"Entrepreneurship, Innovation and Small Business Clustering; the case of Greece"

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Abstract

This thesis explores the interrelations between entrepreneurship, innovation and business clustering as encountered in Europe. This is done by reference to a selected region of Greece. Entrepreneurship is often linked to innovation. Systems of innovation take into consideration organisations, institutions and agents that are all 'co-developed' and 'co-evolved' dynamically in line with the economic, political and social development of a country and/or region. Having structured the conceptual framework, which defines the nature of SMEs, we proceed to explore its most prominent characteristics with particular emphasis to the role played by entrepreneurs, the functions provided by strategic alliances and business networks between firms, and the resources that enhance their innovative capabilities. Furthermore, "clustering" as it affects SMEs productivity, competitiveness and their potential for innovation in conjunction with institutions, authorities, governments and other agents are carefully examined. In attempting to interrelate the concepts of innovation and clustering/networking as they affect SMEs we present a hypothetical, descriptive "*two-dimensional model of innovation and business clustering*". This model examines the innovative performance of SMEs and the extent of their clustering/networking and strategic alliances. This results in four 'illustrative' types of SMEs, namely 'path-breakers', 'collaborators', 'classical-entrepreneurs' and 'survivors'. This model aims to delineate the boundaries of different types of SMEs without presuming to be an all-conclusive typology. These illustrative types are examined by undertaking an empirical study of firms in the IT sector of the region of Thessaloniki-Central Macedonia, in Greece.

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Contents

Introduction

This thesis, as its title indicates, attempts to delve heuristically into existing theoretical and empirical data in order to interconnect the concepts of entrepreneurship, innovation and small business clustering within the framework of contemporary and future business orientations.

In **chapter one**, we explore and delineate concepts of entrepreneurship, innovation and the systems of innovation. We focus our attention on understanding why and how innovation occurs, what is the link between entrepreneurship and innovation and what socio-economic elements influence the process of innovation at the organisational, local, regional and national levels.

In **chapter two**, we define what constitutes SMEs and identify their most prominent characteristics with particular emphasis to the central role of entrepreneurs. We attempt to build a conceptual framework to understand the small and medium-sized enterprises that constitute the backbone of the economies in a majority of countries around the world, including the European Union and Greece. Here we describe the concept of the 'evolution of competition' and how it affects SMEs and the business world in general. Furthermore, we explore the role and importance of business networks and strategic alliances between firms, which seem to strengthen SMEs competitiveness through the sharing of knowledge and resources that can enhance their innovative capabilities.

In **chapter three**, we look at the paradox of 'localisation' and its emerging importance in the era of internationalisation. In this, we define the concept of 'clustering' and its life cycle. We examine the role of SMEs in clusters and how these affect their productivity, competitiveness and potential for innovation. We also investigate the innovation performance of clusters and how innovation can be promoted within regions. We explore the role of institutions, governments and other agents in promoting business clustering, knowledge diffusion, innovation and entrepreneurship. Furthermore, we set up and describe a purposively constructed hypothetical, descriptive two-dimensional model - *"a model of innovation and business clustering"* - to provide four 'illustrative' cases to describe the characteristics, dynamics and performance of SMEs.

In **chapter four**, we present, examine and appraise the socio-economic infrastructure and system of innovation of Greece, and we proceed to delineate and evaluate the socio-economic infrastructure of the prefecture of Thessaloniki in Northern Greece. In doing so, we present and assess the position of Greece against the

other E.U. member states in terms of, for example, the country's innovative potential and capabilities. We present a socio-historical and socio-economic analysis of Greece from the second World War to present times in order to delineate and define those important turning points and features that have operated in placing the country at the bottom of European innovation scoreboards.

In **chapter five,** which constitutes the methodology chapter of the thesis, we present, examine and explain the rationale for selecting the IT business sector of Thessaloniki, Northern Greece to conduct our empirical case studies research and validate our model. We briefly introduce in the realm of qualitative research the approach defined as "case study" which constitutes the main methodological approach of our research. Furthermore, we present in brief how the case studies were conducted in the four selected companies.

Chapter six deals with the first 'illustrative' type of SME to which we assigned the name 'classical entrepreneur'. Techneco Hellas fits the criteria we set for this 'illustrative' SME type. Again based on quantitative and qualitative data gathered through our questionnaires and interviews this company achieves a high performance score on the innovation dimension of our 2-dimensional model, and a very low, virtually non-existent performance score on the networking/clustering dimension. Furthermore, the high performance of the company in the innovation independent variable cannot lead on its own to a high performance/growth of the company. Techneco has a *low* performance/growth rate.

In **chapter seven**, we explore the second 'illustrative' type of SME to which we assigned the name 'path-breaker'. Compucon S.A. fits the criteria we set for this 'illustrative' SME type. As we show throughout this chapter, based on quantitative and qualitative data gathered through our questionnaires and interviews the company achieves high performance scores on both dimensions of the model, namely innovation and networking/clustering. Furthermore, the high performance of the company in the two independent variables leads to a *very high* performance/growth rate of the company.

In **chapter eight**, the third 'illustrative' type of SME to which we assigned the name 'survivor' is explored. Oktabit S.A. fits the criteria we set for this 'illustrative' SME type. The company achieves a very low performance score on the innovation dimension of our 2-dimensional model, and a virtually non-existent performance score on the networking/clustering dimension. Furthermore, the very low performance

of the company on both the innovation and clustering/networking independent variables lead to a *very low* performance/growth rate of the company as we demonstrate in the fifth section of this chapter.

In **chapter nine**, we deal with the fourth 'illustrative' type of SME to which we assigned the name 'collaborator'. Singular Software S.A. fits the criteria we set for this 'illustrative' SME type. Based on quantitative and qualitative data gathered through our questionnaires and interviews the company achieves a low performance score on the innovation dimension of our 2-dimensional model, and a high performance score on the networking/clustering dimension. The high performance of the company in the clustering/networking independent variable leads to a *high* performance/growth rate of the company.

Chapter ten concludes the thesis. We re-state the main objectives of this thesis, present and discuss the main findings from our empirical research by comparing and contrasting the four illustrative types of our hypothetical, descriptive two-dimensional model. Based on these findings we proceed to present some recommendations for future research strategies in the hope that they may serve as guidelines for academic and empirical research, which, in turn, will contribute to the continuing and vibrant SME sector not only in Greece but the European Union as well.

Chapter 1

The concept of entrepreneurship, innovation and systems of innovation

1. Introduction

In the last few decades, it has become universally accepted that innovations of any kind are important sources of productivity growth. There are considered as major means through which not only organisations but also countries can gain and sustain competitive advantage in globally competitive marketplaces. A central theme for the European Union's industrial and enterprise policies, for example, is that, in response to globalisation and the challenges of the knowledge-driven economy, it sets itself the combined goal of strengthening social cohesion and becoming the most competitive and dynamic knowledge-based economy in the world within the next decade. According to the Commission of the European Communities (2000) *Innovation in a Knowledge-driven Economy*, the European Council called for a challenging programme for building knowledge infrastructures, enhancing innovation and economic reform, and modernising social welfare and education systems. The strategy to achieve this was mapped out at Lisbon in the March 2000 conference. An "open method of coordination" was already formulated with the economic convergence of the Member States. Based on this foundation the European Council highlighted the importance of two key messages, namely 'research' and 'innovation' where the Member States have to combine their efforts and devise policies for creating new skills and capacities.

The importance of innovation for an organisation of any kind and for a country as a whole is undisputed in the management literature and the business world of the 21st century. And yet, despite the general consensus of the necessity to invest in innovative practices and processes that will assist companies and countries to be more competitive, innovation, however it is defined, it turns out to be a very complex process. Innovation is dealt in the literature from a variety of different perspectives making it often very unclear for someone to grasp its fundamental nature and gain a clear understanding of what this concept entails.

When management practitioners turn to the literature for advice on how to be innovative in their organisations or when they try to understand the meaning of being innovative and pursue a strategy to promote innovation, they find a variety of different, sometimes contrasting or very vague prescriptions that are often too difficult

to implement in reality. As Wolfe (1994) remarks in his work, "the most consistent theme found in the organisational innovation literature is that its research results have been inconsistent". The levels at which innovation is analysed in the literature and in different research studies conducted all over the world cover the range of national and social systems, international and national economies, industries, organisations, groups and individuals. Authors like Lundvall (1995) and Nelson (1993), for example, deal with innovation as a national and social system affecting the whole economic and social structure of a country. Porter (1990), on the other hand, sees innovation as a determinant of industrial structures, barriers to entrance and competitive advantage. Drucker (1985) talks about innovation as a specific function of entrepreneurship at an individual level while Rosenfeld and Servo (1991) look upon the issue of innovation at an organisational level.

It should, thus, be obvious that different writers and researchers look at the subject of innovation from a variety of perspectives. The aim of this chapter is to investigate and present the major schools of thought on innovation, how entrepreneurship is linked to innovation and the differing definitions that can be encountered, while scanning the pertinent innovation literature and the concept of entrepreneurship. The aim of this chapter, then, is to provide a picture, as clear as possible, of the major approaches to the concept of innovation systems.

Some authors are already characterising the 21st century as the 'innovation century'.

> "…thinkers like MIT's Lester Thurow (1999) and Harvard's David Moss (1996) claim we are now in a Third Industrial Revolution, characterised by rapid advances in robotics, computers, software, biotechnology, new materials and microelectronics…the First Industrial Revolution was the result of steam power. James Watt's steam engine (1769) provided a massive new source of power far beyond existing ones. It radically altered the way people lived and worked. The Second Industrial Revolution was caused by the invention of the dynamo and electricity. Life without electricity is unimaginable – the true acid test of a revolution, compared to a major innovation. The Second Industrial Revolution created large national markets for mass-produced products like automobiles…in the Third Revolution markets are global, rather than national. Nations grow wealthy by successfully competing in world markets…take for

example Singapore. This small nation of only 3.3 million inhabitants, with a land area of a few hundred square miles, has soared from $1,060 per capita GNP in 1970 to $32,810 in 1997 – five doublings of living standards in a single generation (World Bank, 1999)…in the Third Industrial Revolution, small innovative countries flexible enough to reinvent their core activities in line with world demand can grow rich very quickly. In 1980, Singapore made no disk drives. In 1982, it was the world's leading producer of them… Grupp and Maital (2001), argue that just as countries grow rich by innovation, so do companies. In the third industrial revolution, companies that excel in innovation have become phenomenal engines for generating wealth, income and jobs and bring examples of companies like Microsoft, Cisco Systems and General Electric…the authors go on to suggest that it is widely known that on average, fully one-quarter of all corporate profits come from only 10 per cent of companies' products – the innovative 10 per cent. " (Grupp and Maital, 2001, page xiv-xv, introduction)

Drucker (1985) in his work 'Innovation and Entrepreneurship' argues that these two concepts, taken together, are the driving forces of revitalisation in any entrepreneurial society. In his perspective (as well as of other influential scholars) innovation is understood as a process of continuity and transformation-development at the same time. As the author quotes in his work (1985) Tomas Jefferson believes that 'every generation needs a new revolution'. For Drucker, innovation and entrepreneurship tend to be incremental (one product, one policy, one process, one step at a time). They focus upon an opportunity or a need that is temporary and will vanish if it is not realised on time or if it does not succeed. In other words, they are pragmatic and as such can maintain every society, economy, industry, public organisation or private enterprise flexible and self-revitalising. They are the new notion of a 'revolution', which does not end in catastrophe since it is under control and has a positive target and direction.

2. The concept of "entrepreneurship" and "innovation"

Classical economic theory or, as otherwise stated, classical growth theory deals with the functioning of the market as a resource allocation mechanism in which the demand functions interact with the supply functions in order to determine prices that balance and sustain the market equilibrium. According to Parkin (1997), Adam Smith, Thomas Robert Malthus, and David Ricardo, the leading economists of the late eighteenth century and early nineteenth century, postulated this theory. The classical economic theory does not deal with the dynamics of growth; the economy is understood to function according to deterministic laws in which the future is a predictable repetition of the past. It proceeds in a regular manner according to the economic laws of supply and demand, the equivalent of natural laws. Hence, innovation is dealt as nothing more than an unexplained and unexpected shift in the supply function. Within this system, people are conceived to be 'rational individuals' in that they are thought to calculate and predict the economic consequences of every action, choosing those actions that will maximize their individual utilities. Driven by profit and utility maximisation the market functions efficiently to optimise resource allocation. The classical economists of the eighteenth and nineteenth centuries believe that technological change and capital accumulation are the engines of growth. But they also believe that no matter how successful people are in inventing more productive technologies and investing in new capital, they are destined to live at the subsistence level. These classical economists base their conclusion on a belief that productivity growth causes population growth, which in turn, causes productivity to fall. They believe that whenever economic growth raises incomes above the subsistence level, the population will increase. And, they go on to reason, the increase in population brings diminishing returns that lower productivity. As a result, incomes must always fall back to subsistence level. Only when incomes are at the subsistence level is population growth held in check. In such a system the notion of novelty, entrepreneurship and innovation are incompatible (Parkin, 1997).

The neoclassical development of the economic theory continues according to Fonseca (2002), with the framework that innovation is a variable in the supply/ production function of the market equilibrium. Neoclassical growth theory is a theory

of economic growth that explains how saving, investment and economic growth respond to population growth and technological change. This theory was suggested during the 1950s by Robert Solow of MIT, for which he received the Nobel Prize for Economic Science (Parkin, 1997). In neoclassical theory the rate of technological change influences the rate of economic growth, but economic growth does not influence the pace of technological change. Rather technological change is determined by chance. When we are lucky, we have rapid technological change, and when bad luck strikes, the pace of technological advance slows down. But there is nothing we can do to influence its pace. According to Fonseca (2002), innovation is caused by independent variables (exogenous variables) and mechanisms and so rational calculating managers can control it, to a certain extent, but cannot influence its pace. Innovation caused most frequently by technological and less by organisational changes disturbs the market equilibrium, usually by changing the position and shape of the production function and replacing the labour factor of production with the capital factor. Consequently, market forces will react to produce a new equilibrium state. However, technological and organisational innovations are not according to Fonseca explained, in the neoclassical economic theory, but merely are taken as causes embodied in capital assets or knowledge that is necessary to manage capital and labour resources. This way of thinking led neoclassical economists to search for the specific variables and circumstances that trigger innovation to occur and thus help managers to control it. At the level of industry though, innovations are understood as a choice made by organisations on rational grounds in order for them to secure temporary monopoly positions that would maximise their profits. This was based on the thought that since innovations disturbed market equilibrium it could take some time before market mechanisms could react and re-establish the balance between supply and demand. Innovation, thus, becomes a source of, temporarily, at least, monopolist power and more than 'normal' profit. No matter how important innovation came to be in the neoclassical economic theory, it could not, yet, be adequately explained (Fonseca, 2002).

Evolutionary economics, the work attributed to Schumpeter (1942), is one of the first and most influential economic theories to explain innovation and entrepreneurship and to link the two concepts together. The central analytic scheme that pervades all of Schumpeter's work is the evolution of economic systems, or "processes of economic development", as he labelled it. These processes are

inherently dynamic, as opposed to the static structures of the theory of equilibrium, which explicitly or implicitly always has been and still is the centre of traditional theory (Schumpeter, 1934). This does not mean that Schumpeter rejects the theory of equilibrium, but on the contrary, it serves as the underlying base for his dynamic model. This occurs because capitalism is, according to Schumpeter, by nature a form or method of economic change that is never stationary (Schumpeter, 1942).

The fundamental impulse that sets and keeps the capitalist engine in motion comes from the introduction of so-called 'new combinations' (new consumers' goods, new methods of production or transportation, new markets, new forms of industrial organisation) that capitalist enterprise creates (Schumpeter, 1942). Schumpeter argues that the disruptive processes of 'creative destruction', which result in 'new combinations', account for the greater part of economic growth.

Schumpeter's model of economic development is not a substitute for the theory of equilibrium but rather a necessary complement. Without it, it is impossible to understand the functioning of an economic system. But the static description of an economic system – economic life from the standpoint of a 'circular flow' – is an essential building block for the dynamic model, and Schumpeter spends the entire first chapter of his work '*The Theory of Economic Development (1934)*' on it. The essential difference between Schumpeter's evolutionary perspective and that of neo-classical economists, as we described them above, is that Schumpeter treats uncertainty as a key explanation for the patterns of economic development, whereas in the economic theories presented above the notion of uncertainty is wholly absent. Schumpeter is interested in explaining why economic growth occurs, rather than simply ascribing it to unexplained variables. He, thus, places innovation inside the economic system for the first time rather than considering it as an exogenous shock to which economic systems react. Schumpeter is rightly recognised as the founding father of evolutionary economics.

Schumpeter does not deny the existence of autonomous growth in economic systems (for instance, due to a quasi-automatic increase in population and capital). But the fundamental impulse that sets and keeps the capitalist engine in motion comes from new consumers' goods, new methods of production, new markets, and new forms of industrial organisation that capitalist enterprises create:

> "The slow and continuous increase in time of the national supply of productive means and of savings is obviously an important factor in explaining the course of economic history through centuries, but it is completely overshadowed by the fact that development consists primarily in employing existing resources in a different way in doing new things with them irrespective of whether those resources increase or not." (Schumpeter, 1942, p. 64-65)

While consumers' wants are the fundamental force in a theory of circular flow, for a theory of economic change the producers take the leading role:

> "…yet, innovations in the economic system do not as a rule take place in such a way that first new wants arise spontaneously in consumers and then the productive apparatus swings around through their pressure. We do not deny the presence of this nexus. It is, however, the producer who as a rule initiates economic change, and consumers are educated by him if necessary; they are, as it were, taught to want new things, or things which differ in some respect from those they have been in the habit of using." (Schumpeter, 1942, p.65)

Schumpeter already seems to anticipate the importance of the management of niches for the successful introduction of new products and practices. The focus is on the producer and it is here that the '*entrepreneur*' enters the stage. Schumpeter (1942, p. 65) defines production as the combinations or materials and forces that are within our reach. The producer is not an inventor (Schumpeter, 1947). All components that he/she needs for his/her product or service, whether physical or immaterial, already exist and are in most cases also readily available. The basic driving force behind structural economic growth is the introduction of new combinations of materials and forces, not the creation of new possibilities:

> "The new combinations are always present, abundantly accumulated by all sorts of people. Often, they are also generally known and being discussed by scientific or literary writers. In other cases, there is nothing to discover about them, because they are quite obvious…it is this 'doing the thing,' without which possibilities are dead, of which leader's function consists…it is.

therefore, more by will than by intellect that the leaders fulfil their function, more by 'authority', 'personal weight', and so forth than by original ideas. Economic leadership in particular must hence be distinguished from "invention". As long as they are not carried into practise, inventions are economically irrelevant. And to carry any improvement into effect is a task entirely different from the invention of it, and a task, moreover, requiring entirely different kinds of aptitudes…it is, therefore, not advisable, and it may be downright misleading, to stress the element of invention as much as many writers do." (Schumpeter, 1942, p. 88-89)

Innovation in the Schumpeterian sense is then defined by the carrying out of new combinations. This concept covers the following five cases:

i. The introduction of a new good – that is one with which consumers are not familiar yet– or a new quality of a good.
ii. The introduction of a new method of production, that is one not yet tested by experience in the branch of manufacture concerned, which need, by no means, to be founded upon a discovery scientifically new, and can also exist in a new way of handling a commodity commercially.
iii. The opening of a new market, that is a market into which the country in question has not previously entered, whether or not, this market has existed before.
iv. The conquest of a new source of supply of raw materials or half-manufactured goods, again irrespective of whether this source already exists or whether it has first to be created.
v. The carrying out of the new organisation of any industry, like the creation of a monopoly position (for example through trustification) or the breaking up of a monopoly position. (Schumpeter, 1942, p.66)

Schumpeter is realistic enough to see that the carrying out of new combinations involves more than 'an act of will', command over means of production is necessary. In most of the cases, the entrepreneur must resort to credit; especially since most of new venture starts do not have returns from previous production.

Consequently, if someone wants to become an entrepreneur at all, she or he must succeed in raising funds that is in convincing someone to sponsor her/his ideas.

The provision of credit comes from a second hero in the play of economic change, the 'capitalist'. Schumpeter anticipates the rise of the venture capitalists:

> "...Because most of the money that circulates flows in definite established channels, by far the greater part of the funds of the capitalist consists of funds, which are themselves the result of successful innovation and 'entrepreneurial profit'." (Schumpeter, 1942, p.72)

According to Schumpeter (1942), these venture capitalists are entrepreneurs in their own right. First of all, it is they who bear the financial risk (the entrepreneur only risks his reputation). Secondly, because capital is nothing but the diversion of the factors of – established – production to new uses, the venture capitalist needs to be a bold and outspoken person too. He needs to dictate a new direction to production.

The basic structure in Schumpeter's model of economic development has two distinctive spheres in a 'neutral' surrounding environment. On the one hand it is the semi-closed system of the circular flow, which is either in equilibrium or striving for it. On the other hand it is the symbiotic pair of the entrepreneur and the sponsor that is always looking for ways to induce change in the peaceful, yet, boring routine-life of the circular flow. Both spheres function within an endless reservoir of new combinations (e.g., scientific knowledge and technological inventions), but it is only the entrepreneur – backed by the capitalist – who is able to introduce new combinations and new routines in the circular flow. Moreover, Schumpeter uses a definition that strictly separates the two spheres:

> "Everyone is an entrepreneur only when he actually 'carries out new combinations', and loses that character as soon as he has built up his business, when he settles down to running it as other people run their business." (Schumpeter, 1942, p. 78)

A core element of entrepreneurship is the ability to deal with uncertainty. This should be further specified in relation to the dynamic linkage between the two spheres. Once a new introduction gets a foothold in the circular flow, the hitherto

stable data of the system are altered and the equilibrium is upset. Schumpeter (1934) argues that this makes accurate calculation in general impossible, but especially for the planning of new enterprises. Thus, successful entrepreneurs cannot deal very well with uncertainty in the circular flow. What they are relatively good at is in foreseeing what kind of improvement a certain new (but existing and known) combination will bring to the established structure of the circular flow, and in actually realising these improvements.

Schumpeter is not so much interested in the individuality of entrepreneurs and in the concrete factors of change, but in the method by which these work, with the mechanism of change. He sees the 'entrepreneur' merely as the bearer of the mechanism of change (Schumpeter, 1934, p.61). These changes (i.e., the appearance of new markets, new scientific findings) are generated by the evolution of the socio-economic system and would have occurred anyway, but they have to be effectuated by an acting individual: the entrepreneur. Schumpeter's theories are a major contribution to the study of technological change, innovation and entrepreneurship. Furthermore, Schumpeter suggests a strong link of entrepreneurship to innovation as we described it above. It is an abiding perception that when current economic analysis attempts to explain the rationale for developing and/or implementing innovation and the concept of the entrepreneur, the analysis ultimately relies more or less on the original criteria developed by Schumpeter.

The central role that entrepreneurship has on innovation and vice-versa, according to Schumpeter's writings, stimulates us to explore the sociological and cultural factors that affect entrepreneurship by focusing on the historical routes of entrepreneurship and the works of Max Weber T*he Protestant Ethic and the Spirit of Capitalism (1930)* and *Theories of Economic and Social Organisation (1947)*. It should be understood that the depth and scope of Weber's works, and of the research and literature around them are overwhelming to be dealt with, even in a summary form, in this chapter and in this thesis.

In the Middle Ages, Europe's population growth and natural resource endowments, coupled with improved techniques of production, facilitated both the expansion of production and the extension of markets. Thus, by the 14th century, the extension of the market was the primary force leading to the decline of the medieval handicraft system just as the expansion of trade was a primary force in destroying the manorial system two centuries earlier. By the end of the 15th century, only the last

vestiges of rural feudalistic economy remained. Many islands of capitalism flourished in both northern and southern Europe and were on the verge of expanding over European economic life as a whole. Only one essential prerequisite of capitalism was absent: an ethical standard that was compatible with accumulation of capital. (Lehmann and Roth, 1993)

According to Lehmann and Roth (1993), the prevailing ethical standard was negative toward activities aiming to the pursuit and accumulation of wealth. If capitalistic production was to continue its growth, an entirely new ideology was required to give moral sanction to acquisitive behaviour. As the authors argue, the sanction came with the framework of a wholly new intellectual climate, which was to stimulate the birth not only of modern philosophy and the Protestant Reformation, but also of modern science. The authors suggest that while Luther's interpretation of Christian teachings was not particularly sympathetic to industry and trade, the reform movements of John Calvin, John Knox, and the Puritans in the same century (16^{th}) were much more so. Indeed, they adopted such strongly favourable attitudes toward acquisition by useful labour and the judicious and prudent use of wealth that their views have been described as the *Protestant Ethic*, which launched and encouraged the development of capitalism in northern Europe. Max Weber, the German sociologist and economist, in *The Protestant Ethic and the Spirit of Capitalism (1930)*, advanced this thesis in the 19th century.

> "Weber began his essay on *The Protestant Ethic and the Spirit of Capitalism* with the assurance that it was the conventional opinion of his contemporaries that there was a close connection between religion and society. He especially believed that the differences between Protestants and Catholics had a strong impact on social structure and social status; in a society composed of mixed religions, the higher strata, the more advanced and more modern elements, were definitely more Protestant than Catholic: scholars, business leaders, white-collar employees, even skilled workers. The burden of proof was not with those who held this assumption but with those who would deny it." (Lehmann and Roth 1993, p. 73)

According to Max Weber, Protestantism was congenial to the development of personal attributes, which encouraged business activity. In this sense, the Reformation

contributed toward capitalist development and economic thought. Protestantism considers capital acquisition a virtue rather than a sin, and instead of merchants being considered as un-Christian because of their activities for profit, they came to be regarded as pillars of the church and the community. Their pursuit of gain, unrelated to material needs and the virtue of frugality, became as integral a part of the Protestant ethic as the autonomy of the individual. Joined with the notion of the dignity and moral worth of work, Protestant emphasis on frugality served the capitalistic system well, for it stimulated thrift and capital accumulation. (Lehmann and Roth, 1993)

Furthermore, according to Swedberg (1998), Weber in his work of economic sociology compares and contrasts two types of economies: those that are static and aim at rent and wealth and those which are dynamic and aim at profit and capital. In the latter, economy as the author argues the concept of '*opportunity'* ('chance'), is decisive since the profit-making action is in principle a type of action that is oriented towards the exploitation of opportunities in the market. Swedberg notes that Weber presented a very useful typology for different kinds of capitalism: '*rational capitalism'*, '*political capitalism*' and '*traditional commercial capitalism',* in which he defines what he conceives as the entrepreneur,

"The last of these three categories represents a kind of capitalism that has existed very far back in history and which consists of fairly systematic forms of trade and money change. Political capitalism essentially means profit making through political contact or under direct political protection, and it can be found in antiquity as well as in modern world. Rational capitalism is what we today sometimes call free market capitalism. The main actor here is not the typical merchant (as in traditional commercial capitalism) or the political-economic operator (as in political capitalism), but the modern enterprise led by an entrepreneur ('the moving spirit'), and oriented to the exploitation of market opportunities." (Swedberg, 1998, p.13)

At this point, we note that Weber recognises the entrepreneur as a main actor of capitalism and defines him/her as a 'moving spirit' oriented towards market opportunities. This is in line with Schumpeter's arguments that the entrepreneur is a dynamic person or organisation seeking 'new combinations' and market opportunities where others fail to see them.

Furthermore, the collapse of feudal society gave birth to the liberation of the work force permitting the individual labourer to seek employment where wages are higher and simultaneously permitting the individual entrepreneur to abdicate the classical feudal lord's responsibility toward his/her workers. The employee can move freely and the entrepreneur can hire and fire according to the needs of his/her factory. Thus industrial capitalism grew, in addition to the religious spirit, because other changes of sociological nature such as the factory becoming the unit of production, application of science and technology to production and distribution methods and the development of free markets and world trade operating on competitive practices, (Henderson and Parsons, 1965).

At this junction, it behoves us to get a clearer picture of what is entrepreneurship and how it is linked to innovation. As mentioned already, Schumpeter's and Weber's writings define the entrepreneur while the former also links entrepreneurship to innovation. The current definitions rely to a lesser or greater extent at the description and criteria that Joseph A. Schumpeter set on his work back in the 1930s about innovation and entrepreneurship as described earlier in this chapter. The following table provides a short selection of definitions of entrepreneurship, as adapted from Dollinger (1999):

Definitions of Entrepreneurship

Source	*Definition*
Knight (1921)	Profits from bearing uncertainty and risk
Schumpeter (1934)	Carrying out new combinations – new products, new services, new sources of raw material, new methods of production, new markets, new forms of organisation
Hoselitz (1952)	Uncertainty bearing…coordination of productive resources…introduction of innovations and the provision of capital
Cole (1959)	Purposeful activity to initiate and develop a profit-oriented business
McClelland (1961)	Moderate risk taking
Casson (1982)	Decisions and judgments about the coordination of scarce resources
Gartner (1985)	Creation of new organisations
Stevenson, Roberts & Grousbeck (1989)	The pursuit of opportunity without regard to resources currently controlled

Table 1, Source: Dollinger, M. J. (1999, p. 4)

Thus according to Dollinger (1999):

"Entrepreneurship is the creation of innovative economic organisation (or network of organisations) for the purpose of gain or growth under conditions of risk and uncertainty." (Dollinger, 1999, p. 4)

As Dollinger argues the term economic organisation refers to an organisation whose purpose is to allocate scarce resources. This can be a new venture/firm, a business unit within a firm, a network of independent organisations, or not-for-profit organisation. The term creation encompasses according to Dollinger the categories of 'new combinations' that Schumpeter suggested as given in the table above, new product, new service, new sources of raw materials, etc. Finally entrepreneurship exists under conditions of risk and uncertainty. Risk refers to the variability of outcomes and/ or returns while uncertainty refers to the fact that the environment around the entrepreneur, society, economy and organisations cannot be perfectly known. Hence entrepreneurs rely on their understanding of the causes and effects in their environment and have confidence in their estimates on how the world works. Moreover, according to Dollinger (1999), two conditions must exist in order for entrepreneurship to flourish,

> "First, there must be freedom: freedom to establish an economic venture, and freedom to be creative and innovative with that enterprise. Second, there must be prosperity: favourable economic conditions that give entrepreneurial organisation the opportunity to gain and grow." (Dollinger, 1999, p. 6)

Again entrepreneurship is linked to innovation, but as Weber stated in his work on the Protestant Ethic, the surrounding environment of businesses, namely the social and economic conditions of a particular region or country will affect both entrepreneurship and innovation. These relations are explored later in this chapter under the heading of 'systems of innovation.' It is important to add here the note that Schumpeter in his 1949 work, *Economic History and the Entrepreneurial History*, explicitly recognises the rise of what he sees as collective entrepreneurship, adding to another dimension of entrepreneurship as an act not of one individual but of a group of people.

"...The entrepreneurial function needs not to be embodied in...a single physical person. Every social environment has its own ways of filing the entrepreneurial function...it may be and often is filled cooperatively. With the development of the large-scale corporations this has evidently become of major importance: aptitudes that no single individual combines can, thus, be built into a corporate personality; on the other hand, the constituent physical personalities must inevitably to some extent, and very often to a serious extent, interfere with each other." (Schumpeter, 1949, p. 260-261)

Summing up what we have already examined, we could argue that entrepreneurs, young or older people; women; ethnic/ national minorities; creative individuals, and others, start their own business ventures, due to 'push' and 'pull' factors and increasingly due to the cultural changes of the Information Age. Social and cultural reasons explain according to Weber (1930), Scase (2002), and others why some categories of people are more entrepreneurial than others. Although we are tracing a link between entrepreneurship and innovation, this does not assume that innovations only result from entrepreneurs. Schumpeter, and many of the writers and researchers presented in table 1, earlier, argues that entrepreneurs are the creators of 'new combinations'. The definitions of entrepreneurship, as we have presented them above, explicitly or implicitly encompass the notion of innovation.

The link between entrepreneurship and innovation emerges from the influential writings of Drucker (1985). He argues that innovation is the specific function of entrepreneurship. It is the means by which the entrepreneur either creates new wealth-producing resources or endows existing resources with enhanced potential for creating new wealth. Drucker argues that innovation can be presented as a methodology, it can be taught and it can be applied. The entrepreneur must purposefully and systematically search the sources of innovation, the changes and the indications that create opportunities for a successful innovation. For him, the entrepreneur must know and apply the 'principles' of successful innovation. What all the successful entrepreneurs have in common is not a certain kind of personality rather than a commitment to the systematic practice of innovation (Drucker, 1985).

In his work "Innovation and Entrepreneurship", Drucker (1985) attempts to explain how he understands the concept of entrepreneurship since he believes that there is a great confusion around the proper definition of the term. He argues that

some researchers use the term to describe either small businesses or new businesses. In practice, however, a great deal of well established large companies engage in successful entrepreneurship and he gives examples such as the McDonalds Company and the General Electric Corporation amongst others. For Drucker, companies that engage in successful entrepreneurship share some common characteristics, far from only being small or new. The term of entrepreneurship, then, refers not to an enterprise's size or age but to a certain kind of activity. Entrepreneurship is a special characteristic of an individual or an organisation. Innovation is at the heart of entrepreneurship; the effort to create purposeful, focused change in an enterprise's economic or social potential (Drucker, 1985). As we have seen Schumpeter in his 1949 work anticipated and identified the rise of collective entrepreneurship.

Drucker argues that entrepreneurs innovate and that innovation is the specific function of entrepreneurship. It is the activity that endows existing or new resources with the potential for creating new wealth. Innovation creates new wealth. All the resources in nature remain potential creators of new wealth until someone has the ability to endow to the resources the potential to create new wealth. Whatever changes the nature of the existing resources in order to gain financial advantages from, it is an innovation. Drucker argues that we are not in a position to develop a comprehensive and adequate theory on innovation, but rather understand the practice of innovation. We have the knowledge to identify when, where and how we should systematically search for innovative opportunities and how we should estimate their potential success or failure. At this point, and in addition to explaining the notion of innovation and entrepreneurship, we present Drucker's views and suggestions of where innovative opportunities exist and what are the principles of innovation. So, from an abstract and theoretical analysis of entrepreneurship and innovation we move to a closer examination of how innovation is dealt in the business-world.

Most innovations result from a conscious, purposeful search for innovation opportunities. More specifically, Drucker (1985) identifies seven sources of innovation opportunities. The first four are areas of opportunities existing within a company or an industry and as such should become 'visible' mainly to the people that work in the specific company or industry in general. Three additional sources of opportunities exist outside a company in its social and intellectual environment. The first area of opportunity is the u*nexpected occurrences* (Drucker, 1985, p. 53). It is the easiest and simplest form of innovation opportunity. He argues that unexpected

successes, unexpected failures or unexpected events are productive sources of innovation opportunities. The second area of opportunity is *incongruities* (Drucker, 1985, p. 75). An incongruity within the logic or rhythm of a process is a possibility out of which innovation opportunities may arise. Another source is incongruity between economic realities. An incongruity between expectations and results can also open up possibilities for innovation. A third area of opportunity is *process needs* (Drucker, 1985, p. 88-90). In contrast to the innovation based on unexpected occurrences or incongruities, process needs is very specific and starts with exploiting a need. For example, around 1909 a statistician at AT&T projected that with the telephone traffic in about 15 years every single female in the USA would have to work as a switchboard operator. The process need was obvious and within two years the company developed and installed the automatic switchboard. And the fourth and final area of opportunity that exists within a company is *industry and market changes* (Drucker, 1985, p. 96-97). Managers and businessman often tend to believe that industry and market structures are stable, but they can - and often do - change overnight. Such changes create tremendous opportunity for innovation.

The three additional sources of opportunities exist outside the company in its social and intellectual environment. Of the outside sources of innovation, *demographic changes* are the most reliable (Drucker, 1985, p. 110). Demographic events have known lead times, but, yet, policymakers often neglect them. The changes in the numbers of people, age distribution, education, occupations and geographic location may open up innovative opportunities, which are highly rewarding and yet least risky among a variety of entrepreneurial pursuits. Another opportunity arises from c*hanges in perception* (Drucker, 1985, p. 122). 'The glass is half-full' and 'the glass is half-empty' are descriptions of the same picture of reality, but have vastly different meanings. Changing a manager's perception of a glass from half-empty to half-full may open up tremendous innovation opportunities. And the last but not least opportunity is *new knowledge* (Drucker, 1985, p. 131). Among history-making innovations, those based on new knowledge, whether scientific, technological or social, rank high. They are the superstars of entrepreneurship; they get the publicity, the money and the fame. They are what people usually mean when they talk about innovation. Knowledge-based innovations differ from all other innovations in their basic characteristics: lead times are longer, failure rates are higher, they are difficult to predict and pose greater challenges to entrepreneurs.

Drucker identifies certain principles of innovation. He argues that purposeful innovation begins with the analysis of the sources of new opportunities, as these are presented and analysed above. He also suggests that innovation has to be simple and focused. The innovation has to do only one thing in order to work properly and efficiently. The more complex the innovation the greater the number of problems and unexpected failures that will have to be dealt with. According to Drucker (1985) the best award any innovation can get is to make other people say: "This is so obvious, why haven't I ever though of that". Even in the case that an innovation introduces a new product/ service or opens up a new market it has to be focused on one specific market segment and address one specific need.

Moreover, according to the author, effective innovations start small. They are not grandiose. They try to do one specific thing. A simple innovation that gave the Swedish industry of lighting matches virtually a global monopoly for over half a century was the filling of the same number of lighting matches in every matchbox; an innovation that allowed the automation of the production line. Drucker (1985) suggests that the ostentatious ideas that aim to create a 'revolution in an industrial segment' will most likely fail. It is better according to the author for an innovation to start as a small-scale project, involving few R&D personnel, a modest budget and to aim for a niche market. The company can alter this way in course of time, any of the 'ingredients' for the innovation to succeed and most importantly to avoid a failure that would have cost dearly to the organisation in human and capital investment.

Furthermore, an innovation should aim at becoming the standard setter, stay ahead of the pack. As Drucker (1985) argues, an innovation should not target to evolve into a 'big business'. Nobody really knows or can predict if and when an innovation will result in a large enterprise or a mediocre business. What is important for the entrepreneur is to aim through his/her innovations at becoming the standard setter, either by dominating gradually a whole industry, as Intel Corporation did in the IT market, or dominate a 'privilege' niche market like Ferrari is in sports cars.

Above all, innovation is work rather than genius. It requires knowledge, hard, focused and purposeful work. As the author explains, most of the time, innovators focus on one specific segment. Thomas Edison, for example, was indisputably an innovator and a great scientist, who focused all his efforts and talents in the field of electricity. As with any job, entrepreneurship and innovation require, for Drucker,

talent and creativity but most importantly they require hard and focused efforts, diligence, persistence and commitment to the work.

Drucker's analysis is used in this chapter as the foundation in understanding innovation and entrepreneurship in the real business world, with examples of where to search for innovative opportunities and how to establish a strategy for innovation. Above all, entrepreneurs, whether individuals starting their own businesses or entrepreneurial organisations that want to continue to thrive, they see or at least they should see innovation as a strategy, an ongoing process that will bring profits and a competitive advantage to the company. We will now concentrate on the work of Michael Porter, who is one of the first scholars to recognise the competitive advantage that innovations bring to the company and to a nation, and how they should be mastered.

This section aims to strengthen our understanding of the concept of innovation by presenting a list of the most typical causes of innovations. In his work "the competitive advantage of nations", Porter develops a theory about why nations succeed in particular industries, and the implications of his theory for firms and national economies. His ideas and concepts are also applicable to political or geographical units smaller than a nation. He is interested in explaining how a firm's proximate 'environment' shapes its competitive success over time and why some organisations prosper while others fail. Porter (1990) argues that firms will not ultimately succeed unless they base their strategies on improvement and innovation, an eagerness to compete and a thorough understanding of their national environment and ways to improve it. In a previous work, "competitive advantage, creating and sustaining superior performance", Porter has defined what he understands as competitive advantage,

> "Competitive advantage is about how a firm actually puts the generic strategies into practice. How does a firm gain a sustainable cost advantage? How can it differentiate itself from competitors? How does a firm choose a segment so that competitive advantage can grow out of a focus strategy? When and how can a firm gain competitive advantage from competing with a coordinated strategy in related industries? How is uncertainty introduced into the pursuit of competitive advantage? How can a firm defend its competitive position?" (Porter, M.E., 1985, p. xvi, 'preface')

For Porter (1990), firms create and sustain competitive advantage by perceiving or discovering new and better ways to compete in an industry and bringing them to market, which is ultimately an act of innovation. Porter sees innovation in very broad terms and as inherent to the firm's strategic and competitive context.

> "…Innovation includes not only new technologies but also new methods or ways of doing things, that sometimes appear quite mundane. Innovation can be manifested in a new product design, a new production process, a new approach to marketing or a new way of training and organising. It can involve virtually any activity in the values chain…"(Porter, 1990, p.579)

For Porter, much of innovation is not radical but rather cumulative and incremental, consisting of small insights and advances rather than on radical technological or other kind of breakthroughs. He argues that innovation is as much a result of organisational learning as it is of formal research and development activities. It also requires investment in developing skills and knowledge. Porter explains the importance of innovation in creating a competitive advantage for the firm. Innovative opportunities usually grow out of some discontinuity or change in industry structure that could ultimately give a competitive advantage in the company that can see and grasp the opportunity. According to Porter (1990), the five most typical causes of innovations that shift competitive advantage are the following:

1. *New technologies*. Technological change creates new products, new possibilities for the design of an existing product, new ways of marketing, delivering and the supplementary services provided, even new industries. For the author, it is the most common originator of strategic innovation.
2. *New or shifting buyer needs*. When people change priorities or develop new needs an innovative opportunity is created that could lead to a competitive advantage for the company that can respond to these changes.
3. *The emergence of a new industry segment*. Another opportunity to create a competitive advantage is when a new segment in an industry emerges or when several existing segments are regrouped. This could lead to new customers, new ways of marketing and reaching particular customers and new ways of producing particular products.

4. *Shifting input costs or availability*. Competitive advantages often are the results of changes in the costs of inputs such as, labour, raw materials, energy, transportation, machinery, etc. Such changes can shift the competitive advantage to companies that were able to optimise their organising and managing processes according to the new conditions.
5. *Changes in government regulations*. Other stimuli to innovation, which ultimately can result to competitive advantage, are the changes in government regulations in areas such as product standards, environmental rules, barriers to entry, restrictions of trade, etc. Small or early mover companies that are quick to adjust to such changes can gain an advantage against established industrial companies that have built their businesses around certain regulatory regimes.

(Porter, 1990, p. 45-47)

Porter (1990) also presents the significant role of information in the innovation process. Sometimes, it can be the result of sheer R&D investment or market research, but quite often it is just unconventional wisdom, simply looking in the right place at the right time. Innovation for Porter is, with few exceptions, the result of unusual effort. Companies that innovate are frequently not large or established companies, but rather new early movers or small companies. In his research, he discovers that where the innovators are large firms, they are often new entrants to the industry from an established position in another industry. The innovative firm is the one that pursues doggedly innovation in its strategy. For Porter innovation is a means for the company of gaining and sustaining a competitive advantage. It should be inherent to a company's strategy and competitive context.

The following section of this chapter deals with the concept of the systems of innovation. The analysis starts with an investigation of the historical roots of the innovation system and then goes on defining and presenting the characteristics of innovation systems.

3. The concept of "systems of innovation"

The concept of the 'systems of innovation' is a new approach to the study of innovation that has emerged during the past couple of decades starting mainly with the influential writings of Lundvall (1992) and Nelson (1993). In this period the development of national innovations systems has become the objective of many countries trying to strengthen their industrial and economic performance. The approach of innovation as a 'system' is based on the idea that innovation processes occur over time and are influenced by many factors. The concept of innovation systems conveys the idea that innovations do not originate as isolated, discrete phenomena within a firm, but are generated by means of interaction of a number of entities, actors and agents. The approach seems to be very attractive to policy-makers of national economies and international organizations like the Commission of the European Communities as we briefly mentioned in the introductory sector of this chapter. According to Edquist (1997), the 'systems of innovation' approach is considered, nowadays, to be a useful and promising analytical tool for better understanding the innovation process as well as the production and diffusion of knowledge in the economy. He argues that it is also highly useful and relevant from an innovation policy-making point of view.

Hence, while the first part of this chapter explores the concept of innovation and entrepreneurship and the link between the two concepts the second part investigates the concept of the systems of innovation. As we will see, innovation systems can be national, regional or local. They are shaped by the specific and characteristic economic and social conditions and factors of a country. In understanding the competitiveness of a country and the competitive advantages of businesses and business sectors of a country we need to explore the concept of a system of innovation. Important factors such as institutions, authorities and governments at local, regional, and national level may affect the businesses performance and innovative capabilities. The overall aim of this thesis is to investigate entrepreneurship, innovation and small business clustering, and therefore we begin this section by exploring the historical roots of innovation systems, as put forward by Karl Marx and Max Weber.

Although the terminology 'innovation systems or national innovation systems' is only a couple of decades old, if we were to delve into the theoretical positions and the writings of such seminal classical economists-sociologists as Karl Marx and Max Weber we could rather readily trace the historic roots of these concepts of innovation systems in their thought. Under careful scholarly scrutiny, it emerges that these scholars were pioneers in explaining the dynamics of the correlating nature between sociological and economic phenomena and in providing a heuristic sociological prism in investigating the evolution of modern economies through a historic perspective.

In the middle of the 19th century, Karl Marx formulated a 'theory of history', which subsequently became an important influence on the work of other social theorists, and, according to some writers, a central force behind the rise of the social sciences themselves. His theory put forth the principles on which the relations between different forms of social, economic, political, and cultural activities are based. More importantly, Marx proclaimed to have located the motive force lying behind social transformations of central importance in world history. Marx defines economics as the science which studies how historically specific systems of economic relations originate, operate and change. He does not make a sharp distinction between sociology and economics and as a matter of fact is the first scholar to exhibit social qualities in theoretical economics. According to Karl Marx,

> "...neither legal relations nor political forms could be comprehended whether by themselves or on the basis of a so-called development of the human mind, but on the contrary they originate in the material conditions of life, the totality of which Hegel...embraces within the term 'civil society'; that the anatomy of this civil society, however, has to be sought in political economy. In the social production of their existence, men inevitably enter into definite relations, who are independent of their will, namely relations of production appropriate to a given stage in the development of their material forces of production. The totality of these relations of production constitutes the economic structure of society, the real foundation, on which arises a legal and political superstructure and to which correspond definite forms of social consciousness. The mode of production of material life conditions the general process of social, political and intellectual life. It is not the consciousness of men that determines their existence, but their social existence that determines their

consciousness. At a certain stage of development, the material productive forces of society come into conflict with the existing relations of production or with the property relations within the framework of which they have operated hitherto. From forms of development of the productive forces these relations turn into their fetters. Then begins an era of social revolution. The changes in the economic foundation lead sooner or later to the transformation of the whole immense superstructure. In studying such transformations, it is always necessary to distinguish between the material transformation of economic conditions of production, which can be determined with the precision of natural science, and the legal, political, religious, artistic or philosophic – in short, ideological forms in which men become conscious of this conflict and fight it out…no social order is ever destroyed before all the productive forces for which it is sufficient have been developed, and new superior relations of production never replace older ones before the material conditions for their existence have matured within the framework of the old society. In broad outline, the Asiatic, ancient, feudal and modern bourgeois modes of production may be designated as epochs marking progress in the economic development of society. The bourgeois mode of production is the last antagonistic form of the social process of production…but the productive forces developing within bourgeois society create also material conditions for a solution of this antagonism." (Marx, 1971, p. 20-22)

According to Howard and King (1985), Marx's Critique of Political Economy stresses the pre-eminence of the 'economic structure' in explaining all other aspects of a society, including the prevailing 'forms of social consciousness'. The authors argue that Marx's explanations of all economic phenomena (methods of resource allocation, the distribution of income, labour division, dynamic laws of economic development) are based upon the historically specific social relations of the relevant mode of production and are what they are because of the nature of the relations between economic agents (Howard and King, 1985, p. 42), "When these relations change so do the economic laws to which they give rise."

Some decades later, in the beginning of the 20th century, Max Weber was one of the German economic historians and sociologists, who attempted to trace the distinctive features of the capitalist social and economic order. The basic idea behind

Weber's concept of 'social economics' is that not one but several of the social sciences are needed in order to effectively analyse economic phenomena. According to Weber, in the economic theory, material interests exclusively drive the actor but his/her behaviour is not necessarily oriented to the behaviour of other actors; traditions and emotions play no role either. The only types of actions that are analysed in economic theory are consequently those that are purely economic, the relationships of the economy to the politics, to law, to religion, et al are ignored. We can summarise Weber's position in the following words, economic sociology as opposed to economic theory, takes the social structure into account and also looks at the impact of traditions and emotions on economic actions. It furthermore, looks, at economically relevant phenomena as well as economically conditioned phenomena, not just at economic phenomena. According to *The Theory of Social and Economic Organisation (1947)*,

> "Weber begins the chapter by stating emphatically that what he is about to present is not in any sense 'economic theory'…what he presents is rather an account of the social, or perhaps better the institutional, structure of systems of economic activity and above all the ranges of variation to which this structure is subject…two deep underlying convictions dominate his work…the first is the conviction of the fundamental variability of social institutions. To him, the institutional system of the modern Western World is not a 'natural order'…but only one of several possible lines of social development. Other radically different structures, such as those found in the great oriental civilisations, are not 'arrested stages' in a development leading in the same direction, but are simply different…the second closely related convictions is that of inherent instability of social structures. For Weber, human society and underlying that, the situation of human action and the character of humanly possible responses to that situation, are shot through with deep-seated tensions which make the maintenance of any given state of affairs precarious." (Henderson and Parsons (eds), 1965, p. 31-32)

As should be understood by the brief look at Marx and Weber's thought presented above, innovation processes are influenced by many factors; they occur in interaction between institutional and organisational elements, which together may be called 'systems of innovation'. Thus, if we want to describe, understand, explain and

even perhaps influence processes of innovation, we must take all important factors shaping and influencing innovations into account. As we will see in the following pages in the process of innovation firms interact with other organisations, such as other firms but also universities, research institutes, investment banks, schools, government ministries, etc. Furthermore, social patterns and social institutions, not necessarily economic in their nature may operate positively or negatively giving rise to constraints and/or incentives for innovation; these can be laws, health regulations, cultural norms, social rules and technical standards which also shape the behaviour of firms. Interaction and relations between the various agents, institutions and actors shape the system of innovation.

At the core of modern thinking about innovation processes, scholars attempt to describe, explain, understand and potentially influence the structure and dynamics of the 'systems of innovations'. It is the new approach for the study of innovation in the economy, as mentioned earlier, which argues that innovation processes are influenced by many factors and the interactions between those factors.

According to Lundvall (1992) one of the first and very broad definitions of what constitutes a system is given by Boulding (1985) 'anything that is not chaos'. Lundvall suggests that a system is composed by a number of elements and the relationships between these elements. In his theory, the starting point is that innovation is a ubiquitous phenomenon in the modern economy. Whichever part of an economy we look at we will always find an ongoing process of learning, searching and exploring that ultimately results in new markets, products, and forms of organising as well as new techniques (Lundvall, 1992). Hence,

> "…a system of innovation is constituted by elements and relationships which interact in the production, diffusion and use of new, and economically useful, knowledge and that a national system encompasses elements and relationships, either located within or rooted inside the border of a nation state…it is a social system where learning is the central activity and also a social activity…it is also a dynamic system characterised both by feedback and reproduction…"(Lundvall, 1995, p. 2)

He, then, proceeds to a more detailed definition by making a distinction between the narrow sense and the broad sense of a 'system of innovation',

> "...the narrow definition would include organisations and institutions involved in searching and exploring – such as R&D departments, technological institutes and universities. The broad definition...includes all parts and aspects of the economic structure and the institutional set-up affecting learning as well as searching and exploring – the production system, the marketing system and the system of finance present themselves as sub-systems in which learning takes place...determining in detail which sub-systems and social institutions should be included, or excluded in the analysis of the system is a task involving historical analysis as well as theoretical considerations...a definition of the system of innovation must, to a certain degree, be kept open and flexible regarding which sub-systems should be included and which processes should be studied." (Lundvall, 1995, p.12-13)

It becomes clear that in order to study innovation within a business, clusters of businesses, regions, nations, or other geographic or economic units, we need to look at several different aspects of the economic and social environment that affect directly or indirectly entrepreneurship and innovation. How knowledge is diffused in the economic system, how local institutions, agents and governments shape and affect the environment of the business has a deterministic effect to the competitive advantage of the businesses and their potentials.

In the introductory chapter by Nelson and Rosenberg's (1993) in Nelson's book on "National Innovation Systems, a comparative analysis (1993)" the authors produce no explicit definition of a 'system of innovation'. Nelson's book is a comparative study examining 15 countries on the similarities and differences of their institutions, mechanisms and general factors that support and shape technical innovation. Nelson and Rosenberg explore the 'national system of innovation' by discussing individually and in detail the three terms – innovation, national and system – that comprise the concept.

As far as innovation is concerned, Nelson and Rosenberg treat the term rather broadly. For them, 'innovation' as a concept covers the processes by which firms master and get into practice product designs and manufacturing processes that are new to them, if not to the universe or even to the nation (Nelson and Rosenberg, 1993, p.

4). For Nelson and Rosenberg the 'system' is neither created nor developed. In their own words,

> "...the concept is of a set of institutions whose interactions determine the innovative performance...of national firms. There is no presumption that the system was, in some sense, consciously designed, or even that the set of institutions involved works together smoothly and coherently. Rather, the "systems" concept is that of a set of institutional actors that, together, play the major role in influencing innovative performance. The broad concept of innovation that we have adopted has forced us to consider much broader than simply the actors doing research and development. Indeed, a problem with the broader definition of innovation is that it provides no sharp guide to just what should be included in the innovation system, and what can be left out."(Nelson and Rosenberg, 1993, p. 4-5)

For the authors, the 'system' of innovation is not consciously designed and the term 'innovation' is broadly defined. The final component in the national systems of innovation concept for Nelson and Rosenberg is the notion of 'national'. What the authors implicitly argue is more for a sectoral approach on the concept of 'systems of innovation' rather than a national approach,

> "On the one hand, the concept may be too broad. The system of institutions supporting technical innovation in one field, say pharmaceuticals, may have very little overlap with the system of institutions supporting innovations in another field, say aircraft. On the other hand, in many fields of technology, including both pharmaceuticals and aircraft, a number of the institutions are or act transnational. Indeed, for many of the participants in this study, one of the key interests was in exploring whether, and if so, in what ways the concept of "national" systems made any sense today. National governments act as if it did. However, that presumption, and the reality, may not be aligned." (Nelson and Rosenberg, 1993, p. 5)

Another approach to the concept of systems of innovation is proposed by Edquist (1997), who argues in his work that innovations are the most important source

of productivity growth and increased material welfare as well as a major cause for the destruction of old jobs and the creation of new employment. For Edquist innovation processes occur over time and are influenced by a variety of interdependent and interactive factors. Firms rarely innovate in isolation, rather in their pursuit of innovativeness they interact with other organisations to exchange, develop and gain knowledge, information and other resources. Organisations can be other firms such as suppliers, customers, competitors or universities, research laboratories, financial institutions and banks, government institutions, etc. Largely institutions also shape the behaviour of firms. According to the author, institutions constitute laws, technical standards, and incentives for innovation, health regulations, cultural norms and constraints. The various actors and organisations that operate under certain institutional contexts are the elements of the 'system' that creates and uses knowledge for economic purposes, while innovation emerges in such a system. (Edquist, 1997)

Attempting to define the national innovation system in his work, "Systems of innovation, technologies, institutions and organisations", Edquist follows the path of Nelson and Rosenberg, defining separately the three terms that comprise the concept, namely, 'national', 'innovation', 'systems'.

Starting with the term 'innovation' Edquist (1997) argues that different authors who adopt the system of innovation mean different things by the term innovation. For him, there is not a bad or good, a useful or not useful definition of innovation. He argues that when one is interested in examining the systems of innovation he must make explicit at the outset if one is interested in technological process innovations, organisational innovations, product innovations, institutional and organisational change a combination of some of them or in all of them. Accordingly, the conceptual tools that he/she will use for his approach to 'systems of innovation' will be influenced by his decision.

The notion of 'national' system of innovation for Edquist should be discussed in conjunction with 'regional' and sectoral'. Edquist seems to reject the term 'national', in line with the writings of Nelson and Rosenberg. Systems of innovation other than national can and should be identified and studied,

> "...an innovation system can be 'supranational' in several senses; it can be truly global, or it can include only a part of the world (e.g., an integrated Europe). It can also be 'regional' within a country, an example being the

Silicon Valley area in California...an innovation system can also be supranational and regional within a country at the same time, as are part of Germany, France, and the UK...we can distinguish between a supranational system at the European Union level, the national level, and the regional/local level...leaving the geographical dimension, we can talk about the 'sectoral' systems of innovation (i.e., systems that include only a part of a regional, a national, or an international system)...'sectoral' is determined by generic technologies, which can be, but are not necessarily restricted to one industrial branch..."(Edquist, 1997, p. 11)

The system of innovation, according to Edquist (1997), can be supranational, national, regional and local and at the same time sectoral within any of the previous geographic demarcations. The author identifies several potential combinations and argues once more that the final choice of definition relies on the object of the particular study. He goes on to suggest that the approaches given complement rather than excluding each other. Having provided definitions of the terms 'national' and 'innovation', Edquist considers increasingly important the provision of a definition for the third concept, that of the 'system'. He argues that the approaches of Lundvall (1995) and Nelson and Rosenberg (1993) are vague in specifying the boundaries of the system, and thus proposes the following definition,

"One way of specifying the 'system' is to include in it all important economic, social, political, organisational, institutional, and other factors that influence the development, diffusion and use of innovations...provided that the innovation concept has been specified, the crucial issue then becomes one of identifying all those important factors...admittedly, this is not as easy in practice as in principle. We simply do not know in detail what all the determinants of innovation are particularly not for all types of innovations...in spite of that fact...for the time being...we will specify the 'system' as including all-important determinants of innovation. An advantage of this definition is that it is open in the sense that it does not *a priori* exclude any determinants. A disadvantage is that it is unspecific..."(Edquist, 1997, p. 14-15)

4. Characteristics of "systems of innovation"

Having defined the 'systems of innovation' concept the next step is to identify the factors (elsewhere stated as determinants or elements) that constitute the systems of innovation approaches. It should be noted that different scholars assign greater or lesser importance to the various characteristic elements of the systems. In this section an attempt is made to list and explore in some detail the characteristics that the various systems of innovation approaches have in common.

Despite the somewhat different interpretations of innovation given by the various scholars, they all appear to place innovation at the very centre of their focus. They see innovation as a matter of producing new knowledge or combining existing knowledge in new forms and then transforming it into products or processes that have some economic significance. According to Lundvall (1995), learning is the central activity in the system and it is fundamental to the process of innovation. A feature of modern economies is that they seem to develop their mechanisms and capabilities to learn. Basic and applied research is increasingly institutionalised and wedded to science through Research and Development departments, public and private research laboratories and institutes and universities (Johnson, 1995). Furthermore, Johnson argues that economic activities are explicitly aiming at increased knowledge in order to stimulate innovation and he sees the economy as a process of communication and cumulative causation where learning can be conceptualised as the source of innovation.

For Lundvall, many different actors and agents are involved in the learning processes and the everyday experiences in the activities of engineers, sales representatives, and other employees,

> "Such activities involve learning-by-doing, increasing the efficiency of production operations (Arrows, 1962), learning-by-using, increasing the efficiency of the use of complex systems (Rosenberg, 1982), and learning-by-interacting, involving users and producers in an interaction resulting in product innovations (Lundvall, 1988)" (Lundvall, 1995, p. 9)

Edquist (1997) argues that we are currently experiencing the 'knowledge based economy' and the 'learning economy'. For him, it is of vital importance to analyse the knowledge and learning aspects of the system of innovation, including the formal R&D systems, the education and the training system, as well as other processes of learning that are inherent in routine economic activities.

Furthermore, the systems of innovation can be characterised as 'holistic' in the sense that contrary to the theories of innovation that we examined in the first part of this chapter this approach tries to encompass a wide variety, if not all, the determinants that are important to the process of innovation. Furthermore, this approach investigates innovation in an international, national, regional, local or sectoral context.

According to Edquist (1997), for example, the traditional OECD approach to measure innovation was to measure technical change and innovation based on the kind of data collected on R&D and technical change. The approach used a much narrow insight to the R&D systems by focusing mainly on resource inputs such as money and personnel in the R&D system. As the author argues, one reason why the systems of innovation approach goes beyond this limited scope is that innovation processes are also developed outside the formal R&D department through, for example, learning-by-doing, learning-by-using, knowledge diffusion, etc. Furthermore, as we saw in the first part of this chapter sociological factors, as well as a variety of other factors affect the process of innovation and these can all be included in a 'system of innovation' approach.

As Edquist (1997) suggests the systems of innovation is an interdisciplinary approach, and could be best labelled a 'political-economic' approach; for not only economic factors that affect innovation are encompassed in the systems approach, but also organisational, institutional, social and political factors. In his own words,

> "...the system of innovation should be looked upon as a 'whole' because many of its elements are – more or less closely – related to each other. Otherwise, there would be no 'system'. But is also sometimes necessary to deal only with parts of the system – one at a time or a few in relation to each other." (Edquist, 1997, p. 18)

The systems of innovation develop over time and so do institutions and organisations within a nation. Nelson (1993) in his work 'national innovation systems, a comparative analysis', as mentioned above, tries to describe, analyse, compare and understand the similarities and differences across 15 countries in their innovation systems. He begins each case study by a close examination of the historical background of each country. The economic history of each country is carefully delineated from the industrial revolution, to the period between the two World Wars, and the post-World War II era. Nelson (1993) argues that the historical dimension should be stressed in a national innovation system since it is highly influential in determining and understanding the direction and processes of innovation.

Edquist and Lundvall (1993) in their comparative study of the Danish and Swedish systems of innovation argue that,

> "…The Danish and the Swedish systems of innovation have quite different characteristics. It is argued that these characteristics are embedded in the economic structure and in the socio-institutional set-up and that they have strong and deep roots in the economic history of the two countries."(Edquist and Lundvall, 1993, p. 265)

Edquist (1997) suggests that anchor to the analysis of a system of innovation should be the historical perspective of the nation. He argues that it is an advantage when studying the processes of innovation since innovations develop over time. Edquist believes that in their development they are affected by many factors, such as organisations, institutions and other agents that are all 'co-developed' and 'co-evolved' dynamically in line with the economic, political and social development of the country.

As Nelson (1993) explores and describes in his work, the national innovation systems between countries can be quite different. Edquist (1997) goes on one step further to suggest in line with Porter (1990) that differences exist not only between countries but also between the regional, local and sectoral systems of innovation within the same country. Furthermore, he argues that in some countries raw material based production is important (as is the case of Denmark and Sweden) while in others knowledge intensive production is more dominant, as is the case for Japan and South

Korea where technology policy, human resources, knowledge and competence have been created as a substitute for the lack of natural resources.

It is of great importance to realise that the specifications of the elements of national innovation system normally differ between countries. As Lundvall (1995) argues,

> "The focus upon national systems reflects the fact that national economies differ regarding the structure of the production system and regarding the general institutional set-up. Specifically, we assume that the basic differences in historical experience, language, and culture will be reflected in national idiosyncrasies in: internal organisation of firms, interfirm relationships, role of the public sector, institutional set-up of the financial sector, R&D intensity and R&D organisation…the relationships between these elements are also important…the organisation and strategies of the public sector, including its responsibility for education and R&D, and the financial sector will affect the way firms organise and form networks."(Lundvall, 1995, p.13-14)

According to Edquist (1997), one should focus upon the differences between the various systems of innovation at a national, regional, local or sectoral basis. As the author states, without comparisons between existing systems it is impossible to argue that one system is specialised in one way or another,

> "Neither can we argue that one country spends much on R&D or that its system performs well – or badly. This is because the notion of optimality is absent from the systems of innovation approaches. Hence comparisons between an existing system and an ideal system are not possible." (Edquist, 1997, p.21)

Edquist (1997) suggests that we cannot define an optimal system of innovation since innovation by its nature is based on an evolutionary learning process and is, thus, subject to continuous change. The system will never achieve equilibrium since according to Schumpeter 'creative destructions' alter the equilibrium constantly, and according to Edquist the evolutionary processes are open ended and path dependent. It is even impossible to predict if the most optimal course is exploited at all, since we do

not know which one it is. Processes, according to the author, change at least partly randomly and take a long time. In the notion of lack of any optimality it is through the comparison of the systems of innovation that what is good or what is bad, what is a high or a low value for a variable, of the systems of innovation, can be identified and explained. Comparisons, thus, become crucial for policy-making, for the identification of problems and could act as a 'benchmarking' strategy. Comparisons with the theoretical and bibliographical framework that we set up in the first four chapters of the thesis will support and validate the research questions of this thesis as they will be put forward in chapter five, and empirically validated and contrasted by our case studies.

The approach of innovation as a 'system' is based on the idea that innovation processes occur over time and are influenced by many factors. It has been already stated that the concept of innovation systems conveys the idea that innovations do not originate as isolated, discrete phenomena within a firm, but are generated by means of interaction of a number of entities, actors and agents. When innovating, Edquist (1997) argues, firms interact more or less with other organizations, such as customers, competitors, suppliers of inputs – including knowledge and finance, and they do so in the context of certain institutions such as laws, standards, cultural habits, policies, government regulations, rules, etc. Of course one should not forget according to the author, other agents that interact in the process of innovation like, universities, schools, training institutes, government laboratories, public and private research institutes, etc. It appears, from the material presented above that one of the important elements that affects business competitiveness and innovative performance centers on the relations between universities and business, and the role institutions, authorities, agents and governments play in triggering and sustaining such relations.

Following the above arguments concerning the core nature of the systems of innovation approach it appears that the different elements of the system are characterised by high levels of interdependence and interaction, which ultimately determine the innovation processes, for example,

> "The long-term innovative performance of firms in science-based industries is strongly dependent upon the interaction these firms and universities (or other organisations that carry out relevant basic research)." (Edquist, 1997, p.21)

It becomes of major importance then, according to Edquist (1997) to examine and delineate the relations between the different elements of the system. As the author argues, these relations are extremely complex and most of the times are characterised by reciprocity, interactivity and feedback mechanisms in numerous and continuous loops.

Another characteristic of the systems of innovation is that it encompasses product/service and process innovations as well as organisational innovations. Product and process innovations are explicitly included by scholars in their concepts of 'systems of innovation'. Nelson and Rosenberg (1993) stress the importance firm and industrial laboratories dramatise in the process of innovation since they describe them as,

> "…a facility dedicated to research and development of new or improved products and processes…staffed by university trained scientists and engineers…"(Nelson and Rosenberg, 1993, p. 10)

Lundvall (1995) also includes product innovations in his approach to the concept of 'systems of innovation',

> "One way to illustrate how the structure of production and the institutional set-up, together, affect the rate and direction of innovation is to focus upon product innovations, and their roots in the interaction between producers and users."(Lundvall, 1995, p. 10)

The systems of innovation approach must also, according to Edquist (1997), include organisational innovation. The author suggests that there are good and solid reasons why the systems approach must give more emphasis to organisational change and innovation, which he argues, are sources of productivity, growth and competitiveness. His specific arguments in favour of including organisational innovations in the concept of systems of innovation are,

> "Organisational changes are important sources of productivity growth and competitiveness and they might strongly influence employment; Organisational and technological changes are closely related and intertwined

> in the real world, and organisational change is often a requirement for technological process innovation to be successful; All technologies are created by human beings; they are in this sense 'socially shaped'. And this is achieved within the framework of specific organisational forms." (Edquist, 1997, p. 24)

One of the most striking common characteristics of the 'systems of innovation' approaches is the emphasis all scholars place in the role of 'institutions'. As Edquist and Johnson (1997) note, the concept of 'institutions' has become increasingly important in innovation theory and is now viewed as a main character in the innovation process. However, the authors suggest that there are many problems with the role of institutions in the 'systems of innovation' mainly because of conceptual vagueness and the fact that various scholars have given different definitions to the term 'institution'. Edquist and Johnson provide their own definition of institutions, which is fairly open and thus allows the institutions to play a twofold role, either as shaping people's cognitions, views and actions or as a compliant constraint on the decision of agents,

> "…In the sense of patterned behaviour: Institutions are sets of common habits, routines, established practices, rules, or laws that regulate the relations and interactions between individuals and groups. This definitions catches the essence of the classical concept and relates to interactive learning, which is our link between institutions and innovations." (Edquist and Johnson, 1997, p. 46)

Institutions are of crucial importance for the innovation process as one can surmise from the central role that influential writers on the subject of 'systems of innovation' assign to them, for Lundvall (1995, p. 10), the institutional set-up (of a specific firm, a constellation of firms, or a nation) is the second most important dimension of the system of innovation. Nelson and Rosenberg (1993, p. 1) argue that their studies have been carefully designed, developed, and written to illuminate the institutions and mechanisms supporting technical innovation in the various countries. While Carlsson and Jacobsson (1997, p. 268), define technological systems as a network or networks of agents interacting in a specific technology area under a particular institutional infrastructure to generate, diffuse and utilise technology.

Edquist (1997) stresses as well the importance and central role of 'institutions' in the process of innovation and argues that their role should be carefully examined in any system of innovation, whether local, regional, sectoral or national. After examining various definitions of the term 'institutions', as different scholars in the literature present them, he suggests that institutions should be viewed in two main senses,

> "...one being 'things that pattern behaviour' like norms, rules, and laws, and the other 'formal structures with an explicit purpose', i.e. what is normally called organisations." (Edquist, 1997, p. 26)

Considering the concept of the systems of innovations as presented above, we can argue that exploring entrepreneurship and innovation requires an understanding of the environment within which these concepts exist. As we shall see in chapter two, innovations affect the performance of the SMEs and so do business clusters, which are dealt in chapter three. The question that may arise then is how and to what extents can innovation systems, local, regional, or national, affect the competitiveness of the firms and their innovative potential and entrepreneurship. Furthermore, exploring and understanding what characterises a system of innovation will certainly enhance our socio-economic analysis of the country of Greece, which is dealt with in chapter four. Since our empirical research on entrepreneurship, innovation and small business clustering deals with the case of Greece, we need to investigate and present the particular socio-economic conditions of Greece that shape its national innovation system, and the performance of its economy and of particular business sectors.

5. Concluding Remarks

In this chapter we have investigated theoretical concepts of entrepreneurship, innovation and systems of innovation. We explain how different scholars often link entrepreneurship to innovation. The second part of this chapter focuses on systems of innovation, based on the rational that innovation, entrepreneurship and small business clustering are closely interrelated. Such factors as organisations, institutions and other agents that are all 'co-developed' and 'co-evolved' dynamically in line with the economic, political and social development of a country and/or region have to be taken into account.

The critical reader will appreciate that concepts of 'innovation' and 'entrepreneurship' have been subjects of numerous studies by scholars and it would be somewhat pointless and, even more, perhaps cumbersome to attempt an all inclusive presentation of all existing research findings and theoretical opinions on these issues. We chose and presented what are considered to be by far the most influential theories for understanding innovation and its link with entrepreneurship.

Throughout this chapter, we have attempted to explore and delineate the origins of entrepreneurship, innovation and systems of innovation and focus our attention on understanding why and how innovation occurs, what are the links between entrepreneurship and innovation and what socio-economic elements influence the process of innovation at organisational, local, regional and national level?

In chapter two we explore the innovative capabilities of SME's (small and medium size enterprises), the central role of entrepreneurs, the changing nature of competition, and how this has affected the ways SMEs organise their business operations, and maintain their competitive advantage.

Chapter 2

Small and medium-sized enterprises; the evolution of competition

1. Introduction

In the first chapter we introduced the concepts of entrepreneurship, innovation, systems of innovation. We discussed also the link between entrepreneurship and innovation and delineated the theoretical framework for understanding these concepts. This chapter focuses on small and medium sized enterprises. The aim is to attempt a generic understanding of the characteristics of SMEs, as found in the literature and in various research studies. In this chapter we delineate the theoretical framework for understanding SMEs innovative capabilities, the central role of entrepreneurs, the changing nature of competition, the advancement of information and communication technologies and how these affect the way SMEs organise their operations and compete. Furthermore, we address and attempt to answer the issues of how and why business networks and strategic alliances affect SMEs competitiveness and innovative performance.

The role of small and medium-sized enterprises (SME) in the innovation process has become an important component of many policy-making decisions in the European Union in the last decade. The important role of SMEs in the economic and social infrastructure of the European Union and its member states is clearly illustrated by the establishment of "The Observatory of European SMEs" by the European Commission in December 1992. Its primary goal is to improve the monitoring of the economic performance of SMEs in Europe, and to provide information on SMEs for policymakers at national and European level, researchers, SME organisations and to SMEs themselves (European Commission 2002, Observatory of SMEs, No. 1).

According to Goffee and Scase (1995), small businesses have been viewed as being of little importance in market economies, which have been for the most part dominated by large national and multinational enterprises. Traditionally, whereas large enterprises have been equated with government lobbying, manipulating prices, direct and indirect dictation of market forces, the opportunities for small businesses would tend to be limited. In the conditions of the 1990s, the attitudes towards small business have changed, as the authors argue,

"...small business and entrepreneurship are no longer seen as marginal to modern economies. Both government macroeconomic policies and corporate thinking now reflect small business values...opportunities for setting up small business ventures are now greater than in the earlier post-war decades...entrepreneurship is now more important than in the past, while equally, many medium-sized enterprises stem from very small-scale entrepreneurial origins." (Goffee and Scase, 1995, p.1-3)

Small to medium enterprises (SMEs) comprise the largest portion of business in most economies and offer the greatest potential for job creation (Asquith and Weston, 1994). Indeed, in OECD countries over 95% of enterprises are SMEs providing 60%-70% of jobs (OECD 2000). The definition of an SME according to the European Union (EU) is an enterprise employing less than 250 employees and has an annual turnover of no more than 50 million Euros. In the EU, there are about 19 million SMEs representing 99.8% of all enterprises and have been the major job generator by providing jobs to more than 70 million people, that is about two-thirds of all EU employment (OECD 2000). Moreover, the table in the next page provides some data by member state, on the size and class structure of non-primary private enterprises in 2000 in the European Union.

Size-class structure of non primary private enterprise by country 2000

Country	Number of Enterprises (1000)	Size-class dominance*
Austria	225	SME
Belgium	545	Micro
Denmark	180	SME
Finland	210	LSE
France	2.490	Micro
Germany	3.550	LSE
Greece	800	Micro
Ireland	95	SME
Italy	4.125	Micro
Luxemburg	20	SME
Netherlands	555	SME
Portugal	685	SME
Spain	2.700	Micro
Sweden	270	LSE
United Kingdom	3.490	LSE
EU-15 total	19.930	Micro

*Note that the definitions of Micro, SME and LSE classes are dealt at the following section.
Table 1. Source: European Observatory of SMEs, European Commission 2000, No. 2, p.18

The second column describes the total number of enterprises in each country and the third column the size-class of enterprises that dominate the economic structure of the country. An important factor affecting country differences regarding average enterprises size is the per capita GDP. According to the European Observatory of SMEs (No. 2, 2002), the more prosperous the country the larger the average enterprise size tends to be. Unfortunately, though, the observatory does not provide data on the percentage of GDP that the dominant size-class in each country is contributing. It should be noted that the size of enterprises is based on the number of people employed by the enterprise and that the size-class dominance is assessed according to which kind of enterprises have the largest share in total employment in the country.

According to the Observatory of SMEs on average, an enterprise in the European Union provides employment to 6 persons. Nevertheless, this varies between 2 persons in micro enterprises, and over 1,000 in large enterprises. Turnover per enterprises varies between €200,000 for an SME and €255 million in large enterprises. Thus, while SMEs export only 13% of turnover, only 7% represents export activities of micro enterprises, while LSEs share of exports in turnover amounts to 21%. However, due to the fact that SMEs act as subcontractors, supplying goods and services to large exporting enterprises, the indirect exports of SMEs are far

more significant than what was statistically unveiled. A clearer picture evolves from the following table, which provides some indicators, employment, occupied persons, turnover, and share of exports of non-primary private enterprises in 2000 in the European Union.

Main indicators of non-primary private enterprise, Europe-19, 2000

		SME				LSE	Total
		Micro	Small	Medium-sized	Total		
Number of enterprises	(1 000)	19 040	1 200	170	20 415	40	20 455
Employment	(1 000)	41 750	23 080	15 960	80 790	40 960	121 750
Occupied persons per enterprise		2	20	95	4	1 020	6
Turnover per enterprise	Million €	0.2	3.0	24.0	0.6	255.0	1.1
Share of exports in turnover	%	7	14	17	13	21	17
Value added per occupied person	€ 1 000	40	75	105	65	115	80
Share of labour costs in value added	%	66	66	58	63	49	56

Table 2, Source: European Observatory of SMEs, European Commission 2000, No. 2, p.11

The European Commission that convened in Lisbon in March 2000 further highlighted the importance of SMEs for every country and for the EU as a whole, by placing enterprises that operate in the EU markets at the heart of the strategy for,

> "...reaching the objective of becoming the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth, more and better jobs and greater social cohesion will ultimately depend on how successful enterprises, especially small and medium-sized ones, are."(European Commission, Observatory of European SMEs, 2002, No.1, p. 6)

2. Characteristics of SMEs

There is no single definition of a small firm, mainly because of the wide diversity of businesses. This is because a 'small' firm in, say, the petrochemical industry is likely to have much higher levels of capitalization, sales and possible employment, than a 'small' firm in the car repair trades (Storey, 2000). One of the best descriptions that has extensively been used by governments and scientists around the world, according to the management literature, of the key characteristics of a small firm remains is the one used by the Bolton Committee in its 1971 Report on Small Firms. The 'economic' definition regarded firms as "small" if they satisfied the following three criteria:

a. They had a relatively small share of their market place.
b. They were managed by owners or part owners in a personalized way and not through a formalized management structure.
c. They were independent businesses, in a sense of not forming a part of a larger enterprise.

Three key issues immediately emerge from this definition. How can anyone measure the relative size of a company by its market share? What does the Bolton committee see as an independent business? What does the committee mean by a formalized management structure?

According to Burns (1996), the Bolton Committee sees the characteristic of a small firm's share of the market in that it is not capable in influencing the prices or national quantities of goods sold to any significant extent. The author argues that 'personalised management' implies that the owner actively participates in all the decision-making and all aspects of the management of the business. And as far as the independence of the business is concerned Burns argues that the Bolton Committee refers to independence from outside control of any kind, even of small subsidiaries although autonomous in many ways, still have to refer major decisions to a higher authority.

The Bolton Report (1971) also adopts a number of different 'statistical' definitions. It recognises that size is relevant to sector- i.e. a firm of a given size could be small in relation to one sector where the market is large and there are many competitors; whereas a firm of similar proportions could be considered large in another sector with fewer players and/or generally smaller firms within it. Similarly, it accepts that it may be more appropriate to define size by the number of employees in some sectors but more appropriate to use turnover in others. It is most usual to measure size according to numbers of full-time employees or their equivalent. The 'statistical' definitions of the Bolton Committee are the following,

Bolton Committee 'statistical' definitions of a small firm

Sector	*Definition*
Manufacturing	200 employees or less
Construction Mining and quarrying	25 employees or less
Retailing Miscellaneous Services	Turnover of 50,000 or less
Motor trades	Turnover of 100,000 or less
Wholesale trades	Turnover of 200,000 or less
Road transport	Five vehicles or less
Catering	All excluding multiples and brewery-managed houses

Table 3, Source: Storey, 2000, p. 9

The aim of the 'statistical' definition was threefold. First, the Bolton committee wanted to quantify the current size of the small firm sector and its contributions to national aggregates such as, the gross domestic product, employment figures, exports and innovation. Secondly, the purpose was to compare the extent to which the small firm sector changes its economic contribution over time and thirdly, the statistical definition enables comparisons between the contributions of small firms in one country with that of other nations (Storey, 2000).

The Bolton committee's 'statistical' and the 'economic' definitions proved to be incompatible in some ways. For example, how could a firm with 200 employees be managed in a personalised way without having supervisors, different layers of managers and delegation of authority?

Leaving aside the obvious incompatibility and certain question marks of how some elements of the definitions can be measured, the Department of Trade and

Industry in the United Kingdom, for statistical purposes, usually employs the following definitions, following the proposition of the Bolton Committee of 1971:

i. Micro firm: 0 - 9 employees
ii. Small firm: 0 - 49 employees (includes micro)
iii. Medium firm: 50 - 249 employees
iv. Large firm: over 250 employees

According to Storey (2000) the European Commission aiming to overcome the various problems with the definitions analysed earlier and others found in the management literature decided that the term 'small and medium enterprise' (SME) should be coined. According to the author, the SME sector is itself disaggregated into three components:

i. Micro enterprises: those with employing 0 to 9 employees;
ii. Small enterprises: those with 10 to 99 employees;
iii. Medium enterprises: those with 100 to 499 employees.

Furthermore, under the Fourth Framework Programme, an enterprise in order to be considered as an SME must have an annual turnover of no more than euro 38 million and not more than one third owned by an organization larger than an SME (based on turnover and number of employees), unless it is a financial investor, i.e. a bank or venture capitalist.

In April 1996, the European Commission circulated a communication in an attempt to setting out a single definition of SMEs in order to overcome a number of problems with the existing definitions. The Commission proposed a recommendation outlining a new common definition for SMEs (OECD, 2000), which it decided to be applied across Community programmes and proposals. The communication also includes a (non-binding) recommendation to Member States, the European Investment Bank and the European Investment Fund encouraging them to adopt the same definitions for their programmes. The communication permits them to use lower threshold figures, if desired. Finally, the communication explained that existing SME definitions in Community programmes could continue to be used until 31 December

1997. After that date, the single definition should be used. The single definition should be used if programmes were modified in the meantime.

EC SME Definitions

Criterion	*Micro*	*Small*	*Medium*
Max. number of employees	9	49	249
Max. annual turnover	1million Euros	9 million Euros	50 million Euros
Max. annual balance sheet total	1.4 million Euros	10 million Euros	43 million Euros
Max. % owned by one, or several enterprise(s) not satisfying the same criteria	25%	25%	25%

Table 4, Source: European Commission, Brussels, Com 2001

According to the European Commission to be considered an SME under the new definition, an enterprise must fulfil the following criteria:

a) Have no more than 250 employees
b) Not more than 25% owned, either singly or jointly, by a larger company
c) Either does not belong to a group of linked enterprises, or it belongs to a group of linked enterprises that fulfils the conditions laid on the table above
d) Have an annual turnover of no more than euros 50 million

In principal, it is expected that the new definition would apply to the research programmes included under the 5th Framework Programme. The European Commission as of 2002 has officially been using the new definitions of SMEs.

In summary, it appears that there is no uniformly satisfactory definition of small and medium sized enterprises. Nevertheless, the new definition set up by the European Commission has the advantage of being used in several programmes and surveys, which ultimately enhances the comparability of SMEs performances and characteristics between the different member states. Furthermore, it provides also for three sub-categories, namely micro, small and medium enterprises. We are using the definition of an SME as proposed by the European Commission and presented above throughout this thesis.

European firms, both SMEs and LSEs, face the double challenge of being confronted both with the increase global competition and the features related to the

single European market. Having defined 'SME', the next step in the set-up of the theoretical framework of SMEs is to identify the characteristics that distinguish them from large enterprises and multinational alliances. Several research studies and extensive management literature have been devoted to exploring and understanding the characteristics of SMEs, such as for example the management styles, the roles of entrepreneurs, and also their business constraints. It should be noted that different scholars and research studies assign greater or lesser importance to the various characteristics of SMEs and how these affect their everyday operations their potential for growth and competitiveness and ultimately their capability to be innovative. In this section an attempt is made to list and explore in some detail the most significant characteristics that SMEs appear to have in common. We begin our analysis with a perception that small and medium sized enterprises and in particular innovative SMEs are an important source of employment creation. Most economic structures, and the European Union itself as we have already mentioned, are largely composed of SMEs, and despite the presence of large enterprises most employment is concentrated in this group. Hence, we choose to study entrepreneurship, innovation and business clustering within SMEs which are characterised as the 'backbone' of the European economy. SMEs' capacity to become and/or remain competitive and innovative affects their ability to create employment.

> "When a steelwork closes, or a large industry contractor shuts, it is the small and medium sized firm sector which is seen as the source of new employment opportunities for the redundant workforce. Former unskilled employees become self-employed taxi drivers, window cleaners and small garage employees. Draughtsmen, precision engineering fitters and computer specialists become self-employed in their own trades. Where major job shedding takes place, the SMEs sector is seen to be the way in which the local economy can create its own employment by 'pulling itself up by its own boot-straps'." (Storey, 2000, p. 160)

Employment growth 1999-2000 by size of enterprises (percentage of SMEs)

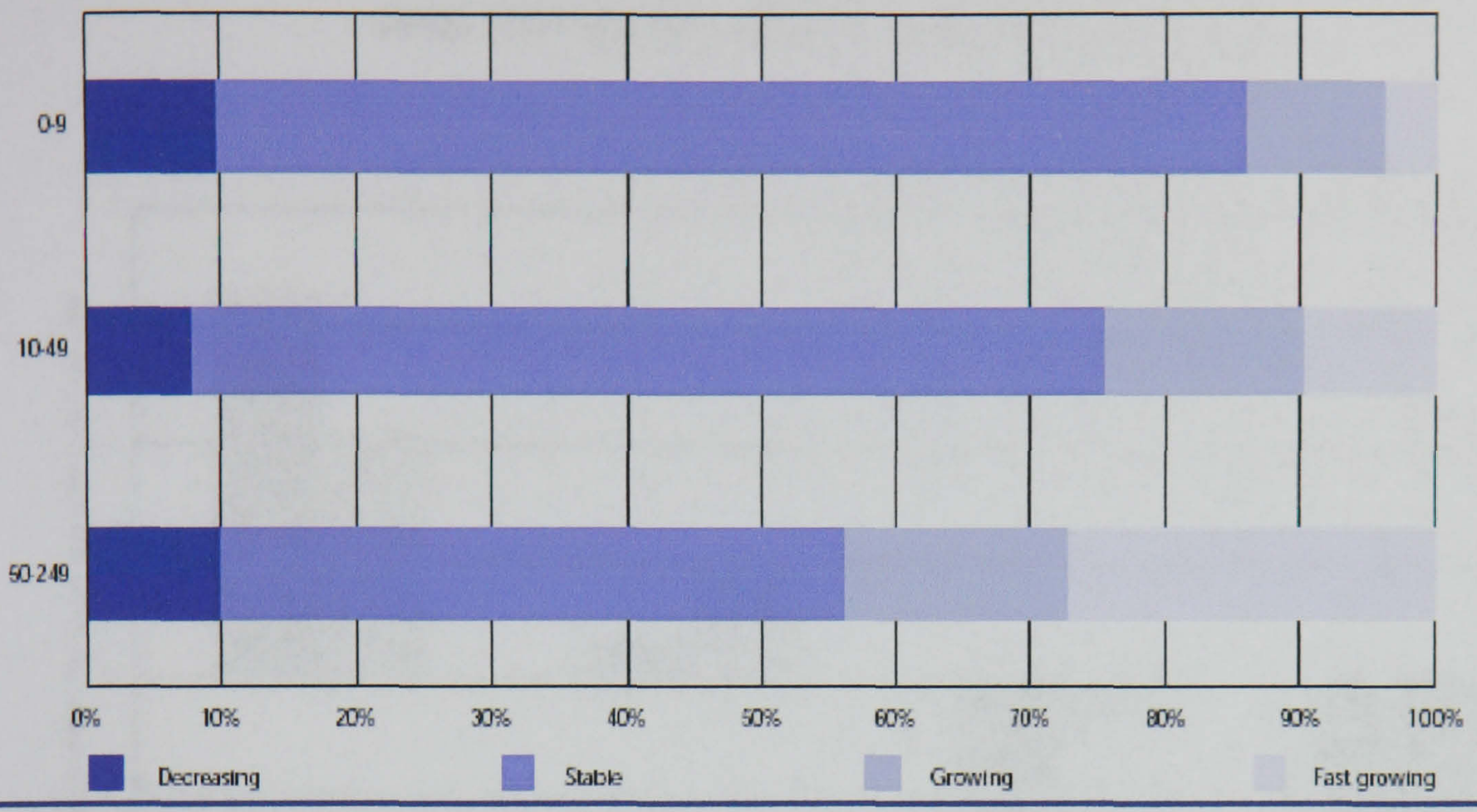


Figure 1, Source: European Commission, Observatory of European SMEs, 2002, No. 1, p. 12.

According to the Observatory of European SMEs (2002) as much as 93 to 98% of all enterprises surveyed during the years 1999 and 2000 are classified in the same size-class for both years. It appears from the figure above that about 18% of micro enterprises, 25% of small enterprises and nearly 45% of medium sized enterprises have grown in terms of employee numbers. Moreover, employment growth is clearly affected by the size of the SME.

According to Storey (2000) from studies in the United Kingdom and the USA, four main conclusions emerge for the quantity of jobs created by SMEs. The first is that small firms make disproportionately large contribution to job creation in the economy. According to the author, in the period 1976-88 the US Small Business Administration reported that firms with less than 20 employees provided 37% of the employment creation, at a time when they represented 19% of total employment. His second finding is that there are differences in the pattern of employment creation varying according to firm size in both countries. Irrespective of the trade cycle it appears that SMEs were making a more consistent contribution to job creation while large firms make weak or negative contributions when job change and the trade cycle is negative or low, but also make a major contribution when the net job change and the trade cycle is high and positive. It should be mentioned here that job change refers, according to the author to the difference between new jobs and job losses (new jobs – job losses = net job change, Storey, 2000, p. 162).

Actual and estimated employment growth by size-class, EU, compound growth 1988-1997 (in %), sizes as deviation from total

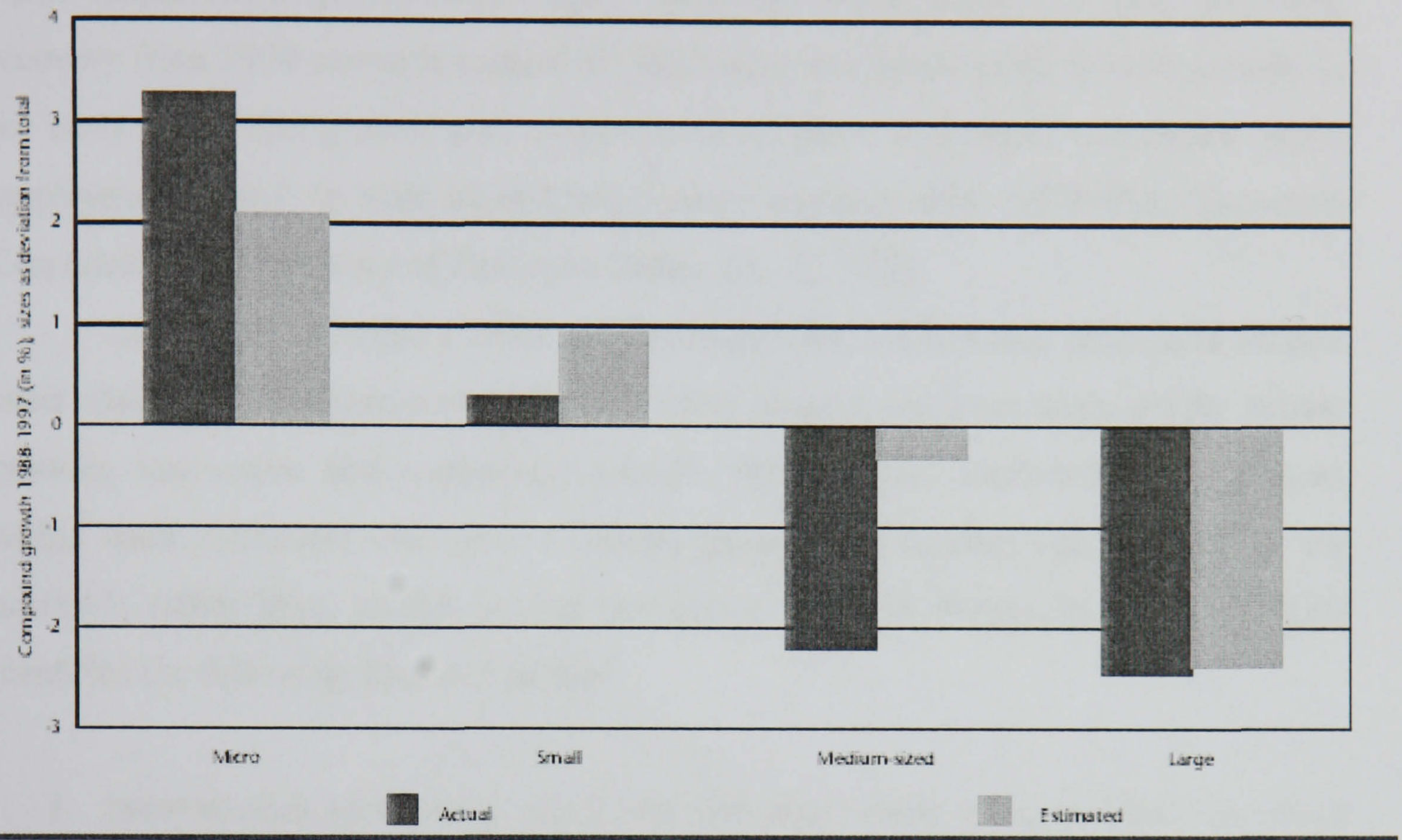


Figure 2, Source: European Commission, Observatory of European SMEs, 2002, No. 2, p. 42.

Employment by size-class, Europe 19, 1988-2001

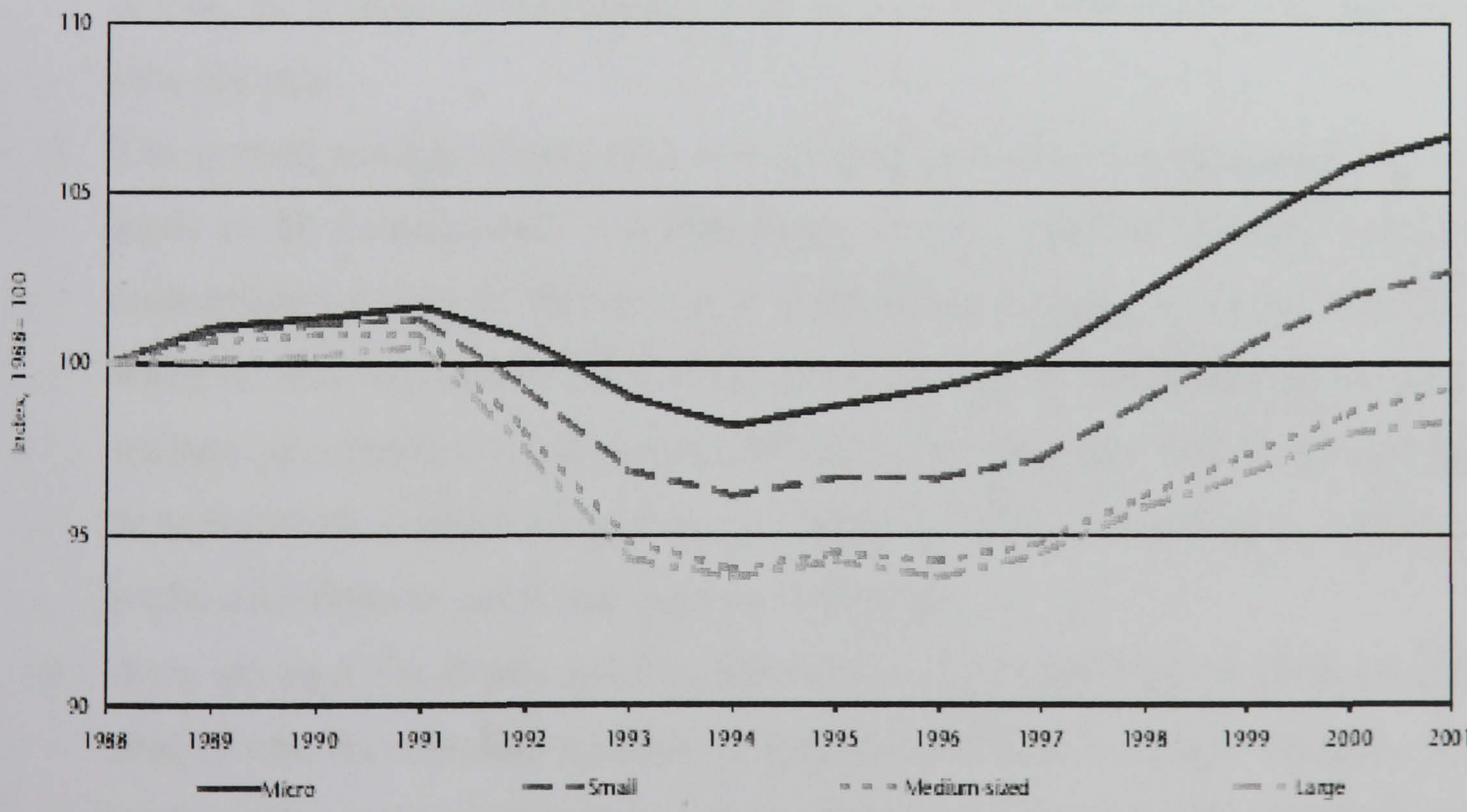


Figure 3, Source: European Commission, Observatory of European SMEs, 2002, No. 1, p. 24.

The figures presented above, further support the proposition that micro and small enterprises are more consistent in employment growth and generation of new jobs than medium sized and large enterprises. LSEs lost jobs between 1988 and 1997. while employment in the SME sector increased. As a matter of fact, economic recovery from 1994 onwards coincided with macro-economic employment growth. In the early years, this growth was concentrated in micro and small businesses, while employment growth in medium and large enterprises started in 1997/1998, (European Commission, Observatory of European SMEs, No. 2, 2002).

According to Tether (2000), the findings from a UK based study and several other studies of European new and small firms suggest that even amongst the fastest growing innovative and technology sectors, the absolute number of jobs created within each individual firm over a decade tends to be modest and counted in the hundreds rather than, as the general perception goes, in thousands. Tether (2000) identifies the following four key factors:

1. Innovative or technology based new and small firms are more likely to create employment than similar firms in the general population.
2. The average rate of employment creation within an individual innovative or technology based new or small firm tends to be modest. According to the author, the average employment growth of such firms tends to be less than ten jobs per year.
3. The growth amongst innovative and technology based new and small firms tends to be concentrated in a few firms. Only a handful of firms will be responsible for most of the new jobs created over a period of a decade or so, while he also argues that 10% of the firms studied were responsible for half the new jobs created by a group of 149 firms over a decade. It is worth noting though that this pattern of growth is also characteristic, according to research studies, for firms in more conventional industries.
4. Even amongst the fastest growing innovative and technology based new and small firms the absolute number of jobs created over a decade tends to be modest. The authors argue that in the USA corporations like Microsoft, Dell. Gateway, Intel, Apple were established in the last 30 years and are now in the Fortune 500 list of the largest companies. Unfortunately, though, there is little evidence of such growth in Europe. Two distinguishable examples are SAP

> the German software company established in 1972 that has now over 7.000 employees, and Dyson Appliances Ltd, in the UK, which was based on a novel vacuum cleaner and is currently employing several thousands of employees.
>
> (Tether, 2000, p. 110-111)

An important characteristic of SMEs is their management and organizational structures. As the quotation that we present below describes it, the differences between SMEs and large enterprises are so significant that they oblige us to explore their idiosyncrasies in some detail. It is useful to point out that even among SMEs there are important differences, such as those concerning size-class patterns that determine how they are organized and managed. The analysis that follows depicts several issues related to the development and growth of an SME, and introduces the central role of the entrepreneur in the inception, survival, growth and management of the enterprise.

> "…The differences in the administrative structure of the very small and the very large firms are so great that in many ways it is hard to see that the two species are of the same genus…"(Storey, 2000, p. 121)

Storey (2000) proposes a five-stage model through which a small company evolves to a bigger one and how this affects its administrative structure as presented in the following table. It should be made clear that the author does not imply by any means that all firms begin from stage 1 and move to stage 5. The model merely describes some of the characteristics of firms rather than try to predict how they will progress during their life span. This suggestion is even more real since a majority of business will not survive to go even beyond stages 1 and 2. The point where we should focus our attention is at the three components that describe an SME: the management role, the management style and its organizational structure.

Stage	*Top management role*	*Management Style*	*Organisation structure*
1. Inception	Direct supervision	Entrepreneurial, individualistic	Unstructured
2. Survival	Supervised supervision	Entrepreneurial, administrative	Simple
3. Growth	Delegation/ Co-ordination	Entrepreneurial, co-ordinate	Functional, centralised
4. Expansion	Decentralisation	Professional, administrative	Functional, decentralised
5. Maturity	Decentralisation	Watchdog	Decentralised functional/product

Table 5, Source: Storey, 2000, p. 121

Greiner, (1972) on the other hand, argues that while organisations grow they progress through five distinguishable phases of development, each of which is characterised by a relative calm period that ends with a management crisis. The future survival and success of the company lies within their organisation and their evolving stages of development. As the author argues, it is the organisation's particular history that determines its future rather than external forces. Each phase of organisational development is characterised by both an evolution and a revolution, for example, centralised practices lead to demands for decentralisation that the author defines as follows,

> "*Evolution* is used to describe prolonged periods of growth where no major upheaval occurs in organization practices and *revolution* is used to describe those periods of substantial turmoil in organization life." (Greiner, 1972, p. 1)

According to Greiner (1972), each phase is both an effect of the previous cause and a cause for the next phase. Five key dimensions emerge as essential for building a model of organisation development: (1) age of the organisation, (2) size of the organisation, (3) stages of evolution, (4) stages of revolution, and (5) growth rate of industry.

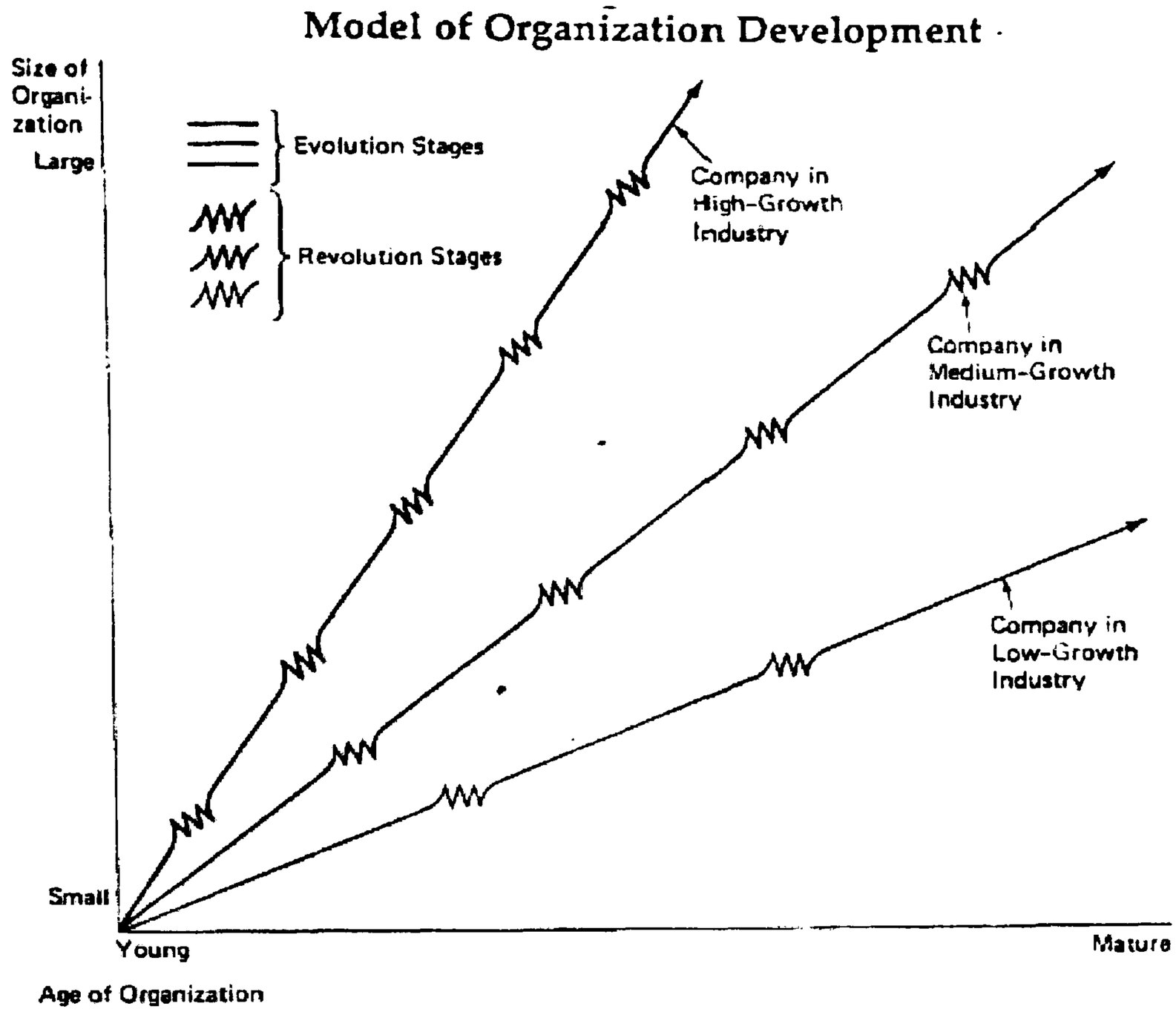


Figure 4 Source: Greiner, (1972)

The combined effects of the proposed five key dimensions are illustrated in the figure above. According to Greiner, the same organisation practices are not maintained throughout a long time span. The passage of time contributes to the institutionalisation of managerial attitudes, while management problems and principles are rooted in time. Furthermore the company's problems and solutions tend to change as the number of employees, the sales volume and the turnover increases. The increased size can amplify problems of coordination and communication among employees as new functions emerge and levels in the management hierarchy multiply, and jobs become more interrelated. As we have defined above the stages of evolution describe the prolonged periods of growth where only minor modifications are necessary for maintaining growth under the same management principles. A serious upheaval of management produces turbulent times, which represent the periods of revolution as described above. Traditional management practices that functioned positively for the past few years and were appropriate for a smaller size are becoming obsolete and inappropriate to follow and manage the growth of the company. According to Greiner (1972) during such periods of crisis, a number of companies fail, particularly those unable to abandon past practices as the above example

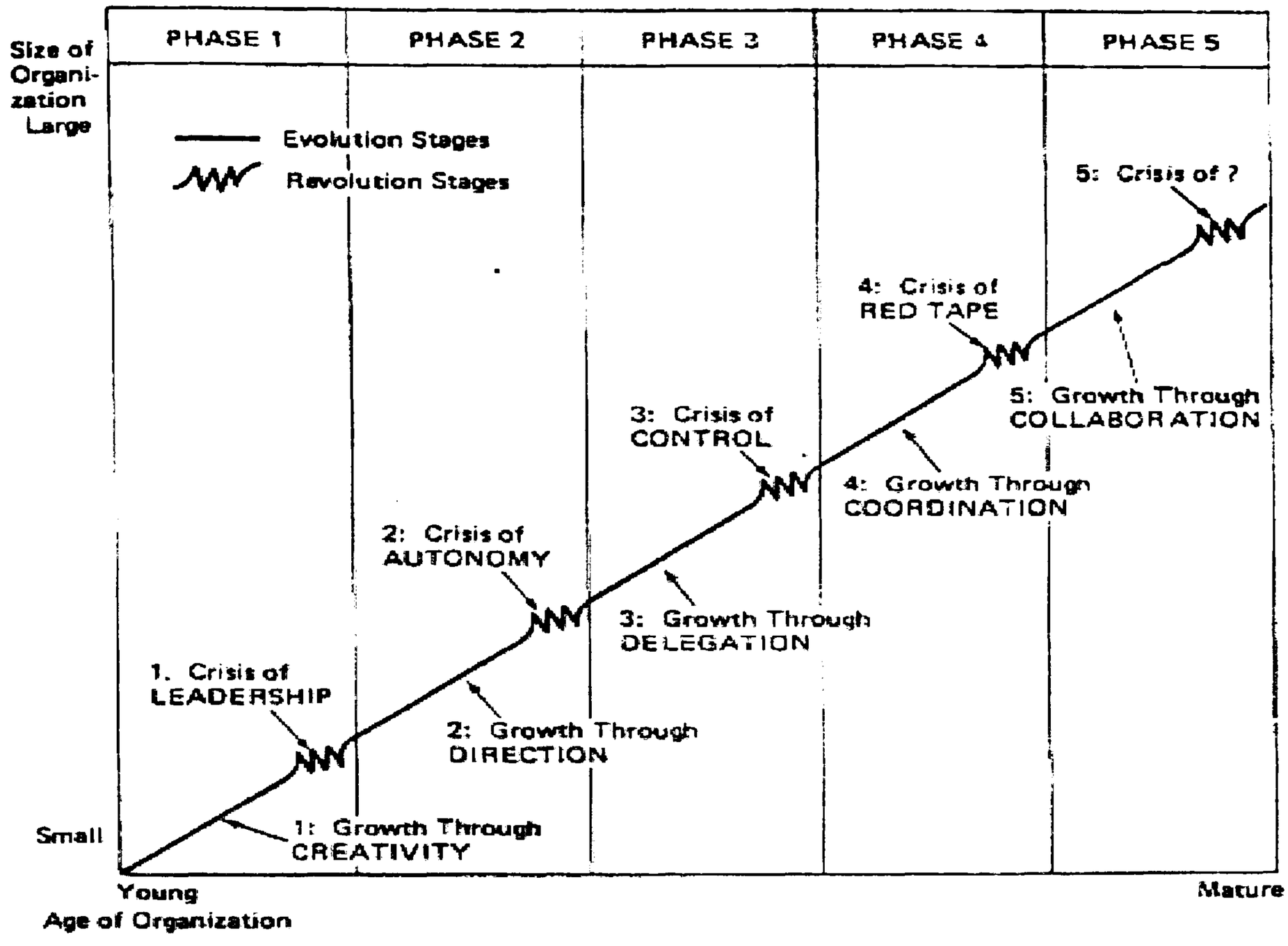
illustrates. The critical task for management is to find a new set of organisational and management practices that will be the basis for managing the next evolutionary period, otherwise the company will fail. As the author argues,

> "Key executives of a retail store chain hold on to an organization structure long after it has served its purpose, because their power is derived from this structure. The Company eventually goes into bankruptcy." (Greiner, 1972, p. 1)

These revolutionary new practices, as the company grows, will eventually become inadequate and force the next revolutionary period. Companies, therefore, experience the irony of seeing a major solution in one time period become a major problem at a later date. The rate at which the company experiences these phases is closely related to the market environment of the industry. Greiner (1972) claims that in a rapidly expanding market the company will have to employ more personnel rapidly; hence the need for new organisation structures and revolutionary periods. On the other hand, a company might prolong its growth by choosing deliberately not to grow as quickly as it could.

With the above framework in mind Greiner examined in depth the five specific phases of evolution and revolution. A prevailing management style used to achieve growth characterises each evolutionary period, while its revolutionary period is characterised by a management problem that has to be solved before growth can continue, as we can see in the following figure and table.

The Greiner Growth Model



Organisational Practices during evolution in the five phases of growth

Category	*Phase 1*	*Phase 2*	*Phase 3*	*Phase 4*	*Phase 5*
Management Focus	Make and sell	Efficiency of operations	Expansion of market	Consolidation of organisation	Problem solving and innovation
Organisation Structure	Informal	Centralised and functional	Decentralised and geographical	Line-staff and product groupings	Matrix of teams
Top Management Style	Individualistic and entrepreneurial	Directive	Delegative	Watchdog	Participative
Control System	Market result	Standards and cost centres	Reports and profit centres	Plans and investment centres	Mutual goal setting
Management Reward Emphasis	Ownership	Salary and merit increases	Individual bonus	Profit sharing and stock options	Team bonus

Figure 5 and Table 6, Source: Greiner, 1972

Both models demonstrate how the management style adopted by the owner-manager must change if they are to pass successfully through the different phases of growth. Their arguments could be confirmed by the data presented by the Observatory

of European SMEs, which depicts SMEs as placing differing emphasis on business policies according to their size, as illustrated in the table below,

Main focus of Business Policy, by size class (percentage of SMEs)

	Number of employees			Total
	0-9	10-49	50-249	
Struggle to survive	21	14	8	20
Consolidation	21	21	18	21
Growth	29	30	38	29
Higher profits	9	12	14	9
Higher quality	11	14	12	11
Innovate	7	7	8	7
Other/ no answer	2	2	2	2
Total	100	100	100	100

Table 7, Source: European Commission, Observatory of European SMEs, 2002, No. 1, p. 17

Micro firms are most usually entangled with a 'struggle to survive' while larger SMEs tend to place more emphasis on other business policies such as higher profits and higher quality of products or services. The importance of 'growth' as a business policy tends to increase by size, from about 30% of micro and small enterprises to about 38% for medium-sized enterprises, (Observatory of European SMEs, No. 1, 2002).

We have already mentioned that the dominant size-class of enterprises in the EU is the SME; moreover, though, we should point out that according to the Observatory of European SMEs survey results (2002) the dominant size-class within the SMEs sector is the micro enterprise (as one can see in table 8). According to the above survey data and the theories of growth we have presented, organisations of this size have somewhat formless organisational structures with the entrepreneur being the central figure and most of the times the founder and/or manager of the company. As illustrated in the following table, sole proprietors constitute the dominant legal form of the micro enterprise section.

Class-Size of Enterprise	*Percentage and Number of enterprises (Total of EU-19, 20,455,000)*		*Legal Form*
Micro	93%	19,000,000	¼ sole proprietors (mostly micro enterprises)
Small	6%	1,200,000	½ private limited enterprises
Medium	1%	170,000	¼ public limited enterprises

Table 8, Source: European Commission, Observatory of European SMEs, 2002, No. 1

The growth models presented above and the empirical data from the Observatory of European SMEs 2001 survey, presented in the tables above, depict a clear relation between the size of an enterprise and its management and organisational policies. In many ways the growth models presented by Storey (2000) and Greiner (1972), earlier, are best used as predictors of problems that the firm is likely to face as it grows and therefore management should be aware of if it wishes the company to continue its growth at different stages of development. This does not imply that these growth models are rendered obsolete but rather that they can be used as tools by the owners/managers to identify the particular phase a firm is in and be able to understand the major issues that they need to address, not only in that stage, but also in the next stages of its development.

Several researchers in their studies give special emphasis to the influential role of the entrepreneur in affecting the performance, survival and growth of the firm particularly when the firm is small, as we are showing above. The idea we bring on stage in this part of chapter two is that the 'basic role played by the owner/manager' is one of the major determinants of SME competitiveness; this turns out to be so because the concentration of decision-making power in the owner/manager in an SME environment, consequently affects the firm's overall strategy. The central and dominating position of the entrepreneur in a business especially at its first stages of development while it is still a micro or small enterprise is highlighted in the work of Storey (2000) and Greiner (1972) and their growth models presented above.

As we examined in chapter one, an entrepreneur, according to Schumpeter (1942), is everyone who 'carries out new combinations'. Schumpeter defines carrying out new combinations as, new products, new services, and new sources of raw material, new methods of production, new markets, and new forms of organisation. The focus is on the producer and it is here that the '*entrepreneur*' enters the stage. Schumpeter (1942, p. 65) defines production as the combinations of materials and

forces that are within our reach. All components that he/she (the entrepreneur) needs for his/her product or service, whether physical or immaterial, already exist and are in most cases also readily available. The basic driving force behind structural economic growth is the introduction of new combinations of materials and forces, not the creation of new possibilities:

> "The new combinations are always present, abundantly accumulated by all sorts of people. Often, they are also generally known and being discussed by scientific or literary writers. In other cases, there is nothing to discover about them, because they are quite obvious…it is this 'doing the thing,' without which possibilities are dead, of which leader's function consists…it is, therefore, more by will than by intellect that the leaders fulfil their function, more by 'authority', 'personal weight', and so forth than by original ideas." (Schumpeter, 1942, p. 88-89)

In his work "Innovation and Entrepreneurship (1985)", presented in some length in chapter one, Drucker (1985) argues that some researchers use the term 'entrepreneurship' to describe either small businesses or new businesses. However, the author argues in line with Schumpeter, that a great deal of well established large companies engage in successful entrepreneurship and he thus believes that entrepreneurship should refer not to an enterprise's size or age but to a certain kind of activity. Entrepreneurship is a special characteristic of an individual or an organisation. Innovation is at the heart of entrepreneurship; the effort to create purposeful, focused change in an enterprise's economic or social potential (Drucker, 1985).

According to Goffee and Scase (1995), the entrepreneurs are these owner-managers that exercise control over their businesses through directly imposed but mostly unwritten guidelines and instructions. They may employ as many as fifty or sixty staff, or even much more according to their ability to exercise control through informal, face-to-face processes rather than according to formalised structures and job descriptions. Nevertheless, in medium sized enterprises there may be different layers of managers, supervisors, job descriptions, etc. but the distinguishable characteristic of the entrepreneur is that he/she will retain almost total control and remain the centre of the decision-making web. Such enterprises according to the authors are sculptured

around the 'personalities' of their owner-managers and their growth potential and financial viability is highly dependent upon the proprietors' preferences, energies, talents and plans.

Further research focusing on the concept of competitiveness and the competency approach by Man (2002), develops a conceptual model to link the characteristics of SMEs owner-managers and their firm's performance. Competitive scope, organizational capabilities, entrepreneurial competencies and performance are the four components of the model. According to the authors, the focal point of the model concentrates on the entrepreneurial tasks that link the different competency areas with the constructs of competitiveness. The entrepreneur's managerial skills and technical know-how, his/hers demographic, psychological and behavioural characteristics are often cited as the most influential factors related to the performance of an SME; particularly since quite often small firms or even medium-sized companies have a dominating entrepreneur, who is most likely to be the founder of the business. The relationship is also affected by many industrial, environmental, firm-specific characteristics and firm strategies, (Man, 2002).

As shown in the figure we present in the next page, competitiveness is conceptualised as having three dimensions, namely potential, process and performance. From the model below, we distinguish between three key aspects that affect the SMEs competitiveness, internal firms factors, external environment and the influence of the entrepreneur, all of which in turn affect the performance of the SMEs. (Man, 2002)

Man (2002) argues that merely the possession of the following competences does not make an entrepreneur competent. Competencies can only be demonstrated by a person's behaviour and actions, which in turn correspond to the dynamic characteristic of competitiveness.

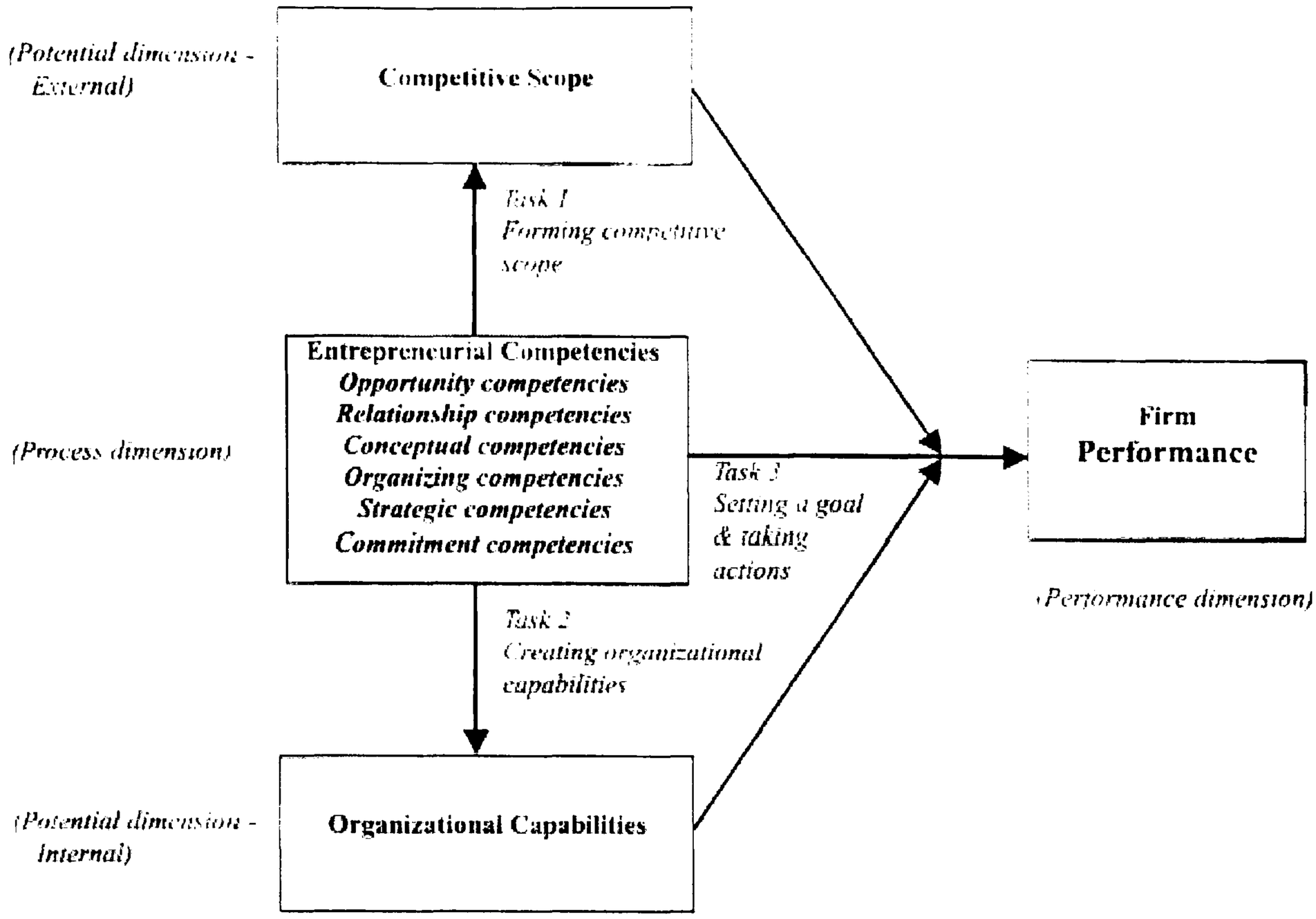


Figure 6, Source: Man, et al, Journal of Business Venturing, 17, 2002, page 134

Man (2002) delineate the entrepreneurial competencies as follows,

1. *Opportunity competencies.* Competencies related to recognizing and developing market opportunities through various means.
2. *Relationship competencies.* Competences related to person-to-person or individual-to-group based interactions, e.g. building a context of cooperation and trust, using contacts and connections, persuasive ability, communication and interpersonal skills.
3. *Conceptual competencies.* Competencies related to different conceptual abilities, which are reflected in the behaviour of the entrepreneur, e.g. decision skills, absorbing and understanding complex information, and risk-taking and innovativeness.
4. *Organising competencies.* Competencies related to the organization of different internal and external human, physical, financial and technological resources, including team-building, leading employees, training and controlling.

5. *Strategic competencies.* Competencies related to setting, evaluating and implementing the strategies of the firm.
6. *Commitment competencies.* Competencies that drive the entrepreneur to move ahead with the business.

(Man, 2002, p. 132)

The authors in their study concluded that the organizing, relationship and conceptual competencies of the entrepreneur are positively related to the organizational capabilities of an SME. They focused upon the competencies of the entrepreneur and found positive relationship between the firm's long-term performance and the strategic and commitment competencies. The authors suggest that in order for the entrepreneur to ensure the competitiveness and survival of the firm he/she must set the direction for the company since it is often the owner-manager of SMEs that leads the strategic planning process. The entrepreneur also needs to be persistent and committed to the task in order to enhance the performance of the firm and motivate through inspiration the employees. Of course, one can argue that the same competencies and characteristics are present in the majority if not all of the high-performing firms irrespective of their size. If we recall the definition of Schumpeter and Drucker on entrepreneurship this makes good sense since entrepreneurship is not solely equated with new and small firms, but rather it constitutes an activity. The important point in this section though as we also stressed above is that the new, the micro and the small business that is most-often created by an entrepreneur will be largely affected by his personality and organisational/management abilities. Goffee and Scase (1995) as well as Greiner (1972) argue the entrepreneurs might decide to keep their business small so that they can 'control' it or they may decide or be forced to pursue a growing strategy. In the latter case, it is again the 'qualities' of the entrepreneur that will play a decisive role in the future survival and growth of the company. If the entrepreneur decides to review his business and personal life strategies, delegate more authorities and responsibilities the company may grow, otherwise it might fail.

It is an abiding perception that SMEs compared with larger enterprises often face difficulty in surviving and growing. Authors like Storey (2000), Burns and Harrison (1996), argue that often the managers/owners of SMEs have difficulties in coping with the multiplicity of external and internal demands placed on them once the

enterprise has grown in size. Moreover, they argue that failure is endemic to the small business sector especially during their first stages of establishment and growth.

We attempt to enhance our understanding of how SMEs operate in the business world by exploring and delineating the multiple and often interrelated obstacles that SMEs often face in today's economies that hinder their growth and prosperity or even lead them to 'chapter 11', according to the management literature and extensive research studies. Because of the variety and complexity of some of the obstacles SMEs are facing we shall explore in depth only the most important and relevant to the concepts of entrepreneurship, innovation and business clustering/ networks, as found in the management literature, i.e. the managerial deficiencies and entrepreneurial characteristics and the limited access to finance.

Previously, we investigated the importance and the central role of the entrepreneur for the SME. It was argued that the personal characteristics of the entrepreneur would to a large degree affect the performance of the company and its survival and success. According to Burns and Harrison (1996), the personal characteristics and qualities of the entrepreneur/manager that can on one hand, lead a company to success can on the other hand, lead it to failure. Storey (2000) argues in his work, understanding the small business sector,

> "It would appear that the owners of young firms were more likely to suffer from inadequate funding, poor products and inefficient marketing. As their companies aged, however, they are more likely to be buffeted by strategic and environmental shocks for which they did not have the managerial skills to respond."(Storey, 2000, p. 105)

Moreover, Burns and Harrison (1996) suggest that when the personal characteristics of the owner/manager of the company are problematic and interact with managerial deficiencies they tend to produce weaknesses in the firm and potentially lead it to failure. Burns and Harrison (1996) provide a list, without further elaboration, of the personal characteristics and managerial deficiencies that could lead to failure of the SME, which are as follows:

Personal Characteristics

i. Exaggerated opinion of business competency based upon knowledge of some skill.
ii. Limited formal education.
iii. Inflexible to change and not innovate.
iv. Uses own personal taste and opinion as the standard to follow.
v. Decisions based on intuition, emotion and non-objective factors.
vi. Past, not future, orientation.
vii. Little reading in literature associated with business.
viii. Resistance to advice from qualified sources but, paradoxically, accepts if from the least qualified.

Managerial Deficiencies

i. Cannot identify target market or customers.
ii. Cannot delineate trading area.
iii. Cannot delegate.
iv. Believes advertising is an expense, not an investment.
v. Only rudimentary knowledge of pricing strategy.
vi. Immature understanding of distribution channels.
vii. No planning.
viii. Cannot motivate.
ix. Believes the problem is somebody else's fault and a loan would solve everything.

(Burns and Harrison, 1996, p. 69-70)

Goffee and Scase (1995) emphasise in their work *Corporate Realities* that managers, scientists, professionals and other experts are attracted to entrepreneurship because of personal motives and usually the employment autonomy and independence, which they hope to enjoy. On the other hand, as we have discussed earlier in this chapter, as the company grows in course of time it requires the adoption of new managerial and organisational practices that the entrepreneur might not be able to adopt, or he/she might be reluctant to relinquish to his/hers personal control over the company. According to the authors, among traditional craft enterprises there is a reluctance to move beyond a size at which face-to-face managing and working is possible. In such a working environment the owner-manager can have a direct control of staff and the company. To shift from this management style to adopting rules, procedures, delegation of authority and responsibility requires from entrepreneurs to develop management competencies. It is in this stage that many of the new and small businesses fail to grow or survive as Goffee and Scase (1995) vividly point out in the following extract from a survey of small business owners,

"Everybody says you've got to delegate but once you leave your hand off the button then your business will start sliding. The main thing is to be on top of it all the time, in touch with every section and really on the ball. If you get to the size where you have to delegate, you've got to work with the person involved so that his mind works like yours and he's totally trustworthy. Personally, I don't want to get to that size. I don't want to get to the point where I don't know where the money's coming from and how different jobs are going. I don't want to get to the stage where I have to take somebody else's word for how the job is going." (Goffee and Scase, 1995, p. 43-44)

Furthermore, Goffee and Scase explain that often in small businesses employers and employees work so close to each other that develop flexible and broad-defined skills, which complement each other and which enhance the overall performance of the company. In the process of business expansion the restructuring of job specifications and relationships can create discomfort and low motivation to staff, resentment, and deterioration of trust relations between the employer and the employees as well as among colleagues. Many of the entrepreneurs according to the authors do not posses the necessary managerial skills and competencies to steer the business towards the fundamental changes in the nature and organisation of their business practices. In such cases, the owner-manager will in due course become overloaded with strategic and operational matters, so that the business controls are neglected and the firm starts to face financial difficulties.

Goffee and Scase (1995) suggest still another category of entrepreneurs and business owners who are people with creative talents that usually have little desire to exercise control over other people. These professional, creative proprietors are more interested in exercising their personal talent and abilities to deliver state-of-the-art professional, quality services or products and get personal recognition. This kind of businesses are unlikely to have a business plan, since most of the time demand and expansion will be random and customer driven.

So far, in our analysis, we are exploring some of the obstacles that start from within the SME, such as management deficiencies, and entrepreneurial incompetence. It is an enduring perception of manager practitioners and policy makers around the world that SMEs often face economic, institutional and legal obstacles that are beyond their influence. The Observatory of European SMEs (2002) asked

entrepreneurs to list the most important impediments on their business performance over the period 1999 to 2001 as shown in the following figure. Nearly 30% of medium-sized enterprises viewed 'lack of skilled labour' as the major constraint whereas 'access to finance' is perceived to be the most important constraint for about 14% of small and 13% of micro enterprises.

Major Business Constraint 2001, by size of enterprise (percentage of SMEs)

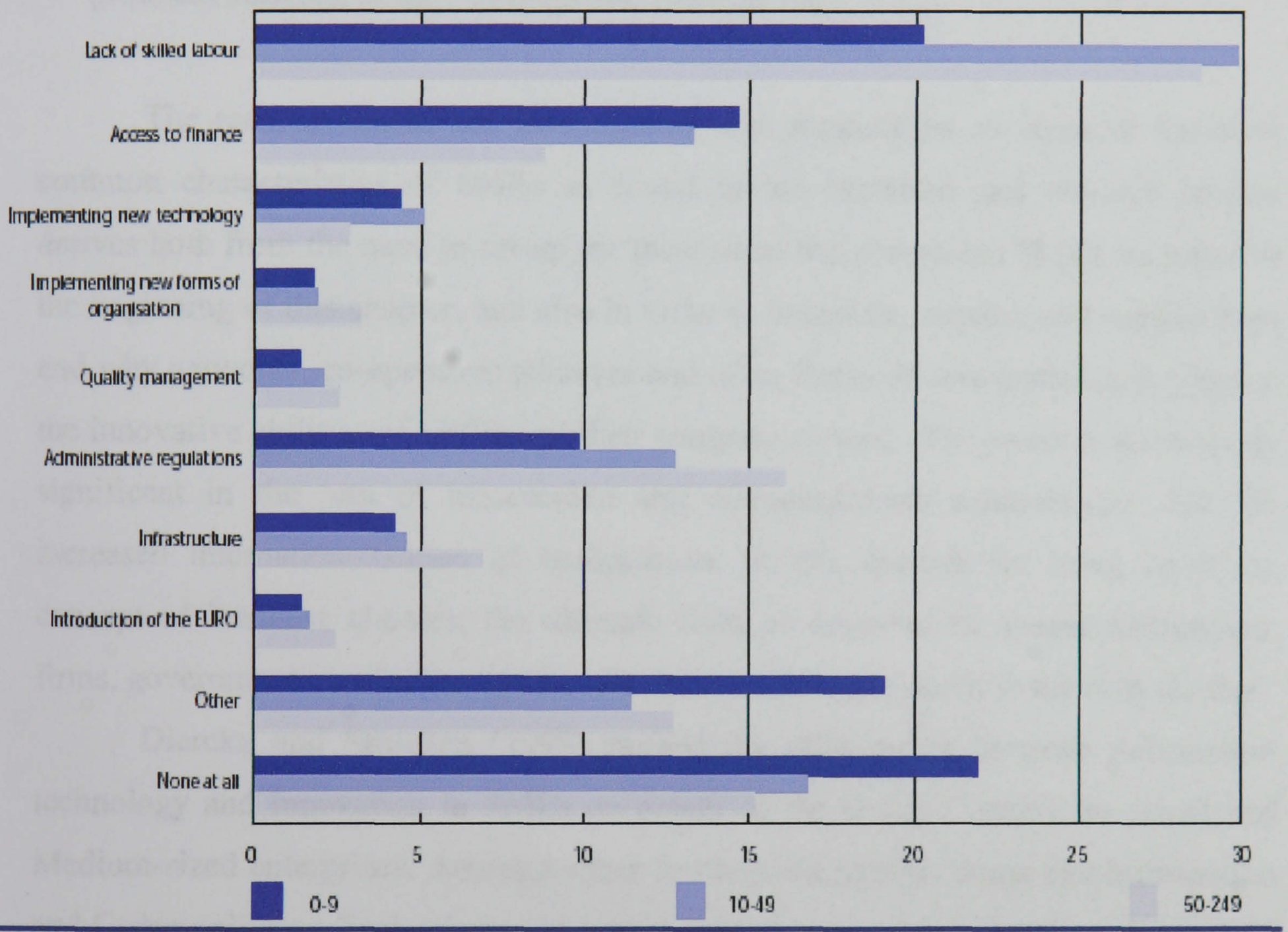


Figure 7, Source: European Commission, Observatory of European SMEs, 2002, No. 1, p. 13.

Several external to the organization variables, such as the economic and social infrastructure of a country, the administrative rules and regulations as well as the limited access to finance could act as an obstacle to the growth of the SME and its survival, as shown in figure 7, above. Extensive empirical researches and theoretical views from influential scholars (Storey, 2000; Burns and Dewhurst 1996; Pissarides 1999; Observatory of European SMEs, 2000) indicate that 'access to finance' is one of the most important obstacles to the growth and survivability of the SME. According to Pissarides (1999) and the European Bank for Reconstruction and Development (EBRD),

> "SMEs are penalised moreover by the fact that in any type of economy they face higher rates on loan finance than their larger counterparts, partly because banks consider the credit risks applying to SMEs higher than those applying to larger firms, and partly because SMEs are generally unable to offer adequate collateral. Only those SMEs that were successful in identifying a niche in the market in which high returns could be obtained can afford to pay the high interest rates. The rest will rely on reinvested profits, reorient their products/markets, or die." (Pissarides, 1999, p. 522)

The reasons behind our investigation and presentation of some of the most common characteristics of SMEs as found in the literature and research studies derives both from the need to set-up the theoretical framework for SMEs, as stated at the beginning of this chapter, and also in order to introduce, explore and suggest how and why networks, co-operative alliances and other forms of cooperation can enhance the innovative abilities of SMEs and their competitiveness. This becomes particularly significant in the 'era of information and communication technologies' and the increased internationalization of competition. In this chapter we bring forth the concept of business clusters, the ultimate form of cooperation among institutions; firms, governments, and other agents, which are explored in depth in the next chapter.

Dierckx and Stroeken (1999) studied the relationship between information technology and innovation in SMEs on behalf of the Dutch Council for Small and Medium-sized enterprises. Amongst other findings the authors argue that Information and Communication Technology can lead to new organisational structures, flatter and more flexible and new form of labour such as teleworking, freelance work and other new independent and mobile forms of work. Thus, in the ever-increasing competitiveness and internationalization of the market place Information and Communication Technologies (ICT) if and when ignored may become a significant threat to a company. In contrast, the same ICT in the hands of a firm that knows how to anticipate and use them can prove to be valuable opportunities for growth and survival.

Moreover, the advent of the World Wide Web and electronic business during the last decade, as one would expect, opened up new perspectives for SMEs as it made electronic communication affordable to even the smallest of companies. Companies can send and receive Electronic Data Interchange messages, to customers

and suppliers through the Internet, or via e-mails and they can also distribute and share information to the parties of interest (for example customers) through web pages. (Stefansson, 2002)

The most common Information and Communication Technologies used by SMEs are, according to the Observatory of European SMEs (2002), mobile phones, stand-alone PCs, network of PCs, Email and Electronic Data Interchange (EDI), Intranet, Internet Connection, and an own web site, as the following figure clearly depicts. A size-class pattern in the percentage share of SMEs that are using various types of ICT seems to emerge.

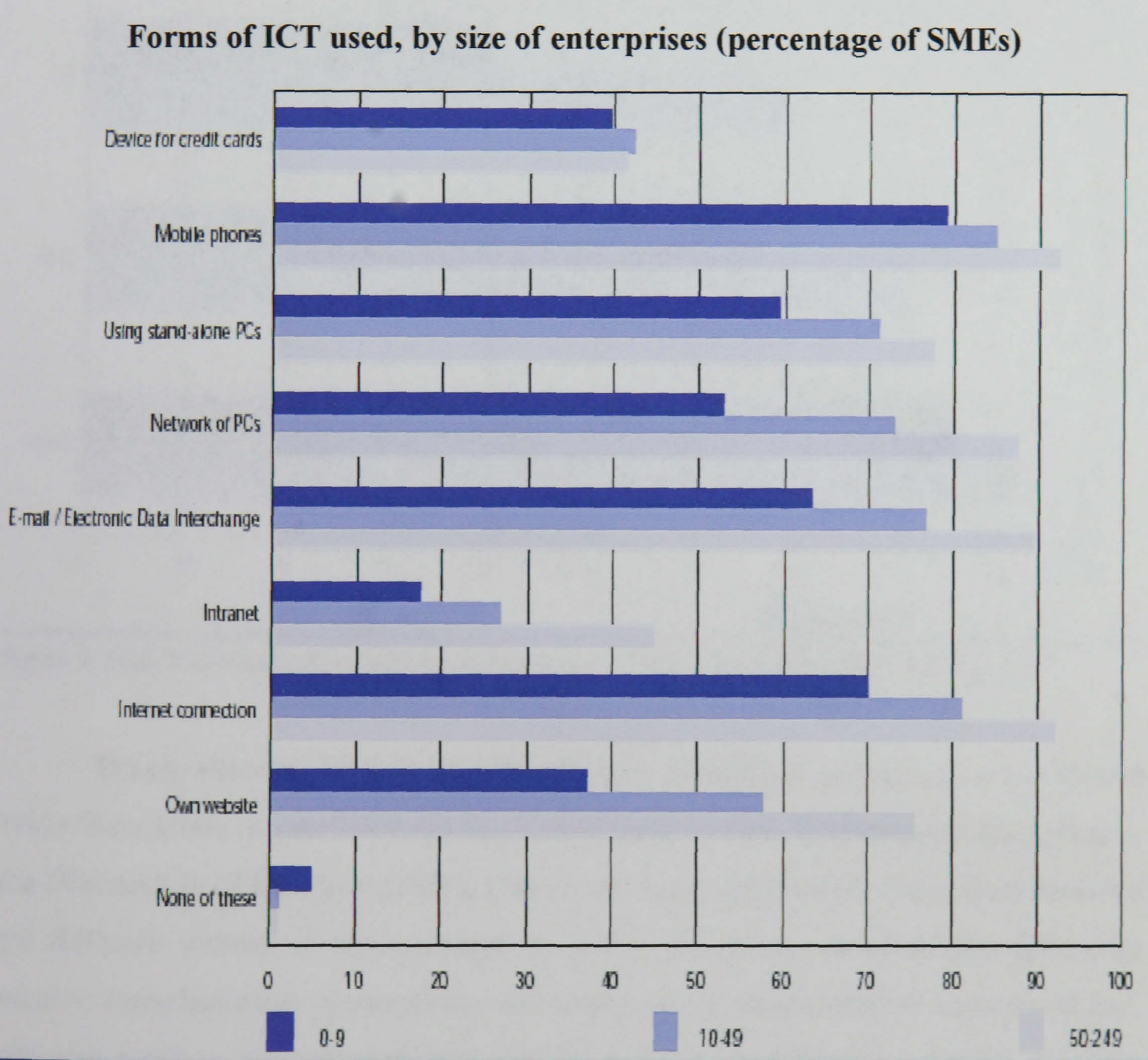


Figure 8, Source: European Commission, Observatory of European SMEs, 2002, No. 1, p. 20.

The size-class pattern is clear. Micro enterprises seem to be slower or more reluctant in adopting ICT. According to figure 11, nearly 30% of micro enterprises do not have an Internet connection, and another 41% do not even have a stand alone PC.

Moreover, only about 17% are using Intranet and 37% have their own web site. On the other hand, larger SMEs seem to extensively using ICT, as 75% have their own web sites, 92% have an Internet connection and nearly 90% have PCs and an installed network within the company.

Despite the obvious size-class pattern, it is interesting to note that micro enterprises seem to be rapidly catching up with the rest of the SMEs, at least as far as the access to the Internet is concerned, as the following figure undoubtedly illustrates,

Access to Internet 1999 and 2001, by size of enterprises (percentage of SMEs)

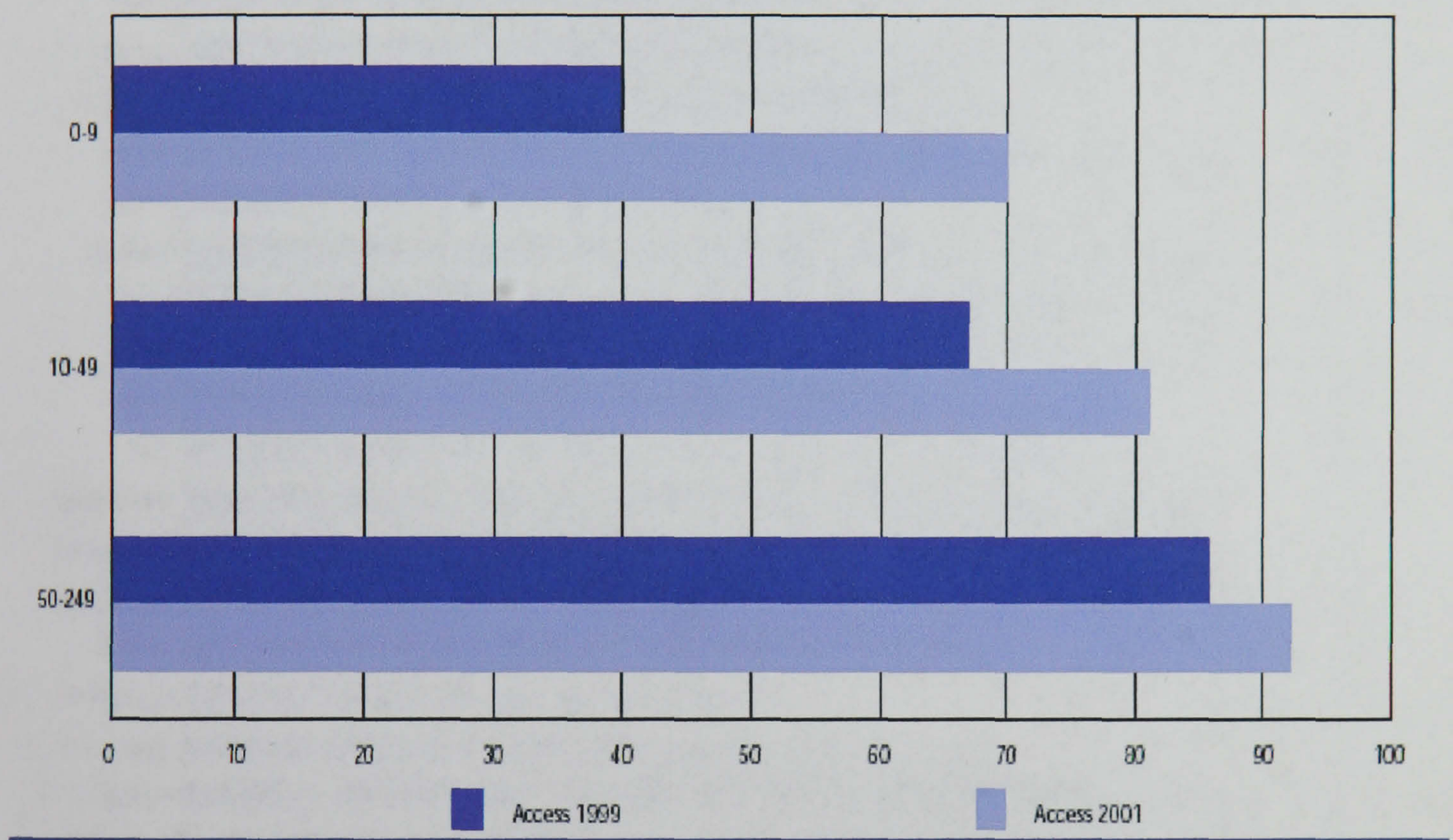


Figure 9, Source: European Commission, Observatory of European SMEs, 2002, No. 1, p. 21.

During the year 1999 only 40% of micro enterprises had access to the World Wide Web, while in year 2001 the figure had risen to 70%. Furthermore, according to the Observatory of European SMEs, (2002), the large differences that existed between the different sectors of the economy in 1999 (the survey involved the following sectors: manufacturing, construction, wholesale, retail, transportation/communication, business services and personal services) have been considerably reduced. In 2001, nearly 70% of SMEs in all sectors had access to the Internet, while business services scored considerably higher reaching more than 80% of enterprises having access.

Access to the World Wide Web by country depicts a more varied pattern, as we can see in the following figure 10. Several of the countries that scored low in Internet access in 1999 are catching up fast, such as Greece, Italy, Spain and the

United Kingdom. The most astonishing performance in this two-year period is recorded in Greece, with 78% of SMEs having Internet in 2001, as compared to a low of 24% in 1999. Portugal is improving its performance with a growth rate well above the average but it still is in the last place with 45%. Denmark, France and the Netherlands are growing at a rate lower than the average and find themselves in a level below the average European level.

Access to Internet 1999 and 2001, by country (percentage of SMEs)

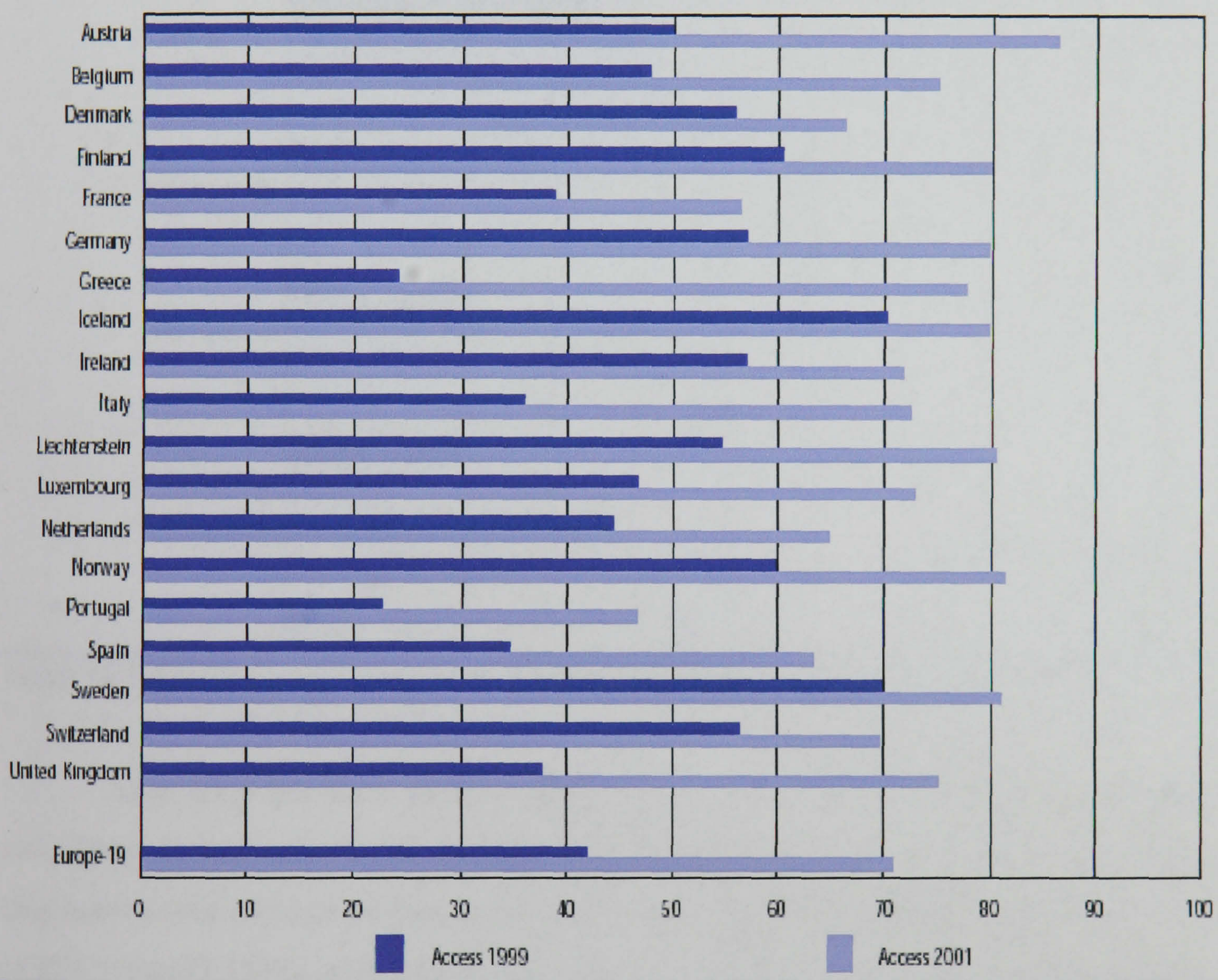


Figure 10, Source: European Commission, Observatory of European SMEs, 2002, No. 1, p. 22.

The increasing number of SMEs connecting to the World Wide Web every year is a clear indication that the enterprises understand the need to use that form of ICT as effectively and as efficiently as possible to increase their competitiveness. An investigation made by the Observatory of European SMEs (2002) identified several commercial uses that SMEs make of the Internet, as shown in the following figure. Ranging from 65% to 75% SMEs use the Internet for distribution of information on

products but even more important to note, about 40% use it to receive orders and another 17% to deliver the products to their customers.

Commercial use made of the Internet, by size of enterprise (percentage of SMEs using the Internet)

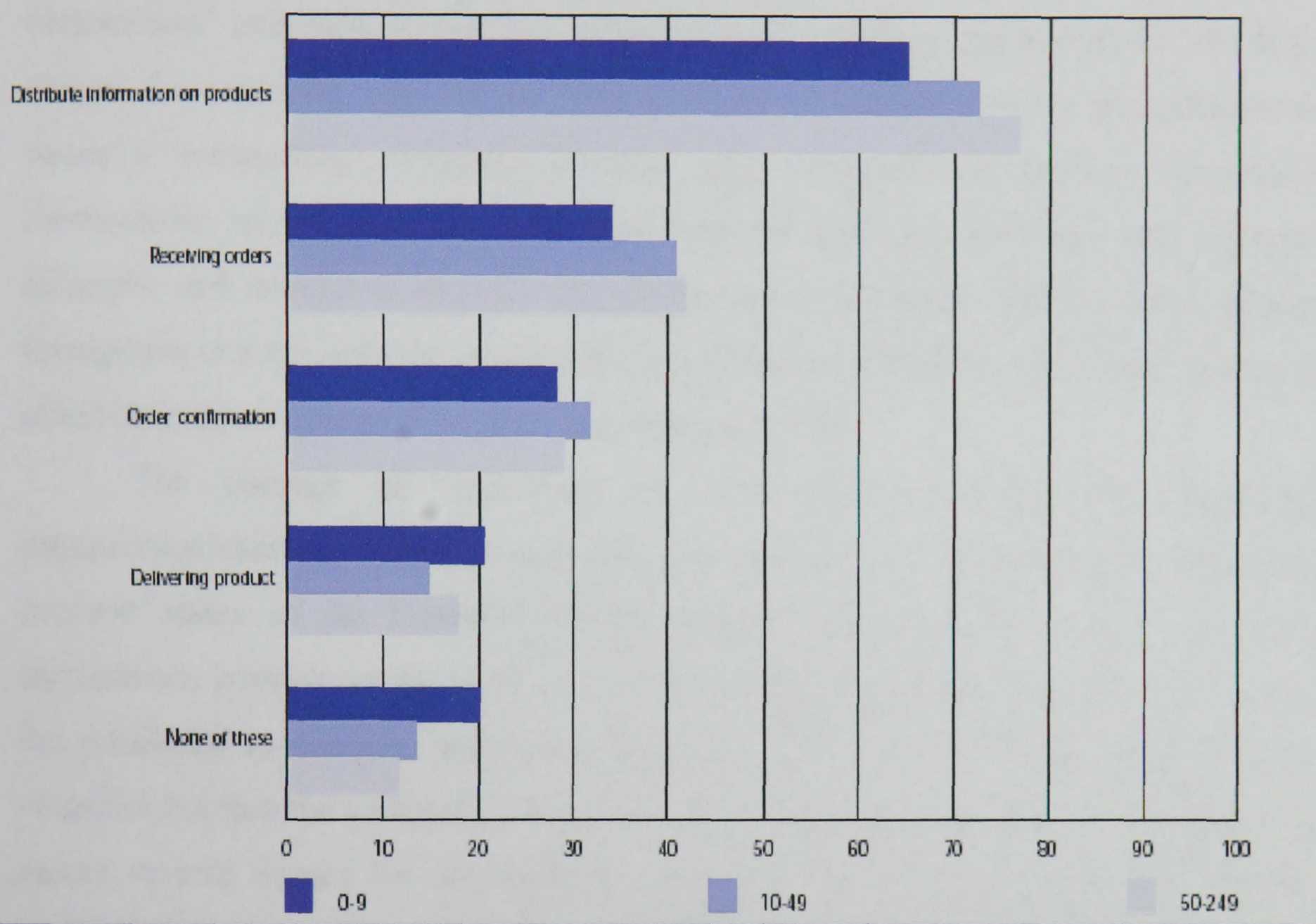


Figure 11, Source: European Commission, Observatory of European SMEs, 2002, No. 1, p. 23.

After what has been said for SMEs in the preceding pages the question that now arises is how can SMEs become more competitive and furthermore, how can they survive the internationalisation of business activities, also attributed to the advent of ICT? Should SMEs, and consequently their entrepreneurs and/or managers, and for what reasons proceed to alter their strategic orientation and organisational policies towards cooperative agreements and strategic alliances? In the following pages, we attempt a first glance into how business networks and strategic alliances affect the competitiveness of SMEs and their innovative capabilities. We establish a theoretical framework to function as a springboard for the investigation and presentation of the concepts of industrial districts, networks and business clusters that are the primary focus of evaluation and analysis of the following chapter.

3. The evolution of competition and competitiveness; business networks and strategic alliances

This part of the chapter starts with the introduction of the concept of the 'evolution of competition' and how it affects SMEs operations and competitiveness. We then. discuss the emerging ways for an SME to retain its competitiveness and address the issues of 'networking', 'strategic alliances' and 'collaborations' between enterprises. Furthermore we explore the historical roots of business networks and strategic alliances, and attempt to explain why companies, particularly SMEs should engage themselves in such activities and pursue co-operative strategies, which will positively affect their innovative performance and competitiveness.

The concept of 'evolution of competition' describes the escalating internationalisation of business activities. For example, the unification of the fifteen member states of the European Union under a single monetary unit (and new legalisation) opened up the markets for enterprises of member states that now have the possibility to compete and seek opportunities not only within the limits of their countries but into the unified European market. On the other hand, internationalisation posses several threats for the companies that have to realise now that competition could strike not only from other companies located in a certain geographical proximity but potentially from any company operating in the EU. Internationalisation or as otherwise stated 'globalisation' is the evolution of competition. According to Castro (2000), globalisation released firms from physical and geographical constraints and from national regulatory frameworks. The authors suggest that globalisation is the outcome of three main processes,

I. The substantial decline of transport costs.
II. The rapid development of telematics, which is the combination and join development of telecommunication and information technologies.
III. The gradual removal of barriers to trade and to the circulation of capital.

(Castro, 2000, p. 193)

Moreover, Narula and Hagedoorn (1999), refer to globalisation as the increasing similarity in consumption and income levels across countries and the simultaneous increase in cross-border activities of enterprises from these countries. The authors suggest that globalisation is mainly associated with the Triad of industrialised countries, United States of America, Europe and Japan, and that its effects vary across industries and is particularly heightened in sectors that are capital and knowledge intensive as well as in sectors that depend on fast evolving technologies.

The internationalisation of competition was strongly illustrated in the survey results of the Observatory of European SMEs (2002). According to the results (2002), 20% of SMEs are engaged in exports whilst there is a clear size-class pattern, with 19% of micro enterprises, 32% of small and 46% of medium-sized enterprises engaged in exporting.

Increase in Competition over the last 5 years, by size of enterprise (percentage of SMEs)

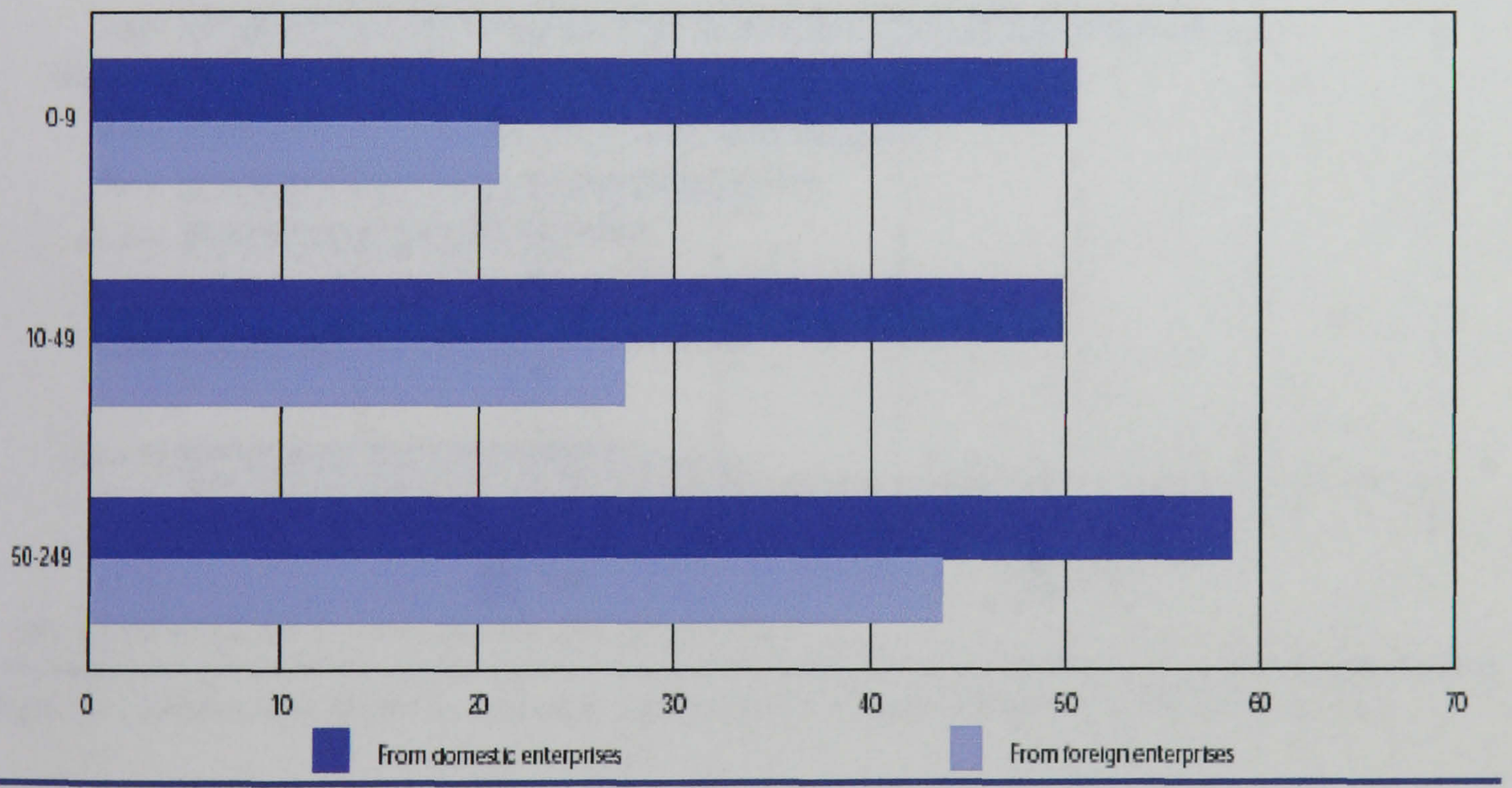
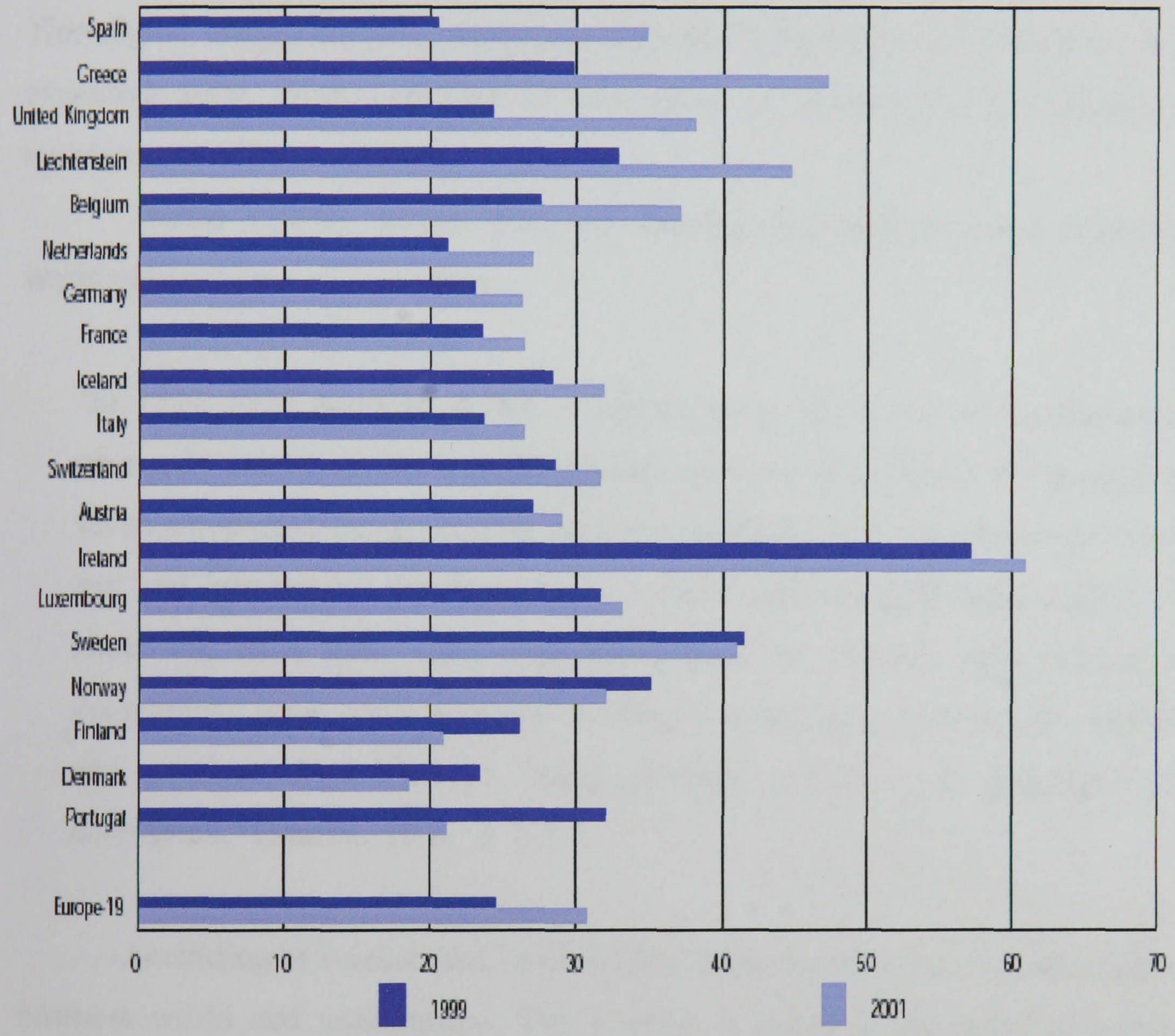


Figure 12, Source: European Commission, Observatory of European SMEs, 2002, No. 1, p. 14.

According to the figure above, 50 to 60% of SMEs are facing an increase in competition from domestic enterprises. The increase in competition from foreign enterprises indicates again a size-class pattern, with only 20% of micro enterprises feeling more competition versus about 28% and 45% for small and medium-sized enterprises respectively. Furthermore, according to the Observatory of European SMEs (2002), about one third of all SMEs report an increase in number of

international business contracts over the last five years, ranging from 30% for micro enterprises to 50% for medium-sized enterprises. The percentage of SMEs reporting an increase in international business contracts over the last 5 years, by country is presented in the following figure.

Percentage of SMEs having more international business contracts than 5 years ago, 1999 and 2001, by country.



Note: The countries are ranked by the increase in the year 2001 over the year 1999.

Figure 13, Source: European Commission, Observatory of European SMEs, 2002, No. 1, p. 15.

According to the Observatory of European SMEs (2002), the SMEs of the member states have encountered an increase in international business contracts ranging from about 26% for countries like Germany and France to 37% for Belgium and UK and to an extraordinary 48% for Greece and 62% for Ireland.

The soaring power of computer technology has spawned powerful communication networks that organisations can use to access vast storehouses of information from around the world and to coordinate activities across space and time.

The world's largest and most widely used network is the Internet. The Internet is becoming the foundation for new business models, new business processes, and new ways of distributing knowledge. Traditional firms are finding they can use the Internet to organise suppliers, manage production, and deliver to customers. Internally, companies can use the Internet and networking technology to conduct more of their work electronically, seamlessly, linking factories, offices, and sales forces around the globe. The Internet has created a universal platform for buying and selling goods. This digital integration both within the firm and outside, from the warehouse to the executive suite, from suppliers to customers, is changing the organisation and management of business firms.

Martin (1996) argues that the Internet is fundamentally changing the worldwide patterns of commerce,

> "In 1994, Ford announced that it was merging all its activities, distributed among 30 countries, into a single global operation. It electronically merged its seven automotive design centres on four continents. Ford developed its 'world car' and split vehicle development by vehicle type, not geographic market. At about the same time, IBM reorganised itself by industry type, instead of geography…large companies are shifting from being geographically specific and product diversified to being product specific and geographically diversified." (Martin, 1996, p. 17)

According to Laudon and Laudon (2001), the Internet has internationalised the business world and marketplace. The Internet is creating new ways of conducting business electronically since it is providing the underlying technology for it. The Internet can link thousands of organisations into a single network, creating vast electronic marketplaces. An electronic market links together numerous buyers and sellers, producers and customers, to exchange information, knowledge, products and services and payments. As the authors argue, through computers and the Internet, the typical marketplace transactions such as selecting suppliers, establishing prices, ordering goods, and paying bills, have lower costs and increased speed. The transactions are made electronically regardless of the location of the suppliers, the buyers, the company, the customers, etc.

Internet has allowed in great part for the internationalisation of competition. In the traditional sense of a marketplace, typically geographically oriented, corporations knew who their competition was. In today's 'Internet market', totally unexpected competition can come from anywhere because it depends on knowledge that can be transmitted anywhere and because of the 'elimination' of national boundaries.

According to Martin (1996), computers and the Internet are used to find the lowest possible price of goods and services, to link cheap-labour countries to the Western societies, to use low-salary designers, educated workers and experts from around the globe in order to create competitive advantages for the company.

One of the most rapidly emerging approaches to industrial competitiveness of small and medium sized enterprises (SMEs) is that it can be accelerated through inter-firm collaboration. When corporations share competencies and knowledge it becomes possible to tackle jobs that no single corporation could tackle alone. In the best cases the assembly of core competencies from different companies enables corporations to build a team of organisations and individuals who together have the highest-level capabilities. This is increasingly essential for world-class competition and innovation. As we have discussed in the previous part of this chapter today's networks, the Internet, video conferencing, and computerised tools make possible flexible but tightly coupled linkages between corporations. Companies are increasingly using information systems and the Internet for strategic advantage by entering into strategic alliance with other companies in which both firms cooperate by sharing resources or services. Such alliances are often information partnerships in which two or more firms share data for mutual advantage. They can join forces without actually merging.

> "American Airlines has an arrangement with Citibank to award one mile in its frequent flier program for every dollar spent using Citibank credit cards. American benefits from increased customer loyalty, whereas Citibank gains new credit card subscribers and a highly creditworthy customer base for cross marketing." (Laudon and Laudon, 2001, p.60)

Martin (1996) provides an example of a globally-networked corporation using computers and the Internet to conduct its business,

"An order in Spain with and order-entry computer in France triggers manufacturing planning software in New York to place items into a manufacturing schedule in Dallas, which requires chips from Japan to be built into circuit boards in Singapore, with final assembly in the robotics factor in Dallas and computer-controlled shipment from a warehouse in Milan." (Martin, 1996, p. 13)

Some companies are extending their enterprise systems beyond the boundaries of the firm to share information and coordinate business processes with other firms in their industry. Industrial or business networks link together the enterprise system of firms in an entire industry. Internet technology has fuelled the growth of industrial and business networks because it provides a platform where systems from different companies can seamlessly exchange information. According to Laudon and Laudon (2001),

"Procter & Gamble (P&G) the world's largest consumer goods company has been developing an integrated industry-wide system that coordinates the grocery store point-of-sale systems with grocery store warehouses, shippers, its own manufacturing facilities, and its supplier or raw materials. This single industry-spanning system effectively allows P&G to monitor the movement of all its processes from raw materials to customer purchase. Typically, there are two kinds of industrial networks. Vertically organised industrial networks as the one just described and horizontally organised industrial networks that link firms across and entire industry. For example, General Motors, Ford and Daimler-Chrysler created a common Internet purchasing system to help them obtain parts and other goods on-line from suppliers, in order to reduce costs and save time from their cooperation." (Laudon and Laudon, 2001, p. 91)

The new competition, according to Rosenfeld (1996), is among alliances of firms and not among individual firms. According to the literature and empirical studies (Hoffmann and Schlosser 2001; Narula and Hagedoorn 1999; Prabhu 1999), cooperative alliances are particularly acute in sectors that are capital and knowledge intensive as well as in sectors that depend on fast evolving technologies. The scholars suggest that this phenomenon is most prominent in industrial sectors where new

product developments are high, and where access to new technology is vital. Prabhu (1999) for example, argues that 60% of Japanese firms expected to be highly depended on external technology sources, and half of the major US firms are expected to increase their participation in joint ventures and alliances primarily for access to new technology. Moreover, Hoffmann and Schlosser (2001) suggest that alliances are most important manoeuvres in industries like information and communication technologies, manufacturing, trade and services. Tomlinson (2000) argues that the depth of networking in the computer industry can reveal the importance of collaboration, using IBM as an example,

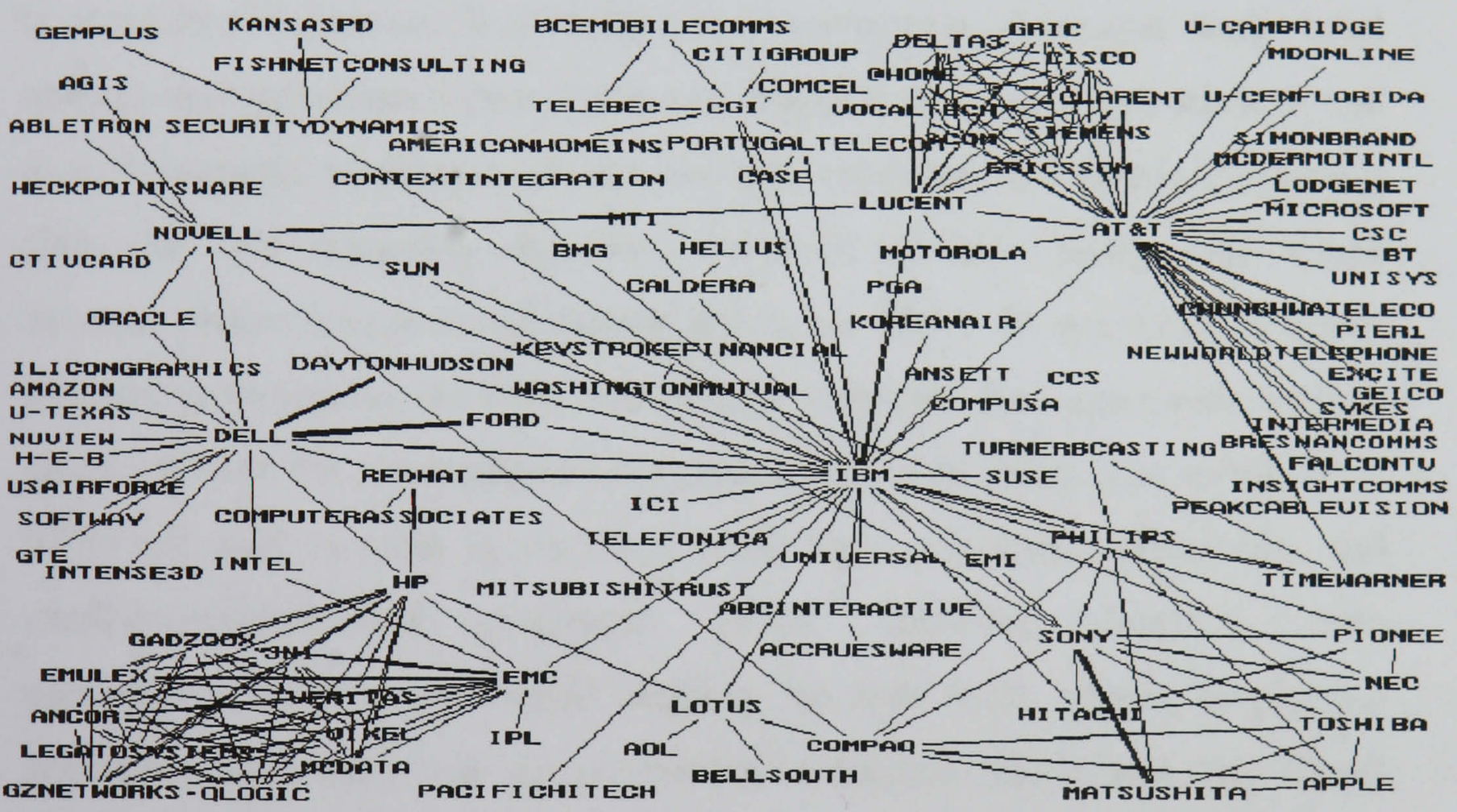


Figure 14, Source: DRUID, Working Paper No. 00-09.

Before the evolution of competition, as described earlier and the advancement of ICT, the case of inter-firm collaboration, which could be assigned the role of catalyst, was noted, among other places, in Europe and specifically in northern Italy in the 1970s where it was common for small artisan firms to band together and to stake out remarkable strong market positions even in traditional industrial markets. These family-owned manufacturing companies owe much of their success to their interdependencies, collective vision, tight knit infrastructure of trade and business associations and membership service centres as Rosenfeld (1996) points out. Perrow (1992) identifies the Small Firms Network (SNF) accordingly,

"The firms are usually very small – say 10 people. They interact with one another, sharing information, equipment, personnel, and orders, even as they compete with one another. They are supplied by a smaller number of business service firms (business surveys, technical training, personnel administration, transport, research and development, etc.) and financial firms. There are, of course, suppliers of equipment, energy, consumables, and so on, as well as raw material suppliers. Finally, while producers may do their own marketing and distribution, it is more common for there to be a fair number of quite small distributors, which is especially striking because SFNs typically export most of their output. The small firms are surrounded by an infrastructure that is essential for their survival and for their economies of network scale: local and regional government provides roads, cheap land, educational services, and even financing; trade associations provide economic information, training, financing, and marketing services; and both of these along with unions monitor unfair business and labour practices. SFNs do not exist in heavy industry or extractive industry, and in final assemble for large goods such as autos we have the nondependent subcontracting form rather than a true SFN. SFNs are said to exist in clothing, food, light machinery, electronics and small-to-medium-sized electronic goods, ceramics, furniture, auto components, motorcycles, small engines, machine tools, robots, textile and packaging machinery, mining equipment, industrial filters, and agricultural machinery. But it is not clear from the literature that in all cases networks of small firms is involved, though networks exist in most…a well-known example would include the textile firms in Prato and Modena in Northern Italy." (Perrow, 1992, p. 455-456)

The success of the noted cooperation among a variety of northern Italy firms soon forced governments in many other countries to adopt the underlying environment and the infrastructure that was necessary for encouraging the cooperation between SMEs. In 1989 the Danish Technological Institute developed a programme that was immediately adopted by the Ministry of Trade and Industry that was based on three features:

1. Training programmes for people that would facilitate cooperative ventures and for people that would identify opportunities.
2. Publicity campaign.
3. Encouragement of three or more firms to cooperate in the design, development and implementation of activities by providing them the necessary funds.

(Rosenfeld, 1996)

According to the author, Denmark has created what is nowadays been commonly accepted as the international term for these kinds of cooperation '*networks*'. The author goes on to suggest that the Denmark case in conjunction with the Italian inspired other countries such as Spain, the United Kingdom and Portugal to implement similar programmes for SMEs networking. In fact, in Europe several government agencies and private foundations are experimenting with and try to support, stimulate and accelerate different forms of inter-firm collaboration, or as otherwise stated 'business networks'. The assumption behind such efforts and programmes is that cooperative behaviour will help SME firms to first of all survive in their market place, innovate through collaborative research and development projects and shared knowledge, and then be able to successfully compete with larger enterprises.

According to Goffee and Scase (1995), the aim in today's business world is to combine operational efficiency and cost effectiveness –attributes commonly associated with large-scale organisations- with flexibility, responsiveness, and innovation –characteristics conventionally linked with smaller enterprises. The ideal for the authors is to achieve global organisation and local responsiveness simultaneously,

> "Networks are faster, smarter and more flexible than reorganisations or downsizing…in effect, a network identifies the 'small company inside the large company' and empowers it to make the four-dimensional trade-offs – among functions, business, units, geography and global customers – that determine success in the marketplace'."(Goffee and Scase, 1995, p. 159)

The authors argue that organisations are, or at least should be focusing upon areas of 'core' strength and competence and spinning off, out-sourcing and

subcontracting all other activities. In this business network, organisational changes and strategies will depend on forming alliances and empowering relations with 'small businesses' that would form a constellation around the 'core enterprise' where boundaries are ambiguously defined and constantly shifting.

Cooperation has been studied from a number of different perspectives. According to Hoffmann and Schlosser (2001), the three most prominent theories that explain the potential reasons for an SME to form a cooperative alliance are,

A. The *transaction cost* theory recommends choosing the organisational mode that minimises the sum of fixed and continual transaction costs. In the case of medium-asset specificity, alliances are considered the most transaction-cost-efficient organisational form.
B. The *resource-based* view of the firm explains firms as bundles of resources, i.e. of all assets and capabilities a company possesses. From this perspective, alliances arise when a firm needs additional resources that cannot be purchased via market transaction and cannot be built internally with acceptable cost (risk) or within an acceptable amount of time.
C. According to the emerging *knowledge based* theory of interfirm collaboration, alliances provide the best context for creating value by exchanging or combining dispersed knowledge. Firms that face high environmental uncertainty especially can utilise alliances to enhance and speed organisational learning, reshape their environment and reduce strategic uncertainty.

(Hoffmann and Schlosser, 2001, p. 358-359)

In their study, Hoffmann and Schlosser (2001) examined several attributes of the strategic alliances of SMEs in the Austrian economy. According to the authors more than 99 per cent of Austrian companies are SMEs. These companies represent almost 60 per cent of the total turnover of all Austrian companies and employ more than 65 per cent of all workers. In Austria, SMEs are called to adjust to new market conditions and competitive situations, particularly now with the unification of the European Union and the globalisation of markets. From an initial random sample of 1000 SMEs only 164 answered, of which 70 SMEs were engaged in a cooperative alliance. The two tables, in the next page, describe the most important attributes of the analysed companies.

Attributes of the analysed companies

Industry Sector		**Number of employees**		**Management**	
Commerce	35.7%	1-9	2.85%	Run by owners	72%
Trade	31.4%	10-99	54.3%	Run by professionals	28%
Manufacturing	20.0%	100-500	42.9%		
Services	12.9%				

Table 10, Source: Hoffmann and Schlosser 2001, p. 366

Field of Cooperation (more than one field of cooperation could be stated)		**Objectives** (more than one objective could be stated)		**Configuration Type**	
Sales and logistics	74.3%	Market entry	76.8%	Contractual alliances	44.3%
Production	42.9%	Cost reduction	72.5%	Joint ventures	32.9%
Procurement	35.7%	Access to new technologies	46.4%	Minority shareholding	12.9%
Administration	28.6%	Risk diversification	21.7%	Other	9.9%
R&D	21.4%				

Table 11, Source: Hoffmann and Schlosser 2001, p. 367

Even though the authors did not use the definitions of SMEs as proposed by the European Commission a clear size-pattern emerges. Only 2.85% of micro enterprises are involved in strategic alliance while for small and medium enterprises the percentage is about 50%. Moreover the attributes identified, i.e. cost reduction, R&D, access to new knowledge, etc., are in line with the three theories outlined earlier for the reasons of an SME to enter a cooperative alliance.

As explained earlier, governments in several countries of the European Union are developing policy schemes, training and funding programmes to induce SMEs to establish alliances in order to overcome their resource shortages and increase their viability in these difficult times. Inter-firm collaborations, such as strategic alliances and joint ventures, have become important management instruments that SMEs adopt or should adopt to improve their competitiveness and innovative capabilities by providing access to external resources, providing synergies and fostering knowledge sharing, learning and creative change, the prerequisites to innovation. Alliances bridge the gap according to Hoffmann and Schlosser (2001), between the firm's present resources and its expected future requirements.

4. In Conclusion

SMEs are central to the focus of this thesis as the title of it explicitly indicates. In this chapter we have defined what constitutes an SME and identified its most prominent characteristics with particular emphasis to the central and important role played by entrepreneurs. We have attempted to build the conceptual framework behind small and medium-sized enterprises that constitute the backbone of the economies in a majority of countries around the world and in the European Union particularly. Moreover, we have described the concept of the 'evolution of competition' and how it affects SMEs and the business world in general. Furthermore, we have discussed the importance of cooperative alliances between firms, which seem to strengthen SMEs competitiveness and because of the sharing of knowledge and resources can also enhance their innovative capabilities.

The importance of this chapter for the purposes of our thesis is twofold. First, it acts as the conceptual framework and springboard for the introduction and exploration of the idea of 'business networks', and 'business clustering', and investigation of the innovative potential of SMEs within the clusters and university-industry-government relations. Furthermore, this chapter builds upon the previous in expanding the theoretical framework for the design of the two dimensional model that we will introduce in chapter three.

Chapter three deals with the concepts of industrial districts, networks and business clusters and explores how business clusters affect innovation and competitiveness in SMEs. It, also, intends to explore and present the important role of institutions, agents and governments in promoting business clusters, networks and university-business relations. In the last section of chapter three, we set up, describe and analyse a hypothetical, descriptive two-dimensional model of SMEs that aims to link the concepts and relations of innovation and business clustering, and to provide four 'illustrative' cases that describe the characteristics and dynamics of SMEs.

Chapter 3

Business Clusters, SMEs and Innovation; Towards a Two Dimensional Model for Understanding SMEs

1. Introduction

In chapter two we identified some of the more important characteristics of SMEs and we argued how SMEs can play a key role in triggering and sustaining economic growth in developed and developing countries. We illustrated that in the EU there are some 19 million SMEs representing 99.8% of all enterprises, which have been the major job generator by providing employment to more than 70 million people. However, the enormous potential of the role of SMEs is often not fulfilled because of particular sets of problems, which characterize them, i.e. their size or the managers/owners lack of competence. Furthermore, individual SMEs are often unable to capture market opportunities, which require large production capacities, homogenous standards, and regular supply. By the same account, small size constitutes a significant hindrance to the internalisation of functions such as training, market intelligence, and innovation, all of which are at the very core of firm dynamism according to management literature. We have also examined the importance and the central role of entrepreneurs for SMEs, and attempted to understand how business networks and strategic alliances affect the competitiveness and innovative performance of SMEs. Chapter two provided the conceptual framework and springboard for the presentation and analysis of the main themes of this chapter; the concepts of 'business clusters', and 'networks', investigation of the innovative potential of SMEs within clusters, the university-industry-government relations, and examination of regional economies like the 'Third Italy' and 'Silicon Valley'.

The aim of this chapter is to provide an understanding of business clusters, adding to the discussion in chapter two. In this chapter we discuss the literature thus providing a review for clusters and networks, adding to the theoretical framework that was established in chapter two and we examine how and why clusters can affect SMEs innovative capabilities and competitiveness, as well as the importance and central role of entrepreneurship and innovation. Furthermore, we attempt to answer how important is the role of institutions, agents, authorities and the government in promoting and supporting business clusters and university-business relations. The attempt will be to clarify the characteristics of clusters and networks by providing

examples of well-known cases. Operating within this conceptual framework, we will examine Silicon Valley since it is the most documented. Hence, having investigated, analysed and presented the concepts of entrepreneurship and innovation in the first two chapters of this thesis and business clustering in this chapter, in the last section we set up, describe and analyse a two-dimensional model of SMEs that aims to link the 'concepts' and their relations and to provide a descriptive framework for understanding the dynamics of SMEs growth.

According to Enright and Ffowcs-Williams (2000) clusters, which are properly defined in the next section of this chapter, could for the time-being be delineated as, a sectoral and geographical concentration of inter-related and inter-connected enterprises which produce and sell a range of related or complementary products. They are, thus, faced with common challenges and opportunities and these can help SMEs realise the opportunities and meet the challenges associated with internationalisation and intense competition, an issue we raised in chapter two. The authors argue that membership of clusters can enhance the productivity, rate of innovation and competitive performance of firms. Moreover, according to the European Commission and the Observatory of European SMEs (2002), clusters are widely recognized by scholars and policy-makers around the world as important settings in stimulating the productivity and innovativeness of companies and the formation of new businesses. According to the Observatory of European SMEs (2002),

> "Competition is increasingly seen to occur between clusters, value chains or network of firms rather than just between individual firms. It is also argued that regional clusters are the best environment for stimulating innovation and competitiveness of firms." (Observatory of European SMEs, 2002, No. 3, p. 13)

The influential writings of Porter (1998) also underline the importance of clustering in affecting competitiveness within countries and across national borders. Porter introduces a way of thinking, where companies reconfigure themselves, institutions such as universities contribute to competitive success and governments promote economic development and prosperity.

As we present and examine with supportive data throughout this chapter. clusters, or as otherwise stated, industrial districts of firms were first observed in Italy the 1960s, mainly consisting of SMEs, which proved to be not only equal, but also more dynamic than large-scale, private or government-run industries, often establishing a strong presence on world markets. Italy's industrial districts became a reference point of the discussion of regional clustering in management literature. Another important reference point at the other side of the Atlantic has been Silicon Valley in California, which is also described as a cluster, or rather an agglomeration consisting of several interrelated clusters (Meyer-Stamer, 2001). As Porter (1998) quotes,

> "Paradoxically the enduring competitive advantages in a global economy lie increasingly in local things-knowledge, relationships and motivation that distant rivals cannot match." (Porter, 1998, p. 77)

The examples of prosperous and well performing regional and industrial clusters established in the 1970s and 1980s in Northern Italy and in the Silicon Valley increased the focus of interest of academics and policy makers in the phenomenon of clustering. In the course of 1990s, clusters became a target for regional and national initiatives and policies to promote competitiveness and innovation, stimulate productivity, growth and the formation of new businesses. According to the Observatory of European SMEs (Regional Clusters in Europe, 2002),

> "The increased focus on regional clusters and innovation systems reflects a (re) discovery by many academics of the importance of the regional level, and the importance of specific local and regional resources in stimulating the innovation capability and competitiveness of firms. Specific regional resources such as a stock of 'sticky' knowledge, learning ability, entrepreneurial attitudes etc. are seen to be of great importance in firms' efforts to be at global competitive level. Building regional clusters is even perceived by some as the way to compete globally, as economic 'specialization is (seen as) the only way to overcome 'the globalisation trap', that is, outrunning the risk of being out competed across the board'."

(Observatory of European SMEs, Regional Clusters in Europe, 2002, No. 3, p. 9)

In this chapter we explore the emerging concept of business clustering as a means for regional and national initiatives and policies to promote competitiveness and innovation, stimulate entrepreneurship, productivity, growth and the formation of new businesses. Delving into these issues obliges us to explore clusters through a historical perspective and address a series of questions such as where and when they first appeared, in which economic sectors, how and why they emerged, how they are defined, and what their characteristics are.

2. Clusters/industrial districts and networks

Theoretical and empirical studies have stressed the importance of location in a world characterised by internationalisation and intense competition. The success of some regional clusters such as, for example, the Silicon Valley and Prato region in Italy have triggered attention to the role of knowledge and local environment in stimulating the competitiveness of networks of firms. With the advent of information and communication technologies, information and knowledge flow is scarcely affected by distance and nowadays even oceans and mountains are considered as relatively small barriers. Physical transportation is no longer as important or as difficult as it used to be. The ever-declining cost of transporting goods and people by air, the improved surface and shipping transportation has led to physical boundaries becoming less important. The broad pattern that seems to be emerging is that of markets being big and based on global regions, whereas producing units are smaller and based on sub-national regions (Padmore and Gibson 1998). Moreover, according to Porter (1998),

> "Economic geography in an era of global competition, then, poses a paradox. In a global economy -which boasts rapid transportation, high-speed communication, and accessible markets- one would expect location to diminish in importance. But the opposite is true. The enduring competitive advantages in a global economy are often heavily local, arising from concentrations of heavily specialised skills and knowledge, institutions, rivals, related business, and sophisticated customers. Geographical, cultural, and institutional proximity leads to special access, closer relationships, better information, powerful incentives, and other advantages in productivity and innovation that are difficult to tap from a distance. The more the world economy becomes complex, knowledge based and dynamic, the more this is true." (Porter, 1998, p. 90)

Industrial districts capture the attention of a substantial body of researchers and policy-makers across a wide range of countries and organisations. According to several influential scholars and researchers, industrial districts do constitute a

potentially attractive model of regional development. Nassimbeni (2003) provides a broad list of the main features of Industrial Districts that summarises the views and works of many scholars on the subject,

i. High proportion of small and very small firms.
ii. Clustering of firms in a geographical location.
iii. Firms engaged at various stages of production-intense specialisation.
iv. Dense networks of a social and economic nature.
v. Blend of competition and co-operation between firms.
vi. Rapid and mainly informal diffusion of information, new ideas, experiences and know-how.
vii. Adaptability and flexibility.

(Nassimbeni, 2003, p. 153)

A proper understanding of the concept of clustering obliges us to begin our analysis with the British economist Alfred Marshall who carried out the first and most important work in the field of industrial agglomeration at the end of the nineteenth century. His seminal work sparked a series of studies on districts. In his work, the *Principles of Economics*, first published in 1890 Marshall (1922) describes districts as a territorial concentration of numerous (small) enterprises characterised by high vertical and horizontal specialisation, a dense network of social and economic, competitive and cooperative relations. The exchange of commercial and technical information including any innovations is prompt but informal.

> "…The mysteries of the trade become no mysteries, but are as it were in the air, and children learn many of them unconsciously. Good work is rightly appreciated, inventions and improvements…have their merits promptly discussed: if one man starts a new idea, it is taken up by others and combined with suggestions of their own, and thus it becomes the source of further new ideas." (Marshall, 1922, p. 271)

Marshall, in his early writings on Sheffield cutlery, Lancashire cottons and other British regions, ascribes their competitive advantage to the presence of external economies, as the 'commons', the infrastructure and other services from which each

individual firm in an industrial district might draw. These include faster dissemination of new ideas, experience and know-how thanks to geographic proximity, cultural homogeneity, common manufacturing traditions, reduced cost of transport (and of transactions in general), and the easier access to complementary services or capabilities.

Furthermore, examples include improved job search and job matching, more favourable access to capital finance and inter-firm labour migration. According to Marshall, the availability of such common resources to a number of firms then enhances their size and diversity as both capital and labour are attracted to such areas to exploit the larger markets for their services. This, in turn, leads to reductions in factor prices and/or increases in factor productivities. These are the ways in which the external benefit to firms of a location in the industrial district manifests itself. Unit productions costs will be lower within the industrial district than out of it.

As Zeitlin (1992) argues the external economies in Marshall's analysis assume three main forms:

1. Economies of specialisation arising from an extended division of labour between firms in complementary activities and processes,
2. Economies of information and communication arising from the joint production of non-standardised commodities (similar to modern notions of transaction costs),
3. Economies of labour supply arising from the availability of a large pool of trained workers.

(Zeitlin, 1992, p. 280)

In addition, the author argues that Marshall also noted the more dynamic but less narrowly economic in character, advantages that the industrial districts seemed to gain from a distinctive 'industrial atmosphere' which facilitated the acquisition of specialised skills and the diffusion of knowledge and innovations through socialisation and interchange between local actors. According to the author, it was much later in course of time, during the 1970s that a number of influential writers sought to elaborate Marshall's notion of 'industrial atmosphere' by including a set of more explicitly 'social' features drawn mainly from the 'Third Italy'. Beccatini (1990) developed one of the most influential works on industrial districts as a 'socio-

economic notion'. Among the new elements introduced into the Marshallian ID (industrial district) were a non-metropolitan, small town environment, a set of shared values such as hard work, co-operation and collective identity, and a social structure based on the prevalence of entrepreneurs and industrial workers. According to Beccatini (1990), an industrial district is defined as,

> "A socio-economic entity, which is characterised by the active presence of both a community of people and a population of firms in one naturally and historically bounded area." (Beccatini, 1990, p.39)

An influential work on business clusters and especially on when, how and why they emerged is presented in Piore and Sabel's text '*The Second Industrial Divide (1984)'* that draws together a meta-historical analysis of the late nineteenth and twentieth century capitalistic mode of production. In their text the authors argue that the epoch of mass production is fading away giving the way to small firm economy,

> "Our claim is that the present deterioration in economic performance results from the limits of the model of industrial development that is founded on mass production: the use of special-purpose (product-specific) machines and of semiskilled workers to produce standardised goods." (Piore and Sabel, 1984, p. 4)

The authors argue that throughout the nineteenth century, two forms of technological development were in collision. One was craft production, based on the idea that machines and processes could augment the craftsman's skill, allowing the worker to embody his/her knowledge in even more varied products, while the other form of technological development was mass production. Its foundation was the idea that the cost of making any particular good could be significantly reduced if only machinery could be substituted for the human skill needed to produce it.

According to the authors, a strong inter-firm division of labour among clusters of small firms, connected by horizontal and vertical competitive and cooperative relationships, can lead to greater collective efficiency than that of large-scaled Fordist enterprises. They cite industrial districts in central and northern Italy where cooperation and innovation is promoted by establishing an ethos of interdependence

among producers in the same market, while competition is encouraged but controlled by mechanisms of social cohesion within the local community. Piore and Sabel (1984) call this flexible specialisation.

> "It is seen in the networks of technologically sophisticated, highly flexible manufacturing firms in central and northwest Italy. Flexible specialisation is a strategy of permanent innovation: accommodation to ceaseless change, rather than an effort to control it. This strategy is based on flexible –multi-use– equipment; skilled workers; and the creation, through politics, of an industrial community that restricts the forms of competition to those favouring innovation. For these reasons, the spread of flexible specialisation amounts to a revival of craft forms of production that were emarginated at the first industrial divide." (Piore and Sabel, 1984, p.17)

The following table illustrates the practical and conceptual differences between mass production and flexible specialisation. The table facilitates the identification of the concepts central to the flexible specialisation system, namely, innovation, inter-firm cooperation, joint problem solving, inter-organisational relations, local and regional infrastructure, the role of institutions, and competition based on innovation. Furthermore, both the analysis of the Marshallian theory of industrial districts, and the theory of Piore and Sabel's flexible specialisation bring forth the central role of small firms in business clusters.

Two Industrial Systems Compared: Mass Production & Flexible Specialisation

Dimension	*Mass Production*	*Flexible Specialisation*
1. Market conditions	Market stability with supplying equally demand.	Market instability, innovation and product development are key to securing market share.
2. Production technology	Purpose built machinery, dedicated to a particular task.	Flexible and multi-use machinery.
3. Products	Low variety, standardised range of products.	Semi-customised and mass variety goods, niche markets.
4. Productive organisation	Managerial hierarchies, span of control, large and centralised factories.	Flatter organisation structures, centralised planning and control system, dispersed production across the network, sub-contracting and franchising.
5. Work processes, operative skills	Rigid divisions between metal and manual labour, semi-skilled workers, predominantly unskilled labour.	Core and periphery of workers, multi-skilled artisans and semi-skilled operatives linked by a chain of sub-contractors.
6. Inter-organisational relations	Adversarial, little communication or inter-company projects.	Co-operative collaborative, based on trust and dependence.
7. Supplier relationship	Arm's length and adversarial, negotiation on price norm.	Obligational contracting relations, joint problem solving.
8. Regional infrastructure	Importance placed on wider macroeconomic policies to ensure supply equals demand.	Local and regional infrastructure central to industrial district development, co-operation between many non-industrial institutions.
9. Competitive strategy	Competition on price, economies of scale; over production compensated by stock piling or mark downs.	Competition based on innovative products and processes, responds to falling market by diversification, innovation or contracting to core business.

Table 1, Source: Day, 2000, p. 6

Piore and Sabel (1984) list a number of famous industrial districts of the nineteenth century. Silks in Lyon, ribbons, hardware, and specialty steel in neighbouring Saint-Etienne, edge tools, cutlery, and specialty steel in Solingen, Remscheid and Sheffield, calicoes in Alsace, woollen and cotton textiles in Roubaix, cotton goods in Philadelphia and Pawtucket, the history of which challenges the classical view of economic progress. According to the authors, small firms in those industrial districts often developed or exploited new technologies without becoming larger, suggesting a craft alternative to mass production as a model of technological advance. Day (2000), quoting from the work of Hirst and Zeitlin, illuminate the physiology of an industrial district as proposed by Piore and Sabel (1984),

"...Geographically-localised networks of small firms that sub-contract between one another and share a range of common services beyond the economic or productive capacity of the single firm...within the district there may be differing roles played by the firms, from productive units though to trade associations, trade unions and local government agencies..." (Day, 2000, p. 7)

According to Day (2000), trust and cooperation between firms in the industrial district are central to its existence. In order for the firms to live in a creative and innovative environment they must share their expertise and proprietary information with others. This mix of trust and dependence creates an atmosphere where competitors are also collaborators. This type of exchange allows the specialist firm to provide its expertise to build products that benefit from a pool of expert knowledge. Piore and Sabel (1984) argue that industrial districts are also depended upon the creation and operation of regional institutions that balance the cooperation and competition among firms, so as to encourage permanent innovation. Institutions create an environment in which skills and capital equipment could be constantly recombined in order to produce rapidly shifting assortments of goods. The institutions discourage firms from competition in the form of wage and price reduction, as opposed to competition through innovation of products and processes. In addition, Day (2000) suggests that the role of the state is to act as a facilitator for the industrial district to thrive within a geographically defined region. The type of support offered could be in form of economic regeneration zones, financial assistance for research and development, provision for training staff and funding for research agencies. The main aim according to the author is to provide the infrastructure support that would foster the industrial district to flourish.

The importance of the role of institutions in promoting business clustering is further supported in the "Californian school" of external economies, which argues that the disintegration of productive systems leads to an increase in firms' transaction costs (Scott and Storper, 1986; Scott, 1988; Storper, 1989). Changes in market and technological conditions have led to increased uncertainty and greater risks of over capacity (of labour and capital) and of being locked into redundant technologies. The response of deepening the organisational division of labour leads to an increase in the number of formal market transactions external to the firm. There may also be an

increase in the unpredictability and complexity of transactions. The costs of carrying out certain types of transaction, especially those where tacit knowledge is important or trust is required and thus complete contracting is impossible, varies systematically with distance. Thus, according to the authors, agglomeration is the result of the minimisation of these types of transactions costs in a situation where such minimisation outweighs other production cost differentials.

The 'Californian school' analysed the growth of new industrial spaces emphasising vertical disintegration of production chains in a new era of 'flexible accumulation', which leads to agglomeration of firms to reduce inter-firm transaction costs and the formation of specialised local labour markets (Scott 1988). Being at the start a mainly structural approach referring to universal causal mechanisms and circumstances the attention soon shifted to examining the role of culture, institutions and governance in the creation of new industrial spaces (Stroper and Salais 1997). The approach considers the agglomeration itself as a source of industrial dynamics, and in particular sees the region as the locus of what Storper (1997) denotes as 'untraded interdependencies', which are conventions, informal rules, practices and institutional norms that coordinate economic players under the conditions of uncertainty.

Underpinning this concept is the principle that economic forms are embedded in particular institutional frameworks. Thus, according to Storper and Salais (1997), the construction of any production system is the creation of behavioural-institutional sources of learning. These interdependencies, as delineated above, help the firm to define strategies in an environment characterised by market and technological uncertainty. The most crucial point according to Stroper (1997) is that these interdependencies often take place outside of conventional traded market mechanisms. Furthermore, since this knowledge is often tacit and localised, it is argued that it helps to create territorialized forms of production.

The influential writings of Porter first on industrial clusters (1990), in his work 'the competitive advantage of nations' and then on regional clusters (1998) in his work, 'clusters and the new economics of competition', describe the tight relationships between participation of firms and industries in clusters and enhanced competitiveness. For Porter (1990), a nation's competitive industries are not evenly spread throughout the economy but are connected and geographically concentrated in what he terms as 'clusters' consisting of industries usually linked through vertical

(buyer/supplier) and/or horizontal (customers, technology, channels, etc.) relationships. The author explicitly defines a cluster as,

> "Critical masses – in one place – of unusual competitive success in particular fields…clusters are geographic concentrations of interconnected companies and institutions in a particular field." (Porter, 1998, p. 78)

Porter (1998) defines clusters as concentrations that include a range of related industries and other entities important to competition. They could include suppliers of specialised inputs, i.e. on one hand, machinery and components and on the other hand, services, and providers of specialised infrastructure. The author argues that clusters often extent downstream to several channels and customers, as well as manufacturers of complementary products and to companies in industries related by skills. technology or common inputs. He also suggests that clusters encompass governments and institutions such as universities, research centres, trade associations etc., that provide education, information and knowledge, research activities, training and technical support.

Consider, for example, the Italian leather fashion cluster (figure 1 in the following page), which contains well-known footwear companies such as Gucci and Ferragamo, as well as a number of specialised suppliers of footwear components, design services, injection-moulding machinery, lasts and tanned leather as shown in the following figure. It also includes several chains of related industries, such as those producing leather handbags, belts, etc. and those producing different types of footwear, i.e. hiking boots, ski boots, etc. The former industries are linked by common inputs and technologies while the latter industries by overlapping channels and technologies. All these industries employ common marketing media and compete in related customer segments. Another Italian cluster, the textile fashion, encompassing clothing, scarves, accessories, etc. often employs common channels with the leather fashion cluster. The multiple linkages and synergies of the businesses participating in the Italian leather fashion cluster can to a great degree explain the astonishing strength of the cluster. (Porter, 1998)

Mapping the Italian Leather Fashion Cluster
Inter-related industries in the Textile Fashion Cluster

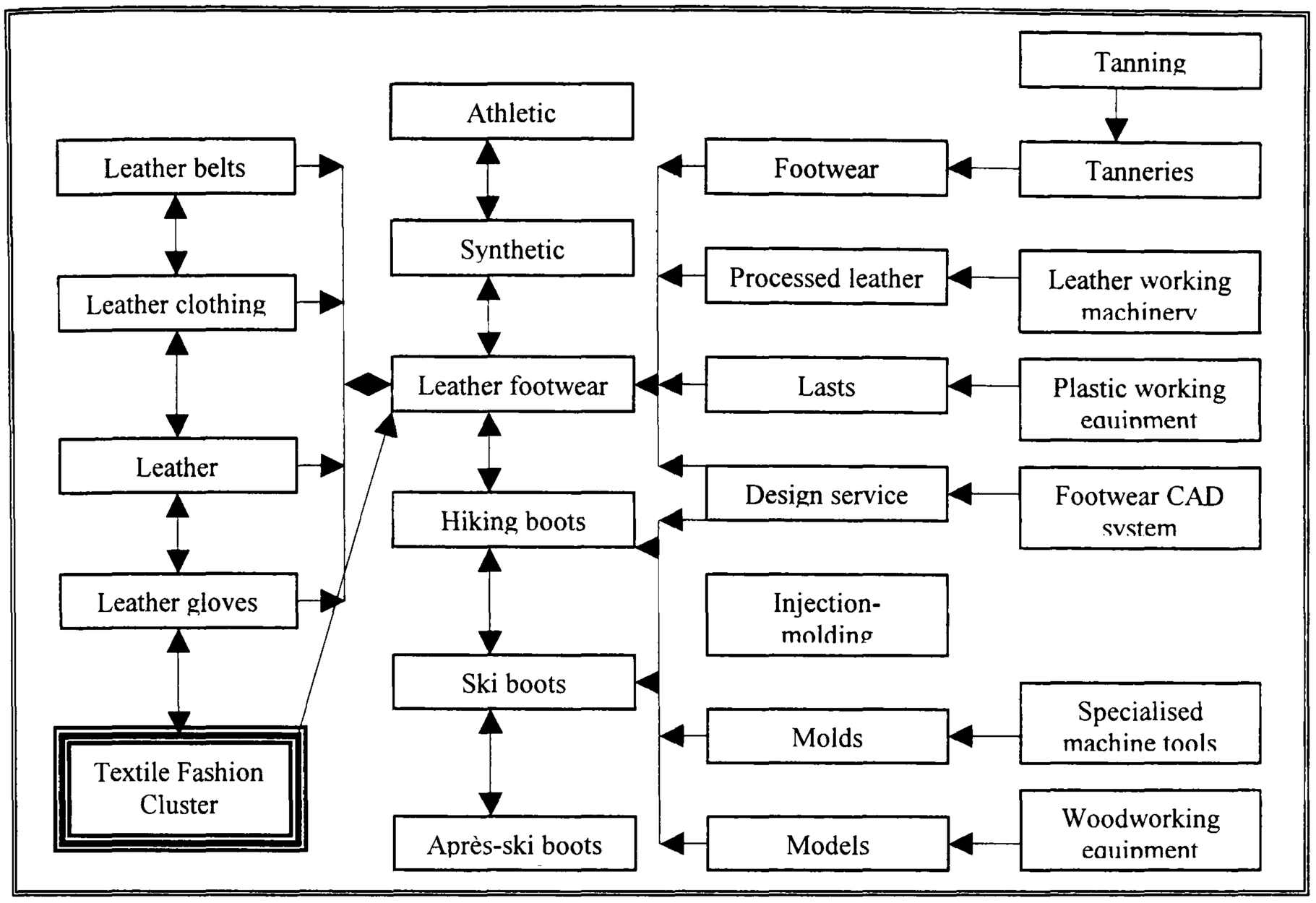


Figure 1, Source: Porter, 1998, p.80

According to the Porter (1998), clusters can and should promote both competition and cooperation since they occur on different dimensions and among different players. The author recognises that clusters are formed by independent and informally linked companies and institutions, usually in arm's-length relationships, thus representing a robust, effective, efficient and flexible organisational form without the inflexibility of vertical integration and the management challenges imposed by formal strategic alliances, networks and partnerships.

Several other scholars define clusters in a somewhat similar manner to that of Porter (1998). Padmore and Gibson (1998) argue, "a cluster is a concentration of firms that prosper because of their interaction, whether that is through competition and cooperation, or by serving as suppliers or customers in the value chain (Padmore and Gibson, 1998, p. 627)." According to Steinle and Schiele (2002), "clusters are localised sectoral agglomerations of symbiotic organisations that can achieve superior business performance because of their club like interaction...moreover...innovative clusters display at an inter-industrial level, underlying networks of interrelated co-operating businesses...such an environment is characterised by intensive knowledge

sharing (Steinle and Schiele, 2002, p. 850-851)." Furthermore, Lyon and Atherton (2000) consider a cluster as, "a group of organisations in related industries that have economic links, and, concentrations of competing, collaborating and interdependent companies and institutions, which are connected by a system of market and non-market links (Lyon and Atherton, 2000, p. 4)."

Synthesizing the aforementioned positions we could surmise, then, that industrial or regional clusters are groups of competing, collaborating and interdependent businesses working in common or similar industries and concentrated in a geographic region. Furthermore, institutions, governments, universities and other agents and entities appear to hold a decisive role in the promotion and success of a business cluster. Businesses draw on shared infrastructure and a pool of skilled workers. This form of cooperation between enterprises is a fundamental strategy for SMEs, capable to reach goals, which would not be obtained by the single enterprise. Cooperation could optimise costs, favour the exchange of know-how, make easier the access to strategic information, support learning dynamics and enhance innovation.

The Observatory of European SMEs (2002), as presented in the following table, attempts to differentiate three distinct concepts, namely those of regional clusters, regional innovation networks and regional innovation systems.

A Hierarchy of Three Concepts

Concepts	***Definitions and differences***
Regional cluster	A concentration of 'interdependent' firms within the same or adjacent industrial sectors in a small geographical area.
Regional innovation network	More organised cooperation (agreement) between firms, stimulated by trust, norms and conventions, which encourages firms' innovation activity.
Regional innovation system	Cooperation also between firms and different organisations for knowledge development and diffusion.

Table 2, Source: Observatory for European SMEs, 2002, No. 3, p. 14

Regional clusters are seen mainly as a spontaneous phenomenon, a concentration of interdependent firms in a geographic location often as a result of spin-offs and entrepreneurial activity. On the other hand, regional innovation systems are more planned and systemic in character according to the Observatory of European SMEs. The regional innovation system denotes regional clusters plus 'supporting' institutions. To create a regional innovation system, regional clusters must first

establish regional innovative networks with more formal and organised cooperation towards innovative projects. Finally, the complete regional innovation system according to the table above will involve cooperation in innovation activity between firms, different institutions, such as research centres, universities, training associations, knowledge creating and diffusion organisations, business associations and finance institutions, and other related institutions.

It should be noted that the Observatory of European SMEs (2002), simply ramifies in three distinct entities the concept of 'clusters' that Alfred Marshal, Michael Porter and other scholars defined earlier. It does not offer an alternative or different definition but rather defines 'cluster' as a 'regional innovation system' and adds emphasis on the innovative orientation of clusters.

The final part of this section explores the 'life cycle' of clusters. As we discussed above clusters, or as otherwise stated Industrial Districts have been developing internationally since the nineteenth century. High profile examples of such clusters include the motion picture industry around Hollywood, the high technology Silicon Valley cluster in California, and the Massachusetts' Route 128 in Boston. Moreover, clustering can been seen in the industrial districts of the North-Central Italy or Spain, Baden-Wuerttemberg and Bavaria in Southern Germany, the Toyota City and the company tows of Ludwigshafen, the fashion capitals of Paris and Milan, and the metropolitan business service centres of London, Hong Kong and New York and several others around the world. According to Enright and Ffowcs-Williams (2000), it has been estimated that around 380 clusters of firms operate in the United States, which together employ some 57% of the workforce and account for 61% of the country's output while in Italy clusters account for some 30% of total employment and in 1994 produced 43% of the county's exports. Finally, in Norway, according to the Observatory of European SMEs (2002), 62 regional clusters were identified, 55 of which are manufacturing-based, employing some 63,000 workers representing 22% of the Norwegian manufacturing employment in 1990.

Although the cluster development process in individual clusters could be different, the history of development of several well-known and prosperous clusters reveals a set of similar characteristics or steps in their evolution process. Since it appears that clusters often go through a life cycle of emergence, growth and decline, we will examine, briefly, each one of these phases below (Observatory of European SMEs 2002, Porter 1998, Enright and Ffowcs-Williams 2000). At this point, it is

important to note that exploring the cluster life cycle adds to the identification of the concept and nature of clusters while it also attempts to answer the key questions we addressed in the opening of this chapter and that are explored in the content of this thesis. The analysis that follows and the examples of clusters that are presented explore the central role of entrepreneurship and innovation in the emergence and growth of the cluster, the university-business relations, the important role of institutions, agents, associations and the government in fostering the development of clusters, the competitive advantages that these regions gain, the inter-firm collaborations and networking between small enterprises and the various institutions and agents that compose the cluster, and the socio-economic environment appropriate for new business start-ups.

The emergence of a cluster can often be traced to numerous reasons such as the availability and uniqueness of natural raw materials, specific knowledge or traditional know-how, local demand, the specific needs of a group of customers or firms, the location of firms and entrepreneurs performing some important innovation that stimulates the growth and accumulation of others, proximity to markets, reduced transaction costs, shared infrastructure, and the presence of local input or equipment suppliers, economies of scale and localised externalities, and labour pooling (Observatory of European SMEs 2002, Enright and Ffowcs-Williams 2000). An example of a cluster is the following,

> "The industrial milieu of Mirandola and surrounding area (Emilia Romagna Region) which is characterised by a well defined and specialised device/bio-medical sector placing the area at the second place in the world for concentration of companies and production. The industrial history of the cluster is connected to the history of a single entrepreneur, who was the first to introduce the disposable medical idea in Italy in the 60s. Since then, this entrepreneur started a number of specialised medium companies, which have been later on acquired by big multinationals. Further, over the years, a number of spin-offs took place. Nowadays, around 100 companies and a total of 2,300 employees compose the industrial milieu. The composition and features of firms comprises: (a) multinational companies, (b) local independent companies, (c) a group of original equipment manufacturers, and (d) a large number of very small assembly companies. Recently, an interesting sub-

> cluster appears consisting of a Consortium of companies working together on a well defined common-project. Besides that, some training and service centres support the cluster." (European Commission, 2002, DELOS, p. 58)

Unique natural resources and traditional know-how provide the most straightforward rationale for the emergence of a cluster. According to Porter (1998), for example, the Dutch transportation cluster, owes its success to Holland's maritime history and accumulated skills and knowledge, to the extensive waterway networks, and the efficiency of the port of Rotterdam. The development of specific knowledge that may be turned into new productive use is another reason for the emergence of a cluster. The author argues that the research conducted at Harvard and MIT universities resulted in many clusters and spin-off enterprises in the area of Massachusetts. Moreover, Herbig and Golden (1993) claim that Stanford/ Cal-Berkeley University that has a reputation for fostering research and facilitating ties between faculty and the business world was one of the major contributing factors for the emergence and growth of the Silicon Valley cluster. The authors quote the words of the late professor Terman of Stanford University, who emphasises that universities are more than places for learning,

> "They are major economic influences in the nation's industrial life, affecting the nation's industrial life, the location of industry, population groups and the character of communities. Universities are a natural resource." (Herbig and Golden, 1993, p.77)

Clusters could also arise due to local demand conditions. Enright and Ffowcs-Williams (2000) argue that local demand led to the establishment of the factory automation industry around Turin and the textile machinery industry of Eastern Switzerland. Porter (1998) also notes that local demand could lead to the emergence of a cluster and sets as an example the environmental cluster in Finland, which simply emerged due to the pollution problems created by local heavy industry, such as metal, forestry, energy and chemicals.

Sometimes, a group of customers or firms with specific needs fosters cluster development although this is rarely the case. As the author argues the outstanding telecommunications capabilities and infrastructure developed in Omaha, Nebraska,

owe much to the decision of the United States Air Force to establish the Strategic Air Force Command (SAC) in the area. SAC was the site of the first installation of fibre-optic telecommunication cables in the United States and many more innovations in the telecommunication industry. Furthermore, the author argues that new clusters may also occur from one or two innovative and entrepreneurial companies that foster the growth of others. America Online and MCI have been hubs for encouraging the development of new businesses in the telecommunication cluster in Washington, D.C., metropolitan area. Route 128 of Massachusetts and Silicon Valley, had an initial leading entrepreneur firm, Shockley/Fairchild and Ken Olsen/Digital Equipment in the Silicon Valley, and An Wang/Wang in Massachusetts Route 128 that provide success stories for other entrepreneurs and spin off companies (Herbig and Golden 1993).

In a world of efficient transportation, and the globalisation of economies and markets, proximity to markets and reduced transaction costs can still be a major reason for the creation of clusters. According to Enright and Ffowcs-Williams (2000), proximity of markets, for example of the stock exchanges and financial markets, helped establish the financial and insurance business services of London, Hong Kong and New York. Localization can reduce the cost of transaction, information communication, negotiating and monitoring.

> "In a May 1998 article, for example, Ben Edwards assessed London's enduring power as a financial centre…Developing financial markets requires a wide range of talents, and clusters make it easier to co-ordinate them. Lawyers must ensure... Accountants must check.... As long as these people prefer to meet in person to co-ordinate their work, there will be a need for financial centres." ("Capitals of Capital: Financial Centres Survey," The Economist, 347:8067, p. 8.)

The presence and existence of already established local input and supplier industries and related industries could be another seed for the creation of new clusters. The presence of local suppliers can allow quicker and more efficient access to local companies. The golf equipment cluster near San Diego took advantage of suppliers of castings and advanced materials as well as engineers with experience and knowledge

in those technologies from the southern California's aerospace industry cluster (Porter, 1998).

The shared infrastructure is, yet, another reason for the development of a cluster. The physical infrastructure in terms of highways, water, sewage, airport and ports, hospital and medical facilities, etc., helped in the creation of the cargo service industries in Singapore and Hong Kong, the flower and food industry of the Netherlands and of the numerous tourist centres as Enright and Ffowcs-Williams (2000) suggest. Universities have also been recorded as hubs generating regional clusters, as we present in the Silicon Valley model later in this chapter. The Observatory of European SMEs (2002) provides an example of a regional cluster developing around the Cambridge University,

> "The Cambridge region has experienced rapid growth since the 1960s. The cluster contains both high technology manufacturing and service sectors, the latter representing the dominant growth component in the region during the 1990s. The cluster contains around 800 high tech firms with more than 27,000 employees in 1998, and has developed around the University of Cambridge with its collaborative research activity, academic spin-offs and graduate researcher recruitment. A process of regional collective learning occurs in the Cambridge region. In the 1990s, the Cambridge region was 'characterized by active processes of entrepreneur and firm spin-off, (...) of inter-firm and organization networking and linkages, and of research and management staff recruitment from the local labour market' (Keeble et al. 1999: 331). At the same time, local high technology firms take part in global and national innovation networks, research collaboration and labour market processes, which complement regional collective learning by brining into the region supplementary technological and managerial expertise. Finally, new collective initiatives, venture capital funds and active intervention by development agencies create more institutional thickness, which are seen to be beneficial to further growth of the high technology cluster in the region." (Observatory of European SMEs, 2002, No. 3, p. 40)

Once an agglomeration of firms becomes established, progressively a self-reinforcing cycle and several other forces promote its growth. As the cluster develops

and expands, so will its influence with public and private institutions, governments and local associations. A successfully growing cluster will signal opportunities, for entrepreneurs, institutions such as universities, research and training centres, talented people and government initiatives. Porter (1998) argues that a cluster requires a decade or more to develop its potential create a competitive advantage and prosper.

According to the Observatory of European SMEs (2002), as a cluster develops, progressively more external economies of scale are created, thus leading to a cumulative process. Numerous specialised suppliers and service firms emerge to cover the needs of the cluster lowering the cost of shared inputs for the client firms. In addition, labour pooling allows a higher degree of efficiency and specialisation of the labour market around the cluster. For example, the labour pools associated with the motion picture industry around the Los Angeles area allows for the Hollywood cluster to bring together a unique workforce for each film (Enright and Ffowcs-Williams 2000).

Knowledge organisations, specialised education establishments, such as universities and technical institutes, public and private research centres and business associations are established in the region of the cluster. These organisations and institutions advance local collaboration, information flow, enhance the learning process and knowledge creation and result in technological and other forms of spin-off and entrepreneurial companies (Observatory of European SMEs 2002, Porter 1998). According to the Observatory of European SMEs (2002), these centres hold specialised competence and industry-specific knowledge that could be diffused in the marketplace, are able to supply the businesses with professional competence and skilled workforce, which SMEs seldom acquire themselves but are often necessary in order to develop innovations. Thus information, skills and knowledge accumulation sparks new businesses and innovation (Porter, 1998).

The prosperity of the cluster, the development of external economies, the emergence of an innovative infrastructure, and the formation of new businesses increases the visibility, attractiveness and prestige of the cluster (Observatory of European SMEs 2002). These could result in more skilled employees being attracted to the region; they could also lead to a high rate of enterprises start-ups and in general create a fertile and prosperous regional economic environment (Enright and Ffowcs-Williams 2000).

Government initiatives could also foster the development of a cluster and provide strong incentives and a fertile ground for the cluster. Government financed research centres, public universities and government funding could be valuable to the financing and assistance of start-up businesses and other SMEs. For example, both Silicon Valley and Massachusetts Route 128 had heavy support from the US military and space programs while firms located near the Research Triangle and in Austin, Texas were recipients of substantial government funds (Herbig and Golden 1993).

"Bizkaia in the Basque Countries refers to a well defined industrial milieu specialised in the automotive component sector. The cluster includes different productive activities: foundry, melting, tooling, mechanising, assembly, plastic injection and rubber treatment. In 1991, the cluster was formed by 156 enterprises including in this classification enterprises with more than 20% of their sales aimed at the automobile sector. The auxiliary automobile industry in the Basque Country has historically very open to the participation of foreign investment. Since 1992, the Basque Government has being trying to promote an integrated approach supporting the regional clusters and among these the automotive cluster. Its main tool is the setting up of thematic working groups. These groups are participated by representatives from firms and their association, technological centres and Universities, expert and consultants. Besides that, the Association of the Cluster of Industries and Automobile Components (ACICAE) was established in 1991 for the revitalisation of the sector and the improvement of its competitiveness, but it is scarcely representative of local SMEs. A Basque Country Technological Centres Network (EITE) operates for the cluster." (European Commission, 2002, DELOS, p. 60)

Clusters continually evolve as new businesses emerge and others decline, as institutions develop and change and as the competition becomes more vigorous and technological and global economic conditions change. Although successful clusters are regions of dynamic economic growth and innovation that can prosper for decades and sustain their competitive advantages, they can and often do lose their competitiveness for a number of forces external and internal to the cluster. Sooner or later, a cluster could find itself in a period of decline reflecting a situation of

technological, institutional, social and cultural 'lock-in' in business behaviour as the Observatory of European SMEs (2002) observes.

> "Upper Styria in Austria is a well defined industrial milieu characterised by a centuries-old industrial tradition based on rich deposits of iron-ore and coal. It has been dominated by nationalised industry, guaranteeing a stable employment situation till 1986. Decreasing competitiveness led to far-reaching structural changes like the subdivision into companies and a shift towards concentration on manufacturing. In 1986, 22,700 people were employed in 19 companies, in 1994 the number of employees was only 9,350, in 38 companies. Still large companies in iron and steel industries are dominating the scene. As low-tech production is facing severe competition, an upgrading of the cluster is essential. That is why technology transfers between manufacturing companies and research institutions is so important. On the one hand, there are old-established research institutions, but on the other hand, the foundation dynamics in this field are remarkable. Recently various technology centres as well as industrial parks have emerged." (European Commission, 2002, DELOS, p. 58)

Porter (1998) argues that technological discontinuities are a significant external threat to the cluster as they can potential neutralise many of the cluster's competitive advantages simultaneously. The author sets as an example the decline of New England's market share in golf equipment, based on steel shafts, steel irons, and woodenheaded woods. When California based industries started making golf equipment with advanced materials the New England producers had difficulty in competing and many went out of business. As the author argues,

> "A cluster's assets-market information, employee skills, scientific and technical expertise and supplier bases- may all become irrelevant." (Porter, 1998, p. 85)

Another external threat is a change in the buyers' needs due to a divergence between local needs and customer needs. According to the author, the U.S. companies traditionally enjoyed the relatively low energy prices. When energy efficiency grew in

importance around the world the U.S. companies were lacking the insight into customer needs and were slow to innovate and catch up with European and Japanese competitors, resulting in tremendous loses for many firms.

As the Observatory of European SMEs (2002, No. 3) states, clusters can be locked-in by the same socio-economic reasons that once gave the region the competitive advantage to prosper and succeed,

> "The initial strength of a regional cluster in the past – be it a well educated or experience workforce holding unique know-how and skill; a highly developed and specialised infrastructure of firms, knowledge organisations, and education and training institutions; close inter-firm linkages; or strong political support by regional institutions – may turn into an inflexible obstacle to innovation." (Observatory of European SMEs, 2002, No. 3, p. 15)

Finally, Porter (1998) draws attention to companies being too inward looking or persisting in behaviours and relationships that no longer contribute to enhancing competitiveness, stagnation of the quality of universities and institutions, cartels, over-consolidation and increased government protection and regulatory inflexibility. These internal forces make it hard for the cluster to perceive the need for continual innovation and renewal of competitive advantages resulting in a decline of the cluster's productivity.

Following the foregone analysis of industrial districts/ business clusters in the preceding pages, questions arise as to how can SMEs become more competitive, how can they survive the internationalisation of business activities? How does business clustering affect the competitiveness and innovation in an SME? Should SMEs, and consequently their entrepreneurs and/or managers, and for what reasons need to alter their strategic orientation and organisational policies towards networking and clustering? How important is the role of governments, institutions, authorities and agents in promoting business clustering and university-business relations? Are clusters a means to create competitive and innovative SMEs, competitive advantages in specific regions that can compete in the world-markets and face the challenges of the intense competition of the 21st century? The following part of this chapter further explores the concept of business clustering and innovation, two concepts central to the two-dimensional model that we have created and will introduce in the final part of this

chapter. In the following section, we attempt to establish a theoretical framework that provides answers to the questions and issues set above.

3. The importance of business clustering for SME's innovation and competitiveness

The need to develop competitive SMEs has become crucial for achieving socio-economic stability and prosperity both in industrialised and in developing countries in the context of global competition. As we discussed in chapter two and previously, SMEs collectively represent or at least potentially could represent the dynamic engine of economic growth, and their aggregate actions are inherently transferable into aggregate economic benefits. SMEs could both take advantage within clusters and facilitate the widespread diffusion of know-how, innovations, knowledge sharing and learning processes.

The aim of this section is to explore the role of SMEs within clusters and the relative benefits that SMEs could gain from participating in a cluster. The essential assumption made here is that SMEs can cooperate in clusters that provide for specialisation, creativity and innovation while, at the same time they can reap the benefit of being part of a larger entity. In other words, SMEs can maintain the small company strengths and at the same time compete with the larger companies or as Porter (1998) argues,

> "A cluster allows each member to benefit as if it had greater scale or as if it had joined with others without sacrificing its flexibility." (Porter, 1998, p.81)

The author claims that many new companies grow up in existing clusters rather than at isolated locations. He identifies several reasons that make clusters conducive to new business formations. First of all, individuals working within the cluster can more easily perceive market opportunities and unsatisfied customer needs around, which can build a business. Skilled workforce, needed skills, know-how, inputs, assets are already available in the region and can easily be assembled into new business forms. Financial institutions and investors are already familiar with the working and nature of the cluster and may require, according to Porter, lower risk premium on capital. Furthermore, an entrepreneur may exploit the networks, relationships and collaborations with other enterprises and research centres that are

already established. The new business creation within a cluster can be very much affected by a positive feedback loop. As the cluster develops and prospers more opportunities and competitive resources will emerge, which will ultimately benefit all members of the cluster.

According to Bouwman and Hulsink (2002), within the network of a successful cluster such entities as information, creativity and entrepreneurial talent are available for reinvestment. Workforce mobility, talent recruitment and spin-offs are an inherent part of the process. Entrepreneurs often leave a larger company or a university to start their own company (what is termed as a 'spin-off' company) by exploiting market opportunities, new technologies and innovations, which usually originate in private or public R&D laboratories and universities. According to the authors, the majority of start-ups in the Silicon Valley are spin-offs of this kind.

The European Commission and the Observatory of European SMEs (2002) conducted an extensive survey to characterise the nature, working, performance as well as important development tendencies in 34 regional clusters in 17 European countries. A starting point for the research was to identify the dominating firm size category within the cluster, the role of SMEs and the role of MNEs (multinational enterprises). According to this survey, more than half of the clusters are dominated by SMEs in the sectors that 'define' the cluster, as shown in the following table. Regional clusters seem to develop mainly from local networks of SMEs, or at least of a mixture of SMEs and large enterprises. The high number of SMEs in clusters can be explained both by the already underlined high level of entrepreneurship, spin-offs and by the increased vertical disintegration by cluster firms, which gives small companies the opportunity to exploit market niches and specialise in particular fields.

Dominating firm size categories in clusters

	Number of clusters
Dominated by SMEs	19
Mix of sizes	12
Dominated by LSEs	3

Table 3, Source: Observatory for European SMEs, 2002, No. 3, p. 30

More important though is the fact that in the last decade SMEs have increased their importance in 12 of the surveyed clusters in Europe. This could signify the

increased importance of SMEs for the competitiveness and economic growth of a country as we have mentioned in chapter two.

Changes in the importance of SMEs and LSEs in the clusters (Number of clusters)

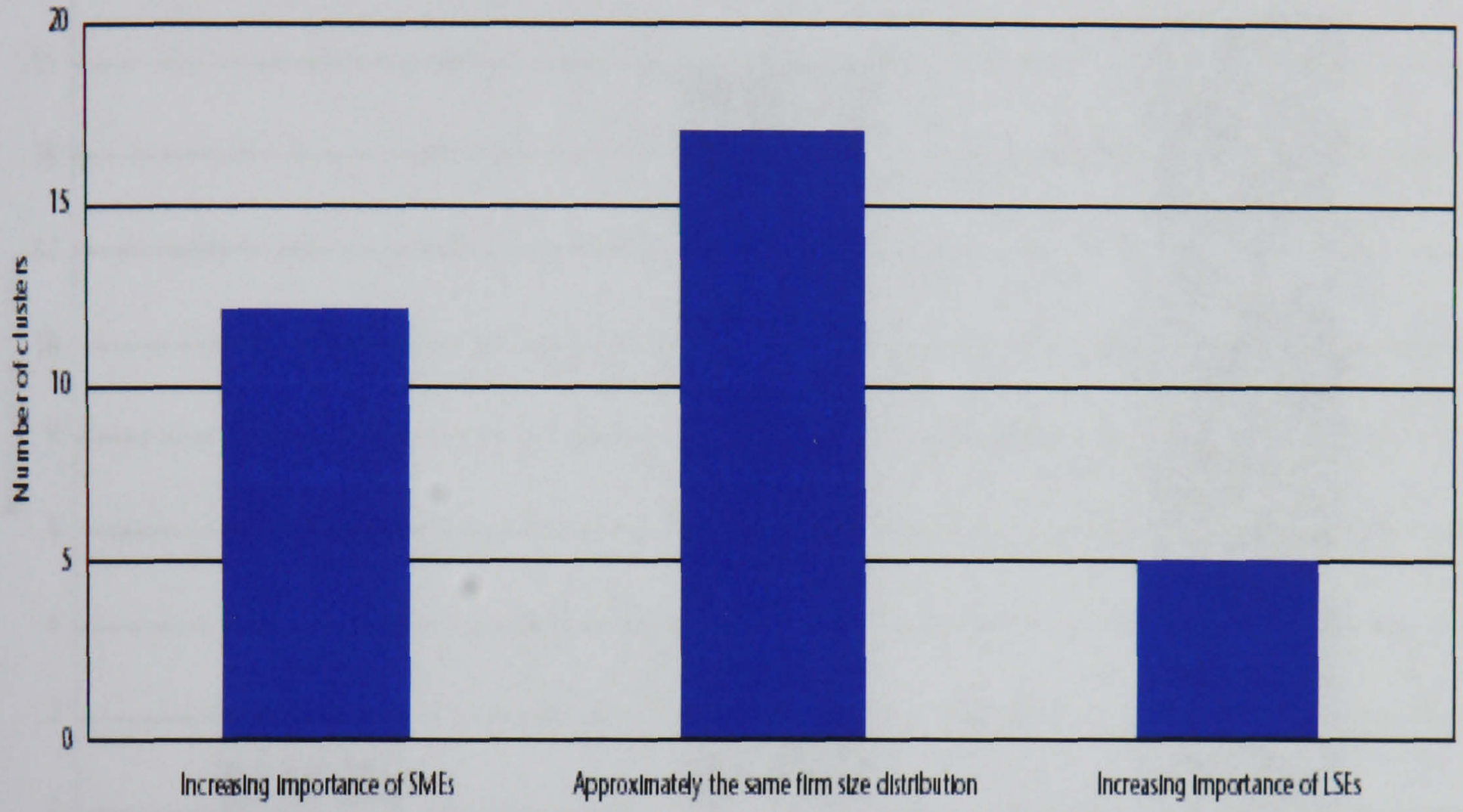


Figure 2, Source: Observatory for European SMEs, 2002, No. 3, p. 31

As the Observatory of European SMEs (2002) argues, the increasing importance of SMEs clearly implies that small firms are highly depended upon the local socio-economic environment since they seldom possess the necessary resources to hold a wide-reaching network and collaborations. The skills, knowledge, connections and relationships of the entrepreneur and business leader are usually concentrated on the places where he/she lives and works. Moreover, the increased importance of SMEs implies that regional resources and know-how are significant for the workings of a regional cluster.

Another significant characteristic of clusters is the increased importance of multinational enterprises (MNEs). According to the Observatory of European SMEs, MNEs spread different activities, know-how, knowledge and technologies around the world. The existence of MNEs in local clusters may stimulate learning, diffusion of knowledge and innovations processes among the firms of a cluster and thus, even affect the future development of the cluster. The figure below illustrates that the

importance of MNEs has increased in most of the surveyed clusters in the last ten years.

Changes in the importance of MNEs in the surveyed clusters over the last 10 years

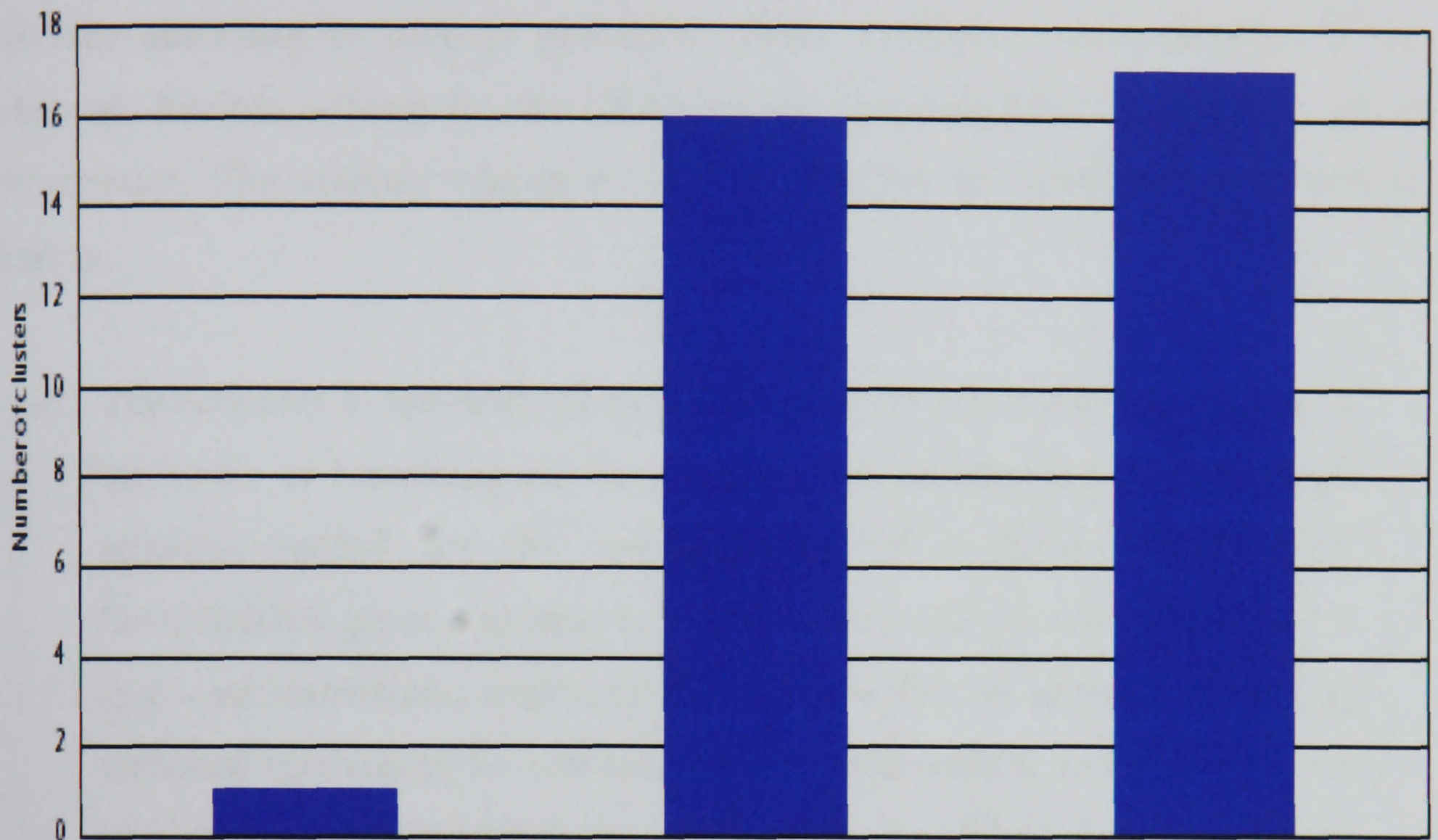


Figure 3, Source: Observatory for European SMEs, 2002, No. 3, p. 32

According to Pyke and Sengenberger (1992), a small firm in an industrial district does not stand-alone, a condition of its success is the success of the whole network of firms, of which it is a part, while they define an industrial district accordingly,

> "…strong networks of (mainly) small firms which, through specialisation and subcontracting, divide amongst themselves the labour required for the manufacture of particular goods: specialisation induces efficiency, both individually and at the level of the district; specialisation combined with subcontracting promotes collective capability. Economies of both scale and scope are the result. It is the firm as part of, and depending on, a collective network which perhaps more than anything else encapsulates the essence of the district's character." (Pyke and Sengenberger, 1992, p. 4)

Pyke and Sengenberger (1992) argue that success for the SMEs and all organisations and institutions in an industrial district depend on certain key principles that would make the 'whole community' of the firms a success. The industrial district is not simply a conglomeration of individually competing firms that happened to be geographically located together. The firms of a district are engaged in related activities according to definite principles. These principles/ characteristics of the industrial districts account for the SMEs enhanced competitiveness and innovation performance. The authors suggest a list of principles, characteristics of industrial districts,

a) The networks of industrial districts belong to the *same industrial sector*, in the sense of containing all the upstream and downstream processes and services needed for the manufacturing of a family of products. Geographical proximity between firms, and between individuals, firms and local institutions, improves effectiveness: for the spread of ideas and technical innovation; for various kinds of collaboration, between firms and of a broader political kind; for social cohesion, collective consciousness; ease and speed of inter-firm transactions.
b) *Readiness for co-operation* is another important characteristic of industrial districts. There can be readiness to share information, such as ideas about new technologies or products, which can help all the firms in the district to become more efficient through improved productivity, quality, design, etc. This co-operation might be carried out informally at a personal level or more formally through especially established institutions and alliances. The collective provision of services and information makes affordable something, which small firms could not hope to manage as isolated individual units.
c) Another feature is the pervasiveness of an *entrepreneurial dynamism*. This is a product of numerous conditions such as, ease of formation of new firms (access to capital and premises), protection from domination and dependency upon large firms, access to the networks, ideas and services mentioned above, knowledgeable individuals capable and confident to establish new firms.

d) The successful districts *compete on a range of dimensions* and not just price. At their best, they compete through differentiated high quality products, flexibility of adjustment, and the ability of innovation. The ability to offer quality, design flair, choice, flexibility, speed and innovation is itself a product of the particular mix or cooperation and competition intrinsic to an industrial district.

e) Central to the organisation of the successful district is the *role of the workforce*. As noted above, flexible response is one of the competitive strategies of a successful district. A crucial component for this kind of strategy is the availability of a trained, adaptable workforce that goes hand in hand with an innovative atmosphere, speed of reaction, and a co-operative attitude. Adaptability is aided by the breaking down of rigid divisions between managers and workforce and the pervasiveness of a trust.

f) *Trust and co-operation*, so important to the thriving performance of the district, is aided by an attitude that seeks competitive success not by aggressive cutting of direct labour costs but by general organisational competence, standards and productivity. The maintenance of high-labour standards, good wages, good basic conditions of work, safeguarding workers rights and providing social protection, established in co-operation with trade unions and the government, increases the performance of labour and subsequently the performance of the district.

(Pyke and Sengenberger, 1992, p. 4-6)

"Modern competition depends on productivity, not on access to inputs or the scale of individual enterprises. Productivity rests on *how* companies compete, not on the particular fields they compete in." (Porter, 1998, p. 80)

As Porter (1998) argues clusters are instruments that can stimulate and contribute to the competitiveness and productivity of SMEs and of the other companies operating in the same geographic region. It should be mentioned that most of the perceived benefits a cluster has on its member companies affect as much the SMEs as they do the larger companies. Several elements that generate and enhance the competitiveness of SMEs within a cluster, as they emerge from a careful

examination of existing bibliographical sources on this subject, are abstracted and presented below. The examples of the Industrial District of Prato and the Silicon Valley high-tech cluster that are presented later in this chapter provide further evidence for the arguments noted here. In sum, we could establish that SMEs working in clusters are competitive because:

1. They are focused in terms of business, competencies and resource destination;
2. They develop capabilities and relationships for quick and appropriate problem solving;
3. They are aided in an advantageous manner by collective resources, otherwise inaccessible to them;
4. They work in a stimulating environment, enriched by competitive pressure and rivalry, information and examples;
5. They work in a context of trust, in which, even smaller producers, feel protected and respected by the community.

An element generating competitiveness is the low cost of information and of product differentiation, due to the presence of a wide number of subcontractors, component producers, and to the possibility to efficiently manage the production process by pieces.

Second, SMEs in clusters can focus their limited resources on just one objective - one product/service, a single part of the production cycle or of the value chain. This is possible because they can easily find complementarities and specialised resources around themselves and in this way, entering the market is less expensive and less risky. At the same time, they can accentuate their specific competencies on the product, process technology and practice, clients' needs in their unique business. This is at the base of their capacity of problem solving, improvement of quality, continuous incremental innovations.

Third, when the cluster reaches a certain level of development, SMEs can exploit collective advantages due to their local concentration. The region in which they are located becomes a point of attraction for clients, providers of raw materials, technology providers, professionals, and so on. Companies in prosperous clusters can tap into a pool of specialised and experienced workforce that is provided by universities operating in the area and by employees working in relative industries. In

addition, when a cluster becomes very relevant in a region, the local government and the private business associations concentrate much more their attention on specific sector problems and needs of public support to firms. The whole community seems to become involved toward the success of the cluster. This leads to the consolidation of sector external economies (specific infrastructure, image, and sector oriented services) for SMEs.

Fourth, a cluster also provides companies with a deep and specialised supplier and input base with the advantage of being locally based thus lowering the transaction costs. SMEs can, thus, exploit the collective advantages due to their local concentration. It minimises the need for inventory and delays as well as offers for better communication between the parties, and provision of specialised auxiliary services and inputs involving embedded technology. When suppliers and buyers operate in close proximity, negotiations and monitoring are more efficient and could become less costly.

Porter (1998) suggests that the linkages between the cluster members result in a whole that is greater than the sum of its individual parts. As an example, the author sets the classical tourist cluster. In a tourist cluster the quality of the visitor's experience will depend on the quality and efficiency of several complementary businesses and institutions such as, hotels, bars, restaurants, transportation means, hospital facilities, shopping outlets, and others. Because the members of the cluster are mutually dependent on each other, the good performance of one will benefit the productivity and performance of the other and in total the competitiveness of the cluster. Moreover Porter argues that private investment, such as training programs, infrastructure development, quality centres, R&D laboratories and others are often made collectively because the cluster members recognise the potential for collective benefits that contribute to enhance productivity and competitiveness that cannot be individually achieved.

The way clusters are formed and operate clearly suggests a new agenda of collective actions in the private sector. Whilst in the past private collective action was mainly targeted on seeking government subsidies and investments, Porter (1998) suggests that nowadays trade and business associations in successful clusters. provide forums for the exchange of ideas and knowledge, and a central point for collective action to overcome impediments to productivity and growth. In Netherlands, the author argues that the Dutch flower cluster's greatest competitive advantages steam

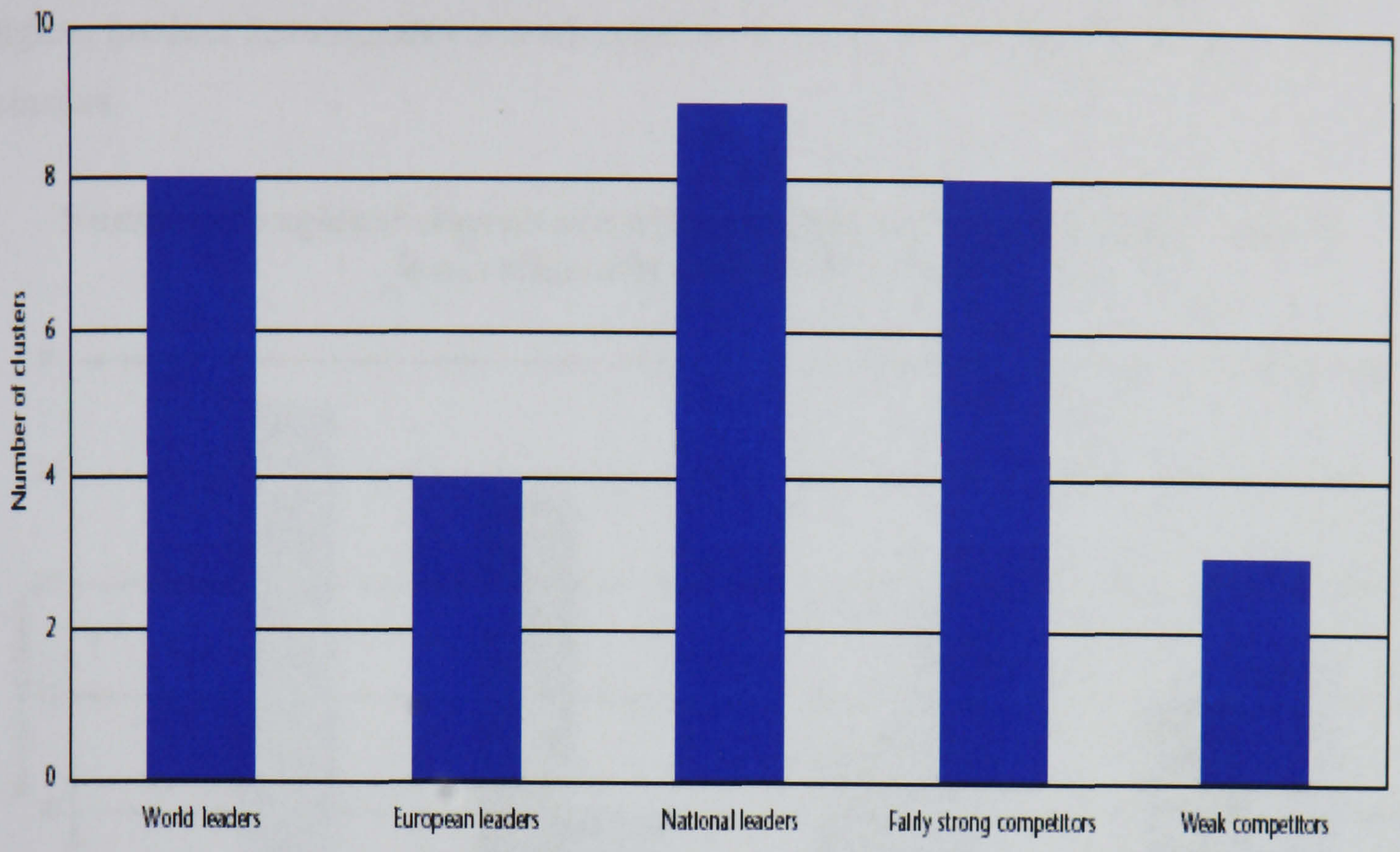
from growers cooperatives building specialised auction and handling facilities. Moreover, the Dutch Flower Council and the Association of Dutch Flower Growers Research Group (in which most growers participate) have assumed joint marketing and applied research activities. SMEs can increase their competitiveness and productivity through the participation and networking with these kinds of associations, as Porter (1998) observes,

> "Associations can lead in such activities as establishing university-based testing facilities and training or research programs, collecting cluster related information, offering forums on common managerial problems, investigating solutions to environmental issues, organising trade fairs and delegations, and managing purchasing consortia." (Porter, 1998, p. 88-89)

The increasing interest in regional clusters relates strongly to the view of clusters as instruments that can enhance competitiveness, productivity as well as innovation. So far, in this chapter, we have only abstractly linked the concept of 'innovation' with clusters. In this section, an effort will be made to explore how clusters promote innovation and thus enhance the competitiveness and productivity of SMEs. We begin by an examination of the innovation performance of the cluster, according to data selected by the Observatory of European SMEs (2002) survey.

Competition by innovation is denoted as strong competition in contrast to competition via low cost strategy, which is considered as weak competition, according to the Observatory of European SMEs (2002). Consecutively, the following figure indicates that clusters often have a fairly strong and competitive position in the world markets. Eight of the clusters are competing head-on with world leaders, i.e. the firms are as competitive as the strongest in the world, while four others with leading Europeans. The eight world-leader clusters have some common characteristics, namely, seven of them have some major multinationals in the region, seven have an innovation capability equal to the best of the world or European level and five are performing strategic R&D.

Number of clusters categorised according to the highest competitive position of the 'average' firms* in the cluster



* End firm denotes a firm that sells on the final market for capital goods or consumer goods, i.e. not producing components that enter into the value chain of a product.

Figure 4, Source: Observatory for European SMEs, 2002, No. 3, p. 38

For the purposes of the research conducted by the Observatory of European SMEs (2002), technological innovation was separated into radical and incremental innovations,

a. Radical innovation processes lead to totally new products or ways of producing commodities.
b. Incremental innovation processes bring about more cautious 'step-by-step' improvements with a lower economic risk.

(Observatory of European SMEs, 2002, No. 3. p. 38)

Regional clusters according to level of innovation activity

	Number of clusters	Number of science based clusters	Number of traditional clusters
Technology generators	8	8	0
Incremental innovators	10	2	8
Technology adapters	6	2	4
Technology users	10	3	7
Total	34	15	19

Table 4, Source: Observatory for European SMEs, 2002, No. 3, p. 39

Additionally, the clusters were examined according to the importance of the different types of innovation activities in the clusters. As illustrated in the following figure, product development is seen to be the most important type of innovation in the clusters.

Number of regional clusters according to importance of different types of innovation activities in the clusters

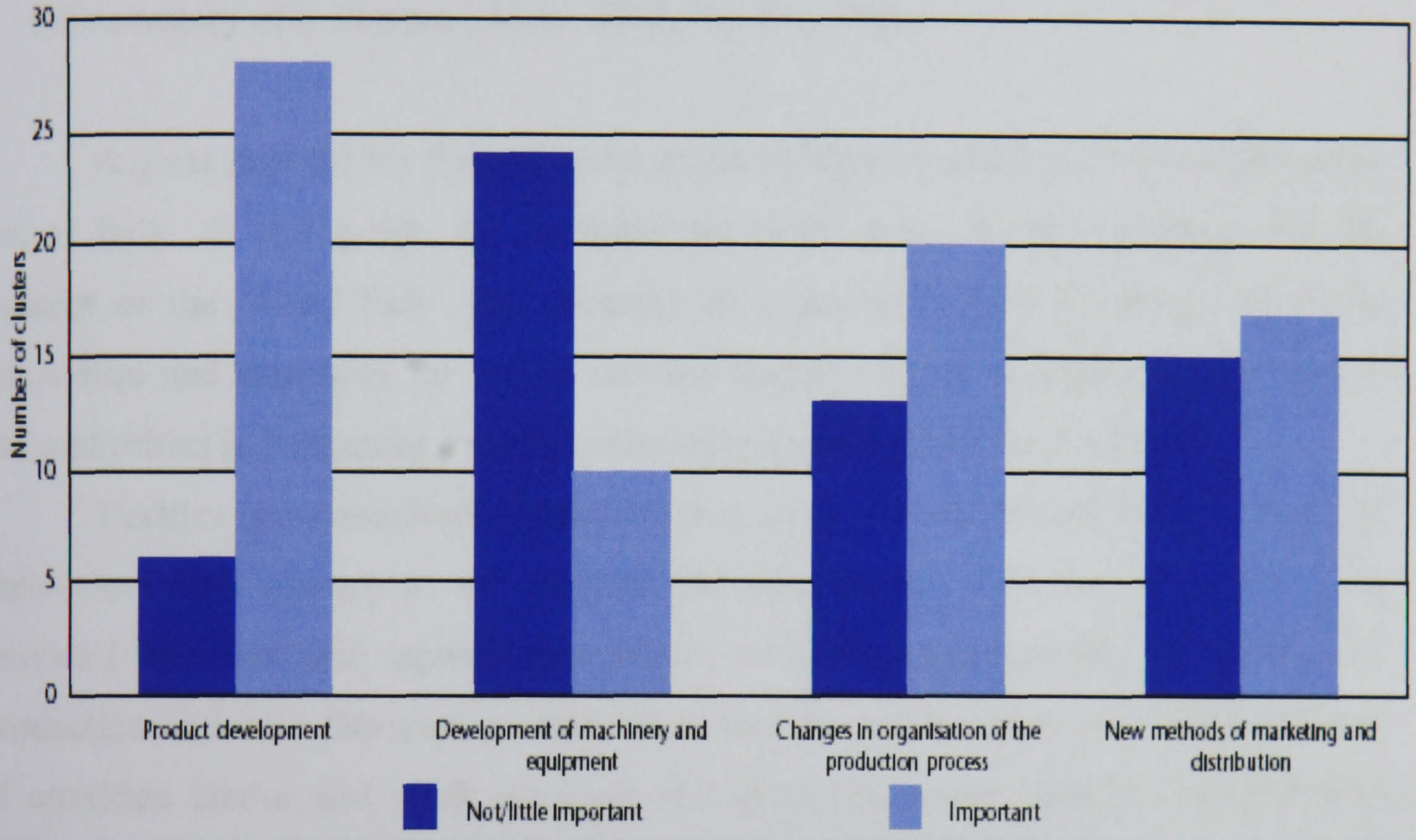


Figure 5, Source: Observatory for European SMEs, 2002, No. 3, p. 39

Organisational, marketing and distribution as well as innovations in the production processes are generally of high importance for more than 50% of the clusters, according to the figure above. In contrast, the development of new machinery and capital equipment production is of little importance for the majority of the clusters, as the Observatory of European SMEs (2002) notes. Furthermore, the Observatory of European SMEs (2002) illustrates the importance of innovation processes for the competitiveness of a cluster setting as an example the successful shipbuilding cluster in Sunnmøre, Norway.

> "Sunnmøre constitutes the largest ship building area in Norway, showing job growth and good performance since 1970. The ship building industry in Sunnmøre covered 4200 jobs in 1997. The competitiveness of the local ship building industry is to a large degree based on the innovation capability in the

cluster. Local user-producer interaction has been a main driving force behind continual incremental improvements of products to satisfy new demands and needs by customers and users. Shipyards have long-term cooperation with some ship owners that often return to the yards to discuss new solutions and build new ships. Discussions with skippers, chief engineers and other crewmembers also give important feedback on how the firms' - and competitors' - products work, as well as suggestions for improvements." (Observatory of European SMEs, 2002, No. 3, p. 40)

A great impetus for the industrial district/cluster model has undoubtedly come out of Italy. At this point, we examine the well-known district of Prato and the concept of the 'Third Italy' that presents an example of how clustering enhances innovation and creativity for SMEs and the importance of institutions, government and authorities in promoting business clustering and fostering their success.

Textiles are considered widely as the most mature of industries. From the early nineteenth century to the present, the construction of a textile industry has provided industrialised regions everywhere with an apprenticeship in mechanical production. Because the mass-production of textiles can be done with large amounts of unskilled labour and small amounts of capital equipment, upstart manufacturers have regularly in the course of time displaced established ones. Some textile producers have withstood the competition and despite the high labour costs have also expanded. A relevant example of this process is the district of Prato, which we examine in detail in the next few paragraphs, a group of towns in the provinces of Florence and Pistoia in central Italy. Italy offered an impetus for the industrial district model, a novel, and dynamic approach to regional economic development. The Italian districts are concentrated in the North Central and North East parts of the country, with the heartland being the province of Emilia-Romagna with its capital Bologna, the so-called '*Third Italy*' (Pyke and Sengenberger 1992, Trigilia, 1992). According to the authors, the industrial districts in Italy tend to specialise in traditional sectors - textiles, clothing, footwear, and furniture- but there has also been a significant development in modern sectors, especially in mechanical engineering. Industrial districts usually coincide with small urban areas and cover one or a handful of communes, while the population of an industrial district do not usually exceed 100,000.

"Between 1966 and 1976, employment in Western European textile industry was generally declining –by about 25% in France and W. Germany, and by more than 35% in Great Britain. But employment in Pratese textiles remained steady (at about 45,000 workers, distributed in roughly 10,000 firms), and export boomed. By 1977, Pratese exports totalled about 820 million current dollars, roughly 60% of output and in 1982 the value of exports had risen to about 1.5 billion dollars, equal to 75% of total production. Prato's success rests on two factors: a long-term shift from standard to fashionable fabrics, and a corresponding reorganisation of production from large integrated mills to technologically sophisticated shops specialising in various phases of production…In 1927 just under 80 percent of the 11,560 persons employed in Prato's textile sector worked in large mills. The pattern changed in the 1930s depression when firms were forced to lay off workers and sold or rented to them equipment for subcontracting work; the firms did this to convert fixed costs to variable costs…the firms reacted to the crisis of the 1950s in the same way. A vast network of small shops emerged in its place, employing one to twenty workers who possessed an intimate knowledge of materials and machines. While these small shops were springing up they needed to be formed into a network. To combine them into flexible production system, and to reduce their dependence on the large firm, it was necessary to coordinate their separate skills in autonomous federations…such coordination became, as of the late 1950s, the function of *impannatore*…this person purchased raw materials, organised a network of small shops to produce cloth according to well-known specifications, and then brought the product to the market or sold it to a merchant…as markets for standardised products became inaccessible, the impannatore…urged the firms to experiment with materials and processes; and the firms' successes, in turn, fanned the creativity of the impannatore, making him or her still more demanding. In this way, small firms coalesced into a network, and this network expanded…the local banks, trade unions, and artists' and industrialists' associations collaborated in a vast project…to devise computer-based technologies to increase the flexibility of the links among firms, as well as the efficiency of each production unit…a system that gave birth to a distinctive technology and a vital economy." (Piore and Sabel, 1984, p. 213-216)

According to Piore and Sabel (1984), the Pratese district made a habit of rapidly adapting to the latest textile technology. In the early 1970s, automatic models, costing 100,000 dollars or more, at a rate of 1,000 per year, was replacing the area's 13,000 old looms. The Pratese small firms also prided themselves on their ability and creativity to modify new machines to perform unsuspected tricks. Their creative and innovative efforts led to the introduction of numerically controlled looms in small shops by the late 1970s. As the authors suggest,

> "All this technological flexibility allowed a firm that had guessed wrong about this year's fashion to serve as a subcontractor for a luckier competitor that had an overflow of orders, and the next year the roles might very well be reversed. Technological innovation, constant subcontracting rearrangements, and the search for new products became the structuring elements of a resilient regional economy." (Piore and Sabel, 1984, p. 215)

As Trigilia (1992) argues, three institutional factors appear to have been of crucial importance in the growth of industrial districts in the 'Third Italy' in general

1. A network of small and medium-sized urban centres with strong craft and trading traditions. These centres have acted as the principal pools from which entrepreneurial skills and resources could be drawn.
2. The spread of family-based agricultural smallholdings (sharecropping, peasant firms), helping to create original flexible supply of an inexpensive workforce whose skills and motivations were well suited to the development of small business.
3. The presence of local political traditions and institutions linked in with a Catholic tradition and a socialist and communist movement. This influence should not be misconstrued. In contrast with what has happened, for example, in the south, politics have thus become more independent of family and private interests, and more strongly tied to the defence of collective interests. This has helped to institutionalise the market. It has promoted good industrial relations and locally based policies, and hence the generation of 'collective goods'.

(Trigilia, 1992, p. 36-37)

As we saw earlier, in the shipbuilding cluster in Sunnmøre, Norway, and the Prato district, the user-producer interaction has as a result the continuous incremental innovations, which maintain high productivity and competitiveness in the cluster. The innovative capabilities created in a cluster allow it to compete successfully against dispersed competitors. According to Enright and Ffowcs-Williams (2000), the effectiveness of innovative activities is a function of the managers and employees, the skills and knowledge of researchers and professionals, the information and knowledge availability and of the firm's ability to bring innovations into the marketplace. According to the authors, the innovative performance and the incentives to innovate will also be affected by the nature of the rivalry and the market structure found in the cluster.

Even in an era of rapid and technologically advanced communication and information systems a geographic concentration provides unique advantages for certain types of communication. The authors suggest that the informal, unplanned, face-to-face personal and oral communications are critical components of the innovation processes. They argue that these types of communication between suppliers and buyers, producers and consumers and business to business provide feedback loops for creative and innovative ideas, particularly for incremental innovations and for industries in which suppliers and buyers are significant sources of new products and services. They also claim that sophisticated buyers from around the world will be attracted by the success of a cluster and offer new insights into advanced market demands.

> "Despite the fact that the cost of transmitting information has declined tremendously and has become largely invariant of distance, the importance of location to innovation and production remains. The primary reasons for this are the benefits that the proximity of others generates to the firms in the area, i.e. Marshallian externalities. Firms located in the area of a specialized cluster of firms may benefit from knowledge spillovers; information concerning new applications or other innovative practices may spread faster among the firms that are located geographically closer to each other. In addition, there are other factors fostering spatial agglomeration such as the availability of skilled labour, good infrastructure, and supporting institutions, e.g. specialized suppliers, universities, and research centres. In other words, there is a

> difference between knowledge and information. The costs of transmitting knowledge, particularly highly contextual and uncertain knowledge that is best transmitted via face-to-face interaction, still rise with distance." (Koski, 2002, p. 147)

As we saw earlier, one of the advantages of clusters is that they tend to accumulate industry specific skills, capabilities, knowledge and information that is diffused widespread in the region adding significantly to the innovation process. According to Baptista (2001), firm networking is an essential element in a region's knowledge infrastructure. Baptista suggests that numerous scholars have demonstrated that network effectiveness and cohesiveness are positively correlated to the degree of innovative success and on the diffusion of industrial innovations. According to the author (2001),

> "If firms rely on each other to learn about new technology, the diffusion process is punctuated by externalities…associated with the learning and transfer of new technological knowledge…their intensity is likely to be stronger at the local level, since this kind of new, tacit knowledge flows more easily through interpersonal contacts. It should also depend positively on the proximity of early users and of technologically close firms, either acting as competitors, customers, suppliers, or service providers…the accumulated experience and demand pressure of a technologically progressive user is also likely to influence incremental improvements and expansion of innovation into new areas. Close interaction and day-to-day contact between users and producers, where allowed by geographical proximity, should deepen (the user-producer) relationships." (Baptista, 2001, p. 33)

Regional clusters are seen as a focal point of entrepreneurship, investments and new business activities as we have highlighted earlier. Some of the characteristics described as enhancing productivity have an even more profound effect on innovation and hence on productivity growth. Enright and Ffowcs-Williams (2000), argue that local universities, research centres, public and private investments on industry specific infrastructure allow a firm to leverage its own abilities and investments to innovate. This infrastructure coupled with the accumulation and diffusion of knowledge and

information, as the authors and Baptista (2001) suggest, create a fertile environment for innovative spin-offs and start-up companies. In fact, many clusters have emerged and developed through such innovative spin-offs and entrepreneurial activities. Virtually every semiconductor company in the Silicon Valley can be traced to an innovative spin-off company as the authors argue. We, thus, have established a theoretical framework that supports and explains how business clusters affect innovation in an SME, the role of institutions, governments, and authorities in promoting business clustering, and the university-business relations that are fostered within a cluster. The following analysis provides further support and enhances the theoretical framework for the assumptions we have set at the opening of the chapter and we re-stated here.

According to Porter (1998), the flexibility that SMEs sustain within a cluster together with the benefits they gain by communicating and cooperating with numerous companies and institutions within the cluster provides them the capacity and flexibility to act rapidly to a new opportunity and implement innovations more quickly. Moreover, a company's close links and geographic proximity with its suppliers and customers, can secure delivery, technical and service support and efficient and effective coordination of activities, thus enhancing the innovation processes. Porter believes that the competitive pressure, constant comparison, and peer pressure that occur in a successful cluster 'forces' executives to outdo one another. This creates a highly innovative environment that fosters productivity and competitiveness. Liyanage (1995) believes that innovative clusters draw together companies and industrial partners who understand that they can mutually benefit from collaborating in research and innovative activities undertaken within the region. Mutual dependency and collaborative efforts create the foundation for innovation and increased productivity.

The ongoing relationships and communication between the agents and entities within the cluster helps the companies learn about new technologies, service and marketing concepts and always have a better window in the market than isolated companies and competitors have. According to Carbonara (2002),

> "The 'learning process' is thought of as a managerial tool that allows organisations the possibility of coping (and adopt pro-active behaviour and practice) with change and the complexity of the environment in which they

compete (Cohen and Levinthal, 1990). In particular, 'organisational learning' is interpreted as a process of development/acquisition of new knowledge necessary for solving organisational, manufacturing, and marketing problems, and creating platforms for the development of new ideas." (Carbonara, 2002, p. 2-3)

This learning process is made more efficient and easy by the geographic proximity of institutions and firms within the cluster, and is stimulated through the cooperation and communication of the numerous agents and entities in the region. As Carbonara (2002) suggests, the development, acquisition and movement of new knowledge from one firm to another or from an institution to a firm enhances the innovative capabilities of the cluster and of the individual firms, respectively.

Another line of enquiry is the learning economy, according to Lundvall and Johnson (1994), that highlights innovation as the basis for obtaining competitiveness for firms, regions and nations. The crucial role of knowledge figures in the related and highly influential concepts of the *learning economy* and the *learning region*, within both of which knowledge is the most important resource fostering competitive advantage and innovation. Innovation is conceptualised as a complex and interactive learning process, emphasising the importance of co-operation and mutual trust that are further promoted by proximity. Learning is, furthermore, seen as mainly a localised process (Asheim and Isaksen 2000a). Diverging innovative capabilities between regions are the result of specific learning trajectories embedded in different institutional systems. Learning is seen as 'sticky' due to the fact that some important types of knowledge are of an informal, tacit nature, and also the efficient use of formal, codified knowledge may demand some tacit knowledge. This kind of knowledge cannot easily be isolated from its individual, social and territorial context; it is a socially embedded knowledge, which is difficult to codify and transfer through formal channels of information. The fact is that while information is relatively globally mobile, some important kind of knowledge is remarkably spatially rooted (Cooke, 2000).

Another direction of research has been in pursuit of the notion of an *innovative milieu*, which is largely based on the work of the group of researchers called GREMI (Groupe de recherché europeen sur les milieux innovateurs), which emphasised the importance of social capital in promoting innovation (Aydalot and Keeble. 1988;

Camagni, 1991, Camagni, 1995; Maillat, 1995). According to the authors in the innovative milieu, social networks are established between individuals within firms and between individuals in different firms. These networks are based on experience of working together in the past and therefore trust bonds within the network are created. This type of cluster tends to be located in urban areas where established relations between firms and individuals have existed for some time. As Capello (1999 has noted,

> "Cumulative and collective learning processes enhance local creativity and innovative output, through the informal exchange of information and specialised knowledge" (Capello, 1999, p. 9)

Learning takes place in a variety of ways with individuals in different firms exchanging information or individuals moving from one firm to another. Examples of innovative milieu clusters include Emilia-Romagna and parts of Northeast Milan. Firms in these types of clusters are willing to jointly pursue common goals on innovative projects, which may involve risk.

The innovative milieu cluster is largely based on small and medium sized firms within urban areas who rely heavily on the skills and knowledge of a common workforce which, in turn, means the firms are deeply 'embedded' in their locale. There are also important differences as well. These types of cluster actively seek to promote innovation rather than simply rapidly responding to it and actively work together to promote common, medium and long-term innovative goals. The firms in the innovative milieu respond to the threats posed by the innovative process, once again, by seeking to spread the risk through active and continuing syndication of their production arrangements. (Aydalot and Keeble, 1988; Camagni, 1991, Camagni, 1995; Maillat, 1995)

We have presented various schools of thought on the relationship between innovation and business clustering. One line of enquiry has focused on the conditions for the establishment and growth of such high technology complexes as Silicon Valley and Route 128. While many factors have been identified, the most discussed is the role of local research-intensive universities, Stanford in the case of Silicon Valley and MIT in the case of Route 128. A large literature on the relationship between research and development and regional development has been spawned. At

this point we examine the well-known Silicon Valley region that presents an example of how clustering enhances innovation and creativity for SMEs and the importance of institutions, government and authorities in promoting business clustering and fostering their success.

As Bouwman and Hulsink (2002) argue, politicians, entrepreneurs, investors, government institutions, and companies in every day practice understand the importance and are interested in the growth of potentially dynamic local and regional economies, i.e. clusters. The most common example that stands out in people's minds is the Silicon Valley model. The authors argue that the inspiration and imitation of the Silicon Valley cluster is so profound that it even makes people around the world imitate its name, Silicon Alley (New York), Silicon Forest (Seattle), Silicon Hills (Austin-San Antonio), Silicon Dominion (Washington, DC), Silicon Valley (Fairfield, Iowa), Silicon Fen (Cambridge, GB), Shalom Valley, also called Silicon Wady (Israel), Silicon Plateau (Bangalore, India), Silicon Valley on Ice (Oulu, Finland), Amsterdam Alley, and Dommel Valley (Eindhoven, the Netherlands).

The emergence of Silicon Valley, what is now being universally termed as a classic innovative 'Hot Spot', had its beginning in the early 1950s and grew into national distinction during the 1970s (Herbig and Golden 1993). Three interconnected factors and two key persons promoted its emergence and the consequent evolution and success, as Sternberg (1996) indicates,

1) A technologically and economically oriented university, Stanford University.
2) Electro-technical enterprises, such as Hewlett Packard.
3) The presence of military and aeronautics institutions and bases with a high demand for semiconductor products.
4) And the vice president of Stanford University, Fred Terman, who persistently promoted the foundation of enterprises by university and the Nobel-prize-winning inventor of the transistor, Bill Shockley.

According to Sternberg (1996), the reputation of Stanford University, under the vice presidency of Fred Terman, attracted numerous researchers, and aided in acquiring state R&D funds. The immediate result was the creation of a highly qualified workforce. Moreover, the author claims, increased governmental demand for technologically complicated semiconductor products boosted the life cycle of the

Silicon Valley. Sternberg (1996) underlines that between 1955 and 1963 the share of public institutions was between 35% and 40%, in the turnover of the cluster's semiconductor industry. On the other hand, a decisive role in the genesis of the cluster was the granting of R&D contracts to Stanford University and SMEs to develop high-tech electronic components and semiconductor products for military purposes. According to the author, this had a decisive influence in the electronic industry to continually produce innovative products.

Gerstlberger (2003) argues that the long time dynamic development and growth of the economy and population presented in the table below is a clear indicator of the success of the Silicon Valley region.

Selected key figures on growth of population and companies in the RIS of Silicon Valley

	1980	*1990*	*2000*	*2010 (projection)*
Number of workplaces (absolute, 1000)	900	1174	1418	1601
Number of inhabitants (absolute, 1000)	1805	2105	2461	2684
Number of households (absolute, 1000)	646	741	806	875
Ratio of regional workplaces/working Inhabitants (%)	0.97	1.02	1.09	1.10
Number of children and youths at the age of education (5-19 years; absolute, 1000)	-	406	515	554

Table 5, Source: Gerslberger, 2003, Vol. 23, article in press, p. 8

Several scholars have examined the Silicon Valley model in an attempt to explain and understand the long-time sustainability of innovative performance and economic prosperity of the region. Several factors (some of which we have already mentioned) have been identified as having played a significant role in the competitiveness and productivity of the cluster, such as the role of the educational infrastructure, physical infrastructure, entrepreneurial activity, venture capitalists, government funds, resources and support, public and private research parks and incubators, networks, communication and the agglomeration effect (Aoki and Takizawa 2002; Bouwman and Hulsink 2002; Herbig and Golden 1993).

The presence of top-class knowledge centres and universities is an important element in the promotion of regional development. Herbig and Golden (1993) argue

that Stanford University situated in the Silicon Valley region collaborating with other private and public institutions provide entrepreneurial spirit and spin-off companies, create and develop new technologies and applications for industries and businesses, and attract talented scientists, engineers and students. Moreover, according to Bouwman and Hulsink (2002), these institutes allow for the flow of information and knowledge within the cluster, and create a highly fertile environment for entrepreneurs and established businesses to spot market opportunities and commercialise innovative ideas. Herbig and Golden (1993) state that Stanford University has established since 1951 a technology park, the Stanford Research Park, which is now fully leased with 90 companies employing over 25,000 people. The purpose of the park according to the authors is to allow companies to take advantage of university and intellectual resources, and research labs while providing a base for faculty contract work.

According to Herbig and Golden (1993), the physical infrastructure of the Silicon Valley region is, yet, another important reason behind its development and success. Airports, highways, water, sewage, hospital and medical facilities, as well as the presence of R&D facilities, technical and managerial supply and access to markets because of the presence of military and the aeronautics industry provided a well-established infrastructure.

Start-up firms and small ventures need a heavy infusion of capital to survive and develop in the highly competitive clusters. Aoki and Takizawa (2002) argue that there are more than 200 venture capital companies in Silicon Valley and are said to receive over 1000 applications for funding per year. The ease and flow of venture funds to spin-off and start-up companies was critical to the growth and development of the Silicon Valley cluster (Herbig and Golden 1993).

Saxenian (1991) argues that Silicon Valley is far more than just an agglomeration of firms. It consists of networks of interdependent, yet, sovereign producers and firms organised to grow and innovate reciprocally. These networks promote new product development by encouraging innovation and by spreading the costs and risks associated with a highly demanding new product. The author goes on to suggest that the networks in the Silicon Valley region allow for the diffusion of knowledge and information and new technologies, while at the same time engage in problem solving and cooperation between businesses or even industries. These

networks create an environment that according to Saxenian (1991) encourages new firms to be more willing, experiment and develop innovative ideas and products.

However, the Silicon Valley model cannot be simply 'transferred and/or 'imitated' to other regions. It can serve as a reference and imitation point without guarantees for duplication of this type of regional cluster, since as Bouwman and Hulsink (2002), explain,

> "One cannot plan the rise of successful clusters. Particularly, in the early stages, chance and fortunate coincidences have produced, for example, in the case of Silicon Valley, a process of co-evolution of technology, market dynamics and institutions, that was to develop further along a path of innovation, depending on the influence of specific local circumstances. While these circumstances serve as a more or less successful breeding ground for regional entrepreneurship and cluster activities and for the structuring of the techno-industrial processes along certain trajectories, it is the spark of local initiative that is needed to start the ice of high -tech region formation. An initial combination of local entrepreneurship, chance, 'lucky success' and a positive feedback on business within the region will lead to a self-reinforcing and cumulative process of the location of several high-tech start-ups, their growth into independent knowledge-intensive businesses and the clustering of these core businesses with new companies (such as spin-offs and specialised suppliers), educational institutions and R&D laboratories." (Bouwman and Hulsink, 2002, p. 300)

Finally, according to Saxenian (1996), the efficiency of the industrial system of the Silicon Valley region is based largely on the effectiveness and efficiency of communication and exchange of information between firms,

> "By all accounts, these informal conversations were pervasive and served as an important source of up-to-date information about competitors, customers, markets, and technologies. Entrepreneurs came to see social relationships and even gossip as a crucial aspect of their business. In an industry characterized by rapid technological change and intense competition. such informal

communication was often of more value than more conventional but less timely forums such as industrial journals." (Saxenian, 1996, p. 33)

Hard commitment and open-minded approaches to cooperation and communication between rivalry enterprises, customers and suppliers, of private and public businesses and institutions can be seen as the foundation of the development, innovation capabilities and competitiveness of the Silicon Valley cluster. Another important point that needs to be noted is that the birth of the region dates back to the 1950s, and its evolution required a time period of over two decades in order to flourish.

In this part of the chapter, we have discussed how the literature suggests that the competitiveness and innovating capabilities of SMEs can be enhanced within clusters. We have considered how business clustering and business networks affect innovation in an SME, how clusters and networks affect the competitiveness of SMEs and identified and explored the various links between the inter-connected agents and actors of a cluster, i.e. universities, research centres, governments, authorities and associations and the importance of each of these in the overall success of the cluster; the relation between entrepreneurship, innovation and business clusters.

4. Towards a Two-Dimensional Model of Innovation and Business Clustering

From the review of the literature considered so far in this dissertation, it appears that there are a number of interrelationships between entrepreneurship, innovation and business clustering. These suggest that:

1. *Innovation and entrepreneurship are intertwined concepts affecting SMEs competitiveness.*
2. *Business networks appear to be associated with the innovative capabilities of SMEs and their competitiveness.*

As we discussed in chapter one of this thesis, in the last few decades it has become universally accepted that innovations, of any kind, are important sources of productivity growth, one of the major goals of economic activity and one of the most important instruments through which not only organisations but countries, as well, gain and sustain competitive advantages in globally competitive marketplaces. Throughout pages 7 to 22, in chapter one, we explored and delineated the origins of entrepreneurship and innovation and focused our attention on understanding what is innovation and entrepreneurship and how the two concepts are linked to each other, as put forward in the writings of various scholars. In the next few paragraphs we recollect some of the theories that identify the link between entrepreneurship and innovation and provide our own definitions for the two concepts.

Weber (1930) recognises the entrepreneur as a main actor of capitalism and defines him/her as a 'moving spirit' oriented towards market opportunities. This is in line with Schumpeter's (1942) arguments that the entrepreneur is a dynamic person or organisation seeking 'new combinations' and market opportunities where others fail to see them. Furthermore according to Dollinger (1999),

> "Entrepreneurship is the creation of innovative economic organisation (or network of organisations) for the purpose of gain or growth under conditions of risk and uncertainty." (Dollinger, 1999, p. 4)

Schumpeter focuses on the producer and it is here that the '*entrepreneur*' enters the stage. Schumpeter (1942) defines production as the combinations of materials and forces that are within our reach. The producer is not an inventor (Schumpeter, 1947). All components that he/she needs for his/her product or service, whether physical or immaterial, already exist and are in most cases also readily available. The basic driving force behind structural economic growth is the introduction of new combinations of materials and forces, not the creation of new possibilities.

The link between entrepreneurship and innovation further emerges from the influential writings of Drucker (1985). He argues that innovation is the specific function of entrepreneurship. It is the means by which the entrepreneur either creates new wealth-producing resources or endows existing resources with enhanced potential for creating new wealth. The entrepreneur must purposefully and systematically search the sources of innovation, the changes and the indications that create opportunities for a successful innovation. What all the successful entrepreneurs have in common is not a certain kind of personality rather than a commitment to the systematic practice of innovation (Drucker, 1985). Entrepreneurs, whether individuals starting their own businesses or entrepreneurial organisations that want to continue to thrive, they see or at least they should see innovation as a strategy, an ongoing process that will bring profits and a competitive advantage to the company.

Michael Porter (1985) recognises the competitive advantage that innovations bring to the company and to a nation, and that they should be mastered. For Porter (1990), firms create and sustain competitive advantage by perceiving or discovering new and better ways to compete in an industry and bringing them to market, which is ultimately an act of innovation. Porter sees innovation in very broad terms and as inherent to the firm's strategic and competitive context.

> "…Innovation includes not only new technologies but also new methods or ways of doing things that sometimes appear quite mundane. Innovation can be manifested in a new product design, a new production process, a new approach to marketing or a new way of training and organising. It can involve virtually any activity in the values chain…" (Porter, 1990, p.579)

While business organisations of any kind acknowledge that innovation is important to their growth and success, the term 'innovation' is still without a consistent, broadly agreed-to definition in the business world. So in addition to the definitions we have presented in chapter one, pages 5-22/28 and in the preceeding analysis, we offer immediately below our own definition, which encompasses several of the key concepts proposed by Schumpeter 1934; Schumpeter 1942; Drucker 1985; Porter 1990; Nelson and Rosenberg 1993; and Commission of the European Communities 2000:

> *"Innovation is creating value by implementing new ideas. It is the process of taking ideas, needs and opportunities to the market. Innovation is the conversion of knowledge, creative ideas and information, into a benefit, a competitive advantage for the organisation; under risk and uncertainty for the outcome of the innovation. Innovation then concerns the puprosefull, focused, strategic search for and the conception, development, adoption and implementation of significantly improved or new processes, organizational structures, methods of production and products/services in order to defferentiate the company from its competitors by creating and sustainig superior performance, and increased productivity."*

As we discussed in chapter two, several researchers in their studies give special emphasis to the influential role of the entrepreneur in affecting the performance, survival and growth of the firm particularly when the firm is small. The idea we brought forward in chapter two, pages 60 to 67, is that the 'basic role played by the owner/manager/entrepreneur' is one of the major determinants of SME competitiveness and performance; this turns out to be so because the concentration of decision-making power in the owner/manager in an SME environment, consequently affects the firm's overall strategy.

According to Goffee and Scase (1995), in SMEs there may be different layers of managers, supervisors, job descriptions, etc. but the distinguishable characteristic of the entrepreneur is that he/she will retain almost total control and remain the centre of the decision-making web. Such enterprises, according to the authors, are sculptured around the 'personalities' of their owner-managers and their growth potential and

financial viability is highly dependent upon the proprietors' preferences, energies. talents and plans.

Further research focusing on the concept of competitiveness and the competency approach by Man (2002) develops a conceptual model (chapter two, figure 6, page 63) to link the characteristics of SMEs owner-managers and their firm's performance. Competitive scope, organizational capabilities, entrepreneurial competencies and performance are the four components of the model. According to the authors, the focal point of the model concentrates on the entrepreneurial tasks that link the different competency areas with the constructs of competitiveness. The entrepreneur's managerial skills and technical know-how, his/hers demographic, psychological and behavioural characteristics are often cited as the most influential factors related to the performance of an SME; particularly since quite often small firms or even medium-sized companies have a dominating entrepreneur, who is most likely to be the founder of the business. The relationship is also affected by many industrial, environmental, firm-specific characteristics and firm strategies. (Man, 2002)

Following the above, as well as the analysis of entrepreneurship in chapter one (pages 7-22) and chapter two (pages 60-67), we come to the realisation that entrepreneurship is often viewed as a function, which involves the purposeful identification and exploitation of opportunities, knowledge and information that exist within a market. Such exploitation is commonly associated with the direction and/or combination of productive inputs. Entrepreneurs usually are considered to bear risk while pursuing opportunities, and often are associated with commitment to creativity and innovation. In addition, entrepreneurs undertake a managerial role in their activities, but routine management of an ongoing operation is not considered to be entrepreneurship. Our definition presented immediately below derives from the influential writings of Schumpeter 1934; Schumpeter 1942; Lehman and Roth 1993; Swedberg 1998; Dollinger 1999; Knight 1921; Hoselitz 1952; Cole 1959; McClelland 1961; Casson 1982; Gartner 1985; Weber 1930; Drucker, 1985; and Porter, 1990:

> *"Entrepreneurship is a creative process in which opportunities are perceived and resources mobilised in order to bring about change in pursuit of financial benefits. Entrepreneurship involves a broad range of activities necessary to create organizations, carry out new processes, organizational structures,*

methods of production, products and services, identify opportunities within the economic system, and bring together factors of production, aiming at the accumulation of wealth, under conditions of risk and considerable uncertainty."

Summing up the distinctive themes of the analysis thus far, on innovation and entrepreneurship, we can suggest the close relation between innovation and entrepreneurship as mentioned at the opening of this section:

1. *Innovation and entrepreneurship are intertwined concepts affecting SMEs competitiveness.*

On the basis of the above analysis we may hypothesize that innovation can be measured on a scale. This is proposed in the following figure.

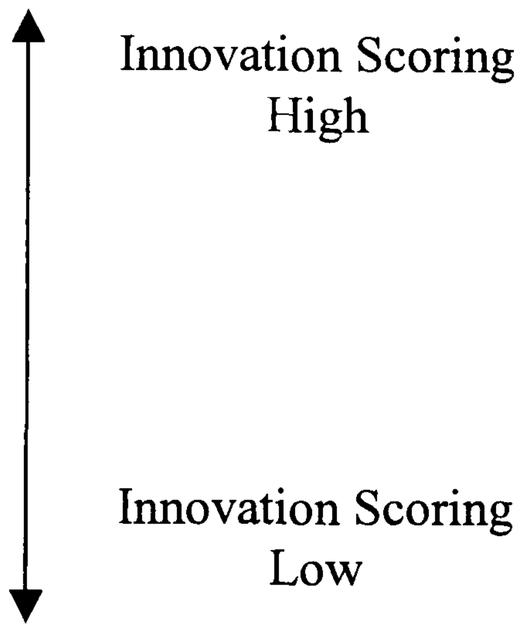


Figure 6, Vertical axis, Innovation

For the purposes of our empirical research, Schumpeter's operational definition of innovation provides one of the most detailed and an explicit paradigm of what constitutes an innovation in real business circumstances.

i. The introduction of a new good – that is one with which consumers are not yet familiar – or a new quality of a good.
ii. The introduction of a new method of production, that is one not yet tested by experience in the branch of manufacture concerned, which need by no means

to be founded upon a discovery scientifically new, and can also exist in a new way of handling a commodity commercially.

iii. The opening of a new market, that is a market into which the country in question has not previously entered, whether or not this market has existed before.

iv. The conquest of a new source of supply of raw materials or half-manufactured goods, again irrespective of whether this source already exists or whether it has first to be created.

v. The carrying out of the new organisation of any industry, like the creation of a monopoly position (for example through trustification) or the breaking up of a monopoly position. (Schumpeter, 1942, p.66)

As we discussed in chapter one, throughout pages 23-39, innovation systems can be national, regional or local. They are shaped by the specific and characteristic economic and social conditions and factors of a country. In understanding the competitiveness of a country and the competitive advantages of businesses and business sectors of a country we need to explore the concept of a system of innovation. Important factors such as, institutions, authorities and governments at local, regional, and national level may affect the businesses performance and innovative capabilities. Innovation processes are influenced by many factors; they occur in interaction between institutional and organisational elements, which together may be called 'systems of innovation'. Thus if we want to describe, understand, explain and even perhaps influence processes of innovation, we must take all important factors shaping and influencing innovations into account.

According to Edquist (1997) firms rarely innovate in isolation, rather in their pursuit of innovativeness they interact with other organisations, such as other firms but also universities, research institutes, investment banks, schools, government ministries, etc. to exchange, develop and gain knowledge, information and other resources. Furthermore, the author argues that social patterns and social institutions, not necessarily economic in their nature may operate positively or negatively giving rise to constraints and/or incentives for innovation; these can be laws, health regulations, cultural norms, social rules and technical standards which also shape the behaviour of firms. Interaction and relations between the various agents, institutions and actors shape the system of innovation. The various actors and organisations that

operate under certain institutional contexts are the elements of the 'system' that creates and uses knowledge for economic purposes, while innovation emerges in such a system.

The notion of 'national' system of innovation for Edquist (1997) should be discussed in conjunction with 'regional' and sectoral'. Edquist seems to reject the term 'national', in line with the writings of Nelson and Rosenberg (1993). Systems of innovation other than national can and should be identified and studied,

> "...An innovation system can be 'supranational' in several senses; it can be truly global, or it can include only a part of the world (e.g., an integrated Europe). It can also be 'regional' within a country, an example being the Silicon Valley area in California...an innovation system can also be supranational and regional within a country at the same time, as are part of Germany, France, and the UK...we can distinguish between a supranational system at the European Union level, the national level, and the regional/local level...leaving the geographical dimension, we can talk about the 'sectoral' systems of innovation (i.e., systems that include only a part of a regional, a national, or an international system)...'sectoral' is determined by generic technologies, which can be, but are not necessarily restricted to one industrial branch..."(Edquist, 1997, p. 11)

It appears, from the literature presented above and discussed thoroughly in chapter one (pp. 23-39) of this thesis that one of the important elements that affects business competitiveness and innovative performance centers on the relations between universities and business, and the role institutions, authorities, agents and governments play in triggering and sustaining such relations.

As we discussed in chapter two, throughout pages 78 to 84, one of the most rapidly emerging approaches to industrial competitiveness of small and medium sized enterprises (SMEs) is that it can be accelerated through inter-firm collaboration. When corporations share competencies and knowledge it becomes possible to tackle jobs that no single corporation could tackle alone. In the best cases the assembly of core competencies from different companies enables corporations to build a team of organisations and individuals who together have the highest-level capabilities. This is increasingly essential for world-class competition and innovation. Today's networks.

the Internet, video conferencing, and computerised tools make possible flexible but tightly coupled linkages between corporations. Companies are increasingly using information systems and the Internet for strategic advantage by entering into strategic alliance with other companies in which both firms cooperate by sharing resources and/or services. Such alliances are often information partnerships in which two or more firms share data for mutual advantage. They can join forces without actually merging.

Some companies are extending their enterprise systems beyond the boundaries of the firm to share information and coordinate business processes with other firms in their industry. Industrial or business networks link together the enterprise system of firms in an entire industry. Internet technology has fuelled the growth of industrial and business networks because it provides a platform where systems from different companies can seamlessly exchange information.

In Europe several government agencies and private foundations are experimenting with and try to support, stimulate and accelerate different forms of inter-firm collaboration, or as otherwise stated 'business networks'. The assumption behind such efforts and programmes is that cooperative behaviour will help SME firms to first of all survive in their market place, innovate through collaborative research and development projects and shared knowledge, and then be able to successfully compete with larger enterprises. Alliances bridge the gap according to Hoffmann and Schlosser (2001), between the firm's present resources and its expected future requirements.

Hence, the second distinctive theme of our literature review emerges from the theories on business networks and SMEs, as follows:

2. *Business networks appear to be associated with the innovative capabilities of SMEs and their competitiveness.*

According to Enright and Ffowcs-Williams (2000), and the literature review in chapter three of this thesis (pp. 91-101) membership of clusters can enhance the productivity, rate of innovation and competitive performance of firms. Moreover. according to the European Commission and the Observatory of European SMEs (2002), clusters are widely recognized by scholars and policy-makers around the world as important settings in stimulating the productivity and innovativeness of

companies and the formation of new businesses. According to the Observatory of European SMEs (2002),

> "The increased focus on regional clusters and innovation systems reflects a (re) discovery by many academics of the importance of the regional level, and the importance of specific local and regional resources in stimulating the innovation capability and competitiveness of firms. Specific regional resources such as a stock of 'sticky' knowledge, learning ability, entrepreneurial attitudes etc. are seen to be of great importance in firms' efforts to be at global competitive level. Building regional clusters is even perceived by some as the way to compete globally, as economic 'specialization is (seen as) the only way to overcome 'the globalisation trap', that is, outrunning the risk of being out competed across the board'." (Observatory of European SMEs, Regional Clusters in Europe, 2002, No. 3, p. 9)

Furthermore according to Porter (1998),

> "Economic geography in an era of global competition, then, poses a paradox. In a global economy -which boasts rapid transportation, high-speed communication, and accessible markets- one would expect location to diminish in importance. But the opposite is true. The enduring competitive advantages in a global economy are often heavily local, arising from concentrations of heavily specialised skills and knowledge, institutions, rivals, related business, and sophisticated customers. Geographical, cultural, and institutional proximity leads to special access, closer relationships, better information, powerful incentives, and other advantages in productivity and innovation that are difficult to tap from a distance. The more the world economy becomes complex, knowledge based and dynamic, the more this is true." (Porter, 1998, p. 90)

Marshall (1922), in his early writings on Sheffield cutlery, Lancashire cottons and other British regions, ascribes their competitive advantage to the presence of external economies, as the 'commons', the infrastructure and other services from

which each individual firm in an industrial district might draw. These include faster dissemination of new ideas, experience and know-how thanks to geographic proximity, cultural homogeneity, common manufacturing traditions, reduced cost of transport (and of transactions in general), and the easier access to complementary services or capabilities. Furthermore, they include improved job search and job matching, more favourable access to capital finance and inter-firm labour migration.

The need to develop competitive SMEs has become crucial for achieving socio-economic stability and prosperity both in industrialised and in developing countries in the context of global competition. Usually SMEs are considered weak because of shortages of human and financial resources, scale inefficiency and low market power. On the other hand, as we discussed in chapter two SMEs collectively represent or at least potentially could represent the dynamic engine of economic growth, and their aggregate actions are inherently transferable into aggregate economic benefits. We brought forth and discussed in chapter three, pages 111 to 135, using several case studies, researches and the Silicon Valley model the benefits of a cluster for SMEs and its effect on business competitiveness and innovation. Operating within clusters SMEs could both take advantage and facilitate the widespread diffusion of know-how, innovations, knowledge sharing and learning processes.

The essential assumption made here is that SMEs can cooperate in clusters that provide for specialisation, creativity and innovation while, at the same time they can reap the benefit of being part of a larger entity. In other words, SMEs can maintain the small company strengths and at the same time compete with the larger companies or as Porter (1998) argues,

> "A cluster allows each member to benefit as if it had greater scale or as if it had joined with others without sacrificing its flexibility." (Porter, 1998, p.81)

The author claims that many new companies grow up in existing clusters rather than at isolated locations. He identifies several reasons that make clusters conducive to new business formations. First of all individuals working within the cluster can more easily perceive market opportunities and unsatisfied customer needs around which they can build a business. Skilled workforce, needed skills, know-how, inputs, assets are already available in the region and can easily be assembled into new business forms. Financial institutions and investors are already familiar with the

working and nature of the cluster and may require, according to Porter. lower risk premium on capital. Furthermore, an entrepreneur may exploit the networks, relationships and collaborations with other enterprises and research centres that are already established. The new business creation within a cluster can be very much affected by a positive feedback loop. As the cluster develops and prospers more opportunities and competitive resources will emerge, which will ultimately benefit all members of the cluster.

According to Bouwman and Hulsink (2002), within the network of a successful cluster such entities as information, creativity and entrepreneurial talent are available for reinvestment. Workforce mobility, talent recruitment and spin-offs are an inherent part of the process. Entrepreneurs often leave a larger company or a university to start their own company (what is termed as a 'spin-off' company) by exploiting market opportunities, new technologies and innovations, which usually originate in private or public R&D laboratories and universities. According to the authors the majority of start-ups in the Silicon Valley are spin-offs of this kind.

Liyanage (1995) believes that innovative clusters draw together companies and industrial partners who understand that they can mutually benefit from collaborating in research and innovative activities undertaken within the region. Mutual dependency and collaborative efforts create the foundation for innovation and increased productivity.

We present below our definition of clusters which is based to some extent on a synthesis of the aforementioned positions with the influential writings of Enright and Ffowcs-Williams 2000; European Commission and Observatory of European SMEs 2002; Porter 1998, Nassimbeni 2003; Marshall 1922; Zeitlin 1992; Beccatini 1990; Piore and Sabel 1984; Day 2000; Scott 1998; Stroper and Salais 1997; Padmore and Gibson 1998; Steinle and Schiele 2002; Lyon and Atherton 2000; Pyke and Sengenberger 1992:

"Clusters are networks of competing, collaborating, complementary and interdependent businesses (including suppliers and service providers), associated agents and institutions, linked formally and informally, vertically and/or horizontally that work in common, similar and/or related industries and located in a geographically bounded space."

On the basis of the above analysis we may hypothesize that business clustering/networking can be measured on a scale as seen in the following figure. The axis describes the classical and the emerging approaches to business competitiveness, internationalisation, innovation and networking of small and medium sized enterprises. At the right-hand side the new era of strategic management and competition follows the business clustering/networking approach, while on the left-hand side the go-it-alone strategy reflects the classical way of competing and formulating strategies. The higher the level the company is engaged in networking/clustering activities the more to the right it will be positioned. On the other hand, the preference of the company to a go-it-alone strategy with no collaboration at all it will position it at the left hand side of the axis.

Figure 7, Horizontal axis, clustering/networking and go-it-alone strategies

For the specific purposes of our empirical research, the following operational definition provides a detailed and explicit paradigm of what constitutes clustering/networking activities in real business circumstances.

In the realm of this definition emerge business cooperation (agreement) for combined research and development of new products and services and networking (cooperation) with the local/regional/national technological and educational institutes and research centres for R&D purposes, as well as for the attraction and employment of young scientists. Furthermore, strategic alliances are made with other firms for the purpose of entering new markets, sales and logistics, and/or extending distribution networks as well as collaborating with government agencies and public institutions for R&D purposes.

5. A Hypothetical 2-Dimensional Model of Innovation and Business Clustering

From the analysis in the previous section it appears that the two dimensions of innovation and clustering can have the following outcomes of four "types" of SMEs. This hypothetical scheme can be depicted as follows:

Combining the dimensions of innovation and clustering

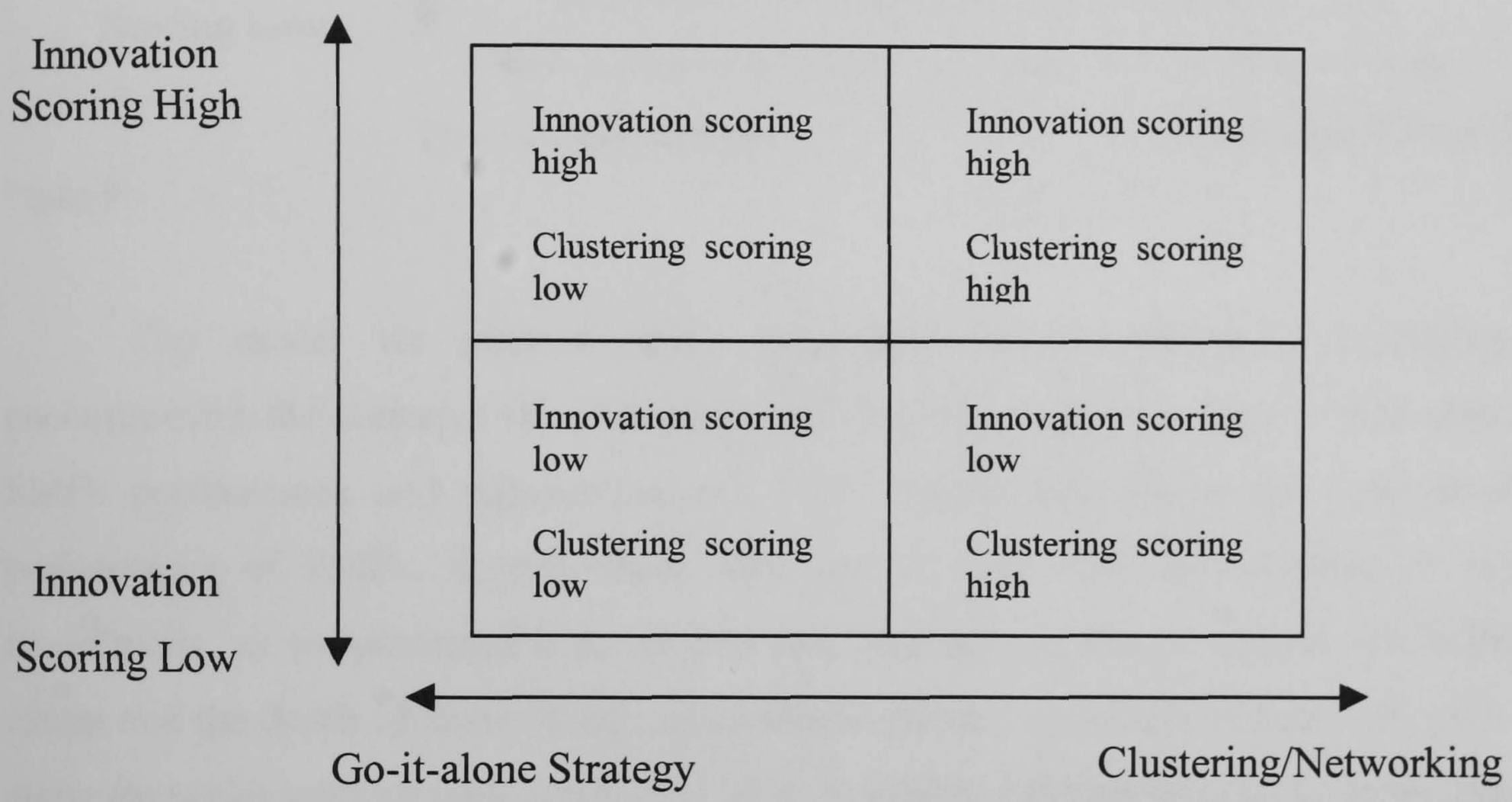


Figure 8

Bringing together the two dimensions of innovation and business clustering we structure a two-by-two model as shown in figure 8, above. The vertical axis shows the innovation performance of SMEs, scoring from very low to very high from bottom to top respectively, and the horizontal axis is the extent and the depth of networking and strategic alliances. The end result is the formation of a hypothetical model of four squares each representing a different "type" of SME based on the relative performance of the companies in the two axes, as shown in the figure.

Two-Dimensional Model
A model of innovation and business clustering

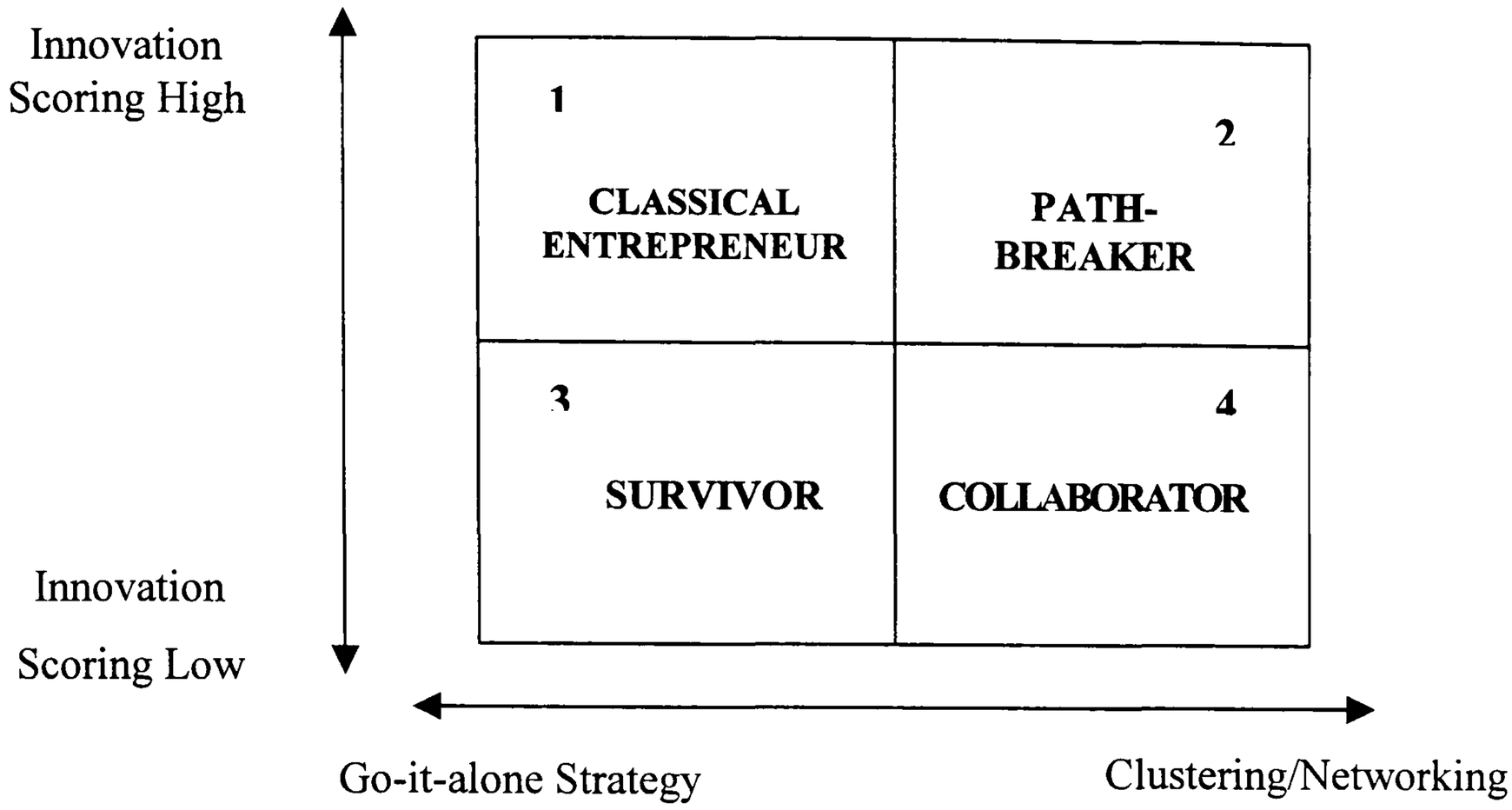


Figure 9

The model we present above is a hypothetical schematic description encompassing the concepts of innovation and clustering and how these could affect SMEs performance and competitiveness. The vertical axis shows the innovation performance of SMEs, scoring from very low to very high from bottom to top respectively, as we presented it in the previous section, and the horizontal axis is the extent and the depth of networking and strategic alliances, scaling from the left, go-it-alone strategies with no collaboration at all to the right, ultimate level of collaboration forming dynamic clusters and strong business networks, as we presented it in section 4 of chapter three. The end result is the formation of four squares each representing a different type of SME based to the relations between the three concepts of innovation and business clustering and the relative scores of the companies in the two axes. The model we present does not presume to be an all-conclusive typology of SMEs concerning innovation and networking but rather a hypothetical model of four case illustrations. The names given to each of the four 'illustrative' cases are hypothetical but relevant for describing each of the four illustrative types of SMEs.

The aim of this hypothetical, descriptive two-dimensional model is to link the concepts of and relations between innovation and clusters/networks in an attempt to explain how the relations between these concepts affect the performance and competitiveness of an SME. As we have discussed in the preceding analysis, the two

distinctive themes derive from the literature and these provide our model with some of the needed theoretical validity. The critical reader has to realise that this is a hypothetical model of how these concepts relate and affect the performance and competitiveness of an SME; it does not negate the possibility that other researchers might reach similar conclusions using different sets of relations that would have emerged from another heuristic point of view. Our two-by-two hypothetical model is our minimal contribution to the edifice of existing management research and theory. In introducing a new, hypothetical model on the subjects of innovation and business clusters we assumed that we could rely on existing theoretical evidence up to a certain point.

Figure 10, presents the output variables, namely the performance and growth of the SME that are driven by the 2 input variables, namely the innovation rate and the clustering/networking level.

Two-Dimensional Model
Output variables of the model; how the innovation rate and the clustering/network level affect the performance of the SME

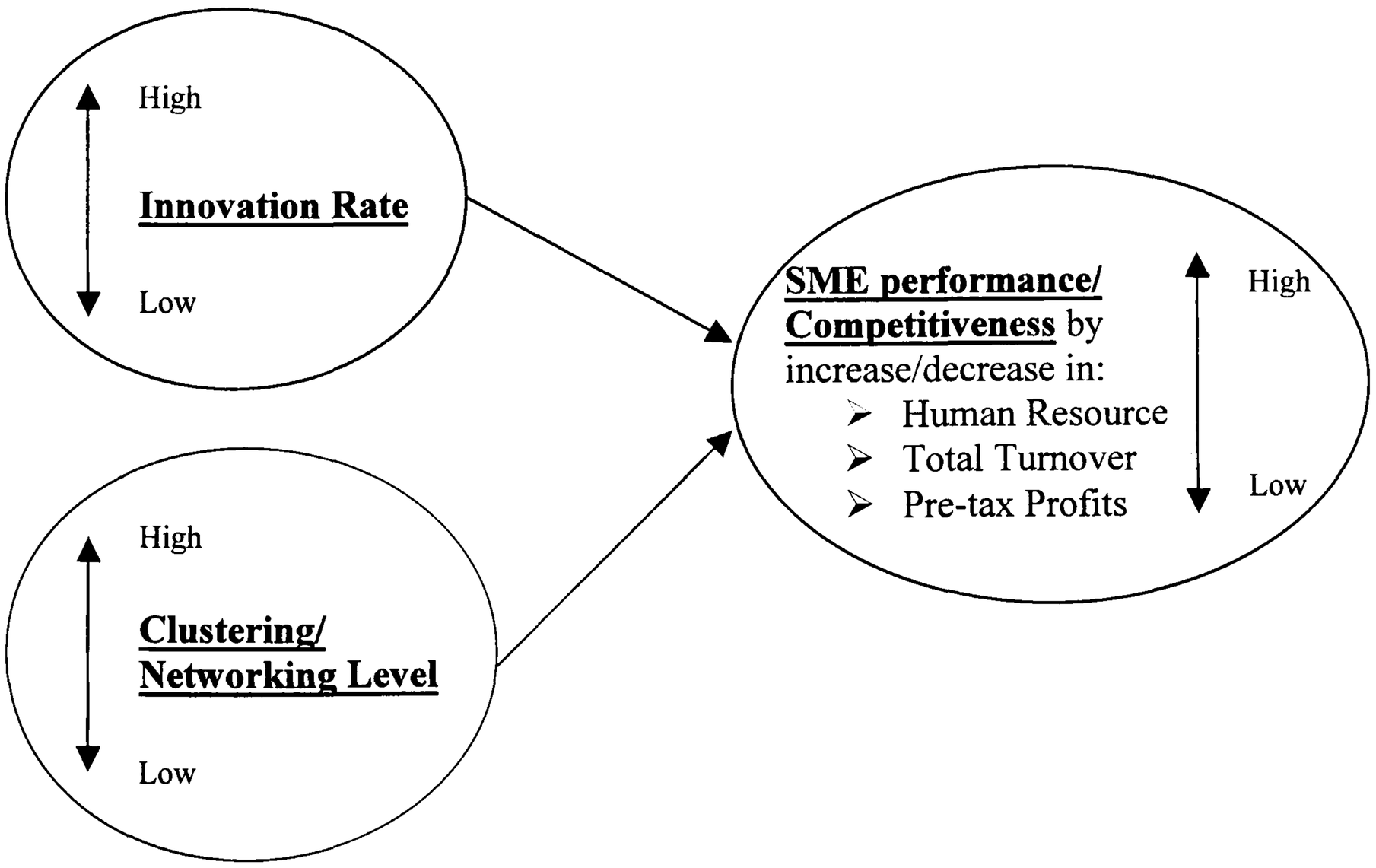


Figure 10, the output variables of the two-dimensional model

Within the five-year period between 1998-2003 we examine the growth of each company in terms of its human resource capital, namely how many more people have been employed in the company and we measure the performance of the company in terms of the total turnover and pre-tax profits increase or decrease in the same period. If we could abstractly describe the performance of a company we could say for example that a high performing company has very high pre-tax profits, especially as a percentage of the total turnover and has significantly increased its human resource capital over the five-year period. On the other hand, the company in the opposite side is a low performing company that manages to survive, which has a sound and even increasing total turnover but very low pre-tax profits, and a slow increase of its human resource capital.

Our hypothetical-illustrative model attempts to provide answers to questions such as why some companies are more innovative and open to networking than other companies, and why some companies are more reluctant to collaborate than other companies? Further, how these characteristics affect the outcome, namely SMEs growth and competitiveness. It could also purport to add insights to a comparison and contrast between the different types of companies in order to answer questions as those set above that will act as guidelines to devise some policies and measures to assist SMEs to improve their competitiveness and performance. The ultimate aim of the model is to add to the scientific knowledge concerning the concepts of entrepreneurship, innovation and business clustering by linking the concepts together and validating their relations and influence in businesses performance, competitiveness and viability.

In the following pages we present the characteristics/requirements that constitute each and every one of the four illustrative types of companies that are appropriately placed on the two-dimensional model incorporating the relevant performance scores they achieve on the two axes of innovation and business clustering. At this point, we need to highlight to the critical reader that the model we introduce creates a hypothetical set of characteristics for each one of the four types of companies. When we present our case study research results in chapters 6 to 9 we are dealing with four real companies that fit those requirements and we attempt to establish the reasons as to how and why these four companies fitted the four illustrative types of our model. Furthermore, the research reveals the nature of the interconnections/relations between the concepts of innovation and clustering, and how

these interconnections affect the business performance and competitiveness of the SMEs.

I. Classical "Entrepreneurs"

In the upper left square of the two-dimensional model (as shown in the following figure, 11) belong SMEs characterised by high innovative performance but scoring very low on networking and strategic alliances showing preference to go-it-alone strategy, usually a strategy followed by the 'classical entrepreneur'. We name this SME '*Classical entrepreneur'*, because the owner and/or manager of the company does not wish to engage in strategic alliances as he/she doesn't see the need for it or simply hasn't got the knowledge and expertise and the adequate managerial abilities to pursue such a strategy. It is the type of SME where the entrepreneur is very reluctant to engage in inter-firm alliances and networks since he/she wants to protect his/her innovations believes in his/her own abilities and pursues a go-it-alone strategy in competing in the market place. Innovation is systematically pursued and is present in the enterprise's policy and it is one of its main components.

From the review of the literature considered in chapter one, pages 7 to 22, an entrepreneur is a dynamic person or organisation seeking market opportunities where other fail to see them, under conditions of considerable risk and uncertainty, in the pursuit of financial benefits. As Schumpeter (1942), argues, an entrepreneur is everyone who 'carries out new combinations', while Weber (1930) defines the entrepreneur as the main actor of capitalism, a 'moving spirit' oriented towards market opportunities. Furthermore, we have discussed the interrelationship between entrepreneurship and innovation as it is suggested from the writings of Drucker (1985), who argues that at the heart of entrepreneurship is innovation, the effort to create purposeful, focused change in an enterprise's economic or social potential. Entrepreneurs, according to the author, see innovation as a strategy, an ongoing process that will bring profits and a competitive advantage to the company.

According to the literature review in chapter two, pages 60 to 67, the owner-manager exercise control over the business since such an SME is structured around the 'personality' of the entrepreneur and is highly dependent upon his/hers preferences, attributes and plans. Such enterprises, according to the literature (Goffee

and Scase 1995; Man 2002; Greiner 1972), are sculptured around the 'personalities' of their owner-managers and their growth potential and financial viability is highly dependent upon the proprietors' preferences, energies, talents and plans. In order for the company to grow in course of time it requires the adoption of new managerial and organisational practices that the entrepreneur might not be able to adopt, or he/she might be reluctant to relinquish to his/hers personal control over the company. As the authors argue, the entrepreneurs might decide to keep their business small so that they can 'control' it or they may decide or be forced to pursue a growing strategy. In other words, there is a reluctance to move beyond a size at which face-to-face managing and working is possible. In such a working environment the owner-manager can have a direct control of staff and the company. To shift from this management style to adopting rules, procedures, delegation of authority and responsibility requires from entrepreneurs to develop management competencies. In the latter case it is again the 'qualities' of the entrepreneur that will play a decisive role in the future survival and growth of the company. If the entrepreneur decides to review his business and personal life strategies, delegate more authorities and responsibilities the company may grow, otherwise it might fail.

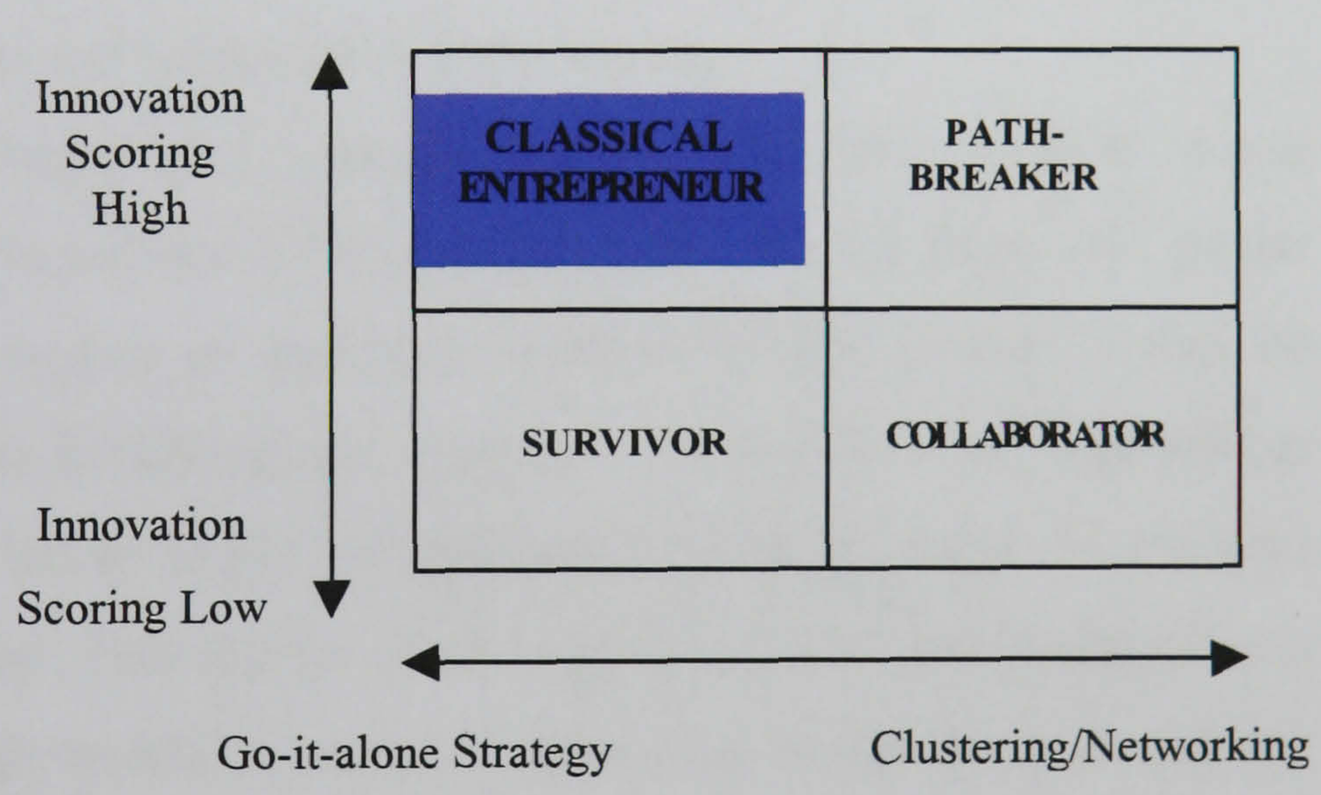


Figure 11, the 2-dimensional model

1st illustrative SME type – 'classical entrepreneur'

II. **"Path-breakers"**

In the upper right square of the two-dimensional model (as shown in the following figure) belong SMEs, which exhibit high innovation performance and high clustering/networking performance, strong inter-firm alliances, networking with universities and research centres, other institutions and agents and are perhaps part of a cluster of firms in the same or adjacent industrial sectors. We name this SME '*Path-breaker*', because it is the optimal, ideal type of SME the one that leads the way and from which we could draw conclusions on how to direct other SMEs to follow its example. This kind of an SME could be, for example, a high-tech organisation operating within the Silicon Valley cluster in the United States. In this kind of SME there is a strong link between entrepreneurship and innovation. The entrepreneur exercises control over his/her business through directly imposed but mostly unwritten guidelines and instructions. The entrepreneur purposefully and systematically searches the sources of innovation, the changes and the indications that create opportunities for a successful innovation. Innovation is seen as a strategy, an ongoing process that will bring profits and a competitive advantage to the company. Furthermore, membership of business networks/clusters enhances the company's productivity, rate of innovation and competitive performance.

As we discussed in chapter two, throughout pages 78 to 84, (Hoffmann and Schlosser 2001; Narula and Hagedoorn 1999; Prabhu 1999; Martin 1996) one of the most rapidly emerging approaches to business competitiveness is that it can be accelerated through inter-firm collaboration. Sharing competencies and knowledge enables SMEs to tackle jobs that no single corporation could tackle alone, by building a team of organisations and individuals who together have the highest-level capabilities. This is increasingly essential for world-class competition and innovation.

From the review of the literature on clusters, in chapter three, the European Commission and the Observatory of European SMEs (2002), suggest that clusters are widely recognized by scholars and policy-makers around the world as important settings in stimulating the productivity and innovativeness of companies and the formation of new businesses.

> "Competition is increasingly seen to occur between clusters, value chains or network of firms rather than just between individual firms. It is also argued

that regional clusters are the best environment for stimulating innovation and competitiveness of firms." (Observatory of European SMEs, 2002, No. 3, p. 13)

Furthermore, Porter (1998) suggests that the linkages between the cluster members result in a whole that is greater than the sum of its individual parts. The members of the cluster are mutually dependent on each other the good performance of one will benefit the productivity and performance of the other and in total the competitiveness of the cluster. Moreover, Bouwman and Hulsink (2002) argue that within the network of a successful cluster such entities as information, creativity and entrepreneurial talent are available for reinvestment. The accumulation and diffusion of knowledge and information, as the authors and Baptista (2001) suggest, create a fertile environment for innovative spin-offs and start-up companies.

Within the business network and through strategic alliances and inter-firm collaborations the 'path-breaker' takes advantage and facilitates the widespread diffusion of know-how, innovations, knowledge sharing and learning processes. The essential assumption made here is that the SME can cooperate in network/clusters that provide for specialisation, creativity and innovation while, at the same time they can reap the benefit of being part of a larger entity. In other words, the 'path-breaker' can maintain the small company strengths and at the same time compete with the larger companies, in a regional, national and international basis.

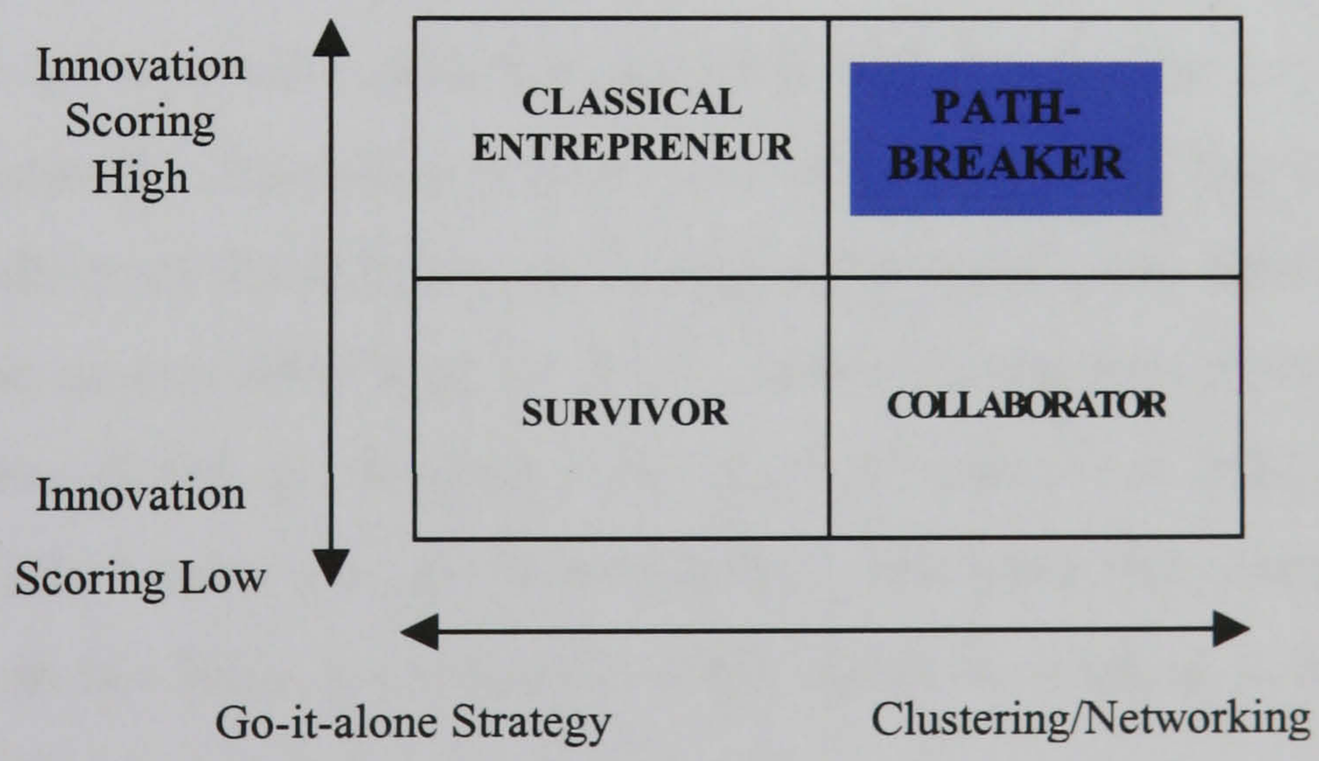


Figure 12, the 2-dimensional model

2nd illustrative SME type – 'path-breaker'

III. **"Survivors"**

In the lower left square of the two-dimensional model (as shown in the figure below) belong those SMEs which score very low both on innovation rate and on networking/clustering level showing clearly characteristics of a business that simply aims to achieve an income for its owner be it as it may, one or more individuals or a family and is not interested or cannot apply modern management and innovation techniques. We name this SME '*Survivor'*, since such an SME does not belong to any strategic alliance or cooperative networks of enterprises, does not have any cooperation with public and private research centres, universities and other agents and the innovative performance of the company is virtually non-existent. This type of SME is the exact-polar opposite of the one in the 2nd illustrative type, the '*path-breaker'*, of the model, stuck in the old way of doing-business. Innovation is something the nature of which the owner-manager may not even understand and is certainly out of the business strategy. The owner and/or manager of the company is not interested in changing anything in his/her company either because he/she lacks the understanding and knowledge to do so or simply because he/she wants to run the business in his/her own way.

It is an abiding perception that SMEs compared with larger enterprises often face difficulty in surviving and growing. As we discussed in chapter two, authors like Storey (2000), Burns and Harrison (1996), argue that often the managers/owners of SMEs have difficulties in coping with the multiplicity of external and internal demands placed on them once the enterprise has grown in size. Moreover, they argue that failure is endemic to the small business sector especially during their first stages of establishment and growth. According to Burns and Harrison (1996), the personal characteristics and qualities of the entrepreneur/manager that can on one hand, lead a company to success can on the other hand, lead it to failure. As we have discussed in chapter one, Schumpeter (1942, p.78) argues that everyone can be an entrepreneur only when he/she actually 'carries out new combinations', and loses that character as soon as he has built up his business, when he settles down to running it as other people run their business.

If we could define the survivor "types" of SMEs we would place them on the typical family business, founded by the person that now is the manager and owner of the company. Unfortunately they describes a big majority of the companies in Greece

and all over Europe as well that have the only goal to achieve a 'good' income for the family. The 'survivor' type of company does not necessarily fail to increase its sales or turnover but rather it is the lack of a modern approach to management and competitiveness that makes this type of company vulnerable to foreign and/or domestic competition by larger enterprises. As we discussed in chapter two, Goffee and Scase (1995) argue that many of the business owners/managers of SMEs do not posses the necessary managerial skills and competencies to steer the business towards the fundamental changes in the nature and organisation of their business practices, towards innovative practices and business networking. In such cases, the owner/manager will in due course become overloaded with strategic and operational matters, so that the business controls are neglected and the firm starts to face financial difficulties.

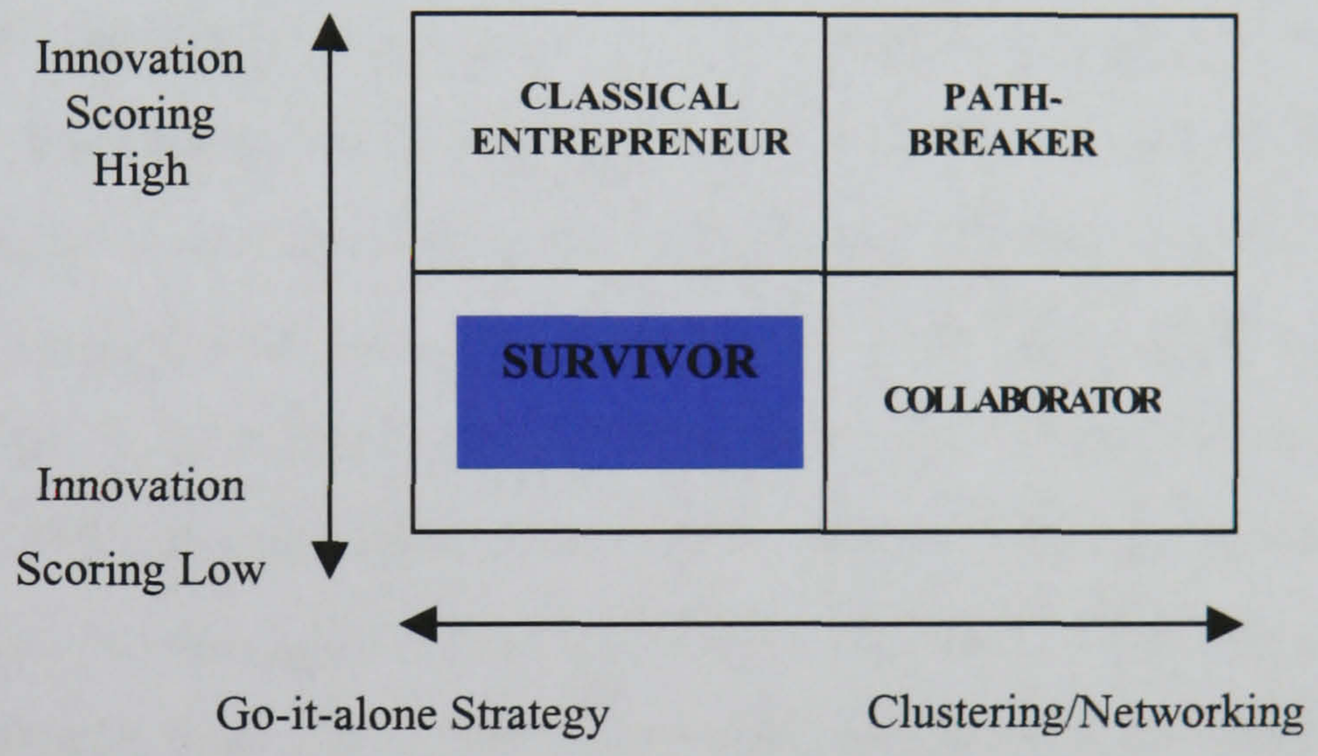


Figure 13, the 2-dimensional model

3rd illustrative SME type – 'survivor'

IV. **"Collaborators"**

In the lower right square of the two-dimensional model (as shown in the figure below) belong SMEs which score very low on innovation, in other words for them innovation is not purposefully and systematically pursued while on the other hand they do belong to networks of firms and/or have formed strategic alliances. We name this type of SME '*Collaborator*', because the SME depends and benefits by belonging to the network/cluster to survive and operate but fails to realise that it should be more

innovative, and create knowledge in order to build and sustain a competitive advantage for itself and for the network of the firms as well. The underlying difference with the 2nd illustrative type of SMEs (path-breakers) stems from the fact that the innovation performance is very low, the company is not introducing any new products and/or services, nor is it collaborating with other companies and/or educational or research institutes in order to develop and launch new products. Business clustering/networking activities are directed more towards the internationalisation of the company's operations and increase in competitiveness, rather than on the enhancement of the innovative performance of the company. From this perspective alliances for the "collaborator" arise when the firm needs additional resources that cannot be purchased via market transaction and cannot be built internally with acceptable cost (risk) or within an acceptable amount of time.

According to the review of the literature and empirical studies considered so far in this dissetatrion, (Hoffmann and Schlosser 2001; Narula and Hagedoorn 1999; Prabhu 1999; Rosenfeld 1996) the new competition is among alliances of firms and not among individual firms. Cooperative alliances are particularly acute in sectors that are capital and knowledge intensive as well as in sectors that depend on fast evolving technologies. The scholars suggest that, this phenomenon is most prominent in industrial sectors where new product developments are high, and where access to new technology is vital. Prabhu (1999) for example, argues, that 60% of Japanese firms expected to be highly depended on external technology sources, and half of the major US firms are expected to increase their participation in joint ventures and alliances primarily for access to new technology.

According to Goffee and Scase (1995), organisations are, or at least should be focusing upon areas of 'core' strength and competence and spinning off, out-sourcing and subcontracting all other activities. In this business network, organisational changes and strategies will depend on forming alliances and empowering relations with 'small businesses' that would form a constellation around the 'core enterprise', where boundaries are ambiguously defined and constantly shifting.

> "Networks are faster, smarter and more flexible than reorganisations or downsizing…in effect, a network identifies the 'small company inside the large company' and empowers it to make the four-dimensional trade-offs –

among functions, business, units, geography and global customers – that determine success in the marketplace'."(Goffee and Scase, 1995, p. 159)

The strategy of the "collaborators" would fit that of a benchmarking approach where the company just adapts to the business environment rather than trying to 'enact' it. At the end of the day all the firms will mutually benefit from a high commitment to deposit knowledge and search for innovation rather than just wait till someone else does the job for them, or as Pyke and Sengenberger (1992) argue, a small firm in an industrial district does not stand-alone, a condition of its success is the success of the whole network of firms.

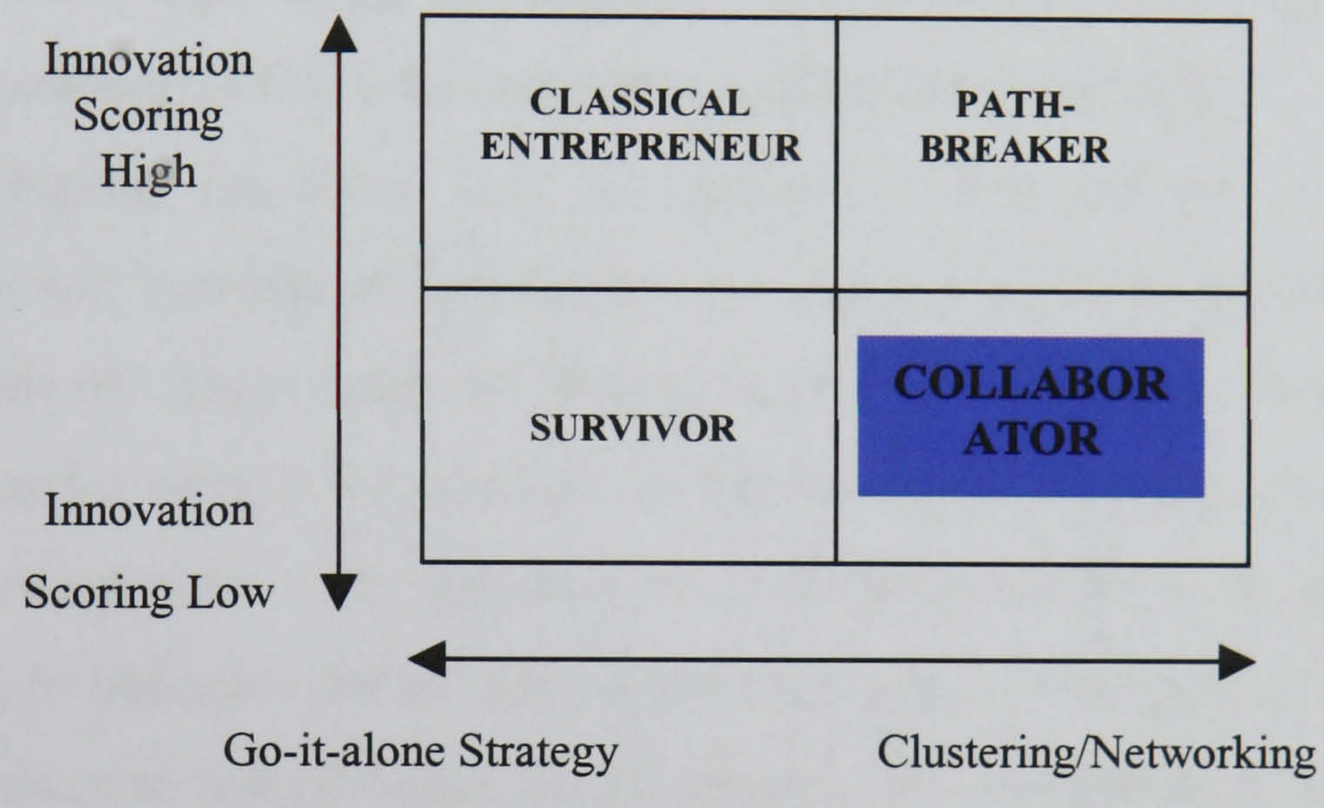


Figure 14, the 2-dimensional model
4th illustrative SME type – 'collaborator'

The next step in our thesis is to attempt an empirical validation of our model, and collect data to test the value of the 4 illustrative types of SMEs. For this we chose a specific business sector, the IT sector, of a specific region, Central Macedonia in Northern Greece, and selected four companies that would fit the requirements of each of the four illustrative types of SMEs, as these were outlined above.

6. In conclusion

In this chapter we have looked at the paradox of 'localisation' and its emerging importance in the era of globalisation. We have defined the concept of 'clustering' and its life cycle. We have examined the role of SMEs in the cluster and how it affects their productivity, competitiveness and potential for innovation. We have also investigated the innovation performance of a cluster as well as how innovation can be promoted within a region. The Silicon Valley and the 'Third Italy, Prato' model have been briefly described to enhance our understanding of how a cluster works, and what factors affect its competitiveness and success. Moreover, we explored the role and importance of institutions, authorities, governments and other agents in promoting business clustering, knowledge diffusion, innovation and entrepreneurship.

In the next chapter, we delve into the specific characteristics of Greece relevant to innovation and systems of innovation. We present a socio-historical and socio-economic analysis of Greece from the Second World War to present times. The selection of Greece carries with it the realisation that academic research and theory should functionally interconnect with regional and national economies. In selecting Greece we are hoping to delineate the necessary techniques and strategies in creating those conditions necessary to propel Greek SMEs toward the recognition of the need for entrepreneurship, clustering and innovation as survival skills in the international competitive market and even more so in the region of the Balkan peninsula.

Chapter 4

The case of Greece; Innovation System

1. Introduction

In chapter three, we dealt with the paradox of 'localisation' and its emerging importance in the era of globalisation. We have defined the concept of 'clustering' and its life cycle, examined the role of SMEs in the cluster and how it affects their productivity, competitiveness and potential for innovation. We have also investigated the innovation performance of a cluster as well as how innovation can be promoted within a region. Moreover, we explored the role and importance of institutions. authorities, governments and other agents in promoting business clustering; knowledge diffusion; innovation and entrepreneurship. Throughout the first three chapters, we have set-up the theoretical framework of this thesis and the conceptual underpinnings for our hypothetical, descriptive two-dimensional model that we introduced in the last section of the previous chapter.

The aim of this chapter is to examine the socio-economic infrastructure and the system of innovation of Greece, and to delineate and evaluate the socio-economic infrastructure of the prefecture of Thessaloniki in Northern Greece. In doing so, we will assess the position of Greece against the other E.U. member states in terms, of the country's innovative potentials and capabilities, as well as the dynamics, i.e. the contribution in GDP and the number of higher education institutes, of the Thessaloniki area as opposed to other regions in Greece.

As we have seen in chapter one, the concept of innovation systems conveys the idea that innovations do not originate as isolated, discrete phenomena within a firm, but are generated by means of interaction of a number of entities, actors and agents. According to Edquist (1997), the 'systems of innovation' approach is considered nowadays to be a useful and promising analytical tool for better understanding the innovation process as well as the production and diffusion of knowledge in the economy. Furthermore, to encapsulate the performance of the Greek economy and the innovation system of the country one has to keep in mind the words of Chesnais (1993),

> "When one is examining the development of a national system of innovation, one is reading a country's economic, social and political history through the

particular prism of the conditions surrounding the use of technology in capitalist production and the choices made by the ruling class or dominant elites regarding the production and application of scientific and technological knowledge." (Chesnais, 1993, p. 194)

At this point, we underscore the fact that there is nothing written in the Greek or international literature on the national innovation system of Greece. This posed a great challenge to the author of this thesis to collect accurate and appropriate data and scholars' opinions for the Greek economy from the National Statistical Service and other official Agencies and from an array of the scarce relevant literature. In Nelson's book on "National Innovation Systems, a comparative analysis (1993)" several authors produce a comparative study examining 15 countries on the similarities and differences of their institutions, mechanisms and general factors that support and shape technical innovation. In my attempt to describe the system of innovation of Greece, I use as guidance primarily the work of Nelson (1993), and to a lesser degree that of Lundvall (1995), Edquist (1997), as well as other scholars.

The primary intention of this chapter analysis is to gather, present and assess data for the Greek economy and of particular infrastructure of the region of Thessaloniki. This is in the attempt to answer a number of questions. For example, what is the post WWII history of the socio-economic and political system of Greece? What are the characteristics of the national innovation system of Greece? How is the industrial structure of Greece shaped? What are the characteristic features of the R&D system? What is the proportion of public as against private investment in R&D? What is the state of the education and training system? What is the supply of qualified scientists and engineers? What is the innovative performance of Greece relative to other EU member states? And what are the characteristics of the economic and R&D system of the region of Central Macedonia?

2. Innovation System of Greece; R&D and Innovation Performance

A national system of innovation is constituted, as we have analysed extensively in chapter one of this thesis, by the institutions and economic infrastructures affecting the rate and direction of technological change in the society. Undoubtedly, the national system of innovation is larger than the R&D system. It must, for example, include not only the system of technology diffusion and the R&D system, but also the institutions and factors determining how new technology affects productivity and economic growth. Moreover, we assume that technical competence is built in a cumulative process. This is a major reason why we find it useful to begin with a historical perspective of the post WWII industrialisation process, and then delve into the present characteristics of Greece.

Greece is a special case, for several reasons. One is its unstable political history. After World War II, the country has undergone several different political-economic systems. By the end of the war and up until 1967, Greece was experiencing high political instability with several governments succeeding one another in power before in 1967 a military junta took over the governance of Greece and in 1974 parallel to the junta's collapse with the referendum of '74 monarchy was discarded and the Hellenic Republic was constitutionally declared as the new and permanent political system of Greece. At the same year, the conservatives came to power with a broad electoral majority. In the October 1981 elections and up to March 2004, the socialists were in government with the exception of the three-year period of 1990 to 1993 when the conservatives regained the governance of Greece, and they did so again in March 2004.

The present profile of the Greek Innovation System illustrates the cumulative character of processes of technical change and the stubbornness of historically established institutional set-ups and economic structures. Greece represents an interesting and complex context for the purposes of our investigation, since it is an advancing economy that finds itself between developed and developing nations..

Immediately, after the end of World War II, Greece entered a period of high political and economical instability that reaches a zenith with the outbreak of the civil war between the communists on the one side and the centre and right parties on the

opposite side in the period 1946-1949. The inclusion of the country in the Marshal Plan was the corner stone for the economic growth and monetary stability of Greece after long periods of economic decline and political instability. During the period of 1949-1967, numerous elected and short-lived governments took over the governance of Greece amidst an unstable political environment. As Mouzelis (1978) argues, during this period, the Greek economy can be characterised as an *under-developed capitalism*: low agricultural production, long-drawn-out, bureaucratic public administration sector, ever growing services (tertiary) sector and an industrial sector incapable of absorbing the unemployed farmers and invest in the secondary sector.

During these decades two colossal banks, namely the National Bank of Greece and the Commercial Bank of Greece who were owned by the state and multiple public enterprises were in control of 90% of all deposits in the country and were in direct or indirect management and control of the insurance business and numerous small and medium enterprises (Choumanidis, 1990). The two banks accounted for 96,3% of the total wealth of all banks in Greece. It is easily understood that in the first phase of the Greek industrialisation the state was almost in total control of the economy. According to the author, the direct public investment in the economy accounted for 4.7% of the GDP in 1957 and climbed up to 9.2% in 1970.

The governments in the 1950's introduced a number of economic measures and policies to help the economy. According to Tsoulfidis (2003), in only a couple of years inflation had started to stabilise while the Greek products were easily traded in the international markets. At the same time, foreign capital started once more to accumulate in the Greek economy mainly due to money transfers from Greek immigrants. As the author argues, the governments concentrated their efforts and measures on large scale infrastructure constructions, i.e. railways, ports, public roads, the support of the building industry and the introduction of tax relief and special legal frameworks favouring enterprises that were willing to invest in Greece creating companies or building production facilities.

Unfortunately, during the first two decades of the industrialisation process the banks, the governments and the foreign and domestic capital investors preferred to invest in trading and commercial activities rather than in long-term vital and prosperous industries, such as metals, electrical machinery, chemicals, electronic machinery, pharmaceuticals, specialised industrial equipment etc., in line with the Western European economies industrialisation. Furthermore, according to Mouzelis

(1978), the political connections of the few big public and private corporations resulted in the concentration of capital and investments around them leaving the thousands of small enterprises scattered all over the Greek territory struggling to survive with outdated production facilities and non-existent organisation. Moreover, a comparison of the Greek economy with the other Balkan countries reveals the inability of Greek economy to industrialise, while even poorer Balkan countries had managed to set their economies to a trajectory towards industrialisation, as shown in the table below.

Industrial Production Indices (158=100)

Countries/Years	1938	1948	1959	1965
Greece	52	34	101	155
Yugoslavia	28	44	114	226
Bulgaria	10	21	121	272
Romania	24	20	110	248

Table 1, Source: Mouzelis, 1978, p. 276

This situation was similar for the agricultural sector. The thousands of small farmers were never organised into strong unions and groups, while they never had any government or other form of financial support (Vergopoulos, 1975). Furthermore, according to the author, no efforts to invest in agricultural productions, to set-up industries, to manufacture machineries, set up R&D laboratories and modernise the agricultural sector were made and the farmers were left to struggle for survival. Comparing the situation of Greece with the Danish agroindustrial sector reveals the incompetence of the Greek system to organise the agroindustrial sector in a Western mode of production,

> "In 1870's the Danish economy was predominantly agrarian and linked to the world mainly through its exports to the UK…decades later the Danish technical innovations were accompanied with an important social innovation – the introduction of cooperatively organised ownership of the agroindustrial sector. This form of organisation proved to be an efficient framework for the modernisation of both primary and secondary industries…it has been very successful in developing, producing, and marketing food products of a uniform, and high standard. State supported development work and quality

control have interacted with the efforts of the cooperatives aiming at a high and stable quality. The success is reflected even in the present export specialisation of Denmark, with butter, cheese, ham and bacon still dominating export products earning an important part of foreign currency." (Edquist and Lundvall, 1993, p. 269-270)

Furthermore, according to Mouzelis, (1978, p.278) during the '60s and '70s about 200 large corporations were dominating the Greek secondary sector. Of these 17 were owned completely by foreign enterprises/ and or investors and in another 39 the foreign investment and ownership fluctuated between 10% and 90%. In addition, the monopolistic power of companies such as, the Water supply company, Olympic Airways, National Electricity company, Cement and Steel companies, National Telephone companies, etc. was growing at fast rates, and so was the government protection and favouritism towards those companies. One of the remarkable characteristics of the Greek economy is that despite the concentration of the capital and funds to a limited number of large corporations, the thousands of smaller ones (in textile, clothing, leather, wood industry) managed to survive. However, these companies failed to get organised in clusters, grow and prosper, as they did in Italy but rather remained small, family-owned aiming to survive and achieve an income for the family,

"The small firms network has grown historically on a local, regional and vocational basis in Italy. The role of regional agencies, local public authorities, and local professional schools is effective in supporting the needs and requirements of small firms in the area. A large part of the Italian industry is composed of a large group of small and medium size firms operating in traditional industries (such as textile and clothing, shoes, furniture, etc.) in mechanics and in equipment supplier industries. These firms are specialised in the supply of custom-made products and of fashion items. These firms are highly profitable and quite successful internationally…they form a highly dynamic atomistic learning network. They are characterised by advanced capabilities of absorbing, adapting, improving, and tailoring new technologies (developed externally) to specific market needs. Innovation originates not

from formal R&D, but from informal learning by doing, by using, and by interacting." (Malerba, 1993, p. 230-232)

The military dictatorship, as mentioned earlier, took over governance of Greece in 1967 and remained there until its fall in 1974. The dictatorship followed mostly the economic policies of the previous governments emphasising on the creation of infrastructure constructions, public investment programs, support and enhancement of economic activity, low tax rates for businesses, it imposed a general ban on labour strikes, followed a strict monetary control and succeeded in maintaining a very low level of unemployment. The Greek economy during the junta years entered a period of fast growth, employee wages were on the increase and the inflation rate was kept at relative low levels, at least for the first years of dictatorial regime. According to Tsoulfidis (2003) though, this performance was soon undermined by the oil crisis and the Bretton Woods agreement collapse. All these had as a result the increase of the inflation rate from the level of 2-3% to the enormous level of 20% that seriously hindered the Greek economy for the next couple of decades.

Studying the figures presented in the following table, one can make some rather interesting observations concerning the Greek economy in the post World War II decades. Specifically, one observes that the rate of growth of GDP is larger for Greece than for the other OECD countries for the period 1950-1973, only second best to that of Japan, while for the period 1973-1986 the rate of growth of GDP remained at high levels despite the fact that it did follow the general slump of the rest of the OECD countries. The situation changed by the beginning of the 1990s with the adoption of more effective economic policies and the substantial support by Community Funds by the European Union.

GDP rates of growth in selected countries

Year / *Country*	*1950-1973*	*1973-1986*	*1980-1990*	*1990-1995*	*1995-2000*
Japan	9.33	3.68	4.0	1.70	1.35
Greece	6.47	2.49	1.6	2.13	3.20
Germany	6.28	1.85	2.2	2.25	1.78
Italy	5.49	2.06	2.2	1.61	2.05
France	5.13	2.12	2.4	1.87	2.46
Canada	5.09	3.26	2.8	2.56	3.68
USA	3.62	2.30	3.2	3.11	3.86
Great Britain	3.00	1.39	2.7	2.15	2.81

Table 2, Source: Tsoulfidis, 2003, p. 289

According to the following table, the agricultural sector's contribution to the GDP has decreased substantially, from 29.5% in 1951 to just over 11% in 1995. Looking at this table in the period 1951 to 1981 the contribution of the industrial production on GDP had been increasing rapidly from 11.53% in 1951 to 21.25% in 1981. On the other hand, its contribution thereafter has been steadily dropping to just 15.11% of GDP in 1995. In 1951, the service industry contributed to over 45% on GDP, while in 1995 its contribution had increased to more than 60% on GDP. Moreover, the workforce employed in the tertiary sector has more than doubled during that period. Hence, in 1951, the percentage of the workforce employed was 22.81% and in 1995 it had more than doubled reaching nearly 50% of the Greek workforce.

Percentage distribution of GDP and employment per economic sector

%GDP *%Employment*	*1951*	*1961*	*1971*	*1981*	*1991*	*1995*
Agriculture	29.15	26.31	17.47	14.23	12.46	11.68
	51.34	49,54	40.32	28.84	19.62	20.45
Mining	0.73	1.16	1.44	1.49	1.75	1.66
	0.51	0.84	0.69	0.68	0.47	0.42
Industry	11.53	13.83	19.59	21.25	17.84	16.62
	16.91	14.02	17.82	19.71	15.63	15.11
Construction	5.51	8.82	9.43	5.79	5.39	4.69
	2.81	6.98	7.92	9.68	8.46	6.59
Public Utilities	0.58	1.13	2.12	3.38	4.32	4.79
companies	0.42	0.78	0.82	0.75	0.98	1.09
Transportations	6.83	6.58	7.85	9.87	-	-
&	5.18	6.23	6.67	7.91	7.31	6.49
Communication						
Services	45.66	42.16	41.64	44.38	58.23	60.54
	22.81	21.61	25.77	32.42	47.53	49.85

Table 3, Source: Tsoulfidis, 2003, p. 289

According to Iakovidis (1998), it has been estimated that in the decade of the 1950's about 32.4% of the total population or some 2,456,000 people were illiterate. 2.9% had graduated from high schools, and 1.1% had finished the university level of education. Furthermore, one third of all children had not completed even the primary/ elementary school. The onset of the '60s found the Greek economy prospering and especially the Greek industrial sectors whose performance clearly outpaced the agricultural ones, as we have seen earlier. According to Mpouzakis (1986), though, for every 35 employees in the market only 1 was a graduate of a technical school. Moreover, according to Imvrioti (1983), Greece ranked in the first place amongst the European countries concerning the percentage of students of the total population that graduate from gymnasiums and lyceums, but on the other hand, was second to last in the percentage of graduates from technical schools. About three out of every four (74%) of all students graduating primary schools chose to continue their studies in the general, classical, education and only 20% followed the technical education curriculum.

According to Iakovidis (1998), in 1964, the newly elected government proposed several measures to boost the Technical education. One of the most important features of the new system was the removal of tuition fees from all levels of the education system and the introduction of compulsory education lasting to the 15th

year of age. Socio-political pressures from several scholars and philosophers and most importantly the junta of 1967-1974 restructured the education systems once more. During this period, the provision of 'free education' remained and by 1969 the military government realised the urgent need for the support to the technical education once more. Eight "Centres of Higher Technological Education" (predecessors to today's T.E.I.- Technological Education Institutes) were created in various parts of the country and a large number of teachers in the middle and higher technical education institutes found employment all over Greece. Unfortunately, though not only the textbooks used, but also the research laboratories were of a poor and outdated quality and the scientific personnel were not adequately trained to cover the increasing needs of a modern technical education system.

Furthermore, the reality remains intact pointing to the indisputable fact that almost all efforts of the various educational reform plans, regulations and policies to enrol more students in technical education failed thus leaving technical education at a level highly underestimated and under-developed in Greece.

According to Mouzelis (1978), the mode of capitalist production in Greece is related to simple commercial production (agriculture, 'light' industrial units) in a way that it does not support these sectors to evolve nor does it destroy them so that they can be reconfigured. This is the underlying difference between Greece and the other Western economies. In Western economies, the numerous small industries and agricultural businesses were both destroyed and reconfigured from scratch or they were organically absorbed in the capitalist mode of production complementing the big industries, as we have earlier mentioned with the example of Italy and Denmark. These European countries managed to industrialise by investing at the right time the financial and human resources to develop a strong industry around pharmaceuticals, metals, electronics, electrical appliances, machinery, chemicals, nuclear energy, military equipment, road vehicles, etc. According to the author, these countries created a core R&D system, which is highly affected by technological change and demand conditions. It includes a number of different agents and institutions: large oligopolistic firms, small high-technology firms, universities, public research centres, central and local government agencies, etc. Agrarian economies such as Denmark and Sweden developed and organised an agro-industry to enhance their exports in agricultural and food products and Italy has the small-firms network, in traditional industrial sectors, such as textile, leather clothing, shoes and furniture that have

shown a high degree of internationalisation (Nelson, 1993). Furthermore, in USA the famous Silicon Valley region was developed around the military demand for high-tech products and university R&D among other factors as we discussed in chapter three of this thesis.

Greece's failure to industrialise in line with Western European countries was the result of the 'wrong' choices made by the numerous governments, the highly unstable political environment, the lack of the mentality of Greek people toward joint efforts and cooperation in order to develop a strong and competitive economy, the myopic sight of businessmen and investors who were only interested in maximum profit with the less possible effort, and the lack of coherent organised long-term economic growth policies. Several characteristics describe the Greek economy and its Innovation System, according to the analysis presented so far. First of all, a significant percentage of the National budget was and continuous to be earmarked for the Defence Department's expenditures in acquiring military equipment. Unfortunately, the country did not manage to develop a military industry and relevant R&D capacity, even of a small scale that would act as a springboard to diffuse knowledge and technological advancements to high tech and other industries.

Second, the educational infrastructure was re-formed almost every second year, resulting in a continuous instability. Furthermore, the educational and academic world was never linked to the industry, as has been the case in many other developed countries. The R&D departments are of a very limited scale and scope and are strictly used by academicians for inter-university purposes. Technical education in Greece never evolved to the needed level and is still lagging behind other E.U. member states.

Third, most of the industries that evolved during the past decades are in traditional economic sectors, textile, clothing, food, etc. or are branches of multinational corporations that simply distributed their imported products, or have limited value added local activities and are not involved in basic applied research. Even among these multinationals, during the last decade the majority closed down their branches and migrated to other Balkan countries or Turkey where they could find cheaper labour and more favourable governmental provisions for investment and taxation.

Fourth, the small firms never managed to get organised as they did in Italy or in other European countries. The lack of governmental support in financial but most

importantly in educational and organisational means resulted in a situation were every small business is struggling to survive on its own.

Fifth, there was never any long-term planning, policies and investment to develop manufacturing and agricultural industries. Throughout the Greek economic history, only a few dozens of private, and sometimes, ailing enterprises, with the 'right' political connections were strongly supported by socio-economically dysfunctional 'protective' governmental policies, regulations and investments.

Sixth, the public sector in Greece has grown to gigantic proportions of an unprecedented extent over the past few decades reminding more a socialist country, rather than a capitalistic one. In order for the country to provide jobs for the vast numbers of unemployed population, the governments have nationalised ailing private corporations, and supported already 'bankrupt' social institutions and enterprises. The post junta conservative governments promoted the nationalisation of large companies, such as the Olympic Airways, the Water Supply company, the Commercial Bank of Greece as well as the cement and parts of the clothing industry and created more government owned public corporations. The main economic policies are still characterised by increased state intervention aiming to 'save' and keep alive the almost bankrupt problematic companies, as well as several social security programs, i.e. pension systems, health system, and unemployment benefits.

Seventh, there is no tradition of industrial R&D that dates back to the pre-1980's period. As we show later on this chapter, even now the public and private R&D investments are as low as 0.5% of Greece's annual GDP.

Finally, the financial and investment sectors faced a serious setback in their advancement and growth since major changes begun only in the decade of the 80's. Until the mid-80s this sector of the economy was under the supervision and continuous regulation of the state, monetary organisations and several other official and public bodies. For example, the regulation of the interest rates on loans and deposits by the state, numerous indirect controls over financial aid and grants and strict regulation on foreign currency exchanges had as a result the money market to be controlled almost exclusively by government decrees and not by the 'laws of the market'. Unfortunately, this over-regulation resulted in the slow adaptation and reaction to new market needs and changes, both domestically and internationally, resulting in a general inefficiency of the financial and investment system.

During the 1980s national and international adverse economic conditions resulted in continuous devaluation of the Greek drachma against the dollar and other currencies; inflation was uncontrollable and labour strikes were nearly an everyday phenomenon. Despite all efforts, public debt had reached a zenith and the economy remained extremely weak. Coming into power as the result of the 1990s elections. the conservatives who governed until 1993 and by 1995 the socialists who regained control in the fall of 1993 begun introducing policies for the privatisation of many public companies and in general focused priorities at closing the gap with the other E.U. member states. The markets were set free, the inflation started to decline, the public debt was somewhat lessened and the National priority target was to enter the Euro-zone in 2001.

The following table presents some of the most important macro-economic aggregates of the Greek national economy. It is worth noting, though, that the government with the assistance of European Structural Programs managed to maintain a high degree of real GDP growth in the past five years. It is obvious, as we indicated, that the GDP is steadily increasing over the period 1995-2001, from 27,235 in 1995 billion drachmas to 44,446 billion drachmas in 2001. What is more important to note though, is the negative balance between the imported and exported goods and services, which is growing in the past years. While the balance in 1995 was –2,172 billions in 2001 it widened to –3,452. It is a negative sign for an economy that wants to have long-term economic prosperity since it shows that the economy is based largely on domestic consumption and there are no major income flows from abroad. Furthermore, it is in correlation with the ever decreasing agricultural export and production performance and the inability of the industrial sector to compete internationally.

Gross Domestic Product (Billions of Drachmas)

Current Prices/ Years	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*
Production of Goods and Services (Basic Prices)	42,584	46,365	50,286	54,289	57,598	63,500	67.707
Gross Value Added (Basic Prices)	24,425	26,656	29,330	31,860	33,714	36,227	38,872
Exports of Goods and Services	4,800	5,245	6,523	7,150	7,893	10,343	10,872
Imports of Goods and Services	6,792	7,633	8,958	10,159	10,720	13,633	14.329
Gross Domestic Product (Market Prices)	27,235	29,935	33,132	36,042	38,449	41,371	44,446

Table 4, Source: National Statistical Service of Greece (2002)

In the following pages, we take a more thorough look at the Greek National Economy and its performance on the primary, secondary and tertiary sectors. A quick overview according to the Bank of Greece (2001) indicates that the GDP of the primary sector increased in 2000 by 1.5% while the GDP of the secondary sector grew at a faster pace of 6.9% and the GDP of the tertiary sector by 3.1%.

VALUE ADDED AT BASIC PRICES. AND GROSS DOMESTIC PRODUCT AT MARKET PRICES

		Billion drachmas	Annual percentage changes (constant prices of year 1995)					
		1995	1996	1997	1998	1999	2000	
1.	Primary sector (agriculture)	2.479.7	–3.3	0.7	2.6	1.4	1.5	
2.	Secondary sector	5.639.2	2.2	4.9	3.0	4.7	6.9	
2.a	Mining and quarrying	162.1	–3.0	1.0	–0.8	–9.2	3.5	
2.b	Manufacturing	3.261.5	3.9	1.4	1.3	1.5	5.0	
2.c	Electricity - Town gas - Water supply	596.6	–2.4	3.1	9.8	12.1	11.0	
2.d	Construction	1.619.0	1.0	13.2	4.2	9.0	9.0	
3.	Tertiary sector	17.048.1	2.4	3.5	3.4	2.2	3.1	
3.a	Trade	3.413.7	5.9	4.6	5.7	4.8	5.5	
3.b	Hotels - Restaurants	1.042.7	4.0	4.9	10.1	0.2	3.0	
3.c	Transport - Communications	1.696.3	–5.6	5.5	1.5	5.0	4.0	
3.d	Financial intermediaries	1.060.4	8.2	3.0	3.0	2.7	3.2	
3.e	Real estate management and other activities	4.285.6	1.7	1.4	1.8	1.5	2.0	
3.f	Public administration - Security	1.808.8	7.0	–1.3	0.5	–0.9	0.2	
3.g	Health	1.123.8	–1.9	3.1	1.4	1.2	1.5	
3.h	Education	1.313.7	–3.8	8.8	2.3	1.9	2.5	
3.i	Other activities	703.1	3.2	7.0	3.5	1.3	5.0	
4.	Gross value added	25.167.0	1.8	3.5	3.3	2.7	3.8	
5.	Imputed banking services	–741.3	3.3	4.8	4.7	2.2	–4.3	
6.	Gross value added at basic prices	24.425.7	1.8	3.5	3.2	2.7	4.1	

Table 5, Source: Bank of Greece (2001, p. 62)

As we can see in the table above, the contribution of the tertiary sector in the gross value added is nearly 3 times more than that of corresponding secondary sector and more than 7 times of the primary sector. As we have discussed earlier in this chapter, the Greek economy failed to industrialise properly in either the secondary or the primary sector. In the past two decades, the composition of the Greek economy has shifted towards a 'service' economy. Nowadays, the majority of the workforce is employed in that sector and the contribution to the GDP of this sector is more than 65% as the table shows. The strongest sectors are the 'trade' and 'real estate management and other activities' that together correspond to nearly 45% of the GDP of the sector. Commercial and trade activities have been entering new markets, such as e-commerce and e-trade, which provided access to markets anywhere in the world combined with the deregulation of e-trade within the boundaries of the E.U. (Bank of Greece, 2001).

On the other hand, we see the primary sector of the economy facing serious problems, and its contribution falling to only 2,479, or about 10% to the gross value added. According to the Bank of Greece (2001), between 1987 and 1997 the agricultural labour force in Greece decreased by 30%, a fact that further indicates the deterioration and economic inability of the sector to play a major role in the economic prosperity of Greece in the 21st century.

The secondary, industrial sector has been increasing its productivity and contribution to the value added of the Greek economy in the past five years. According to the data presented in the table below, total industrial production grew by 7.7% in 2000, reflecting a stepping up of output productivity in the majority of its sub-sector with the exception of the consumer non-durables sector and on the other hand, the strong recovery of the mining and quarrying 'oil wells and extraction of natural gas' sector.

INDUSTRIAL PRODUCTION (1993=100)

INDUSTRY	Weights (1993)		Average annual percentage changes 1996	1997	1998	1999	2000*	2000 level* (1993=100)
	100.00		1.3	0.7	6.9	2.8	7.7	124.2
1. Mining and quarrying	4.7	100.0	4.0	-1.0	-1.5	-6.0	13.6	114.7
Coal and lignite extraction		42.2	4.0	-1.8	3.6	1.6	5.3	125.5
Oil wells and extraction of natural gas		9.1	13.5	-8.9	-32.3	-94.3	1,469.9	49.1
Ores extraction		15.9	1.4	0.8	-6.4	-4.8	12.0	113.4
Other extraction and quarrying activities		32.8	3.4	1.1	0.4	-4.6	14.6	119.6
2. Manufacturing	76.9	100.0	0.2	0.7	5.6	0.6	6.1	115.0
3. Electricity - Natural gas - Water supply	18.4	100.0	4.4	1.1	13.8	11.6	11.3	163.2
Electricity		90.6	3.8	0.4	6.7	7.1	8.7	141.6
Natural gas		0.2	23.9	105.2	1,587.1	79.8	34.3	9,618.3
Water supply		9.2	9.7	5.4	8.4	4.6	8.0	156.2
INDUSTRY	100.00		1.3	0.7	6.9	2.8	7.7	124.2
Basic categories								
Energy	25.0		6.7	0.6	12.8	4.6	13.0	158.2
Intermediate goods	29.4		0.1	0.6	2.3	1.6	7.8	117.0
Capital goods	9.8		-6.4	-2.3	14.0	-0.6	7.6	100.3
Consumer durables	1.9		10.6	4.3	15.7	7.3	16.1	172.6
Consumer non-durables	33.9		-1.2	1.1	3.7	2.5	1.7	107.9

Table 6, Source: Bank of Greece (2001, p. 63)

Manufacturing production increased by 6.1% in 2000 and has increased by 15% during the period 1995-2000. According to the Bank of Greece (2001), certain industries, i.e. those producing high technology products, have improved their export performance, which was accompanied by a considerable increase in output. According to data given in the following table, the strongest sectors in the manufacturing industry are the machinery and equipment items, office appliances and computers, electrical machinery and appliances, radio, television and communication appliances, as well as medical instruments and precision instruments. To a lesser degree, the industries of paper, printing, publishing, chemicals, rubber, plastics and to an even lesser degree, those of basic and final products from metal as well as non-metallic minerals managed to improve their export performance. By contrast, though, the industries of textile, clothing, leather and footwear, wood, cork, office equipment and office appliances-PCs, recorder a decline in their export performance and productivity in the period 1995-2000. In general, the increase in domestic production was made possible by the considerable growth of business investment that we

presented earlier and by the considerable financial aid of the 3rd Community Support Framework.

MANUFACTURING PRODUCTION (1993=100)

	Weights (1993)	Average annual percentage changes					2001* Level (1993=100)
		1996	1997	1998	1999	2001*	
Manufacturing	100.0	0.2	0.7	5.6	0.6	6.1	115.0
Food-beverages	22.4	−0.8	7.2	3.0	0.8	3.6	119.5
Tobacco	1.7	−8.8	−2.9	−13.5	7.7	1.3	110.8
Textiles	8.4	−0.4	−9.7	−2.2	−1.2	8.9	84.5
Clothing	6.8	−8.1	−3.8	−2.7	−4.3	−1.7	67.0
Leather-footwear	1.8	−3.8	−16.4	−18.4	5.4	0.9	67.2
Wood and cork	2.0	−1.3	−22.7	−17.3	−0.5	63.1	100.4
Paper and paper products	3.1	−6.9	−13.1	50.7	1.1	−15.2	116.3
Printing and publishing	3.4	7.9	−8.4	−4.7	10.6	11.6	112.3
Petroleum and coal products	5.6	17.7	2.2	13.8	−15.2	18.3	162.3
Chemicals	9.1	3.6	4.6	5.5	3.7	1.7	128.9
Rubber and plastics	3.7	0.9	−3.6	31.7	7.9	0.6	148.7
Non-metallic minerals	7.1	2.7	5.4	0.8	0.2	1.5	114.7
Basic metals	4.9	−2.8	12.6	−5.9	7.8	12.5	137.7
Metallurgical products	4.1	4.5	0.8	1.3	16.8	0.9	120.8
Machinery and appliances, excluding electrical	3.5	6.1	3.9	5.8	−6.2	18.3	152.1
Office appliances – PCs	0.1	−67.4	722.0	−60.4	−22.9	107.7	38.4
Electrical machinery, appliances etc.	2.4	−1.0	0.1	5.2	3.9	11.7	121.1
Radio, television and telecommunication appliances	2.1	−25.9	4.2	138.9	−12.2	30.5	121.3
Medical tools and precision instruments	0.3	12.8	8.0	−16.2	−3.0	29.7	157.8
Vehicles	0.7	−29.7	1.8	70.7	46.4	9.8	112.3
Other transport equipment	4.7	−5.1	−10.6	−5.1	−5.5	−5.8	68.9
Furniture – other industries	2.0	−8.7	6.9	17.9	7.2	8.7	126.0

Table 7, Source: Bank of Greece (2001, p. 67)

The mining and quarrying sector production recorded an impressive upturn of 13.6% in the year 2000, following a continuous decline during the 1997-1999 period. According to the Bank of Greece (2001), the increase in the demand of quarry material and non-metallic minerals, is mainly associated with domestic consumption. Several of these materials are mainly used in road construction and their increase in demand is significantly associated with the construction of major road arteries and other projects connected with the Olympic games in 2004. Finally, the increase in the Electricity, natural gas, and water supply sectors was unprecedented with 63% over the past five-year period. According to the Bank of Greece (2001), the upward course of the previous years was a result of the increased domestic needs for electric power for households, commercial and industrial uses. In particular, though, a significant part of the increased productivity of this sector of the economy has to do with the high investments in infrastructure in the natural gas source of power and the substitution and/or addition by many households and industries of this 'cleaner and cheaper' source of power.

A final important indicator of the socio-economic and industrial structure of Greece is the population, labour force and the employment in the various sectors of the economy. According to the data presented in the table below, the rate of participation in the labour force has decreased from 49.1% in 1995 to 48.7% in 2001. Although the unemployment rate has decrease in the past three years it remains a high of 10.2% while in 1994 it was 8.9%.

In particular, the decrease of employment in the primary sector has been impressive over the period 1994-2001, showing some 22% decrease. The primary sector is now employing only 16% of the labour force of Greece. This fact comes to support our earlier analysis on the deterioration of the primary sector in Greece. The secondary sector employment has slightly recovered by increasing its employment by 0.7%. Overall, the secondary sector employees nearly 23% of the labour force, but shows sign of relative steady decline over the period under examination with the exception of a 5.5% increase in 1998.

POPULATION, LABOUR FORCE AND EMPLOYMENT

	2001 (thous. persons)	Annual percentage changes							
		1994	1995	1996	1997	1998	1999	2000	2001
Population aged 15 or more[1]	8,954	1.4	0.9	1.0	1.2	0.0	1.0	0.8	0.9
Population aged 15-64[1]	6,860	0.5	0.1	0.3	–0.1	2.1	–0.2	–0.7	–0.2
Labour force[1]	4,362	2.2	1.1	1.9	–0.5	4.3	0.4	–0.6	–1.7
Employment:[1]	3,918	1.9	0.9	1.2	–0.4	3.0	–0.7	0.2	–0.7
– Primary sector[1]	627	–0.4	–1.0	0.5	–2.4	–8.0	–5.0	0.2	–6.5
– Secondary sector[1]	894	–0.6	–0.9	–0.1	–2.1	5.5	–1.3	–1.5	0.7
– Tertiary sector[1]	2,396	3.8	2.4	2.1	1.1	5.7	0.8	0.8	0.4
Rate of participation in the labour force[2]		(49.1)	(49.2)	(49.7)	(48.8)	(51.0)	(50.7)	(50.0)	(48.7)
Employment rate[2]		(54.1)	(54.5)	(54.9)	(54.8)	(55.6)	(55.4)	(55.8)	(55.6)
Unemployment (as a percentage of the labour force)[2]	445	(8.9)	(9.1)	(9.6)	(9.6)	(10.8)	(11.7)	(11.1)	(10.2)
Employment in:									
– Manufacturing[3]	557	–0.3	0.0	–0.3	–2.8	3.4	–1.6	–2.1	0.0
– Construction[3]	285	0.0	–3.4	0.0	–1.2	13.3	–3.2	1.2	2.9
– Banks[4]	62	5.3	4.0	2.8	1.0	1.8	1.1	2.3	–0.9
– Civil service	346	–2.0	2.2	2.3	1.0	0.9	2.4	1.9	1.0
– Public enterprises and entities[5]	137	4.4	0.2	–0.3	–1.5	–2.6	–1.9	–4.3	–3.9

Table 8, Source: Bank of Greece, 2002, p. 59

The tertiary sector went on rising (0.4%) in 2001, and as one can see in the table above it employees more than 60% of the Greek labour force. Furthermore, according to the Bank of Greece (2001), the composition of total unemployment on the basis of educational level is the following,

a) 40.0% have had six years of secondary education,
b) 21.2% have been through primary school,
c) 12.1% have had 3 years of secondary education,
d) 15.1% have a higher technical education degree,
e) 9.9% have a university degree,
f) 0.6% has never gone to school (0.6%)
g) 0.4% has attended only some primary school classes (0.4%),
h) 0.3% are doctorate or other postgraduate degree holders,
i) 0.3% has studied in universities failing to obtain a degree.

In the above analysis, we investigated some of the most important macro-economic aggregates of the Greek national economy, its performance on the primary, secondary and tertiary sectors, and the population, labour force and the employment in the various sectors of the Greek economy. To understand national innovation systems, it is essential to understand how technical advance occurs in the modern world. Today, R&D facilities, staffed by university-trained scientists and engineers attached to business firms, universities, or government agencies, are the principal vehicles through which technological advance proceeds (Nelson, 1993). Most contemporary examinations of national capabilities in technology focus on these kinds of institutions such as the innovation scoreboard that we will present later in this chapter. Of course, R&D data ignore the complex process of technological accumulation whereby tacit knowledge is built up and transmitted within institutions, firms and industries. As such R&D is only at best a poor proxy to an innovation system, but on the other hand it represents coherent and comprehensive data that we can easily process and reproduce with accuracy. R&D may not capture the linkages between organisations, the feedback processes or the different and interconnected networks between firms, universities and other institutions, but it does give an overall picture of the innovative potentials and current dynamics of the economy.

Furthermore, in the following analysis, we compare several indices of R&D performance of Greece against other EU member states, which clearly reveal the lack of investment, proper attention, and long-term planning, of Greek governments to support and enhance R&D activities, since Greece is mostly in the bottom-end of the tables.

The Gross Domestic Expenditure for Scientific and Technological Research (GDESTR) represents the total expenditure for Scientific and Technological Research (STR) for the whole country within a year. It is important to mention that it includes the STR that was financed from foreign institutes and used within the country, but not the STR that was financed by domestic institutes to organisations abroad. As it can be clearly seen in the following table 9, Greece finds itself at the last position compared to other European Union member states falling behind by 0.15 to second last Portugal. The Community's four weakest members (Greece, Portugal, Spain and Ireland) have R&D expenditure levels, which are two or three times lower than the Community average.

Gross Domestic Expenditure for Scientific and Technological Research as percentage of Gross Domestic Product (comparison between countries)

Country	**1993**	**1995**	**1997**
E.U.	1.92	1.84	1.82
Austria	1.49	1.59	1.6
Belgium	1.58	1.58	1.58
France	2.45	2.34	2.24
Germany	2.42	2.31	2.31
Denmark	1.74	1.83	1.89
Greece	**0.49**	**0.49**	**0.51**
Ireland	1.2	1.36	1.43
Spain	0.91	0.85	0.86
Italy	1.14	1.01	1
United Kingdom	2.15	2.02	1.87
Holland	2	2.07	2.12
Portugal	0.62	0.58	0.65
Sweden	3.39	3.59	3.85
Finland	2.21	2.35	2.78

Table 9, Source: GSRT, *The Research in Greece 1994-1998,* (2001, p. 14)

According to the General Secretariat of Research and Technology (GSRT) of the Greek Ministry of Development, as research personnel are counted those employees (irrespective to the contractual agreement with their employers) who are occupied with research activities and the hours they spend in such activities are expressed as Equivalent to Full Employment (E.F.E.). In the Greek scheme measurement is counted in human year. According to the following table. the European Union mean shows a slight increase over the period 1993 to 1997. Greece during this period tops Portugal but again is only second to last with a huge gap from the leading economies of Sweden and Finland. R&D personnel in Greece and Portugal represent only one quarter to one fifth of the same personnel in the more advance states, and one third of the community average.

Equivalent of Full Employment (EFE)/ Thousand of human workforce (comparison between countries)

Country	**1993**	**1995**	**1997**
E.U.	9.3	9.4	9.5
France	12.5	12.6	12.3
Germany	12.3	11.6	11.6
Denmark	9.5	10.8	11.9
Greece	**3.5**	**4.1**	**4.7**
Ireland	5.6	6.6	7.8
Spain	4.9	5	5.3
Italy	6.1	6.1	6
Holland	10.5	10.7	10.9
Portugal	2.9	3.2	3.6
Sweden	13.1	14.5	15.4
Finland	12.2	13.3	16.4

Table 10, Source: GSRT, *The Research in Greece 1994-1998,* (2001, p. 30)

The table below takes a closer look at the research personnel in Greece measuring their education level and not the hours devoted to research activities. It is interesting to note the significant increase of undergraduates from both University level Higher Education Institutes (HEI) and Technical Education Institutes (TEI)

during the period 1993 to 1997 and the simultaneous increase of students holding Doctoral Degrees despite a small decline in 1995.

Analysis of Research Personnel by their Education Level in Greece

Education Level	1993		1995		1997	
	No. of persons	*EFE*	*No. of Persons*	*EFE*	*No.of persons*	*EFE*
Doctorates	10399	4882	10151	4979	10840	5596
Postgraduates	2286	1254	1873	1260	2732	1694
Undergraduates HEI	7541	3599	10457	5641	13309	6120
Undergraduates TEI	1841	1016	3029	1595	4383	2059
Tertiary education	6489	2858	7444	3205	8460	3874
Basic education	1989	937	3431	888	3528	812
Total	30545	14548	36385	17571	43252	20157

Table 11, Source: GSRT, *The Research in Greece 1994-1998,* (2001, p. 33)

The national expenditure for scientific and technological research is being financed from the state budget and the programmes of state investments. According to the GSRT (2001), T*he Research in Greece 1994-1998*, the national expenditure for scientific and technological research consists amongst others of,

(a) Personnel salaries,
(b) Purchase of land and buildings, construction, rental and reconstruction of buildings,
(c) Purchase of accessories and equipment,
(d) Fixtures and fittings, books, travels, printing, purchase of services etc.

This financing is addressed to Research centres and institutes, Higher education institutes, companies and international education and research organisations.

Table 12 presents the national expenditure for scientific and technological research as a percentage of GDP of Greece in comparison to other European Union member states. Greece holds the last position despite the fact that the figures have improved since 1994. This improvement appears to be the result of the inclusion from

1995 onwards of community funding earmarked for scientific and technological research in Greece. It is interesting to note that during the same time period there appears a general trend for most of the EU member states to decrease their national expenditure for STR.

National Expenditure for Scientific and Technological Research as percentage of Gross Domestic Product (comparison between countries)

Country	**1994**	**1996**	**1998**
E.U. – 15	0.85	0.82	0.76
E.U. – 11	0.87	0.82	0.78
Austria	0.71	0.64	0.64
Belgium	0.61	0.63	0.66
France	1.22	1.1	1
Germany	0.93	0.91	0.84
Denmark	0.68	0.74	-
Greece	**0.21**	**0.3**	**0.29**
Ireland	0.29	0.36	0.31
Spain	0.48	0.58	0.56
Italy	0.63	0.59	0.59
United Kingdom	0.78	0.78	0.72
Holland	0.8	0.8	0.79
Portugal	0.47	0.52	0.56
Sweden	1.21	1.16	0.84
Finland	1.03	0.97	1.12

Table 12, Source: GSRT, *The Research in Greece 1994-1998,* (2001, p. 42)

In Greece, expenditures of national research institutes include the total budgets (independent of the source of financing) that have been spend for scientific and technological research by national research institutes and regional centres. As is clearly shown in the following table, when we extrapolate the current prices to fixed prices the expenditure has declined by nearly 13 million euros. In addition, it appears that the financing of National research institutes has declined as a percentage of GDP from 0.16% in 1993 to 0.12% in 1997. The same decline in research expenditure (as a percentage of GDP) among the other European Union member states is observed in

table 14. From this respect, Greece is in the same position as Austria, Ireland, Spain, Portugal and Sweden.

Research expenditure of National Research Institutes (Million Euros)

Year	1993	1995	1997
Current Prices	94.27	99.04	115.29
Fixed Prices	94.27	81.65	81.76
Percentage % of GDP	0.16	0.13	0.12

Table 13, Source: GSRT, *The Research in Greece 1994-1998,* (2001, p. 91)

Research Expenditure for Scientific and Technological Research as percentage of GDP (comparison between countries)

Country	1993	1995	1997
European Union – 15	0.31	0.29	0.27
Austria	0.13	-	-
Belgium	0.10	0.06	-
France	0.51	0.48	0.45
Germany	0.36	0.35	0.33
Denmark	0.31	0.31	0.30
Greece	0.16	0.13	0.12
Ireland	0.12	0.12	0.10
Spain	0.18	0.15	0.14
Italy	0.24	0.21	0.21
United Kingdom	0.30	0.29	0.27
Holland	0.36	0.36	0.35
Portugal	-	0.15	0.15
Sweden	0.13	0.13	0.13
Finland	0.44	0.38	0.37

Table 14, Source: GSRT, *The Research in Greece 1994-1998,* (2001, p. 93)

Business expenditures for R&D in Greece and Portugal represent one tenth of the community average and are 15 to 20 times lower than France and Germany as

shown in the table below. The results refer to private and public enterprises that were engaged in R&D during the period 1993 to 1997.

Business Expenditure for Scientific and Technological Research as percentage of GDP (comparison between countries)

Country	1993	1995	1997
Greece	*0.13*	*0.15*	*0.13*
Portugal	0.14	0.12	0.14
Spain	0.44	0.39	0.40
Italy	0.60	0.53	0.53
Norway	0.93	0.97	0.95
Ireland	0.80	0.97	1.03
Belgium	1.00	1.06	-
Holland	0.99	1.04	1.11
European Union	**1.18**	**1.12**	**1.13**
Denmark	1.02	1.05	1.19
United Kingdom	1.42	1.30	1.20
France	1.48	1.41	1.35
Germany	1.58	1.50	1.54
Finland	1.27	1.45	1.79
USA	1.85	1.88	2.01
Japan	1.90	1.94	2.10
Sweden	2.28	2.57	2.77

Table 15, Source: GSRT, *The Research in Greece 1994-1998,* (2001, p. 193)

During the three year period 1995 to 1997, the number of enterprises in Greece that were engaged in R&D activities increased by 22% from 490 to 598. Table 17 differentiates those organisations that have an internal specific R&D department and those that subcontract or use external research facilities. There appears to be a positive trend as more enterprises realise that they need to invest in R&D in order to become competitive in the domestic, European and World markets. According to GSRT (2001), the majority on Greece of businesses with specific R&D departments has been established over the last two decades. More importantly, though, the total number of enterprises reported to engage in R&D activities is just under 600 when as we have seen the number of SME alone in Greece is more than 800,000 (chapter 2,

table 1). Moreover, 70% of the R&D is self-financed, 8.8% by E.U. programs, 13.4% by Structural Programs (including 3rd CSF) and 5.4% by State funded initiatives. The remaining percentages correspond to other financial sources such as private and public enterprises, other national or European sources, etc. (GSRT, *The Research in Greece 1994-1998,* 2001).

Number of Enterprises engaged in Research based on their ownership type

	1995	*1996*	*1997*	*1995*	*1996*	*1997*
	Number			Percentage %		
Private Organisations	454	502	548	92.7	91.1	91.6
Public Utility Companies	6	5	5	1.2	0.9	0.8
General Public Section	30	44	45	6.1	8.0	7.5
Total	490	551	598	100.0	100.0	100.0

Table 16, Source: GSRT, *The Research in Greece 1994-1998,* (2001, p. 195)

Organisations with specific R&D department

	1995	**1996**	**1997**
No. of Organisations with R&D department	183	193	207
Total no. of Enterprises engaged in R&D	490	551	598
Percentage %	37.3	35.0	34.6

Table 17, Source: GSRT, *The Research in Greece 1994-1998,* (2001, p. 195) Note: The GSRT does not specify the economic sector and/or size of firm for the above data

Research and Development is a section of the Greek economy that has been overlooked for decades. As it is shown briefly, through, the above figures the state and private business expenditure on R&D, the level of education of the research personnel and the number of companies public and private engaged in R&D activities place Greece in the last position in comparison to the rest of the member states of the European Union. Despite governmental efforts to improve this situation, the gap with the EU mean figures and the leading economies is huge. There is an increasing demand for more public investments and policies that will steer the Greek economy towards scientific and technological research, prerequisites to a large degree of innovation, spin-off enterprises and enhanced competitiveness.

To understand the poor position of Greece in R&D we look once more at the historical origins of the R&D system in Greece. According to the GSRT (http://www.gsrt.gr), it was only in 1964 that the Greek Government realised the need for the economic development of Greece, and proceeded in the creation of a pilot project that would investigate the research and technology standards in the Greek business world. The aim of the Government was the prosperity and economic development of Greece. In 1977, the first National Programme of Research and Technology was established. Its immediate goal was to work on building the necessary business and financial foundation in the most developing and promising financial economic/business segments.

In 1982, the increasing importance of innovation, research and technology compelled the Greek government to form an autonomous ministry, the Ministry of Research and Technology. In 1985, the Ministry of Research and Technology was combined with the Ministry of Industrial Energy and Natural Resources to form the *General Secretariat for Research and Technology*. In addition two new programmes were created, Programme Development of Industrial Research and the Programme for the Enhancement of Research Resources. In 1990, in line with the first Community Framework Support Programme (CFSP I) set by the European Union, the first Operational Programme for Research and Technology (OPRT I) was approved with a total budget of 101,552 MECU. Its main goals were,

i. Research in organisations, bringing together research and operations (creation of Technology Parks and Business Segments).
ii. Transfer and dissemination of research and technology information and knowledge through the creation of databases and webs of libraries.
iii. Further development of research infrastructure in all relevant business sectors.
iv. Human resource development, researchers and technicians' manpower development.
v. Operational/business infrastructure.

The OPRT I received great support because it provided substantial amount of financial aid to Research and Technology activities that helped develop and support the Greek research infrastructure both in terms of human resources and operational resources. The positive effects of OPRT I were such that the Greek government

realised immediately the importance of investing and supporting research and technology programmes throughout the numerous Greek business segments. In 1992, STRIDE HELLAS was the second support programme investing on greater financial resources and cooperation between industries and research centres than in OPRT II. Several similar programmes were established around the less developed economies of the European Union, Spain, Portugal, South Italy, Corsica and Ireland.

In 1994, the planning of the OPRT II was concluded. It represented in its majority the technological and research policies in Greece for the six-year period 1994 to 2000. During the five-year period 1994-1999, with co-funding from the European Union, GSRT successfully implemented the second Operational Programme for Research and Technology (OPRT II), thus helping to direct research towards areas of popular concern, including: health, education, environment, nutrition, education, communications, advanced technologies, informatics and culture. OPRT II has been the driving force behind the improvement of the country's research and technological infrastructure and the development of significant research projects.

Since 1996, GSRT is part of the Ministry of Development and has been assigned the responsibility of planning, developing and executing science and technological policies in Greece, such as, improvement of R&D activities in segments of high economic interest (quality of life, biosciences, information systems, new methods of production and development), industrial research, transfer of technology, *innovation* (National Information system, international research and technological collaboration), improvement, enhancement and redesign of the research backbone of the country, human resource development, administration, follow up and monitoring of the programme.

After delineating the socio-economic and R&D characteristics of Greece, the next step in the analysis of the present infrastructure of the country is to examine its innovation performance in the manufacturing and service sector of the economy in comparison to other EU member states, and observable major weaknesses and strengths.

In the past three decades, and specifically since the early 80's the Greek economy has experienced considerable transformations in its structures that were accompanied by remarkable changes in the practices and applications of innovative techniques both in the manufacturing and service sectors. The General Secretariat of Research and Technology (GSRT) of the Ministry of Development in cooperation

with EUROSTAT (Community Innovation Survey) have investigated these changes over the past ten years in both the manufacturing and service sector.

According to information provided in the GSRT survey covering the period 1989-1991, there were only 297 innovative enterprises in the manufacturing sector while as it can be seen in the following table the total number rose drastically to 1045 in the period 1994-96, nearing a 252% change. On the other hand, as seen in the table below the percentage of innovative companies with 10-19 employees was only 3.6% in 1994-96 and has since decreased to 2.1%. The percentage of innovative companies is much higher for companies that employ more than 20 persons reaching a level of 30.3% in the sector of manufacturing for the period 1997-1998.

Number of innovative manufacturing enterprises
Enterprises with 10+ employees

Business Sector	1994-96		1997-98	
	Number	Share in Business Sector (%)	Number	Share in Business Sector (%)
10-19 Employees	94	3.6	53	2.1
20+ Employees	951	26.5	1088	30.3
Total	1045	16.9	1141	18.4

Table 18, Source: GSRT, *National Census of Corporate Innovation 1994-1998,* (2001, p. 16)

The rapid growth in the number of innovative enterprises that is observed in the Greek economy during the last decade (from 297 to 1045) had as a result the narrowing of the gap between Greece and the other European countries. The gap is narrowed especially with other European partners such as Spain, Belgium and Portugal in the percentage share of manufacturing companies that introduced product or process innovations during the period 1994-96, as shown in the following figure. Despite the rapid jump, though, it is obvious that Greece falls far behind in innovation in the manufacturing sector when compared with the leading partners such as Ireland, Denmark, and Germany.

Percentage share of manufacturing enterprises that introduced product or process innovations, 1994-1996. Enterprises with 20+ employees

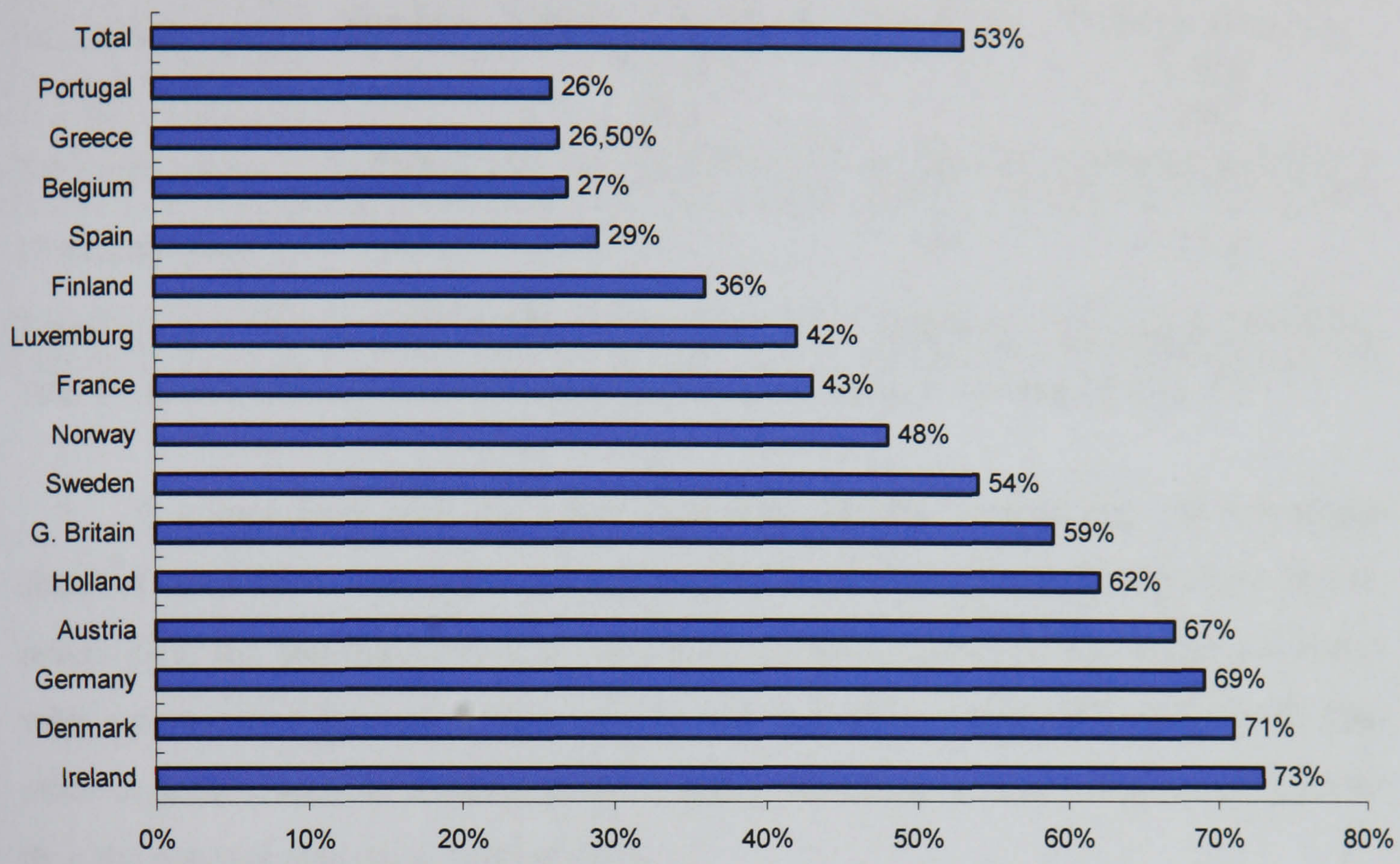


Figure 1, Source: GSRT, *National Census of Corporate Innovation 1994-1998,* (2001, p. 17)

The changes that took place in the past twenty years, as we discussed earlier, saw an increase in the number of enterprises representing the service sector, while simultaneously, there has been a noted general shift towards a service oriented economy. Despite this change, the table below signifies the fact that the percentage share of innovative service oriented companies with more than 10 employees remained considerably lower in the 1997-98 period (15.5%), compared to the 30.3% registered by the manufacturing sector in the same time period.

In addition, in smaller companies of the service sector employing 5 to 9 persons there was a considerable decline in the percentage of innovative enterprises from the 8.7% of the period 1994-96 to only 5.6% in the period 1997-98. In general, GSRT concluded that the innovative service sector enterprises were less than half of those of the manufacturing enterprises for the reported periods.

Number of innovative service enterprises
Enterprises with 5+ employees

Business Sector	1994-96		1997-98	
	Number	Share in Business Sector (%)	Number	Share in Business Sector (%)
5-9 Employees	287	8.7	183	5.6
10+ Employees	473	11.1	661	15.5
Total	760	10.1	844	11.2

Table 19, Source: GSRT, *National Census of Corporate Innovation 1994-1998,* (2001, p. 61)

A comparison with the other European partners concerning the percentage share of innovative enterprises in the service sector, as shown in the chart below, makes clear the fact that Greece is the least innovative country in the respective sector with a percentage limited to only 11.1%. The percentage is significantly lower than other countries such as Ireland, Austria and Luxemburg and as much as 30% lower than the average statistical level of 41%.

Despite the relatively low scoring performance of both sectors of the Greek economy in terms of innovation, we have to admit that the period of the 1990s has been a period of continuous readjustment of the Greek economy. On the one hand, we have the transformation of the economy to a service oriented economy and on the other hand, we have State and governmental programs and policies, as well as structural funds from the European Union, aiming at the enhancement of the competitiveness of Greek firms and industries. The fact, though, remains, as seen in the following figure, and the data given above, that Greece needs urgently to catch up with this new way of managing and competing in the world markets.

Percentage share of innovative enterprises in the Service sector, 1994-1996.

Enterprises with 10+ employees

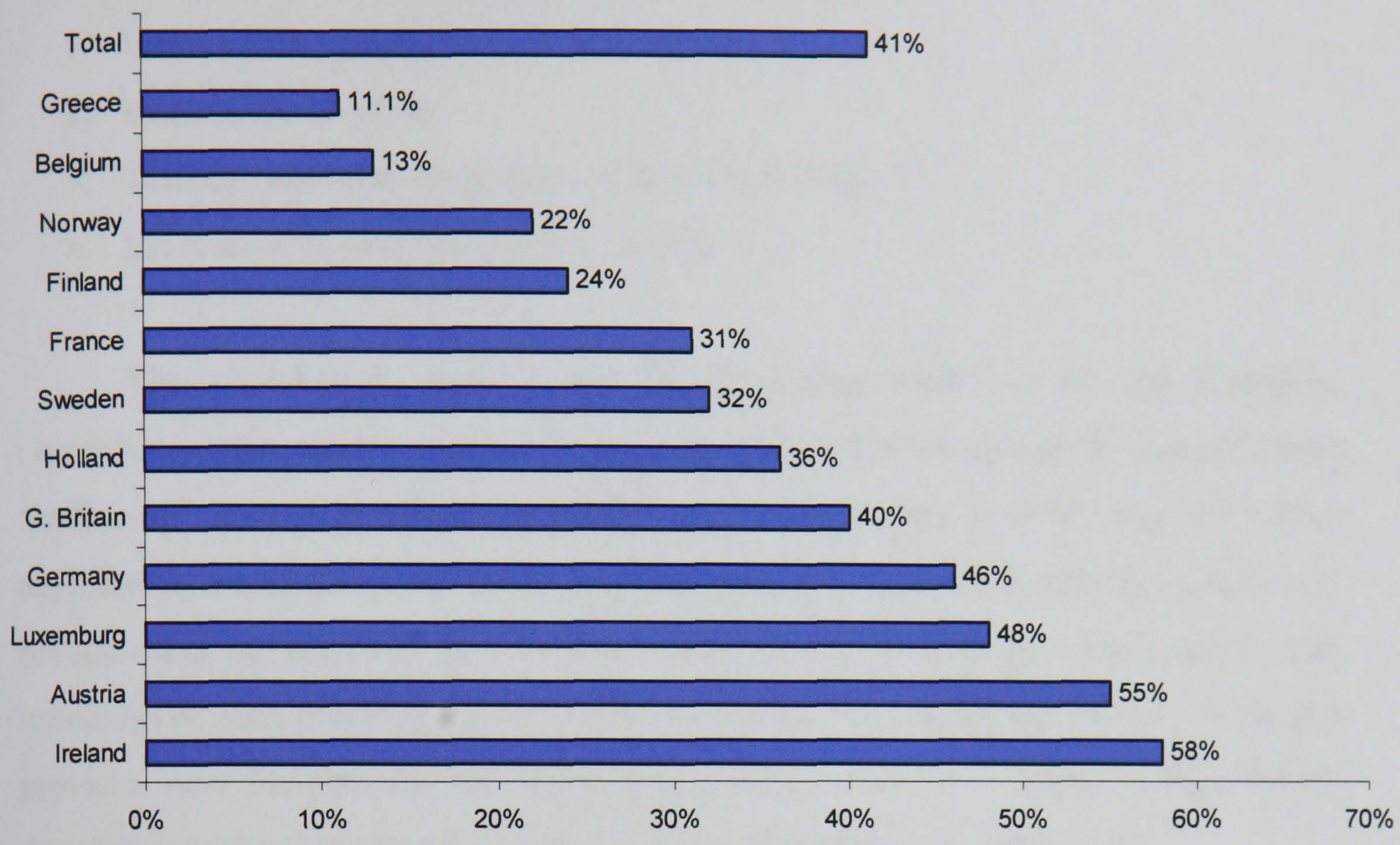


Figure 2, Source: GSRT, *National Census of Corporate Innovation 1994-1998,* (2001, p. 62)

In the new competitive environment and the economic convergence of E.U. member states Greece cannot afford to stand still. Appraising the position of Greece as presented in the CIS survey and the GSRT tables above, my homeland is scoring the lowest and lags far behind EU member states and other European countries. Innovation is a policy priority of all E.U. member states. Throughout the E.U., hundreds of policy measures and support schemes have been implemented in the past few years and still more are in preparation. The under-performance of Greece in innovation, as well as several of the reasons that account for it, is highlighted in the innovation scoreboard of the EU. The "European Innovation Scoreboard" compiles a set of indicators, which together give an assessment of Europe's innovative performance. The Innovation Scoreboard allows the relative strengths and weaknesses of the innovative performances of the Member States to be assessed. It is designed according to the Commission of the European Communities (2001) to provide an overview of European member States innovation performance, to capture the main drivers of a 'new knowledge-based economy' by presenting and analysing statistical

data on several indicators in the following four areas (complete list of indicators and the relevant scorings of each country, in appendix 1, appendices, end of thesis),

1. Human Resources
2. Knowledge creation
3. Transmission and application of new knowledge
4. Innovation finance, output and market

The scoreboard, one of the benchmarking exercises of the European Commission that were launched in response to the Lisbon European Council, uses 'traditional' indicators based on R&D (this is one of the reasons why we earlier explored in some detail the R&D performance of Greece) and patent statistics and several other indicators as derived from other surveys. It highlights the strengths and weakness of each Member States' performance, portrays achievements and trends and provides new insights for the convergence of E.U. member States in innovation. According to the Commission of the European Communities (2000, p. 27),

> "A cross-country comparison of the innovation indicators can help identify national strengths, and areas of weaknesses that are amenable to public and private intervention. However, it is important to keep in mind that innovation is a complex activity that is driven by a wide range of factors. An innovation scoreboard can only provide a broad outline of the strengths and weaknesses of national innovation capabilities." (Commission of the European Communities, 2000, p. 27)

According to the Commission of the European Communities (2001), the scoreboard provides comprehensive and detailed analysis by countries and by indicators. In order to simplify matters the Commission of the European Communities provides an immediate overview, a tentative summary innovation index (SII) and an overall countries trend (Fig 3). Countries above the horizontal axis have an above average SII, while countries to the right of the vertical axis show an overall trend above the EU average. These two axes divide the following figure into four quadrants. Countries in the upper right quadrant are 'moving ahead' because both their summary innovation index and past rate of change for the trend indicators are above the EU

averages. Conversely, countries in the bottom left quadrant are 'falling further behind' because they are below the EU average for both variables. Figure 4 provides a snapshot of present country performances.

Fig. 1 Overall country trends by innovation index

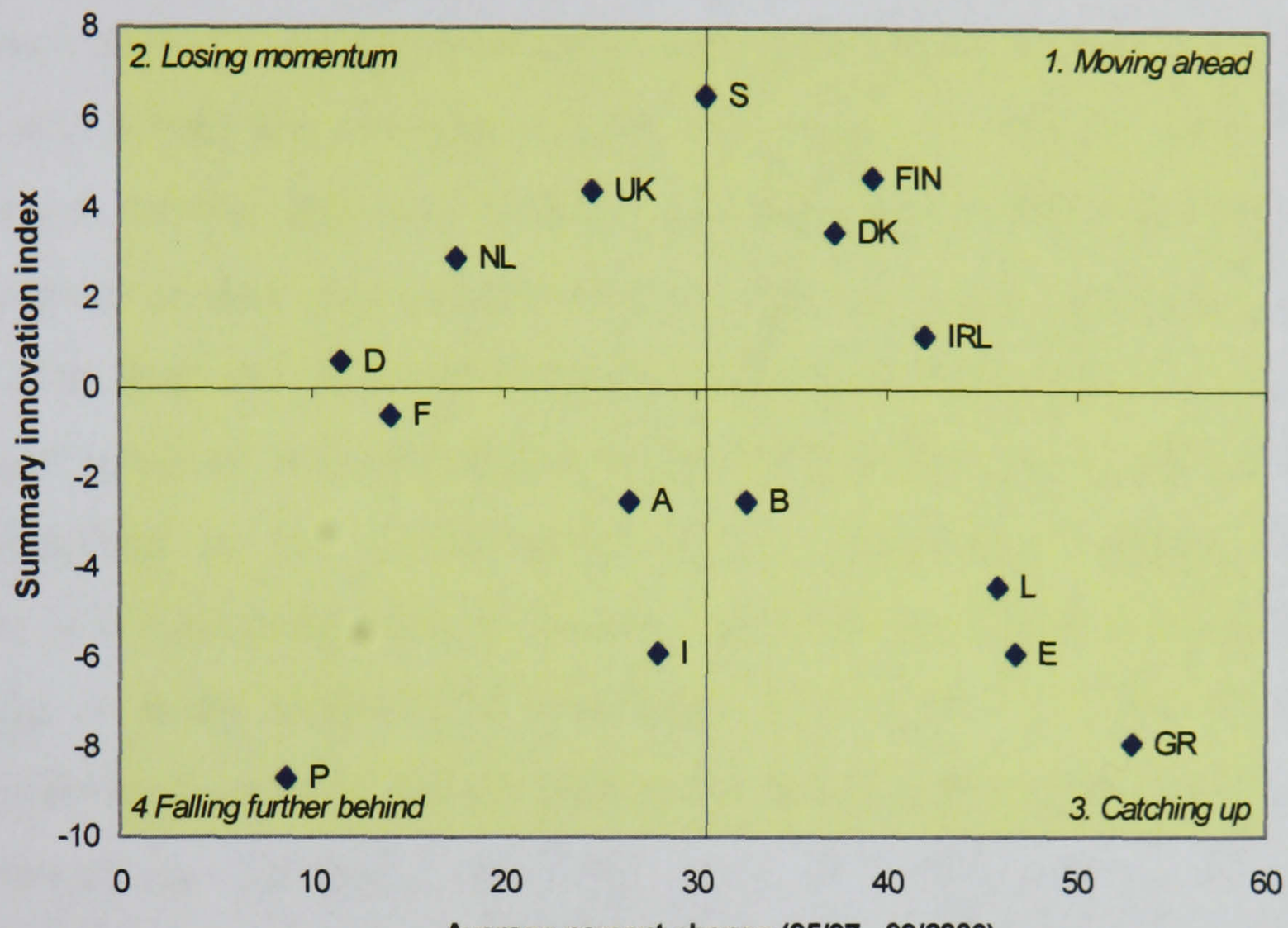


Figure 3, Source: Commission of the European Communities, (2001, p. 4)

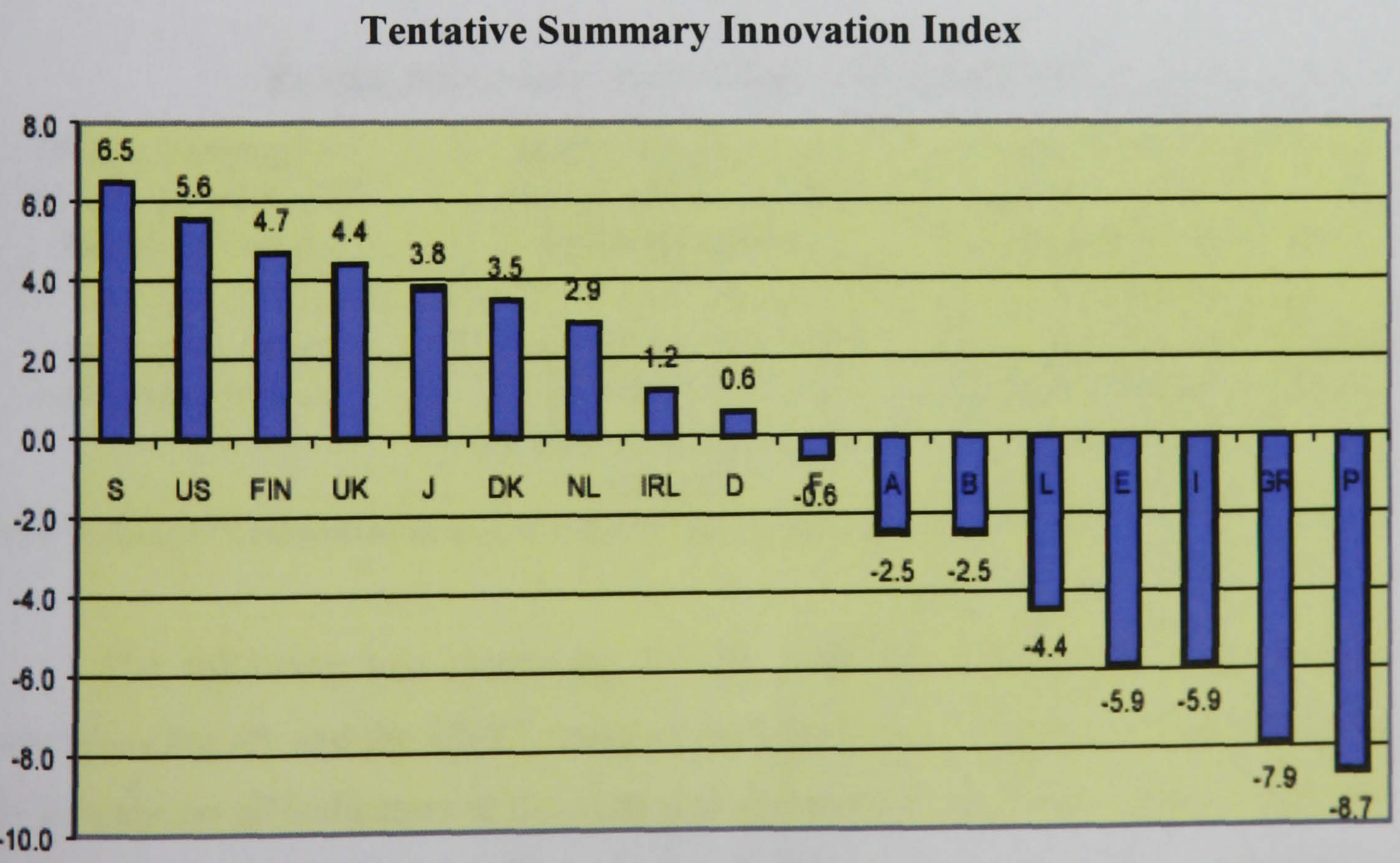


Figure 4, Source: Commission of the European Communities, (2001, p. 15)

As the Commission of the European Communities argues, three countries with currently low results show the most positive trends: Greece, Luxembourg and Spain have clearly been 'catching up'. The three largest EU economies, namely the Netherlands, Deutschland and the UK have also improved, but at rates below the EU average, whilst the UK has improved the fastest in this group. Among the most innovative EU countries, Denmark and Finland have been 'moving ahead'; Sweden has improved at the EU average and Ireland improved its innovative performance and is clearly above both EU averages. On the other hand, as one can see in the figure above, France, Austria, Italy and Portugal are falling further behind, somehow losing ther momentum of their previous performances as they were recorded. Moreover, it becomes clear from the outset of this analysis that although Greece is placed at the 'catching up' quadrant, it is still lagging behind the European mean performance.

According to the Commission of the European Communities (2000), *Innovation in a Knowledge-driven Economy*, and the *Innovation Scoreboard* (2001), Greece lags in many measures of innovation performance, as shown in the table below, but efforts to reverse this are underway primarily through the new Operational Programmes of the Community Structural Funds. Innovation policy is now becoming increasingly recognised as essential, as, for the first time, all 13 regions of the country will earmark some regional funds for innovation. These are expected to supplement the national funds distributed all over the country.

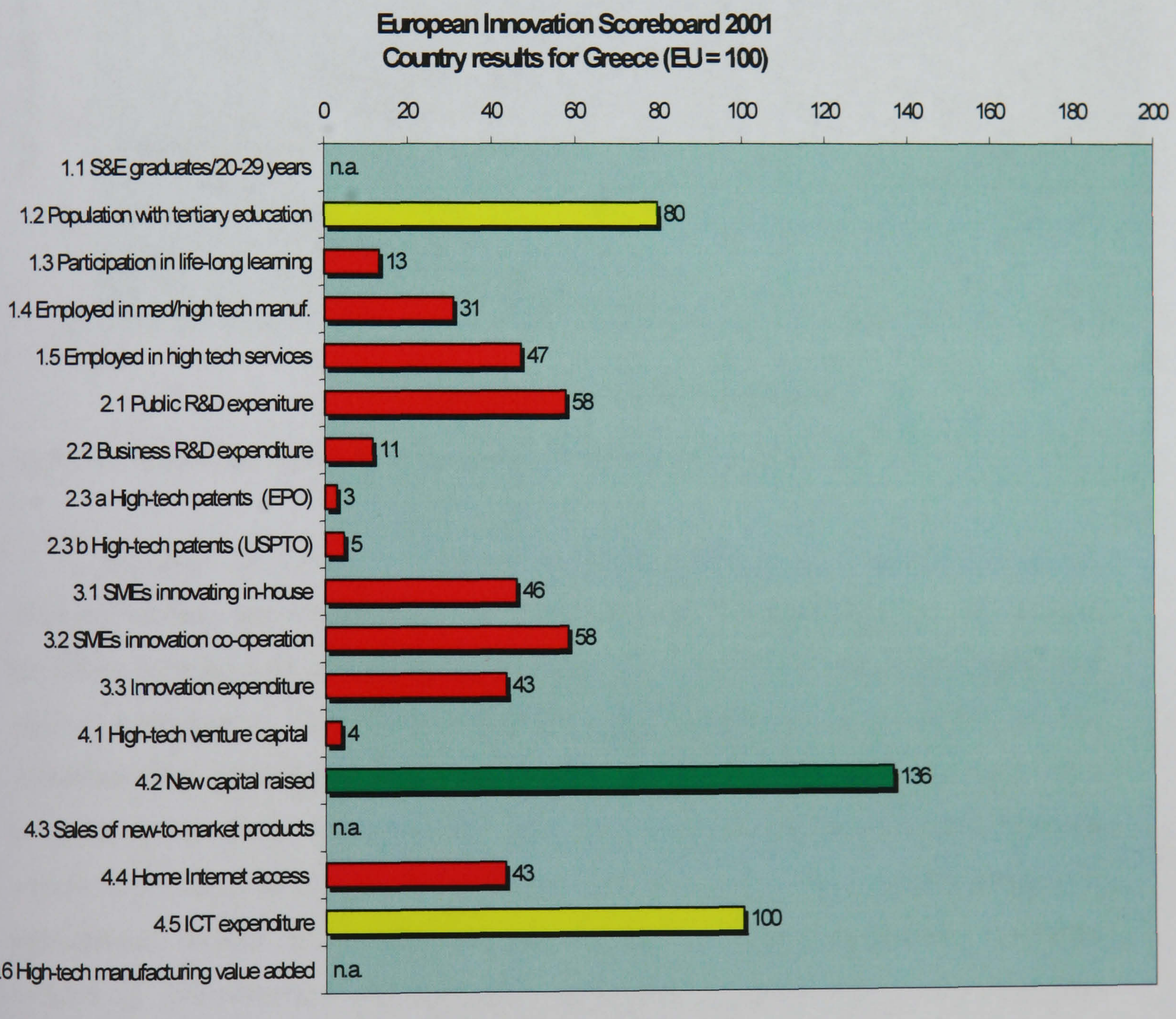
Results for Greece, Innovation Scoreboard 2001

Major Strengths relative to other EU Member States	Major Weaknesses relative to other EU Member States	Major Observed Trends between mid 1990s and most recently available data
New capital raised, Innovation finance	Public and business R&D; High-tech patenting; Innovative SMEs; Internet access	Increasing public R&D and ICT investment; declining business R&D

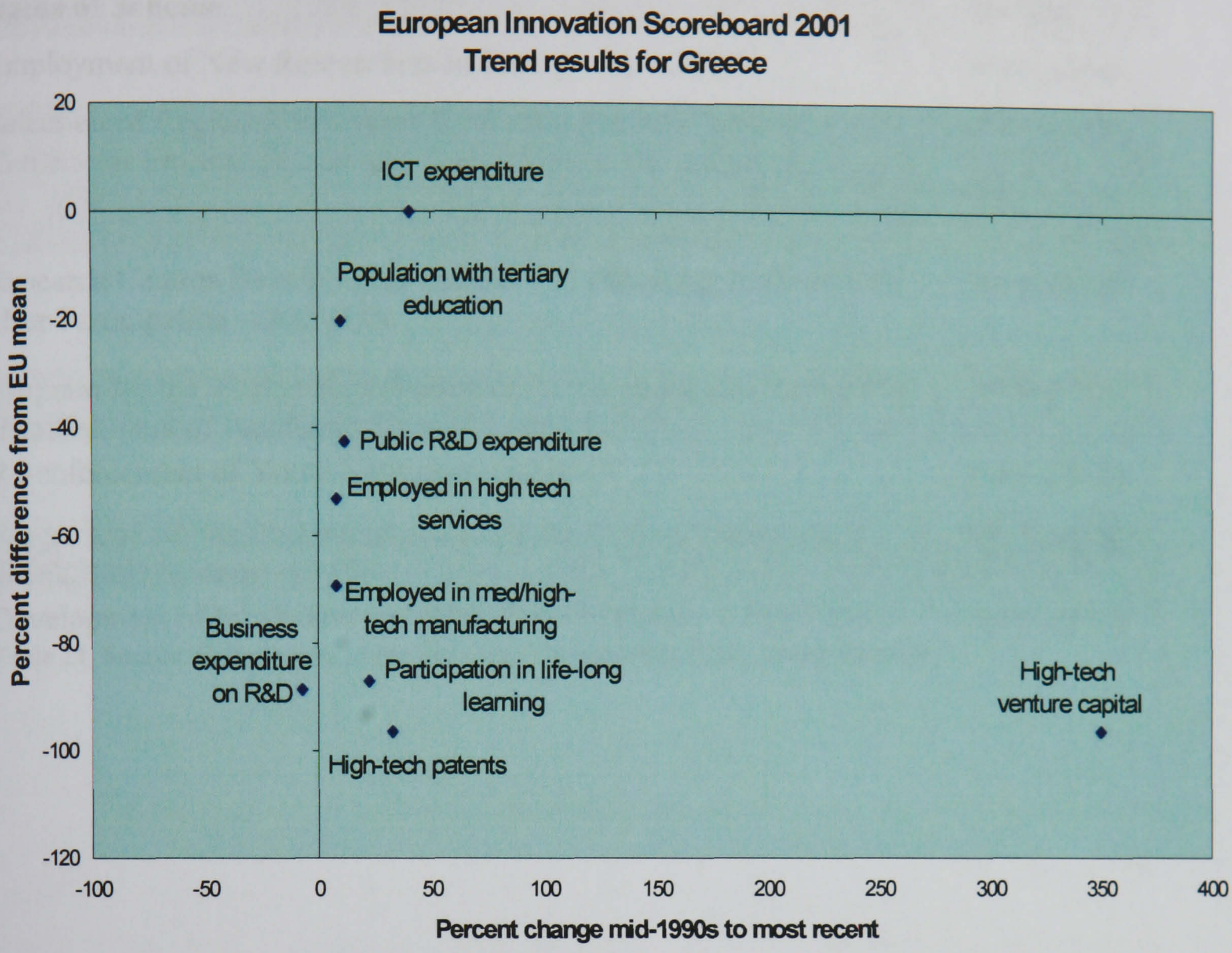
Table 20, Source: Commission of the European Communities, (2000, p. 12-13)

The following two charts are in line with the results of the Community Innovation Survey and the GSRT research presented above. Greece is well below the EU average on all indicators at the European Innovation Scoreboard apart from 'new capital raised', and 'ICT expenditure' indicators as shown in the charts. According to

the Commission of the European Communities, the graphs of the trend results show the current performances of Greece, for each indicator, against the recent trend. The performances refer to the differences from the EU mean. The trends refer to the percentage change between 1995-1997 and 1999 or 2000. The horizontal or X-axis is the trend, or the percentage change over time, while the vertical or Y-axis is the current difference from the EU mean. All indicators to the right of the vertical axis have shown growth in the country, while all indicators above the horizontal axis are above the EU average.



Figures 5, Source: Commission of the European Communities (2001, annex Greece)



Figures 6, Source: Commission of the European Communities (2001, annex Greece)

In order for Greece to improve its current position in relation to other EU member states, the Commission of the European Communities has set several priorities starting with the financing of innovation via public and private funds and policy instruments. The Commission has also suggested improvements of the administrative procedures legal framework and finance available for new firm creation, particularly for academic spin offs. Intensifying co-operation between research, universities companies and the government is also a key feature, along with educational reform and evaluation and support to Higher Education Institutes, improving infrastructure and expanding activities (Commission of the European Communities, 2001). The table below summarises some of the new innovation policies schemes in Greece that the General Secretariat of Research and Technology in line with the Commission of the European Communities intends to implement. It is imperative to underline, at this point, the fact that some of the above are central to our investigation and substantial to our thesis.

New Innovation Policy Schemes in Greece for 2001-2010

Name of Scheme	Website
Employment of New Researchers in Enterprises – IRON	www.gsrt.gr
Selection of Regional Structures for Entrepreneurial Support – Centers for Entrepreneurial and Technological Development	www.gsrt.gr
Research Centres Development and Service Providing Projects with User Participation – AKMON	www.gsrt.gr
Program for the Market Exploitation of Research Results through the Establishment of Academic Spin-offs – PRAXE	www.gsrt.gr
Re-enforcement of Youth Entrepreneurship	www.gsrt.gr
Programme for the Placement of Researchers from Abroad to the Greek R&D System – ENTER	www.gsrt.gr
Development of Incubators and S&T Parks in Greece – ELEFTHO	www.gsrt.gr

Table 21, Source: Commission of the European Communities (2001, annex Greece)

3. Central Macedonia Region and the Prefecture of Thessaloniki

The analysis attempts to present some of the economic and R&D data of the region of C. Macedonia and the Thessaloniki areas. The region of Central Macedonia is assuming continuously increasing importance in the country's economic life. The area of C. Macedonia and the prefecture of Thessaloniki are in the process of securing their position as a major export base for the country. According to the Bank of Greece Thessaloniki Branch (2003), a large portion of Greek exports originates in this area, along with a considerable share of the investment, which flows towards the Balkans and, to a certain extent, the Commonwealth of Independent States (CIS – former USSR) and the new Black Sea countries. With all these countries, the region of Central Macedonia and the prefecture of Thessaloniki maintain and could further increase relatively privileged economic links, since the advantages of geographic proximity, especially with the Balkan countries are obvious.

The prefecture of Thessaloniki is the second most important centre in Greece after Attica (prefecture of greater Athens region). Its importance is due to the fact that most of the Region's industrial activity is concentrated here, and that its port and airport handle a substantial percentage of the country's imports and exports (Komninos, 1998). According to the author, the area immediately surrounding the city contains most of the Region's manufacturing and processing industry, while banking, commerce and services are concentrated in the city centre. Thessaloniki has the second largest airport (after Athens) and ranks as the third largest (after Athens and Irakleion) airport in terms of passenger traffic in the country. Moreover, the port of Thessaloniki is the second largest of the country and one of the largest in terms of capacity in the greater Balkan area, acting as a 'crossroad' of trading.

We argue that an empirical research of Greek SMEs operating in the Thessaloniki area, as it relates to the core substance of this thesis, namely, entrepreneurship, innovation and business clustering, would be at best a poor proxy to these concepts if it was not based on an understanding of the peculiarities, characteristics and dynamics of the Greek economy in general and the economy of Thessaloniki in particular. Following the above analysis, the results of the case studies can be cross-referenced to the arguments made throughout this chapter. Issues such as

the minimal public investment in R&D, the low support of local institutions, agents and authorities to promote business clustering, the 'connections' of few enterprises with the state and public bodies, and how it affects their performance and competitiveness, the link of entrepreneurship to innovation, the importance of the 'general' infrastructure of the region for the competitiveness and day-to-day operations of the companies, and other related issues are highlighted at the findings of the case studies, as presented in chapters 6-9.

In the last section of this chapter, we demarcate and analyse the socio-economic and industrial structure of Central Macedonia and more specifically of the Prefecture of Thessaloniki, which is the specific area of the empirical research in our thesis. Prefectures are administrative units defined on a geographical basis and constitute the second tier of local self-government. Before we proceed with the analysis, it is useful to present in the following figure the 'map of Greece' so that we can have a visual representation of the area we are examining. As we can see, Greece is divided in thirteen regions whilst the prefecture of Thessaloniki and the region of Macedonia are located in Northern Greece.

Figure 7, Map of Greece

Table 22, below, brings forth the general picture for gainful employment and unemployment rates for the labour force of central Macedonia. The unemployment rate for 2002 is 11.6% while Central Macedonia accounts for 16.5% of the country's total economically active population. Moreover, according to the Bank of Greece Thessaloniki Branch (2003), the total population of Central Macedonia is 1,859.641 inhabitants, corresponding to 17.0% of the country's total, while the population of the prefecture of Thessaloniki is 842,641 people.

Labour Force in 2002

	Economically Active Population		*Persons Employed*		
	Persons	% of Country Total	Persons	% of Country Total	*Unemployment Rate*
C. Macedonia	726,200	16.5	640,200	16.1	11.8
Macedonia-Thrace	1,072,000	24.4	947,300	23.8	11.6
Country Total	4,3964,00	100.0	3,977,200	100.0	9.5

Table 22, Source: Bank of Greece Thessaloniki Branch (2003, p. xi)

According to the data presented in the following table, the sectoral distribution of the Gross Value Added in Central Macedonia is similar to the national distribution between the three economic sectors. The tertiary, service, sector is the most significant for this regional economic system with the secondary, industrial sector producing 22.8% of the Annual GVA. Moreover, if we extrapolate the data of the table we can estimate that the Region of Central Macedonia has accounted for 18,5% of the country's GVA in the primary sector, 18.5% in the secondary sector and 17.06% in the tertiary sector for the year 1998. Furthermore, from the table below we can clearly see that the Regional Gross Value Added per capita was above the national average by 2.4%.

Basic Economic Aggregates in Region of Central Macedonia 1998

Sectoral Distribution of Gross Value Added						
	Primary Sector		Secondary Sector		Tertiary Sector	
	Mil. Drachmas	%	Mil. drachmas	%	Mil. drachmas	%
C. Macedonia	499,138	8.7	1,313,503	22.8	3,949,783	68.5
Country Total	2,698,539	8.2	7,118,617	21.6	23,150,308	70.2

Regional Gross Value Added per capita		
	Drachmas (Euros)	% of Country Average
C. Macedonia	3,209,047 (9,417.5 Euros)	102.4
Country Total	3,134,872 (9,197.8 Euros)	100.0

Table 23, Source: Bank of Greece Thessaloniki Branch (2003, p. x-xi)

The following table presents data for the Prefecture of Thessaloniki in contrast to C. Macedonia, Northern Greece as well as Greece in total. As we saw in the previous sections of this chapter, the gross domestic product has been growing during the last decade. In this table, we clearly see the continuous increase of the contribution of the prefecture of Thessaloniki in the GDP, which in 1998, corresponds to an impressive 66% of C. Macedonia, 36.7% of Northern Greece and 11.4% of Greece. Even more impressive is the growth of the per capita GDP, which according to table 24 below in 1998 is 21.6% above the national average (121.6%) and which is steadily higher than the national and regional averages throughout the period under examination.

Basic Economic Aggregates in Prefecture of Thessaloniki

Gross Domestic Product (in million drachmas, current prices)				
Year	*1995*	*1996*	*1997*	*1998*
Greece	27,235,205	29,935,080	33,132,660	36,042,240
Northern Greece	8,156,549	9,229,635	10,301,568	11,176,935
C. Macedonia	4,497,497	5,230,481	5,853,333	6,229,868
Prefecture of Thessaloniki	2,819,671	3,373,596	3,780,240	4,104,719
Per Capita Gross Domestic Product (in million drachmas, current prices)				
Year	*1995*	*1996*	*1997*	*1998*
Greece	2,608,021	2,857,523	3,155,841	3,427,252
Northern Greece	2,420,649	2,729,481	3,035,079	3,283,423
C. Macedonia	2,551,228	2,943,660	3,274,993	3,508,345
Prefecture of Thessaloniki	2,942,266	3,480,323	3,866,663	4,169,314
Prefecture of Thessaloniki, % of country Average (100)	112.8%	121.8%	122.5%	121.6%

Table 24, Source: NSSG (2003)

Gross Domestic Product – Sectoral Distribution 1991-1998

Secondary Sector								
Year	1991	1992	1993	1994	1995	1996	1997	1998
% of total product Prefecture of Thessaloniki	33%	32%	32%	28%	29%	30%	29%	30%
% of total product C. Macedonia	19,32 %	19,22 %	18,75 %	16,59 %	17,01 %	17,78 %	17,23 %	17,78 %
% of total product of Greece	3,25%	3,23%	3,16%	2,78%	2,85%	2,98%	2,92%	2,97%
Tertiary Sector								
Year	1991	1992	1993	1994	1995	1996	1997	1998
% of total product Prefecture of Thessaloniki	63%	63%	65%	67%	67%	67%	68%	67%
% of total product C. Macedonia	36,89 %	37,84 %	38,08 %	39,70 %	39,31 %	39,72 %	40,40 %	39,71 %
% of total product of Greece	6,20%	6,36%	6,42%	6,65%	6,59%	6,66%	6,85%	6,62%
Primary Sector								
Year	1991	1992	1993	1994	1995	1996	1997	1998
% of total product Prefecture of Thessaloniki	5%	5%	3%	5%	4%	3%	3%	3%
% of total product C. Macedonia	2,93%	3,00%	1,76%	2,96%	2,35%	1,78%	1,78%	1,78%
% of total product of Greece	0,49%	0,50%	0,30%	0,50%	0,39%	0,30%	0,30%	0,30%

Table 25, Source: NSSG (2003)

Examining in more detail the economic and industrial infrastructure of the prefecture of Thessaloniki, as presented in the table above, we realise that the secondary and tertiary sectors account together for 97% of the prefecture's GDP. In particular, the dominating sector on the prefecture of Thessaloniki is the 'service' sector corresponding to 67% of the area's GDP. This figure is, in fact, in line with the new era of the Greek economy and its transition to a service economy from the traditional agricultural and industrial type economy. Furthermore, according to Komninos (1998) the SMEs dominate the Region's and the Prefecture's productive system, accounting for 98% of all manufacturing firms in the region and absorbing 72% of total industrial employment. Moreover, 72.51% of the enterprises are situated in the greater Thessaloniki metropolitan area.

Percentage Distribution – Number of Enterprises
Prefecture of Thessaloniki (1995)

Figure 8, Source: NSSG (2003)

The region of Central Macedonia in its infrastructure has two Universities and two Higher Technological Education Institutes, while the research activity in the region is fragmented into a large number of small research units. Of the 277 research units for applied R&D in the region 138 are university laboratories, 130 in the Aristotle University of Thessaloniki, the largest university in terms of student population in Greece, and 8 in the University of Macedonia, both of these are urban Universities are located at the centre of the city of Thessaloniki. Another 110 research laboratories belong to the Technological Educational Institute of Thessaloniki (the fourth largest institute in Greece) and the T.E.I. of Serres. According to the General Secretariat of Research and Technology, from the remaining research units 5 are associated with the laboratories of the Foundation for Research and Technology, 19 belong to the national Agricultural Research Institute, 2 to the Institute for the Control of Cultivated Plant Species, and one each to the Geology and Mining Research Institute, the National Tobacco Board and the National Cotton Board, (Komninos, 1998).

The following table presents the regional distribution of the gross domestic expenditure for scientific and technological research in Greece. It can easily be seen that as figures for 1997 show the two regions of Central Macedonia and Attiki account for 69.82% of the domestic scientific and technological research that is taking place, a figure that signifies the fact that R&D is concentrated in these two major regions of Greece.

Gross Domestic Expenditure for Scientific and Technological Research per Region in Greece

Region	1993 Percentage	1995 Percentage	1997 Percentage
East Macedonia-Thrace	3.64	3.47	3.49
Central Macedonia	**18.91**	**17.65**	**18.23**
West Macedonia	0.23	1.12	0.62
Thessaly	1.88	2.30	1.95
Epirus	2.25	2.32	2.88
Ionian Islands	0.40	0.33	0.58
Western Greece	5.79	5.80	7.01
Sterea Ellada	2.35	2.57	1.74
Peloponnisos	0.91	1.19	1.11
Attica	53.05	53.59	51.59
North Aegean	0.74	0.87	1
South Aegean	1.15	0.62	0.28
Crete	8.71	8.17	9.53
Total %	100	100	100
Million Euros (in total)	294.82	388.55	492.23

Table 26, Source: GSRT, *The Research in Greece 1994-1998,* (2001, p. 25)

Many of the causes of regional disparities in economic development may be traced to disparities in productivity and competitiveness. Table 27 verifies the characteristics of the Greek economy and explains some of the regional disparities while the two regions of Central Macedonia and Attiki concentrate and employ 64,74% of the research workforce in 1997. Western Greece and Crete combined represent 14.39% of the research personnel in Greece, while the allocation of personnel is very limited in the remaining 9 Greek regions.

Regional allocation of the Greek research workforce (percentage %)

Region	1993	1995	1997
	No. of people	No. of people	No. of people
East Macedonia-Thrace	5.01	4.66	4.35
Central Macedonia	**22.72**	**21.73**	**21.69**
West Macedonia	0.26	0.74	0.72
Thessaly	1.63	2.45	3.18
Epirus	3.40	2.95	4.69
Ionian Islands	0.46	0.63	0.84
Western Greece	7.08	5.67	7.75
Sterea Ellada	1.97	2.38	1.77
Peloponnisos	0.68	1.35	1.58
Attica	47.56	46.44	43.05
North Aegean	1.18	1.34	2.75
South Aegean	0.7	1.65	0.95
Crete	7.36	8.01	6.69
Total %	100	100	100

Table 27, Source: GSRT, *The Research in Greece 1994-1998,* (2001, p. 36)

The situation with regional disparities becomes clearer when we look at the following table showing the allocation of research expenditure of state research institutes. In 1997, more than half of the research budget was allocated to the region of Attiki (56.41%) while Crete followed with 22.06% leaving Central Macedonia third with only a 9.65% of research expenditure being allocated to the area. The research expenditure in Central Macedonia has decreased over the three-year period 1995-1997 by 1%. Despite the fact that C. Macedonia held a good percentage of 18.23% at the regional allocation of gross expenditure of scientific and technological research and 21.69% on research personnel distribution, it appears that in terms of financing the region is lacking the appropriate state financial grants.

Regional allocation of research expenditure of national research institutes

Region	1995 Percentage	1997 Percentage
East Macedonia-Thrace	3.56	3.64
Central Macedonia	**10.57**	**9.65**
West Macedonia	0.54	0.62
Thessaly	1.83	1.68
Epirus	0.80	0.68
Ionian Islands	0.14	0.20
Western Greece	3.51	2.76
Sterea Ellada	0.76	0.75
Peloponnisos	0.56	0.72
Attica	56.99	56.41
North Aegean	0.30	0.37
South Aegean	0.50	0.46
Crete	19.95	22.06
Total %	100	100
Million Euros (in total)	99.04	115.294

Table 28, Source: GSRT, *The Research in Greece 1994-1998,* (2001, p. 98)

On the other hand, according to GSRT, *The research in Greece 2001*, the expenditure of private and public businesses for scientific and technological research in the Region of C. Macedonia has increased during the period under investigation, from 4,517 million drachmas in 1995 to 5,415 million drachmas in 1997, a percentage increase of nearly 20%. At the same time, there has been an increase in the number of people employed by companies (private and public) for scientific and technological research from 671 in 1995 to 715 in 1997, a 6.5% increase.

The prefecture of Thessaloniki has a potentially dynamic R&D infrastructure with its 277 research laboratories, the 2 universities and the 2 higher technological educational institutes. Unfortunately, though, there has been a substantial lack of investment by both private enterprises and the Greek government, which lead to the creation of the regional disparities we have described above. R&D, which is to a large degree under-developed in Greece, is also lagging behind in the Prefecture of Thessaloniki. For a region that accounts for 11.4% of the country's GDP having only 715 people dedicated to R&D signifies a serious lack of investment in that area.

4. In Conclusion

This chapter was conceived and presented in an effort to achieve two objectives: to present crucial and necessary economic, historical and to some extent sociological and political data describing the evolution of modern Greek Economy since World War II and to create a heuristic spring-board for the comprehension of the country's belated arrival and lagging position in the areas of R&D and innovation when compared to other European nations.

A continuous succession of educational reforms amidst a politically unstable environment, lack of emphasis on the need for technical and professional education and an overemphasized classical education, lack of R&D investments and applied science research, belated, problematic and limited introduction of industrial production along with ever decreasing agricultural production, the expansion of the tertiary sector and the negative trade balance have created structural problems which are difficult to be dealt with in the modern sharply competitive European Union environment.

Membership in the E.U. and the flow of funds from Brussels and Strasburg have helped Greece to overcome some of its crippling economic dysfunctions, while currently introduced educational reforms seem to place, at last, the due and proper attention on the need for technical education and preparation of adequate numbers of personnel to meet the forthcoming challenges.

The area constituting the focus of this thesis, namely the prefecture of Thessaloniki located at the heart of the region of C. Macedonia has been presented with vital socio-economic data as well as with data pertaining to the R&D and innovation potential. From such data, it becomes obvious that the economic character and dynamism of this geopolitical region, well exceeding all other regions in terms of per capita GDP, has not gained appropriate support from Greek central government. It has managed to do well despite this and, having a solid educational and research infrastructure, one could hypothesize that it has the potential, which should, if properly utilized, propel this area into a prominent place.

As we have mentioned several times throughout the first chapters of this thesis, we attempt to investigate relations concerning the concepts of innovation and small business clustering by delving into the relevant international literature and by empirically researching the relations we have set-up with the use of our hypothetical, descriptive two-dimensional model, which we introduced in the previous chapter. Simply researching those concepts without the analysis presented in this chapter will not provide the necessary scope and depth required to understand the workings of the Greek business world. For example, the Greek governments have neglected to look after the vast majority of SMEs and to construct policies for the encouragement of competitiveness, innovation, and clustering. We also bring forth the lack of a tradition in university-business relations. We examine the very low-scoring innovation performance of Greece as compared to other EU member states. Examining and more importantly understanding these realities in the depth and scope of this chapter's analysis gives us the ability to empirically apply our two dimensional model to the Greek SMEs and second to propose methods to enhance Greek SMEs competitiveness.

The next chapter sets forth the necessary methodological framework, which will serve as the basis for our empirical research in the Thessaloniki geographic region.

Chapter 5

Research Methodology

1. Introduction

Throughout the first three chapters of this thesis, we attempted to investigate relations concerning the concepts of entrepreneurship, innovation and small business clustering by delving into the relevant international literature and researching the relations we have set-up. At the end of chapter three, we set up, described and analysed a hypothetical, descriptive two-dimensional model of innovation and small business clustering that aims to link the 'concepts' and to provide four 'illustrative' cases that describe the characteristics and dynamics of SMEs. Simply researching those concepts without the analysis presented in chapter four would not provide the necessary scope and depth required to understand the workings of the Greek business world. For example, the Greek governments have neglected to look after the vast majority of SMEs and to construct policies for the encouragement of competitiveness, innovation, and clustering. We brought forth the lack of a tradition in university-business relations and examined the very low-scoring innovation performance of Greece as compared to other EU member states.

Having investigated, analysed and presented the three conceptual themes mentioned above, and the two dimensional model we created, the aims of this chapter emerge in three parts as follows.

In the first part we present, examine and explain the rationale for selecting the IT business sector of Thessaloniki, Northern Greece to conduct our empirical case studies research and validate our model. In the second part, we briefly introduce in the realm of qualitative research the approach defined as "case study", which constitutes the main methodological approach of our research. In the third part, we present in brief how the case studies were conducted in the four selected companies.

2. Validating the two-dimensional model in the IT sector of Thessaloniki, Northern Greece

As we have examined throughout the first four chapters of this thesis, the concepts of business clustering and innovation apply in the majority of business sectors and types of firms; from traditional sectors such as textile, clothing, and agricultural products, as we saw in the Third Italy case, to high-tech and knowledge intensive sectors such as Information and Communication Technologies in the Silicon Valley Region. Our hypothetical, illustrative two-dimensional model links the concepts of 'innovation' and 'networking/clustering' that can be found in various sectors of an economy. In our empirical research, we test the model in the IT sector of the Greek economy. and in particular, in the Thessaloniki area. We selected four SMEs that belong to the same industrial sector, since this enhances the comparability of the results by keeping some parameters constant for all SMEs. Our intention in using this model is to provide a typology of the four 'illustrative' types of SMEs that can be applied to a variety of economic sectors, wherever innovation and business clustering as proposed by the international literature can be relevant.

As we show and discussed in chapter four, where relevant data have also been presented, the region of Central Macedonia is assuming continuously increasing importance in Greece's economic life. The area of C. Macedonia and the prefecture of Thessaloniki are in the process of securing their position as a major export base for the country. A large portion of Greek exports originates in this area, along with a considerable share of the investment, which flows towards the Balkans and, to a certain extent, the Commonwealth of Independent States (CIS – former USSR) and the new Black Sea countries. The region of Central Macedonia and the prefecture of Thessaloniki maintain and could further increase with all these countries relatively privileged economic links, since the advantages of geographical proximity, especially within the Balkan peninsula are obvious. Thessaloniki is a transport hub; its port and airport handle a substantial percentage of the country's imports and exports. Thessaloniki has the second largest airport (after Athens) and ranks as the third largest (after Athens and Irakleion) airport in terms of passenger traffic in the country. Moreover, the seaport of Thessaloniki is the second largest of the country and one of

the largest in terms of capacity in the greater Balkan area, acting as a 'crossroad' of trading. Furthermore, the prefecture of Thessaloniki has a potentially dynamic R&D infrastructure with its 277 research laboratories, the two universities and one higher technological educational institute.

According to the above data, Thessaloniki has the necessary infrastructure to organise several business clusters in different industrial and service sectors. The geographic proximity of the educational institutes, the research laboratories and the businesses create a fertile ground for university-industry-government co-operation. Unfortunately, though, as we stressed out in chapter four, traditionally Greece has not invested in such co-operative alliances, on regional and national innovation systems. and business-to-business co-operations. As we show in the next few pages, the IT sector in Greece is one of the most prospering sectors of the Greek economy. The Greek IT market has in the last decade reorganised itself trying to catch up with the Western European economies. This reorganisation offers a sound foundation to apply modern management techniques, such as innovation management and business clustering, in a sector of the economy that is commonly accepted as one of the most knowledge intensive sectors. Furthermore, there is currently an ongoing initiative in the Region of Thessaloniki from SEPVE, the Association of Information Technology Companies of Northern Greece to promote and encourage university-business co-operations, and/or business-to-business networking. This organisation has more than 200 member companies in Northern Greece. This initiative of SEPVE, a pioneer project for the country and the IT industry in Greece, is the creation of a cluster of IT companies in Thessaloniki, the "Silicon Valley of South-Eastern Europe in Thessaloniki-Technopolis". Thirty-nine IT companies, the University of Macedonia, the International Fair of Thessaloniki and other agents and institutions of the Region, support and develop this long-term project who view the Technopolis initiative. namely the clustering and networking of IT companies, as one of the Region's future competitive advantages, having a leading role particularly in South-East Europe and Asia.

As we have seen in chapter four, Greece is well below the EU average on all indicators at the European Innovation Scoreboard apart from 'new capital raised', and 'ICT expenditure' indicators. As we present in the following pages the IT sector of the Greek economy is a fast growing and evolving sector forecasted to continue its growth performance for at least the next three years. Combining the geo-political

characteristics of the Thessaloniki area, with the presence of the R&D infrastructure that we mentioned above, and the performance of the IT sector in Greece we decided to apply the two-dimensional model in the IT business sector of the Thessaloniki area. Furthermore the IT sector in any economy is commonly accepted (as discussed also in chapters two and three) as a knowledge intensive, innovative, with companies usually keen to networking and forming cooperative alliances for the purposes of knowledge diffusion and access to new technology. The Silicon Valley model, presented in chapter three, supports these arguments with its increased competitiveness, the potentials for spin-off entrepreneurial enterprises, the industry-government-university relations, and inter-firm alliances. For the above reasons we believe that the IT industry and Central Macedonia, and in particular the greater Thessaloniki area would provide information rich cases to test and validate the two-dimensional model, propose recommendations and future research strategies and perhaps some policy actions for SMEs, the governments and the educational and research infrastructure of the area to co-operate and increase their competitiveness.

According to the reports of the Association of Information Technology Companies of Northern Greece (AITCNG), for 2002, IT spending per capita for Greece was only 23.9% of the Western European Average, while Internet penetration stood 26.4% of the Western European average, and there were 11.5 Internet users per 100 inhabitants. The following table provides the basic IT indicators for the years 2001-2002, in Greece.

Greece: Basic IT indicators

	2001	*2002*
IT Market, Value (m€)	1873.6	2100,8
IT Spending per capita (€)	175	196.4
IT Market as % GDP	1.50	1.68
Total PCs (000)	1713	1950
PC penetration (per 100inh.)	16	18.2
Total Home PCs (000)	460	545
Home PC penetration (per 100 inh.)	4.3	5.1
Total Business PCs (000)	1253	1405
Business PC penetration (per 100 inh.)	11.7	13.1
ISDN Lines (000)	560	880
ISDN penetration (per 100 inh.)	0.52	0.82
Internet Users (000)	930	1230
Internet penetration (per 100 inh.)	8.7	11.5

Table 1, Source: AITCNG

The Greek IT market rose by 12.1% and reached €2100.8 million in value, in 2002. The market was mainly driven by strong PC sales and by vivid activity from small and medium IT services companies. PC sales reached 580,000 units, with global brands manufacturers almost catching up with local manufactures sales. IT services were the fastest growing segment of the hi-tech sector standing at a rate of 13.3%. The Internet community in Greece keeps on growing faster, while Internet users finally passed the 1 million mark climbing to 1.230.000. Furthermore, AITCNG argues that e-business penetrated even more in the Greek SMEs, starting with bookshops and tourist organisations, and moving to e-marketplaces, mainly at a business-to-business level. It is forecasted that IT markets will continue to grow for the next three years, at annual rates between 7.5% and 15%, reaching a peak in growth during the current Olympic year, 2004.

Basic IT indicators for Greece demonstrate the modernization of IT in Greece over the past few years. The major trend is the rise of PC penetration, which in the home users sector remains at low levels and has a long way to go to catch up with other EU countries. Even more, home PC penetration is very low compared to the business sector. Additionally, according to AITCNG, IT spending per capita has reached €196.4 for 2002, while the European Union average was almost €850 for the same year. This gap has to be narrowed down, as the difference in GDP per capita between Greece and the EU average is far smaller than the difference in IT spending per capita. Greece is obviously an under-performer when it comes to Internet and IT use. Greece repeats its low performance and ranks last in the EU when it comes to technological and broadband diffusion. Observing the following table, we realise that Greece ranks last in the Information society and network industries sections, columns 2 and 5 respectively.

Ranking of EU Countries According to the Lisbon Scores, 2002

Country	*Information Society*	*Innovation, R&D*	*Liberalisation*	*Network Industries*	*Financial Services*	*Enterprise Environment*	*Social Inclusion*	*Sustainable Development*	Average Rank
Finland	1	1	1	1	2	1	3	1	1.4
Netherlands	7	8	3	6	4	4	1	2	4.4
Denmark	4	9	5	4	3	5	4	4	4.8
UK	3	4	2	9	1	2	10	7	4.8
Sweden	2	3	9	3	5	6	7	5	5.0
Germany	5	2	8	2	9	11	9	3	6.1
Austria	6	7	4	8	7	8	5	6	6.4
Belgium	9	5	6	5	11	10	2	8	7.0
France	10	6	11	7	10	12	6	9	8.9
Ireland	11	10	7	13	6	3	12	13	9.4
Portugal	8	12	10	10	8	7	13	10	9.8
Spain	12	11	12	11	12	9	8	12	10.9
Italy	13	13	13	12	13	13	11	11	12.4
Greece	14	14	14	14	14	14	14	14	14.0

Table 2, Source: AITCNG (World Economic Forum)

The year 2002 was characterised by consolidation and efforts to rebalance the economy and financial activities in Greece, and information technologies in particular. In the aftermath of a global slump in high tech and stock markets, which had its effect in the Greek business world, local industry has tried to reduce its losses and move on. The Greek IT market managed to do much better than most other EU member states, mainly due to the large inequities in technological levels. The market size rose by 13.3% from 2002, reaching the volume of €2.38 billion for 2003. In general, as shown in the figure below, the IT market is forecasted to continue its growth at least till 2006. It is estimated that within the period 2001 to 2006 the growth will exceed 190% increase.

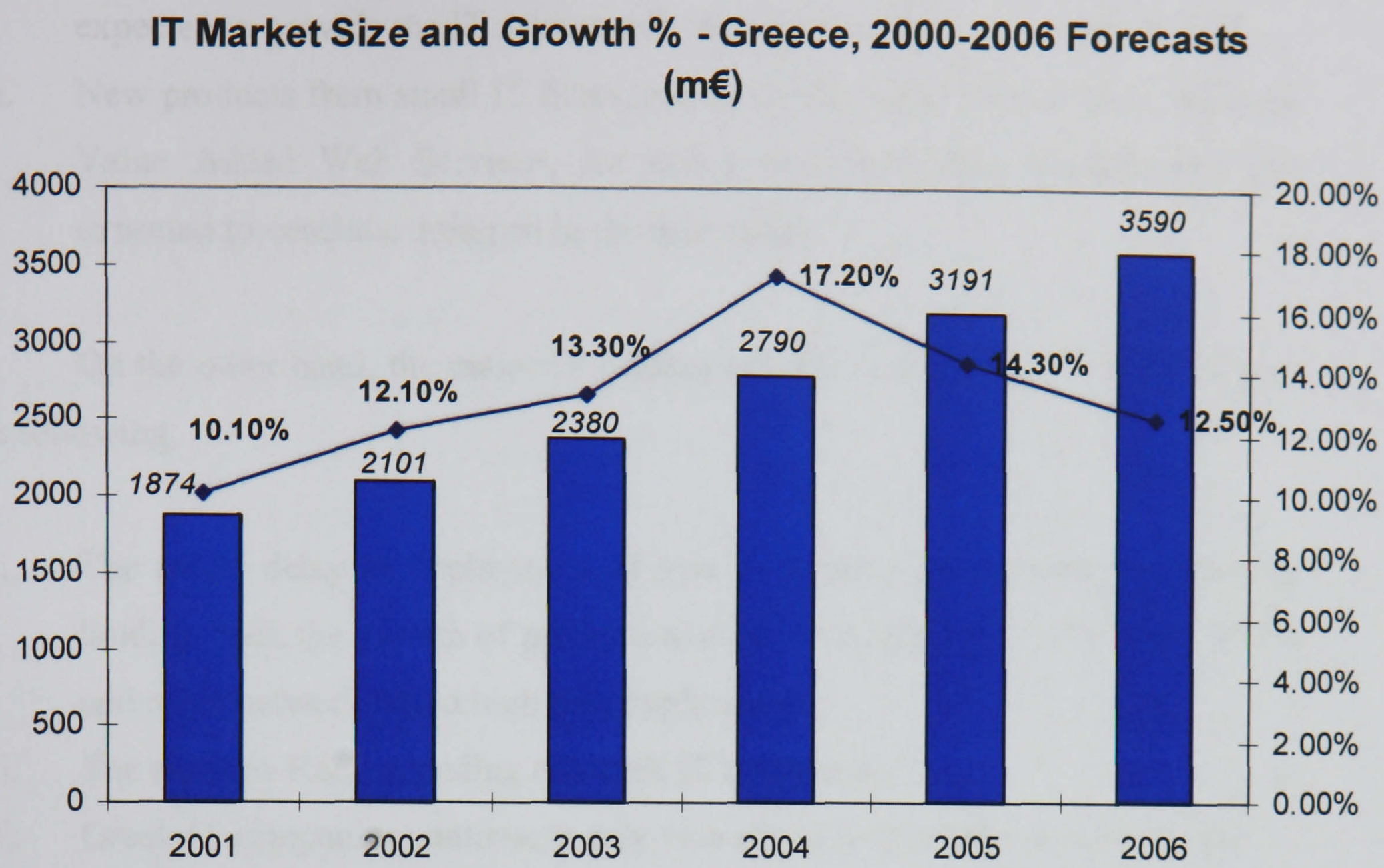


Figure 1, Source: AITCNG

According to the Association of Information Technology Companies of Northern Greece the main IT market drivers, are the following,

i. The establishment of Greece as a stable economy has formed a favourable environment for foreign investments and for arrival of global IT companies in the local market.
ii. The better late than never procurement of 3rd CSF related projects will provide the IT market with fresh capital for at least three more years.
iii. The Olympic Games of 2004 have increased IT infrastructure needs, which do not exhaust themselves in the level of the official organisational committee needs, but also extend to the private sector, who is modernising its structure in order to be able to handle the extra business.
iv. The liberalisation of all kinds of communications in Greece benefits IT growth as well.
v. The continued rise in Internet penetration in Greece brings Greeks closer to high tech.

vi. The low level of digital technology used by the Greek public sector is expected to provide the IT market with new projects for many years to come.

vii. New products from small IT firms, mainly in the sector of Software and High Value Added Web Services, are doing well in foreign markets and are expected to continue doing so in the near future.

On the other hand, the major IT Market Inhibitors, according to AITCNG are the following,

i. The major delay of deployment of true broadband connections in Greece is holding back the growth of products and services like ASP, e-business, VPNs and other network based high tech applications.

ii. The still low R&D spending of Greek IT companies.

iii. Greek IT companies continue to rely very strongly on public sector projects.

iv. Software piracy continues to be a problem for Greece expanding now from simple Windows S/W to more complex applications like web servers and database S/W.

3. The Set up and Structure of the Case Studies

Considering the alternatives in designing the research methodology for this thesis, we are led directly to the need for comparing and contrasting the relative strengths and weaknesses of qualitative and quantitative data. According to Patton (1987), qualitative methods permit the researcher to study and explore the selected events, cases, and issues in depth and in great detail, since the data collection methods are not constrained by predetermined categories of analysis. On the other hand, according to the author, the quantitative methods use predetermined response categories and standardised measures that fit diverse various opinions and experiences. In other words, qualitative research refers to research findings not subject to quantification or quantitative analysis though they provide depth and detail while quantitative research uses mathematical models and analysis, facilitating the comparisons and the statistical management of aggregated data. Our aim in this thesis is to become more experienced with the concepts of entrepreneurship, innovation, business clustering, SMEs to achieve a deeper understanding and perhaps generate or at least help in generating new theories and policies that would be applicable to the Greek business world, IT sector of the Thessaloniki area, and SMEs in general. We do recognise the fact that qualitative research is a vast and complex area of methodology and if we tried to present thoroughly we would need whole textbooks. The purpose of this section is to briefly introduce in the realm of qualitative research the approach defined as "case study", which constitutes the main methodological approach of our research.

Eisenhardt (1989), states that case studies focus on understanding the dynamics present within a single setting. Rather than using large samples and following a rigid protocol to examine a limited number of variables, case study methods involve a detailed and in-depth, longitudinal examination of an issue and in particular in our case of a specific SME. It is a systematic way of looking at what is happening, collecting data, analysing information, and reporting the results. The product of this method is a sharpened understanding of why the instance happened as it did, how the instance happened, what the result was, and, finally, what might be important to look at in more depth and more extensively in future research. Thus, case studies are especially well suited toward generating, rather than testing, hypotheses.

The case study is a method of learning about a complex instance through extensive description and contextual analysis in an attempt to answer why, what and how.

According to Yin (1984, p. 23), a case study is "an empirical inquiry that investigates a contemporary phenomenon within its real life context when the boundaries between phenomenon and context are not clearly evident and in which multiple sources of evidence are used." Mitchell (1983, p.192) defines a case study as "a detailed examination of an event (or series of related events), which the analyst believes exhibits (or exhibit) the operation of some identified general theoretical principle".

The nature of the case study and the definitions provided should make clear why we chose this particular method of research as opposed to other more quantitative methods. Furthermore, Meredith (1998) gives a more complete and detailed definition of a 'case study',

> "A case study typically uses multiple methods and tools for data collection from a number of entities by a direct observer(s) in a single natural setting that considers temporal and contextual aspects of the contemporary phenomenon under study, but without experimental controls or manipulations…example entities include financial data, interviews, memoranda, business plans, organisational charts, tools and other physical artefacts, questionnaires and observations of managerial or employee actions and interactions. The goal is to understand as fully as possible the phenomenon being studied through 'perceptual triangulation', the accumulation of multiple entities as supporting sources of evidence to assure that the facts being collected are indeed correct." (Meredith, 1998, p. 442-443)

The important point to be made here is that the 'understanding' achieved is only meaningful within a conceptual framework of assumptions, beliefs and perspectives that we set at the outline of this research and in particular of this chapter. According to Meredith (1998), the 'understanding' can only be considered knowledge within the specific conceptual and perceptual framework of the researcher.

A qualitative case study seeks to describe a unit, in our case each of the four SMEs we have selected, in a holistic manner, namely in depth, detail and context. Case studies are particularly useful when one needs to understand some particular

problems, or characteristics, or a situation in great depth. Moreover, according to Patton (1987), case studies are used when one needs to identify cases rich in information, rich in a sense that a great deal can be learned from only a few or even one exemplar of the phenomenon. The author goes on to suggest that the case studies become even more valuable when the interest is on capturing the individual differences and/or unique variations of the units under investigation.

Three outstanding advantages of a qualitative case research approach have been identified by Benbasat (1987),

1. The phenomenon can be studied in its natural setting and meaningful, relevant theory generated from the understanding gained through observing actual practice.
2. The case method allows the much more meaningful question of *why*, rather than just *what* and *how*, to be answered with a relatively full understanding of the nature and complexity of the complete phenomenon.
3. The case method lends itself to early, exploratory investigations where the variables are still unknown and the phenomenon not at all understood.

(Benbasat, 1987, p. 370)

It is obvious that the third advantage is not of particular interest to our research, since the phenomenon and its conceptual framework have been established in good detail in the first chapters of this thesis and some of the variables are already familiar. Meredith (1998), and Eisenhardt (1989) suggest a number of additional advantages of the case study research method such as, the richness of explanations, relevance, understanding, exploratory depth, empirical validity, and generation of novel theories and testing of theories.

Another important advantage of case study research is the opportunity of the holistic view of the process as Gummesson (1991), quotes,

> "The detailed observations entailed in the case study method enable us to study many different aspects, examine them in relation to each other, view the process within its total environment and also utilise the researcher's capacity for 'verstehen'. Consequently, case study research provides us with a greater

opportunity than other available methods to obtain a holistic view of a specific research project." (Gummesson, 1991, p. 76)

On the other hand, as with every research method carrying through a case study research contains its own drawbacks. Some of the drawbacks are directly related to the kinds of data collection that are used in qualitative methods, like in-depth and open-ended interviews and direct observation. The data from open-ended interviews consist of direct quotations from people about their experiences, knowledge, feelings, opinions and perceptions of certain situations. Moreover, the data from direct observation consist of detailed descriptions of the participants' behaviours and actions, a full range of human interactions, detailed descriptions of organisational procedures and day-to-day management, etc. The most commonly suggested difficulties with conducting a case study research are, thus, access, cost and time, the need for multiple methods and tools for triangulations, lack of controls, complication of context and temporal dynamics, overly complex theories, lack of statistical validity, and the unfamiliarity of theory building and testing using case study research, since traditionally 'case study' is a familiar term mostly in sociology and ethnography, while 'statistical methods' have been favoured as methodologies in management and business administration (Meredith 1998, and Eisenhardt 1989).

A case study methodology is likely to be the most effective and appropriate approach to our fieldwork. As indicated above, the case study approach calls for the application of multiple methods of data gathering and analysis, involving different permutations of participants and the application of different types of research questions within a range of settings. The case studies have aided in the exploration and testing of the conceptual constructs as well as the analysis of data derived from observing, documenting and decoding the behaviours of the actors, managers and staff. Case study entails the collection of both quantitative and qualitative data, including in-depth interviews, content analysis, statistical analysis of secondary data (such as financial data of the SMEs) and observation, and the interpretative synthesis of these different data sources to provide an overall interpretation of each case.

The various scholars that deal with this method of qualitative research have identified several types and uses of case studies. Yin (1984), distinguishes between three types of uses of case study research: exploratory, descriptive, and explanatory. According to the author, *exploratory* use refers to case studies being used in a limited

scope as a pilot study in order to formulate more testable hypothesis and more precise questions. Exploratory case studies are condensed case studies, undertaken before implementing a large-scale investigation. Where considerable uncertainty exists about program operations, goals, and results, exploratory case studies help identify questions, select measurement constructs, and develop measures; they also serve to safeguard investment in larger studies. *Descriptive* case studies attempt to describe what a situation is like, usually considered the simplest form of research method since they more or less are based on mere observation and reporting. These case studies serve to make the unfamiliar familiar, and give readers a common language about the topic. Finally, Yin identifies the third use of case studies, as *explanatory* research, which is a useful method for studying processes in companies and also for clarifying, enlightening purposes. It is a method of learning about a complex instance through extensive description and contextual analysis, it is concerned with answering the *whys*, the *whats* and the *hows*.

In his work, Gummesson, E. (1991) provides a quotation by Kjellen and Soderman, who point to another use of case study research,

> "...To *generate theory* and as a means for *initiating change*...if a change process is going to succeed the researcher must have a fundamental knowledge of the studied organisation and its actors, an ability to develop a language and concepts that are appropriate to the specific case, and must concentrate on processes that are likely to lead to understanding -verstehen- rather than on a search for casual explanations." (Gummesson, 1991, p. 75)

This type and use of a case study is further supported by other scholars such as Meredith (1998) and Richardt and Cook (1979), who argue that rationalist/ quantitative methods of research are most appropriate for testing and verifying existing theory, while interpretive/ qualitative methods like case studies are best for generating and/ or extending theory. The authors go on to suggest that the rationalist methods are most appropriate in answering the *whats* and *hows*, while the case method is concerned with the *whys* as well as the *whats* and *hows*.

From the above presentation, it should become clear that the use of case studies in our empirical research combines both explanatory research and a means of generating theories, testing the model and initiating change. This is true particularly

since we have stated at the outset of this chapter that the immediate aim is to understand the processes within the SMEs under investigation, develop a 'tacit knowledge' and 'understanding' rather than a formal method of explicit theorising, and contribute to the Greek business world and the IT business sector of the Thessaloniki region by providing insights and policy recommendations of what needs to be done to bring SMEs of the 2nd and 3rd square, the 'collaborator' and the 'classical entrepreneur' to the optimal 'path-breaker', 1st square level.

In designing the research study, the common practice is to divide the factors of interest into three sets as Meredith (1998) argues,

1. Parameters: They define the population of interest and are held constant during the study. In a case study, the researcher controls these factors by selecting the situation or site to be studied. In our case, the parameters are the ICT SMEs in the Thessaloniki prefecture and specifically the four types of SMEs that we have described earlier. We have, thus, limited the cases to be studied only to the ones that fit our description and requirements.

2. Independent variables: These are the variables over which the researcher has some control, can monitor, select for or can manipulate to some extent and that is hypothesised to cause or influence the dependent variables. Because the researcher is usually limited in his/hers ability to monitor or control the number of independent variables we try to place as many as possible in the set of parameters that are held constant. In our case, the independent variables are the two axes of our model, namely the innovation rate and the clustering/networking level.

3. Dependent variables: These are the variables expected to be explained or caused by the independent variables and which the case researcher observes. In our case, the dependent variables, are the performance and growth of the SME, as we have described earlier in this chapter.

One has to realise that in a case study research we do not measure variables in the sample and statistically infer relationships, but rather, as previously stated, we directly observe the processes and use logic to deduce or infer relationships. Thus, it

is a situation more or less simulating a laboratory experiment or a complete survey and so the use of additional cases cannot be equated to an increase in the sample size but are more in the spirit of running the experiment at more depth. According to Meredith (1998, p. 447), in the process of trying to understand, we strive to identify the variables (the parameters are already defined by the case chosen) that affect the phenomenon, estimate their variability, determine their effect size, and understand their workings and relationships.

As Patton (1987, p. 51-52) states, the power of purposeful sampling lies in selecting *information-rich* cases for study in depth. Information-rich cases are those which we use in our model, they are the illustrative cases from which we can learn a great deal about the conceptual themes we have set out to investigate in this thesis. The author identifies several different strategies, sampling techniques, for purposefully selecting information-rich cases. In our case, the combination of two sampling procedures serves our purpose, the *extreme or deviant case sampling* and the *critical case sampling*. According to Patton, the *extreme case sampling* focuses on cases that are information-rich because they are unusual or special in some way with the logic that lessons can be learned from extreme conditions and outcomes, which are relevant and could help in improving other more typical cases. The aim is to think through cases from which we could learn the most, cases that can be extremely enlightening, and these are the cases we have selected for our research, four 'illustrative' types of SMEs', according to the conceptual framework we have identified and presented in our model.

The other strategy for selecting purposeful samples is to look for *critical cases*. According to Patton (1987), critical cases are those that can make a point quite dramatically or are, for some reason, particularly important in a scheme of things. The clues to the existence of a critical case are the statements to the effect that,

a) If it happens there, it will happen anywhere.
b) If it doesn't happen there, it won't happen anywhere.
c) If that group is having problems then we can be sure all the groups are having problems.

(Patton, 1987, p. 54-55)

Hence, the most important point in the critical case sampling is to select the site, in our case the company, which would yield the most information and thus. will contribute to the creation of knowledge in the conceptual framework under investigation. The four types of SMEs we have studied are considered illustrative cases and we have focused on gathering data that will enable us to understand what is happening in each of the cases. Each case is particularly important deepening our knowledge in the overall scheme of regional competitiveness of the Thessaloniki area in the context of innovation and networking/clustering.

As it has already been emphasised, qualitative evaluations, and case study research in particular are interested in descriptive data; they focus on interactions and processes, try to understand a social situation from a participant's perspective, to describe events and actions scientifically without using numerical data, they are explanatory in nature and try to interpret the dynamic reality behind things. This is of great importance for 'testing' the conceptual framework that we have elegantly placed in the two-dimensional model and it describes what we aim to gain from the field-research. In the next few paragraphs, we briefly describe how we can achieve rigor in case studies, avoiding an extended analysis of this issue, which would be above the scope of this thesis.

Case studies are governed by the same, but different in nature, principles of evidence and proof as are the more quantitative methods of research. The difference is in the methods used to achieve the rigor in case studies. According to Lee (1989) and Meredith (1998), case studies can attain each of the four requirements of the rigor. controlled observations, controlled deductions, replicability and generalisability, as shown in the following table, and discussed below.

Methods to meet the requirements for rigor

	Controlled observation	*Controlled deduction*	*Replicability*	*Generalisability*
Rationalism	Laboratory or statistics	Mathematics	Results	Assumptive
Case	Natural	Logic	Theory	Theoretic

Table 3, Source: Meredith, 1998, p. 448

Controlled observations in case studies are attained through natural controls. rather than laboratory or statistical controls, the same controls that an astronomer or a

geologist typically uses. According to Lee (1989) and Meredith (1998), the natural controls rely on the proper selection of the parameters, which are held constant during the research, while others are left free to vary as they would. For example, in a case study factors such as, managerial policies, inventory systems can be the parameters 'held constant', while others such as, costs, defect rates, profits can be left free to vary as they would naturally. Thus, according to the authors, case and field studies achieve the same ends through natural methods that experiments and statistical methods achieve through direct control of the independent variables.

As Lee. (1989, p. 40) states, "mathematics is a subset of formal logic, not vice versa. Logical deductions in the general case do not require mathematics. A case study that performs its deductions with verbal propositions (i.e. qualitative analysis), therefore, only deprives itself of the convenience of the rules of algebra; it does not deprive itself of the rules of formal logic to which it may still turn when carrying out the task of making *controlled deductions*." Hence, since formal logic encompasses mathematics, the requirement of controlled deductions, as shown in table 3 above, can be achieved by applying the rules of formal logic to verbal propositions arising from the case and/or field research. An example according to the author is the theory of evolution, which was logically deduced by Darwin through statements and words not through statistics, mathematics and numbers.

Replicability is attained in quantitative research methods by achieving the same results when the study is precisely duplicated, same parameters, independent variables, dependent variables and controls (Meredith, 1998). Since in case studies replicating the exact same conditions in another situation is not fully achievable replicability can be achieved according to the authors by applying the resulting case study theory to a somewhat different set of conditions, for example in our case, by testing the model in different types of organisations in either the manufacturing or the service sectors of the economy, large enterprises, different regions, etc. The author argues that although the result might be a different prediction, the same theory is being tested.

The inherent need of researchers and scholars to generalise the findings and the knowledge gained from any survey is widely recognised. In quantitative methods, *generalisability* is easily achieved to a certain extent through statistical means and large-scale surveys covering representative samples of the population. According to Lee (1989), the researchers who do algorithmic and/or statistical modelling often

suggest that their results are highly generalisable because they apply to any situation and time period where the assumptions hold while the findings from case and field research have little generalisability because the results are only valid for the specific case's characteristics and situation. On the other hand, the researchers that favour case studies argue that the theories/ arguments developed from case studies are applicable to other similar situations, which have the same population parameters, or even to non-similar to the original case study but where the theory still applies and predicts different results. Furthermore, the author argues that scholars who do case and field studies put forward that mathematic and statistical modelling have little generalisability because real situations are much more complex than the simplified and codified reality assumed by rationalists and that no real situation can ever satisfy all the assumptions on which the findings are originally based. Norman (1970), amongst many other scholars, suggests that generalisability can be achieved in a case study, as follows,

> "If you have a good descriptive or analytic language by means of which you can really grasp the interaction between various parts of the system and the important characteristics of the system, the possibilities to generalise also from very few cases, or even one single case, may be reasonably good…the possibilities to generalise from one single case are founded in the comprehensiveness of the measurements which makes it possible to reach a fundamental understanding of the structure, process and driving forces rather than a superficial establishment of correlation or cause-effect relationships." (Norman, 1970, p. 53)

The case study method allows for the exploration and testing of the conceptual framework we have developed, as well as the analysis of data derived from observing, documenting and decoding the behaviours, processes and actions of the managers and staff in the four SMEs. As indicated above, the case study approach calls for the application of multiple methods of data gathering and analysis, involving different permutations of participants and the application of different types of research questions within a range of settings. It entails the collection of both quantitative and qualitative data, including surveys, content analysis, statistical analysis of secondary data and observation, and the evaluative synthesis of these different data sources to

provide an overall interpretation of each case. The general sequence we pursue in each of the four case studies is the following:

i. Observe events and ask questions (interviewing) with open-ended answers. In addition, administer in a face-to-face interview two questionnaires, one on innovation and one on clustering/networking in order to gain some crude operational, quantifiable and comparable data.
ii. Record/log what is said and/or done.
iii. Interpret (personal reactions, write emergent speculations or hypothesis, monitor organisational methods and processes).
iv. Return to observe, or pose more questions to people in the organisation.
v. Recurring cycles of steps 2-4, iteration.
vi. Formal theorising, after approximately a week researching each SME.

One of the major advantages in conducting a case study research is the flexibility that one can obtain and the easiness by which we can change strategies and adapt to the circumstances of the particular SME. As far as secondary data are concerned (i.e. financial records, human resources records and historical and other official data and statistics that each company has), we obtain most of them upon request, apart from those that were 'classified'. According to Pole and Lampard (2002), once, in a research project, any primary data have been collected existing data may serve to contextualise these new data or at least help in the assessment and critical review of their representativeness. The two methods of primary data collection that we use in our empirical research are observation and interviewing, which we explore in some detail below.

Observation is a method of data gathering, which involves a highly complex set of activities in which the researcher interfaces with the research setting and the emerging data at a number of levels. In more detail, Foster (1996) provides a definition of observation arguing that,

> "Observation is a matter of collecting information about the nature of the physical and social world as it unfolds before us directly via the senses rather than indirectly via the accounts of others. But observation is more than just this. Our minds must make sense of the data they receive. To do this we order.

interpret and give meaning to incoming information. Physical objects are recognised and categorised, their category labels symbolising their key features and qualities. Similarly by employing our existing knowledge, conceptual schemata and theories, we recognise and give meaning to the human behaviour we witness." (Foster, 1996, p. vii)

There are several advantages to observational fieldwork for qualitative evaluation and research, as Patton (1987) identifies. First, by direct observation the researcher is able to understand and evaluate the context in which operations and actions are taking place, thus obtaining a holistic perspective. Second, the evaluator can be inductive-discovery oriented in approach, since he/she can directly experience the phenomenon and the day-to-day operations of the organisation. A third advantage of observational methods is the opportunity for the researcher to observe things that he/she could have missed out during the interview process. The researcher can find out if he/she has obtained all the available and relevant material. A fourth strength identified by the author is that the researcher can gain information and knowledge that would otherwise be unavailable, missed out or even that the managers would be unwilling to talk about in the interview. Fifth, observation methods give the evaluator the opportunity to make his/hers own perceptions part of the data, which enables him/her to present a more comprehensive view of the issue, in our case the organisation, being studied. Last but of no least importance, being close and observing firsthand the physical and social settings, permits the researcher to use personal knowledge and experience in understanding and interpreting the situation. This is beyond what can be fully recorded even in the most well structured questionnaire and/or detailed and in-depth interview.

Interviews involve the collection of data through talking to respondents (interviewees) and recording their responses. Pole and Lampard (2002) keep their definition of an interview fairly loose in order to accommodate the range of different kinds of interviews, which exist.

> "Viewed this way, then, an interview is a verbal exchange of information between two or more people in which the interviewing person aims at gathering information from the other(s)." (Pole and Lampard, 2002. p. 126)

Interviews are usually conducted by telephone or face-to-face. In our research we chose the latter method the case study research with the four SMEs.

According to the authors, face-to-face interview methods vary from in-depth, unstructured or semi-structured (i.e. structured questions without response codes) methods to highly structured, pre-coded response questionnaires, or they can involve a combination of the two. Sometimes, measurement instruments are handed to the respondents (self-completion or self-administration measurement scales) to complete themselves during face-to-face interviews. As Patton (1987, p.108-109) argues, the purpose of interviewing, then, is to allow us to enter the other person's perspective. For the author, depth interviewing involves asking open-ended questions, listening to and recording the answers, and then following up with additional relevant questions.

According to Patton (1987) and Pole and Lampard (2002), the advantages of face-to-face interviews are that interviewers can probe fully for responses and clarify any ambiguities, more complicated and detailed questions can be asked, more information and of greater depth can be obtained, inconsistencies and misinterpretations can be checked, and that there are no literacy requirements for respondents. Furthermore, the scholars argue that open-ended questions can be included to enable respondents to give their opinions in full on more complex topics. They also provide rich and quotable material, which enlivens research reports.

The three choices to collecting qualitative data through in-depth, open-ended interviews, according to Patton (1987) are,

i. *The informal conversation interview*. This method relies entirely on spontaneous generation of questions and in the natural flow of an interaction that goes on along with the direct observation of situations, actions and circumstances. The questions arise through the context of the conversation.

ii. *The general interview guide approach*. This method is an interview based on a list of questions and subjects that are to be explored in the course of the interview. The list is prepared to give an overall guide to the conversation and ensure that same or at least similar questions will be asked from a number of people within the same area or between different case studies. The guide provides a framework within which the

interviewer would develop questions, initiate discussions and focus in greater depth if more information is needed.

iii. *The standardised open-ended interview*. According to the author, the standardised open-ended interview consists of a set of questions carefully worded and arranged for the purpose of taking each respondent through the same sequence and asking each respondent the same questions with essentially the same words. Flexibility is, thus, limited, while the questions are written in advance in exactly the way and sequence they are going to be asked, more or less like filling a questionnaire, also not allowing for unanticipated topics or issues that could arise during the interview.

(Patton, 1987, p. 109-114)

In our thesis, we have decided to proceed with a combination of all the styles of interviewing, namely an *informal conversation interview*, the *general interview guide approach* and the *standardised open-ended interview*. This enables us, as discussed above, to plan and have a list of open-ended questions, subjects and issues to discuss with the personnel and the managers/owners of the four SMEs, while we also trigger a spontaneous conversation with the key-personnel to get information and knowledge that could be missed out during the guided interview. Furthermore, as we briefly mentioned in the last section of chapter three, in order to enhance the operational measures of innovation and clustering/networking, the comparability of the results between the four different SMEs, and to 'triangulate' the collected data from the case studies, and in general to limit several of the drawbacks of the qualitative research as we explored them earlier in this section of the chapter, we constructed two questionnaires, one on innovation and one on clustering/networking (see appendix 2 and appendix 3, in appendices, end of thesis).

Within the framework of social science research, any questionnaire should be viewed as a multi-stage process commencing with the appropriate definition of the variables to be examined and concluding with the interpretation of findings and results. Proper research methodology, strategy and techniques presuppose that in creating a questionnaire every step needs to be designed carefully since the final results will only be as good as the weakest link in the questionnaire process. Questionnaires may be inexpensive to administer compared to other data collection methods, however, this was not the criterion in our choice to use a questionnaire.

Indeed, in our case each questionnaire was personally administered to the appropriate board of directors and managerial team of every company that was included in the case study sample while their answers were gathered in face-to-face interviews. Such a survey technique, as the face-to-face interview enhances the validity and credibility of the responses minimizing the pitfalls related to dealing with an impersonal mailed questionnaire.

According to Sudman and Bradburn (1982), in general, there are two types of questions on which we designed the questionnaire, *open format or closed format.* Open format questions are those that ask for unprompted opinions. In other words, there are no predetermined sets of responses, and the participant is free to answer however he/she chooses. Open format questions are good for soliciting subjective data or in cases where the range of responses is not tightly defined. An obvious advantage is that the variety of responses should be wider and would, thus, more truly reflect the opinions of the respondents. This increases the likelihood of receiving unexpected and insightful suggestions, for it is very difficult if not impossible, even for more seasoned researchers, to predict the full range of opinion. Open format questions have also several disadvantages. First, their very nature requires them to be read individually. There is no way to automatically tabulate or perform statistical analysis on them. They are also open to the influence of the reader, for no two people will interpret an answer in precisely the same way. Finally, open format questions require more thought and time on the part of the respondent. Whenever more is asked of the respondent, the chance of tiring and/or boring the respondent increases.

As the authors suggest, closed format questions usually take the form of a multiple-choice question. There is no clear consensus on the number of options that should be given in a closed format question. Obviously, there needs to be sufficient choices to fully cover the range of answers but not so many that the distinction between them becomes blurred.

Closed format questions offer many advantages in time and money. By restricting the answer set, it is easy to calculate percentages and other hard statistical data over the whole group or over any subgroup of participants. Closed format questions also allow the researcher to filter out useless or extreme answers that might occur in an open format question.

In addition to choosing the forms of the questions, one will also choose the form of the answers. Answers can be indicated in an *open-ended or closed-ended*

fashion. In the former, no limit is put on the choice of answers, while in the latter the respondent must choose from the available responses.

Several types of closed-ended questions and open-ended questions were used in the different sections of the questionnaire (see appendix 2 and appendix 3. in appendices, end of thesis) as shown below,

- Dichotomous

  Description: Question offering two choices

  Example: Questionnaire on innovation, Q.1 *Were there innovative activities in your company in the 5 year period between 1998-2003?*

  ❑ Yes (If the answer is yes there is a list of innovative activities to be filled appropriately)
  ❑ No

- Numeric

Description: Respondent specifies a particular value (can include decimal places)

Example: Questionnaire on Innovation, Q.4 *What percentage of sales do innovative products represent?*

List products/percentage (1998-2003)……..

- Likert scale

Example Questionnaire on Clustering/Networking, Q.2 *Listed below are some of the various fields and objectives of business clustering, networking and strategic alliances. Please check the appropriate degree in which the various fields and objectives concern the clustering/networking activities of the company in the 5-year period from 1998 to 2003.*

Not Important		**To**		**Very Important**
1	**2**	**3**	**4**	**5**

Responses to questions and statements are measured here along a scale. Likert scale consists of a series of graded responses indicating degree of agreement with a statement, such as strongly agree, agree, neutral, disagree, strongly disagree. Scales usually have from 5 to 9 response categories with which to indicate strength of agreement. Of course, the scale could also be labelled as in our case to indicate degree of importance or any other dimension.

- Unstructured (open-ended)

Description: Question that respondents can answer in an unlimited number of ways?

Example: Questionnaire on Clustering/Networking Q. 7 *How many new markets has the company entered as a result of cooperating with other businesses and/or from being part of an established network of interrelated companies belonging to the same or adjacent industrial sectors? (This includes first time foreign markets penetration and diversification of market fields.)*

.....

.....

The questionnaire on innovation was structured based on the descriptive characteristics of our two-dimensional model and the guidelines of the Oslo Manual and Eurostat. For the aims of the questionnaire only, we segregate innovation as it concerns the process, the product or the technology. For the rest of the case study, the operational definition we use to measure the rate of innovation is the one proposed earlier in this chapter, namely innovation as defined by Schumpeter (1942, p. 66). In this respect, the Oslo Manual (1997), p61-63 gives the following useful definitions:

> *"Process innovation* is judged to be the significant alteration of technological production processes or products, which aim at the improvement of production levels or the improvement in our products. In this respect is usually included new machinery and know how, new techniques and strategies or both.
>
> As *technological innovation* is considered the significant change in production processes or products; and concerns its application to the production process (process innovation) or introduction of new products to the market (product innovation).

Product innovation is considered the manufacturing or introduction of a technologically new product so that the consumer has significantly or totally new benefits in using the specific product.

On the other hand, what does not constitute innovation are minor changes (of either technological or aesthetic nature) affecting characteristics of a product, which are not considered to be significant, cannot be judged as innovations. For example, one cannot consider as innovation the change of a fabric's colour or the change of the percentages of mixing natural and synthetic fibres.

Adding new machinery or replacing some machinery with newer models which are already available and used by competitors, does not constitute innovative management action in contrast to managerial action in which the company acquires and introduces in its production process machinery or accessories which is unknown to the rest of the sector. ." (Oslo Manual, 1997, p. 61-63)

On the other hand, the questionnaire on clustering/networking was based on the descriptive characteristics of our two-dimensional model and the operational definition we use to measure the level/degree of clustering/networking as proposed earlier in this chapter. In this respect, since these two concepts cover a variety of cases, we proceed by adopting an operational definition capable of measuring the performance of the SMEs in networking/clustering as follows:

i. Business cooperation (agreement) for combined research and development of new products and services.
ii. Networking (cooperation) with the local/regional/national technological and educational institutes and research centres for R&D purposes, as well as for the attraction and employment of young scientists.
iii. Strategic alliances with other firms for the purpose of entering new markets; sales and logistics; and/or extending distribution networks.
iv. Collaborating with government agencies and public institutions for R&D purposes.
v. Part of an establish network of interrelated companies belonging in the same or adjacent industrial sectors.

For a period of one week we were physically present observing and interviewing key personnel in each of the four SMEs studied. Each one of the following 4 chapters will present our findings. At this point, we present below some of the key questions (mainly open-ended questions) and topics guiding our interviews and fieldwork:

- Situation analysis of the firm: (a) *Company's internal position* (structure, financial situation, marketing organisation)

- What is the organisational structure and HRM structure of the company?
- Where does the balance of power lie?
- What is the company's, if any, particular philosophies?
- What are the key characteristics of the company?
- Who are the decision-makers for each functional area, if any?
- How do the lines of communication operate?
- What is the business strategy of the firm?
- What are the formal and informal decision-making structures operate?

(b) *Market analysis* (market structure, customers),

- What is the market size?
- What are the trends in the market and how is it structured?
- Which part, segment or customer(s)/group(s) is the company targeting?

(c) *Competition* (key players, market share, competitive position),

- How is the market share divided amongst competing organisations?
- Who is the market leader?
- On what basis are the key players and the organisation competing?
- What marketing strategy is the company following, leader, challenger, niche?

- How and to what extent does the central government, the regional government and the local government encourage inter-firm relationships?
- How and to what extent does central government and regional government provide support to firms on technological and on financial matters?
- How and to what extent do business associations stimulate information exchange between firms?
- How and to what extent do universities, research institutions, and training institutions provide direct support to organisations in terms of education and technology?
- Are large firms and/or multinationals encouraging the development of networks and supplier relationships?

- Particularly for those organisations that show high networking/clustering performance:

- How is the network/cluster organised?

- How loosely/tightly bounded?
- Is there a cluster management?
- Is there a formal structure?
- How do actors in the cluster/network communicate?
- What is the main vehicle of communication and exchange?
- Is there a mutual awareness that the firms or enterprises are involved in a common enterprise? What is the nature and level of interaction among the different kinds of institutions, including the firms, that comprises the 'case'?

▪ Particularly for the two SMEs that score high on innovation performance the additional questions could be as follows:

- Is the company systematically and purposefully pursuing innovation?
- What are some examples of innovations (product, process or services)?
- Description of the most prominent sources of innovative ideas?
- How and to what extent did certain innovation help financially or otherwise the company?

4. Conducting the case studies research

According to the analysis of the previous section, a case study methodology is the most effective and appropriate approach to our fieldwork. As we indicated earlier in this chapter we chose the ICT sector of Thessaloniki, Northern Greece to conduct the case studies. In order to validate our model we selected four companies that met the requirements of the four illustrative cases. This was achieved by getting in contact with the General Manager Mr. Spyros Ignatiadis, of SEPVE, the Association of Information Technology Companies of Northern Greece. SEPVE has currently more than 200 member companies all operating in Northern Greece. Searching through the database of the association provided to us by SEPVE we identified 10 companies with characteristics, which would qualify them, at first sight, as target companies for our research. The next step was to get in contact with the managers of the companies and through a short telephone interview to establish which four came closer to the typology we have outlined in chapter three for each of the four illustrative cases. Over the telephone interview, we used the questionnaires (see appendix 2 and 3) that we have constructed to measure the relative scores of each company in the dimensions of innovation and clustering/networking.

The next step in our research was to see in person the following people and arrange for the period they would grant us to visit their companies and carry through our research: Messrs. Evangelos Chatzikos, CEO and Senior Director of Techneco Hellas (the '*classical entrepreneur*' type of SME) Vasileios Thomaidis, President and CEO of Compucon S.A. (the '*path-breaker*' type of SME), Antonis Gialamaidis, Managing Director of Oktabit S.A. in Northern Greece (the '*survivor*' type of SME), and Anastasios Tzikas, Managing Director of Singular Software S.A. (the '*collaborator*' type of SME). At this point, I have to highlight the fact that because of the friendship with the four persons named above I was granted the permission to use their names, company titles and other information as was necessary, as well as more importantly to conduct our research, interviews, observation and collection of data, as I felt appropriate.

The third step was to spend approximately 7 working days in each one of the four companies. Multiple methods of data gathering and analysis, involving different

participants and the application of different types of research questions within a range of settings were used. The basic research questions asked were outlined in the section above, while the questionnaires administered to the management team of each company can be seen in appendices 2 and 3. Both quantitative and qualitative data, including in-depth interviews, content analysis, statistical analysis of secondary data (such as financial data of the SMEs) and observation, and the interpretative synthesis of these different data sources help to provide an overall scheme of each case. In the following pages, we present in brief some useful data concerning the name and location of each company, the names and hierarchical positions of each person we interviewed in-depth and the nature of data they provided to us. At this point, we should mention that field notes from the case studies research such as questionnaires, income and balance statements, human resource figures, cassettes from the interviews, etc. are available upon request.

Case Study I – "Classical Entrepreneurs"

The case study was conducted at Techneco's Headquarters-Offices, 3 Nikiforou Ouranou Str. Thessaloniki. It lasted 7 days and included interviews with the executive team of the company and the financial director:

- Mr. Evangelos Chatzikos, Founder, CEO and senior Director. Interviewed about innovation and business networks/clustering.
- Mr. Dimitris Chatzikos, General Manager and executive Director. Interviewed on Human Resource issues, ISO certification, and business strategies. Interviewed about the range of products and services as well as.
- Mrs. Stella Chatzikou, President and executive Director. Interviewed about the range of products and services, as well as innovation and business networking issues.
- Mrs. Chaido Tsaknaki, Financial Director. Interviewed about the financial situation of company, provided the relevant charts and figures.

The company's CEO answered the questionnaires on innovation and clustering/networking with the appropriate aid from the rest of the executive directors and management teams where it was felt necessary. The methods used during the case study, were observation, interviewing and collection of secondary material. The information given to us by the executive directors and management teams has been to some extent tape-recorded while some is kept in the form of notes.

Case Study II – "Path-Breakers"

The case study was conducted at Compucon's Headquarters, 14th Km Thessaloniki/Moudania Highway. It lasted 7 days and included interviews with the management team of the company:

- Mr. Vasileios Thomaidis, President and CEO. Interviewed about innovation and business networks/clustering.
- Mr. Dimitrios Routos, Vice President, General Managers. Interviewed about innovation and business networks/clustering.
- Mr. Dimitris Tiliaveridis, Sales & Marketing Director. Interviewed about marketing and sales issues, provided the relevant tables and charts.
- Mr. Sotiris Dourdoumas, Financial Director. Interviewed about the financial situation of company, provided the relevant charts and figures.
- Mr. Pericles Alexandrides, Technical Director. Interviewed about the range of products and services, as well as innovation and business networking issues.
- Mr. Costas Demopoulos, Quality Manager. Interviewed on Human Resource issues, ISO certification, and business strategies.

The company's CEO answered the questionnaires on innovation and clustering/networking with the appropriate aid from the rest of the management team where it was felt necessary. The methods used during the case study were observation, interviewing and collection of secondary material. The information given

to us by the management team has been to some extent tape-recorded while some is kept in the form of notes.

Case Study III – "Survivors"

OKTABIT Partners Network conducted at Oktabit's Northern Greece Offices, 7 Frixou Str. & Nikiforou Ouranou, Thessaloniki. It lasted 7 days and included interviews with the executive team of the company and the financial director:

- Mr. Antonis Papaioannou, Founder of Oktabit, Managing Director of Oktabit S.A. in Central and South Greece. Interviewed about innovation and business networks/clustering.
- Mr. Dimitris Papaioannou, General Manager. Interviewed on Human Resource issues, ISO certification, and business strategies.
- Mr. Anlexandros Papaioannou, Commercial Manager. Interviewed about the financial situation of company, provided the relevant charts and figures. Also interviewed about marketing and sales issues, provided the relevant tables and charts
- Mr. Antonis Gialamaidis, Founder of Victor Hellas, Managing Director of Oktabit S.A. in Northern Greece. Interviewed about innovation and business networks/clustering. Interviewed on Human Resource issues as well.

The company's Managing Director answered the questionnaires on innovation and clustering/networking with the appropriate aid from the rest of the executive directors and management teams where it was felt necessary. The methods used during the case study were observation, interviewing and collection of secondary material. The information given to us by the executive directors management teams has been to some extent tape-recorded while some is kept in the form of notes.

Case Study IV – "Collaborators"

The case study was conducted at Singular's Headquarters, 10A Dodekanisou Str. Thessaloniki. It lasted 7 days and included interviews with the management team of the company:

- Mr. Anastasios Tzikas, Founder, Managing Director and Member of the BoD of Delta Singular Group of Companies. Interviewed about innovation and business networks/clustering.
- Mr. Ioannis Charalambidis, Deputy General Manager. Interviewed about innovation and business networks/clustering. Also interviewed on Human Resource issues, ISO certification, and business strategies.
- Mr. Dimos Aravanis, Commercial Director. Interviewed about the range of products and services, as well as innovation and business networking issues. Also interviewed about marketing and sales issues, provided the relevant tables and charts.
- Mr. Michalis Chavouzis, Financial Director. Interviewed about the financial situation of company, provided the relevant charts and figures.
- Mrs. I. Staiou, Quality Manager. Interviewed on Human Resource issues, ISO certification, and business strategies.

The company's Managing Director answered the questionnaires on innovation and clustering/networking with the appropriate aid from the rest of the management team where it was felt necessary. The methods used during the case study were observation, interviewing and collection of secondary material. The information given to us by the management team has been to some extent tape-recorded while some is kept in the form of notes.

In each and every company, I was granted the permission to move around and ask the personnel of company about anything that would prove useful to our research having as ultimate goal the understanding, as fully as possible, of the operations of each company that would justify its position in the relevant square of our two dimensional model. Furthermore, the research aim was to delineate the distinctive characteristics that differentiate each one of the four companies in terms of their relative scores in each of the two dimensions of our model. Having the opportunity to literally walk around the premises of each company, talk to people and observe how the work is actually carried out I had the opportunity to test if the answers I was getting in the questionnaires and the interviews from the managing directors actually described the true state of affairs in the company. We do realise, of course, that in order to get an in-depth understanding of the company's particular organisational culture and tacit knowledge we would to spend much more time in each company and to interview more people with different and complementary skills, but this would far exceed the scope of this thesis. Nevertheless this 'perceptual triangulation', the accumulation of multiple entities as supporting sources of evidence to assure that the facts being collected are indeed correct offered us the opportunity to gather those qualitative and quantitative data, such as, interviews, memoranda, business plans, organisational charts, tools and other physical artefacts, questionnaires and observations of managerial or employee actions and interactions necessary to validate our model. Having been able to spend 7 working days in each company, gave me the opportunity to return back to people in different departments, observe and pose more questions that were not planned at the onset of our research, but which consequently proved very important to our formal theorising. Finally, the general sequence pursued in each of the four case studies was the following:

i. Observe events and ask questions (interviewing) with open-ended answers. In addition, administer in a face-to-face interview two questionnaires, one on innovation and one on clustering/networking in order to gain some crude operational, quantifiable and comparable data.
ii. Record/log what is said and/or done.
iii. Interpret (personal reactions, write emergent speculations or hypotheses, monitor organisational methods and processes).
iv. Return to observe, or pose more questions to people in the organisation.

v. Recurring cycles of steps 2-4.

vi. Formal theorising, after approximately a week researching each SME.

5. Concluding Remarks

In this chapter, we present and explain the rationale for selecting the IT business sector of Thessaloniki, Northern Greece to conduct our empirical case studies research and validate our two dimensional model. Furthermore, we briefly introduce in the realm of qualitative research the approach defined as "case study", which constitutes the main methodological approach of our research. In the last section, we present how the case studies were conducted in the four selected companies.

Our empirical research is based on case studies of four SMEs we have selected. The procedure of structuring each case study lead us to spend a week's time of physical presence on the premises of each company. The research is based on interviews with managers and/or owners of each company, two structured questionnaires administered to the managing directors and/or the board of directors, direct observation of the operations of the organisation and acquisition of secondary data that we kindly requested each company to make available to us such as financial performance indicators etc. The process of selecting the four companies presupposed that each one met and satisfied all the necessary characteristics of each one of the four 'illustrative' types of SMEs of our model.

In each one of the following four chapters, namely chapter 6 through 9, we present the case study and fieldwork research findings of each one of the SMEs we selected using as criterion each of the four types of SMEs of our hypothetical, descriptive two-dimensional model. The focus of our research is the IT sector of the Greek economy and, in particular, the Thessaloniki geographic area. We chose four SMEs that belong to the same industrial sector, since this enhances the comparability of the results by keeping some parameters constant for all SMEs. The tenth and final chapter of this thesis will serve as an epilogue integrating our theoretical and empirical positions and serving as springboard for suggestions for future research and policy implementation efforts.

Chapter 6

Case Study I – '*Classical Entrepreneurs*' – Techneco Hellas

1. Introduction

Characteristics of the 'Classical Entrepreneur'- Techneco Hellas

High Innovation rate

- **6** - New goods introduced between 1998-2003
- **64%** - Average percentage of sales of innovative products between 1998-2003
- **6.8%** - Percentage of funds allocated to R&D and innovative activities as part of total turnover
- **45%** - Percentage of R&D personnel as part of total personnel employed

Moderate to Low Performance/growth

- **33%** - Human resource growth between 1999-2003
- **93%** - Total turnover percentage change between 1999-2003
- **-70%** - Pre-tax profits percentage change between 1999-2003
- **1.3%** - Pre-tax profits as percentage of total turnover in 2003

Very low Clustering/Networking level

- **1** Company – **0** Distributors – **0** Universities – **0** Research Inst., the company is cooperating with in 2003
- **0%** - The company is not cooperating with any firm and/or institution for the development of new products
- **0** – There are no co-developed products
- **0** – Foreign markets penetration **0** – new market fields between 1998-2003

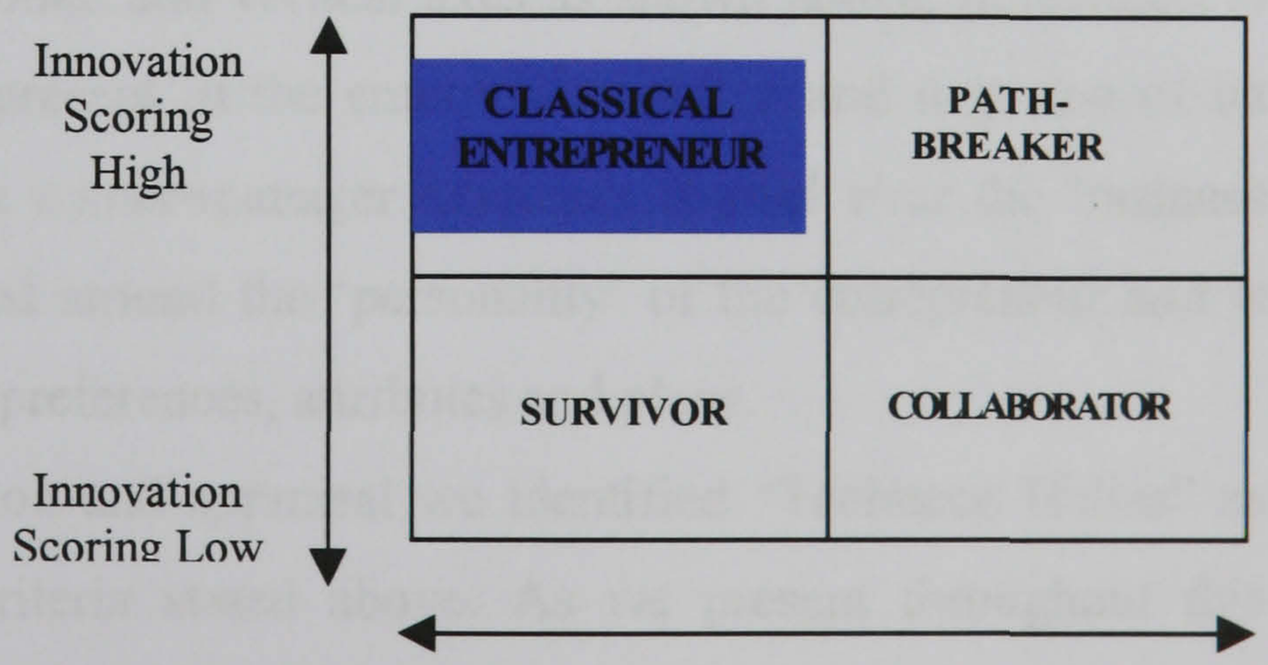


Figure 1, the 2-dimensional model

1st illustrative SME – 'classical entrepreneur'

In the opening section of chapter 6, we find it necessary to present the major key findings of the first case study, the SME type we assigned the name 'classical entrepreneur' so that the reader can have a condensed but explicit overview of the company's particular scores on innovation rate, clustering/networking level and overall performance/growth. Four parameters are used to measure the relevant scores of each of the independent variables, namely the innovation rate and the clustering/networking level, and the dependent variable, namely the performance/growth of the company. At the bottom right corner of the previous page, there is a small figure of our hypothetical, descriptive two-dimensional model highlighting the position and the symbolic name we assigned to the 1st illustrative type of SME in our 2-dimensional model.

As we suggest in the scheme presented and identified in chapter 3, the SME of the 'classical entrepreneur' type exhibits high innovation performance but it scores very low on networking and strategic alliances showing preference to go-it-alone strategy, usually a strategy followed by the classical entrepreneur. We name this SME *'Classical Entrepreneur'*, because the owner and/or manager of the company does not wish to engage in strategic alliances as he/she does not see the need for it or simply does not process the knowledge and expertise and the adequate managerial abilities to pursue such a strategy. It is the type of SME where the entrepreneur is very reluctant to engage in inter-firm alliances and networks since he/she wants to protect his/her innovations believes in his/her own abilities and pursues a go-it-alone strategy in competing in the market place. In the present chapter, we aim to provide an in-depth analysis of the 'classical entrepreneur', focusing on its innovation performance and clustering/ networking strategies and on several other indicators relevant to the conceptual themes of the horizontal and vertical axes as shown above. Innovation is systematically pursued and is present in the enterprise's policy and it is one of its main components. Usually, the owner-manager exercises control over the business since such an SME is structured around the 'personality' of the entrepreneur and is highly dependent upon his/hers preferences, attributes and plans.

After careful investigation and appraisal we identified "Techneco Hellas" as the ideal SME meeting the criteria stated above. As we present throughout this chapter and as shown schematically in figure 1 above, Techneco shows a high innovation record as revealed by the number of 6 innovative products that the company introduced in the market in the 5-year period between 1998-2003. In its total

sales volume, 64% come from innovative products and 6.8% of the total turnover is spend on innovative activities and R&D costs, while 45% of its total workforce are employed in the R&D department. On the other hand, Techneco Hellas shows a very low, virtually non-existing clustering/networking performance record. The company apart from 1 cooperation agreement with the Delta Singular Group of companies in promoting and supporting their ERP software products, in the 5-year period under examination has not engaged in any other networking and cooperating activities. Thus, the company has not developed and launched any products through business cooperation agreements and/or by cooperation with educational and research institutes. Furthermore Techneco has not diversified its market fields nor penetrated through clustering/networking activities any foreign markets in the years 1998-2003. Finally, as shown in figure above the 'classical entrepreneur' type of SME exhibits moderate to low sores in our dependent variable of performance/growth. In terms of total turnover the company's percentage increase was 93% and the increase of its human resource capital was 33% over the five-year period 1999 to 2003. On the other hand, pre-tax profits percentage decreased substantially, falling by 70% over the same five-year period. The low performance of the company is also illustrated by the very low amount of pre-tax profits, which stand at mere 1.3% as part of the total turnover.

Techneco's core business includes the design, development and installation of Communication Networks, Application Software Programs and the development of new Information Technology Systems. A high technology company of Greek origin operating and competing in the IT sector of the Northern Greek economy it is located in the Thessaloniki area where it was founded in 1987. Mr. Evangelos Chatzikos' the Founder, Senior Director and CEO of Techneco initial goal and primary vision was to own and operate his own IT Company. As the founder of Techneco explained to us during the interview, the economic and environmental conditions in the IT market of Northern Greece motivated him toward the establishment of the company. Furthermore, he always felt the desire and was attracted to the challenge and excitement of creating something novel, of developing innovative products and solutions combining new technologies and his educational background and academic experience as a professor in the IT and Automation department of the T.E.I (Technological Education Institute) of Thessaloniki.

The company's core business activities are comprised of the design, installation and support of communication networks, Local Area Networks (LANs)

and Wide Area Networks (WANs) and the Industrial Automation and New Technologies, which include telecommunication networks, telematics and the design and development of Water Resource Management applications and products. Furthermore, Techneco designs, develops and provides its own application software programs and also operates as the distributor of third party application software products for the Delta Singular Group of Companies as it is a certified Value Added Reseller, a Singular Business Centre. The business activities of Techneco Hellas appeal to both small and medium enterprises as well as to large-scale and Hi-end organisations.

2. Situation, Market and Competition Analysis

In this section, we attempt a brief investigation of the company's internal structure and organizational culture, drawing attention particularly to HRM practices, the financial situation, marketing and competition assessment.

From the inception of the company to the very recent past, the development of the company was largely the result of the efforts, activities and entrepreneurship of Mr. Evangelos Chatzikos, the Founder and CEO of Techneco Hellas. This has resulted in the concentration of procedures and activities around one specific person a reality that presented a significant business risk. Coming into terms with this business risk, during the last few years, Mr. Chatzikos embarked upon a series of remedial actions, which included the appointment of a three-member Directors' team and the employment of two persons responsible for the day-to-day business administration of Techneco. Mr. Evangelos Chatzikos, as shown in the following figure, is in control of the majority of the company's shares, while the two other shareholders are the two executive directors Mr. Dimitris Chatzikos and Mrs. Stella Chatzikou the Founders' brother and daughter respectively who hold an aggregate of 30% of the company's shares.

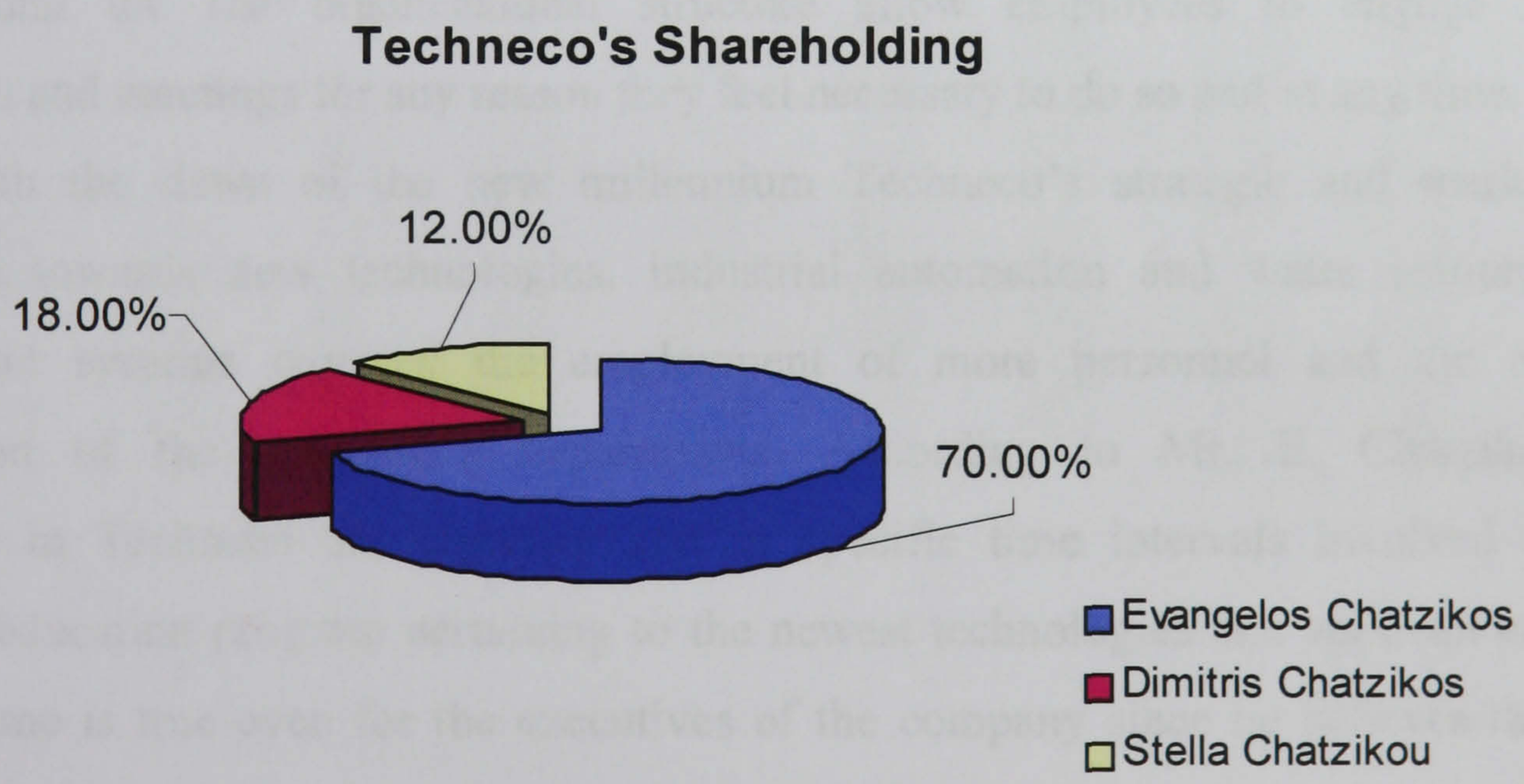


Figure 2, Techneco's Shareholding 2003

As the founder of Techneco explained to us during the interview, and as it can clearly be seen in the above pie chart the company is a 'typical' family business. The Founder and CEO explains that in a family business like Techneco the structure and distribution of ownership –who owns how much of the company– has a profound effect on the company's business activities, operation and strategy. The management team and the executive directors team decide the day-to-day operation and management of the company including the responsibilities and the authorities of every job in the company collectively, but top-management decisions and strategic orientation are solely the domain of the Founder and CEO of the company.

Techneco Hellas is a small sized enterprise that employees 20 people. Techneco's facilities are organised under a complete 'flat' structure. All the company's offices are located in one flat and it is easily noticeable that walls or screens do not separate offices, desks and cubicles and there is no sense of isolation among its employees. The only office isolated in a separate area in the corner of the flat is the CEO's office. As Mr. E. Chatzikos explained to us during our interviews he operates with "an open door policy" and so most of the time his office's door is open and anyone can interrupt him, about anything and at any time. As he said, the only times that the 'door closes' is during some private conversations and meeting with employees, customers and the executives of the company. Although the company is using a sophisticated management information system, the proximity of the different facilities and the flat organisational structure allow employees to engage in discussions and meetings for any reason they feel necessary to do so and at any time.

With the dawn of the new millennium Techneco's strategic and market orientation towards new technologies, industrial automation and water resource management systems required the employment of more personnel and the re-organisation of the company's departments. According to Mr. E. Chatzikos employees in Techneco are regularly and in specific time intervals involved in continues education program pertaining to the newest technologies and applications, and the same is true even for the executives of the company since he believes that they have to keep themselves up-to-date with technological changes, and customers needs. Table 1 below provides an overall allocation of personnel by department. As Mr. Chatzikos further explained to us, 9 persons representing 45% of the company's workforce are engaged in R&D activities; 3 in the application software department

and 6 in the production department. It becomes clear that for a small company like Techneco R&D is of utmost importance.

Workforce Allocation by Department (2003)

Executive-Administration Department	3
Business Administration Department	2
Financial Department	2
Application Software Department	4
Production Department (industrial automation, communication networks, etc.)	9
Total	**20**

Table 1, Techneco Hellas, Personnel by Department 2003

Techneco Hellas has shown a significant growth of its human resource capital borne out by the fact that in the past 9 years the number of personnel employed in the company has increased substantially from 9 persons in 1995 to 20 persons in 2003 as shown in the figure below.

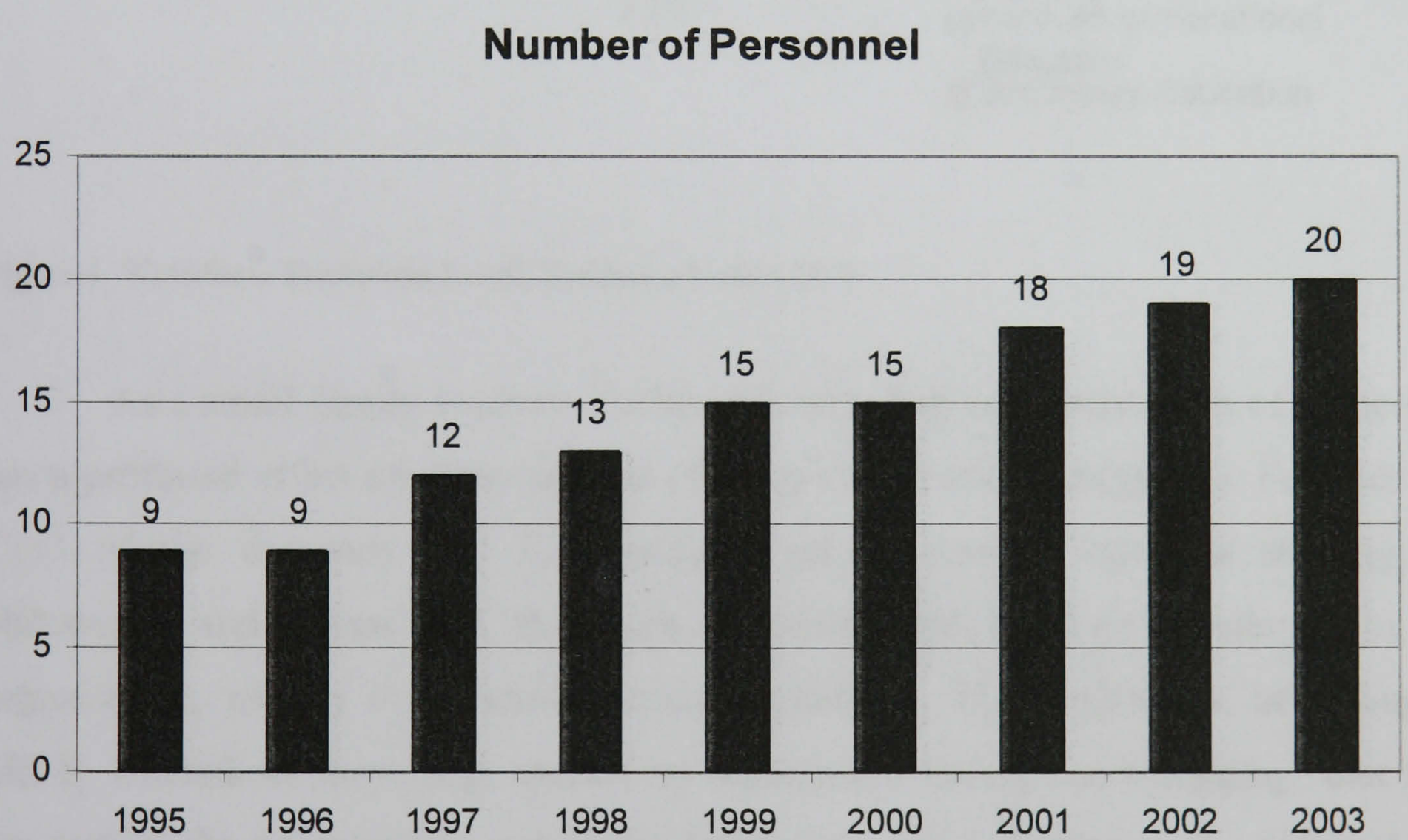


Figure 3, Number of Personnel, Techneco Hellas

Another important characteristic of the company's human resource capital is that the majority of the personnel are well educated. Techneco's focus on people is reflected in the investment it makes in building a pool of talented individuals, 35% of

staff hold a University degree and 15% have Postgraduates degrees, as shown in the following figure 4. Another 40% of the company's employees are graduates of Technological and Vocational Institutes. The executive directors believe that one of Techneco's strong features is the dedication and commitment of its employees who combine their knowledge and skills in providing innovative products and top-quality services.

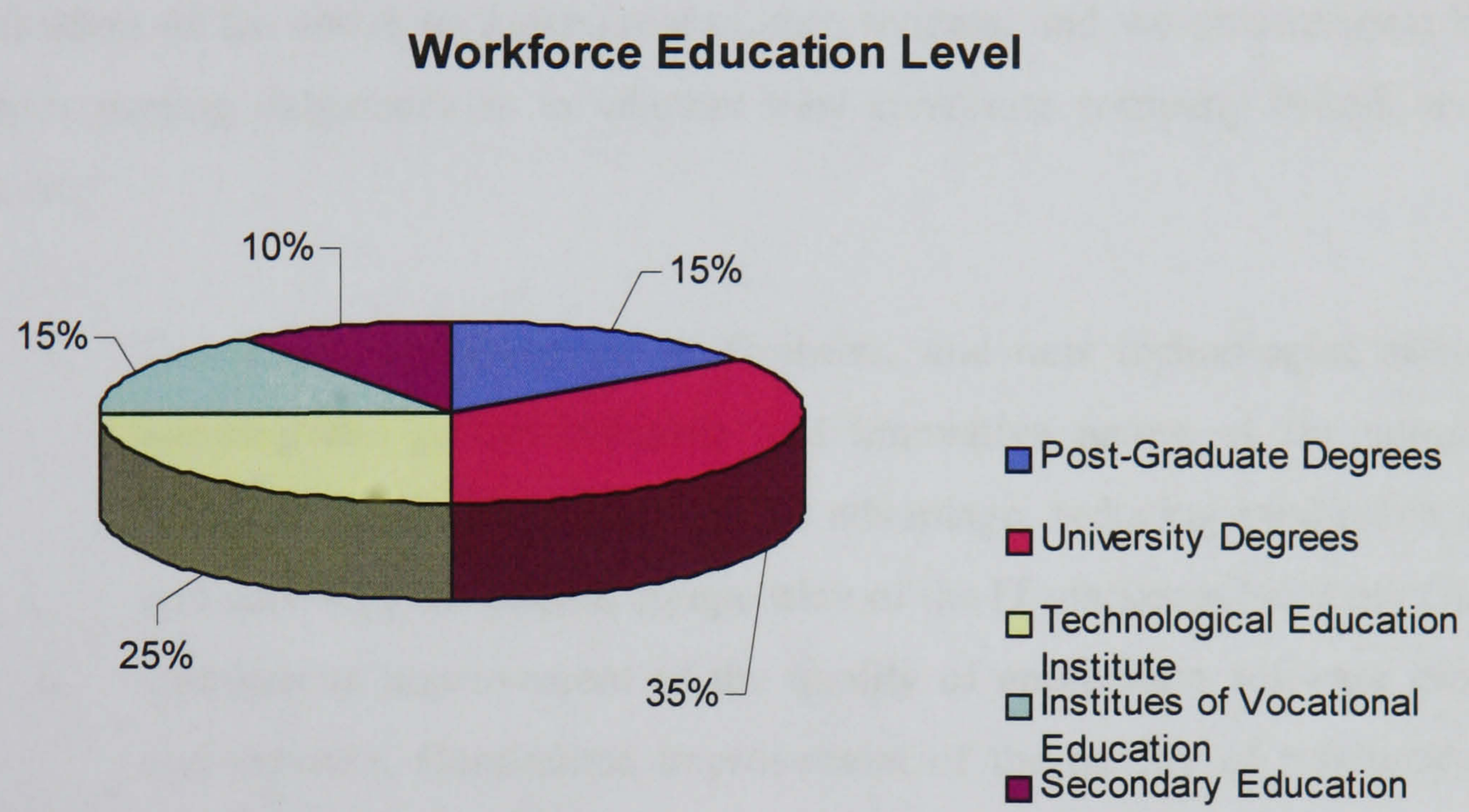


Figure 4, Workforce Education Level, Techneco Hellas 2003

As a small family business Techneco's structure and distribution of ownership has a profound effect on many aspects of its operation and strategy. The Founder and CEO of the company Mr. E. Chatzikos set Techneco's business strategy, its philosophy and values and these are communicated to every employee in the organisation, usually in person-to-person interaction. The employees, according to Mr. E. Chatzikos, show high morale by acquiring a feeling 'of belonging' that they are part of the organisation and of the family and are dedicated to the survival and future success of the company. Being the sole leader of the company, Mr. E. Chatzikos believes that internal stakeholders (executives, managers and employees) appreciate the lack of confusion about the owner's directives, and there is less risk of missing an opportunity as it happens in companies where disagreeing owners struggle for in-company dominance. As Mr. Chatzikos argues, being the sole leader of the company makes life easier for the organisational environment, banks, creditors,

customers and suppliers, as they have direct contact with him when they need to make a decision.

Techneco's strategic objective is the development of cutting-edge industrial automation products and water resource management systems. Techneco's organisational culture and philosophy is the establishment and maintenance of the social and innovative character of the company, which Mr. E. Chatzikos assumes characterises the company. The following general statements were related to us in verification of the above organizational culture scheme, and we present them below without passing judgement as to whether they constitute company beliefs or mere rhetoric:

i. Continuous improvement of facilities, and new technologies aiming at securing the ground breaking and innovative nature of the company's products, maintaining competitive advantage, reducing production costs, and surviving the intense competition of the IT market in Northern Greece.
ii. Continuous improvement of the quality of application software products and services. Continuous improvement of the quality of production and installation activities.
iii. Differentiation and expansion of product lines, aiming at fully exploiting the company's accumulated knowledge and know-how in communication technologies, telematics and Water Resource Management Systems.
iv. Retain the family character of the company, since Techneco does not aim to grow into a larger enterprise.
v. The company aims at designing and developing innovative products that provide solutions to environmental phenomena, weather related problems and potential disasters.

The financial data presented in the following figure (total turnover and pre-tax profits) illustrate the moderate performance and the financial situation of the company. Mrs. Tsaknaki, the financial manager of the company, explained to us during our interview that the immediate aim of a small company like Techneco is to survive. As seen in the following figure, the company has a reasonable total turnover over the years but the pre-tax profits had dropped to an all time low of just €5,000 in 2000. As the Financial Director explained in the past few years, the company

managed to gather some funds from European and Greek research programs, it has restructured its organisational procedures, employed more personnel and altered its strategic objective focusing more on new technologies and industrial automation. The results of these efforts will be visible by the end of the year 2003 as well as in the years to follow. Techneco's estimates for the year 2003 suggest an increase in total turnover by more than 65% and a 100% increase in pre-tax profits in relation to year 2002.

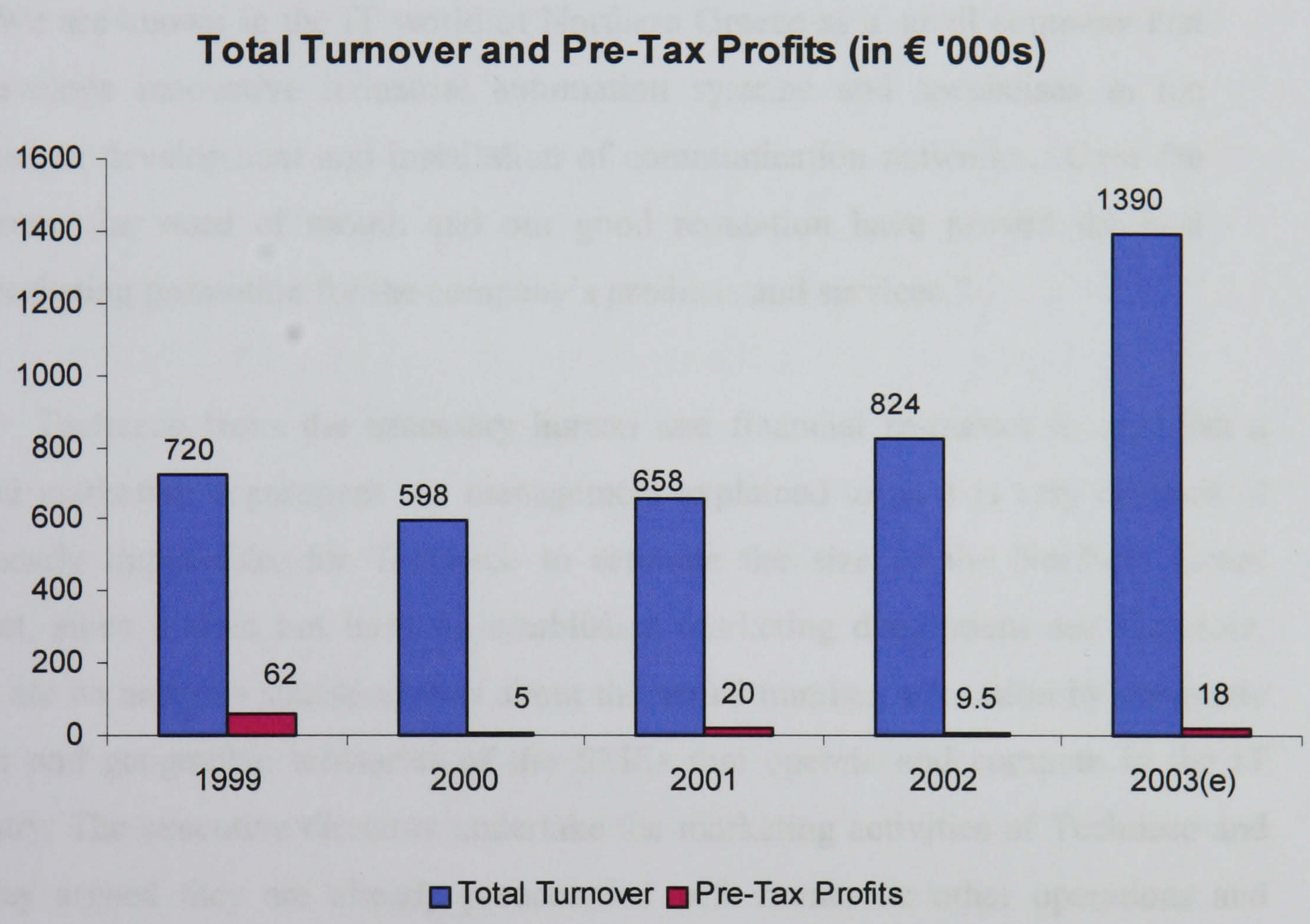


Figure 5, Techneco's Financial Position

According to Mr. Dimitris Chatzikos, the General Manager, Techneco operates exclusively in Thessaloniki and Northern Greece and does not aim to expand its activities elsewhere in Greece or in International markets. Furthermore, as the General Manager explained to us during the interview, when a system is installed, such as an ERP and/or an Industrial Automation System or a communications network, it is then very difficult, expensive, time and resource consuming for his customer to change the installed system with another IT company's product. In other words, especially in the large scale and Hi-end enterprises and organisations it is all about establishing long-term agreements. This is why Techneco as Mr. D. Chatzikos

argues is investing in establishing and maintaining the reputation of a 'respectable and honest' company. Once the company installs one of our systems, as the General Manager argued, then Techneco is responsible for updates, modifications, support, customisations and a series of other support services that are profitable to the company. The executive directors place huge importance on the reputation of the company. They believe that it is one of the Techneco's competitive advantages. As they said,

> "We are known in the IT world of Northern Greece as a small company that develops innovative industrial automation systems and specialises in the design, development and installation of communication networks…Over the years, the word of mouth and our good reputation have proved the best marketing promotion for the company's products and services."

Techneco lacks the necessary human and financial resources to establish a formal marketing department. As management explained to us it is very difficult, if not nearly impossible, for Techneco to estimate the size of the Northern Greek market, since it does not have an established marketing department and therefore, there are no accurate statistical data about the actual number, allocation by economic sector and geographic territories of the SMEs that operate and compete in the IT industry. The executive directors undertake the marketing activities of Techneco and as they argued they are already preoccupied with numerous other operations and activities of the company.

The directors of the company explained to us that the introduction of IT in the business world of Northern Greece and more specifically of greater Thessaloniki area is a very slow and arduous process,

> "People and businesses, particularly SMEs are not used to and do not want to pay for the provision of IT services. SMEs, who comprise the majority of the businesses in Northern Greece, do not invest in new technologies and information systems…somehow they do not see the need to invest in them. They avoid the necessary training on new technologies and introduction of communication networks and application software programs that at the end of the day will increase their competitiveness and performance. Industrial

Automation Systems, ERP systems and communication technologies were 'words unknown' to the industrial sector of Thessaloniki a few years ago. Quite often we had to travel ourselves to large industrial complexes and try to explain to people the importance and effectiveness of IT and new technology systems, and sell our products. Greece is paddling far behind our European Partners in the introduction of IT to all economic sectors and we simply do not see how and when we will catch up with them…"

Nonetheless, the executive directors believe that the IT sector of Greece is probably the most rapidly expanding economic sector of the country, despite the general setback of the Greek economy in the past two years that has affected it. They believe that a central reason to this is the high education level of the people who manage and work in IT companies. They also believe that the IT sector has over the years acquired a "halo" effect as being one of the most prestigious economic sectors.

Furthermore, according to the General Manager, Mr. D. Chatzikos, Techneco due to their high-level of services, trustworthiness and expertise in communication technologies has managed to create long-term relationships in the Northern Greek market with a wide range of very important clients some of which are the following; three Municipalities in the greater Thessaloniki area, the Technological Education Institute of Serres, the University of Macedonia, several Institutions of Vocational Education (Pythagoras, Xini, and others) and 2 Inland Revenue branch offices in Thessaloniki.

3. High Innovation Rate

Techneco Hellas is a small 'family' company that develops and provides its own software application programs, distributes and supports software programs developed by the Delta Singular Group of Companies; furthermore it develops industrial automation solutions, water resource management (WRM) systems, and designs and installs communication networks.

As Mr. Chatzikos explained to us during our interview, Techneco Hellas was originally set up in 1987 under the name of Techneco Computers. The core activity of the company was the assembling of personal computer systems, which were sold under the brand name of Techneco Computers in the markets of Northern Greece. The company would import all the parts necessary to assemble a P/C from Japan or other Asiatic markets and then either configure them according to market demands and distribute them to retail shops or produce customised systems according to the particular needs of their individual customers and SMEs.

By the beginning of the 1990s, complete P/C systems imported from Taiwan and Japan were sold at very competitive prices in the Greek market, while domestic competition in the P/C assembling market was rapidly increasing. Techneco, faced with the increased competition, decided to change its strategic orientation and turned to the market of application software products and communication networks. As Mr. Chatzikos explained to us, by assembling computer systems and setting them up with the necessary software for individuals or companies the personnel of the company had developed the basic 'know-how' in designing communication networks while they were already engaged in the distribution and customisation of application software programs of other IT companies. Furthermore, using its accumulated knowledge in the design and development of hardware electronic solutions, and the academic knowledge of Mr. Chatzikos Techneco also moved to the Industrial Automation, Telematics and New Technologies market. A small R&D department was established to enhance these new business activities. The company's strategic and market orientation had changed from one of assembling P/C systems to an IT company, which placed most of its emphasis in the development of new technologies and innovative products and solutions. Techneco, by the end of the 1990's, became a

certified Singular Business Centre, promoting and supporting the Delta Singular Group of Companies range of products in the Thessaloniki area. Furthermore, the company expanded its activities in the field of telecommunications networks.

A central mission statement for the founder of the company that reflects on his values, the 'family' nature of the company, and especially on innovation and social character is the following,

> "We invest in new technologies and we place innovation at the core of our business philosophies and strategy. The purpose of our business is not profit maximisation but rather to contribute to society. We simply aim to survive year-by-year by achieving a reasonable 'income' for the family and our employees."

In this section, we explore the high innovation rate/performance of the 'classical entrepreneur' type of SME by examining and presenting both 'quantitative data' from the analysis of the questionnaire on innovation, and 'qualitative' data derived from our case study and the interviews with the company's management team. Mr. Evangelos Chatzikos, the Founder and CEO of Techneco Hellas answered the questionnaire on innovation, with the appropriate aid from the rest of the executive directors and management team where it was felt necessary (see appendix 4, in appendices, end of thesis, for a complete list of the team and their responsibilities). Throughout the presentation of the innovation rate of the 'classical entrepreneur' type of SME, the findings of the questionnaire are enriched and elaborated by the qualitative data and examples of innovative products and processes that were gathered during our case research. As we explained in chapter 3, the operational definition of innovation that we use to measure innovation in our case study is based on the Schumpeterian sense of defining innovation as the carrying out of new combinations. This concept covers the following five cases:

i. The introduction of a new good – that is one with which consumers are not familiar yet– or a new quality of a good.
ii. The introduction of a new method of production, that is one not yet tested by experience in the branch of manufacture concerned, which need by no means

to be founded upon a discovery scientifically new, and can also exist in a new way of handling a commodity commercially.

iii. The opening of a new market, that is a market into which the country in question has not previously entered, whether or not this market has existed before.

iv. The conquest of a new source of supply of raw materials or half-manufactured goods, again irrespective of whether this source already exists or whether it has first to be created.

v. The carrying out of the new organisation of any industry, like the creation of a monopoly position (for example through trustification) or the breaking up of a monopoly position. (Schumpeter, 1942, p.66)

Objectives of innovative ideas

In this section, we examine whether there were product/service and/or process innovative activities in the company for the 5-year period between 1998-2003. In particular, in the first part of the following table, we distinguish the innovative activities in three parts and present the number of innovations for each part. The introduction of new products/services is the one of the four core measuring parameters of the innovation rate of the company as we presented it in the opening scheme of this chapter. The second part of the table presents the main innovative activities of the company concerning the production process.

Objectives of Innovative activities
Innovative activities in the company in the 5-year period between 1998-2003

Introduction of new products/services	
In the Greek Market	6
Internationally	0
Creative improvements of specific characteristics and properties	
In the Greek Market	2
Internationally	0
Copying other products/services	
Copying products/services available in the Greek market	0
Copying products/services available in the Greek market but not produced locally	0

To the production process	
Revamping existing machinery	**Yes**
Raw materials	No
Utilising intermediate products or by-products	**Yes**
Organisation & rationalisation of production phases	No
Energy conservation	No
Lessening percentage of defective products	**Yes**
Improving working conditions	**Yes**
Lowering warehousing costs	No
Lowering labour costs	No
Lowering product design costs	No

Table 2, Question 1, Questionnaire on Innovation, Techneco, 2003.

As we can see from the above table, Techneco has introduced in the Greek market a significant number of innovative products in the time period under examination. In particular, Techneco has introduced 6 innovative products in the 5-year period achieving a very high innovation rate in the particular parameter. Innovative activities for Techneco correspond to the introduction of new products, the creative improvements of specific characteristics and properties of products already produced in the company, and the creative design and installation of communication networks. Moreover, innovations are present at the production process as well by revamping existing machinery, utilising intermediate products and/or by-products and improving working conditions, lessening the percentage of defective products. The innovative activities in the production process are distinguished by the yes/no entry concerning the fields in which the company invests. The directors team and the management team suggested to us that in order to put forth the significance and the

rate of innovation for Compucon it would be necessary and appropriate to take a careful view of the processes through which product lines of the company evolved.

A core activity of the company concerns industrial automation activities and investment in new technologies. As we discussed earlier, Mr. Evangelos Chatzikos always felt the desire and the challenge to create innovative products and solutions combining new technologies with his academic experience and education knowledge in the field of IT and automation. In 1997-8, Techneco designed and developed the first water resource management system in Greece and a pioneer product worldwide. It was initiated by the need to control and record the pollution of the port and the sea of Thessaloniki. According to Mrs. Stella Chatzikou (daughter of the Founder Mr. Chatzikos), the President and executive director of Techneco, technology brings out an immense growth generating a need for more and better services, innovative products but also of social character and sensitivity. As Mrs. Chatzikou explained to us during our interviews,

> "My father developed the water resource management system because he felt he should do something to control and restrain the pollution of the port of Thessaloniki and of the sea surrounding the town. He wanted to contribute to society. Soon afterwards he realised the potentials of his innovation and altered the strategic orientation of the company."

Mr. Chatzikos engaged the company in intense R&D activities in order to develop a product that would appeal to the environmental needs of Thessaloniki. '*Andromeda'* was constructed and placed in the Thermaikos gulf of Thessaloniki. The system was sold to the Organisation of Water and Sewage of Thessaloniki, a large public organisation. '*Andromeda'* uses three devices placed in the Thermaikos gulf of Thessaloniki that measure data in real-time and are on-line connected with the Headquarters of the Water and Sewage Organisation of Thessaloniki. It has the capacity to measure and control the pollution of the gulf (ph, temperature, % of oxygen, etc.), and to collect several other data. These data can be used in the planning and organisation of several activities related to fishing.

Mr. Chatzikos realised the potential of his innovation and altered the strategic orientation of the company. With the onset of the new millennium, he has strengthened his beliefs in investing in new technologies. Techneco using its

accumulated knowledge and expertise in the design and development of communication networks and the 'Andromeda project' saw several new business opportunities and developed several spin-off and intermediate products.

'*Interisk early warning and risk analysis'*, water resource system is used in rivers and lakes across Northern Greece. Such systems can measure through numerous telematics devices and sophisticated communication networks not only the pollution of the water, but also have the ability to predict environmental phenomena and water-related disasters, such as river overflows, the percentage of downpour, etc. The system can also detect the case of increased toxic waste being dumped in cross-national lakes and rivers.

'*Machine Vision'* is another water resource management system that can monitor and control a town's Water supply networks and prevent any maliciously intended or non-intentional contamination of its water supplies. Furthermore, the company developed and launched a system of automatic and telematics-coordination of water and sewage systems.

In addition, the company using its accumulated know-how in the telematics, communication networks and water resource systems developed an automatic fire detector and extinguishing system for the forest surrounding the Thessaloniki area. The system can detect the increased temperatures and automatically alert the Headquarters of the fire department.

According to the five cases of the operational definition of innovation, we provided earlier in this section, the water resource management systems product range reflects a 'new combination'. The complete range were new products, which consumers were not familiar with when they were first presented (case i). The company opened for the first time ever an entire new market of water resource management systems in Greece while it also created a monopoly position domestically for such products (cases iii and v).

Sources of innovative ideas

In this section, we examine some of the various sources from which companies usually derive ideas for process or product/service innovations. They may be logically divided in two broad categories, internal and external to the organisation sources. The

analysis was made with the use of closed-format question/answer based on a Likert scale, while the graphs produced and presented follow the structure of the question and analyse separately the internal and external sources of innovative ideas. The following figure, 'Internal Sources', shows the different degrees of importance in which the various internal sources of the organisation contributed to innovative ideas in the 5-year period

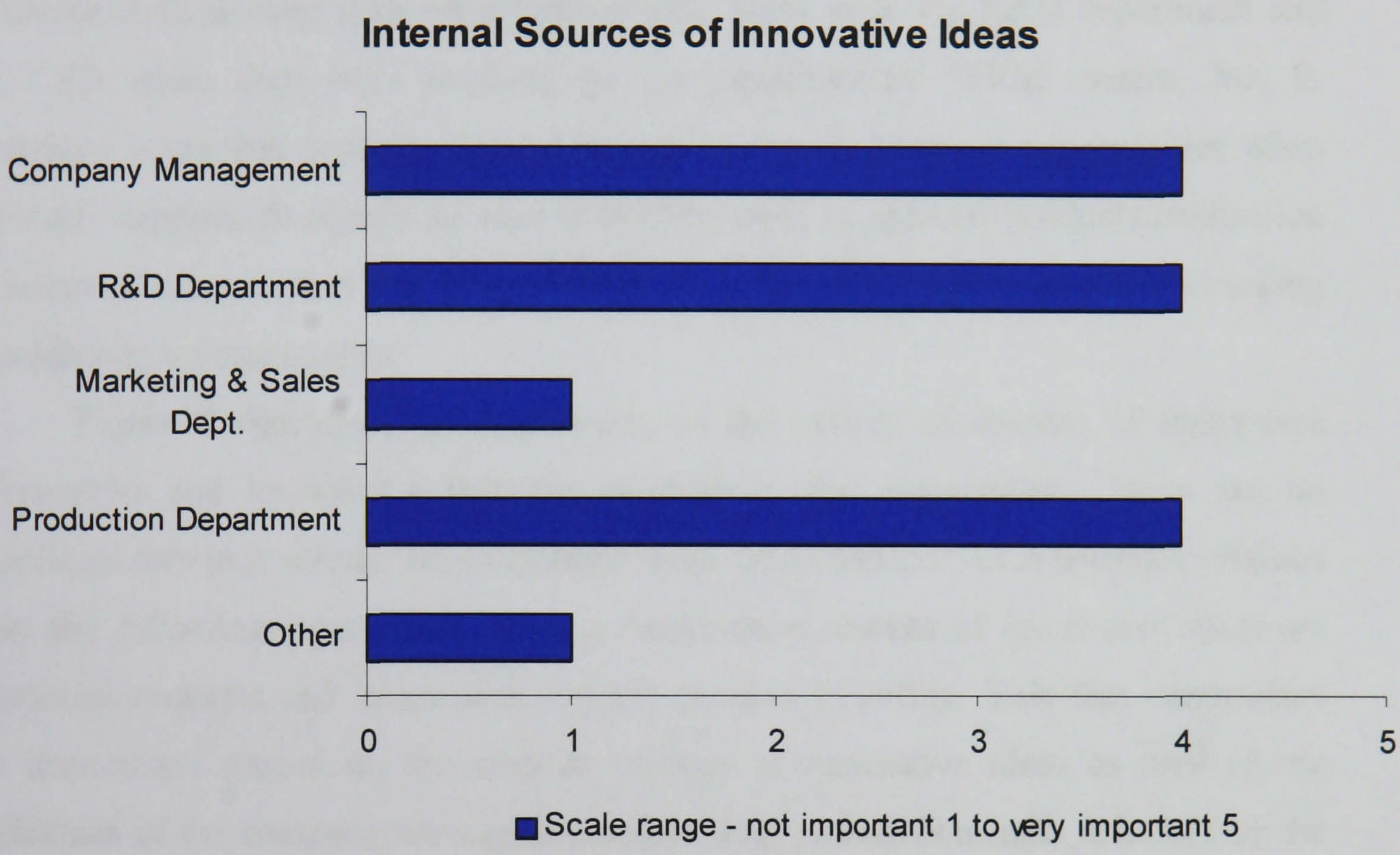


Figure 6, Question 2, Questionnaire on Innovation, Techneco, 2003

What emerges from this figure is that company management the R&D department and the production department are considered as very important sources of innovative ideas. Techneco's strategy and philosophy is based on commitment to continuous research and development to introduce breakthroughs in hardware technology. Literally, every product in the field of industrial automation, and WRM systems started as an innovative idea that was developed into an innovative product. The R&D is the cornerstone of our company, argues the executive team, and this is reflected by the number of people working in the department, namely 9 out of a total number of 20 that the company employs. For example, the R&D department has only recently designed and developed the forest fire detection and extinguishing system, as we have seen above using advanced telematics, telecommunication and WRM

technology. The R&D department is also designing and developing telecommunication and videophone networks combining existing technology with its own software solutions to produce creative solutions and customised networks.

According to the CEO, the company's philosophy and experience in the domestic market together with its solid technical infrastructure and expertise enable the company to engage dynamically in new IT areas and activities. The Fire detection and extinguishing systems, the *Interisk early warning and risk analysis* 'Water Resource System were spin off entrepreneurial ideas from the R&D department and the CEO when they were working on the 'Andromeda' WRM system. Mr. E. Chatzikos is capable and experienced enough to see the business opportunities when the R&D department comes up with something new, or spin off products (utilisation of intermediate products and by-products). He is an entrepreneur constantly seeking new ideas to commercialise.

Figure 7 illustrates the importance of the variety of sources of innovative information and knowledge that are external to the organisation. There are no significant external sources of innovative ideas for Techneco. As it becomes obvious from the following figure, only average importance sources of innovative ideas are customers requests and innovation support programs/funding. This fact emphasizes the importance placed on the internal sources of innovative ideas as well as the preference of the company for a go-it-alone strategy, which is usually followed by the 'classical entrepreneur'.

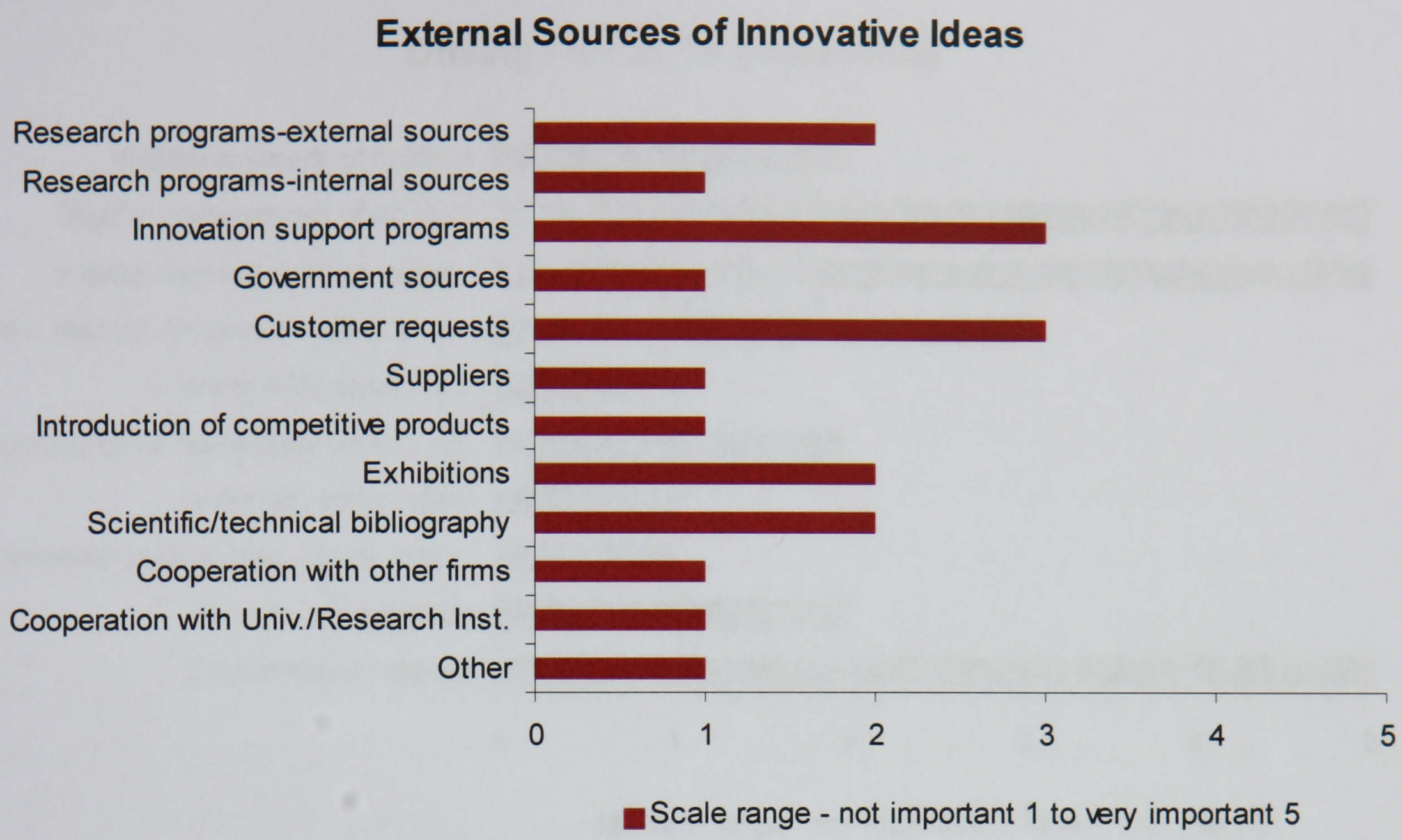


Figure 7, Question 2, Questionnaire on Innovation, Techneco, 2003

Driving forces for innovations

In this section, we examine some of the various driving forces for the introduction of product/service innovations and/or process innovations. In figure 8 the different degrees of importance in which the various driving forces contributed to the introduction of innovations in the 5-year period examined are presented. The most important driving forces for innovations turn out to be the quality improvement of products, the increase/expansion of the products capabilities and environmental issues, which as we explained earlier is central to the values and philosophy of the company, and its Founder.

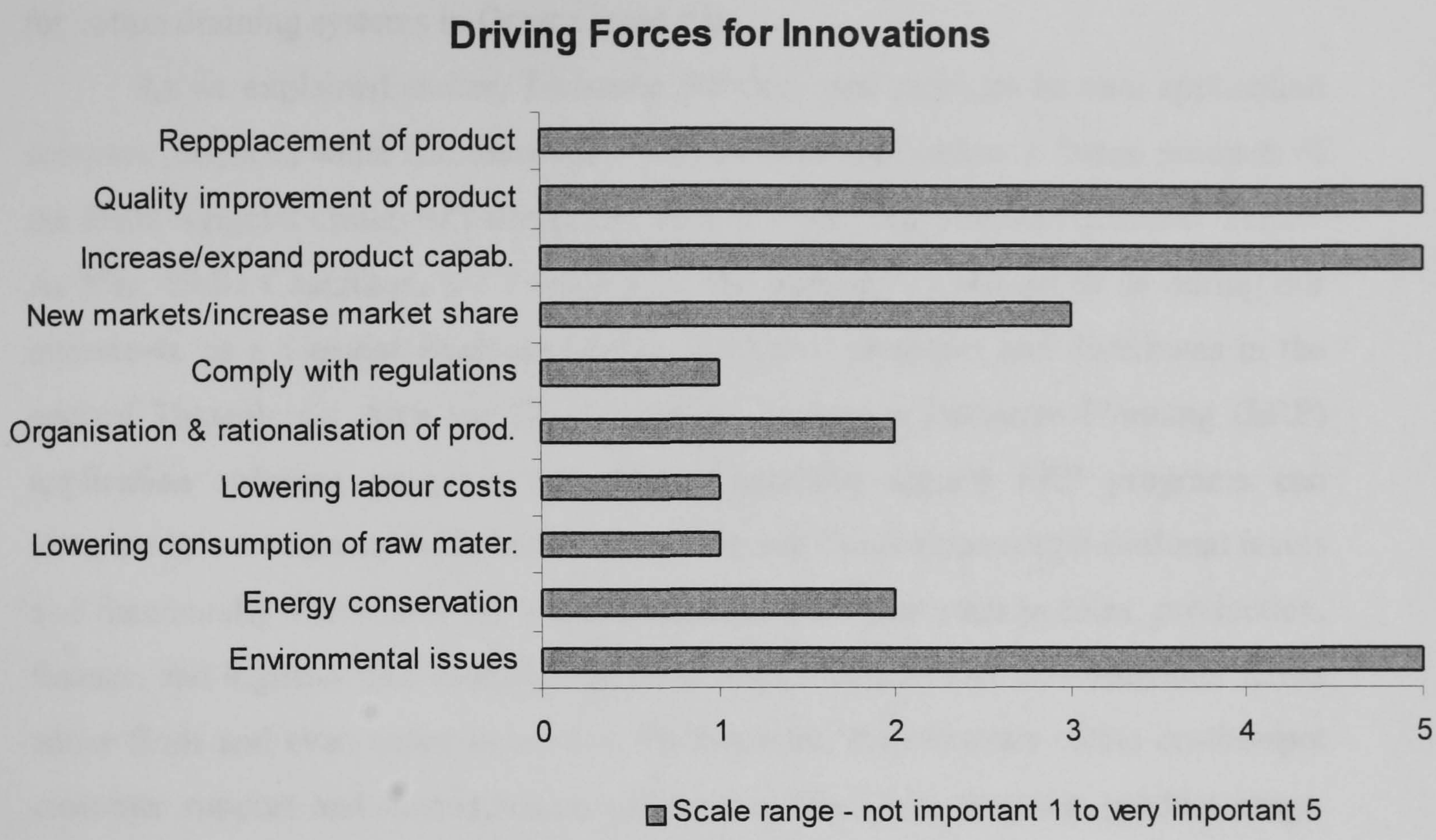


Figure 8, Question 3, Questionnaire on Innovation, Techneco, 2003

Over the past few years, Techneco is designing and developing videoconferences and telecommunication systems. According to Mr. Chatzikos, the Founder and CEO of the company a telecommunication system is a collection of compatible hardware and software arranged to communicate information from one location to another. Telecommunication systems using wireless transmission, cellular telephones, ISDN lines etc., can transmit text, graphic images, and voice or video information.

Techneco has acquired the necessary know-how and expertise in new technologies; telematics, application software products and communication networks that allow it to design and develop customised industrial automation systems. As Mr. E. Chatzikos explained to us during our interview, one of the numerous innovative industrial automatic systems Techneco has designed is an automatic cotton draining system for a large Thessaloniki-based company. According to the five cases of the operational definition of innovation we provided in chapter 3 and earlier in this section, the automatic cotton draining system reflects another 'new combination'. It is a product that was designed from scratch, custom made to the particular needs of the specific company and as such the consumers were not familiar with when it was first

developed, installed and presented (case i). The company again opened a new market for cotton draining systems in Greece (case iii).

As we explained earlier, Techneco develops and provides its own application software products, while simultaneously it distributes application software products of the Delta Singular Group of Companies, as it is a certified Singular Business Centre. As Mrs. Stella Chatzikou, the President of the company explained to us during our interviews, as a Singular Business Centre, Techneco promotes and distributes in the general Thessaloniki Area the Delta Singular Enterprise Resource Planning (ERP) application software programs. As Mrs. Chatzikou argued ERP programs can integrate into a company-wide business process that flows across organisational levels and functionally interrelates the various business processes such as sales, production, finance, and logistics thus enabling the coordination of activities and decisions across entire firms and even entire industries. Furthermore, the company offers on-the-spot customer support and customisation utilities on the Delta Singular product range. Apart from third party application software products, the company has developed and provides a series of software solutions in an attempt to modernise and computerise the Greek SMEs. As the President explained to us, the R&D department has the responsibility of keeping the products up-to-date with customers' demands and IT changes. Thus, Techneco incessantly introduces creative improvements and new features on their software application solutions.

According to the five cases of the operational definition of innovation we provided in chapter 3, and elsewhere, the application software range of products and services for SMEs and LSEs and High End organisations, briefly presented above, do not reflect a 'new combination'. As a Singular Business Centre, Techneco is simply distributing and selling products that are developed and produced by the Delta Singular Group of Companies. Furthermore, their own application software products don't fit the parameters of our operational definition of innovation, since several more sophisticated domestically and internationally-branded ERP products, backed-up with full after sales service and support are available in the Greek market since the mid 1980s. Techneco's software products were new for the company, but not new for the Greek customers/market. Since they were originally developed they are constantly upgraded to be compatible with the newer versions of operation systems, such as Windows ME, NT, 2000, XP, etc, or customised to meet the particular needs of the customers.

Quantifiable aspects of innovative products

We begin this section by examining the percentage of sales that innovative products represent in the period between 1998-2003. The data given in the following pie chart represent the average percentage of sales for the 5-year period under examination, as it was classified for the company's managers to provide us details for each product's sales for each of the five years. What springs forth from this figure is the total percentage of sales of innovative products, which stands at 64% of total sales. The percentage of total sales of innovative products is the second of the four core measuring parameters of the innovation rate of the company as we presented in the opening part of this chapter. As shown in the figure, in the next page, the products under the heading other/non-innovative products, represent just 36% of total sales.

Average Percentage of Sales of Innovative Products between 1998-2003

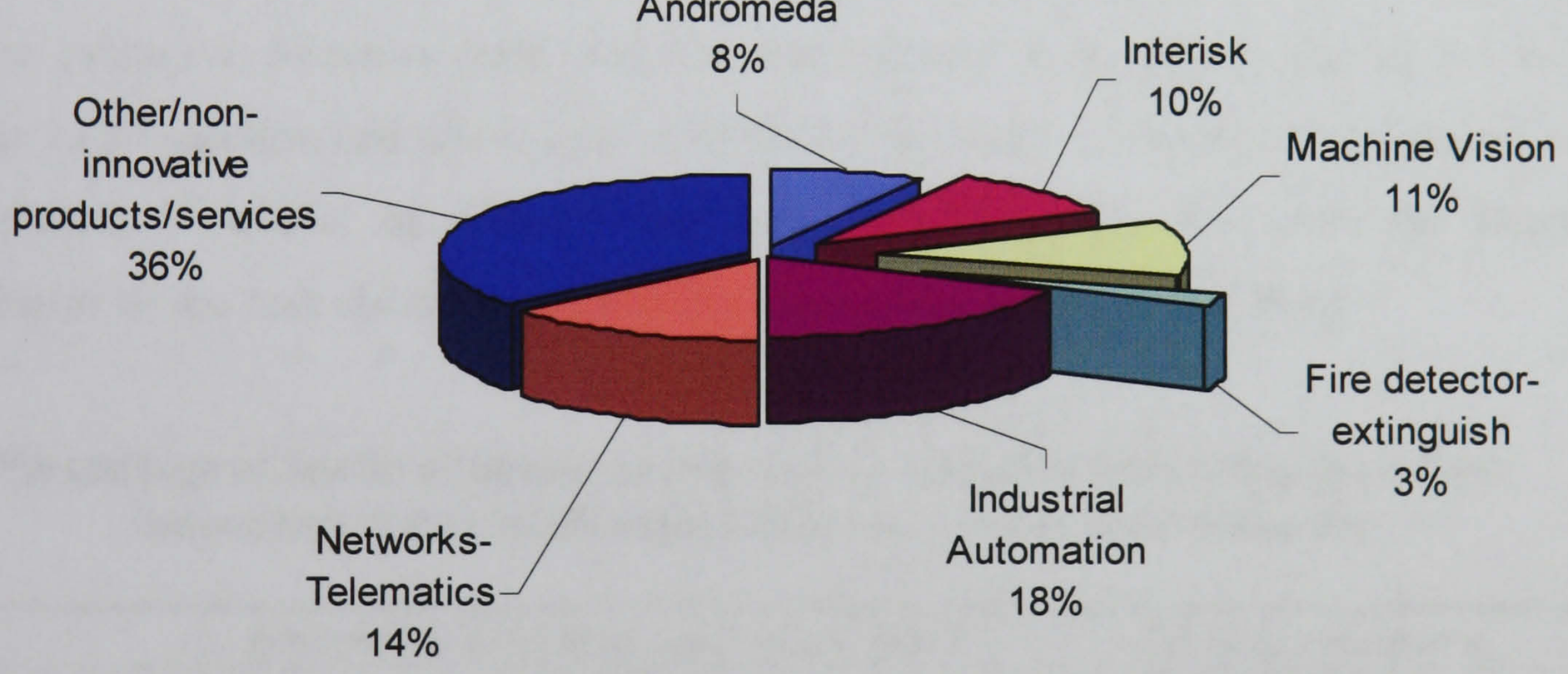


Figure 9, Question 4, Questionnaire on Innovation, Techneco, 2003

Elaborating more on the sales of innovative products, we examine whether the innovative products are sold abroad and what percentage of company exports do they represent. The following table illustrates that none of the innovative or any other products are sold abroad.

Are the innovative products sold abroad?
None of the innovative or any other product is sold abroad
What percentage of company exports do they represent?
The company is not exporting any products

Table 3, Question 5, Questionnaire on Innovation, Techneco, 2003.

Furthermore, we examine the percentages of funds allocated to R&D and other innovative activities, such as revamping existing machinery, utilising intermediate products and by-products, and in general refer to innovative activities in the production process for the period under examination. As the following table illustrates, the R&D expenditure represents a high percentage of the company's total turnover. The table also shows funds allocated every year for innovative activities other than R&D as indicated. Adding the percentages of the two columns brings forth the commitment of the company to innovation, which for the years 2001 and 2002 represented an expenditure of 6.8% of the total turnover. The percentage of funds allocated to R&D and other innovative activities, i.e. the ISO certification that we discuss below, as part of the total turnover, is the third of the four core measurements of the innovation rate of the company. The R&D is the cornerstone of the company, as the executive directors team and the management team argues and as we saw earlier in this section and this is also reflected by the number of people working in the department 9 people, or 45% of the total workforce, which is also the fourth parameter of the core measurements of the innovation rate of the company.

Percentage of funds allocated to innovative activities (referring to process innovations) and R&D expenditure as part of total turnover

	Innovative activities other than R&D	*R&D expenditure*
1998	1.0%	5.5%
1999	2.5%	5.8%
2000	1.2%	6.2%
2001	1.0%	5.8%
2002	1.1%	5.7%

Table 4, Questions 6 and 7, Questionnaire on Innovation, Techneco, 2003.

Techneco's team of three executive directors believe that successful development of the company's activities depends, amongst other factors, on continuous provision of top-quality products and services. Central in the philosophy of the company is the satisfaction of its customers. As Mrs. Chatzikou explained to us

during the interview, quality is an integral element of Techneco's philosophy and organisational culture. The company's commitment to quality has led to the certification of the company to ISO 9002 in 2001 that deals with,

> "Quality systems model for quality assurance in production and installation of Industrial Automation systems, application software products, and communication networks."

As Mrs. Chatzikou added, the quality management system of Techneco focuses on the customer and aims at the continuous enhancement of the customer's satisfaction through the provision of high-quality services and state-of-the-art products, customised to meet the customer's specific and rapidly changing needs.

According to Dimitris Chatzikos (the brother of the Founder Evangelos Chatzikos), the General Manager and executive director of Techneco, most of the information systems we use today require networks and communication technology. SMEs and LSEs are or at least should be using networked systems and the Internet to locate suppliers and buyers, to negotiate contracts with them, and to service their trades. Applications of networks are multiplying in research, organisational coordination, and control.

One of the core activities of Techneco, according to the General Manager, is the design, installation and maintenance of communication networks that appeal in all types of organisations. The company specialises in various types of networks and network-based applications that can increase an organisation's efficiency and competitiveness. In addition, the company promotes and sells a range of third party hardware products, i.e. PCs, printers, scanners, communication devices and computer peripherals, which compose such networks. Techneco has gained a good reputation over the years in Thessaloniki and Northern Greece as being a reliable customer oriented company experienced in setting-up quality but also economically affordable communication networks. The two most common networks the company designs and installs, as Mr. Dimitris Chatzikos explained to us during our interviews are: (a) Local Area Networks, which encompass a limited distance, usually one building or several buildings in close proximity. Most LANs connect devices located within a 500-600 metres radius, and they have been widely used to link PCs. And (b) Wide Area Networks, which span broad geographical distances, ranging from a couple of

kilometres to entire continents. WANs often include satellite communications. This product does not fit the parameters we set-up with the operational definition of innovation in chapter 3 and re-stated earlier in this section. Several companies designing and installing communication networks of various types exist in the Greek Market, according to Mr. Dimitris Chatzikos, some of which were established long-before Techneco.

Techneco's survival and relative growth is by large due to the trustworthiness that the company has gained during its years of operation in Thessaloniki, its reputation of providing quality products and services as well as the entrepreneurial spirit of Mr. E. Chatzikos and their investment in innovative activities.

4. Very Low Clustering/Networking Level

The analysis presented in the previous section 3 above, justifies the high innovation performance/rate of Techneco and its strategy of purposefully and systematically pursuing innovative activities. In this section, we explore the very low, virtually non-existent clustering/networking level of the 'classical entrepreneur' type of SME examining and presenting both 'quantitative data' from the analysis of the questionnaire on clustering/networking, and 'qualitative' data derived from our case study and the interviews with the company's directors and management team. Mr. Evangelos Chatzikos the CEO of Techneco answered the questionnaire on clustering/networking, with the appropriate aid from the rest of the directors and management team where it was felt necessary (see appendix 4, in appendices, end of thesis, for a complete list of the team and their responsibilities). Throughout the analysis of the investigation of the clustering/networking level of the 'classical entrepreneur' type of SME, the findings of the questionnaire are enriched and elaborated by the qualitative data. As we explained in chapter 3, where we identified our two-dimensional model of innovation and business clustering, we expand our empirical research towards the conceptual themes of strategic alliances and networks. Since these two concepts cover many cases, we proceed by adopting an operational definition capable of measuring the performance of the SMEs in networking/clustering as follows:

i. Business cooperation (agreement) for combined research and development of new products and services.
ii. Networking (cooperation) with the local/regional/national technological and educational institutes and research centres for R&D purposes, as well as for the attraction and employment of young scientists.
iii. Strategic alliances with other firms for the purpose of entering new markets: sales and logistics; and/or extending distribution networks.
iv. Collaborating with government agencies and public institutions for R&D purposes.

v. Part of an establish network of interrelated companies belonging in the same or adjacent industrial sectors.

Nature of clustering/networking activities

In this section, we examine whether there were clustering/networking activities during the 5-year period between 1998-2003. As shown in the following table, we are interested in the nature of the clustering/networking activities of the company and present the number of the relevant activities for each case. As we show, Techneco did not engage in any clustering/networking activities in the 5-year period we examined, with the exception of becoming a certified Singular Business Centre for the Thessaloniki area.

Nature of clustering/networking activities for the 5-year period between 1998-2003

Nature of clustering/networking act.	***Number as appropriate***
Equity holdings	0
Marketing agreement	0
Licensing agreement	0
Development agreement	0
Research agreement	0
Joint venture	0
R&D agreement	0
Manufacturing agreement	0
Grant/research funding	0
Supply agreement	0
Distribution agreement	0
Unspecified agreement	0
Other (specify)	1 (Certified Singular Business Centre. Sales & Support of Singular's ERP Software programs)

Table 5, Question 1, Questionnaire on Clustering/Networking, Techneco, 2003

Fields and objectives of clustering/networking

In this section, we examine some of the various fields and objectives of business clustering/networking and strategic alliances. The analysis was made with the use of

closed-format question/answer based on a Likert scale. In the following figure the different degrees of importance in which the various fields and objectives concern the clustering/networking activities of the company in the 5-year period examined are presented.

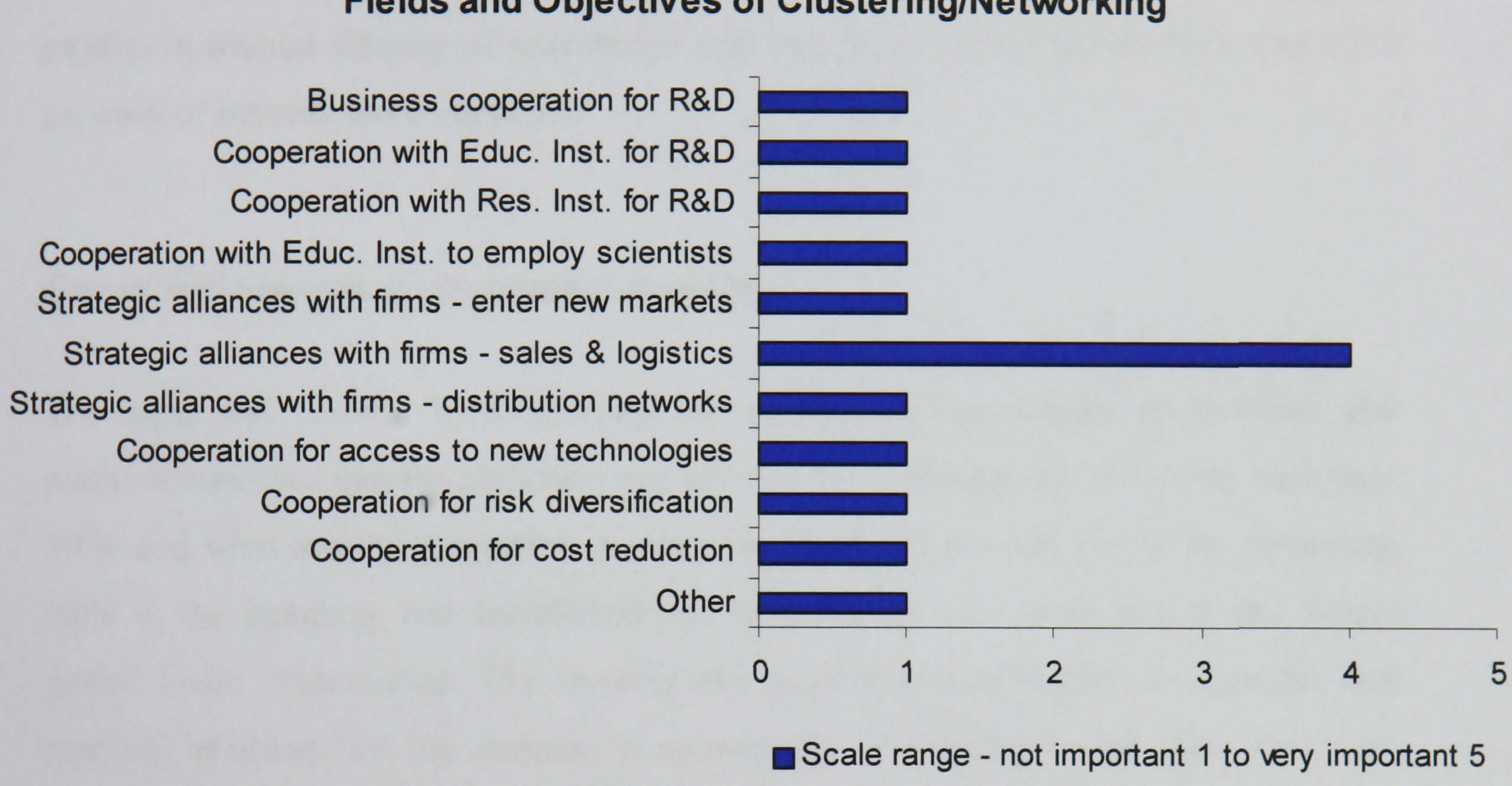


Figure 10, Question 2, Questionnaire on Clustering/networking, Techneco, 2003

It is obvious that with the only exception of a strategic alliance for the promotion and support of the ERP product lines of the Delta Singular Group, Techneco has not engaged in any field of clustering/networking activities. This confirms the preference of the company to a go-it-alone strategy, which results in very low clustering/networking levels.

As we discussed in the previous section, the product and support service range Techneco has developed over the years was not the result of strategic alliances with other IT companies and collaborations with universities and research centres. Techneco is not a part of an established network of interrelated companies belonging in the same or adjacent industrial sectors. Thus, Techneco's activities do not fit the parameters of our operational definition of clustering/networking.

The only exception is that Techneco operates as a Singular Business Centre, promoting, distributing and supporting some of the Delta Singular's Group of Companies products and services. On a glimpse, according to our operational

definition of clustering/networking, this fits case iii, namely the strategic alliance with another firm for the purpose of sales. However, Delta Singular simply uses their know-how and expertise in communication networks and software applications to promote its products and services in the Thessaloniki area. Techneco has not established a two-way strategic alliance with the Delta Singular Group of companies in order to promote its own product range through their distribution channels and/or engage in mutual sharing of knowledge and expertise, and/or becoming a part of a network of interrelated companies.

Quantifiable aspects of clustering/networking

We begin this section by examining the number of companies, universities and research institutes that the company was cooperating/networking with in the base year 1998 and what are the respective numbers in 2003. As we can see in the following table 6, the company has established one cooperation agreement during the 5-year period under examination. The number of companies, distributors, universities and research institutes that the company is cooperating/networking is one of the four core measuring parameters of the clustering/networking level of the company as we discussed in the opening scheme of this chapter. This fact supports our argument that the company is scoring very low in this parameter.

Number of companies, universities and research institutes that the company was cooperating/networking with in base year 1998 and the respective numbers in year 2003

	Companies	*Distributors*	*Universities*	*Research Institutes*
1998	0	0	0	0
2003	1	0	0	0

Table 6, Question 3, Questionnaire on Clustering/Networking, Techneco, 2003

The executive team of Techneco explained to us during our interview that strategic collaborations with other companies are 'very dangerous' in Greece. As they said a few years ago, in the mid-1990's Techneco had formed a strategic alliance with another IT company, which was producing IT products complementary to their own. They thought that through such an alliance they could increase their market share,

improve the company's position in Northern Greece, promote technological and knowledge transfer and the mutual exchange of know-how, expertise and skills. Unfortunately, as the executive directors told us, they strategic alliance not only failed but the other company left a colossal debt to Techneco, which threatened its very existence. Techneco struggled to successfully manage he crisis and quite often Mr. E. Chatzikos thought of dissolving his company. What was disappointing and discouraging according to the executive directors of Techneco was not so much the failure of the strategic alliance but the failure and negligence of the local and national governmental authorities and agents to help the company, as they said,

> "We appealed to several governmental and financial agents to help us financially to overcome the burden of the debts but they refused. We appealed to the judicial system to claim our legal rights against the frauds of the other company and they couldn't do anything. Over the years, Greece has proved to be a very unorganised country that doesn't protect and support the small companies. Then and there, we decided not to engage in any strategic alliances unless things change in this country or unless it is a well organised collective effort by many companies, agents and institutions."

Next, we examine the percentage of sales that co-developed products represent in the period between 1998-2003. As we see in the table below, the statistical entry stands at zero level of sales for the 5-year period under examination, as the company has not been cooperating with any firm and/or educational and research institute. This is the second of the four core measuring parameters of the clustering/networking level of the company and here the company is scoring zero (0).

What percentage of total sales do co-developed products represent?
There are no (0) co-developed products.

Table 7, Question 4, Questionnaire on Clustering/Networking, Techneco, 2003

Furthermore, we examine the number of products that the company successfully developed and launched in the market through business cooperation agreements and by cooperating with educational and research institutes in the 5-year period between 1998-2003. The number of products the company has developed and

launched in the market through co-operative activities between 1998-2003 is the third of the four core measuring parameters of the clustering/networking level of the company. Again as shown in the following table Techneco has not developed any products through cooperation and strategic alliance activities, consequently the company is again scoring zero (0) in this parameter of clustering/networking.

Number of products the company has developed and launched in the market through co-operative activities

Through business cooperation agreements	None (0)
By cooperating with educational and research institutes	None (0)

Table 8, Questions 5 and 6, Questionnaire on Clustering/Networking, Techneco, 2003

Finally, we explore the number of new markets, which include first time foreign markets penetration and diversification of market fields, that the company entered as a result of its clustering/networking activities in total. Table 9 below illustrates once more the virtually non-existent clustering/networking activities for Techneco since it has not entered any foreign markets nor has it diversified its activities by co-developing and co-producing new product lines. The number of new markets the company has entered through clustering/networking activities between 1998-2003 is the fourth of the four core measuring parameters of the clustering/networking level of the company, in which Techneco is, again, scoring zero (0).

Number of new markets the company has entered through clustering/networking activities

Foreign markets	None (0)
Market fields	None (0)

Table 9, Question 7, Questionnaire on Clustering/Networking, Techneco, 2003

According to Mr. E. Chatzikos, the Founder of the company, Techneco is a small 'family' business operating and marketing in the greater Thessaloniki area that does not aim to expand its activities beyond the Northern Greek territory as he said.

"We aim to strengthen the position of the company in the local market of Thessaloniki and of Northern Greece. We are a small company and we do not possess the necessary financial, human and capital resources to expand our activities. Even if we had them it is our strategy to remain a small family business. Strategic collaborations with other companies could result in a takeover of our business and the loss of its family orientation."

When the executives of Techneco were asked, during our interview, if the infrastructure of the Region of Thessaloniki, its airport, port, railway and highway system are developed enough to help the business activities of the company, the answered back smiling 'you must be joking…' As they indicated to us, from a logistics viewpoint, the region's infrastructure is inadequate and obsolete when compared to a "silicon valley" model. In order to further prove the lack of organisation of the Greek business community they referred to us about the slow IT introduction process in SMEs and LSEs that we have already mentioned earlier in this chapter and to the lack of efficiency even in the simplest banking and finance transactions as they said,

"Even the simplest things in Greece can be time and resource consuming. We go to the bank two or three times a week and believe us it is a very irritating activity. Most of the time, at the peak hours of the day there is only one cashier to serve the customers. The queues are endless. The most disturbing thing is that you can see that most of the other bank employees are seated at their chairs without doing anything. From my experience in England, said Mr. E. Chatzikos, I remember all the personnel and even the branch manager working temporarily as cashiers in order to lessen the queues and serve the customers. It is simple every-day things that depict the lack of organisation in Greece, and justly bestow upon us the 'honour' of the last position in terms of competitiveness in the European Union"

The CEO, Mr. E. Chatzikos, claims that there is no mechanism in the Region of Thessaloniki, and of the broader Greek territory, to promote and encourage university-business co-operations, and/or business-to-business networking. Not only there is lack of such mechanism, but also Mr. E. Chatzikos added to that,

"The corruption of the public and private sectors in Greece has gained an unprecedented extent in the last decade. Research programs and funding initiatives are selectively given to enterprises and organisations that have the 'right' political connections. In Greece, everything is about 'who knows whom'. If you are part of that system, you can survive and prosper, if you are a small family business like Techneco, you will have to struggle to survive and make a decent 'living'."

The executives believe in the advantages, at least on a theoretical level that emerge from participating in a cluster but they realise that with the conditions of corruption and lack of organisation in Greece, the cluster is a utopia. Despite the efforts of the Association of Information Technology Companies of Northern Greece, SEPVE, there is no governmental willingness to invest in the project. As the executive directors believe, systems of innovation, regional competitiveness and clustering are meanings unknown to the central and regional government. SEPVE alone does not have the necessary financial and human resources to organise and see this project through.

5. Outcome: Moderate to Low Performance/Growth

The above analysis in sections three and four verify the high innovation rate and very low, virtually non-existent clustering/networking level of Techneco Hellas, the 'classical entrepreneur' type of SME. In this last section of chapter six, we investigate the dependent variable of our hypothetical, illustrative two-dimensional model, namely the performance/growth of the company. As we highlighted in the opening part of this chapter, and as shown in the following figure 11, Techneco Hellas is scoring moderate to low in the chosen performance/growth parameters.

Performance/Growth of Techneco Hellas between 1999-2003

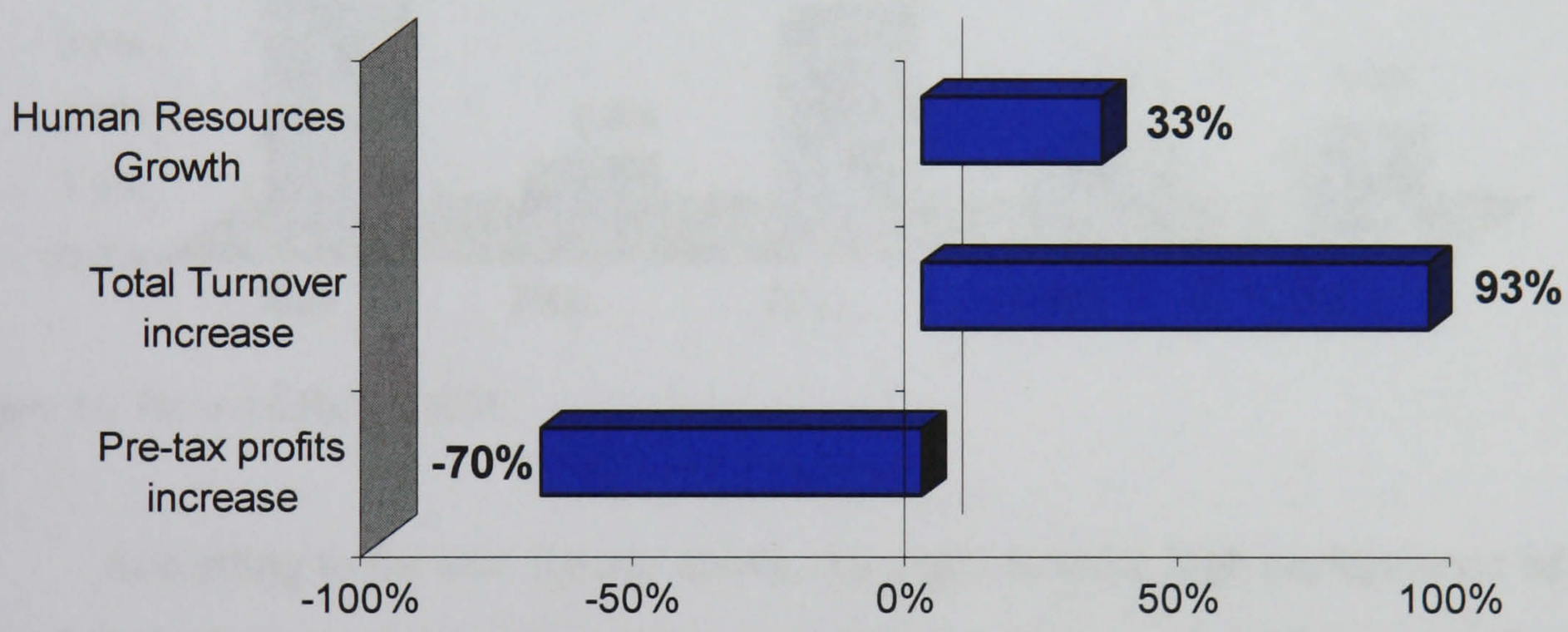


Figure 11, Techneco Hellas, 2003

Over the five-year period, between 1999-2003, Techneco increased its human resource capital from 15 to 20 persons, a 33% increase, as shown in figure 3 in the first section of this chapter. Furthermore, the company boosted by 92% its total turnover from €720,000 to €1.39 million euros, as shown in figure 5 earlier in this chapter. On the other hand, Techneco Hellas suffered a substantial decrease in its pre-tax profits falling about 70% from €62,000 to €18,000 euros, as presented in the first part of this chapter in figure 5. These parameters are three of the four measurements of the dependent variable, namely the performance/growth of the company and illustrate the moderate to low score of the 'classical entrepreneur' type of SME in this

variable. Furthermore, the last parameter we use to measure the performance/growth of the company is the percentage that pre-tax profits represent as part of the total turnover. As shown in the figure below, Techneco has again suffered a substantial decrease from 8.6% to 1.3% in this parameter. Pre-tax profits represent in 2003 a fraction of 1.3% of the total turnover signifying potential problems in the viability and future existence of the company.

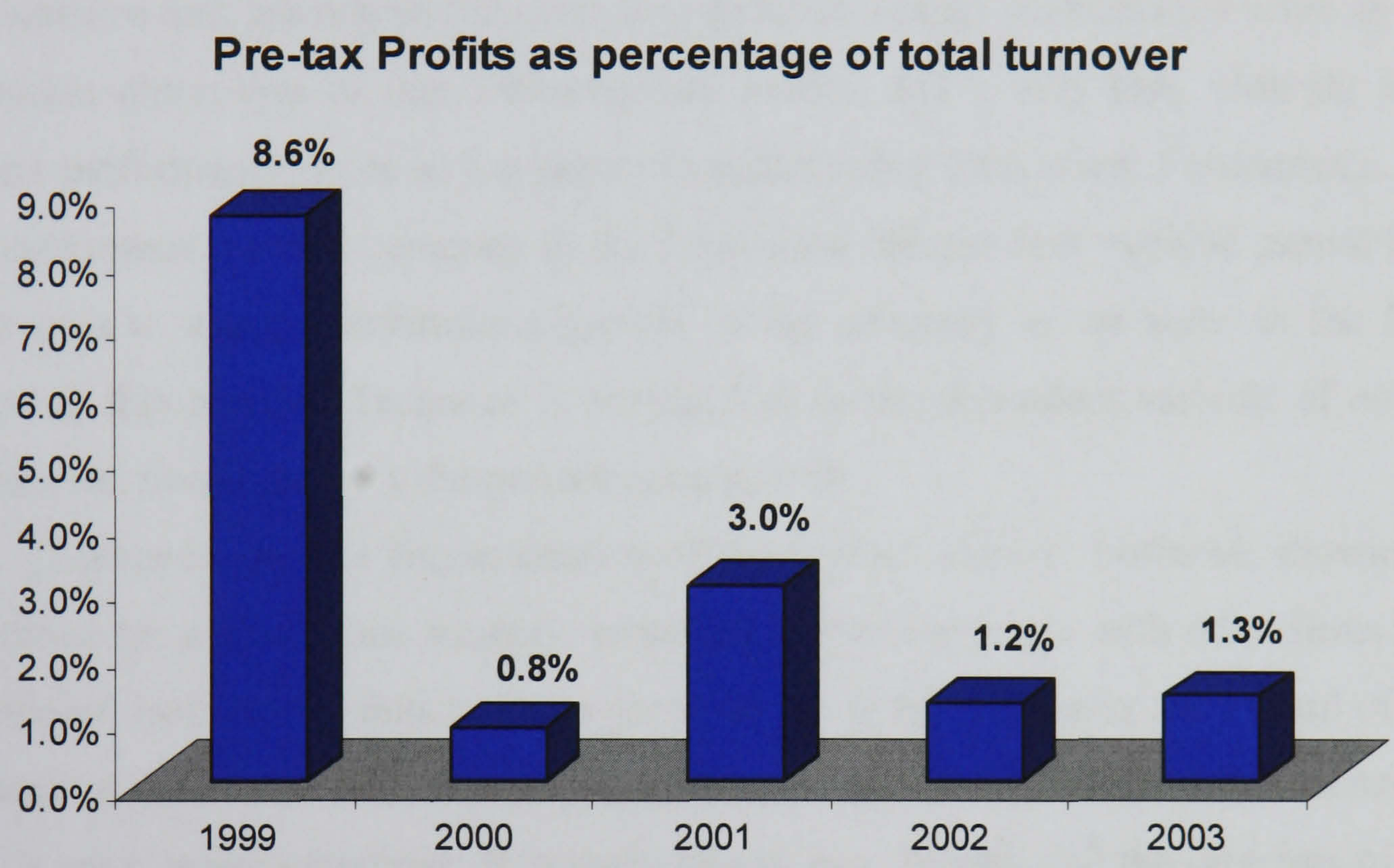


Figure 12, Techneco Hellas, 2003

According to the two figures above, we argue that the high performance of the company in the innovation independent variable alone, does not lead to a satisfactory performance of the company. Its low clustering/networking level and its strategy of one-against-all could be identified as one of the reasons that hinder the company's potential to achieve higher profits and secure its existence in the following years.

6. In Conclusion

Techneco Hellas fits the criteria we set for the 'illustrative' SME type named 'classical entrepreneur' and located in the upper left square of our hypothetical, descriptive two-dimensional model. As we show in the third and fourth sections of this chapter, based on quantitative and qualitative data gathered through our questionnaire and interviews the company achieves a high performance score in the innovation dimension of our 2-dimensional model, and a very low, virtually non-existent performance score in the networking/clustering dimension. Furthermore, the high performance of the company in the innovation independent variable cannot lead on its own to a high performance/growth of the company as we show in the fifth section of this chapter. Techneco is scoring low in the dependent variable of our 2-dimensional model, namely the performance/growth.

Techneco fits the characteristics of the typical 'family' business, showing a preference for a go-it-alone strategy, unwillingness to cooperate with other firms and educational institutions, reluctance to grow bigger in fear of losing the control of the business or due to the lack of the appropriate managerial and business knowledge of how to run a larger enterprise. It is important to note though that the directors of the company have described several circumstances that depict a lack of organization of the general Greek economic and business world and of the Thessaloniki area.

On the other hand as we show innovation is scoring high in Techneco, which has managed to survive some turbulent times, the failure of a strategic alliance, and the increased competition. Its strategy orientation towards new technologies and innovation in the turn of the new millennium seems to be working and the company is steadily increasing its sales and turnover, but pre-tax profits remain significantly low threatening the potential viability of the company.

Chapter seven, deals with the second 'illustrative' type of SME to which we assigned the name 'path-breaker' found in the upper right square of our hypothetical two-dimensional model. Our intention is to explore and present the high innovation rate and high clustering/networking performance of this type of SME. We examine the very high performance of the company, which seems to be largely attributed to the networking strategy and the high innovation performance of the company.

Chapter 7

Case Study II – "*Path-Breakers*" – Compucon S.A.

1. Introduction

Characteristics of the 'Path-breaker'- Compucon S.A.

High Innovation rate

- **14** - New goods introduced between 1998-2003
- **91%** - Average percentage of sales of innovative products between 1998-2003
- **10%** - Percentage of funds allocated to R&D and innovative activities as part of total turnover
- **38%** - Percentage of R&D personnel as part of total personnel employed

Very High Performance/growth

- **135%** - Human resource growth between 1999-2003
- **139%** - Total turnover percentage change between 1999-2003
- **357%** - Pre-tax profits percentage change between 1999-2003
- **48%** - Pre-tax profits as percentage of total turnover in 2003

High Clustering/Networking level

- **7** Companies – **40** Distributors – **2** Universities – **1** Research Inst., the company is cooperating with in 2003
- **21%** - Average percentage of sales of co-developed products between 1998-2003
- **6** - Products the company developed and launched through co-operative alliances
- **9** – Foreign markets penetration **2** – new market fields between 1998-2003

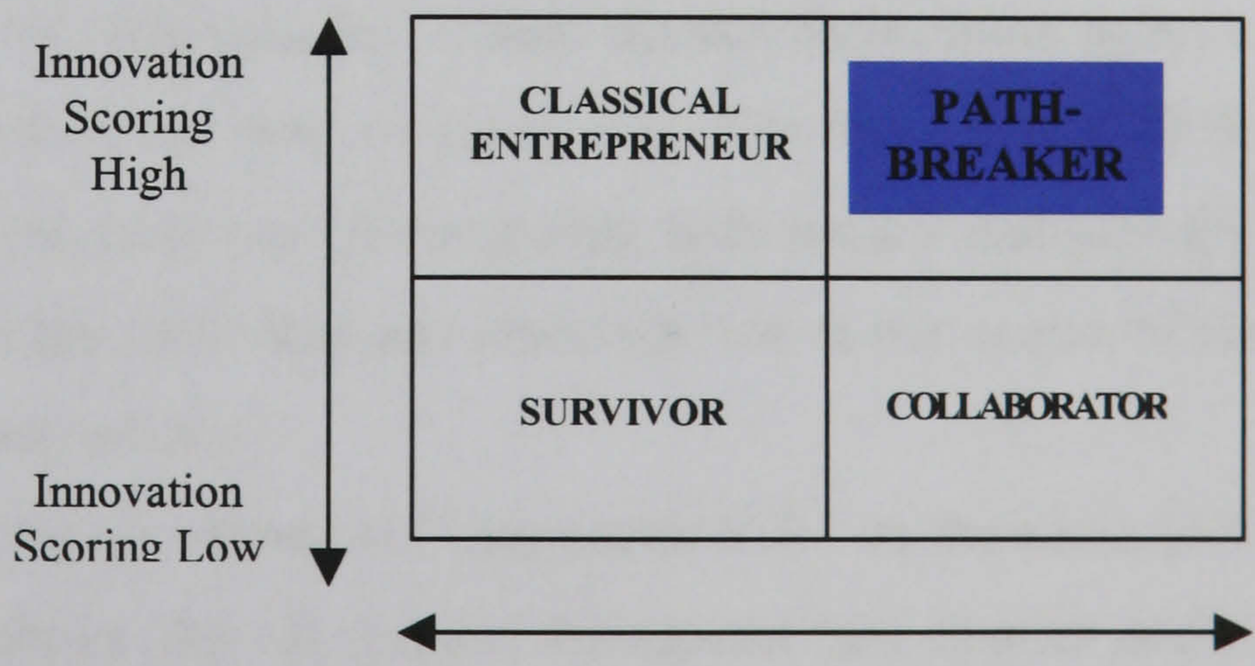


Figure 1, the 2-dimensional model

2nd illustrative SME – 'path-breaker'

In the opening section of chapter 7, we find it necessary to present the major key findings of the second case study, the SME type we assigned the name 'path-breaker' so that the reader can have a condensed but explicit overview of the company's particular scores on innovation rate, clustering/networking level and overall performance/growth. Four parameters are used to measure the relevant scores of each of the independent variables, namely the innovation rate and the clustering/networking level, and the dependent variable, namely the performance/growth of the company. At the bottom right corner of the previous page, there is a small figure of our hypothetical, descriptive two-dimensional model highlighting the position and the symbolic name we assigned to the 2nd illustrative type of SME in our 2-dimensional model.

As we suggested in the scheme presented and identified in chapter 3, the SME of the 'path-breaker' type exhibits high innovation performance and strong inter-firm alliances, networking with universities and research centres, other institutions and agents and is perhaps part of a cluster of firms in the same or adjacent industrial sectors. We name this SME '*Path-breaker'*, because it is the optimal, ideal type of SME the one that leads the way and from which we could draw conclusions on how to make other SMEs follow its example. In the present chapter we aim to provide an in-depth analysis of the 'path-breaker', focusing on its innovation performance and cooperation/networking strategies and on several other indicators relevant to the conceptual themes of the horizontal and vertical axes as presented previously. The SME's high innovation performance indicates the existence of a strategy orientation that purposefully and systematically promotes innovation. On the other hand it is highly engaged in inter-firm alliances, collaborating with universities and research centres in order to introduce 'new combinations'. These characteristics point again to a company that is adapting to the new way of competing. For this kind of SME, networking and cooperating is the new way of competing both locally and globally. Innovation, diffusion of knowledge and ideas and creativity are at the centre of the organisation and its strategies and policies.

After careful investigation, we identified "Compucon S.A." as the ideal SME meeting the criteria as stated above. As we present throughout this chapter and as shown schematically in figure 1, Compucon shows a high innovation record as revealed by the large number of 14 innovative products that the company introduced in the market in the 5-year period between 1998-2003. In its total sales, 91% come

from innovative products and nearly 10% of the total turnover is spend on innovative activities and R&D costs, while 38% of its total workforce are employed in the R&D department. Furthermore Compucon shows a high clustering/networking performance record. The company is cooperating with 7 other companies, 40 distributors, 2 universities and a research institute, which resulted in 21% of total sales coming from 6 co-developed products, diversification of its market fields in 2 new market areas and 9 foreign markets penetrated in the past 5 years. Furthermore, as shown in the figure above the 'path-breaker' type of SME exhibits very high performance, in terms of total turnover and pre-tax profits percentage increase, 139% and 357% respectively, as well as a remarkable increase of its human resource capital over the five-year period 1999 to 2003 of 135%. The very high performance of the company is also illustrated by the remarkable 48% that pre-tax profits represent as part of the total turnover.

Compucon S.A. develops and provides integrated software applications and high technology electronics solutions. A high technology company of Greek origin operating and competing in the IT sector of the Greek economy it is located in the Thessaloniki area where it was founded in 1982. Mr. Vasilis Thomaidis is the Founder, President and CEO of Compucon S.A. He designed his first digitising and editing system for the embroidery industry in 1982, becoming one of the pioneers of computer aided stitch processing. Two years later (1984), the entrepreneur Thomaidis opens a punching studio using his first system and continues the development of the punching and editing system. In September 2000, the European SME Group awarded Mr. Thomaidis the coveted prize for "European Small Business Person of the Year 2000" award.

Since its inception, Compucon has concentrated on the development of CAD/CAM applications for industrial use, in particular, software and electronic applications and networking systems to provide computer assisted stitch design and processing in the textile field. The company has recently established a medical solutions business unit, focusing on the development and marketing of specialised medical software and tools. Furthermore, using its accumulated knowledge in the design and development of hardware electronic solutions, Compucon has also moved into the telematics market, designing Automatic Vehicle Location (AVL) applications, products and solutions. In 2003, the company launched a new product

range of web solutions addressed to small and medium sized companies and individuals who want to develop and control their web-presence.

2. Situation, Market and Competition Analysis

In this section, we attempt a brief investigation of the company's internal structure and organizational culture, drawing attention particularly to HRM practices, the financial situation, marketing and competition assessment.

From the inception of the company to the very recent past, the development of the company was largely the result of the efforts, activities and entrepreneurship of Mr. Vasileios Thomaidis, the Founder, President and CEO of Compucon S.A. This reality had as a result the concentration of procedures and activities around one specific person a fact that presented a significant business risk. Coming into terms with this business risk, during the last few years Mr Thomaidis embarked upon a series of remedial actions, which included the employment of more senior management, the appointment of a five member Board of Directors as well as the introduction of a five-person management team. Mr. Thomaidis, as shown in the figure below, is in control of the majority of the company's shares, while no other shareholder is permitted to accumulate more than 5% of the company's shares.

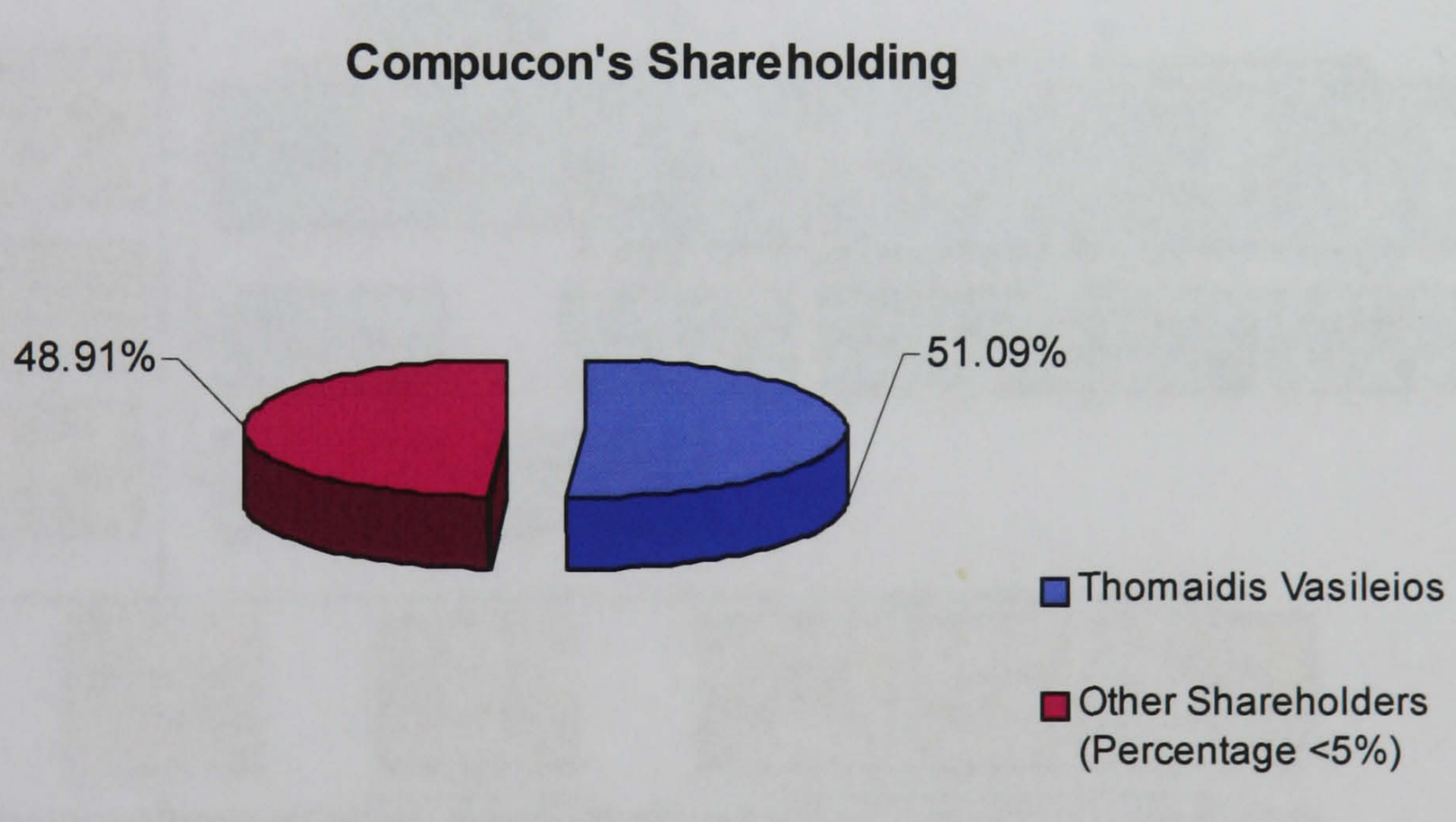


Figure 2, Compucon's Shareholding 2002

Compucon's management believes that successful development of the company's activities depends on continuous provision of services by senior and middle management personnel employed in research & development, marketing and administration, who have significant experience and maintain key relationships with

outsiders, which are vital for the implementation of the company business plan. As the HRM director explained, the general strategies, mission plans and the philosophy of the company are decided at the Board level with the synergy of the management team. Most of the top-management decisions, i.e. which market segments should be targeted, or where does a new business opportunity lie for the company, are decisions taken solely by the CEO and the Vice president of the company. Compucon S.A. organisational structure is presented in figure 3, below.

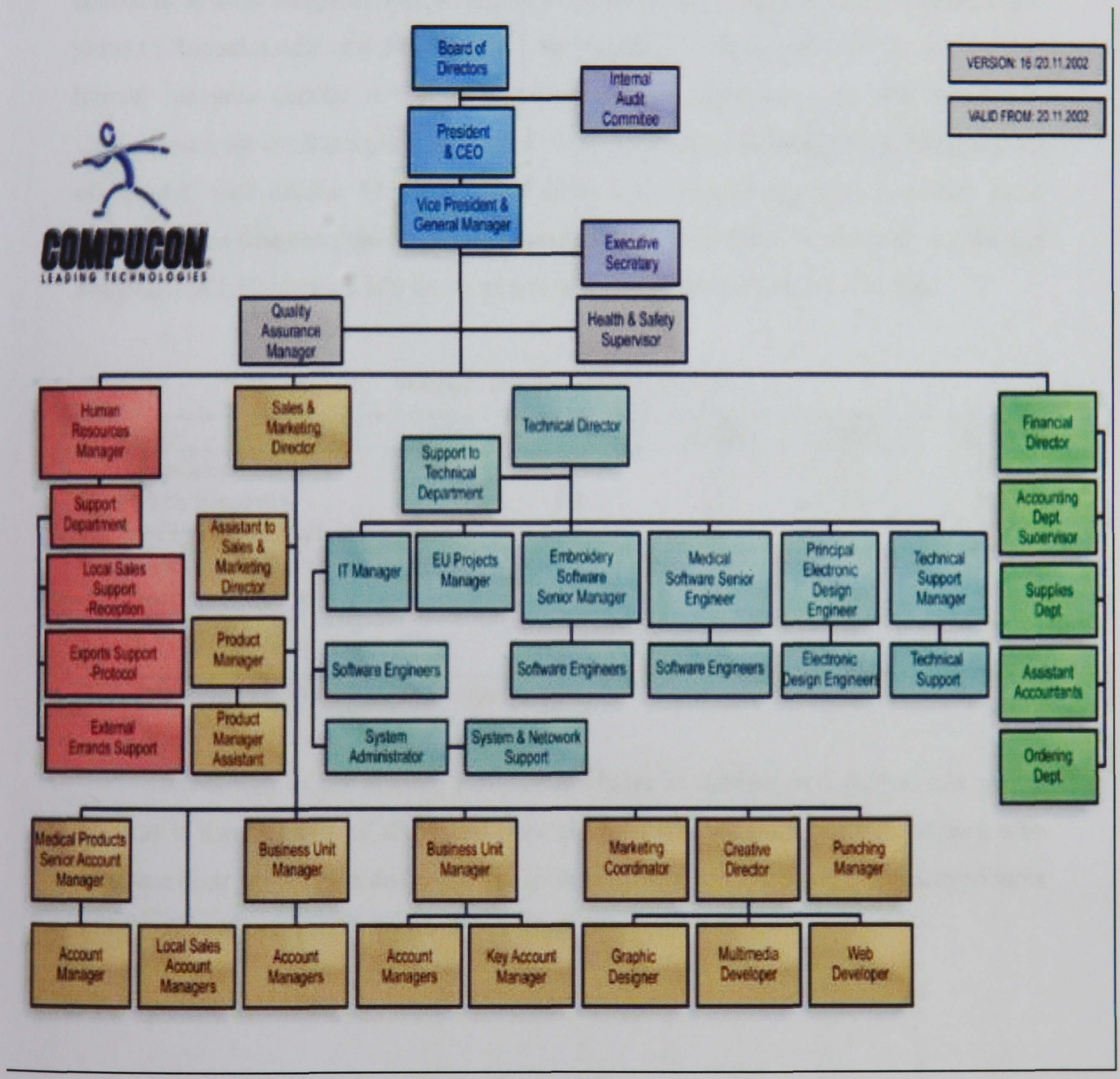


Figure 3, Compucon S.A. Organisational chart

According to the HRM director, the company maintains an internal communication system of vertical and horizontal free flow of information whereby all employees can express their concerns or ideas, in a written form, via email, or in informal/formal meetings to their manager who is responsible to evaluate it and pass it on appropriately to a higher level manager. Furthermore, with the use of a sophisticated management information system all employees can engage in two-way discussions via e-email if for any reason they feel it necessary to do so, and have access to a wide range of the company's information from marketing and strategic plans to financial data and daily events. An important characteristic of the company's human resource capital is that the majority of the personnel are well educated. Compucon's focus on people is reflected in the investment it makes in building a pool of talented individuals; 68.5% of staff hold a University degree and 20.5% have Postgraduates degrees (table 1). The average experience level of the staff, within the company, is 2.37 years, while the total average experience level is 4.99 years.

Workforce Education Level

Category	**1999**	**2000**	**2001**	**2002**
Post-graduate Degrees	2	8	13	15
University Degrees	18	20	26	26
Technological education Institute	6	6	6	7
Institutes of Vocational Education	4	5	15	17
Secondary Education	16	14	8	7
Primary Education	-	1	1	1
Total	46	54	69	73

Table 1, Workforce Education Level, Compucon S.A.

According to the Human Resources Manager, another of Compucon's strong features is the diversity of skills and expertise of its employees (table 2, below), who combine their knowledge and expertise in providing innovative and practical products and services, an objective they seem to reach most of the time.

Workforce Allocation

Category	1999	2000	2001	2002
Software	10	17	19	21
Engineers (No-Software)	1	4	7	8
Technicians (No-Software)	1	1	2	2
Economists	4	6	4	4
Business Administration	3	3	6	6
Sales	9	11	14	14
Others	18	12	17	17
Total	46	54	69	73

Table 2, Workforce Allocation, Compucon S.A.

Personnel by Department (2002)

Research and Development	28
Sales and Marketing	19
Finance and Administration	24

Table 3, Personnel by department, Compucon S.A.

Table 3 above provides an overall allocation of personnel by department and it becomes clear that R&D is of utmost importance for Compucon, as we make clear throughout this chapter. Compucon has shown a remarkable growth of its Human Resource capital borne out by the fact that in the past 10 years the number of personnel employed in the company has increased substantially from 10 persons in 1993 to the 73 persons in 2003 as shown in the figure below.

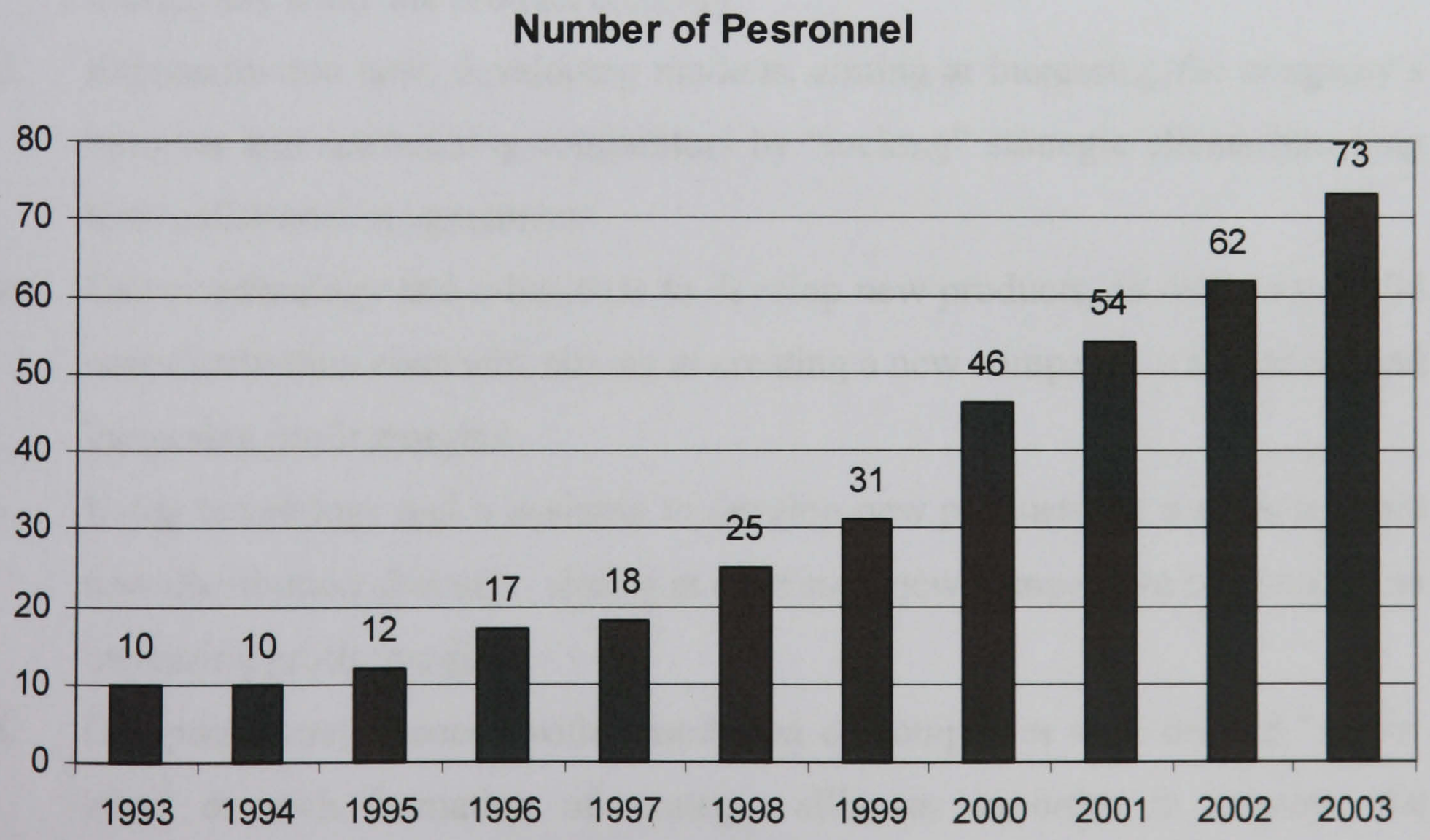


Figure 4, Number of Personnel, Compucon S.A.

Compucon's business strategy, its philosophy and values are set by the Board of Directors and the Management team and they are communicated in formal and informal manner, in person to person interaction and by the use of memoranda to every employee of the organisation. In this way, the CEO and Founder Mr. Thomaidis believes that the employees acquire a feeling 'of belonging' that they are part of the organisation and an "invaluable resource", as he quoted, to the operation and future success of the company. As it was made clear to us by the company's top personnel, this strengthens the way leading to the realization of Compucon's strategic objective, which is the development of cutting edge, specialised software and hardware solutions. The following general statements were related to us in verification of the type of organizational culture described above, and we present them below without passing judgement as to whether they constitute company beliefs or mere rhetoric:

i. Continuous improvement of facilities, investment in human resources and technological advances aiming at securing the ground breaking and innovative nature of the company's products, maintaining competitive advantage and reducing production and distribution costs.

ii. Differentiation and expansion of product lines, aiming at fully exploiting the company's accumulated knowledge and global sales network and eliminating the business risk associated with the case where the source of income comes exclusively from one product category.

iii. Expansion into new, developing markets, aiming at increasing the company's turnover and neutralizing competitors by "locking" strategic clients into long term collaboration agreements.

iv. Using technology and e-business to develop new products, as well as to build new distribution channels, aiming at creating a new competitive advantage and increasing profit margins.

v. Using technology and e-business to develop new products, as well as to build new distribution channels, aiming at creating a new competitive advantage and increasing profit margins.

vi. Compucon may proceed with acquisition of companies with desired "know-how" or with formation of strategic alliances in order to improve the company's position and competitiveness in the international market.

In accordance with the company's objectives, Compucon's investments have been planned for a 3-year period (2002-2005) and are re-evaluated at regular intervals. With regard to sales and profit margins, the company sets annual targets for performance in each product category, which are regularly monitored and assessed. The financial data presented in the next page (figures 5 and 6) illustrate the very high performance, the sound financial situation of the company and the strengthening of its financial position as each year goes by.

Investment Plan 2002-2005 (in € '000s)

Category	**In €**
Redesign Internal Information Systems Infrastructure	2,065
Continuing R&D in Embroidery Software Products and Services	1,453
Development of Laser Cutting and Engraving Systems	1,285
Strengthening of Compucon's International Sales Network (Reorganisation and Development)	1,967
Modernisation and Expansion of Compucon's Electronic Applications and Design Laboratory	763
Development and Commercialisation of Medical Software Products	581
Development of Specialised Software for E-commerce in Embroidery Sector	784
Total	**8,897**

Table 4, Investment Plan 2002-2005, Compucon S.A.

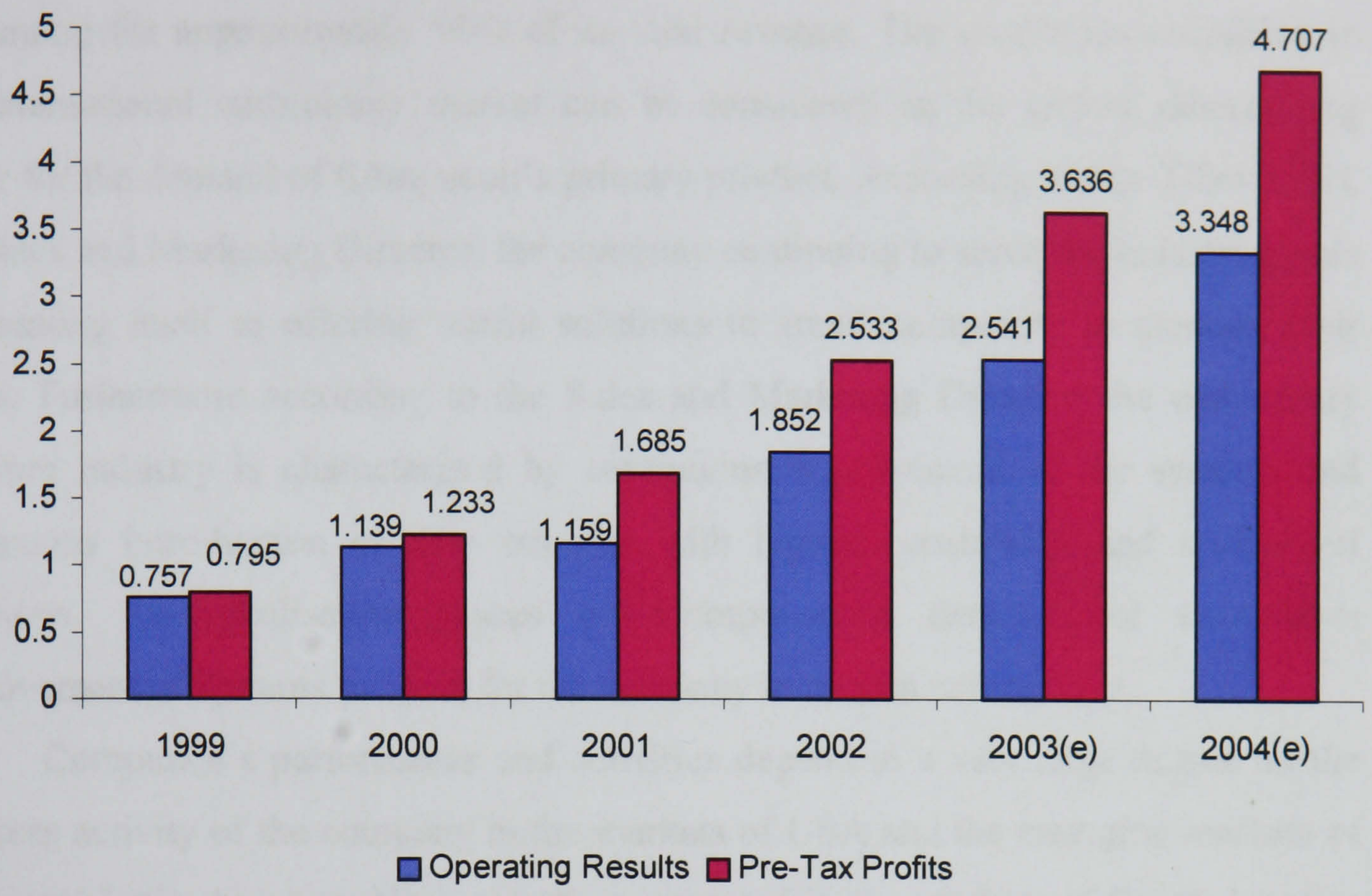


Figure 5, Compucon's Financial Position (a)

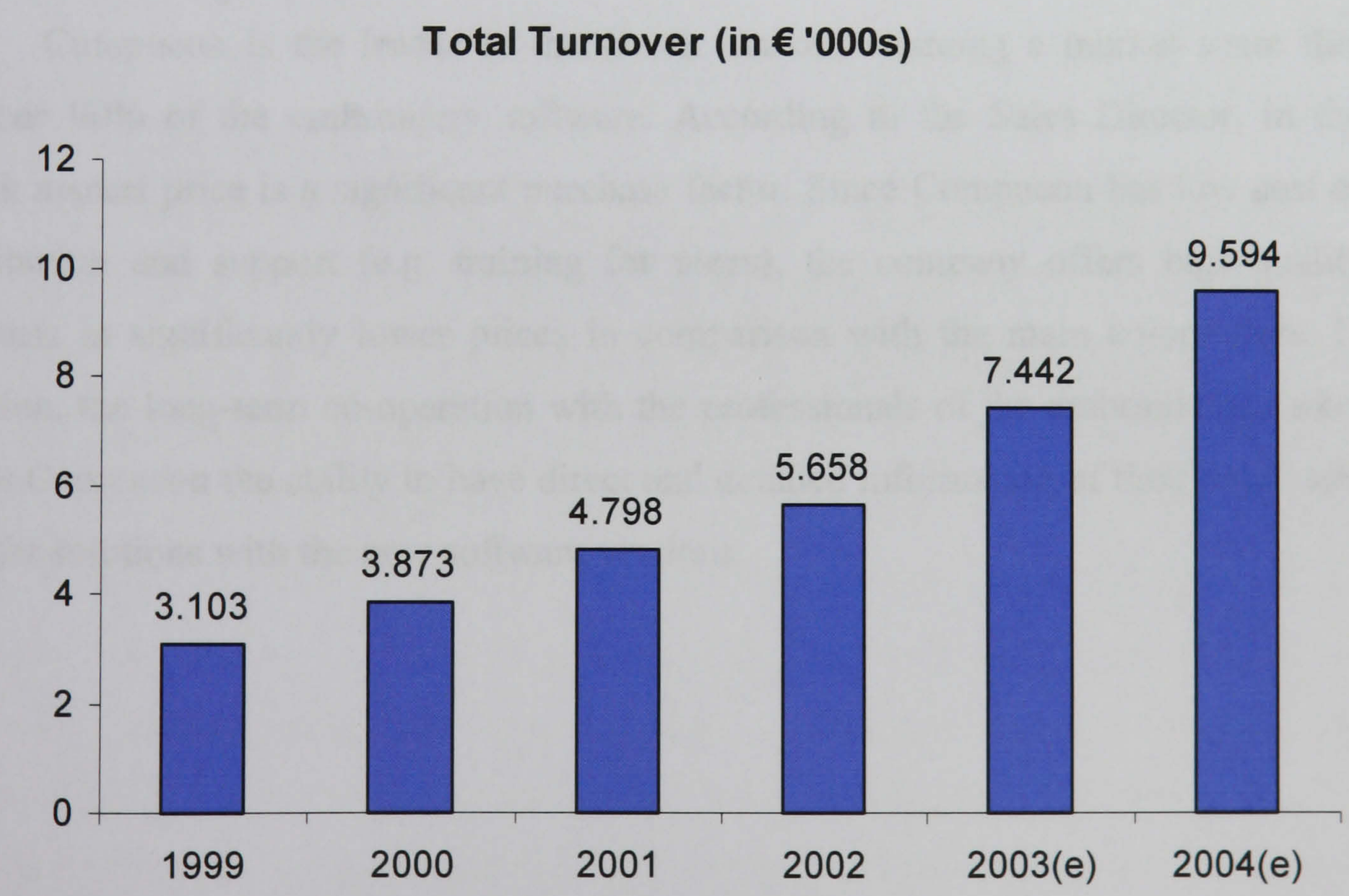


Figure 6, Compucon's Financial Position (b)

Compucon's activities are focused on software applications and high technology electronics solutions, specialised in software applications for the embroidery industry, which represent the main revenue source for the company accounting for approximately 90% of its total revenue. The conditions prevailing in the international embroidery market can be considered as the critical determining factor for the demand of Compucon's primary product. According to Mr. Tiliaveridis, the Sales and Marketing Director, the company continuing to serve the industry giants is orienting itself to offering useful solutions to small companies in meeting their needs. Furthermore according to the Sales and Marketing Director, the embroidery software industry is characterized by continuous improvement of the systems and continuous introduction of new editions with higher capabilities and multi-level functions. This realisation places on Compucon a demand for continuous improvement of systems in order for the company to remain competitive.

Compucon's performance and activities depend to a very large degree on the overseas activity of the company in the markets of USA and the emerging markets of Japan and Latin America. High growth is expected in the markets of South America and Southeast Asia, as well as the markets of China and East Europe. According to the sales, distribution data given in table 5 below, Japan and USA account for 50% of the company's sales.

Compucon is the leader in the Greek market, claiming a market share that exceeds 90% of the embroidery software. According to the Sales Director, in the Greek market price is a significant purchase factor. Since Compucon has low cost of distribution and support (e.g. training for users), the company offers high-quality products in significantly lower prices in comparison with the main competitors. In addition, the long-term co-operation with the professionals of the embroidery market offers Compucon the ability to have direct and detailed information of their needs and to offer solutions with the new software versions.

Sales Distribution by Geographic Area (all products)

Geographical Area	% Of company sales				
	1998	*1999*	*2000*	*2001*	*2002*
USA & North America	50%	39%	31%	23%	23%
Europe (except Greece)	22%	19%	21%	20%	20%
Japan	11%	21%	21%	28%	27%
Australia	6%	2%	1%	1%	1%
Middle East and Africa	6%	2%	5%	5%	6%
Greece	3%	7%	12%	16%	16%
South America	2%	-	4%	3%	3%
Asia	-	10%	5%	4%	4%

Table 5, Sales Distribution, Compucon S.A.

As the Sales Director explained to us, it is very difficult to estimate the size of the international market of embroidery software. The main reason for this is that on international level there are a wide variety of related but not similar or comparable products. Furthermore, in some countries customized solutions are produced and sold by small companies and, finally, there is a market for illegal software copies of legitimate companies. As the management team suggested to us though, Compucon has a leading position in the international embroidery software market, by having a strong local presence in about 50 countries and all continents, including countries where embroidery is considered to be a developing and/or traditional sector of the local economy. For example, they said in the United States and Japan, Compucon's market share in annual sales of Professional Embroidery Software is estimated to be 25% and 35% for each country respectively.

As we have said earlier, since Compucon's performance depends largely on the commercial success of the embroidery products and services a possible setback of this market, and/or the threat of new entrants with more sophisticated and/or cheaper products and services could affect negatively the financial status of the company. This is one of the major reasons for the company's diversification into new activities and markets, such as the laser cutting and engraving devices, web-solutions, medical software and telematics. On the other hand, the directors of the company realise the increased business risks of the new activities, coming not only from the increased competition and new entrants in those fields but also from the loses from a potential failure i.e. the cost in the development and commercialisation of the laser cutting and engraving products.

The Sales and Marketing Director has provided us with additional data on the market size of the medical software. Conducting relevant market research Compucon has estimated that the total number of medical doctors in Greece is approximately 63,000. It is further estimated that 29,000 M.D.'s have their private practise, 9,500 M.D.'s have a P/C at their office and around 7,200 of them use their computers for keeping Medical Records. From their contacts with medical doctors and through detailed research, Compucon spotted an increase on the demand of computers and medical software programs. The penetration of Compucon's product at this market in its two-year presence is calculated, so far, at approximately 3%.

3. High Innovation Rate

Compucon, as already stated, is an SME that develops and provides integrated software applications and high technology electronic solutions. When we asked the company's Founder and CEO, Mr. Vasilis Thomaidis the simple, yet, so hard to answer question, "do you innovate?" he answered back smiling, "define for me please, what is innovation…"

From the outset the company was based on a novel initiative undertaken by Mr. Thomaidis who designed and launched his first punching and editing system in 1982. His vision, as we mentioned in the introduction of this chapter, was to combine the concept of embroidery and new technology into a successful business activity. Hence, it is obvious that the whole company was built around the entrepreneurial spirit of Mr. Thomaidis and on an innovative idea. Two decades later, Mr. Thomaidis continuous to lead the way along that pioneering route. A central mission statement for the founder of the company that reflects on his values, and especially on innovation as described above is the following,

> "To sustain a leadership in developing and launching new, high quality products and services addressed to the embroidery industry, incorporating features not yet available in the market place."

In this section, we explore the high innovation rate/performance of the 'path-breaker' type of SME by examining and presenting both 'quantitative data' from the analysis of the questionnaire on innovation, and 'qualitative' data derived from our case study and the interviews with the company's management team. Mr. Thomaidis the President and CEO of Compucon answered the questionnaire on innovation, with the appropriate aid from the rest of the management team where it was felt necessary (see appendix 5, in appendices, end of thesis, for a complete list of the team and their responsibilities). Throughout the presentation of the innovation rate of the 'path-breaker' type of SME, the findings of the questionnaire are enriched and elaborated by the qualitative data and examples of innovative products and processes that were gathered during our case research. As we explained in chapter 3, the operational

definition of innovation that we use to measure innovation in our case study is based on the Schumpeterian sense of defining innovation as the carrying out of new combinations. This concept covers the following five cases:

i. The introduction of a new good – that is one with which consumers are not familiar yet– or a new quality of a good.
ii. The introduction of a new method of production, that is one not yet tested by experience in the branch of manufacture concerned, which need by no means to be founded upon a discovery scientifically new, and can also exist in a new way of handling a commodity commercially.
iii. The opening of a new market, that is a market into which the country in question has not previously entered, whether or not this market has existed before.
iv. The conquest of a new source of supply of raw materials or half-manufactured goods, again irrespective of whether this source already exists or whether it has first to be created.
v. The carrying out of the new organisation of any industry, like the creation of a monopoly position (for example through trustification) or the breaking up of a monopoly position. (Schumpeter, 1942, p.66)

Objectives of innovative ideas

In this section, we examine whether there were product/service and/or process innovative activities in the company for the 5-year period between 1998-2003. In particular, in the first part of the following table, we distinguish the innovative activities in three parts and present the number of innovations for each part. The introduction of new products/services is the one of the four core measuring parameters of the innovation rate of the company as we presented it in summary form in the opening scheme of this chapter. The second part of the table presents the main innovative activities of the company concerning the production process.

Objectives of Innovative activities
Innovative activities in the company in the 5-year period between 1998-2003

Introduction of new products/services	
In the Greek Market	14
Internationally (included in the 14 above)	3
Creative improvements of specific characteristics and properties	
In the Greek Market	3
Internationally (included in the 3 above)	3
Copying other products/services	
Copying products/services available in the Greek market	0
Copying products/services available in the Greek market but not produced locally	0

To the production process	
Revamping existing machinery	**Yes**
Raw materials	No
Utilising intermediate products or by-products	**Yes**
Organisation & rationalisation of production phases	No
Energy conservation	No
Lessening percentage of defective products	No
Improving working conditions	**Yes**
Lowering warehousing costs	No
Lowering labour costs	No
Lowering product design costs	**Yes**

Table 6, Question 1, Questionnaire on Innovation, Compucon S.A., 2003.

As we can see from the above table, Compucon has introduced a large number of innovative products in the 5-year period we examined, both domestically in the Greek market and internationally. In particular, Compucon has introduced 14 innovative products in the 5-year period achieving a very high innovation rate in this particular parameter. Innovative activities for Compucon correspond to the introduction of new products, and services and to creative improvements of specific characteristics and properties of products and services already produced in the company. Moreover, innovations are present at the production process as well, by revamping existing machinery, utilising intermediate products and/or by-products and improving working conditions. The innovative activities in the production process are distinguished by the yes/no entry concerning the fields in which the company invests. For Compucon, innovation is the core philosophy and the anchor of their strategies, as we explain throughout this chapter and as they put it,

"To us technology means to invent the non invented and turn them into differentiated products and services."

The management team suggested to us that in order to put forth the significance and the rate of innovation for Compucon it would be necessary and appropriate to take a careful view of the processes through which product lines of the company evolved.

Compucon's core activity since 1982 has been the development of software solutions for the embroidery industry. According to the Technical Director, Mr. Alexandrides, Compucon's product lines for the embroidery industry are sold in over 50 countries worldwide and are the result of combined knowledge and experience in fields such as digital technology and image processing, automated design and production (CAD/CAM), design of electronic systems and artificial intelligence. EOS (Embroidery Operating System) software is an integrated digitising and editing system, and one of the most advanced and sophisticated embroidery software systems available in the world market today. It forms the core platform for guiding the creation of embroidery at each stage, always ensuring higher quality results. EOS is available in different levels to cater for the varying needs of embroiderers. It is designed to fit the needs of any user, from the very beginner to the most experienced professional. Compucon also works in developing and promoting networking solutions (PCs and embroidery machines) and in representing established embroidery machines manufacturers in the domestic Greek market. Compucon's electronic commerce solutions provide integrated and interactive online embroidery for consumers and embroidery professionals, giving the best possible products and services in real time, on line. The company has created an online hub for learning and communicating, where users can find anything from embroidery accessories and software to educational tools, training materials and discussion forums.

Compucon turned out to be the first Greek company to penetrate the global market providing services and a range of innovative products to the embroidery industry, thus becoming a worldwide leader in this field. Succeeding in presenting continuously innovative embroidery solutions in all respects, the company changed the way embroidery is applied. The company's products enable customers, embroidery designers and industries located by now in all major economic areas, to create, edit, modify and finally produce a full gamut of embroidery designs.

According to the five cases of the operational definition of innovation presented earlier in this section, the embroidery product range, briefly presented above, reflects a 'new combination'. It was a new product, which consumers were not familiar with when it was first presented (case I). The company opened for the first time ever a new market not only in Greece but also in numerous other countries such as USA, EU and Japan as we presented in the first section of this chapter, while it also created a monopoly position in Greece for embroidery products (cases III and V). Furthermore the company is handling commercially the commodity in a new way, using electronic solutions and online hubs (case II).

The latest product of the company is a range of new suite of web solutions, launched in 2003. As the Technical Director explains, '*SiteCosmos'* is a specialized web-generating platform and toolset that enables small and medium sized companies, organizations, individual professionals and hobbyists, to develop and control their web presence. According to the director, it is the golden equilibrium between a "do-it-yourself" and a "do-it-for-you" solution, which enables even users with only basic computer literacy to create a unique web presence with minimum effort and cost. During 2003 Compucon S.A. has been eager in entering into strategic partnerships (as we explain in the next section) in Greece and abroad to disseminate '*SiteCosmos*' quickly across niche segments in international markets. The 'vision' of the General Manager and the CEO of the company is to use '*SiteCosmos'* technology and tools to enhance e-inclusion, i.e. to make web publishing and content management easily accessible and usable to an ever-growing population of novice Internet users. The characteristics of this product fit the parameters set in the first case of 'new combinations', namely it is a new good (case I), at least for the Greek market, since it is a combination of do-it-yourself and do-it-for-you solution and allows for both the development of the web site and the control of the web presence, as we saw above.

Sources of innovative ideas

In this section, we examine some of the various sources from which companies usually derive ideas for process or product/service innovations. They may be logically divided in two broad categories of sources, that is, internal and external to the organisation. The analysis was made with the use of closed-format question/answer

based on a Likert scale, as we explained in chapter five, while the graphs produced and presented follow the structure of the question and analyse separately the internal and external sources of innovative ideas. The following figure, 'Internal Sources', shows the different degrees of importance in which the various internal sources of the organisation contributed to innovative ideas in the 5-year period.

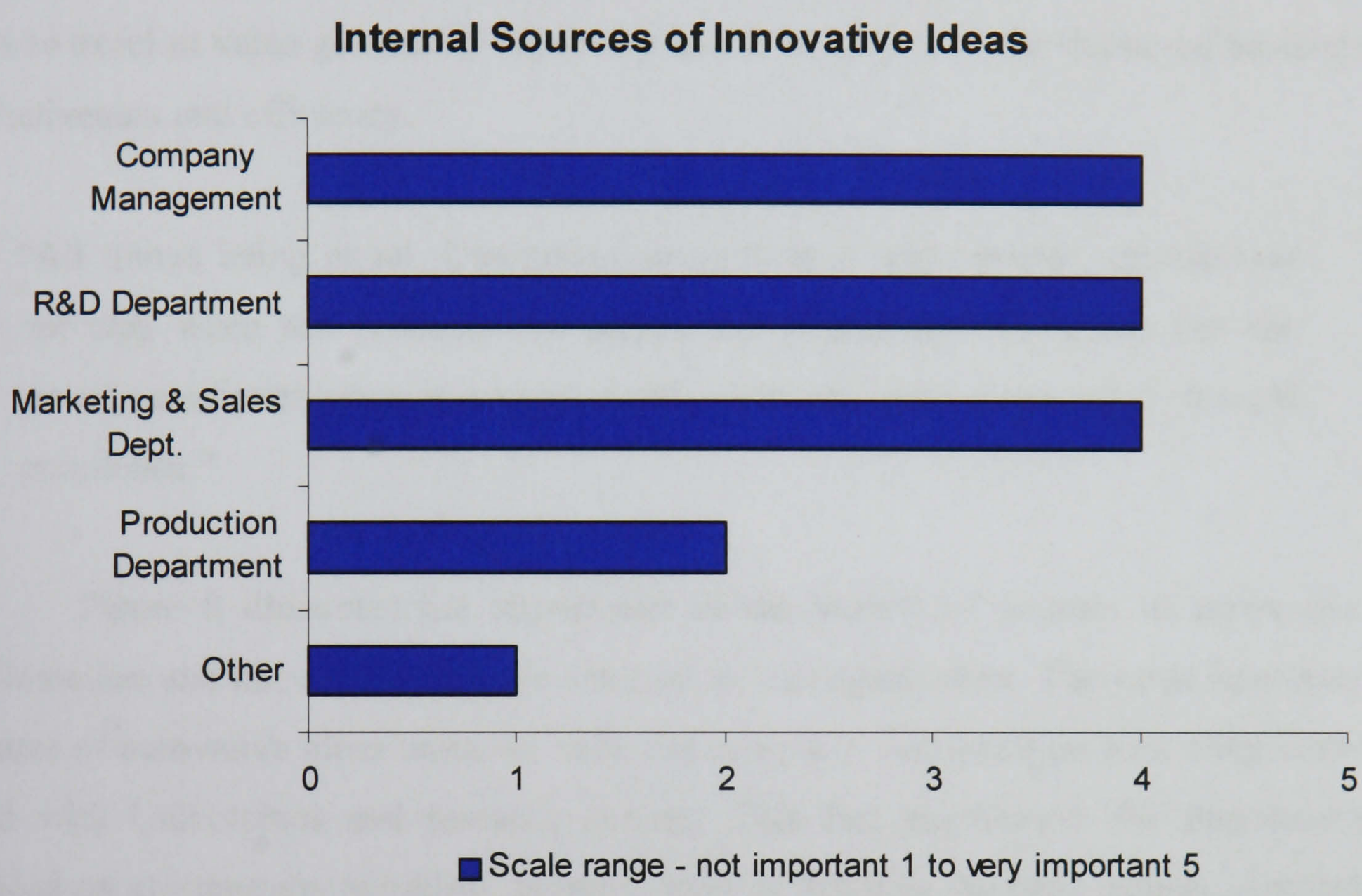


Figure 7, Question 2, Questionnaire on Innovation, Compucon S.A., 2003

What emerges from this figure is that company management, the R&D department and the Marketing and Sales department are considered as very important sources of innovative ideas. The company's philosophy and experience in the international markets together with a solid technological infrastructure and expertise enable Compucon to engage dynamically in new fields and activities. The Laser cutting and engraving systems were a spin off entrepreneurial idea from the R&D department when they were working on the embroidery software and so were the telematics applications. Mr. Thomaidis is capable and experienced enough to see the business opportunities when the R&D department comes up with something new, or a spin off product (utilisation of intermediate products and by-products). On the other hand, Mr. Thomaidis is an entrepreneur constantly seeking new ideas to put in

commercial applications and this is how he has structured the company. We can take as an example the EN ISO 9001:2000 for the Design, Development, Supply. Sales, Distribution, Installation and Maintenance of Software Products and Applications (TUV CERT awarded) certification that demonstrates that Compucon's Quality System is comprehensive and in accordance with the internationally accepted quality standards, but registration was only a milestone for the company, not a target. The target, according to Costas Demopoulos, the Quality Manager is business excellence; it is to excel in value generation capability and to be able to attain improved business effectiveness and efficiency.

> "All things being equal, Compucon research and development activities do not stop when the products are priced and placed on the market but the process continues since improved quality demands even more efforts toward excellence."

Figure 8 illustrates the importance of the variety of sources of innovative information and knowledge that are external to the organisation. The most important source of innovative ideas turns out to be the company's cooperation with other firms and with Universities and research centres. This fact emphasizes the importance placed on clustering/networking, as we discuss in detail in the next section. Another important source of innovative ideas are exhibitions, while sources of average importance for innovation Compucon considers customers requests, suppliers, competitive products and scientific/technical bibliography.

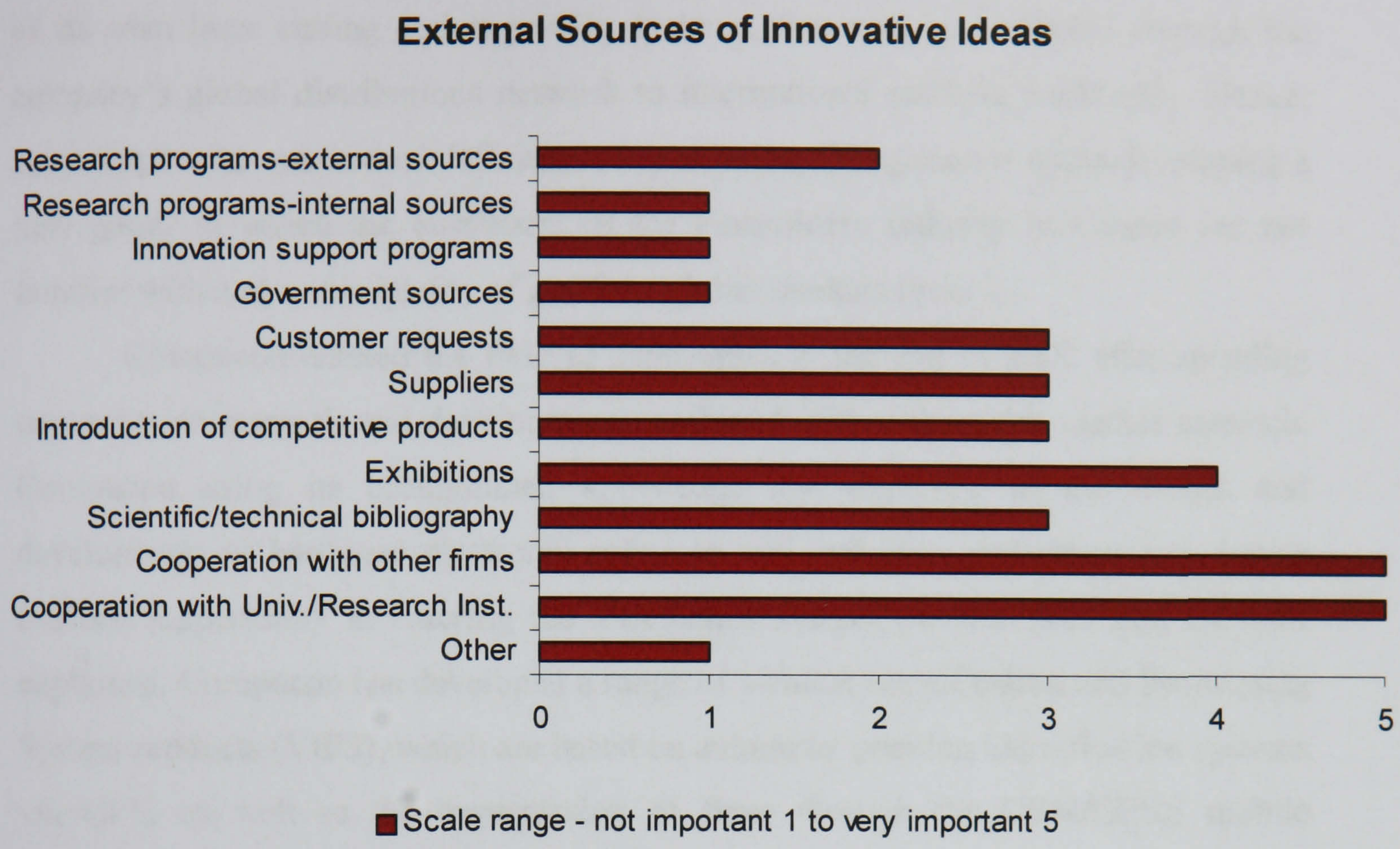


Figure 8, Question 2, Questionnaire on Innovation, Compucon S.A., 2003

Compucon entered the Laser technology systems sector in 1999, in order to satisfy the needs of the embroidery industry, which required up-to-date solutions for cutting fabrics and other applications for the embroidery sector and the textile industry in general. Compucon became the distributor for the Greek and Cypriot market of Great Computer Company (GCC, Taiwan) Laser Systems and the Mercury Model of ACI (Germany), which is a fully automated Laser System. As the technical director, Mr. Alexandrides, indicated to us during the last two years market penetration of Laser Cutting and Engraving devices is growing rapidly. The General Manager and the Technical Director believe that this is due to the high return on investment ratios, as a result of their high productivity, which is significantly aided by the support and training that Compucon offers. According to their market analysis, predictions, professionals in the embroidery sector and manufacturers of leather materials and promotional and advertising material producers are increasing the use of Laser Cutting and Engraving Devices. Compucon, as we discuss in the next section, is co-operating with the University of Crete's Institute of Technology and Research and has established a spin-off company located in Thessaloniki (in which the majority stockholder is Compucon and minority is the ITR of the University of Crete). The

spin off is dedicated exclusively to the development of technology for and production of its own laser cutting and engraving systems, that will be marketed through the company's global distributions network to international markets worldwide. Hence, according to the operational definition of innovation, Compucon is again developing a new good, in which the customers of the embroidery industry in Greece are not familiar with and a new quality of good for global markets (case I).

Compucon entered the field of Telematics at the end of 2002 after spending two years of research and development combined with a thorough market research. Compucon using its accumulated knowledge and expertise in the design and development of hardware electronic solutions and software application saw a new business opportunity in entering the Telematics market. As the Technical Director explained, Compucon has developed a range of Vehicle Identification and Positioning System products (VIPS), which are based on automatic position identification systems via GPS, as well as the transmission of fixes through the GSM/GPRS mobile telephony networks. It can identify the geographic coordinates and give the exact position of any vehicle and/or moving object on which the relevant software is installed. The applications of VIPS are numerous and can be used individually or in combination with one another, depending on specific client requirements such as, fleet management, security systems, vehicle control and, navigation systems.

Compucon SA has moved on to strategic alliances in this field (we present this in the next section) and to the development of needed services relating to vehicle fleet management for large companies and organisations on a worldwide basis. According to the technical director and the General Manager, Compucon aims to offer a complete, flexible and reliable solution to satisfy the needs of managing and locating the target vehicles, while at the same time allowing for further expansion and exploitation of new possibilities that may arise in the future. This product maybe new for the company but does not fit the parameters we set-up with the operational definition of innovation in chapter 3.

Driving forces for innovations

In this section, we examine some of the various driving forces for the introduction of product/service innovations and/or process innovations. In figure 9, the different

degrees of importance in which the various driving forces contributed to the introduction of innovations in the 5-year period examined are presented. The most important driving forces for innovations turn out to be the quality improvement of products, the increase/expansion of the products capabilities, new markets penetration and diversification of market fields, and replacement of products.

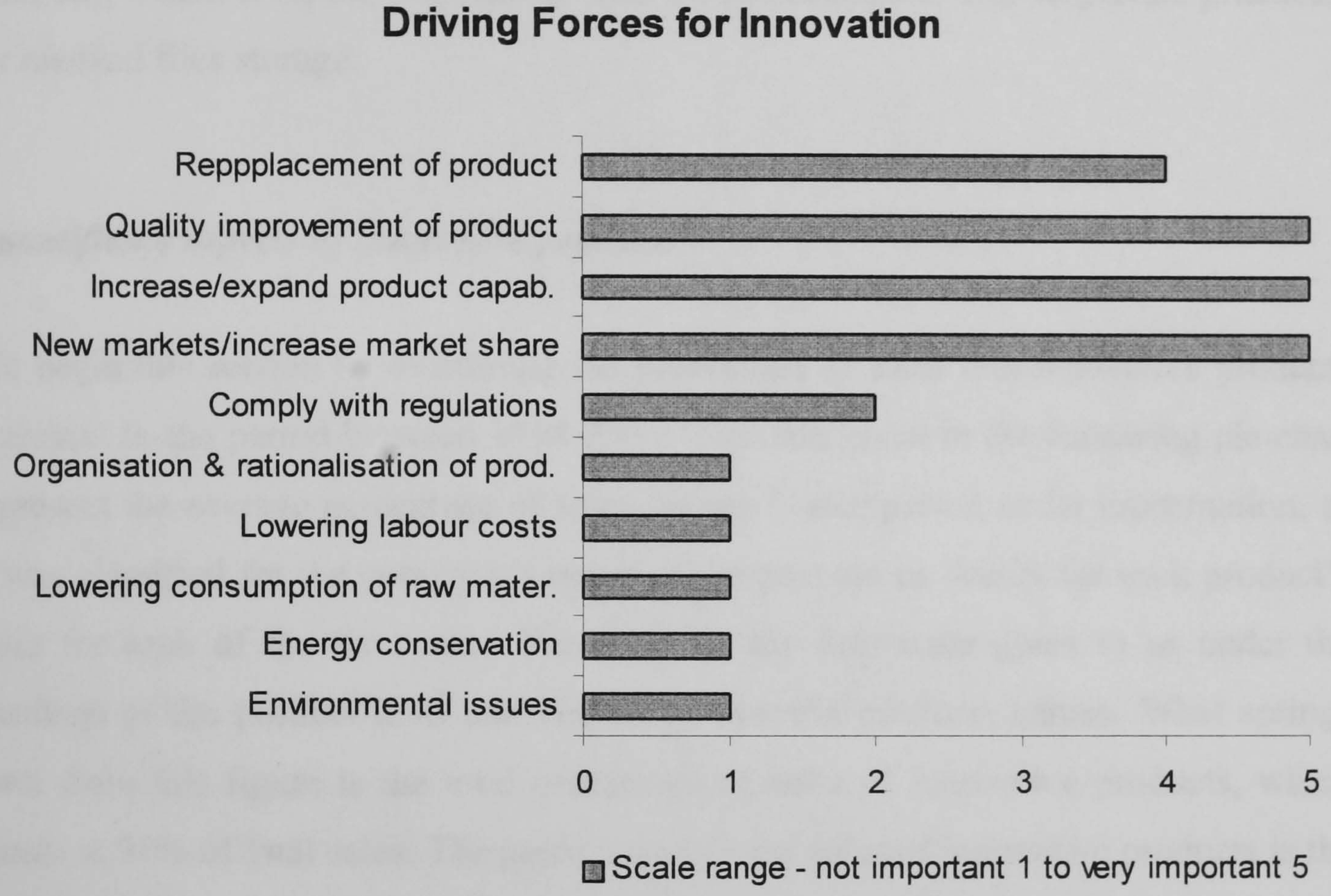


Figure 9, Question 3, Questionnaire on Innovation, Compucon S.A., 2003

The business philosophy of Compucon along with the extensive experience in the international markets and the know-how in the fields of High-Technology enabled the company, according to the technical director, to expand its business activities in the medical fields, by designing and developing specialized medical software and tools. This activity initiated in 1989 and for that purpose COMPUCON collaborated (as we see in detail in the next section) with well-know scientists and specialists, I.T. professionals, Medical Doctors and Experts in Health Systems. The result of this initiative and research is the new product line of "*MEDIfiler*", a complete package of medical applications, in other words, a medical information system that addresses the needs of small medical centres and private practise M.D.'s, covering 17 different medical specialities. A reliable distribution network supports the specialised needs of Greek M.D.'s in managing their clientele's medical records.

According to our operational definition of innovation, the medical software and tools product range constitutes another 'new combination'. It is a new product that Greek customers are not familiar with yet since foreign companies are not marketing any products in the Greek language. In addition, domestic competitors seem to be targeting more on private clinics and hospitals with common software product for all medical specialities (case I). Furthermore, it opens up a new market (case III), which is rapidly expanding with the penetration of PCs in private practices, for medical files storage.

Quantifiable aspects of innovative products

We begin this section by examining the percentage of sales that innovative products represent in the period between 1998-2003. The data given in the following pie chart represent the average percentage of sales for the 5-year period under examination, as it was classified for the company's managers to provide us details for each product's sales for each of the five years. Furthermore, the data were given to us under the headings of the product lines and not of the specific products names. What springs forth from this figure is the total percentage of sales of innovative products, which stands at 91% of total sales. The percentage of total sales of innovative products is the second of the four core measuring parameters of the innovation rate of the company as we presented in the scheme at the opening part of this chapter. As shown in the figure below, the products under the heading other/non-innovative products, represent just 9% of total sales.

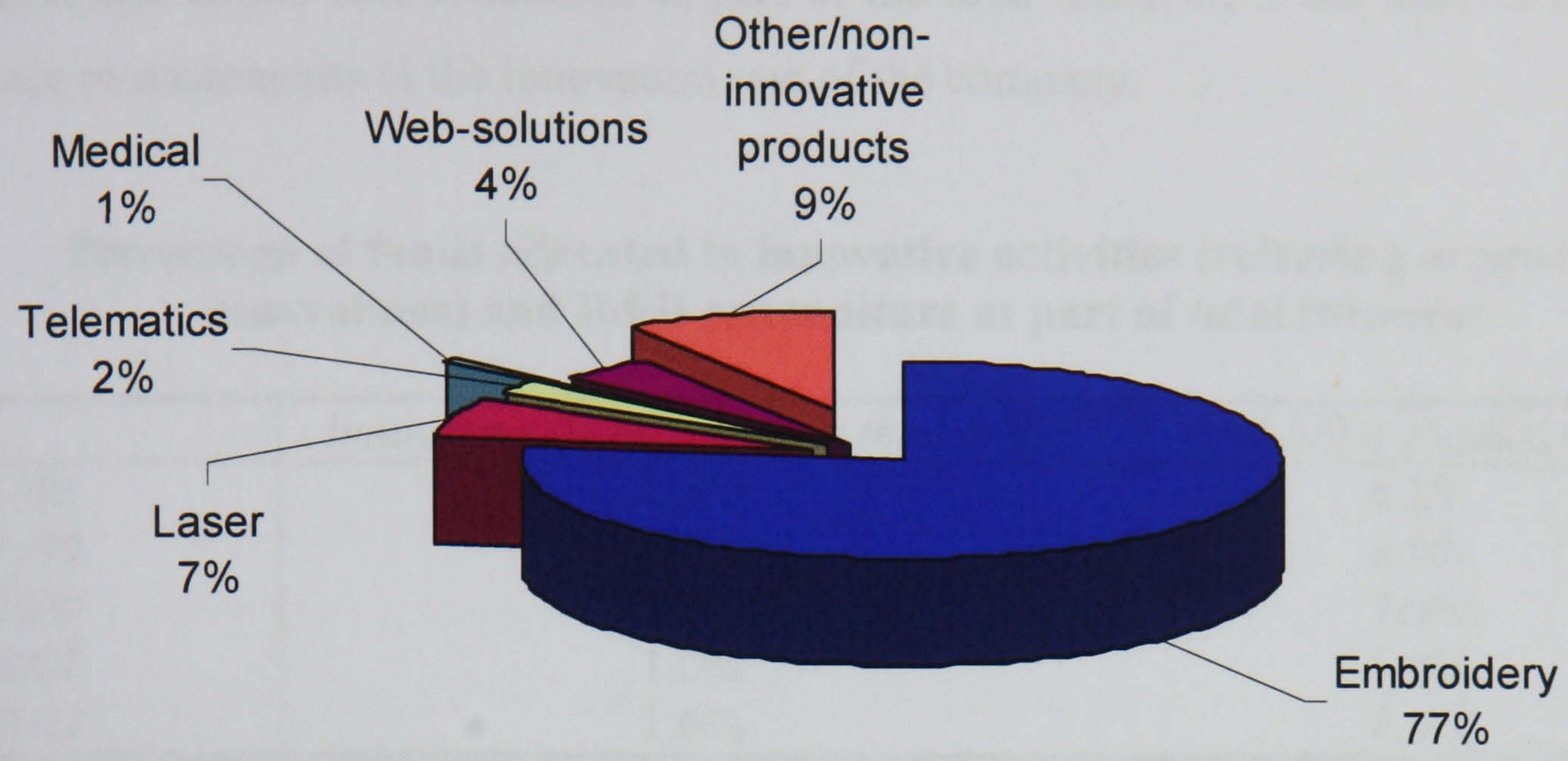


Figure 10, Question 4, Questionnaire on Innovation, Compucon S.A., 2003

Elaborating more on the sales of innovative products, we examine whether the innovative products are sold abroad and what percentage of company exports do they represent. The following table illustrates that 6 products of the embroidery product line are sold abroad and account for 90% on average of the company's exports for the period between 1998-2003.

Are the innovative products sold abroad?
6 products of the embroidery product line
What percentage of company exports do they represent?
90% on average for the period between 1998-2003

Table 7, Question 5, Questionnaire on Innovation, Compucon, S.A., 2003

Furthermore, we examine the percentages of funds allocated to innovative activities, both R&D and other activities such as revamping existing machinery, improving working conditions, and in general refer to innovative activities in the production process for the period under examination. As the following table illustrates the R&D expenditure represents a high percentage of the company's total turnover. The table also shows funds allocated every year for innovative activities other than R&D as indicated. Adding the percentages of the two columns, the commitment of

the company is brought forth to innovation, which for the years 2001 and 2002 represented an expenditure of 10% of the total turnover. The percentage of funds allocated to R&D and other innovative activities, i.e. the ISO certification that we discussed earlier in this section, as part of the total turnover, is the third of the four core measurements of the innovation rate of the company.

Percentage of funds allocated to innovative activities (referring to process innovations) and R&D expenditure as part of total turnover

	Innovative activities other than R&D	*R&D expenditure*
1998	1.1%	6.2%
1999	1.0%	6.9%
2000	1.5%	7.7%
2001	1.0%	9.0%
2002	1.6%	8.4%

Table 8, Question 6 and 7, Questionnaire on Innovation, Compucon, S.A., 2003

Compucon's competitive advantage is based among other factors on a commitment to continuous research and development to introduce breakthroughs in software and hardware technology. Most of the products and/or services, as we saw earlier, started as an innovative idea that was developed into an innovative product or service, and more importantly in the last five years, the company has been developing new products and services in collaboration with other firms and bodies. The R&D is the cornerstone of the company, as the management team argues, and this is reflected not only by the number of people working in the department (28 people, or 38% of the total workforce, which is also the fourth parameter of the core measurements of the innovation rate of the company), but also by the huge and continuous investments on this section of the company (as we show in section 1, table 4, investment plan). For example, the investment: "Development of specialized software for e-commerce in embroidery sector", will be used for the commercialisation of an innovative idea, which approaches the need for provision of reliable and tested solutions in strategic intermediaries of retail business (e.g. big chains of hypermarkets or international clothing producers). It concerns the perspective of these enterprises to 'equip' their electronic outlet with the potential of creating and ordering online embroidered materials of clothing/household/present. It is estimated that with this immediate and pioneer activity Compucon will be able to enter by 2004-5 a market valued at approximately $400 million.

4. High Clustering/Networking Level

The analysis presented, thus far in the previous section 3 justifies the high innovation performance/rate of Compucon and its strategy of purposefully and systematically pursuing innovative activities. In this section, we explore the high clustering/networking level of the 'path-breaker' type of SME examining and presenting both 'quantitative data' from the analysis of the questionnaire on clustering/networking, and 'qualitative' data derived from our case study and the interviews with the company's management team. Mr. Thomaidis, the President and CEO of Compucon, answered the questionnaire on clustering/networking, with the appropriate aid from the rest of the management team where it was felt necessary (see appendix 5, in appendices, end of thesis, for a complete list of the team and their responsibilities). Throughout the analysis of the investigation of the clustering/networking level of the 'path-breaker' type of SME, the findings of the questionnaire are enriched and elaborated by the qualitative data and examples of clustering/networking activities and processes that were gathered during our case research. As we explained in chapter 3, where we identified our hypothetical, descriptive two-dimensional model of innovation and business clustering, we expand our empirical research towards the conceptual themes of strategic alliances and networks. Since these two concepts cover many cases we proceed by adopting an operational definition capable of measuring the performance of the SMEs in networking/clustering as follows:

i. Business cooperation (agreement) for combined research and development of new products and services.
ii. Networking (cooperation) with the local/regional/national technological and educational institutes and research centres for R&D purposes, as well as for the attraction and employment of young scientists.
iii. Strategic alliances with other firms for the purpose of entering new markets; sales and logistics; and/or extending distribution networks.
iv. Collaborating with government agencies and public institutions for R&D purposes.

v. Part of an establish network of interrelated companies belonging in the same or adjacent industrial sectors.

Nature of clustering/networking activities

In this section, we examine whether there were clustering/networking activities during the 5-year period between 1998-2003. As shown in the following table, we are interested in the nature of the clustering/networking activities of the company and present the number of the relevant activities for each case. As we show, Compucon engaged in various different clustering/networking activities in the 5-year period we examined, both domestically in the Greek market and internationally.

Nature of clustering/networking activities for the 5-year period between 1998-2003

Nature of clustering/networking act.	***Number as appropriate***
Equity holdings	2
Marketing agreement	8
Licensing agreement	0
Development agreement	2
Research agreement	0
Joint venture	1
R&D agreement	4
Manufacturing agreement	2
Grant/research funding	3
Supply agreement	4
Distribution agreement	40 distributors/sub-distributors
Unspecified agreement	0
Other (specify)	1 (Technopolis)

Table 9, Question 1, Questionnaire on Clustering/Networking, Compucon, S.A., 2003

Mr. Thomaidis, the CEO, explained to us that cornerstone of the business strategy of Compucon is the constant attempt to proceed in acquisition of companies (know-how) or formation of strategic alliances and collaboration with Universities and/or Research Institutions. Compucon is relying heavily in its global distribution network and for the CEO the case of Compucon forming strategic alliances and/or proceeding with company acquisitions is not only possible but constitutes a necessity in today's global competition, either with the initiative of Compucon or stemming

from a third party. Although Compucon is based in Thessaloniki, Mr. Thomaidis and the management team are strongly in favour of global co-operations and strategic alliances as they are seen as "the new way of competing" for the company and a move that would increase the market share and improve the Company's position in the international market, promote technological and knowledge transfer and the mutual exchange of know-how, expertise and skills.

Fields and objectives of clustering/networking

In this section, we examine some of the various fields and objectives of business clustering/networking and strategic alliances. The analysis was made with the use of closed-format question/answer based on a Likert scale. In the following figure the different degrees of importance in which the various fields and objectives concern the clustering/networking activities of the company in the 5-year period examined are presented.

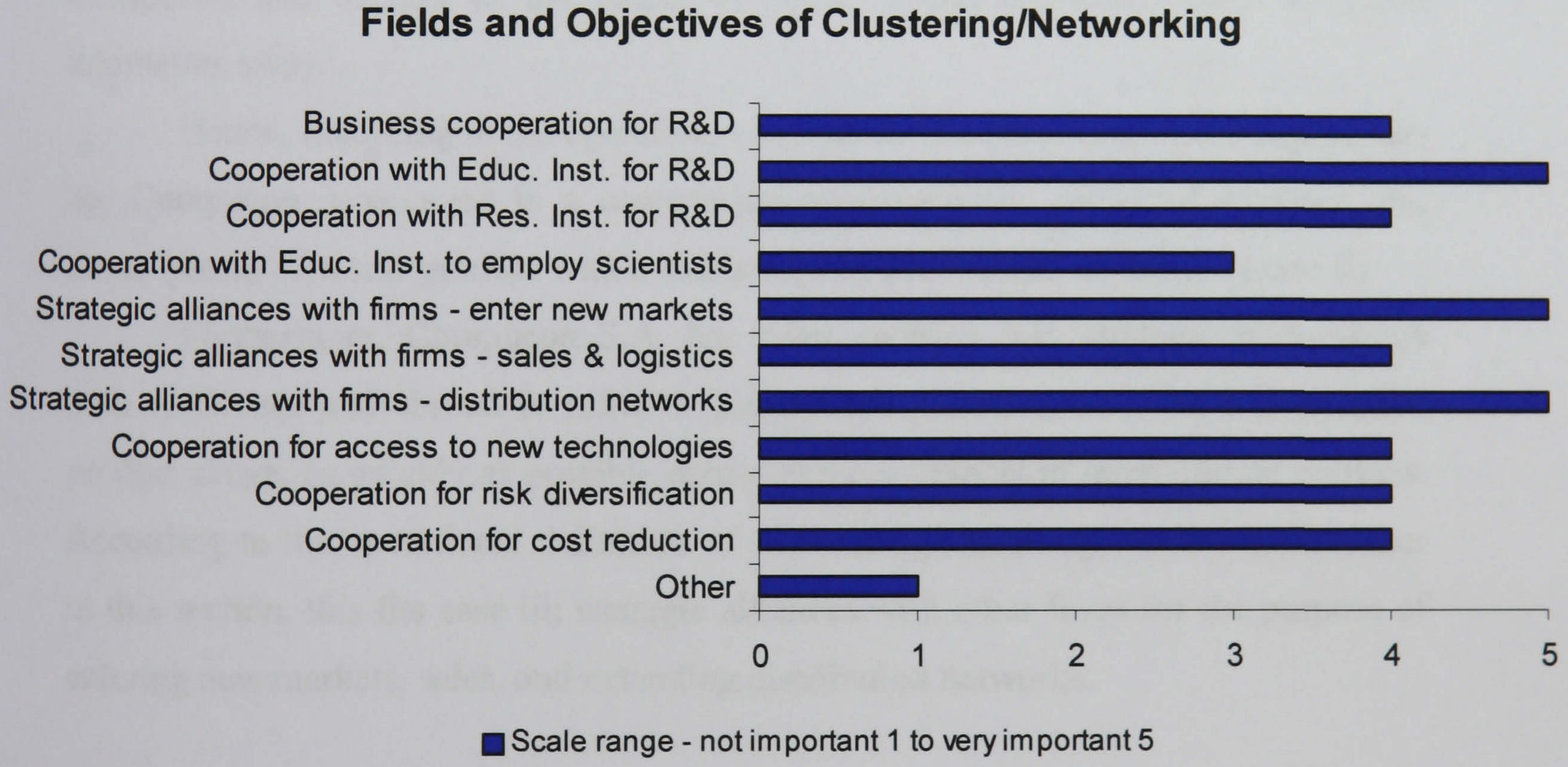


Figure 11, Question 2, Questionnaire on Clustering/networking, Compucon S.A., 2003

It is obvious that with the exception of networking and cooperation with universities for the attraction and employment of young scientists the company is actively engaged, to a very large degree, in all the other fields of

clustering/networking and strategic alliance activities. This confirms the importance Compucon places on clustering/networking.

The management team suggested to us that in order to put forth the significance of networking for Compucon it would be necessary and appropriate to take a careful view of the processes through which product lines of the company evolved. Specifically, as we noted in the previous section, Compucon has signed an agreement with ITE Crete (Institution of Technology & Research of the University of Crete) and the Greek Research, Technology & Education Support Company for the systems development of cutting, engraving and elaborating materials with laser, that can be sold in the international market. The innovation of the specific investment, which is expected to be realised through the establishment of the subsidiary company in Thessaloniki, is that it aims to develop laser machinery with low or medium capacity at a low production cost, which are going to be distributed globally, through the company's international network. As the technical director explained to us since the Region of Thessaloniki and Central Macedonia did not have the necessary research and development facilities to help form a university-company co-operation Compucon had to turn to the island of Crete, which is located close to 1,000 kilometres away.

Hence, according to the operational definition of networking/clustering we set-up, Compucon is engaged in a cooperation agreement for combined research and development of a new product with a technological educational institution (case II).

Furthermore, Compucon S.A. has been entering into strategic partnerships both in Greece and abroad in order to disseminate "*SiteCosmos*", the web-solution product range, as quickly as possible across niche segments in international markets. According to the operational definition of networking/clustering, we re-stated earlier in this section, this fits case iii; strategic alliances with other firms for the purpose of entering new markets, sales, and extending distribution networks.

Quantifiable aspects of clustering/networking

We begin this section by examining the number of companies, universities and research institutes that the company was cooperating/networking with in the base year 1998 and what are their respective numbers in 2003. As we can see in the following

table 10, the company has nearly doubled its cooperation/networking agreements and activities during the 5-year period under examination, a sign that further supports our argument that the company is systematically pursuing such activities. The number of companies, distributors, universities and research institutes that the company is cooperating/networking is one of the four core measuring parameters of the clustering/networking level of the company as we presented in the opening scheme of this chapter. Compucon is scoring high in this parameter as shown in the table below with a respectable number of strategic alliances and joint ventures.

Number of companies, universities and research institutes that the company was cooperating/networking with in base year 1998 and the respective numbers in year 2003

	Companies	*Distributors*	*Universities*	*Research Institutes*
1998	4	21	0	0
2003	7	40	2	1

Table 10, Question 3, Questionnaire on Clustering/Networking, Compucon, S.A., 2003

Next, we examine the percentage of sales that co-developed products represent in the period between 1998-2003. The data given in the following pie chart represent the average percentage of sales for the 5-year period under examination as it was classified for the company's managers to provide details for each product's sales for each one of the five years. Furthermore, the data were given to us under the headings of the product lines and not of the specific products names. What emerges from the figure is that the total percentage of sales of co-developed products is 21%. This is the second of the four core measuring parameters of the clustering/networking level of the company. The rest of the company's products, are not developed through co-operative activities and represent 79% of total sales.

Average Percentage of Total sales of co-developed products between 1998-2003

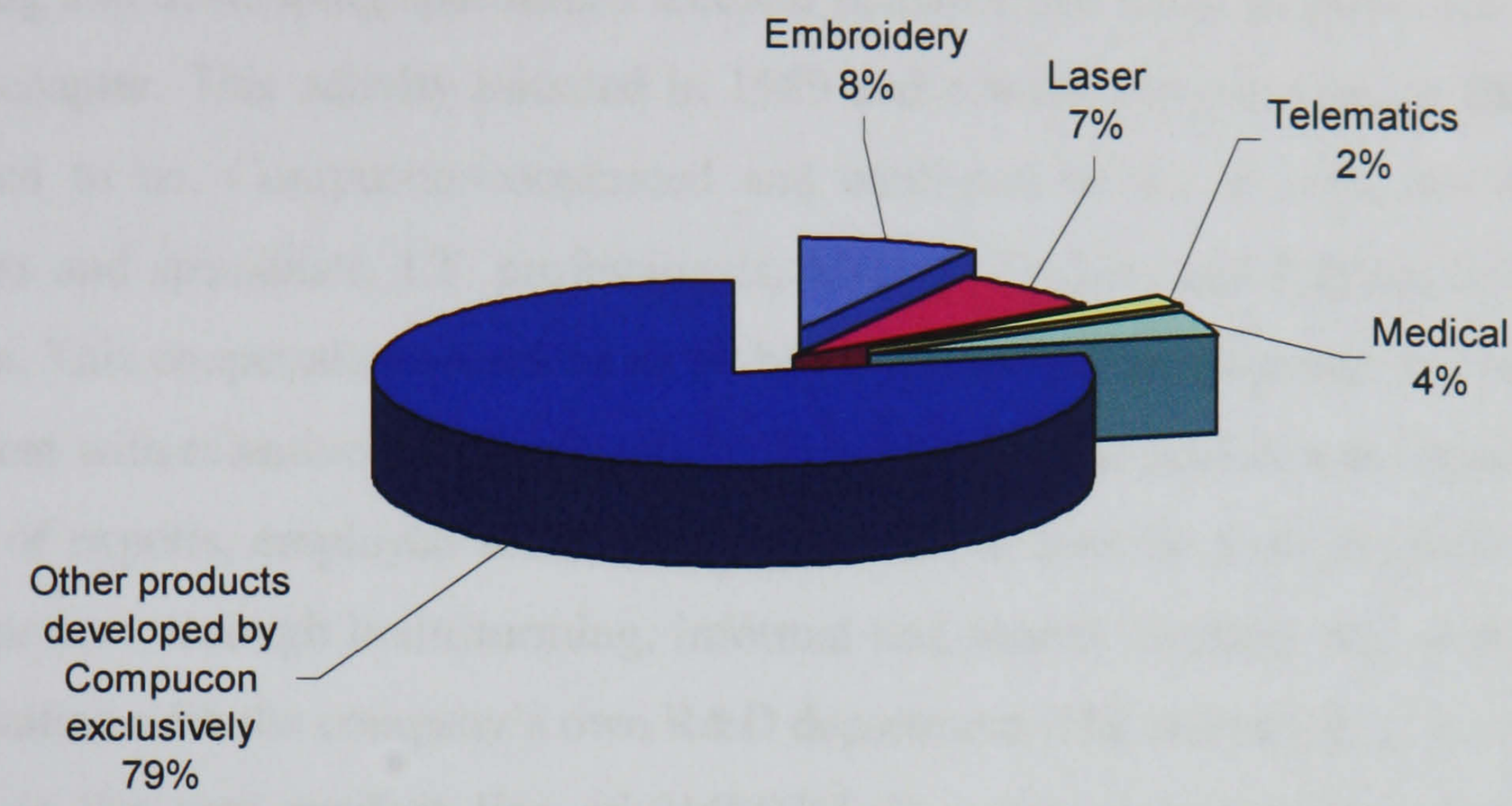


Figure 12, Question 4, Questionnaire on Clustering/networking, Compucon S.A., 2003

As we have discussed earlier in this chapter, Compucon realises the importance of strategic alliances, joint ventures and cooperation agreements with other firms and bodies for the development and launching of new products as well as the penetration of foreign markets and the diversification of its market fields. At first sight, the average percentage of sales of co-developed products might not seem so significant. However, at a closer investigation it appears that 13% of the sales of co-developed products represent newly launched products in 3 new market fields that the company has entered only in the past five years and as such the numbers are very promising for the future. Furthermore, the 8% of the sales of the embroidery co-developed product represent the importance the company is placing on networking/clustering since as we have discussed in the first and second part of this chapter the embroidery industry is reaching a maturing stage and the company is keen in developing new products through collaborating activities. While the figure of 21% of sales of co-developed products could be probably seen as an average for a high-tech company in Western European countries, it happens to be very high for the Greek standards, and this is the national environment where we test our 2-dimensional model.

The business philosophy of Compucon S.A., aided by the company's extensive experience in the international markets and the know-how in the fields of High-Technology enabled it to expand its business activities in the medical fields by designing and developing specialized medical software and tools, as presented earlier in this chapter. This activity initiated in 1989 and toward that purpose, as the CEO explained to us, Compucon cooperated and continues to do so with well-known scientists and specialists, I.T. professionals, Medical Doctors and Experts in Health Systems. This cooperation occurs on an ad hoc form for the development and research agreement with scientists and experts in the above fields. The project was organised in groups of experts, employed for their expertise and at specific time intervals of the whole project, through brainstorming, informal and formal meetings and working in collaboration with the company's own R&D department. The end result, as mentioned earlier, is the new product line of "*MEDIfiler*", a complete package of medical applications, which covers all the specialized needs for managing medical files. Compucon's medical business unit is currently on a joint venture and R&D agreement with an Athens based company toward the objective of strengthening its R&D activities and, simultaneously, is working together with another Athens based company, having undersigned a supply and marketing agreement, in order to strengthen its presence in the domestic, medical software products Greek market. Hence, according to the networking/clustering operational definition, this fits the first case, namely business cooperation for combined R&D of new products, and case iii, namely strategic alliance with another firm for entering new markets, sales and extending distribution networks.

Furthermore, we examine the number of products that the company successfully developed and launched in the market through business cooperation agreements and by cooperating with educational and research institutes in the 5-year period between 1998-2003. As shown in the following table, Compucon developed and launched 5 products as well as the complete medical product line through cooperation and strategic alliance activities. The number of products the company has developed and launched in the market through co-operative activities between 1998-2003 is the third of the four core measuring parameters of the clustering/networking level of the company.

Number of products the company has developed and launched in the market through co-operative activities

Through business cooperation agreements	Embroidery: 1 product Telematics: 3 products Medical: the complete product line (17 sub-products)
By cooperating with educational and research institutes	Laser: 1 product

Table 11, Questions 5 and 6, Questionnaire on Clustering/Networking, Compucon, S.A., 2003

In the embroidery market, Compucon maintains and expands its supply agreements and joint ventures, designing and producing custom made products and services, for large multinational companies that produce embroidery products such as SINGER (in 2001 the company set up a manufacturing and supply agreement with SINGER, developing SINGER Professional Sewing software Sew-Ware) and BROTHER. The company also works in developing and promoting network solutions (PCs and embroidery machines) and in representing foreign established embroidery machines producers in the domestic Greek market. The company has also formed supply and licensing agreement with several of the major producers of embroidery machinery enabling itself to market along with the software it produces the required hardware-machinery needed for embroidery. The company has established a network of 40 distributors and sub-distributors not only domestically but worldwide as well, to promote and sell its products. This fits case v of the operational definition of networking/clustering, since the company is part of an established network of interrelated companies belonging in the embroidery (software and hardware) industry.

Finally, we explore the number of new markets, which include first time foreign markets penetration and diversification of market fields, that the company entered as a result of its clustering/networking activities in total. The following table 12 illustrates the importance of clustering/networking for Compucon's competitiveness and the high level of networking since it entered 9 foreign markets and diversified its activities by developing and producing 2 new product lines. The number of new markets the company has entered through clustering/networking activities between 1998-2003 is the fourth of the four core measuring parameters of the clustering/networking level of the company.

Number of new markets the company has entered through clustering/networking activities

Foreign markets	9 (China, Japan, Latin America, Mexico, Canada, Spain, Portugal, Finland, Middle East)
Market fields	Laser and Telematics

Table 12, Question 7, Questionnaire on Clustering/Networking, Compucon, S.A., 2003

Compucon maintains a leading role in the embroidery global market with an integrated distribution network spread out from America to Japan, Europe, South East Asia and Middle East, Australia and S. Africa. As the business grows, so does the need for higher-level expertise and for this reason Compucon extends is co-operating with experienced executives and outstanding global distributors. Compucon as previously noted employs more than 70 persons and co-operates with more than 40 distributors and sub-distributors all around the world.

In 1999, Compucon USA was established in Greensboro, NC, aiming to fulfil the role of becoming the basis for promoting Compucon's product and services in United States, Canada and Mexico. In 2002, Compucon S.A. acquired 100% of Compucon U.S.A. shares. The expansion of sales in new geopolitical and economic areas constitutes a basic parameter of Compucon's strategy. Within this framework, the company has laid forth, as an immediate priority, its further strengthening of presence in "key" markets in U.S.A. and Japan, as well as the penetration in the Chinese market for which the market trend shows that the growth rates will be significantly increased in the years to come. In order to support the above, options Compucon has planned for the next three years to proceed with a program of specific investments. Some of them include the realisation of expansion investments in the local US and China market, installation of integrated computer system to the facilities of the Japanese distributors along with market research and creation of distribution network in China. More specifically, the company plans to reinforce its presence in the market of China and the Middle East forming strategic alliances (marketing and distribution agreement) with local companies. In addition Compucon is in the process of establishing an R&D agreement with the IT department of a University in Israel, for the development of embroidery software to the specific needs of the Middle East market, i.e. the translation of the software to local languages. Considering the fact that the Chinese market is still rather defensive and closed to foreign investors, the creation of a network with local firms and distributors was the only way to ensure a

proper and low-risk investment in those markets. The above strategies fit cases i, ii and iii of the network/clustering operational definition, namely business cooperation (agreement) for combined R&D, networking with local educational institutions for R&D purposes and strategic alliances with other firms for the purpose of entering new markets and extending distribution networks.

In 1999, a cooperative (joint venture and manufacturing agreement) effort with OTE, the Greek National Telecommunications Enterprise, resulted in the birth of a spin-off project for telematics. Compucon S.A. decided to enter the field of Telematics at the end of 2002, following two years of research, collaboration and exchange of technical know-how with OTE and after a thorough market research project had been concluded. Compucon developed a range of VIPS products (Vehicle Identification Positioning System), which is based on automatic position identification systems via GPS, as well as the transmission of fixes through the GSM network. Compucon SA has moved on to strategic alliances (supply and distribution agreement) in this field and to the development of needed services relating to vehicle fleet management for large companies and organisations on a worldwide basis. According to the operational definition of networking/clustering, this fits case one (i), namely business cooperation for combined research and development of a new product/service and case three (iii) for entering new markets and extending distributions networks.

In other key-activities, in order to enhance its networking capabilities, Compucon has hired the services of Mr. Vasilis Kafatos, partner in Deloitte & Touche Consulting S.A. to head the Thessaloniki branch and has placed him in charge of Strategy and Performance Management services in Greece, (he is an independent member of the Board of Directors) that follows and keeps track of all the European and Greek research programmes, funds for innovative actions, etc. During the past two years, Compucon has managed to gather some funds from European Regional programmes sponsoring innovative activities. Furthermore, Compucon has hired Dr. Aristotelis D. Spiliotis the co-founder and Managing Director of the Companies 4E "AEEKES" and "AIAS FINANCE SA.", which were established in 1999 and are active in the field of Venture Capital. For several years, Dr Spiliotis was investment director in a Greek Mutual Fund and a consultant in business strategy and finance for several companies. This person (working as an independent member of the Board of Directors) is now the link of the company with the Aristotle University of

Thessaloniki, charged with the responsibility to enhance a strategically important collaboration in the research and design (knowledge and know-how exchange) of some Compucon's product lines, embroidery and telematics, with the university's research facilities and personnel, as well as attracting young talented scientists. At the moment, the company is sponsoring a young scientist who is doing his Philosophy Doctorate in Laser technologies and who is already working in the new Compucon subsidiary company of Laser Cutting and Engraving Systems in Thessaloniki. This is another network/clustering activity of the company corresponding to case ii of the operational definition, namely the networking with local educational institutes for R&D purposes and for the attraction and employment of young scientists.

When we asked the managers if the infrastructure of the Region of Thessaloniki, its airport, port, railway and highway system are developed enough to help the business activities of the company, the answer was unanimously negative. As they indicated to us, from a logistics viewpoint, the region's infrastructure is inadequate and obsolete if compared to a 'silicon valley' model, but on the other hand, they mentioned that their company relies mostly on the World Wide Web to conduct its global business activities.

Furthermore, the CEO of the company claims that there is no mechanism in the Region of Thessaloniki to promote and encourage university-business co-operations, or business-to-business networking. The only initiatives stem from SEPVE, the Association of Information Technology Companies of Northern Greece. This organisation has more than 200 member companies in Northern Greece. The most important initiative of SEPVE is the creation of a cluster of IT companies in Thessaloniki, the "Silicon Valley of South-Eastern Europe in Thessaloniki-Technopolis". Compucon is one of the 39 IT companies, the University of Macedonia, the International Fair of Thessaloniki and other agents and institutions of the Region, that support and develop this long-term project. Mr. Thomaidis, who is also a member of the board of directors of the Technopolis initiative, sees clustering and networking of IT companies as one of the Region's future competitive advantage, having a leading role particularly in South-East Europe and Asia.

5. Outcome: Very High Performance/Growth

The above analysis in sections three and four verify the high innovation rate and high clustering/networking level of Compucon S.A., the 'path-breaker' type of SME. The Greek economy has, yet, to form and establish a national innovation system and promote clustering and university-business-government relations. In such an environment and under the peculiarities of the Greek business, political and socio-economic system a company like Compucon is the 'path-breaker' type of SME, which should serve as an example for other companies to follow. In this last section of chapter seven, we investigate the dependent variable of our hypothetical, descriptive two-dimensional model, namely the performance/growth of the company. As we highlighted in the opening part of this chapter, and as shown in the following figure 13, Compucon is scoring very high in the chosen performance/growth parameters.

Performance/Growth of Compucon S.A. between 1999-2003

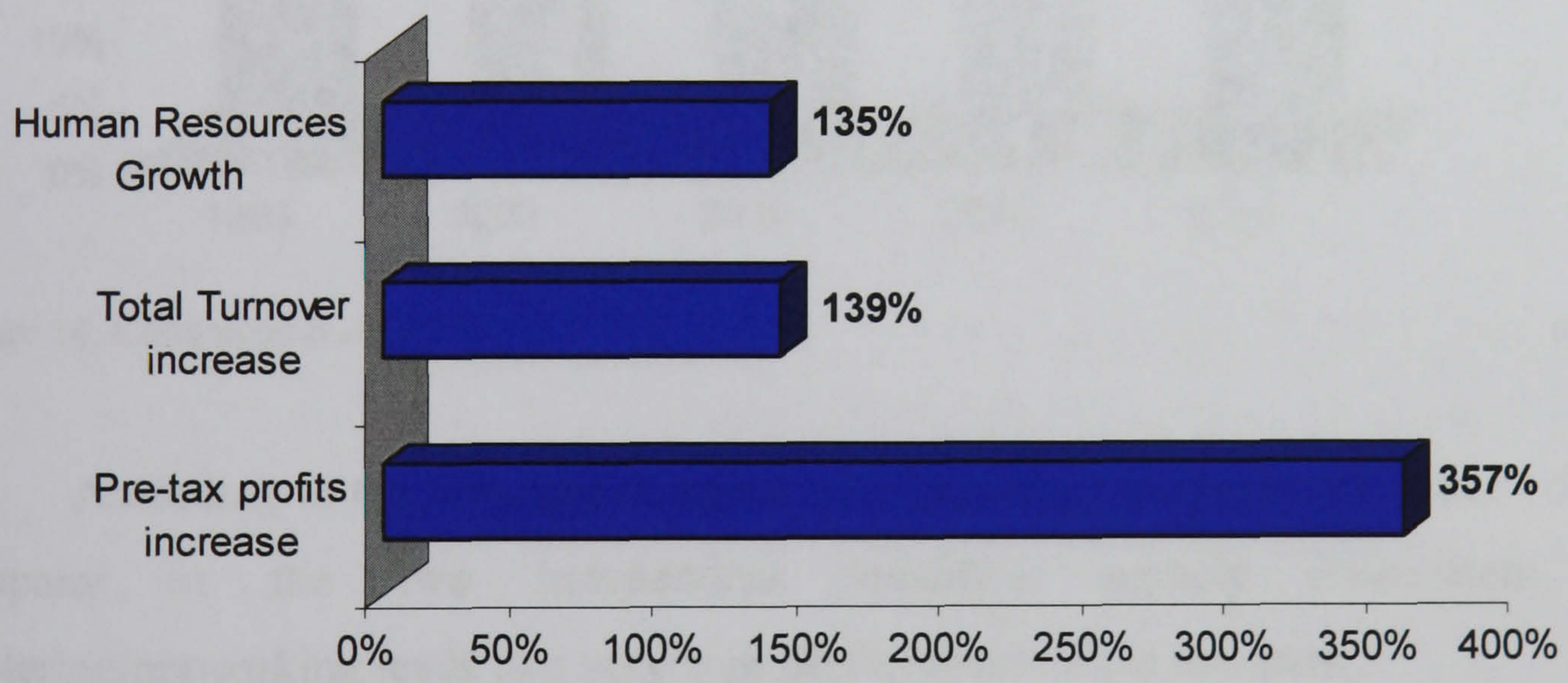


Figure 13, Compucon S.A., 2003

Over the five-year period between 1999-2003, Compucon increased its human resource capital from 31 to 73 persons, a 135% increase, as shown in figure 4 in the first section of this chapter. Furthermore, the company boosted by 139% its total turnover from €3.1 to €7.44 million euros, as shown in figure 6 earlier in this chapter. Compucon S.A. also shows an impressive 357% increase of its pre-tax profits from

€795,000 to €3.6 million euros, as presented in the first part of this chapter in figure 5. These parameters are three of the four measurements of the dependent variable, namely the performance/growth of the company and clearly illustrate the high score of the 'path-breaker' type of SME in this variable. Furthermore, the last parameter we use to measure the performance/growth of the company is the percentage that pre-tax profits represent as part of the total turnover. As shown in the figure below Compucon has almost doubled this figure, verifying the very high performance of the company.

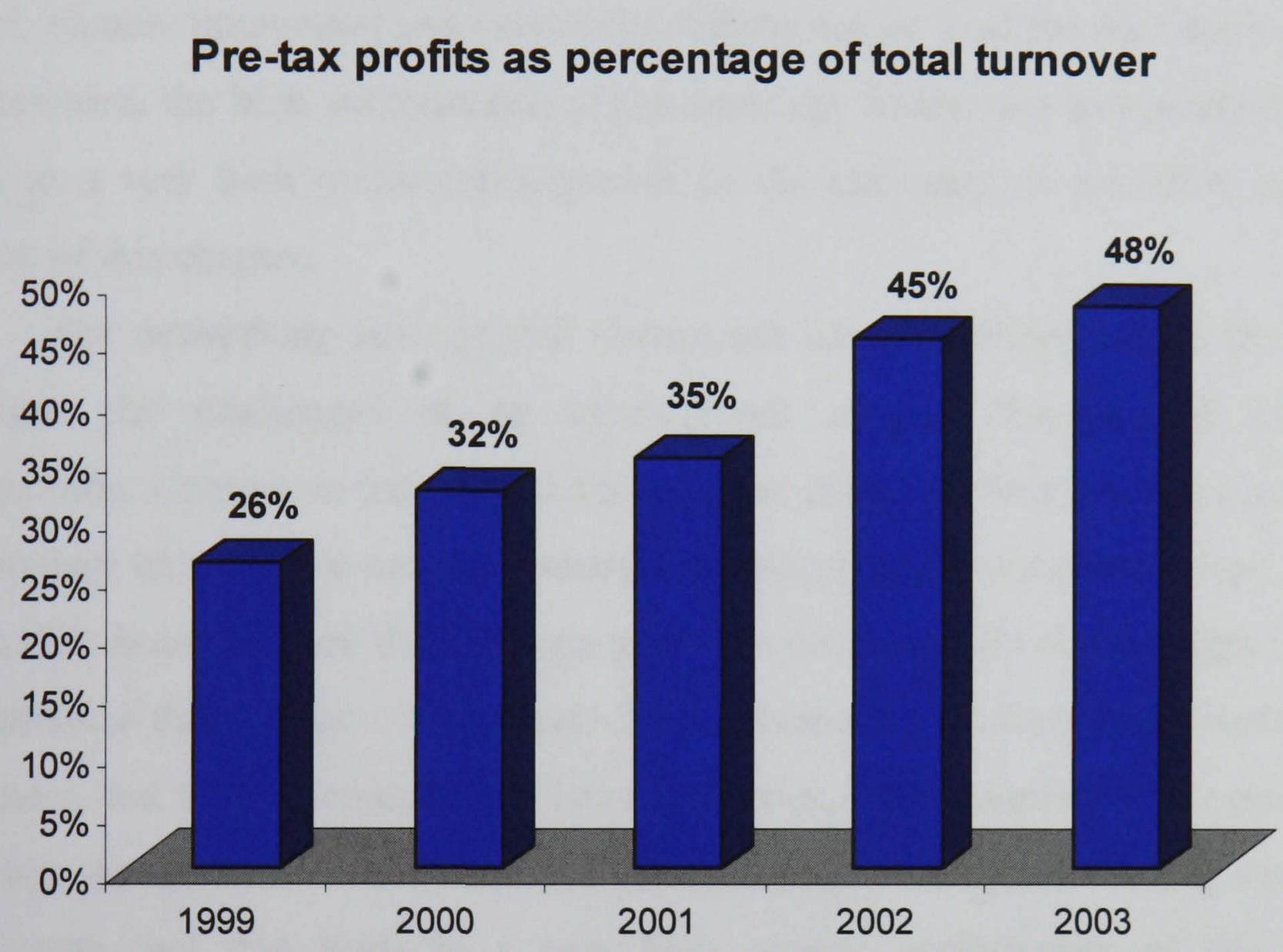


Figure 14, Compucon S.A., 2003

According to the two figures above, we argue that the high performance of the company in the two independent variables, namely innovation and clustering/networking leads to a very high performance of the company.

6. In Conclusion

Compucon S.A. fits the criteria we set for the 'illustrative' SME type named 'path-breaker' which is located in the upper right square of our hypothetical, descriptive two-dimensional model. As we show in the third and fourth sections of this chapter, based on quantitative and qualitative data gathered through our questionnaire and interviews the company achieves high performance scores in both dimensions of the model, namely innovation and networking/clustering, at least for the Greek standards. Furthermore, the high performance of the company in the two independent variables leads to a very high performance/growth of the company as we show in the fifth section of this chapter.

The networking strategy that Compucon has established allows the company to meet the challenges of an international market characterised by intense competition. Compucon has managed to enhance its productivity, being a leader in the embroidery industry not only in Greece, but also in many countries around the globe and a distributor in more than 50 countries. It is enhancing its already high innovation performance through the collaboration with universities, professionals, customers and suppliers, and with companies in related industries, with complementary products and services. As we show innovation and clustering/networking are scoring very high in Compucon and that leads to a very high overall performance of the company. Compucon managed to increase substantially its sales, turnover, established two subsidiaries and entered the Athens New Market Stock Exchange, and more than doubled its human resource capital in the period between 1999-2003.

Chapter eight deals with the third 'illustrative' type of SME to which we assigned the name 'survivor' and placed in the lower left square of our hypothetical, descriptive two-dimensional model. Our intention is to explore and present the very low innovation and virtually non-existent clustering/networking performance of this type of SME. We examine the low performance of the company, which seems to be largely attributed to its persistence in the one-against-all strategy and its inability to apply modern management techniques to boost the innovative rate of the company.

Chapter 8

Case Study III – '*Survivors*' – Oktabit S.A.

1. Introduction

Characteristics of the 'Survivor'- Oktabit S.A.

Very Low Innovation rate

- **0** - New goods introduced between 1998-2003
- **0%** - The company is not producing any innovative products between 1998-2003
- **0.39%** - Percentage of funds allocated to innovative activities, there is no R&D department
- **0%** - The company does not have an R&D department

Low Performance/growth

- **9%** - Human resource growth between 1999-2003
- **37%** - Total turnover percentage change between 1999-2003
- **-14%** - Pre-tax profits percentage change between 1999-2003
- **1.01%** - Pre-tax profits as percentage of total turnover in 2003

Non-Existent Clustering/Networking level

- **0** Companies – **0** Distributors – **0** Universities – **0** Research Inst., the company is not cooperating at all
- **0%** - The company is not cooperating with any firm and/or institution for the development of new products
- **0** – There are no co-developed products
- **0** – Foreign markets penetration 0 – new market fields between 1998-2003

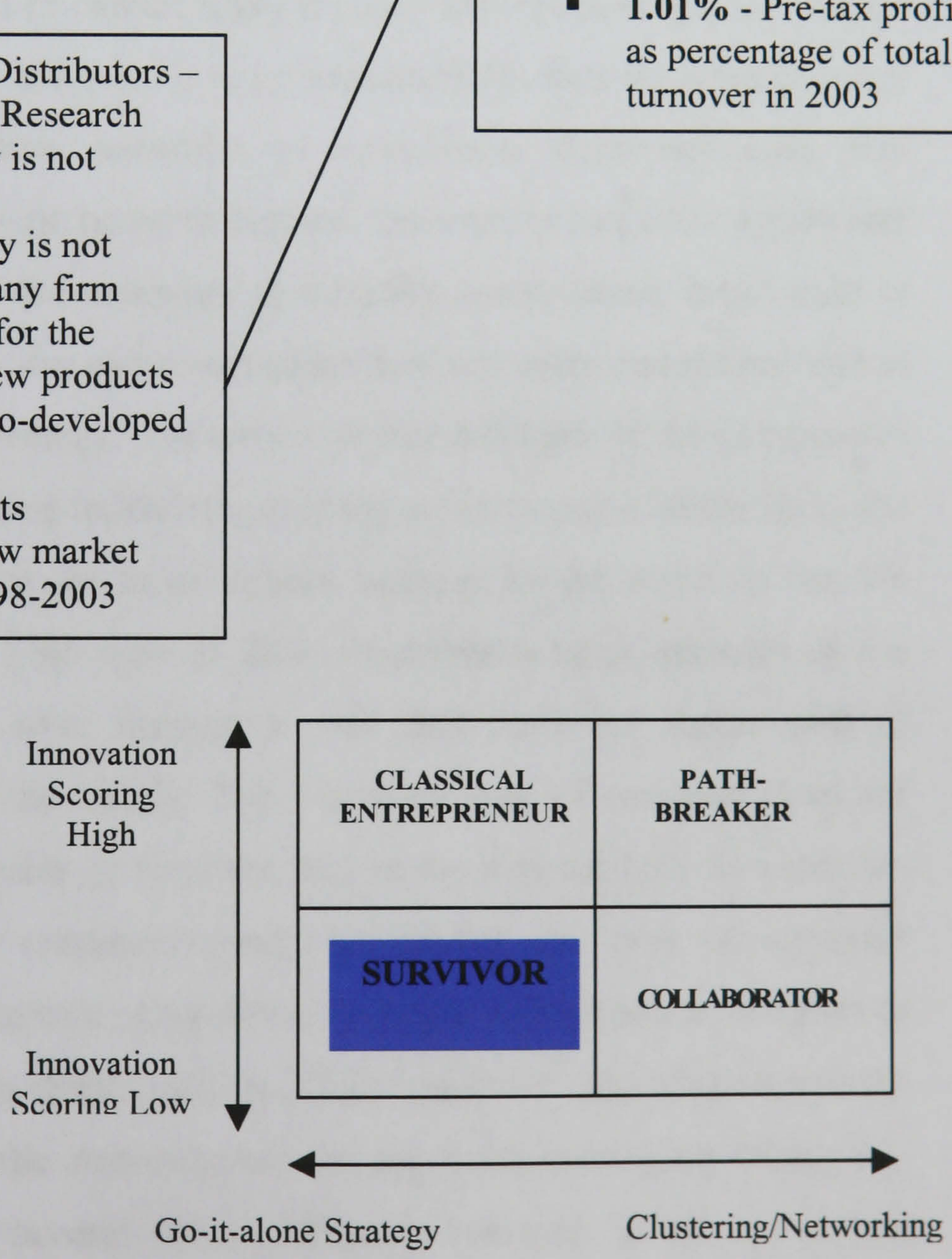


Figure 1, the 2-dimensional model

3rd illustrative SME – 'survivor'

In the opening section of chapter 8, we find it necessary to present the major key findings of the third case study, the SME type we assigned the name 'survivor' so that the reader can have a condensed but explicit overview of the company's particular scores on innovation rate, clustering/networking level and overall performance/growth. Four parameters are used to measure the relevant scores of each of the independent variables, namely the innovation rate and the clustering/networking level, and the dependent variable, namely the performance/growth of the company. At the bottom right corner of the above page, there is a small figure of our hypothetical, descriptive two-dimensional model highlighting the position and the symbolic name we assigned to the 3rd illustrative type of SME in our 2-dimensional model.

As we suggest in the scheme presented and identified in chapter 3, the SME of the 'survivor' type exhibits very low performance/scoring both on innovation and on networking/clustering showing clearly characteristics of a business that simply is formulated to achieve an income for its owner be it as it may, one or more individuals or a family and is not interested or cannot apply modern management and innovation techniques. We name this SME '*Survivor*', since such an SME does not belong to any strategic alliance or cooperative networks of enterprises, does not have any cooperation with public and private research centres, universities and other agents and the innovative performance of the company is virtually non-existent. Innovation is something the nature of which the owner-manager may not even understand and is certainly out his/her business strategy. The owner and/or manager of the company is not interested in changing anything in his/her company either because he/she lacks the understanding and knowledge to do so or simply because he/she wants to run the business in his/her own way. This type of SME describes a large majority of the companies in Greece and all over Europe as well that have the single goal of achieving a 'good' income for the family. The 'survivor' type of company does not necessarily fail to increase its sales or turnover, but rather it is the lack of a modern approach to management and competitiveness that makes this type of company vulnerable to foreign and/or domestic competition by larger enterprises. In the present chapter, we aim to provide an in-depth analysis of the 'survivor', focusing on its very low innovation performance, the non-existent scoring performance on clustering/ networking strategies and on several other indicators relevant to the conceptual themes of the horizontal and vertical axes as shown above.

After careful investigation and appraisal we identified "Oktabit S.A." as the ideal SME meeting the criteria stated above. As we present throughout this chapter and as shown schematically, in figure 1 above, Oktabit shows a very low innovation record having introduced only process innovations in the 5-year period between 1998-2003. The company's total sales come from the distribution of hardware and software products of third-party manufacturers since the company is not producing any products of its own and only a fraction, namely 0.4% of the total turnover is spend on innovative activities, while the company does not have an R&D department. On the other hand, Oktabit shows a virtually non-existent, clustering/networking performance record. The company in the 5-year period under examination has not engaged in any networking and cooperating activities. Thus, the company has not developed and launched any products through business cooperation agreements and/or by cooperation with educational and research institutes. Furthermore, Oktabit has not diversified its market fields nor penetrated through clustering/networking activities any foreign markets in the past 5 years. Finally, as shown in the figure above the 'survivor' type of SME exhibits low scores in our dependent variable of performance/growth. In terms of total turnover, the percentage increase was 37% and the increase of its human resource capital was just 9% over the five-year period 1999 to 2003. On the other hand, pre-tax profits percentage fell by 2.8% over the five-year period under examination. The low performance of the company is also illustrated by the very low pre-tax profits, which represent only 1.01% as part of the total turnover.

Oktabit's core business includes the representation and distribution in the Greek market of hardware products and software applications of world-class manufacturers. It is a company of Greek origin that made its debut in 1992 and now has two operation centres one located in Thessaloniki and one in Athens. Oktabit S.A. is a company operating and competing in the IT sector of the Greek economy. Oktabit's primary goal and vision was to achieve excellence in distribution focusing on the top-quality of its products and the long lasting cooperation with reliable vendors. Eleven years have lapsed since then and today Oktabit S.A. is the 4th largest company in the market of distribution of computers and peripherals in Greece, succeeding to continuously expand its product range, cooperating with more than 35 world-class manufacturers. Oktabit is a 'box-moving' company that exhibits a virtually non-existent innovative performance as well as a virtually non-existent

clustering/networking performance, which was unveiled to us during our interviews. as Mr. Gialamaidis, the northern Greece managing director indicated:

> "We are a 'turnover intensive' company, not a 'knowledge intensive' one. We aim at becoming the leading distributor of IT products in Greece. We compete against bigger and more powerful companies and we have managed to survive and prosper utilising on our own efforts and strengths."

2. Situation, Market and Competition Analysis

In this section, we attempt a brief investigation of the company's internal structure and organizational culture, drawing attention particularly to HRM practices, the financial situation, marketing and competition assessment.

From the merger of Victor Hellas and Oktabit and the inception of Oktabit S.A., the development of the company was largely the result of the efforts, activities and strategic planning of the six-member Board of Directors. Mr. Gialamaidis, the Managing Director explained to us during our interviews, that the general strategies, mission plans and the philosophy of the company are determined at the Board level while the management team decides the day-to-day operation and management of the company including the responsibilities and authorities of every job in the company.

The two offices of Oktabit S.A., one located in Athens and one in Thessaloniki, are organised under the six-member Board of Directors and below them in the organisational chart are 15 managers responsible for the day-to-day management of the business, i.e. inventory managers, logistics managers, marketing managers, operation managers and others. According to Mr. Gialamaidis, Oktabit is organised under the classic three-level management pyramid structure, where the Board of Directors is on top, middle management constitutes the middle layer all the other line employees are found at the base of the pyramid. The directors believe that for a company of their size this organisational structure is as 'flat' as possible.

Oktabit does not have a formal and organised human resource department. According to Mr. Gialamaidis, the company is relying on the various managers and the director's expertise and experience to deal with the human resource needs as they arise. Oktabit has shown a limited growth of its human resource capital in the past 5 years, when the personnel employed in the company has increased from 83 persons in 1999 to the 91 persons in 2003, as shown in the figure below.

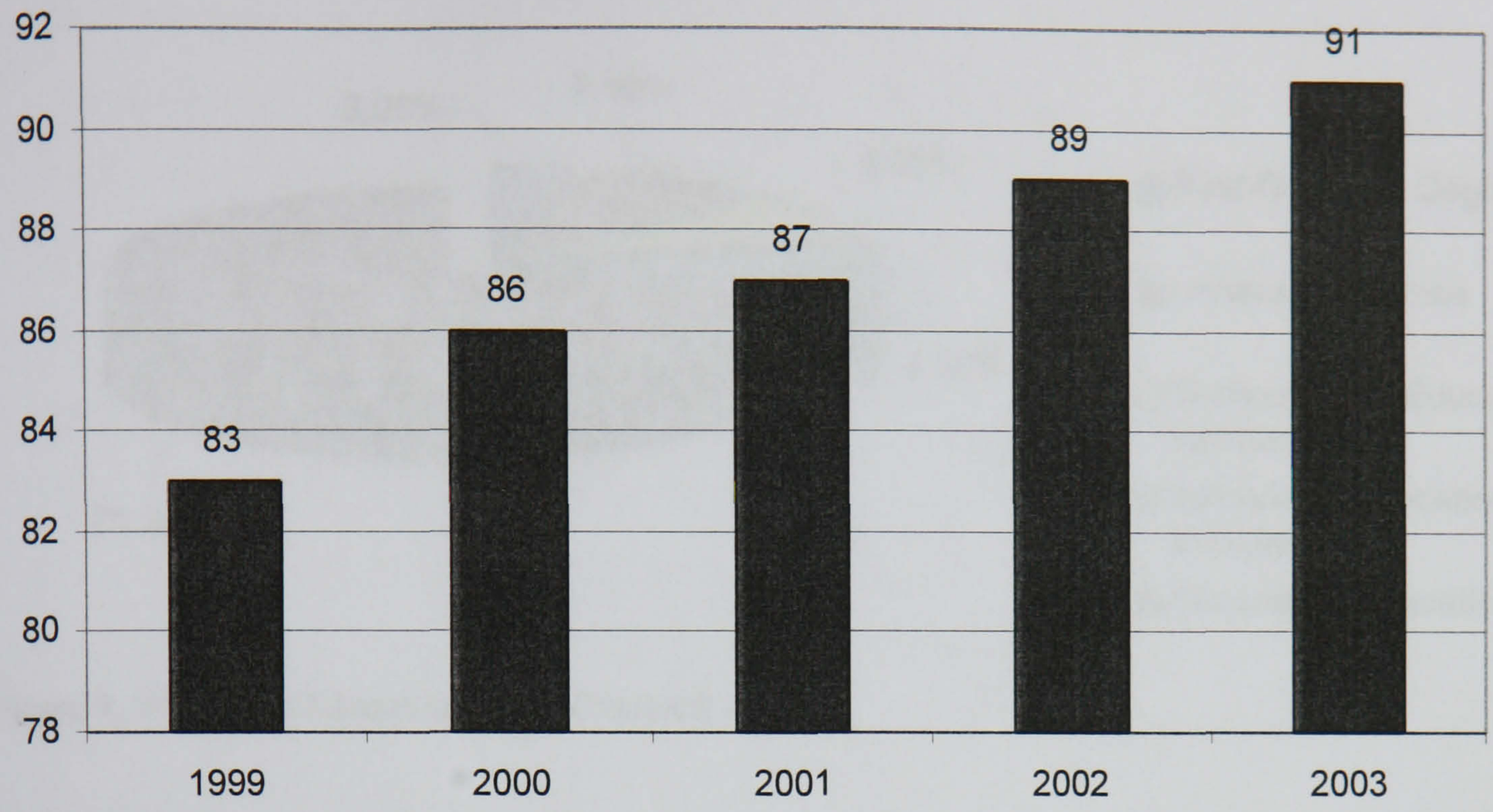


Figure 2, Number of Personnel, Oktabit S.A.

Oktabit's is a people intensive business and an important characteristic of its human capital is their low education level. As figure 3 in the following page illustrates, 71.30% of the staff possess secondary level education and another 16.84% are graduates of Vocational Education Institutes and Technological Education Institutions. The need of the company to have their personnel kept up-to-date, with the technological changes, know-how and new inventory planning and control systems is reasonably dealt with their continuous engagement in training and education seminars. According to the directors/management team, even the executives and the managers of Oktabit are regularly and in specific time intervals trained and educated to the latest management and marketing techniques, i.e. in logistics and inventory applications, since they believe that they have to keep themselves up-to-date in order to steer the company towards success and growth. Moreover, some of the company's middle managers and two of its Directors are not even University graduates, which place an even greater need for continuous education seminars.

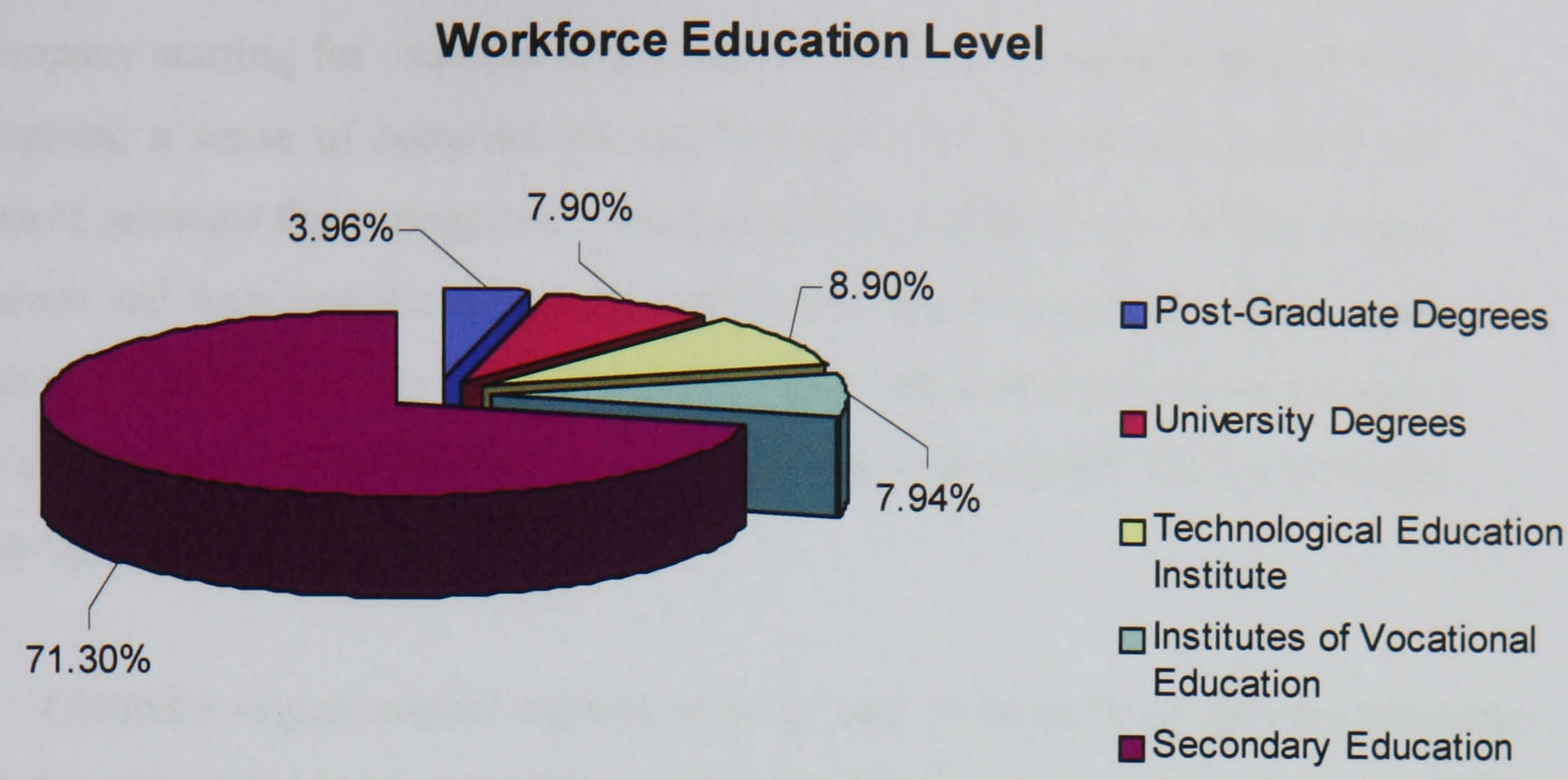


Figure 3, Workforce Education Level, Oktabit S.A.

According to the information provided to us by the Managing Directors (Messrs Antonis Papaioannou and Antonis Gialamaidis), Oktabit's weakest features is the lack of dedication and commitment of its employees to the company's philosophy and vision,

> "The majority of the young people employed in Oktabit do not look beyond their job tasks. It seems that they do not want to or avoid being actively involved in the company. They do not share the same dedication and commitment as the older employees to the values and culture of the company. We feel that most of the young people that work for us at the same time prepare their C.V.'s in order to get a job elsewhere."

Adding to that, Mr. Gialamaidis believes that less than 10% of the employees show high morale by acquiring a feeling 'of belonging' that they are part of the organisation, as he quoted, and are dedicated to the survival and future success of the company. Furthermore, the directors of the company explained to us that there is a serious 'generation gap' between the employees, as they said,

> "There are huge differences between employees that are in their mid 20's-30's and middle aged employees. The directors of the company and most of the managers that are middle aged come across difficulties in communicating with

younger employees. People that have spend more than 10 years in the company starting for example as drivers and evolving to sales managers have acquired a sense of commitment and belonging to the company that is not shared amongst the youngsters. Young people do not seem to understand these values and their importance to the company's future success. If a better paid job is offered to them in another company they will quit their jobs on the spot. We feel that we have to invest more on our HR management and try to bridge the 'generation gap'."

Oktabit's organisational culture, strategy and philosophy is the establishment and maintenance of long-term relationships with its customers, which they assume is the cornerstone for the evolvement of the company in the dynamic and highly competitive markets of IT. Oktabit is offering carefully selected products from world-class suppliers of computers and peripherals. By focusing on carefully selected numbers and types of vendors the company is able to concentrate on its purchasing power and streamline administration minimising the distribution costs. The customers benefit from the better and quicker availability and pricing, supported by a high level of technical knowledge and expertise for all the products the company distributes. According to the Directors, the focused product strategy based on a selective product portfolio and the effective selection and support of the vendors differentiates the company from its competitors and creates another competitive advantage for Oktabit.

The following general statements were related to us in verification of the above organizational culture scheme, and we present them below without passing judgement as to whether they constitute company beliefs or mere rhetoric:

i. Continuous communication and strengthening of relationships with the customers/clients, "locking" strategic clients into long term collaboration agreements.
ii. Continuous improvement of facilities, and investment in new systems of inventory planning and control aiming at minimising distribution costs, faster times of delivery and lowering the risks associated with stock becoming obsolete.

iii. Using technology and e-business to build new distribution channels, aiming at creating a new competitive advantage and increasing profit margins.

iv. Continuous improvement of the quality of their distribution process and services.

The financial data presented in the following figures (total turnover and pre-tax profits) illustrate an overall low financial performance of the company, achieving a reasonable total turnover performance, but a very low pre-tax profits figure. Furthermore, the data reveal the 'turnover intensive' character of the business as we have mentioned earlier in this chapter. In the period between 1999-2003 the total turnover of the company increased by 37% while pre-tax profits have fell by 2.8%.

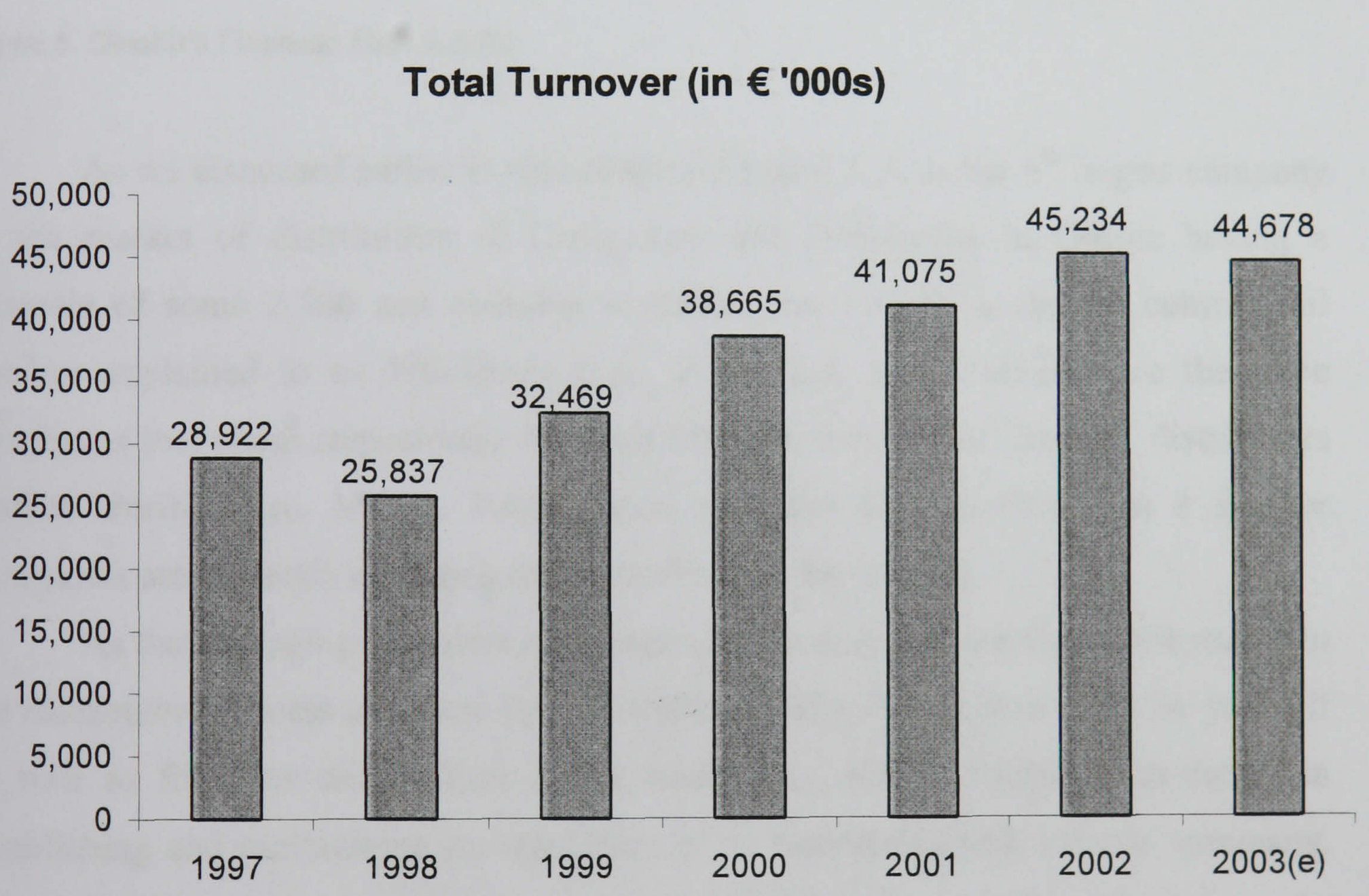


Figure 4, Oktabit's Financial Situation (a)

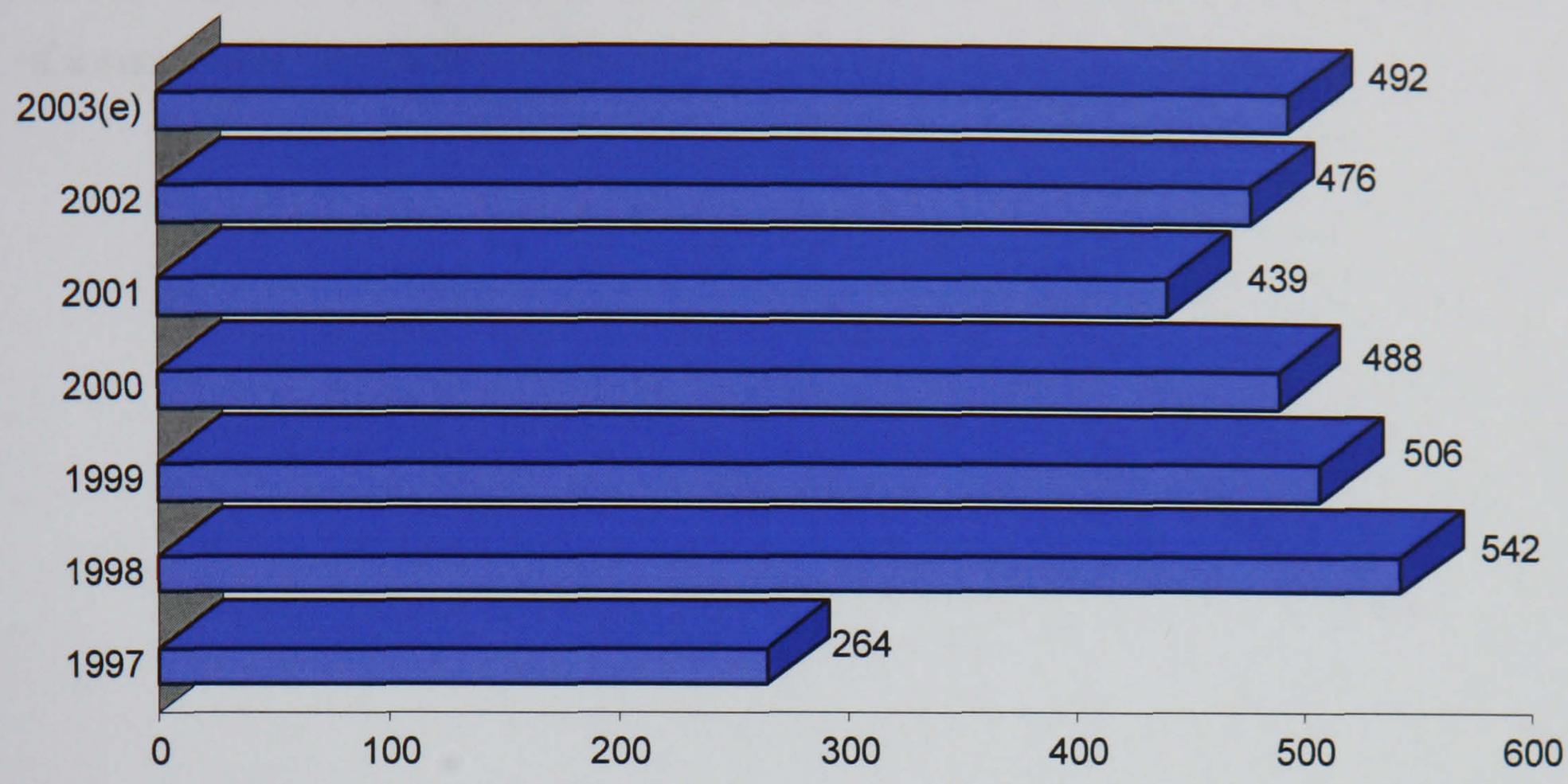


Figure 5, Oktabit's Financial Situation (b)

As we discussed earlier in this chapter, Oktabit S.A. is the 4th largest company in the market of distribution of Computers and Peripherals in Greece having a clientele of some 2,500 and claiming a market share of 10%. As the commercial director explained to us Info-Quest S.A., Altec S.A. and Pouliadis are the three companies that claim respectively the three first positions in the Greek IT distributors market. Furthermore, Mr. A. Papaioannou estimates that another 7 or 8 smaller companies are currently operating and competing in this market.

As the Managing Directors explained to us during our interviews, the reality in the distributor business concerns the establishment of a competitive edge for yourself as well as for your client. This is the reason for which Oktabit is investing in establishing and maintaining its reputation of a 'respectable and reliable' company, Mr. Gialamaidis argued. Reputation is one of Oktabit's competitive advantages. As they said,

> "A vendor has to make a strategic choice as to which distributor he/she will establish an agreement with. We offer to our clients, top-quality products and a high level of service. In addition we offer them the lowest possible distribution cost and reliable on-time delivery of the products they have ordered. We try to keep up-to-date with the technological changes so that we

import all the new IT gismos and gadgets that the clients want. We offer our clients the opportunity to track and trace their orders 24-hours 7days a week on-line. Reliability, reputation and fast delivery at a low cost are the essence of a successful distribution company."

3. Very Low Innovation Rate

Oktabit S.A., a medium sized enterprise that employees 91 people, represents and distributes hardware products and software applications of world-class manufacturers through a selected number of vendors and through the World Wide Web. The company has two 'operation centres', one in Athens covering the Central and South Greece market and one in Thessaloniki covering the Northern Greece market. When we asked Mr. Gialamaidis, the managing director in Northern Greece the simple, yet, so hard to answer question, "do you innovate?" he answered back smiling, "innovation is a word almost unknown in our kind of business…"

Mr. Antonis Gialamaidis is the Managing Director of Oktabit's Northern Greece operation centre. Mr. Gialamaidis was the founder of Victor Hellas, an IT company that he established in the Thessaloniki area in 1987. His vision was to establish a small family business that would operate and compete in the IT sector in Northern Greece, which was in an infantile stage when his company was first established. The core activity of the company was the representation and distribution of computer systems and peripherals of international manufacturers and the assembling of personal computer systems, which were sold under the brand name of '*Victor Computers*', in the markets of Northern Greece. By the beginning of the 1990s complete P/C's systems imported from Taiwan and Japan were sold at very competitive prices in the Greek market, while domestic competition in the assembling P/C's market and the distribution market was rapidly increasing. Mr. Gialamaidis, faced with the increased competition and the inability to attract investors and raise more working capital to expand the company's activities decided to merge with Oktabit S.A., an IT company that was distributing computers and peripherals in Central and South Greece that was seeking to expand its activities in Northern Greece.

According to Mr. Gialamaidis, the new company was named Oktabit S.A. simply because the company name 'Oktabit' was recognised by more people in Greece than his company's name 'Victor'. As he explained to us during the interview,

> "Central and South Greece represent probably 80% of the Greek IT market while Northern Greece represents only 20%. When Victor and Oktabit

companies decided to merge there was no question of which name we should keep. Oktabit was already an established and well know company in 80% of the Greek IT market."

As Mr. Gialamaidis explained to us, before the merger with Victor Hellas, Oktabit was a small family business owned by three brothers, Antonis, Dimitris and Alexandros Papaioannou who are currently members of the Board of Directors of Oktabit S.A. The Papaioannou family shared the same vision with Mr. Gialamaidis in establishing a business that would act as representative and distributor of state-of-the-art hardware and software products of world-class manufacturers in the markets of Central and South Greece.

In this section, we explore the very low innovation rate/performance of the 'survivor' type of SME by examining and presenting both 'quantitative data' from the analysis of the questionnaire on innovation, and 'qualitative' data derived from our case study and the interviews with the company's management team. Messrs Antonis Papaioannou and Antonis Gialamaidis the Founder/CEO and Managing Directors of Oktabit respectively answered the questionnaire on innovation, with the appropriate aid from the rest of the directors/management team where it was felt necessary (see appendix 6, in appendices, end of thesis, for a complete list of the team and their responsibilities). Throughout the presentation of the innovation rate of the 'survivor' type of SME, the findings of the questionnaire are enriched and elaborated by the qualitative data that were gathered during our case research. As we explained in chapter 3, the operational definition of innovation that we use to measure innovation in our case study is based on the Schumpeterian sense of defining innovation as the carrying out of new combinations. This concept covers the following five cases:

i. The introduction of a new good – that is one with which consumers are not familiar yet– or a new quality of a good.
ii. The introduction of a new method of production, that is one not yet tested by experience in the branch of manufacture concerned, which need by no means to be founded upon a discovery scientifically new, and can also exist in a new way of handling a commodity commercially.

iii. The opening of a new market, that is a market into which the country in question has not previously entered, whether or not this market has existed before.

iv. The conquest of a new source of supply of raw materials or half-manufactured goods, again irrespective of whether this source already exists or whether it has first to be created.

v. The carrying out of the new organisation of any industry, like the creation of a monopoly position (for example through trustification) or the breaking up of a monopoly position. (Schumpeter, 1942, p.66)

Objectives of innovative ideas

In this section, we examine whether there were product/service and/or process innovative activities in the company for the 5-year period between 1998-2003. In particular, in the first part of the following table, we distinguish the innovative activities in three parts and present the number of innovations for each part. The introduction of new products/services is the one of the four core measuring parameters of the innovation rate of the company as we presented it in the opening scheme of this chapter. The second part of the table presents the main innovative activities of the company concerning production process.

Objectives of Innovative activities
Innovative activities in the company in the 5-year period between 1998-2003

Introduction of new products/services	
In the Greek Market	0
Internationally	0
Creative improvements of specific characteristics and properties	
In the Greek Market	0
Internationally	0
Copying other products/services	
Copying products/services available in the Greek market	0
Copying products/services available in the Greek market but not produced locally	0
To the production process	
Revamping existing machinery	**Yes**
Raw materials	No
Utilising intermediate products or by-products	No
Organisation & rationalisation of production phases	**Yes**
Energy conservation	No
Lessening percentage of defective products	No
Improving working conditions	No
Lowering warehousing costs	**Yes**
Lowering labour costs	No
Lowering product design costs	No

Table 1, Question 1, Questionnaire on Innovation, Oktabit S.A., 2003.

As it becomes clear from the above table, Oktabit hasn't introduced in the Greek market any innovative products in the 5-year period we examined, achieving a zero (0) score in this particular parameter of innovation. Innovative activities for Oktabit correspond to the innovations at the production process, by revamping existing machinery, organisation and rationalisation of production phases (inventory control) and lowering warehousing costs. The innovative activities in the production process are distinguished by the yes/no entry concerning the fields in which the company invests.

Oktabit's core activity since 1992 has been the distribution of computers and peripherals from world-class suppliers in the Greek market. According to the Commercial Director Mr. Alexandros Papaioannou, the company has a carefully selected portfolio of products which includes: HDDs, optical storage, external storage, CPUs, M/Bs, memory modules, VGA cards, modems, monitors, networking products,

Servers, Nas Storage, PCs, UPS, Printers, Software, Multimedia Products, etc. The company's portfolio of products is created through the cooperation with more than 35 internationally established manufactures some of which are: Maxtor, Microsoft, Intel, Sony, LG, Teac, Ricoh, SMC Networks, Guillemot/Hercules, APC, Cyberdrive, Cyberhome, Viking Components, Sonicblue, Eizo, Neovo, Pyramid, Mandrake (Linux), Snap Appliances, etc. Oktabit has more than 2,500 clients in the Greek market and has established a well-organised and trained sales network. Oktabit's main types of customers according to the Commercial Director Mr. Alexandros Papaioannou are: resellers, value added resellers, system integrators, retail shops, local and regional distributors.

According to the five cases of the operational definition of innovation we provided earlier, the business activities of Oktabit S.A., and their product range briefly presented above, do not fit any of the parameters of our operational definition. Oktabit is simply distributing and selling products that are developed and produced by other manufacturers.

Sources of innovative ideas

In this section, we examine some of the various sources from which companies usually derive ideas for process or product/service innovations. They may be logically divided in two broad categories, internal and external to the organisation sources. The analysis was made with the use of closed-format question/answer based on a Likert scale, while the graphs produced and presented follow the structure of the question and analyse separately the internal and external sources of innovative ideas. The following figure, 'Internal Sources', shows the different degrees of importance in which the various internal sources of the organisation contributed to innovative ideas in the 5-year period.

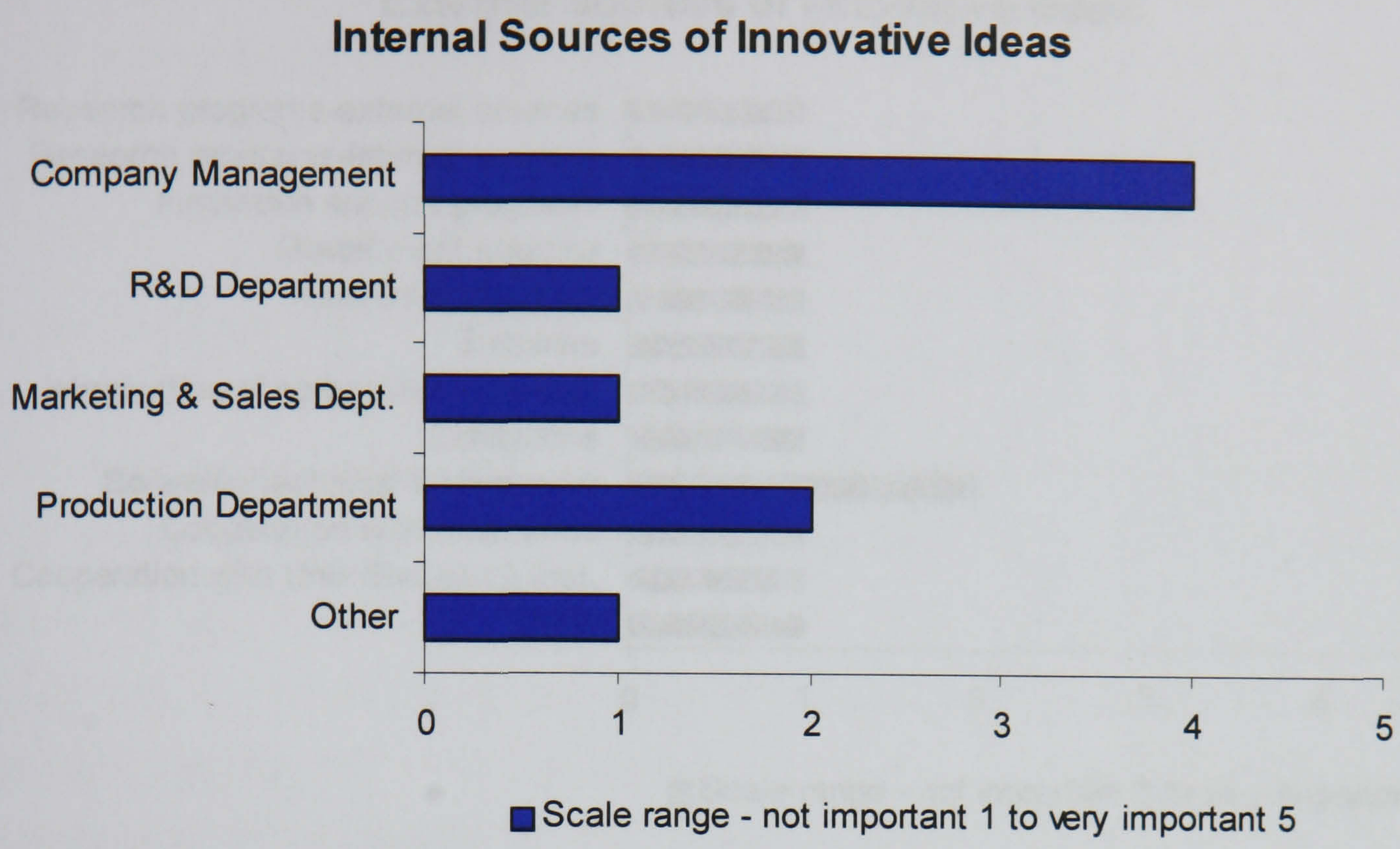


Figure 6, Question 2, Questionnaire on Innovation, Oktabit S.A., 2003

What emerges from this figure is that only the company management is considered as a very important source of innovative ideas. Figure 7 illustrates the importance of the variety of sources of innovative information and knowledge that are external to the organisation. There are virtually no external sources of innovative ideas for Oktabit. As it becomes obvious from the figures 6 above and 7 below only the top management, sometimes with the aid of scientific and technical bibliography provide innovative ideas that concern the production process, i.e. using up-to-date inventory management and control methods. This fact emphasizes the very low innovative performance/rate of the company as well as the preference of the company for a go-it-alone strategy.

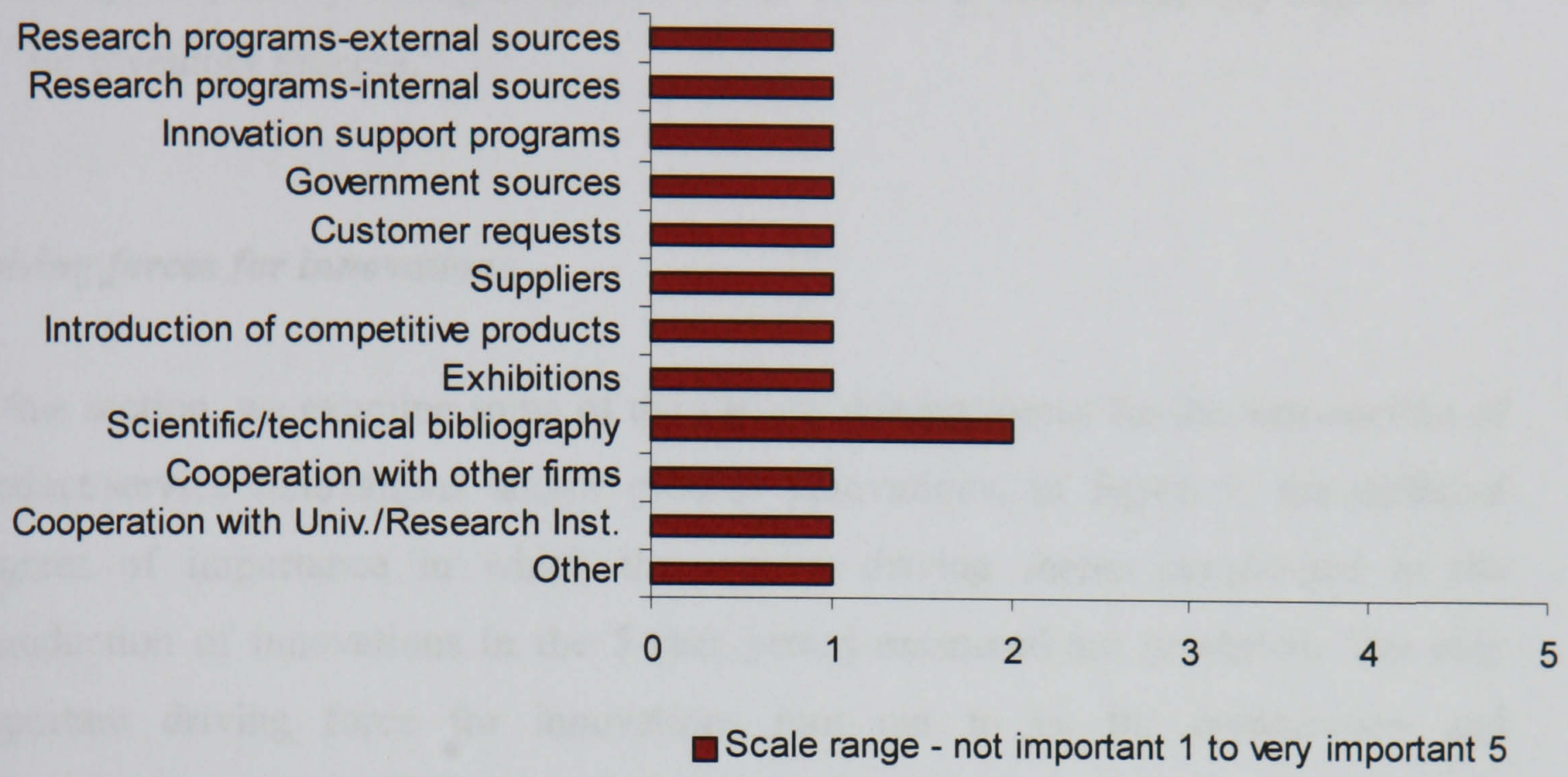


Figure 7, Question 2, Questionnaire on Innovation, Oktabit S.A., 2003

Oktabit S.A. is not designing, nor developing any hardware or software products. It is simply distributing products to the Greek market supplied by world-class manufactures. Furthermore, Okatbit's continuous improvement of inventory planning and control in order to achieve maximum efficiency and effectiveness is mainly accomplished through the acquisition of inventory models from international specialists and to a very small degree through their own creative improvements. As the directors of the company explained to us during our interview,

> "If there is something we can call 'innovation' in our company that would be the improvements in the inventory management and distribution processes of the company. For us the most crucial part of the business is to have effective and efficient stock rotation. We invest in the latest tools and newest software solutions and techniques of inventory planning and control to keep a competitive advantage against the competition. Reliability, fast delivery times and impeccable inventory management are the cornerstones of Oktabit's success. Of course we do not have the ability to develop such applications and tools ourselves, but we have the financial capacity to acquire the know-how from anywhere in the world. If you can count as innovation the continuous

search for better answers and solutions to the three fundamental decisions of inventory management, *how much to order, when to order, and how to control the system*, then you might say that we as Oktabit at least creatively improve our inventory process."

Driving forces for innovations

In this section, we examine some of the various driving forces for the introduction of product/service innovations and/or process innovations. In figure 8, the different degrees of importance in which the various driving forces contributed to the introduction of innovations in the 5-year period examined are presented. The only important driving force for innovations turn out to be the organisation and rationalisation of production, which as we explained earlier is central to the philosophy and strategy of the company.

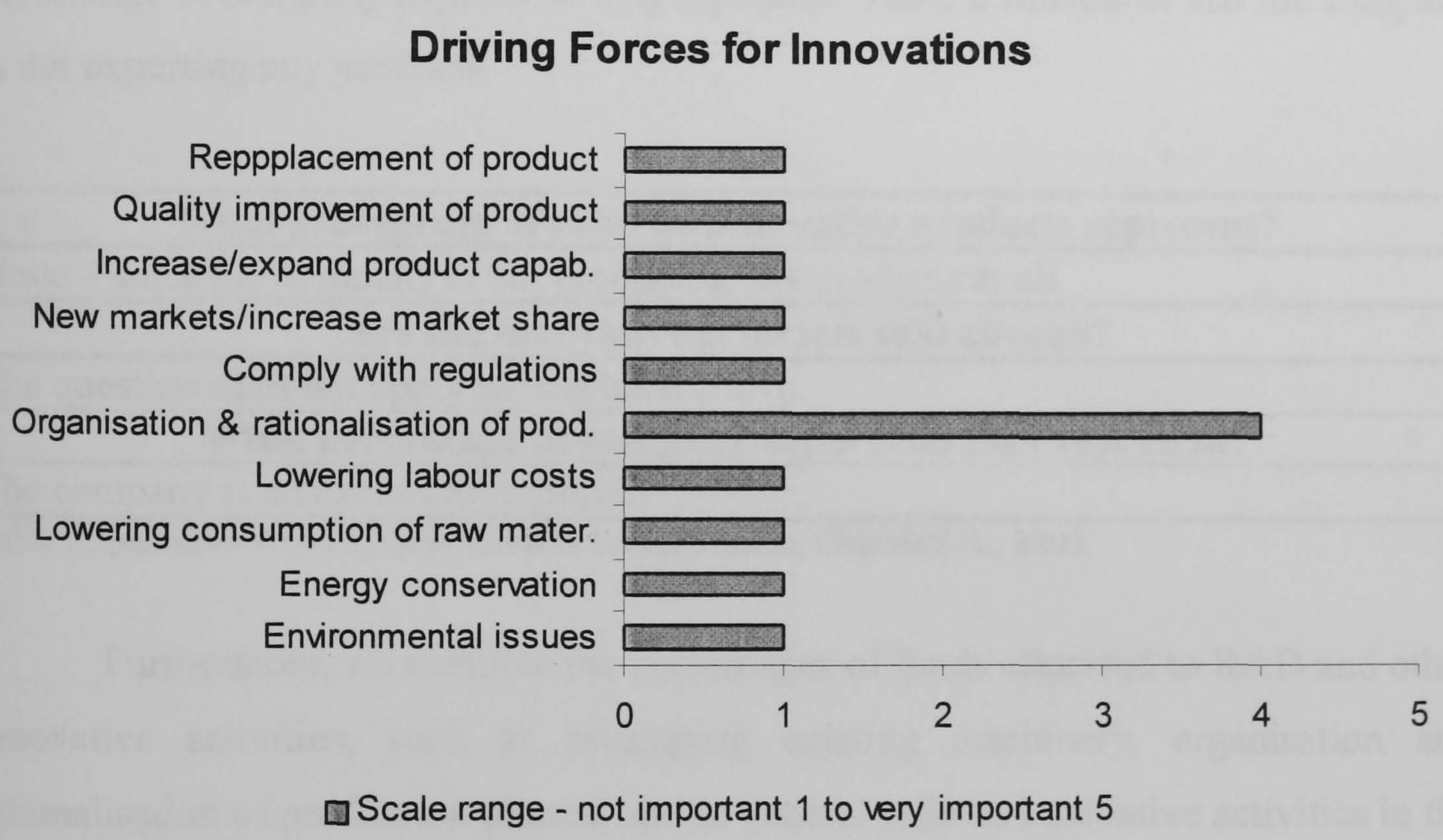


Figure 8, Question 3, Questionnaire on Innovation, Oktabit S.A., 2003

According to Mr. Gialamaidis, the Managing Director of Oktabit's Northern Greek operation centre, technology brings out an immense growth generating a need for 'fast stock rotation'. As Mr. Gialamaidis explained to us during our interviews,

"The IT products, both hardware and software, tend to become obsolete every 6 months if not earlier. This puts an immense effort in our business to try to renew our inventory of products as fast as possible reducing the chances of some products rendered obsolete and consequently not easy to be sold or at least sold at a profitable price."

Quantifiable aspects of innovative products

We begin this section by examining the percentage of sales that innovative products represent in the period between 1998-2003. The percentage of total sales of innovative products is the second of the four core measuring parameters of the innovation rate of the company as we presented in the opening part of this chapter. According to the following table 2, the company is not producing any innovative products, consequently it scores zero (0) in this particular parameter.

Next, we examine whether the innovative products are sold abroad and what percentage of company exports do they represent. Table 2 illustrates that the company is not exporting any products.

What percentage of sales do innovative products represent?
None – since the company is not producing any products at all.
Are the innovative products sold abroad?
The question does not apply as indicated above.
What percentage of company exports do they represent?
The company is an exclusive importer

Table 2, Questions 4 and 5, Questionnaire on Innovation, Oktabit S.A., 2003.

Furthermore, we examine the percentages of funds allocated to R&D and other innovative activities, such as revamping existing machinery, organisation and rationalisation of production phases, and in general refer to innovative activities in the production process for the period under examination. As mentioned above and shown in the following table the company does not have an R&D department. The table also shows a fraction of funds, around 0.4% of the total turnover, allocated every year for innovative activities other than R&D as indicated. The percentage of funds allocated to R&D and other innovative activities as part of the total turnover, is the third of the four core measurements of the innovation rate of the company. The number of people

working in the R&D department as a percentage of the total workforce is the fourth parameter of the core measurements of the innovation rate of the company and here, again, the company scores a zero (0) since there is no R&D department.

Percentage of funds allocated to innovative activities (referring to process innovations) and R&D expenditure as part of total turnover

	Innovative activities other than R&D	*R&D expenditure*
1998	0.36%	
1999	0.46%	0%. The company does not have an R&D department
2000	0.31%	
2001	0.44%	
2002	0.39%	

Table 3, Questions 6 and 7, Questionnaire on Innovation, Oktabit S.A., 2003.

As the General Manager, Mr. D. Papaioannou, explained to us during our interview, Oktabit does not have a Research and Development Department simply because their business activities do not require the existence of such a department. Furthermore, as we have said above, the company has the financial capacity to acquire the know-how in distribution processes and inventory management whenever they assume necessary.

Oktabit's directors' team believes that successful development of the company's activities depends on continuous provision of state-of-the-art, top quality products and the long lasting cooperation with reliable vendors. Central in the philosophy of the company is the continuous satisfaction of its customers. As Mr. A. Papaioannou, the Commercial Director, explained to us during the interview, quality is the cornerstone of Octabit's philosophy and organisational culture,

"Quality focuses on the customer. Quality is the responsibility of every employee at all levels of the enterprise."

The company's commitment to quality has led to the certification of the company to ISO 9001:2000, achieving excellence in,

"The analysis, planning, organisation in the distribution and sales of computers and peripherals. The support, training and consulting services of its customers."

As Mr. A. Papaioannou explains, the quality management system focuses on the customer and aims at the continuous enhancement of the customer's satisfaction through the provision on time and with low distribution costs of high-quality services and state-of-the-art products, customised and carefully selected to meet the customer's specific and rapidly changing needs.

Oktabit's success in the Greek Market is by large due to the trustworthiness that the company has gained during its years of operation in Greece, its reputation of providing state-of-the-art, quality products and services, in a reliable and on-time manner and the fact that it keeps very close relationships with a carefully selected number of clients and vendors and that it provides reliable and high-standard after sales services.

4. Non-Existent Clustering/Networking Level

The analysis presented in section 3, above, justifies the very low innovation performance/rate of Oktabit in all four core-measuring parameters of the independent variable. In this section, we explore the virtually non-existent clustering/networking level of the 'survivor' type of SME examining and presenting both 'quantitative data' from the analysis of the questionnaire on clustering/networking, and 'qualitative' data derived from our case study and the interviews with the company's directors and management team. Messrs Antonis Papaioannou and Antonis Gialamaidis the Founder/CEO and Managing Directors of Oktabit respectively answered the questionnaire on clustering/networking, with the appropriate aid from the rest of the directors and management team where it was felt necessary (see appendix 6, in appendices, end of thesis, for a complete list of the team and their responsibilities). Throughout the analysis of the investigation of the clustering/networking level of the 'survivor' type of SME, the findings of the questionnaire are enriched and elaborated by the qualitative data. As we explained in chapter 3, where we identified our hypothetical, descriptive two-dimensional model of innovation and business clustering, we expand our empirical research towards the conceptual themes of strategic alliances and networks. Since these two concepts cover many cases we proceed by adopting an operational definition capable of measuring the performance of the SMEs in networking/clustering as follows:

i. Business cooperation (agreement) for combined research and development of new products and services.
ii. Networking (cooperation) with the local/regional/national technological and educational institutes and research centres for R&D purposes, as well as for the attraction and employment of young scientists.
iii. Strategic alliances with other firms for the purpose of entering new markets; sales and logistics; and/or extending distribution networks.
iv. Collaborating with government agencies and public institutions for R&D purposes.

v. Part of an establish network of interrelated companies belonging in the same or adjacent industrial sectors.

Nature of clustering/networking activities

In this section, we examine whether there were clustering/networking activities during the 5-year period between 1998-2003. As shown in the following table, we are interested in the nature of the clustering/networking activities of the company and present the number of the relevant activities for each case. As we show, Oktabit did not engage in any clustering/networking activities in the 5-year period we examined.

Nature of clustering/networking activities for the 5-year period between 1998-2003

Nature of clustering/networking act.	***Number as appropriate***
Equity holdings	0
Marketing agreement	0
Licensing agreement	0
Development agreement	0
Research agreement	0
Joint venture	0
R&D agreement	0
Manufacturing agreement	0
Grant/research funding	0
Supply agreement	0
Distribution agreement	0
Unspecified agreement	0
Other (specify)	0

Table 4, Question 1, Questionnaire on Clustering/Networking, Oktabit S.A., 2003.

Fields and objectives of clustering/networking

In this section, we examine some of the various fields and objectives of business clustering/networking and strategic alliances. The analysis was made with the use of closed-format question/answer based on a Likert scale. In the following figure the different degrees of importance in which the various fields and objectives concern the clustering/networking activities of the company in the 5-year period examined are presented. It is obvious that Oktabit did not engage in any field of

clustering/networking activities. This confirms the preference of the company on a go-it-alone strategy.

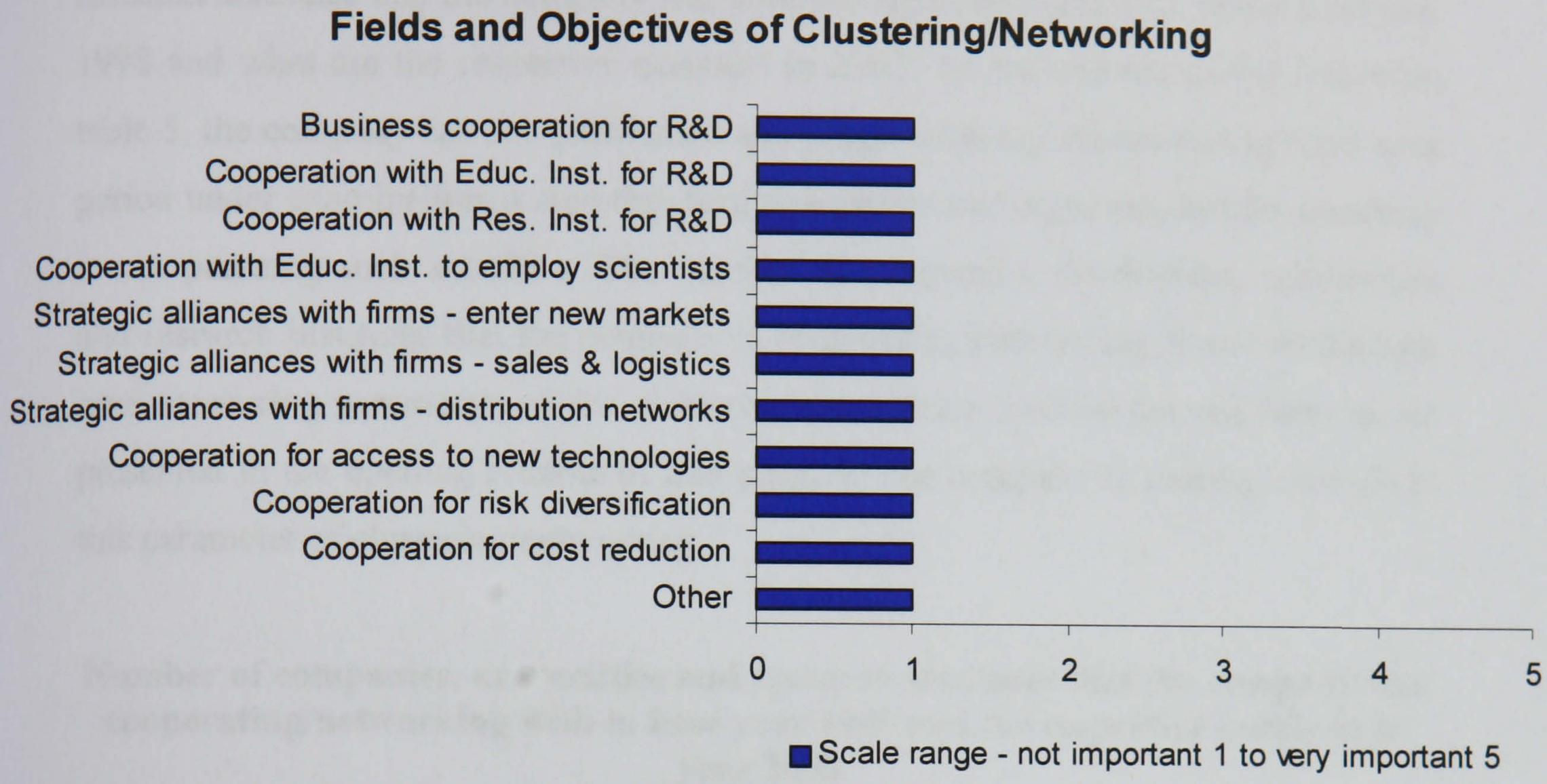


Figure 9, Question 2, Questionnaire on Clustering/Networking, Oktabit S.A., 2003.

The product portfolio Oktabit has accumulated over the years was not the result of strategic alliances with other IT companies and collaborations with universities and research centres. Oktabit operates as a distributor, a dealer of Computer and Peripherals and thus bases its operations on contracting long-term business agreements with world-class suppliers and manufacturers at one end and vendors and customers at the other end. In other words, we could argue that Oktabit's operations fit the middleman business model. The important point to note here is that they have not got a formal strategy of pursuing strategic alliances and networking, i.e. with other distributors to expand their imported product lines or with other companies in order to import complementary products to theirs, etc. Thus, Oktabit's activities do not fit the parameters of our operational definition of clustering/networking, which we presented above.

Quantifiable aspects of clustering/networking

We begin this section by examining the number of companies, universities and research institutes that the company was cooperating/networking with in the base year 1998 and what are the respective numbers in 2003. As we can see in the following table 5, the company has not established any cooperation agreement during the 5-year period under examination, a sign that further supports our argument that the company is not pursuing such activities. The number of companies, distributors, universities and research institutes that the company is cooperating/networking is one of the four core measuring parameters of the clustering/networking level of the company as we presented in the opening scheme of this chapter. The company is scoring zero (0) in this parameter of clustering/networking.

Number of companies, universities and research institutes that the company was cooperating/networking with in base year 1998 and the respective numbers in year 2003

	Companies	*Distributors*	*Universities*	*Research Institutes*
1998	0	0	0	0
2003	0	0	0	0

Table 5, Question 3, Questionnaire on Clustering/Networking, Oktabit S.A., 2003.

Next, we examine the percentage of sales that co-developed products represent in the period between 1998-2003. This is the second of the four core measuring parameters of the clustering/networking level of the company. As we see in the table below there are no sales for the 5-year period under examination, as the company is not cooperating with any firm and/or educational and research institute, thus scoring zero (0) in this parameter.

What percentage of total sales do co-developed products represent?
There are no (0) co-developed products.

Table 6, Question 4, Questionnaire on Clustering/Networking, Oktabit S.A., 2003.

Furthermore, we examine the number of products that the company successfully developed and launched in the market through business cooperation agreements and by cooperating with educational and research institutes in the 5-year period between 1998-2003. The number of products the company has developed and

launched in the market through co-operative activities between 1998-2003 is the third of the four core measuring parameters of the clustering/networking level of the company. Again as shown in the following table Oktabit has not developed any products through cooperation and strategic alliance activities, consequently the company's performance in this parameter of clustering/networking is at zero (0) level.

Number of products the company has developed and launched in the market through co-operative activities

Through business cooperation agreements	None (0)
By cooperating with educational and research institutes	None (0)

Table 7, Questions 5 and 6, Questionnaire on Clustering/Networking, Oktabit S.A., 2003.

Finally, we explore the number of new markets, which include first time foreign markets penetration and diversification of market fields, that the company entered as a result of its clustering/networking activities in total. Table 8, illustrates once more the virtually non-existent clustering/networking activities for Oktabit since it has not entered any foreign markets nor has it diversified its activities by co-developing and co-producing new product lines. The number of new markets the company has entered through clustering/networking activities between 1998-2003 is the fourth of the four core measuring parameters of the clustering/networking level of the company, in which Oktabit is scoring zero (0).

Number of new markets the company has entered through clustering/networking activities

Foreign markets	None (0)
Market fields	None (0)

Table 8, Question 7, Questionnaire on Clustering/Networking, Oktabit S.A., 2003.

When we asked the managing director of Oktabit Northern Greece, during our interview, if the infrastructure of the Region of Thessaloniki, its airport, port, railway and highway system are developed enough to help the business activities of the company, the answered was negative. As he argued,

"The international airport of Thessaloniki does not have but a minimum number of direct flights with European and Asian towns. Most of the time if we want to fly to a particular destination we will have to go through Athens. or a city in a Balkan Country and change flights there. This has a detrimental effect to the price and delivery time of certain imported products while it increases the risk failure to deliver the products on time. Furthermore the Thessaloniki port lacks the supporting facilities, such as logistics companies, big warehouses etc, which are vital for an organisation like ours. Whenever we place an order, i.e. 2 containers from Japan, we ship everything to the port of Piraeus in Athens and then lorries to Thessaloniki transport the products. You can realise how time consuming and expensive this procedure is. In addition the war in Yugoslavia has depleted the road infrastructure of these areas and this hinders the road-transports from Western and Central Europe."

The managing directors, Messrs Papaioannou and Gialamaidis, argue that there is no mechanism in the Region of Thessaloniki, and of the broader Greek territory, to promote and encourage university-business co-operations, or business-to-business networking. Not only there is lack of such mechanism but also the managing directors added to that,

"The corruption of the public and private sectors in Greece has gained an unprecedented extent in the last decade. The 'big' public projects and constructions are selectively granted to enterprises and organisations that have the 'right' political connections. One of the main reasons for our inability to achieve a greater share in the Greek IT market is that we always lose the big projects to our three main rivals. Furthermore the governmental funds and support programmes require so much paperwork and so many standards, i.e. total turnover, pre-tax profits, number of personnel, etc. that literally apply only to Large Scale and Hi-end organisations. The overall low competitiveness and lack of organisation in Greece is seriously affecting the competitiveness of the IT sector. We can only resemble the situation with a steam-engine train. Imagine that the steam engine is the Greek economy and the IT sector is a luxurious new technology wagon at the very back of the

train. No matter what are its abilities and potentials they are limited because the engine, the Greek economy, is rotten."

5. Outcome: Low Performance/Growth

The above analysis in sections three and four verify the very low innovation rate and virtually non-existent clustering/networking level of Oktabit S.A., the 'survivor' type of SME. In this last section of chapter eight we investigate the dependent variable of our hypothetical, descriptive two-dimensional model, namely the performance/growth of the company. As we highlighted in the opening part of this chapter, and as shown in the following figure 10, Oktabit S.A. is scoring low in the chosen performance/growth parameters.

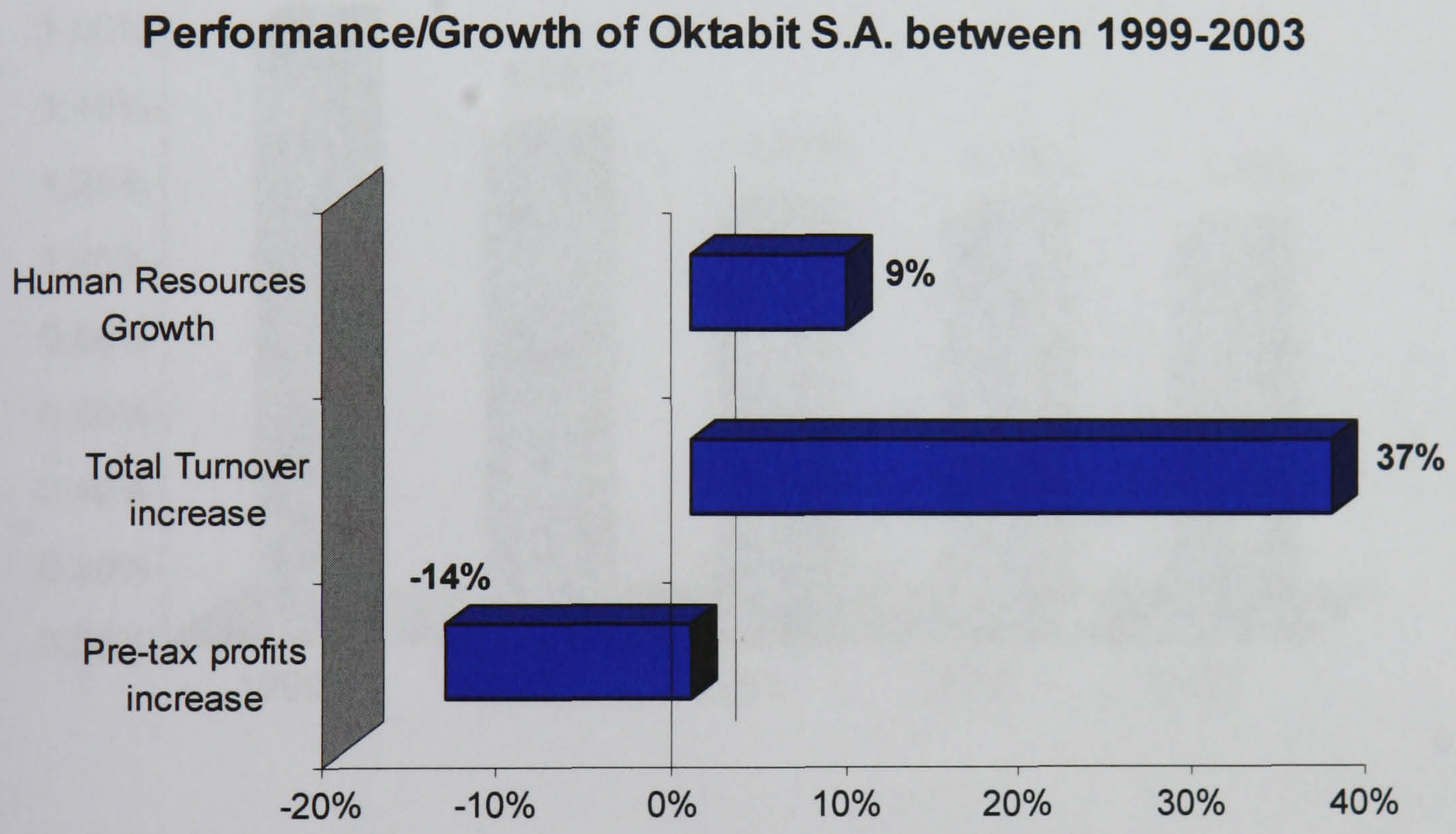


Figure 10, Oktabit S.A., 2003

Over the five-year period between 1999-2003, Oktabit increased its human resource capital from 83 to 91 persons, a mere 9% increase, as shown in figure 2 in the first section of this chapter. The company increased by 37% its total turnover from €32.4 to €44.6 million euros, as shown in figure 4 earlier in this chapter, which compared to the previous 3 SMEs is not so significant as it might appear at first sight. On the other hand, Oktabit S.A. suffered a decrease of 2.8% of its pre-tax profits from €506,000 to €492,000 euros, as presented in the first part of this chapter in figure 5. These parameters are three of the four measurements of the dependent variable,

namely the performance/growth of the company and illustrate the low score of the 'survivor' type of SME in this variable. Furthermore, the last parameter we use to measure the performance/growth of the company is the percentage that pre-tax profits represent as part of the total turnover. As shown in the figure below, Oktabit suffers a constant decrease year-by-year from the already low 1.55% to 1.01% in this parameter. Pre-tax profits in 2003 represent a fraction of just over 1% of the total turnover signifying potential problems in the viability and future existence of the company, despite its total turnover and sales volume.

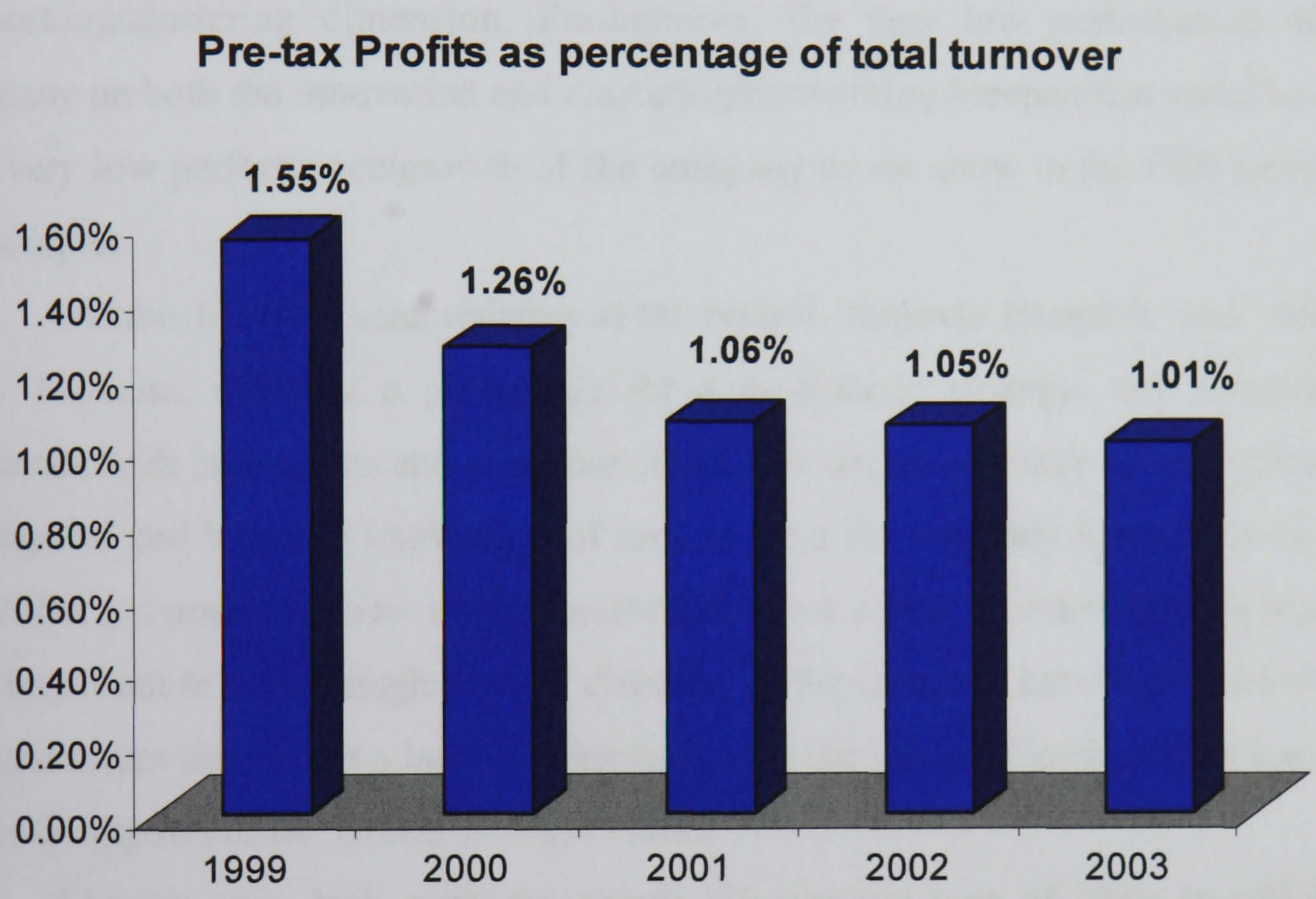


Figure 11, Oktabit S.A., 2003

According to the two figures presented above, we argue that the very low performance/scoring of the company on both the innovation and the clustering/networking independent variables leads to a very low performance/growth of the company. Its persistence in the one-against-all strategy and its inability to apply modern management techniques to boost the innovative rate of the company could be identified as two of the reasons that hinder the company's potential to achieve higher profits and secure its existence in the following years.

6. In Conclusion

Oktabit S.A. fits the criteria we set for the 'illustrative' SME type name 'survivor' and located in the lower left square of our hypothetical, descriptive two-dimensional model. As we show in the third and fourth sections of this chapter, based on quantitative and qualitative data gathered through our questionnaire and interviews the company achieves a very low performance score in the innovation dimension of our 2-dimensional model, and a non-existent performance score in the networking/clustering dimension. Furthermore, the very low performance of the company on both the innovation and clustering/networking independent variables lead to a very low performance/growth of the company as we show in the fifth section of this chapter.

Oktabit fits the characteristics of the typical 'turnover intensive' and 'middle-man' business, showing a preference for a go-it-alone strategy, unwillingness to cooperate with other firms and educational institutions, and the lack of the appropriate managerial and business knowledge of how to steer the company towards innovative activities, i.e. open up a new market and/or introduce a new inventory control method. It is important to note though that the directors of the company have described several circumstances that depict a lack of organization of the general Greek economy as well as the corruption of the Greek business world.

Chapter nine deals with the fourth 'illustrative' type of SME to which we assigned the name 'collaborator' found in the lower right square of our hypothetical, descriptive two-dimensional model. Our intention is to explore the low innovation and high clustering/networking performance of this type of SME. We examine the relatively good performance of the company, which seems to be largely attributed to the high networking level and cooperating activities it has developed.

Chapter 9

Case study IV – '*Collaborators*' – Singular Software S.A.

1. Introduction

Characteristics of the 'Collaborator'- Singular Software S.A.

Low Innovation rate

- **0** - New goods introduced between 1998-2003
- **32%** - Average percentage of sales of innovative products between 1998-2003
- **2.8%** - Percentage of funds allocated to R&D and innovative activities as part of total turnover
- **2.9%** - Percentage of R&D personnel as part of total personnel employed

High Clustering/Networking level

- **39** Companies – **650** Distributors – **0** Universities – **0** Research Inst., the company is cooperating with in 2003
- **27.8%** - Average percentage of sales of co-developed products between 1998-2003
- **6** - Products the company developed and launched through co-operative alliances
- **13** – Foreign markets penetration **2** – new market fields between 1998-2003

High Performance/growth

- **23%** - Human resource growth between 1999-2003
- **192%** - Total turnover percentage change between 1999-2003
- **245%** - Pre-tax profits percentage change between 1999-2003
- **11.6%** - Pre-tax profits as percentage of total turnover in 2003

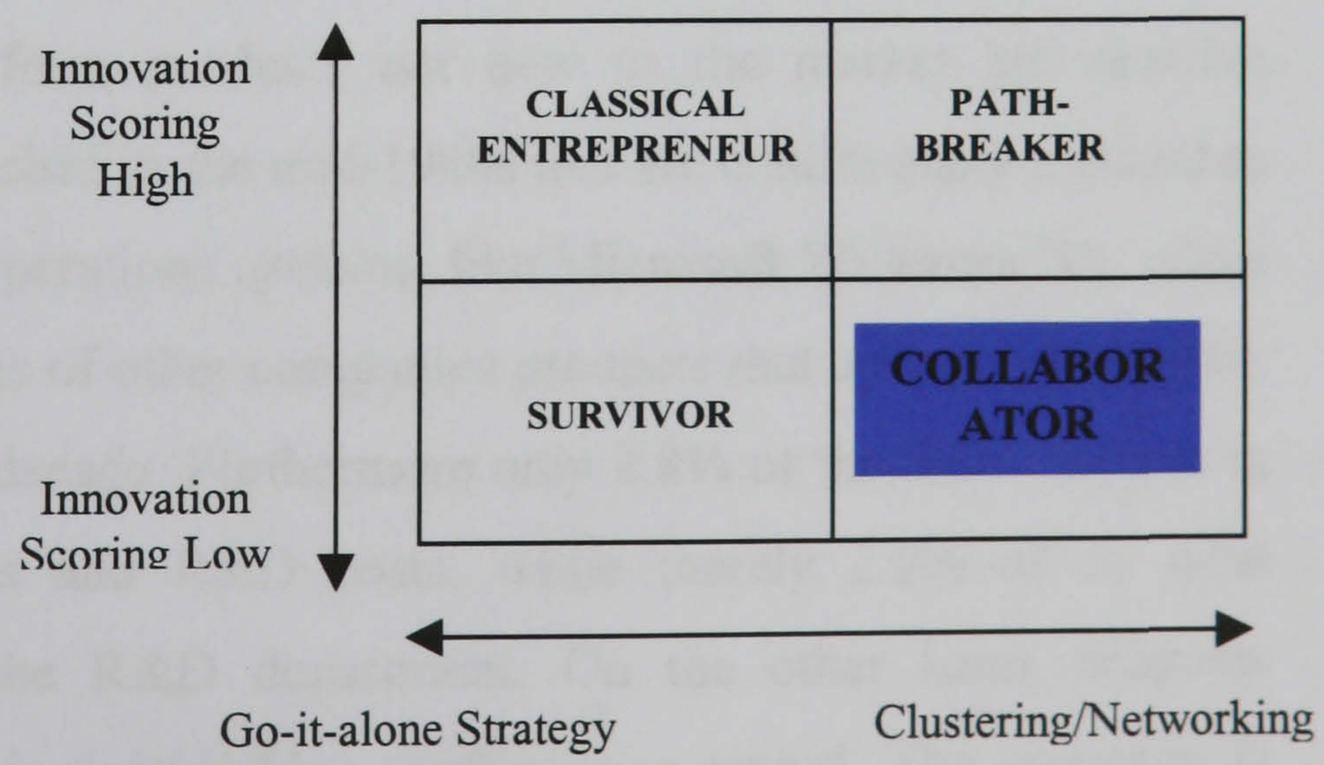


Figure 1, the 2-dimensional model

4th illustrative SME – 'collaborator'

Concluding our case studies presentation as we suggest in the scheme presented and identified in chapter 3, the SME of the 'collaborator' type exhibits low, below average innovation performance but rather strong inter-firm alliances, networking with universities and research centres, other institutions and agents and is perhaps part of a cluster of firms in the same or adjacent industrial sectors. We name this SME '*Collaborator'*, because the SME depends and benefits by belonging to the network/cluster to survive and operate but fails to realise that it should be more innovative, creative and create knowledge in order to create and sustain a competitive advantage for itself and for the network of the firms as well. In the present chapter we aim to provide an in-depth analysis of the 'collaborator', focusing on its innovation performance and clustering/ networking strategies and on several other indicators relevant to the conceptual themes of the horizontal and vertical axes as shown above. The SME's low innovation performance stems from the fact that the company is not introducing any new products and/or services, nor is it collaborating with other companies and/or educational or research institutes in order to develop and launch new products. If we could briefly define the strategy of the company it would fit that of a benchmarking approach where the company just adapts to the business environment rather than trying to 'enact' it. At the end of the day all the firms will mutually benefit from a high commitment to deposit knowledge and search for innovation rather than just wait till someone else does the job for them.

After careful investigation and appraisal, we identified "Singular Software S.A." as the ideal SME meeting the criteria as stated above. As we present throughout this chapter and as shown schematically, in figure 1 above, Singular shows a low, below average innovation record as revealed by the fact that it has not introduced any new products/services in the market in the 5-year period between 1998-2003. In its total sales, only 32% come from products not new to the market but creative improvements of products launched in the mid-1980s that are continuously updated to be compatible with the latest operations systems, like Microsoft Windows XP, while the other products are imitations of other companies products that are available in the Greek market for more than a decade. Furthermore only 2.8% of the total turnover is spend on innovative activities and R&D costs, while merely 2.9% of its total workforce are employed in the R&D department. On the other hand, Singular Software shows a high clustering/networking performance record. The company is cooperating with 39 other companies and 650 distributors, which resulted in 27.8% of

total sales coming from 6 co-developed products, diversification of its market fields in 2 new market areas and 13 foreign markets penetrated in the past 5 years. Finally, as shown in the figure above the 'collaborator' type of SME exhibits high performance, in terms of total turnover and pre-tax profits percentage increase, 192% and 245% respectively, as well as an increase of 23% in its human resource capital over the five-year period 1999 to 2003. The high performance of the company is also illustrated by the amount of 11.6% that pre-tax profits represent as part of the total turnover.

Singular Software's core business includes the development and sale of standardised application software, the sale and support services of third party application software addressed to specific market needs (Hospitality, Retail, etc.), as well as supporting services on its own software products. Mr. Anastasios Tzikas is the Founder, Senior Manager/ Director and CEO of Singular Software S.A. and an Executive Director of the Delta Singular Group of companies. Mr. Tzikas established Singular in 1984 in Athens and in 1988 moved the Headquarters to Thessaloniki, where they are located ever since. Mr. Tzikas vision was to produce and/or distribute state-of-the-art application software in the Greek IT market that was in an infantile stage when his company was first established. Singular Software is a company operating and competing in the IT sector of the Greek economy. As of January 2002, the company is a member of the Delta Singular Group of Companies, operating on an independent basis.

The business activities of Singular Software appeal to both small and medium enterprises as well as large-scale and Hi-end organizations. The company's range of application software products is comprised of two main categories. The first is application software solutions, ERP (Enterprise Resource Planning) and CRM (Customer Relationship Management), which appeal to the Hi-end, large-scale organizations. The second category is software application products for the small and medium sized companies in operating, trading and accounting issues. The company engages also in business consulting, project management and application consulting, training and support, as well as customisation offers supporting services.

This chapter follows the format of the previous three chapters in discussing the company's internal and external features and how these affect its level of performance.

2. Situation, Market and Competition Analysis

In this section, we attempt a brief investigation of the company's internal structure and organizational culture, drawing attention particularly on HRM practices, the financial situation, marketing and competition assessment.

The establishment of Delta Singular Group of Companies resulted in the appointment of an eleven-member Board of Directors that would plan and organise the strategic management of the Group. As noted earlier, Mr. Tzikas apart from being the Managing Director of Singular Software is also an Executive Director at the Board of Directors of the Delta Singular Group of Companies. As he explained to us during our interview, Singular Software is an independent company. The general strategies, mission plans and the philosophy of the company are decided at the Board level with the synergy of the management team, wherever necessary. Following the strategic alliance of Singular Software Group of Companies and Delta Informatics, the Group's Board of Directors plans and manages the overall strategy of the Group and the decisions are then delegated and communicated to the member companies. Mr. Tzikas explained to us, that the Group is responsible for strategic decisions concerning for example, how to expand the activities of the Group to international markets while on the other hand it has the financial, human and technological capacity and resources to collaborate with large public and private organisations and participate in large-scale R&D projects.

Mr. Tzikas believes that through this 'network/group' of interrelated companies Singular Software can realise the opportunities and meet the challenges associated with globalisation and intense competition. Furthermore, the Managing Director argued that the participation in the Group of companies has enhanced their performance and competitiveness, as if they were actually operating on a greater scale, in term of finance, human resources, marketing and sales network and so on.

Singular's management team believes that successful development of the company's activities depends on continuous provision of state-of-the-art, top quality products and services. Central in the philosophy of the company is the continuous satisfaction of its customers. As the Quality Manager, misses Staiou, explained to us

during the interview, quality is the cornerstone of Singular's philosophy and organisational culture,

> "Quality focuses on the customer. Quality is the responsibility of every employee at all levels of the enterprise."

The company's commitment to quality has led to the certification of the company to ISO 9001:1994 and to ISO 9001:2000 that covers all the activities of the company,

> "The analysis, planning, development, the production and sales of software products and solutions. The provision of installation, maintenance, training, support and consulting services as well as the participation, administration and execution of IT projects."

As Mrs. Staiou, the Quality Manager explains, the quality management system focuses on the customer and aims at the continuous enhancement of the customer's satisfaction through the provision of high-quality services and state-of-the-art products, customised to meet the customer's specific and rapidly changing needs. According to the Quality Manager, the company is investing the necessary human and financial resources on the Total Quality Program since they believe that it is the competitive advantage of the company. Furthermore, the company maintains an internal communication system of free flow of information whereby all employees can and are motivated to express their concerns or ideas to their manager or supervisor who will pass it to the Quality Department for evaluation. A committee, usually formed by a Director, the Production Manager and other senior managers will assess the idea and if it is approved it will be implemented. As the Quality Manager explained to us during the interview, the ideas usually come from the sales and production department concerning improvements on the products, on customer relationships or it could be ideas concerning the organisation and operation of the company in general. The employee that proposes an idea that is assessed as valuable and is implemented receives a financial bonus, analogous to the importance of the idea.

Singular Software is a medium sized enterprise that employees 223 people. It has two offices, one located in Thessaloniki where the Managing Director and the Financial Director (Messrs Tzikas and Chavouzis) coordinate the activities and operations of the company on a strategic level and one in Athens (located at the offices of Delta Singular Group of Companies) where the Deputy General Manager and the Commercial Director (Messrs Charalambidis and Aravanis) are positioned. The two offices are organised under a common board of directors and management team. The branch in Athens, due to its closer proximity to the Delta Singular Group, is responsible for the development and production of the software applications since all the R&D facilities of the Group are located in Athens.

Singular invests in people. The production and development teams work closely with the sales and marketing departments in order to identify and respond promptly to the needs of their customers and to be up-to-date with the IT market trends. Employees in Singular, as the Quality Manager explained to us, are engaged in continuous education and training aiming to familiarize them with the newest technologies and applications, and the same is true even for the top-managers of the company who receive continuous training pertinent to their fields of activities. Table 1 below provides an overall allocation of personnel by department.

Workforce Allocation by Department (31/12/2003)

	Thessaloniki	**Athens**
Administration Department	7	6
Financial Department	8	5
Sales Department	8	19
Marketing Department	1	7
Distribution	0	6
Production	20	64
Professional Services/Support	33	39
Total	**77**	**146**

Table 1, Singular Software, Personnel by Department 2002

Singular Software has shown a significant growth of its human resource capital born out by the fact that in the past 9 years the number of personnel employed in the company has practically doubled going from 114 persons in 1995 to the 223 persons in 2003 as shown in the figure below.

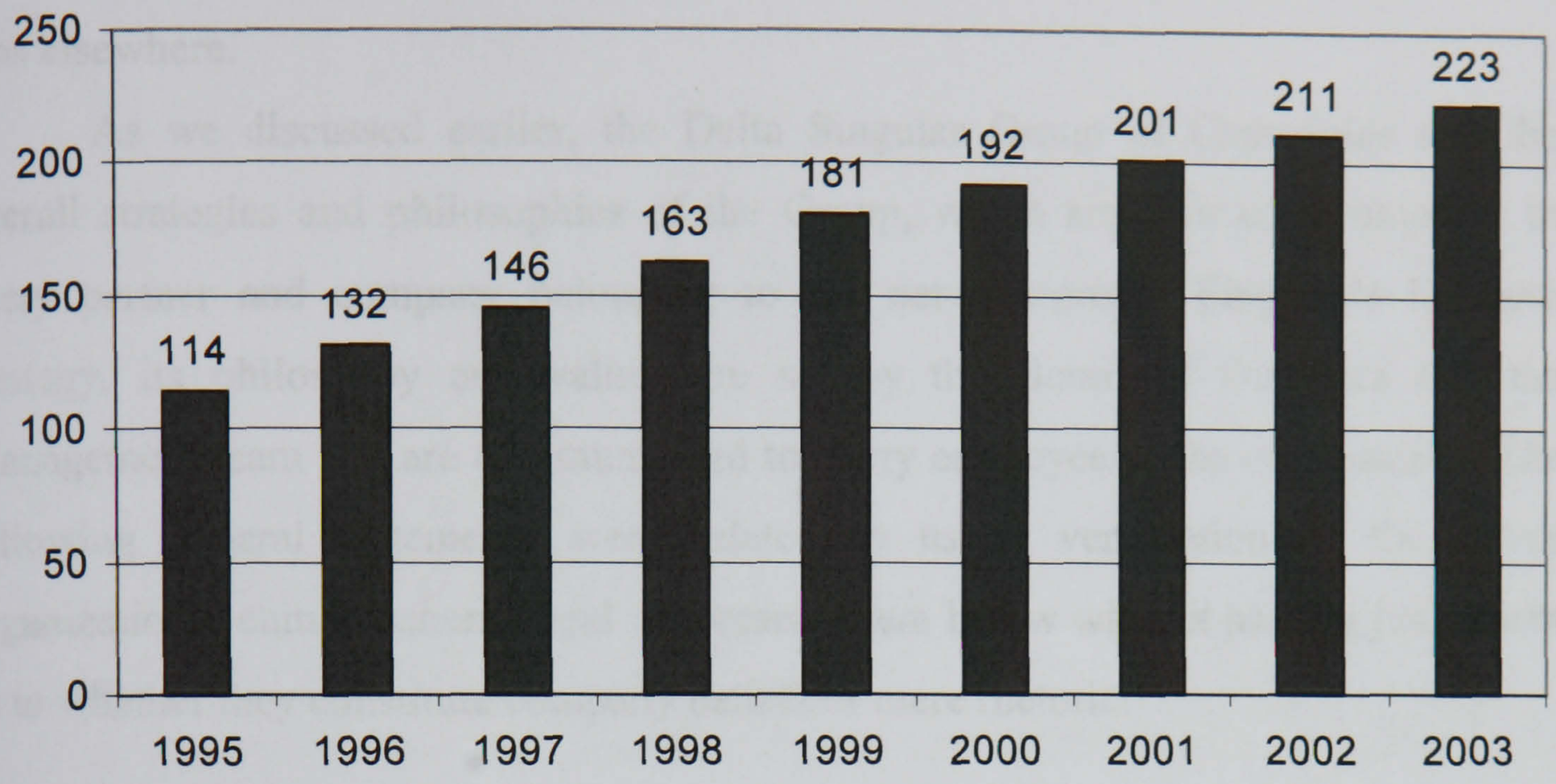


Figure 2, Number of Personnel, Singular Software S.A.

A challenge for Singular's HR management is the fact that it is a people intensive business. As figure 3 in the following page illustrates, 56% of the staff are secondary level educated and another 13% are graduates of Technological Institutions. The need of the company to have their personnel kept up-to-date, with the technological changes and know-how is reasonably dealt with through their continuous engagement in training and education seminars.

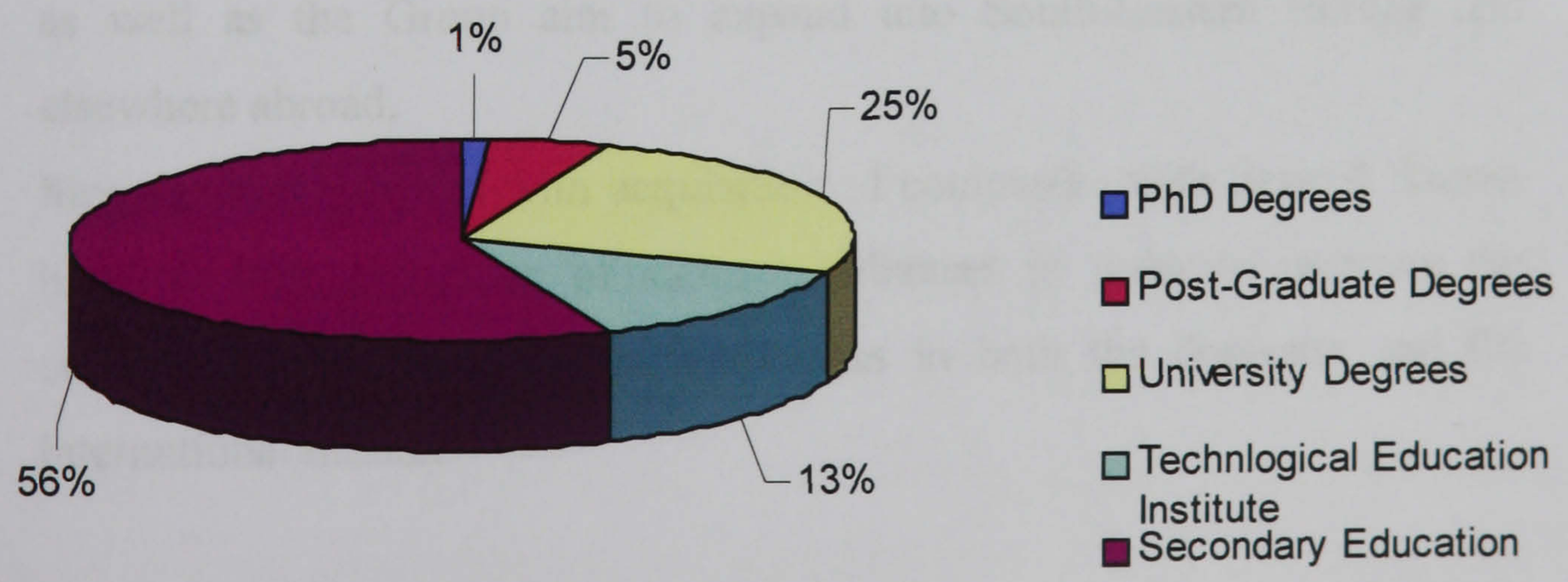


Figure 3, Workforce Education Level, Singular Software S.A.

From our interviews we have drawn the conclusion that the better-educated staff were more likely to follow a carrier path within the company while the majority of the least educated staff were more likely to leave the company in search of other jobs elsewhere.

As we discussed earlier, the Delta Singular Group of Companies sets the overall strategies and philosophies of the Group, which are then communicated to every partner and company belonging to the network/group. Singular's business strategy, its philosophy and values are set by the Board of Directors and the Management team and are communicated to every employee in the organisation. The following general statements were related to us in verification of the above organizational culture scheme, and we present them below without passing judgement as to whether they constitute company beliefs or mere rhetoric:

i. Continuous communication and strengthening of relationships with the customers/clients, "locking" strategic clients into long term collaboration agreements.
ii. Continuous improvement of the quality of application software products and services.
iii. Continuous investment in human resources, investment in evolving the network of the company. Provision of ongoing training and education of the employees.
iv. Exploiting the company's accumulated knowledge and international sales network as well as the formation of the Delta Singular Group and the differentiation and expansion of the product and service lines the company as well as the Group aim to expand into South-Eastern Europe and elsewhere abroad.
v. Singular may proceed with acquisition of companies with desired 'know-how' or with formation of strategic alliances in order to improve the company's position and competitiveness in both the domestic and the international market.

The financial data presented in the following figure (total turnover and pre-tax profits) illustrate the good performance, the sound financial situation of the company and the relative strengthening of its financial position as each year goes by.

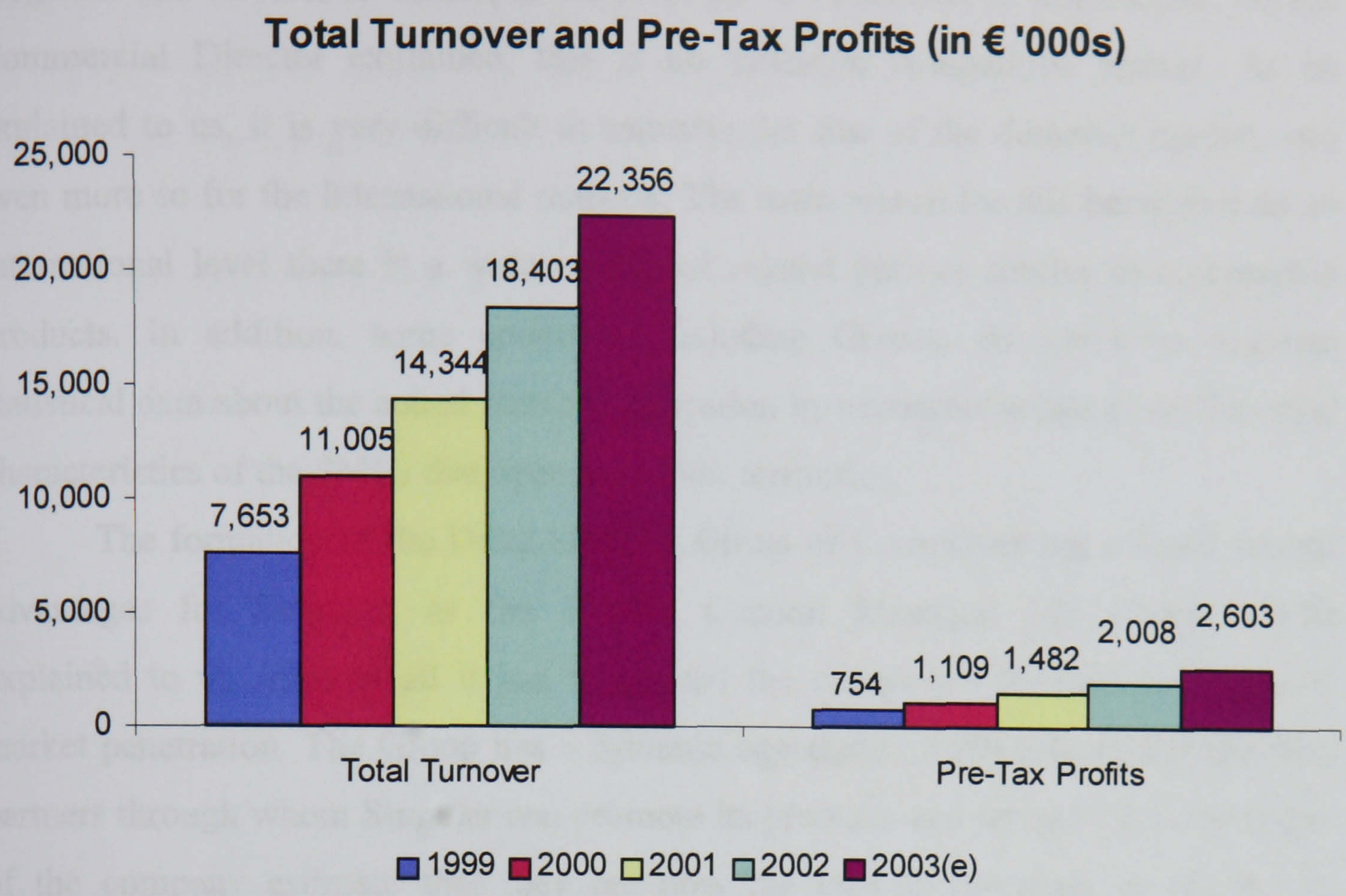


Figure 4, Singular's Financial Position

According to Mr. Aravanis, the Commercial Director, the IT industry is characterised by continuous improvements of the application of software solutions and continuous introduction of new editions with higher capabilities and multi-level functions. This realisation places on Singular a demand for continuous improvement of its application software programs and services in order for the company to remain competitive as well as retain close relationships with customers in order to 'lock' them in strategic long-term collaboration agreements. As the Commercial Director explained to us during the interview, when a system is installed, such as an enterprise resource planning system that will integrate all business activities into a company-wide business process that flows across organisational levels and functions it is then very difficult, expensive and time consuming for the company to change the installed system with another IT company's product. In other words, in the large scale and Hi-end enterprises it is all about establishing long-term agreements. Once the company installs the system, as Mr. Aravanis argued, it then assumes responsibility for updates, modifications, support, customisations, training and a series of other support services that are very profitable for Singular.

Apart from the Hi-end market Singular offers a range of application software programs and services to SMEs, as we shall see in detail later in this chapter. As the Commercial Director explained, this is an intensive competitive market. As he explained to us, it is very difficult to estimate the size of the domestic market, and even more so for the International markets. The main reason for this being that on an international level there is a wide variety of related but not similar or comparable products. In addition, some countries, including Greece, do not keep accurate statistical data about the actual number, allocation by economic sector as well as vital characteristics of the SMEs that operate in their territories.

The formation of the Delta Singular Group of Companies has offered several advantages for Singular, as the Deputy General Manager, Mr. Charalambidis explained to us. First of all it has broadened the company's foreign and domestic market penetration. The Group has a dynamic aggregate of 650 dealers and business partners through whom Singular can promote its products and services. The managers of the company estimate that they are now the leading company in Greece for application software solutions. Singular provides its services to more than 45.000 customers (SMEs, LSEs and individuals) in the Greek market, and the figure is increasing rapidly as the Deputy General Manager was eager to mention. According to the Commercial Director, since Singular has a low cost of distribution and support the company can offer high-quality products and services in markedly lower prices in comparison with other competitors. In addition, the wide network of partners and dealers offers Singular the ability to have direct and detailed information of customers needs and respond promptly to any of their demands.

Most importantly though Singular has now the financial, human and technological capacity and resources to engage in large scale projects and contracts, as well as expand its activities internationally. One of the long-term strategic objectives of Singular Software S.A. is to establish a leading position in the North-Eastern Europeen IT market. Through the wide network of subsidiary companies, business partners and the growing number of inter-firm alliances that the Delta Singular Group is creating Singular can promote its products and services to international markets. The Delta Singular Group, and with it Singular has a reasonable presence in the following markets as the following figure depicts; United Kingdom, Cyprus, Germany, Holland, Poland, Czech, Hungary, Bulgaria, Romania, Serbia, Bosnia, Albania, United Arabic Emirates.

The company primarily aims at establishing new and retain its existing relationships with large public organisations and institutions in the North-Eastern European countries as well as with multinational corporations that are looking forward to expand their activities to these markets.

International Presence of Singular and of the Delta Singular Group

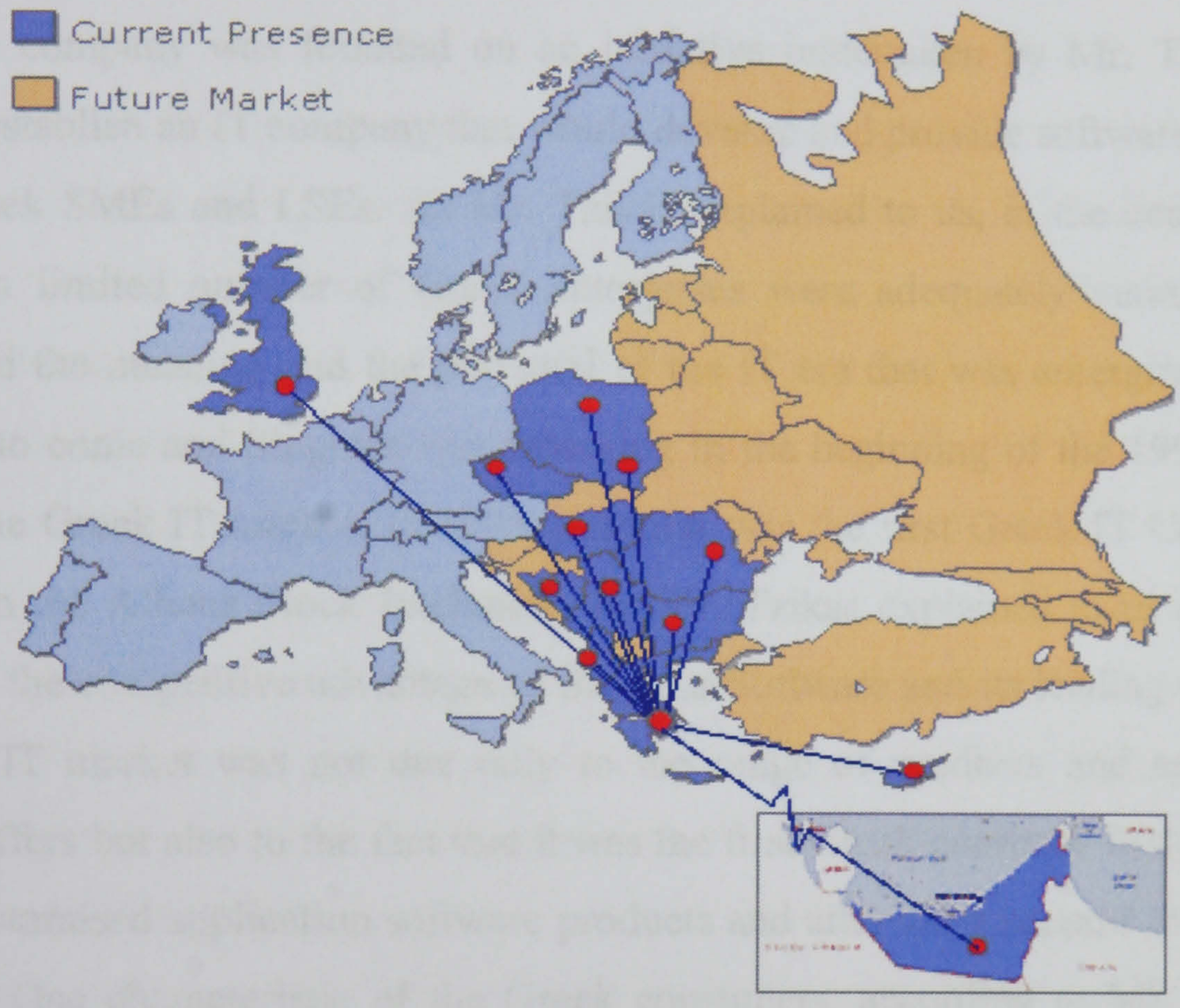


Figure 5, Sales Distribution, Delta Singular Group/ Singular

Furthermore, according to the General Deputy Manager, Mr. Charalambidis, Singular Software and Delta Singular, due to their high-level of services, trustworthiness and expertise in the IT sector, have managed to create long-term relationships in the Greek market with a wide range of very important clients some of which are; the Ministry of Finance, the Ministry of Internal Affairs, the Ministry of Environment and Public Constructions, the Greek Telecommunication Organisation (OTE), the Greek Water and Sewage Organisation, nearly 20 banks and financial institutions (Alpha Bank, National Bank of Greece, Emporiki Bank, Agricultural Bank of Greece, and others), the National Statistical Service of Greece, and the National Television and Radio Corporation.

3. Low Innovation Rate

Singular Software is an SME that develops and provides its own application software products and services, software programs and services developed by other companies belonging to the Group and furthermore it operates as the distributor and dealer of third party software solutions.

The company was founded on an initiative undertaken by Mr. Tzikas who wanted to establish an IT company that would develop and provide software programs for the Greek SMEs and LSEs. As Mr. Tzikas explained to us, in the decade of the 80's only a limited number of Greek enterprises were adequately visionary as to comprehend the meaning and the potential of the IT era that was emerging. Success was quick to come and Singular was emerging in the beginning of the 1990's as the leader in the Greek IT market. In 1994, Singular was the first Greek IT Company to be listed on the Athens Stock Exchange. As Mr. Tzikas explained to us during our interviews, the competitive advantage of Singular Software and its leading position in the Greek IT market was not due only to the range of products and services the company offers but also to the fact that it was the first Greek company to develop and provide customised application software products and after sales support in the Greek IT market. One characteristic of the Greek consumers, according to Mr. Tzikas, is their preference for Greek products,

> "Customers often feel they can communicate better their needs and wants and after sales support and questions to a Greek manufacturer and representatives rather than an international manufacturer that often seems too distant to understand them. We made sure to capitalise on our Greek identity and furthermore to provide less expensive but good quality products than our international competitors, like IBM, Microsoft, etc."

Today, almost 20 years after its birth, Singular continues to expand its network of business partners, forming strategic alliances (as we discuss in the next section) with numerous IT companies, and penetrating the markets of Central and Eastern

Europe. The central mission statement for Singular that reflects on its philosophy and values is the following,

> "To sustain close relationships with the customers, to retain the leadership in the application software and service market, to engage everyone in the company to the importance of quality that is the cornerstone of our competitive advantage."

According to the top management team (see appendix 7, in appendices, end of thesis, for a complete list of the team and their responsibilities), the Delta Singular Group of Companies that was formed, in 2000, as a result of the merger between Singular Software and Delta Informatics, constitutes a powerful Group of IT Companies, aims not only at establishing long-term relationships with its clients (some of which are private and public banks, organisations and institutions) but also in becoming a single point of reference to meet all IT needs. The Delta Singular Group of Companies has more than 45,000 clients domestically and internationally and has established a well-organised and trained network of 70 specialised support centres (Singular Business Centres) and 520 Dealers throughout Greece (as we discuss in the next section).

In this section, we explore the low/below average innovation rate/performance of the 'collaborator' type of SME by examining and presenting both 'quantitative data' from the analysis of the questionnaire on innovation, and 'qualitative' data derived from our case study and the interviews with the company's management team. Mr. Tzikas the Managing Director of Singular, answered the questionnaire on innovation, with the appropriate aid from the rest of the management team where it was felt necessary (see appendix 7, in appendices, end of thesis, for a complete list of the team and their responsibilities). Throughout the presentation of the innovation rate of the 'collaborator' type of SME, the findings of the questionnaire are enriched and elaborated by the qualitative data. Additionally we present the company's products and relevant processes of acquisition, development and launch of several of them that the company develops and/or distributes, as we determined from our case research. As we explained in chapter 3, the operational definition of innovation that we use to measure innovation in our case study is based on the Schumpeterian sense of defining

innovation as the carrying out of new combinations. This concept covers the following five cases:

i. The introduction of a new good – that is one with which consumers are not familiar yet– or a new quality of a good.
ii. The introduction of a new method of production, that is one not yet tested by experience in the branch of manufacture concerned, which need by no means to be founded upon a discovery scientifically new, and can also exist in a new way of handling a commodity commercially.
iii. The opening of a new market, that is a market into which the country in question has not previously entered, whether or not this market has existed before.
iv. The conquest of a new source of supply of raw materials or half-manufactured goods, again irrespective of whether this source already exists or whether it has first to be created.
v. The carrying out of the new organisation of any industry, like the creation of a monopoly position (for example through trustification) or the breaking up of a monopoly position. (Schumpeter, 1942, p.66)

Objectives of innovative ideas

In this section, we examine whether there were product/service and/or process innovative activities in the company for the 5-year period between 1998-2003. In particular, in the first part of the following table, we distinguish the innovative activities in three parts and present the number of innovations for each part. The introduction of new products/services is one of the four core measuring parameters of the innovation rate of the company as we presented it in the opening scheme of this chapter. The second part of the table presents the main innovative activities of the company concerning the production process.

Objectives of Innovative activities
Innovative activities in the company in the 5-year period between 1998-2003

Introduction of new products/services	
In the Greek Market	0
Internationally	0
Creative improvements of specific characteristics and properties	
In the Greek Market	5
Internationally (included in the 5 above)	5
Copying other products/services	
Copying products/services available in the Greek market	0
Copying products/services available in the Greek market but not produced locally	2

To the production process	
Revamping existing machinery	**Yes**
Raw materials	No
Utilising intermediate products or by-products	No
Organisation & rationalisation of production phases	**Yes**
Energy conservation	No
Lessening percentage of defective products	No
Improving working conditions	**Yes**
Lowering warehousing costs	No
Lowering labour costs	No
Lowering product design costs	**Yes**

Table 2, Question 1, Questionnaire on Innovation, Singular Software S.A., 2003.

As it becomes obvious from the above table, Singular has failed to introduce new products/services in the Greek and/or international markets. The company has instead introduced 5 creatively improved products in the 5-year period we examined, both domestically in the Greek market and internationally and imitated 2 products that exist in the Greek market since the late 1980s, hence achieving a low innovation rate in the particular parameter. The innovative activities in the production process are distinguished by the yes/no entry concerning the fields in which the company invests.

According to the Commercial Director, Mr. Aravanis, Singular Software capitalising on its know-how and technical expertise as well as its knowledge of the Greek taxation system and of the characteristics of the Greek small and medium sized business world, initially, in the decade of the 80's, developed and provided a series of business solutions in an attempt to modernise and computerise the Greek SMEs. Furthermore, it is the philosophy of the company, as the Commercial Director

explained to us during the interview, to add value to its product range by providing a full range of on-going support services to its customers. All Singular Business Centres offer on-the-spot customer support, and customisation utilities, while there is also a 24hours and 7days-a-week support hotline. In addition, the company is collaborating with Delta Singular Training Company that plans and organises training and specialisation seminars for SMEs either on Singular's products or for almost any other IT need the company could have. The product range includes:

1) "*Singular Control*", a specially designed software programme that organises and supports the day-to-day economic and commercial operations of an SME.
2) "*Singular Accountant*", it is software product especially designed to cover the needs of Greek accounting offices and all of their bookkeeping and financial reports, clients income statements, etc.
3) "*Singular Logistica*", it is addressed to all kinds of SMEs by providing solutions to their financial and accounting management needs.
4) "*EuroFasma*", it is a range of software programmes for the management and growth of SMEs as well as the organisation of their economic and commercial operations.
5) "*Singular Manpower*", it is an application software program specifically designed for the management of Human Resources in SMEs. Some of its functions include an efficient pay-roll system for the company's employees together with a complete system that keeps up-to-date information about each employee's historical data.
6) "*Office Manager*", an application software product addressed to all Private Practice Professionals that want to manage and control their operations and financial situation.
7) "*Cachier Online*", it is a complementary software product that enables the 'on-line' connection of the Singular Control applications with electronic cash register machines.

According to the five cases of the operational definition of innovation we provided in chapter 3 and re-stated earlier in this section, the range of products and services for SMEs under the Singular brand name, briefly presented above, do not

reflect a 'new combination'. Back in the 1980's, the company developed and produced the range of application software products as mentioned above. It could be argued that these products were new (case i) in the sense that they were custom made for Greek enterprises, for example incorporating the Greek taxation features, were in the Greek language, and most importantly were backed-up by full after sales service and support; i.e. activities constituting novel features that the Greek market was not familiar with. We could also argue that the company opened and to some extent expanded the IT software market in Greece with its service and support range (case iii). Again, of course, these were not 'new products' for foreign markets or for Greece since similar and often more sophisticated products, from large IT multinationals, such as IBM and Microsoft, were already being sold around the globe and in Greece. According to Mr. Tzikas, his company's range of products and services, were imitations and creative customisations of foreign more sophisticated products. The important point to be mentioned here is that since their original design and development the products are continuously upgraded in order to keep up with the rapid evolution of the operating systems, i.e. Windows. In other words, while originally they were designed for DOS, they soon had to be converted to be compatible with Windows 3.1 and UNIX, later with Windows 95, Windows NT, etc. Thus, at this moment these products are at best creative improvements of 'new combinations' for the Greek market that were developed nearly 20 years ago. As such they do not fit the parameters of our operational definition of innovation. Furthermore, in our measurement of the innovative performance of Singular Software we exclude the range of the other products, such as Eurofasma, Office Manager, etc. since they are not developed by Singular but are products of other companies of the Delta Singular Group.

Sources of innovative ideas

In this section, we examine some of the various sources from which companies usually derive ideas for process or product/service innovations. They may be logically divided in two broad categories, internal and external to the organisation sources. The analysis was made with the use of closed-format question/answer based on a Likert scale, as we explained in chapter 5, while the graphs produced and presented follow

the structure of the question and analyse separately the internal and external sources of innovative ideas. The following figure, 'Internal Sources', shows the different degrees of importance in which the various internal sources of the organisation contributed to innovative ideas in the 5-year period.

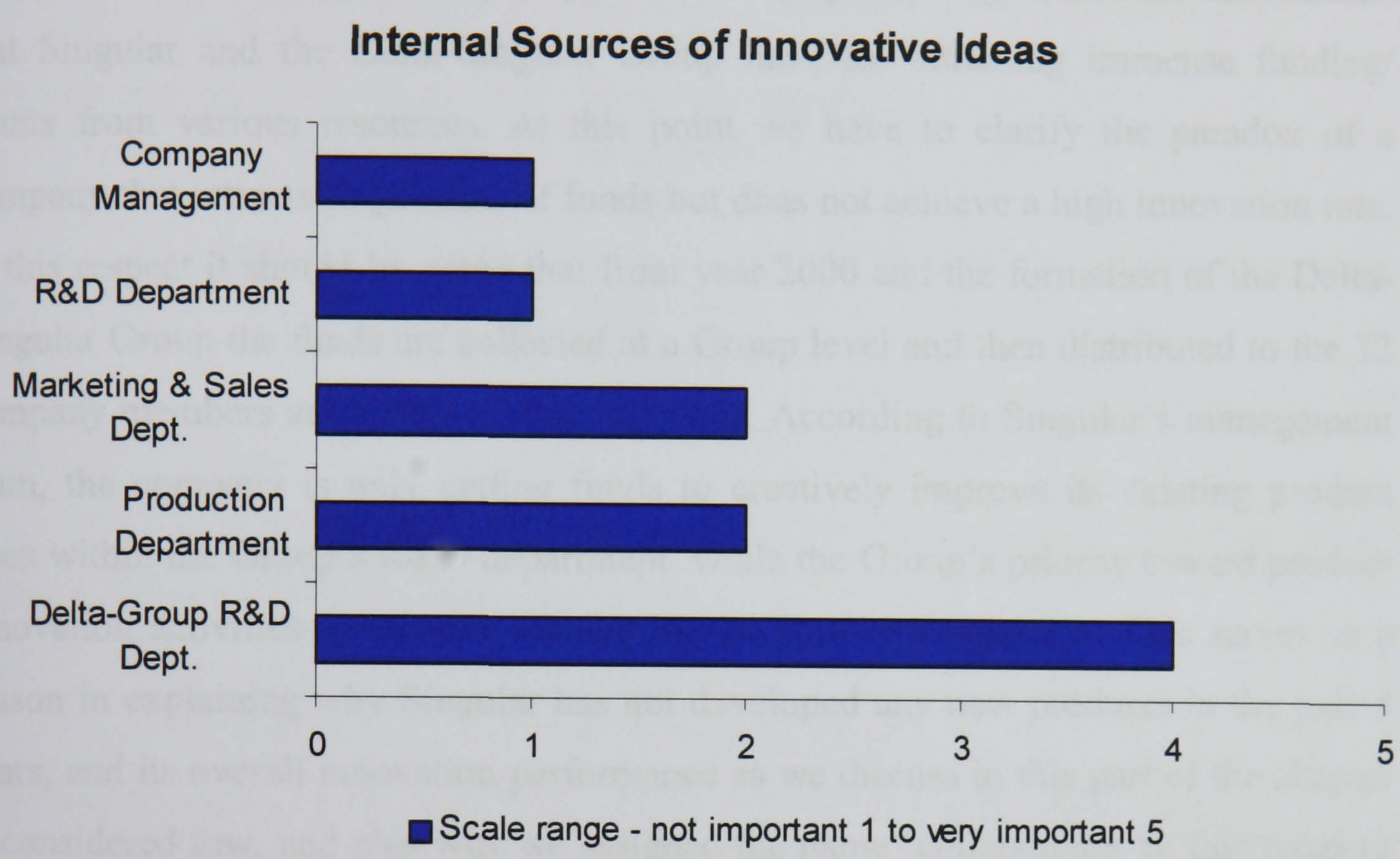


Figure 6, Question 2, Questionnaire on Innovation, Singular Software S.A., 2003

What emerges from this figure is that only the Delta-Singular Group of Companies R&D department is considered as an important source of innovative ideas. As the Deputy General Manager, Mr. Charalambidis, explained to us during our interview, Singular's activities under the Group's management, include the distribution of several products, contraction of long-term agreements with strategically important clients, i.e. public organisations, private and public financial institutions, etc. and customisation of the products to meet the particular needs of each customer, and on-going support services. According to the Deputy General Manager, the Delta Singular Group of Companies in its facilities in Athens laying nearly 500 kilometres away from the company's Headquarters undertakes the Research and Development on Singular's products. Again, the R&D concentrates, according to Mr. Charalambidis, to the creative improvements and the introduction of some new features in the newer versions of the application software solutions that have been in the market for many years.

Figure 7 illustrates the importance of the variety of sources of innovative information and knowledge that are external to the organisation. The most important source for innovative ideas turns out to be government sources/funding, and the company's cooperation with other firms. Other important sources of innovative ideas are research programs financed from external sources, i.e. EU programs, innovation support programs and customers requests. The foregoing emphasizes the connections that Singular and the Delta-Singular Group have for attracting immense funding/ grants from various resources. At this point we have to clarify the paradox of a company that attracts large sums of funds but does not achieve a high innovation rate. In this respect it should be noted that from year 2000 and the formation of the Delta-Singular Group the funds are collected at a Group level and then distributed to the 32 company members according to specific needs. According to Singular's management team, the company is only getting funds to creatively improve its existing product lines within the Group's R&D department, while the Group's priority toward product innovation activities is to assist financially the smaller companies. This serves as a reason in explaining why Singular has not developed any new products in the past 5 years, and its overall innovation performance as we discuss in this part of the chapter is considered low, and also why we assigned the name 'collaborator' to this types of SMEs.

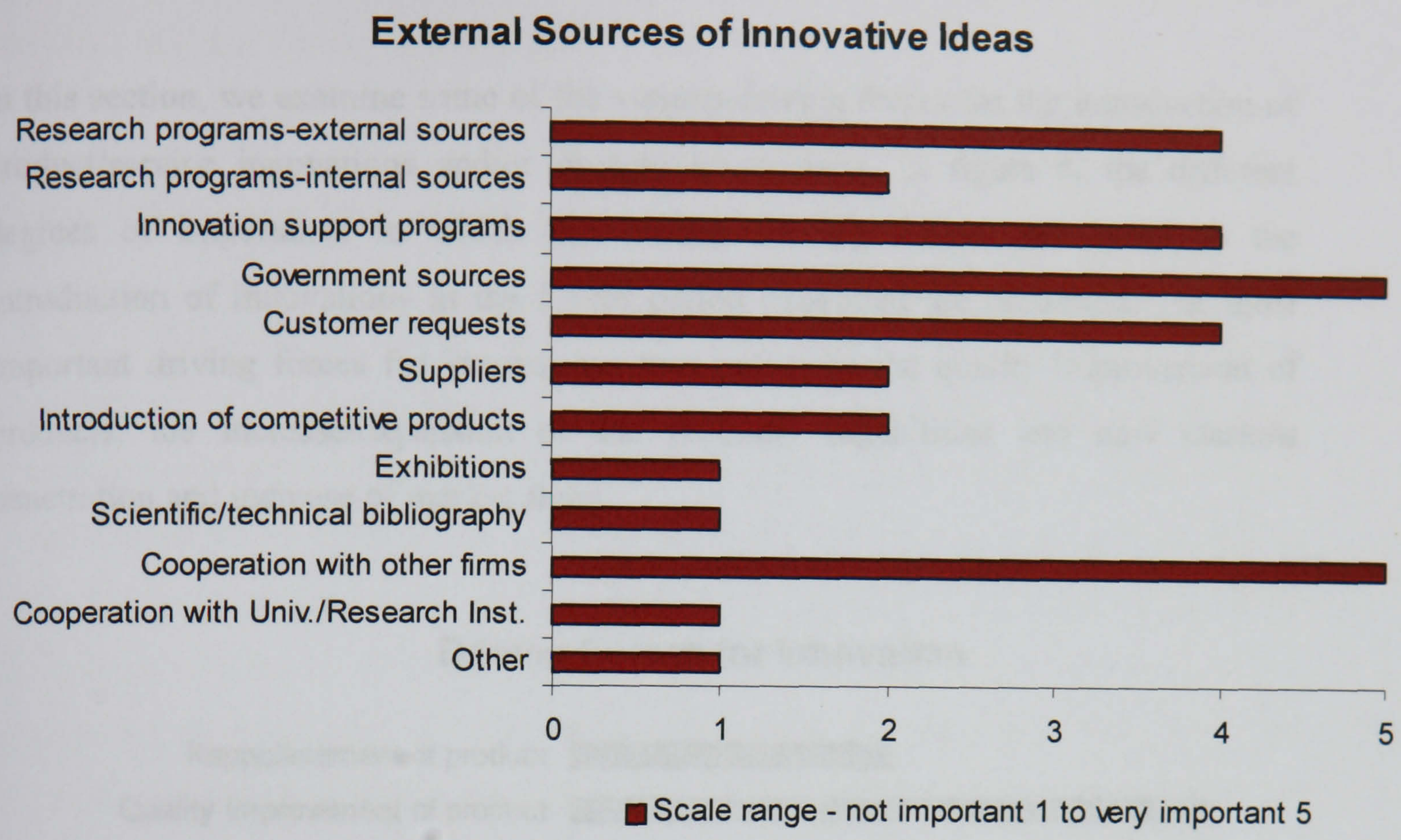


Figure 7, Question 2, Questionnaire on Innovation, Singular Software S.A., 2003

As the Commercial Director related to us, the necessity to customise the products according to the specific customer needs and wants, while at the same time maintaining close relationships with all the customers has proved to be a competitive advantage for the company bringing positive results. Customer Relationship Management Systems (CRM) combines the newest information technology to coordinate the large numbers of customers and networking companies a company could have. In cooperation with AlphaNova Company, Singular is providing the "Alphapartner" application software solutions that enable the coordination and automation of the sales, marketing, and support and after sales services of customers, and the synergies between the company and its business network. Again, this application software product doesn't fit the parameters of our operational definition of innovation, since it is distributed and sold by Singular but it has been developed and produced by AlphaNova Company, a member of the Delta Singular Group of Companies.

Driving forces for innovations

In this section, we examine some of the various driving forces for the introduction of product/service innovations and/or process innovations. In figure 8, the different degrees of importance in which the various driving forces contributed to the introduction of innovations in the 5-year period examined are presented. The most important driving forces for innovations turn out to be the quality improvement of products, the increase/expansion of the products capabilities and new markets penetration and increase of market share.

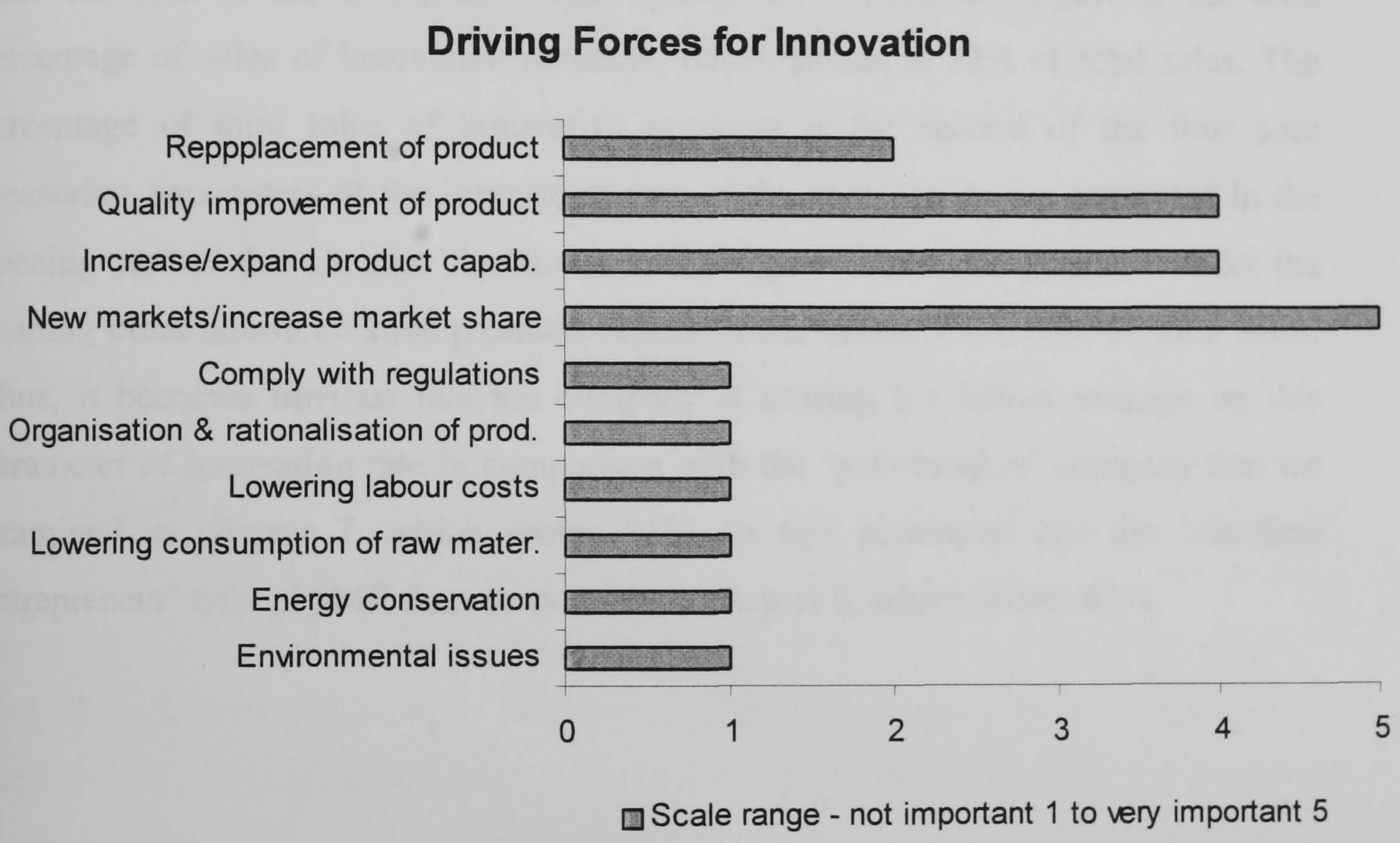


Figure 8, Question 3, Questionnaire on Innovation, Singular Software S.A., 2003

Singular's leading position and sound financial situation (which we show in the previous section) provides it with the opportunity to acquire the know-how and engage in strategic agreements with numerous companies in order to enter new activities and market fields. For example, when Singular wanted to enter the Greek Internet market it acquired two Internet companies, the '*OneWorld*' and the '*Internet Hellas*' Companies. That way Singular didn't have to invest in time and resource consuming R&D but, instead, in the first stage it simply 'bought the ideas and the products' and incorporated them to their own product lines, and in the second phase it was able to distribute them in the entire Greek territory at a notably low cost using its

established country-wide network of more than 650 business partners and dealers of the Delta Singular Group of companies.

Quantifiable aspects of innovative products

We begin this section by examining the percentage of sales that innovative products represent in the period between 1998-2003. The data given in the following pie chart represent the average percentage of sales for the 5-year period under examination, as it was classified for the company's managers to provide us details for each product's sales for each of the five years. What springs forth from this figure is the total percentage of sales of innovative products, which stands at 32% of total sales. The percentage of total sales of innovative products is the second of the four core measuring parameters of the innovation rate of the company as we presented in the opening part of this chapter. As shown in the figure below, the products under the heading other/non-innovative products represent the majority i.e. 68% of total sales. Thus, it becomes obvious that the company is scoring low/below average on this parameter of innovation rate in comparison with the 'path-breaker' company that we examined in chapter 7, which scores 91% on this parameter and the 'classical entrepreneur' type of SME that we examine in chapter 6, which scores 64%.

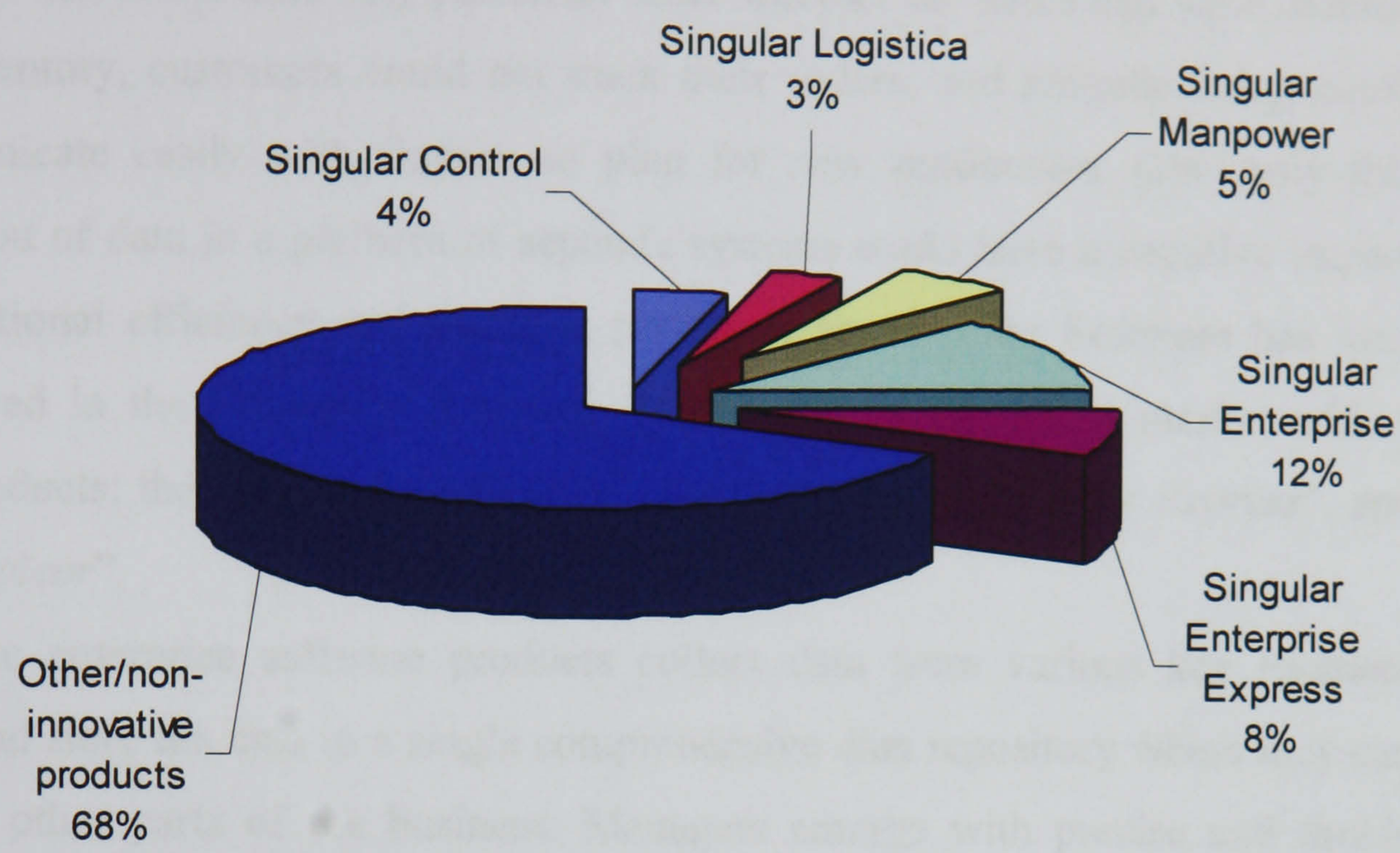


Figure 9, Question 4, Questionnaire on Innovation, Singular Software S.A., 2003

Elaborating more on the sales of innovative products, we examine whether the innovative products are sold abroad and what percentage of company exports do they represent. The following table illustrates that 5 products, Singular Control, Singular Logistica, Singular Manpower, Singular Enterprise, Singular Enterprise Express are sold abroad and account for 16% on average of the company's exports for the period between 1998-2003.

Are the innovative products sold abroad?
5 products Singular: Control/Logistica/Manpower/Enterprise/Enterprise Express
What percentage of company exports do they represent?
16% on average for the period between 1998-2003

Table 3, Question 5, Questionnaire on Innovation, Singular Software S.A., 2003.

Mr. Aravanis, the Commercial Director explained to us during the interview that Information technology could provide a set of technologies that can be used to coordinate activities and decisions across entire firms and even entire industries. As the Director set it forth a large organisation typically has many different kinds of

information systems that support different functions, organisational levels, and business processes. Most of these systems that are build around different functions, business units, and business processes 'do not talk to each other', and managers might not be able to tell at the time they placed an order whether the items that were ordered were in inventory, customers could not track their orders, and manufacturing could not communicate easily with finance to plan for new production. Obviously this fragmentation of data in a plethora of separate systems could have a negative impact on organisational efficiency and business performance. Singular Software has long been involved in the Enterprise Resource Planning Systems (ERP) market with a range of products: the "*Singular Enterprise*", the "*Singular Enterprise Express*", and the "*E-by-Epicor*".

These enterprise software products collect data from various key business processes and store the data in a single comprehensive data repository where they can be used by other parts of the business. Managers emerge with precise and timely information for coordinating the daily operations of the business and a firm-wide view of business processes and information flows. In other words, various business processes such as sales, production, finance, and logistics can be integrated into a company-wide business process that flows across organisational levels and function. As Mr. Aravanis explained, the difference between the three products is the level of sophistication and utilities they offer, while E-by-Epicor, is the internationally leading product in volume of sales that Singular is distributing for the Epicor Company in Greece.

According to the five cases of the operational definition of innovation we provided earlier in this chapter, the range of products and services for LSEs and High End organisations under the Singular brand name, briefly presented above, do not reflect a 'new combination'. Back in 1998, Singular developed and presented the first Greek ERP software applications under the brand names Singular Enterprise and Singular Enterprise Express. These two software products cannot be considered new combinations according to our operational definition of innovation. Several internationally-branded ERP products, backed-up with full after sales service and support were available in the Greek market since the mid 1980s and early 1990s. Singular's products were new for the company, and new for the Greek market in the sense that for the first time a Greek Software company managed to develop and produce its own range of application software products. As such the ERP software

product of Singular doesn't fit the parameters of our operational definition of innovation we provided earlier. Since they were originally launched they have been constantly upgraded to be compatible with the newer versions of operation systems, such as Windows ME, NT, 2000, XP, etc. Furthermore, in our measurement of the innovative performance of Singular Software we exclude E-by-Epicor, since this product is simply distributed and supported by Singular but is developed by Epicor International.

Furthermore, we examine the percentages of funds allocated to innovative activities, both R&D and other activities, such as revamping existing machinery, improving working conditions, lowering product design costs and in general refer to innovative activities in the production process for the period under examination. As the following table illustrates, the R&D expenditure represents a low percentage of the company's total turnover. The R&D costs have decreased since the year 2000 with the formation of the Delta-Singular Group of Companies and the establishment of a common R&D department for the Group. The table also shows funds allocated every year for innovative activities other than R&D as indicated. Adding the percentages of the two columns brings forth the low innovation record and the lack of strong commitment to innovation of the company, which for the years 2001 and 2002 represented an expenditure of just 2.8% of the total turnover. The percentage of funds allocated to R&D and other innovative activities as part of the total turnover, is the third of the four core measurements of the innovation rate of the company.

Percentage of funds allocated to innovative activities (referring to process innovations) and R&D expenditure as part of total turnover

	Innovative activities other than R&D	*R&D expenditure*
1998	0.5%	3.0%
1999	0.7%	3.6%
2000	0.9%	3.1%
2001	0.4%	2.5%
2002	0.5%	2.3%

Table 4, Questions 6 and 7, Questionnaire on Innovation, Singular Software S.A., 2003.

The following table supports our arguments about the philosophy and strategy of the company and the Group that aims to provide quality products and services rather than to purposefully and systematically pursue innovation. According to the table, from the 801 personnel that are employed at the various companies

participating in the Delta Singular Group of Companies in Athens only 24 people or 2.9% are engaged in R&D, which is also the fourth parameter of the core measurements of the innovation rate of the company. As the managers were eager to explain to us during our interviews, the company and the Group have the financial capacity to 'acquire an innovation' when they see a profitable investment and a potential market for it.

Workforce Allocation by Department, Delta Singular Group of Companies

Administration and Financial Services	70
Sales and Marketing	47
Professional Services	250
Support of Services	410
Research and Development	24
Total	**801**

Table 5, Workforce Allocation by department, Delta Singular S.A.

From the above we argue that the leading position Singular has in Greece is by large due to the trustworthiness that the company has gained during its years of operation in Greece, its reputation of providing state-of-the-art, quality products and services, and the fact that it keeps very close relationships with its customers and that it provides reliable and high-standard after sales support services. Twenty years after its birth, the company capitalises on these values that are central to the company's philosophy and organisational culture. They rely on these values to maintain and expand their business activities. They most importantly rely on the sheer size of the Group and its enormous financial capabilities and wide connections to promote their products and services. This could be the main reason for which the company is not purposefully and systematically pursuing innovation, and it is not investing more resources in R&D.

4. High Clustering/Networking Level

The analysis presented in the previous section 3, justifies the low innovation performance of Singular and its failure in introducing any new products in the past 5 years. In this section, we explore the high clustering/networking level of the 'collaborator' type of SME examining and presenting both 'quantitative data' from the analysis of the questionnaire on clustering/networking, and 'qualitative' data derived from our case study and the interviews with the company's management team. Mr. Tzikas, the Managing Director of Singular Software S.A., answered the questionnaire on clustering/networking, with the appropriate aid from the rest of the management team where it was felt necessary (see appendix 7, in appendices, end of thesis, for a complete list of the team and their responsibilities). Throughout the analysis of the investigation of the clustering/networking level of the 'collaborator' type of SME, the findings of the questionnaire are enriched and elaborated by the qualitative data and examples of clustering/networking activities and processes that were gathered during our case research. As we explained in chapter 3, where we identified our hypothetical, descriptive two-dimensional model of innovation and business clustering, we expand our empirical research towards the conceptual themes of strategic alliances and networks. Since these two concepts cover many cases we proceed by adopting an operational definition capable of measuring the performance of the SMEs in networking/clustering as follows:

i. Business cooperation (agreement) for combined research and development of new products and services.
ii. Networking (cooperation) with the local/regional/national technological and educational institutes and research centres for R&D purposes, as well as for the attraction and employment of young scientists.
iii. Strategic alliances with other firms for the purpose of entering new markets; sales and logistics; and/or extending distribution networks.
iv. Collaborating with government agencies and public institutions for R&D purposes.

v. Part of an establish network of interrelated companies belonging in the same or adjacent industrial sectors.

Nature of clustering/networking activities

In this section, we examine whether there were clustering/networking activities during the 5-year period between 1998-2003. As shown in the following table, we are interested in the nature of the clustering/networking activities of the company and present the number of the relevant activities for each case. As we show, Singular engaged in more than 90 different clustering/networking activities in the 5-year period we examined, both domestically in the Greek market and internationally, while in the year 2000 became a part of the Delta-Singular Group of Companies.

Nature of clustering/networking activities for the 5-year period between 1998-2003

Nature of clustering/networking act.	***Number as appropriate***
Equity holdings	10
Marketing agreement	7
Licensing agreement	6
Development agreement	3
Research agreement	0
Joint venture	4
R&D agreement	1 (Common for the 32 companies belonging to Delta Singular Group of Companies)
Manufacturing agreement	7
Grant/research funding	24
Supply agreement	29
Distribution agreement	650 distributors/ sub-distributors
Unspecified agreement	0
Other (specify)	1 (Technopolis)

Table 6, Question 1, Questionnaire on Clustering/Networking, Singular Software S.A., 2003.

Fields and objectives of clustering/networking

In this section, we examine some of the various fields and objectives of business clustering/networking and strategic alliances. The analysis was made with the use of

closed-format question/answer based on a Likert scale. In the following figure the different degrees of importance in which the various fields and objectives concern the clustering/networking activities of the company in the 5-year period examined are presented.

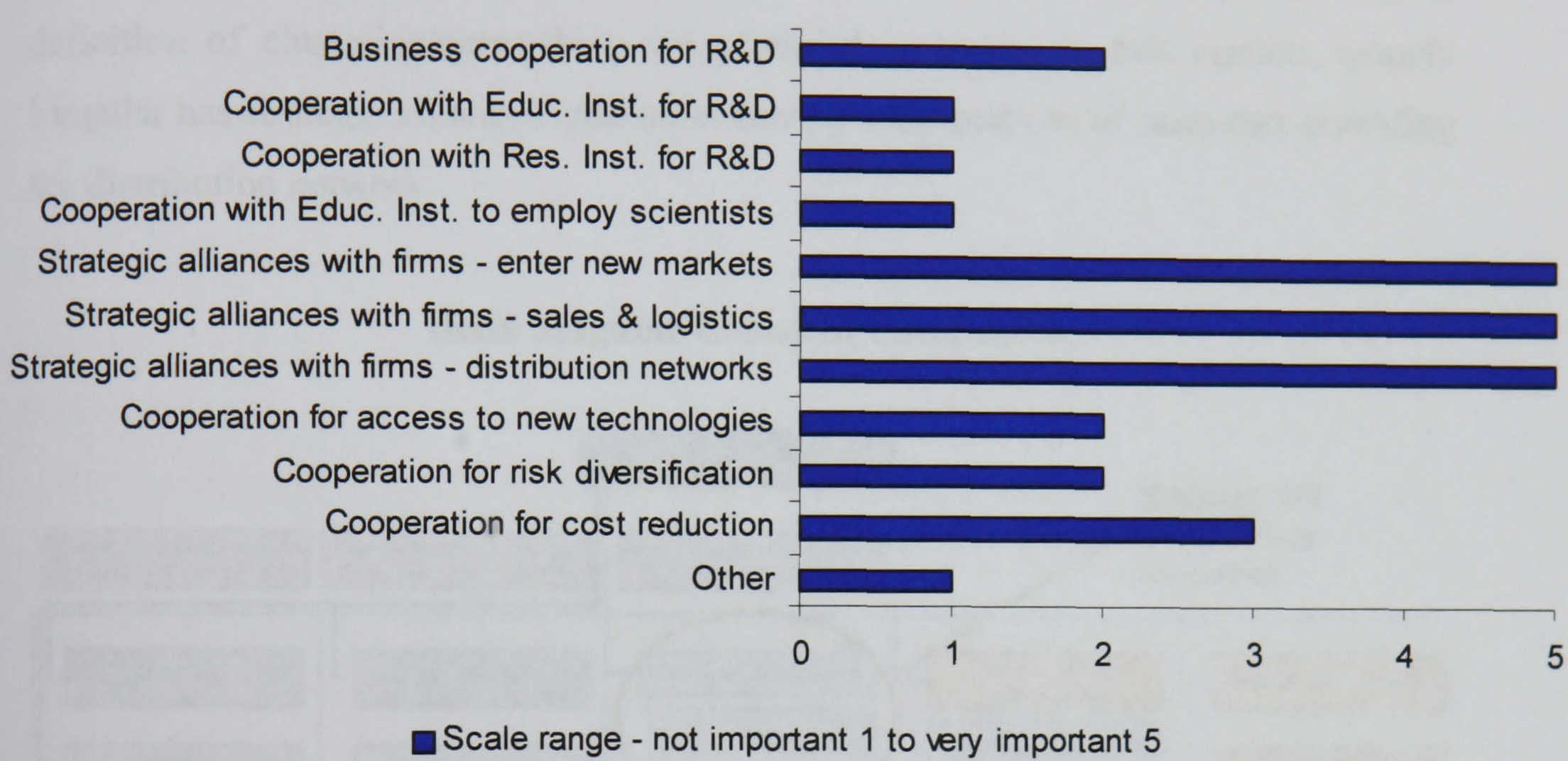


Figure 10, Question 2, Questionnaire on Clustering/Networking, Singular Software S.A., 2003

It is obvious that the company is actively engaged to a very important degree in strategic alliances with firms for the purposes of entering new/foreign markets, sales and logistics, and extending distribution networks. This confirms the importance Singular places on clustering/networking.

Singular has created and controls the largest distribution network throughout Greece. Singular as a member and the founding partner company of the Delta Singular Group of Companies uses the distribution network of the Group to promote its products and services. The network has the capability to offer after sales support and a wide-range of services to the customers at a local level nearly everywhere in Greece. Singular Software S.A. currently employs more than 220 persons and co-operates with more than 650 distributors and sub-distributors, or as the Group names them, VARs (Value Added Resellers). For Mr Tzikas, the Managing Director of the Company, this network is one of the main competitive advantages of Singular and of the Delta Group in general. Seventy-one VARs are authorised support centres, the Singular Business Centres, which are medium sized IT companies that are promoting

and supporting the Singular application software solutions in collaboration and through strategic alliances (marketing, supply and support agreements) with the Delta Singular Group. Singular is placing properly trained and educated employees to promote and support its products and services in each of these Centres. Another 60 VARs are authorised distributors of Singular Software, and 522 VARS are authorised distributors of the Singular Business Centres. The above fit case iii of our operational definition of clustering/networking we provided in earlier in this section, namely Singular has strategic alliances with other firms for the purpose of sales and extending the distribution network.

Delta Singular Group of Companies

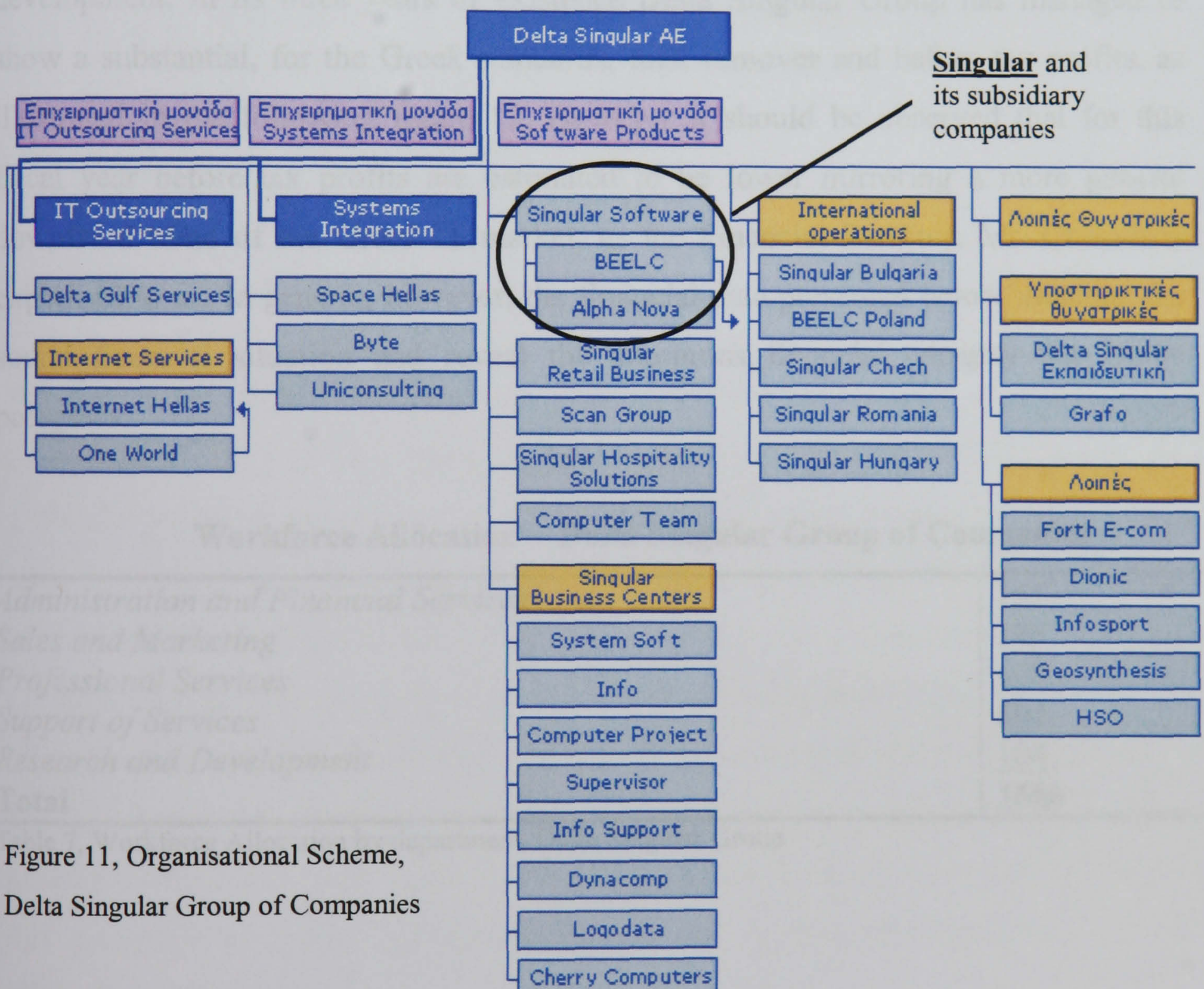


Figure 11, Organisational Scheme,
Delta Singular Group of Companies

The figure above presents the organisational diagram of the Delta Singular Group of Companies. It puts forth the significance and extend of the networking and inter-firm collaborations for Singular and for the Group in general. According to our

operational definition of networking/clustering, Singular fits case v, namely it is part, as well as the co-founder, of an established network of interrelated companies belonging to the IT industrial sector.

At this point it appears to be necessary to provide some data concerning the total human and financial resources of the Delta Singular Group of companies. As the following table illustrates, the Group employs 1556 persons in its various business activities and companies. In line with our previous analysis the Group does not appear to be investing strongly in R&D since only 104 persons or 6.7% of the total workforce is employed in R&D activities or departments. Case i of our operational definition of networking/clustering foresees business cooperation with other companies, Singular has entered agreements with other members of the Group for combined research and development. In its three years of existence Delta Singular Group has managed to show a substantial, for the Greek standards, total turnover and before tax profits, as illustrated in the following figure 12. However it should be observed that for this fiscal year before tax profits are estimated to be lower mirroring a more general downward trend of the Greek IT market, as the Financial Director, Mr. Chavouzis explained to us. In general, however, the financial data presented below illustrate the sound financial situation and reveal the enormous financial capacity the Group possesses.

Workforce Allocation -- Delta Singular Group of Companies

Administration and Financial Services	155
Sales and Marketing	185
Professional Services	608
Support of Services	504
Research and Development	104
Total	**1556**

Table 7, Workforce Allocation by department, Delta Singular Group

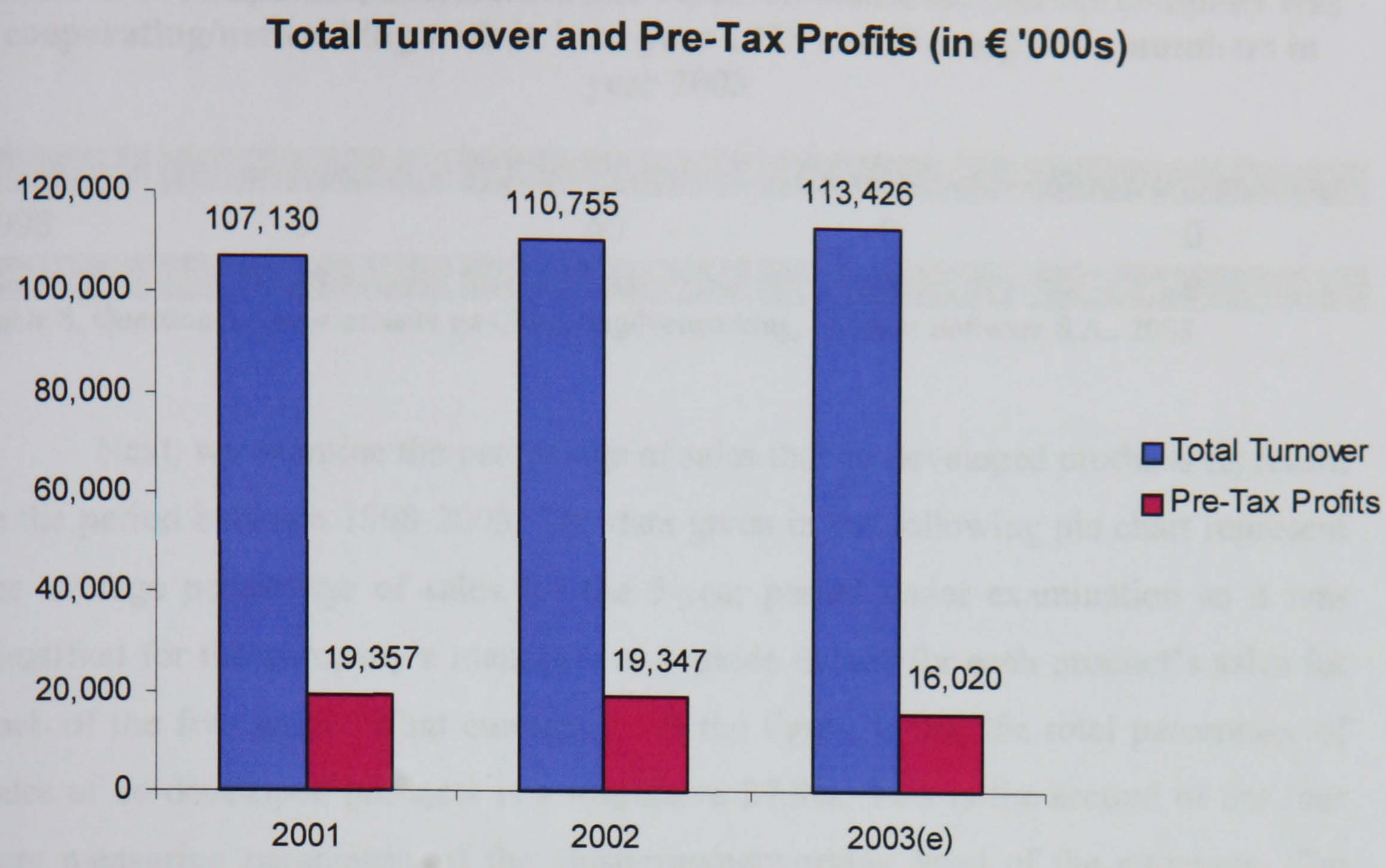


Figure 12, Delta Singular Group of Companies Financial Data

Quantifiable aspects of clustering/networking

We begin this section by examining the number of companies, universities and research institutes that the company was cooperating/networking with in the base year 1998 and what are the respective numbers in 2003. As we can see in the following table 8, the company has radically increased its cooperation/networking agreements and activities during the 5-year period under examination, a sign that further supports our argument that the company is systematically pursuing such activities. The number of companies and distributors that the company is cooperating/networking is one of the four core measuring parameters of the clustering/networking level of the company as we presented in the opening scheme of this chapter. Singular is scoring very high in this parameter as shown in the table below with a remarkable number of strategic alliances and joint ventures.

Number of companies, universities and research institutes that the company was cooperating/networking with in base year 1998 and the respective numbers in year 2003

	Companies	*Distributors*	*Universities*	*Research Institutes*
1998	9	60	0	0
2003	38	650	0	0

Table 8, Question 3, Questionnaire on Clustering/Networking, Singular Software S.A., 2003.

Next, we examine the percentage of sales that co-developed products represent in the period between 1998-2003. The data given in the following pie chart represent the average percentage of sales for the 5-year period under examination as it was classified for the company's managers to provide details for each product's sales for each of the five years. What emerges from the figure is that the total percentage of sales of co-developed products is a respective 27.8%. This is the second of the four core measuring parameters of the clustering/networking level of the company. The rest of the company's products, under the heading other products developed either by Singular or by Third party companies, are not developed through co-operative activities and represent 72.2% of total sales.

Average Percentage of total sales of co-developed products between 1998-2003

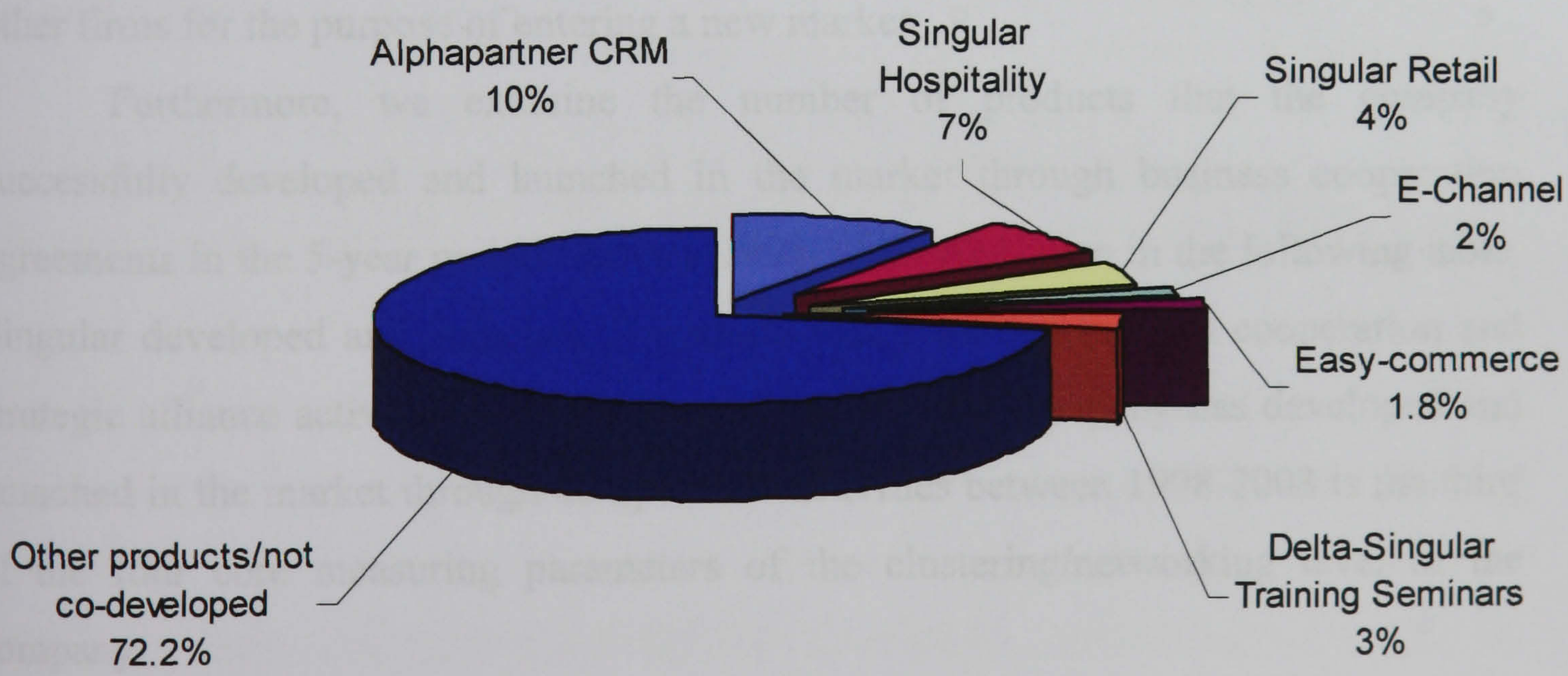


Figure 13, Question 4, Questionnaire on Clustering/Networking, Singular Software S.A., 2003

The figure of 27.8% of sales of co-developed products while it probably is considered average for a high-tech company in Western European countries it is very high for the Greek standards, and the Greek market is the setting where we test our 2-dimensional model.

The management team suggested that in order to put forth the significance of networking for Singular it would be necessary and appropriate to take a careful view of the processes through which the product lines of the company evolved. As previously noted in this chapter, Singular has singed agreements (licensing and supply agreement) with 'Internet Hellas' and 'One World' companies for the promotion of two new product lines, the 'e-*channel'* and the '*easycommerce'*. As we have discussed earlier, Singular has engaged in take-over activities by 'buying the ideas and the products' and thus diversifying and expanding its own product lines. As Mr. Aravanis, the Commercial Director explained to us during our interview, it is much simpler and less time and resource consuming to acquire the know-how or the whole company and promote its products rather than engage in co-development or exchange of information and knowledge that would enable us to develop our own internet related products. Once the products are labelled under the Singular Brand name the distribution is rather simple and cost-efficient through the established network of business partners and dealers we have described earlier, while the company commits itself to creative improvements of such products. According to our operational definition of networking/clustering this fits case iii, namely the strategic alliance with other firms for the purpose of entering a new market.

Furthermore, we examine the number of products that the company successfully developed and launched in the market through business cooperation agreements in the 5-year period between 1998-2003. As shown in the following table, Singular developed and launched 5 products and 1 service through cooperation and strategic alliance activities. The number of products the company has developed and launched in the market through co-operative activities between 1998-2003 is the third of the four core measuring parameters of the clustering/networking level of the company.

Number of products the company has developed and launched in the market through co-operative activities

Through business cooperation agreements	5 Products: CRM with Alphaparter/ Singular Hospitality/ Singular Retail/ E-channel/ Easy-commerce 1 Service: Delta-Singular Training Seminars
By cooperating with educational and research institutes	None (0)

Table 9, Questions 5 and 6, Questionnaire on Clustering/Networking, Singular Software S.A., 2003.

Finally, we explore the number of new markets, which include first time foreign markets penetration and diversification of market fields, that the company entered as a result of its clustering/networking activities in total. Table 10, illustrates the importance of clustering/networking for Singular's competitiveness since it entered 13 foreign markets and diversified its activities by entering the Internet-related software market, as we discussed above, and by offering a range of services. The number of new markets the company has entered through clustering/networking activities between 1998-2003 is the fourth of the four core measuring parameters of the clustering/networking level of the company.

Number of new markets the company has entered through clustering/networking activities

Foreign markets	13 (UK, Cyprus, Germany, Holland, Poland, Czech, Hungary, Bulgaria, Romania, Serbia, Bosnia, Albania, United Arabic Emirates)
Market fields	Internet (E-channel/ Easy-commerce) Services: Delta-Singular Training

Table 10, Question 7, Questionnaire on Clustering/Networking, Singular Software S.A., 2003.

The Deputy General Manager explained to us that, one cornerstone of the business strategy of Singular is the continuous preparedness to proceed with the acquisition and/or strategic alliance with companies, possessing useful know-how. Singular is relying heavily in the distribution network we described above and for the managers of the company forming strategic alliances or proceeding with company acquisitions should not only be considered as desirable but rather as a necessity in today's global intense competition. Singular, as noted throughout this chapter, is based in Thessaloniki and according to the company executives we interviewed this

places them in a very strong position in their strategic objective to reinforce their international activities in South-Eastern Europe. Singular's management team. as well as the Board of Directors at the Delta Singular Group level are strongly in favour of global co-operations and strategic alliances as they are considered to be the 'new way of competing'. For example, in 1999 Singular Software Northern Greece was renamed to Singular International starting off its export and expansion activity by establishing a strategically important collaboration with BAAN Company NV. Singular International and BAAN co-established the BAAN Eastern European Localisation Centre (BEELC) Company. During the same year Singular International proceeded to the full ownership (100%) of BAAN Hellas, and the subsidiaries of BAAN in Czech, Hungary and Poland. Singular International established commercial collaboration and acquired 30% of the English company AplhaNova S.A., which develops and installs CRM software programmes. Cooperation would tend to strengthen the company's presence in those countries, their market share and furthermore improve Singular's and the Group's position in the international market. The expansion of sales in new geopolitical and economic areas constitutes a basic parameter of Singular's strategy. Singular aims to become the springboard of the Group in South-Eastern Europe. In addition, the Group aims to expand its activities in several other countries as we show in section 2 earlier in this chapter. The economies of scale, and the potentials from entering new markets using such wide-international networks are enormous for an SME like Singular. Thus according to the operational definition of networking/clustering the above fit cases iii and v, namely forming strategic alliances for the purpose of entering new markets, sales, extending distribution networks, and being part of an established network of interrelated companies belonging in the IT sector.

Engaging in other crucial activities in order to enhance their networking capabilities, outside the 'strict' parameters of our operational definition of networking/clustering, Delta Singular Group of Companies has established a Department aiming to profitably use existing European Union Funds. As in the case of the R&D, this department is located in the facilities of the Delta Singular Group in Athens and aided by the Group's special Bureau located in Brussels. Both the Athens and Brussels departments share their activities and expertise with all member-enterprises belonging to the Group. The responsibilities of this department is to make the most of Programs of Research and Development at a Greek and European Level.

as well as of any Community Research and Support Frameworks. Singular uses this department to keep up-to-date with the technological changes introduced in the global IT market and to participate in Research projects/ contests and gather funds. All the companies of the Group financially support both the R&D department and the Department of Utilisation of European Funds.

When the managers were asked, during our interview, if the infrastructure of the Region of Thessaloniki, its airport, port, railway and highway system are developed enough to help the business activities of the company, the answer was unanimously negative. As they indicated to us, from a logistics viewpoint, the region's infrastructure is inadequate and obsolete when compared to a "Silicon Valley" model, but on the other hand they mentioned that their company relies mostly on the World Wide Web to conduct its business activities. The management team of the company travels from Thessaloniki to Athens and vice versa usually two to three times a week. As they explained to us, the majority of the production facilities and the R&D of the Group, which is common for all member enterprises located in Athens so it becomes mandatory to travel quite often in order to coordinate and manage the various company activities.

The Managing Director, Mr. Tzikas, claims that there is no mechanism in the Region of Thessaloniki, and in Greece in general, to promote and encourage university-business co-operations, or business-to-business networking. Mr. Tzikas is currently the president of SEPVE, the Association of Information Technology Companies of Northern Greece. This organisation has nearly 200 member companies in Northern Greece. The most important initiative of SEPVE and its president is the creation of a cluster of IT companies in Thessaloniki, the "Silicon Valley of South-Eastern Europe in Thessaloniki-Technopolis". Singular is one of the 39 IT companies, the University of Macedonia, the International Fair of Thessaloniki and other agents and institutions of the Region, that support and develop this long-term project. Mr. Tzikas, who is also the President and Managing Director of the Technopolis initiative, sees clustering and networking of IT companies as one of the Region's future competitive advantage, having a leading role particularly in South-East Europe and Asia. After all clustering and networking is the cornerstone of the business philosophy of Singular Software S.A, which Mr. Tzikas founded.

As Mr. Tzikas explained, the network/ cluster that Singular is participating in allows the company to meet the challenges associated with globalisation and intense

competition. Singular has managed to enhance its productivity, its sales and its total turnover, being a leader in the IT sector in the Greek Market while at the same time it maintains a 'respectable' international presence.

5. Outcome: High Performance/Growth

The analysis presented in sections three and four verify the low innovation rate and high clustering/networking level of Singular Software S.A., the 'collaborator' type of SME. The Greek economy has, yet, to form and establish a national innovation system and promote clustering and university-business-government relations. Keeping in mind this contrast between other EU countries and Greece we must bring forth the fact that the company in the past five years simply modernizes its IT products or buys out small innovative companies in order to expand its product lines. Hence the company scores very low on the four critical parameters we set to measure the innovation rate as we presented in the opening part of this chapter. In this last section of chapter nine, we investigate the dependent variable of our hypothetical, descriptive two-dimensional model, namely the performance/growth of the company. As we highlighted in the opening part of this chapter, and as shown in the following figure 14, Singular Software is scoring high in the chosen performance/growth parameters.

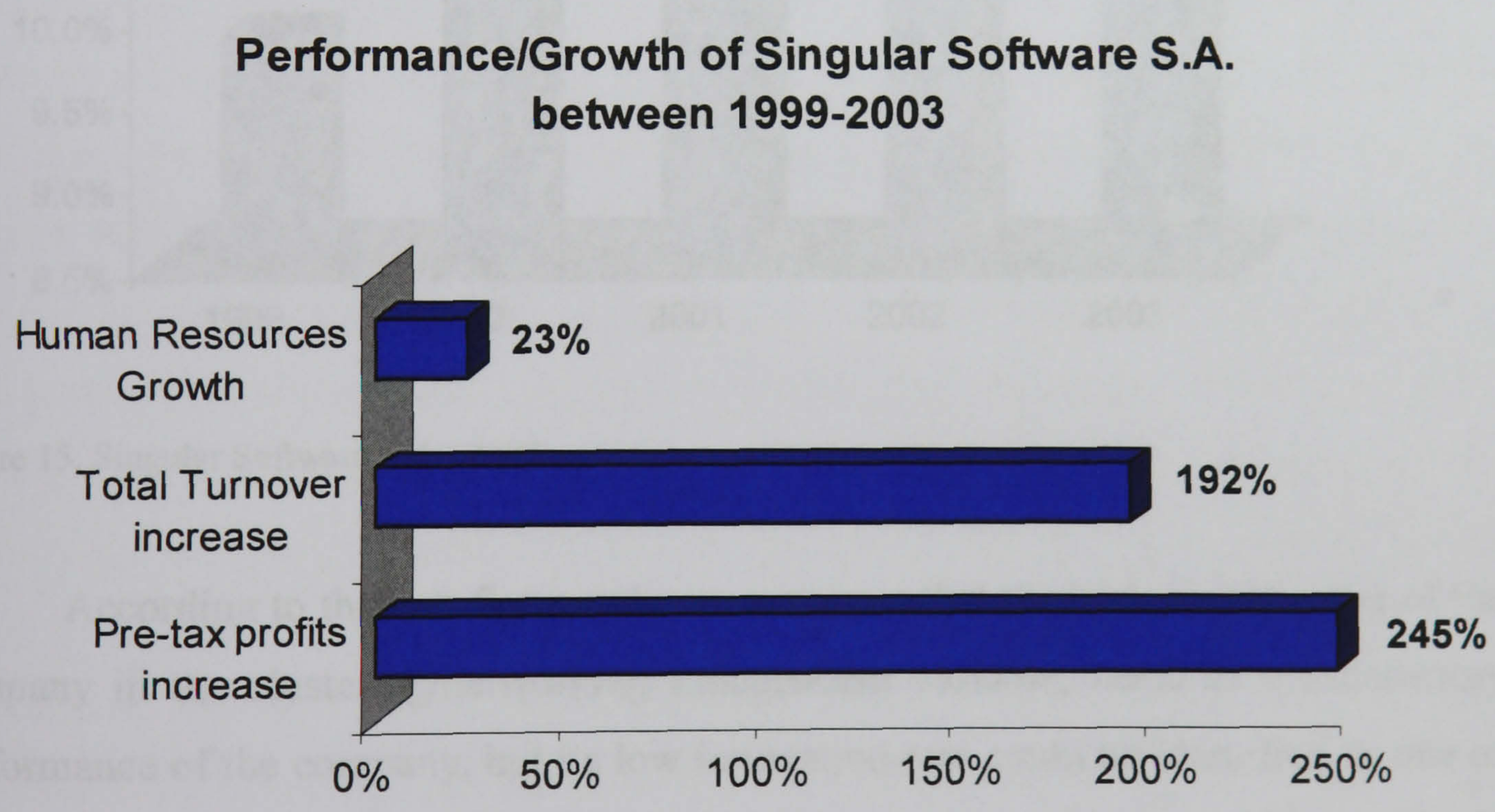


Figure 14, Singular Software S.A., 2003

Over the five-year period between 1999-2003, Singular increased its human resource capital from 181 to 223 persons, a 23% increase, as shown in figure 2 in the

first section of this chapter. Furthermore, the company boosted by 192% its total turnover from €7.6 to €22.3 million euros, as shown in figure 4 earlier in this chapter. Singular Software S.A. also shows an impressive 245% increase of its pre-tax profits from €754,000 to €2.6 million euros, as presented in the first part of this chapter in figure 4. These parameters are three of the four measurements of the dependent variable, namely the performance/growth of the company and clearly illustrate the good score of the 'collaborator' type of SME in this variable. Furthermore, the last parameter we use to measure the performance/growth of the company is the percentage that pre-tax profits represent as part of the total turnover. As shown in the figure below Singular has slightly increased this figure by 1.7%. Pre-tax profits represent more than 10% of the total turnover since the year 2000.

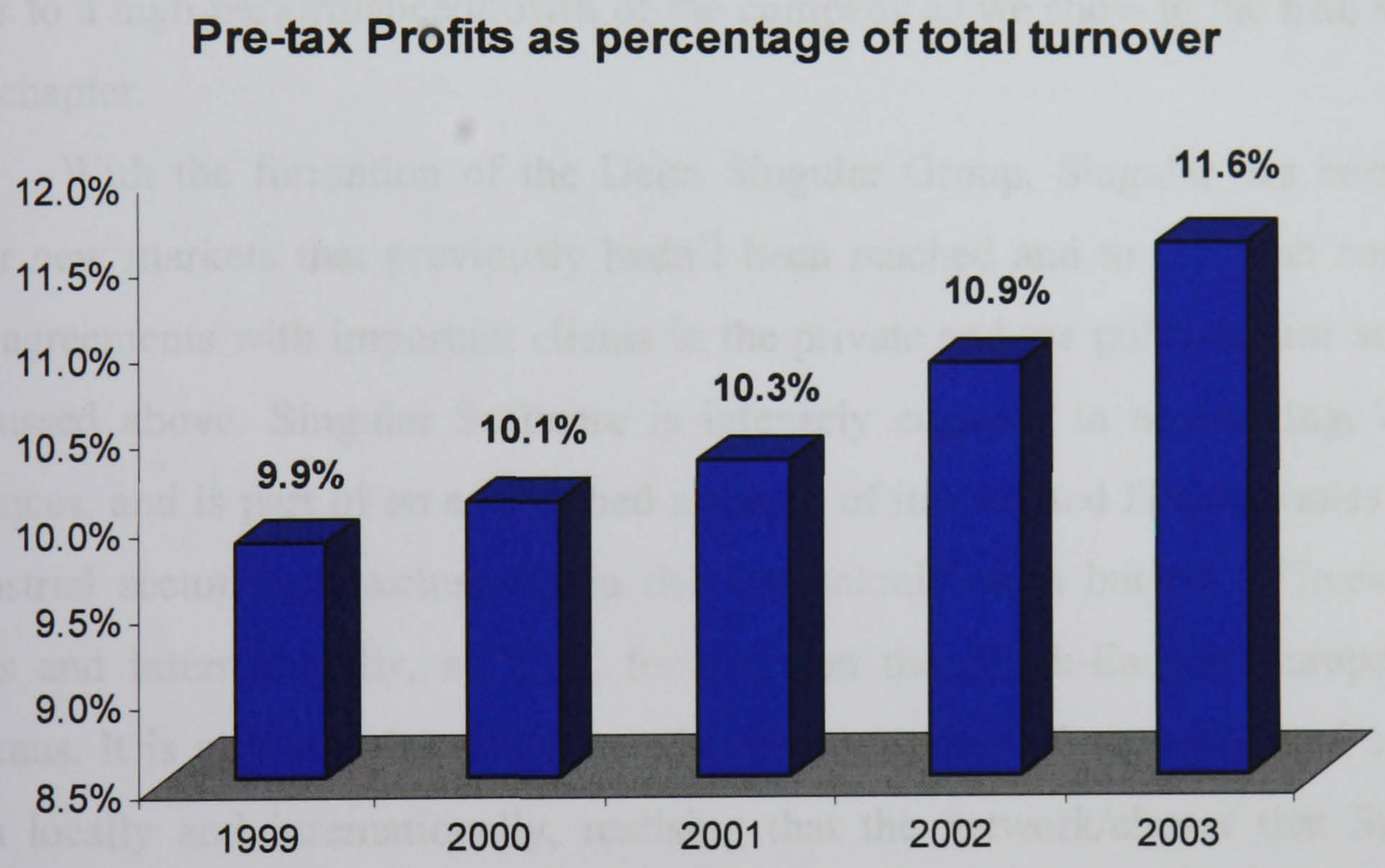


Figure 15, Singular Software S.A., 2003

According to the two figures above, we argue that the high performance of the company in the clustering/networking independent variable, leads to a satisfactory performance of the company, but its low innovation rate could be identified as one of the reasons that hinder the company's potential to achieve higher profits and truly benefit from its networking activities as was the case of the 'path-breaker' type of SME we examined in the chapter 7.

6. In Conclusion

Singular Software S.A. fits the criteria we set for the 'illustrative' SME type named 'collaborator' and located in the lower right square of our hypothetical, descriptive two-dimensional model. As we show in the third and fourth sections of this chapter, based on quantitative and qualitative data gathered through our questionnaire and interviews the company achieves a low performance score in the innovation dimension of our 2-dimensional model, and a high performance score in the networking/clustering dimension, at least for the Greek standards. Furthermore, the high performance of the company in the clustering/networking independent variable leads to a high performance/growth of the company as we show in the fifth section of this chapter.

With the formation of the Delta Singular Group, Singular has been able to enter new markets that previously hadn't been reached and to establish connections and agreements with important clients in the private and the public sector as we have discussed above. Singular Software is intensely engaged in networking, inter-firm alliances, and is part of an established network of interrelated IT companies in the IT industrial sector, not exclusively in the Thessaloniki area but on a Greek national basis and internationally, as well, focusing on the South-Eastern Europe and the Balkans. It is an SME that has adapted to the new way of managing and competing both locally and internationally, realising that the network/cluster that Singular is participating in allows the company to meet the challenges associated with globalisation and intense competition. Singular has managed to enhance its productivity, its sales, its total turnover and pre-tax profits, being a leader in the IT sector in the Greek Market while at the same time it maintains a 'respectable' international presence, and its distinct identity. As we saw, business networking has not affected the innovative performance of the company, which remains very low; this constitutes, perhaps an indication that if the company does not pursue a strategy towards innovation the mere fact of participating in a business network does not ensure a high innovation performance.

In chapter ten, which follows, we re-state the main objectives of this thesis, present and discuss the main findings from our empirical research by comparing and

contrasting the four illustrative SME types of our hypothetical, descriptive two-dimensional model. Based on these findings we proceed to present some recommendations for future research strategies in the hope that they may serve as guidelines for academic and empirical research, which, in turn, will contribute to the continuing and vibrant SME sector not only in Greece but the European Union as well.

Chapter 10

Conclusion

Concluding Remarks

This thesis, as its title indicates, attempted to delve heuristically into existing theoretical and empirical data in order to interconnect the concepts of entrepreneurship, innovation and small business clustering within the framework of contemporary and future business orientations. The following distinctive themes constituted the epicentre of the thesis and the backbone of our hypothetical, descriptive two-dimensional model of innovation and business clusters/networks:

1. *Innovation and entrepreneurship are intertwined concepts affecting SMEs competitiveness.*
2. *Business networks appear to be associated with the innovative capabilities of SMEs and their competitiveness.*

As was shown in chapter three, the above distinctive themes which interrelate the concepts of innovation, business clustering and business performance/competitiveness were brought forward by the literature, case studies and research review we have analysed and presented in the first three chapters of this thesis.

The model we presented in chapter three is a hypothetical schematic description encompassing the concepts of innovation and clustering and how these could affect SMEs performance and competitiveness. In this schematic presentation (see figure 9, pp.149), the vertical axis shows the innovation performance of SMEs, and the horizontal axis is the extent and the depth of networking and strategic alliances. The end result is the formation of four squares each representing a different type of SME based on the relations between the concepts of innovation and business clustering and the relative position of each company in the ensuing scheme. The names given to each of the four 'illustrative' cases (namely, 'classical entrepreneurs', 'path-breakers', 'survivors' and 'collaborators') are hypothetical but relevant for describing each of the four illustrative types of SMEs.

The aim of this hypothetical, descriptive two-dimensional model is to link the concepts of and relations between innovation and clusters/networks in an attempt to

explain how the relations between these concepts affect the performance and competitiveness of an SME. As we have discussed in chapter three, pages 136-147 the two distinctive themes derive from the literature and these provide our model with some of the needed theoretical validity. The critical reader has to realise that this is a hypothetical model of how these concepts relate and affect the performance and competitiveness of an SME; it does not negate the possibility that other researchers might reach similar conclusions using different sets of relations that would have emerged from another heuristic point of view. Our two-by-two hypothetical model is our minimal contribution to the edifice of existing management research and theory. In introducing a new, hypothetical model on the subjects of innovation and business clusters we assumed that we could rely on existing theoretical evidence up to a certain point. Beyond this point the empirical research we conducted in the IT sector of the Central Macedonia Region in Northern Greece (chapters 6 to 9) provided on the one hand some verification of the validity of our hypothetical model and the two distinctive themes/relations and on the other a useful contribution to existing management literature theory on these subjects.

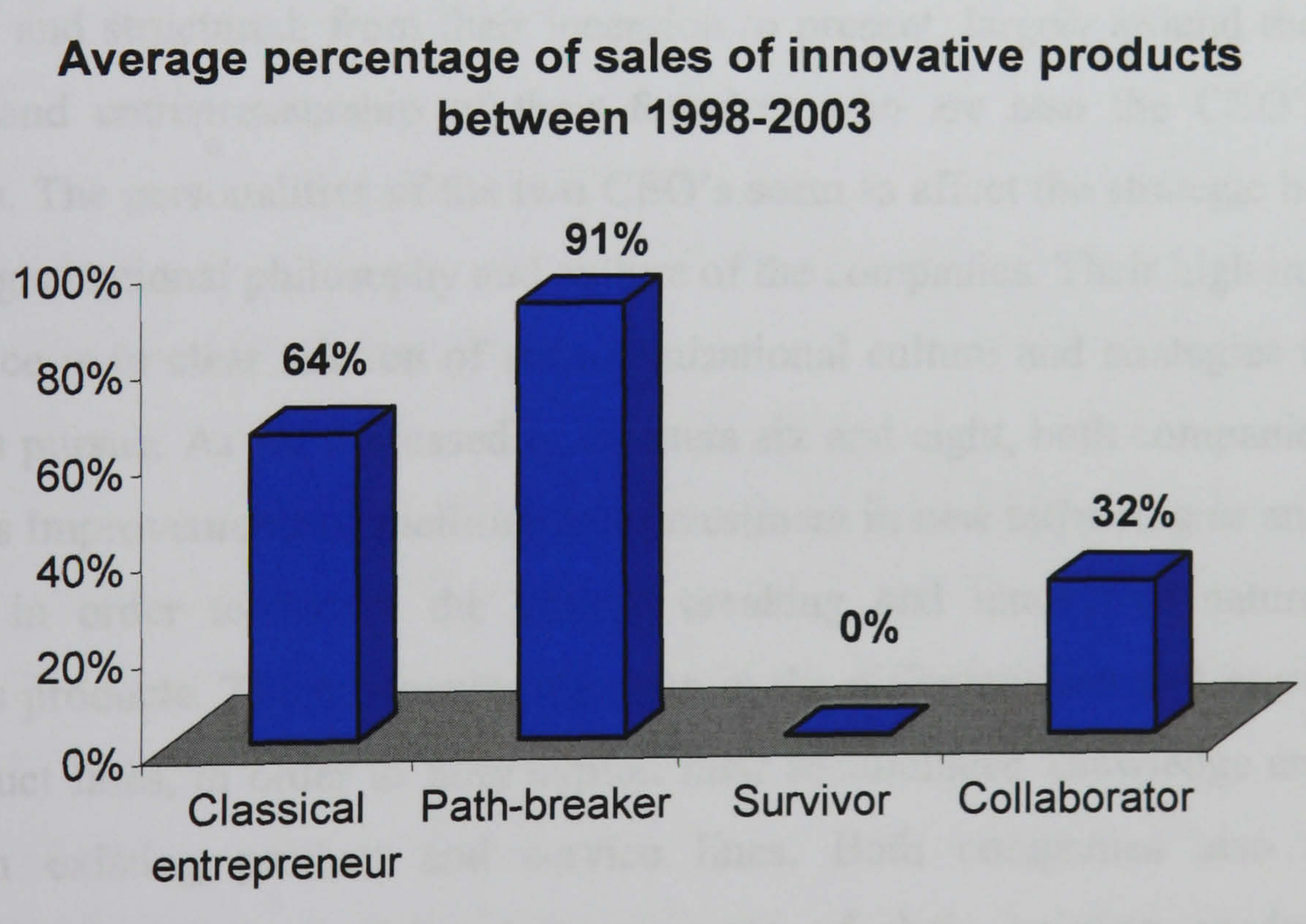
As we examine in the following section, our hypothetical-illustrative model provided answers to questions such as why some companies are more innovative and open to networking than other companies, and why some companies are more reluctant to collaborate than other companies? Further how these characteristics affect the outcome, namely SMEs growth and competitiveness. It also purports to add insights to a comparison and contrast between the different types of companies in order to answer questions as those set above that will act as guidelines to devise some policies and measures to assist SMEs to improve their competitiveness and performance. The ultimate aim of the model is to add to the scientific knowledge concerning the concepts of entrepreneurship, innovation and business clustering by linking the concepts together and validating their relations and influence in businesses performance, competitiveness and viability.

In the following pages, we present in summary form the key findings of each one of the four case studies. Four parameters are used to measure the relevant scores of each of the independent variables, namely innovation rate and clustering/networking level, and the dependent variable, namely the performance/growth of the company. The value and contribution to the existing knowledge in the subject area of our hypothetical two-dimensional model and the 4

illustrative types of SMEs can be confirmed by their contrasting behaviour. With the use of charts and tables we compare and contrast the four illustrative types of SMEs according to the key findings of the case studies research in relation to: (a) innovation (b) clustering/networking and (c) performance/growth. At the end of each section we relate the findings of the four empirical case studies with the theoretical elements we raised in the first four chapters of this thesis.

Innovation

Focusing in the first independent variable, namely the innovation rate, what emerges from the following figures 1 and 2 is that the SMEs named 'path-breaker' (this is the case of the SME which scores high on innovation and high on business networking) and 'classical entrepreneur' (this is the case of the SME which scores high on innovation and low on business networking) are scoring high on innovation performance, introducing several new products in the period between 1998-2003,



which represent also the vast majority of their total sales, 91% for the 'path-breaker' and 64% for the 'classical entrepreneur'.

Figure 1

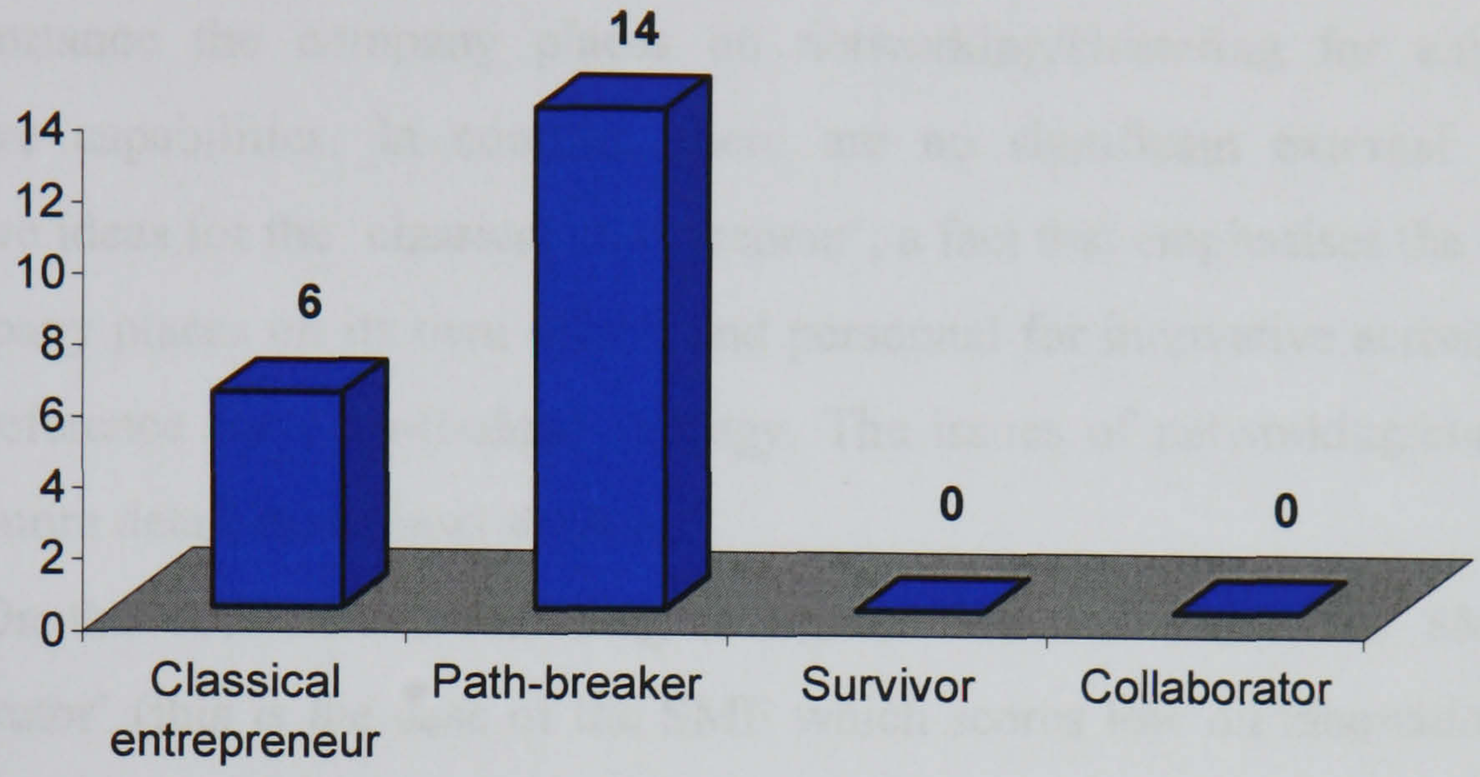


Figure 2

The 'path-breaker' and the 'classical entrepreneur' types of companies developed and structured, from their inception to present, largely around the efforts, activities and entrepreneurship of their founders who are also the CEO's of the companies. The personalities of the two CEO's seem to affect the strategic behaviour and the organisational philosophy and culture of the companies. Their high innovation performance is in clear relation of the organisational culture and strategies that both companies pursue. As we discussed in chapters six and eight, both companies aim at continuous improvements of facilities and investment in new technologies and human resources in order to secure the ground breaking and innovative nature of the companies products. The companies also aim at the differentiation and expansion of their product lines, in order to fully exploit their accumulated knowledge and know-how from existing product and service lines. Both companies also seem to continuously invest in creative improvements of their existing product lines. Furthermore, in both types of SMEs, the respective company's management and the R&D department are considered as very important sources of innovative ideas. Similarities also exist in the driving forces for innovations that amongst others include the quality improvements of products and the increase/expansion of the products

capabilities. On the other hand, when it comes to the external sources of innovative ideas some differences emerge that are attributed to the different strategies the two companies adapted in the networking/clustering subject. For the 'path-breaker' type of SME, the most important source of innovative ideas turns out to be the company's cooperation with other firms, universities and research centres a fact that emphasises the importance the company places on networking/clustering for enhancing its innovative capabilities. In contrast, there are no significant external sources of innovative ideas for the 'classical entrepreneur', a fact that emphasises the importance the company places on its own efforts and personnel for innovative activities as well as its preference for a go-it-alone strategy. The issues of networking/clustering are dealt in more detail in the next section.

On the other hand, according to figures 1 and 2 above, the SMEs named 'collaborator' (this is the case of the SME which scores low on innovation and high on business networking) and 'survivor' (this is the case of the SME which scores low both on innovation and on business networking) have, respectively, a low and non-existing innovation performance. Both companies have not introduced any new products, in the 5-year period examined, while only the collaborator has a below average, 32% sales of innovative products which refer to creatively improved products and not 'new combinations' in the Schumpeterian sense as we discussed in chapter seven. In contrast to the 'path-breaker' and 'classical entrepreneur' types of companies the 'collaborator' type of SME as we have discussed in chapter seven, does not pursue a strategy towards innovation. The collaborator type of SME is intensely engaged in networking, inter-firm alliances and is part of an established network of interrelated IT companies on a Greek national basis and internationally. The organisational strategy of the business is oriented around the strengthening of relationships with its customers/clients, 'locking' them into long term collaboration agreements, the improvement of the quality of its products and services and the investment towards expanding the Delta-Singular network, product and service lines and market penetration through the acquisition of or strategic alliances with other companies. In contrast to the 'path-breaker' type of company that is engaged in networking/clustering activities in order to enhance its innovation rate, the 'collaborator's' leading position and sound financial situation provides it with the opportunity to acquire the know-how and engage in strategic agreements with numerous companies in order to enter new activities and market fields. The

'collaborator' fails to invest in exchange of knowledge and combined R&D with the other companies belonging to the network but rather buys the ideas and products and incorporates them in its own product lines. This is the main difference between the highly innovative 'path-breaker' and 'classical entrepreneur' types of SMEs, which invest in creating an organisational culture that aims towards innovative activities and the 'collaborator' that uses their strong clientele and the Delta-Singular groups dynamics to expand, increase their performance in terms of human resource growth, pre-tax profits and total turnover.

The strategic orientation towards innovative activities of the 'path-breaker' and the 'classical entrepreneur' types of SMEs is further supported from the following figures 3 and 4, which present two more parameters of innovation. It becomes clear that the 'path-breaker' and the 'classical entrepreneur' are investing highly on innovation as their percentage of funds allocated to innovative activities and R&D are 10% and 6.8% of the total turnover respectively, while the 'collaborator' and the 'survivor' are scoring very low, 2.8% and 0.39% respectively.

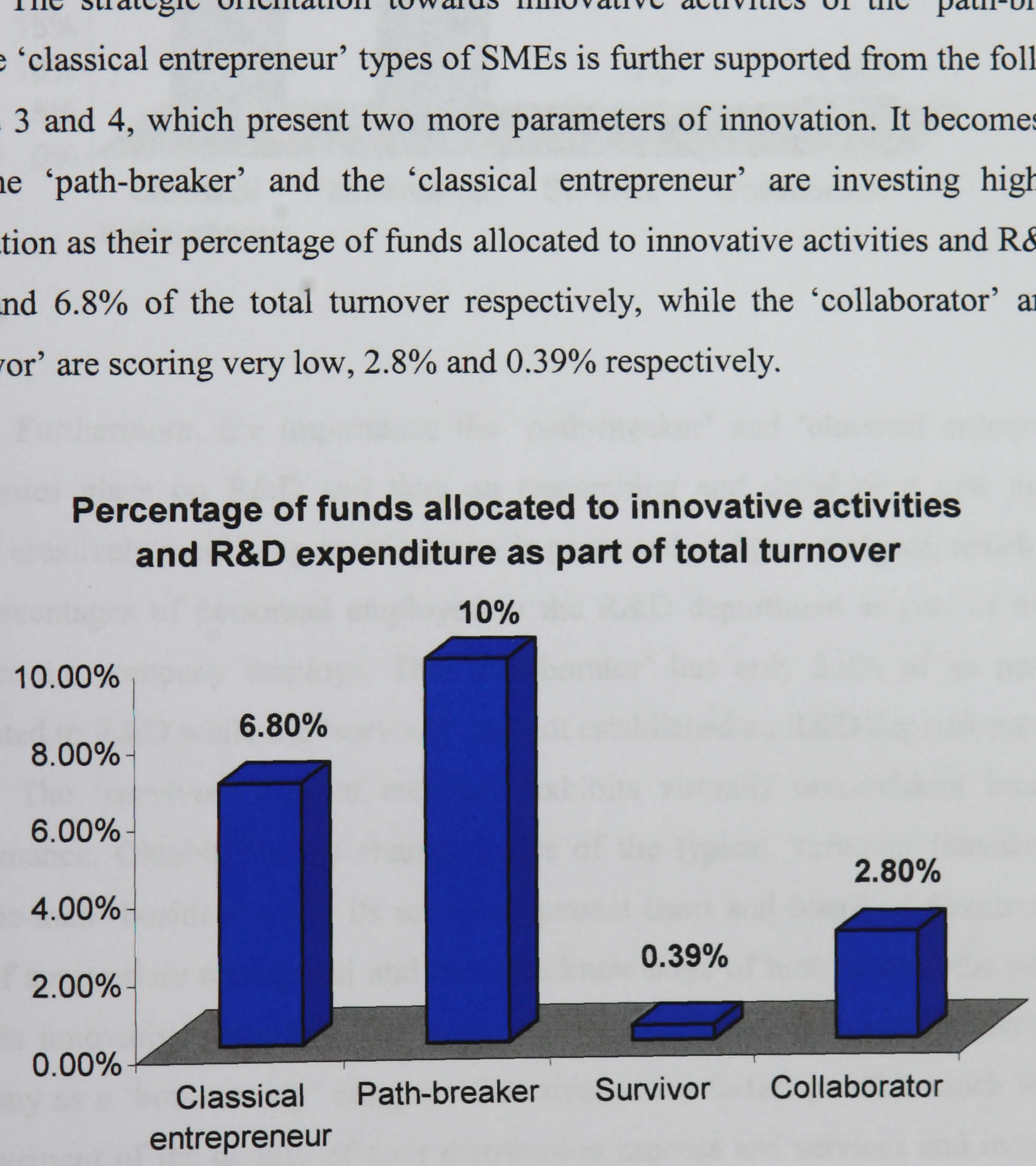


Figure 3

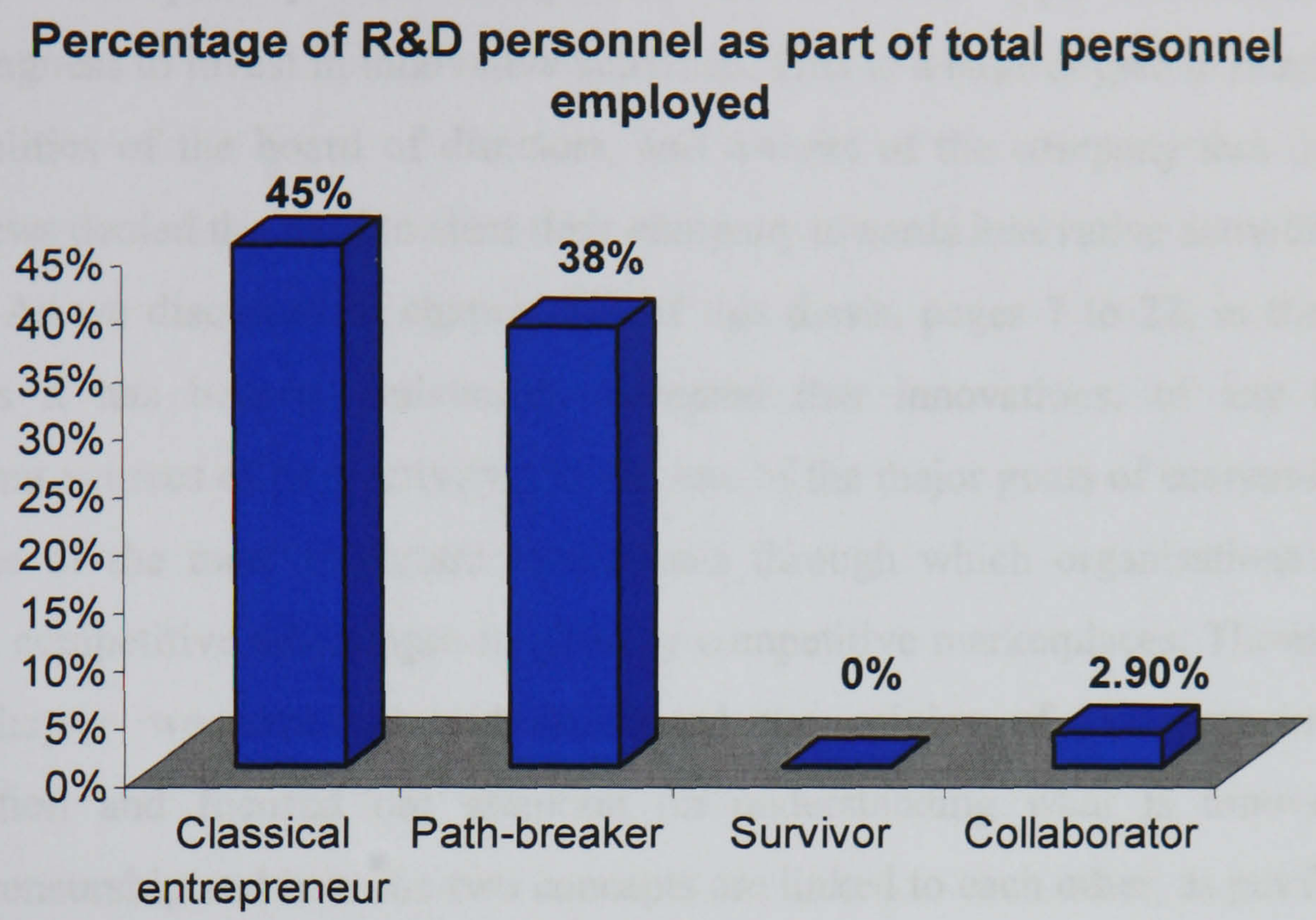


Figure 4

Furthermore, the importance the 'path-breaker' and 'classical entrepreneur' companies place on R&D and thus on researching and developing new products and/or creatively modifying existing ones is presented in figure 4 above, which shows the percentages of personnel employed in the R&D department as part of the total number the company employs. The 'collaborator' has only 2.9% of its personnel dedicated to R&D while the 'survivor' has not established an R&D department at all.

The 'survivor' type of company exhibits virtually non-existent innovative performance. Oktabit fits the characteristics of the typical 'turnover intensive' and 'middle-man' business while its top-management team and board of directors show lack of appropriate managerial and business knowledge of how to steer the company towards innovative activities. The company's management team have organised the company as a 'box-moving' company that aims at the fastest possible stock rotation, improvement of the quality of their distribution process and services and increase of their market share in Greece. As shown above, the company doesn't have an established R&D department, neither a human resource department. The only source of innovative ideas comes from the management team and refers to the acquisition of inventory models from international specialists and some creative modifications upon them. Thus in contrast to the 'collaborator' type of SME that at least uses the network

it belongs to and its financial strength to search and 'acquire' innovative products and services developed by other companies, the 'survivor' type of company shows unwillingness to invest in innovative activities. This to a large degree in relation to the personalities of the board of directors, and owners of the company that during our interviews denied the need to steer their company towards innovative activities.

As we discussed in chapter one of this thesis, pages 7 to 22, in the last few decades it has become universally accepted that innovations, of any kind, are important sources of productivity growth, one of the major goals of economic activity and one of the most important instruments through which organisations gain and sustain competitive advantages in globally competitive marketplaces. Throughout the first chapter we explored and delineated the origins of entrepreneurship and innovation and focused our attention on understanding what is innovation and entrepreneurship and how the two concepts are linked to each other, as put forward in the writings of various scholars. From the review of the literature on innovation and entrepreneurship considered in this dissertation, we suggested, *"innovation and entrepreneurship are intertwined concepts affecting SMEs competitiveness"*.

Furthermore, as we discussed in chapter two, several researchers in their studies give special emphasis to the influential role of the entrepreneur in affecting the performance, survival and growth of the firm particularly when the firm is small. The idea we brought forward in chapter two, pages 60 to 67, is that the 'basic role played by the owner/manager/entrepreneur' is one of the major determinants of SME competitiveness and performance; this turns out to be so because the concentration of decision-making power in the owner/manager in an SME environment, consequently affects the firm's overall strategy.

As we presented above, the empirical data from our case studies verify the interrelationship between innovation and entrepreneurship. The SMEs named 'path-breaker' and 'classical entrepreneur', developed and structured, from their inception to present, largely around the efforts, activities and entrepreneurship of their founders who are also the CEOs of the companies. Their high innovation performance is in clear relation with the organisational culture and strategies that both types of companies pursue and which aim towards innovative activities. Here, entrepreneurs purposefully and systematically search the sources of innovation, the changes and the indications that create opportunities for a successful innovation.

As we discussed in chapter two, throughout pages 78 to 84, one of the most rapidly emerging approaches to industrial competitiveness of small and medium sized enterprises (SMEs) is that it can be accelerated through inter-firm collaboration. When corporations share competencies and knowledge it becomes possible to tackle jobs that no single corporation could tackle alone. Today's networks, the Internet, video conferencing, and computerised tools make possible flexible but tightly coupled linkages between corporations. Companies are increasingly using information systems and the Internet for strategic advantage by entering into strategic alliance with other companies in which both firms cooperate by sharing resources and/or services. Such alliances are often information partnerships in which two or more firms share data for mutual advantage. The cooperative behaviour beyond helping SMEs to survive in their market place, facilitate their innovation through collaborative research and development projects and shared knowledge, and then enable them to successfully compete with larger enterprises. Hence, the review of the literature on business networks/clusters and innovation considered in this dissertation, suggests that 'b*usiness networks appear to affect positively the innovative performance of SMEs and their competitiveness'*.

As we presented above, the empirical data from our case studies verify this suggestion. For the SME named 'path-breaker' the most important source of innovative ideas turns out to be the company's cooperation with other firms, universities and research centres, a fact that emphasises the importance the company places on networking for enhancing its innovative capabilities. On the other hand, the 'collaborator' type of SME, as we have discussed in chapter seven, is intensely engaged in networking, inter-firm alliances since it is part of an established network of interrelated IT companies. In contrast to the 'path-breaker' type of SME that is engaged in networking activities in order to enhance its innovation rate, the 'collaborator's' leading position and financial situation provides it with the opportunity to acquire the know-how and engage in strategic agreement with other companies in order to enter new activities and market fields, which ultimately increase its competitiveness.

Clustering/Networking

Focusing on the second independent variable, namely the clustering/networking level, as shown in the following table 1 the SMEs named 'path-breaker' and 'collaborator' are cooperating/networking with numerous companies, distributors, and other institutions achieving high clustering/networking scores.

Numbers of companies, distributors, universities and research institutes that the company is cooperating in 2003

	Companies	*Distributors*	*Universities*	*Research Inst.*
Classical entrepreneur	1	0	0	0
Path-breaker	7	40	2	1
Survivor	0	0	0	0
Collaborator	39	650	0	0

Table 1

Central to the organisational philosophy of the 'path-breaker' and the 'collaborator' types of SMEs are the formation of strategic alliances, networking and clustering with universities, research centres, and companies (including suppliers and customers) in the same or adjacent industrial sectors with similar or complementary products and services. As we have mentioned earlier and discussed in chapter seven, Singular, the 'collaborator' type of SME is part of an established group of companies, the largest in Greece, in the ICT sector, the Delta-Singular group of companies. Despite the fact that the two types of SMEs achieve very high, at least for the Greek standards, rate on networking/clustering there is a fundamental difference between the natures of these activities. While the 'path-breaker' type of SME is actively engaged in business cooperation with other firms, universities and research institutes for R&D purposes, for access to new technologies and for risk and cost diversification, the 'collaborator' type of SME is engaged in networking activities for the purposes mainly of extending its distribution networks, entering new markets and increasing its sales. Both companies have adapted to the new ways of managing and competing both locally and internationally through networking and clustering activities but the different nature of such activities and their different organisational strategies lead the 'path-breaker' at a high innovation rate, while the 'collaborator' scores low in innovation.

On the opposite side, the 'survivor' has no cooperative agreements and the 'classical entrepreneur' is cooperating only with one company. Techneco, the 'classical entrepreneur' type of SME, as we discussed in chapter eight, attempted to form a strategic alliance with another company that not only failed but also left a colossal debt to Techneco, which threatened its very existence. The CEO of the company has described its personal experiences with what seemed to be a very unorganised local and regional economic and business environment (non-existence of local and regional initiatives towards the encouragement of university-business-government cooperation) that discouraged them from following a business strategy towards networking/clustering. In addition, the persistence of the CEO to a typical small 'family' organisation of the company, his reluctance to grow bigger in fear of losing his personal control over the company and the lack of appropriate managerial and business knowledge of how to expand, cooperate with other business led to a preference for a go-it-alone strategy. In the same line of arguments the 'survivor' type of SME shows unwillingness to cooperate with other firms and educational institutions, since the company's management believes that these do not apply in their type of 'box-moving' business. Furthermore, they do not see the need for, or the ways of cooperating, for example with other distributors to expand their imported product lines and/or import complementary products to theirs. On the other hand, they also highlighted the fact that there are no mechanisms in the region of Thessaloniki, and central Macedonia to promote and encourage university-business co-operations or business-to-business networking.

According to figure 5 below, the 'path-breaker' and the 'collaborator' show a 21% and 27.8% average total sales of co-developed products between 1998-2003, a figure that verifies their strategy towards cooperative/networking activities. On the other hand, both the 'classical entrepreneur' and the 'survivor' have no co-developed products.

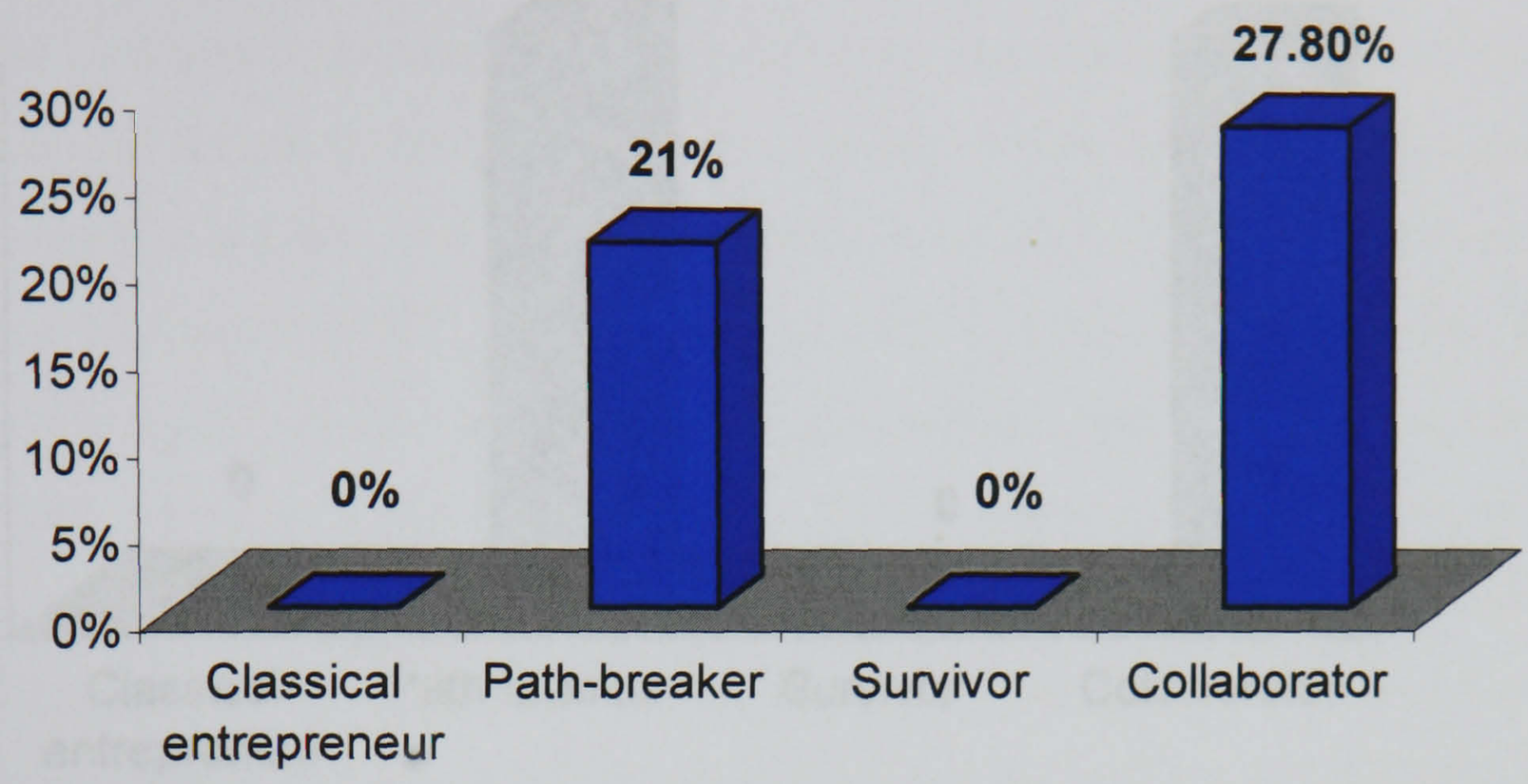


Figure 5

In addition, the virtually non-existing performance on clustering/networking of the 'classical entrepreneur' and the 'survivor' type of SMEs emerges from the following figure 6 and table 2, where both companies score zero in the respective parameters of the clustering/networking variable.

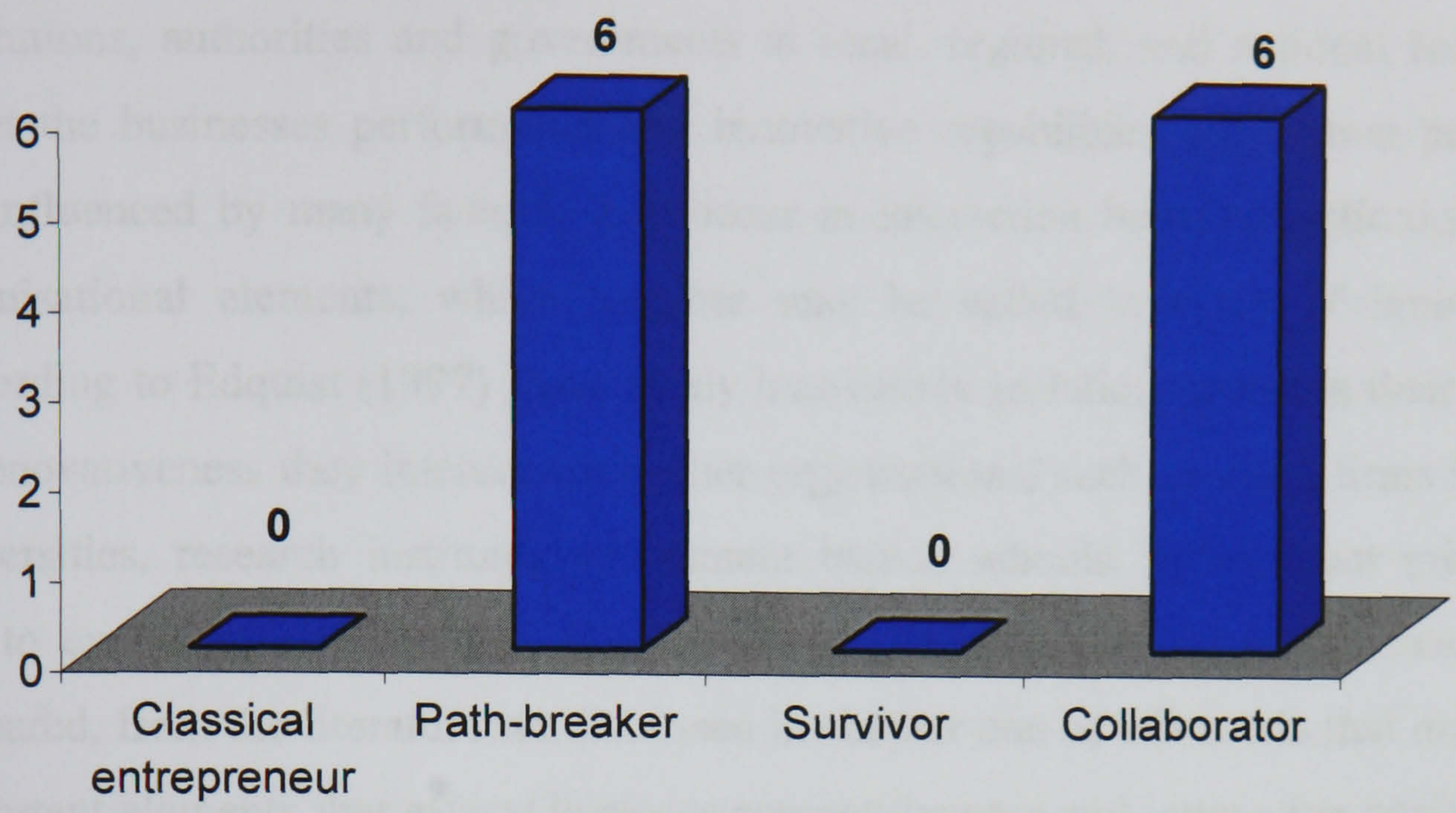


Figure 6

Numbers of new markets the companies have entered through clustering/networking activities between 1998-2003

	Foreign Markets	*Market Fields*
Classical entrepreneur	0	0
Path-breaker	9	2
Survivor	0	0
Collaborator	13	2

Table 2

The high performance of the 'path-breaker' and the 'collaborator' is illustrated both by the number of products they have managed to develop and launch through co-operative alliances, and the number of foreign markets and new market fields they have penetrated through clustering/networking activities. One of the similarities of these two types of SMEs is that their clustering/networking activities have enabled them to compete internationally. Both companies have engaged in networking and strategic collaboration activities in order to meet challenges associated with globalisation and intense competition. On the contrary, the 'survivor' and the 'classical entrepreneur' types of SMEs are competing domestically in Greece with the latter type of SME actually targeting only the northern regions of the country. Thus, we could argue that cooperation/networking amongst businesses in the same or

adjacent industrial sectors provide SMEs the opportunity to reach markets that could not be reached individually.

As we discussed in chapter one, pages 23-39, important factors such as. institutions, authorities and governments at local, regional, and national level may affect the businesses performance and innovative capabilities. Innovation processes are influenced by many factors; they occur in interaction between institutional and organisational elements, which together may be called 'systems of innovation'. According to Edquist (1997) firms rarely innovate in isolation, rather in their pursuit of innovativeness they interact with other organisations, such as other firms but also universities, research institutes, investment banks, schools, government ministries, etc. to exchange, develop and gain knowledge, information and other resources. It appeared, from the literature we discussed in chapter one of this thesis that one of the important elements that affects business competitiveness and innovative performance centers on the relations between universities and business, and the role institutions, authorities, agents and governments play in triggering and sustaining such relations.

Furthermore, as we discussed in chapter two, pages 78 to 84, the industrial competitiveness of small and medium sized enterprises (SMEs) can be accelerated through inter-firm collaboration. The assembly of core competencies from different companies enables corporations to build a team of organisations and individuals who together have the highest-level capabilities. Inter-firm collaboration, or as otherwise stated 'business networks', assist SMEs first of all to survive in their market place, innovate through collaborative research and development projects and shared knowledge, and then be able to successfully compete with larger enterprises. Alliances bridge the gap according to Hoffmann and Schlosser (2001), between the firm's present resources and its expected future requirements.

According to Enright and Ffowcs-Williams (2000), and the literature review in chapter three of this thesis (pp. 91-101) membership in clusters can enhance the productivity, rate of innovation and competitive performance of firms. Moreover, according to the European Commission and the Observatory of European SMEs (2002), clusters are widely recognized by scholars and policy-makers around the world as important settings in stimulating the productivity and innovativeness of companies and the formation of new businesses. We also brought forth and discussed in chapter three, pages 111 to 130, using several case studies, researches and the Silicon Valley model the benefits of belonging to a cluster for SMEs and its effect on

business competitiveness and innovation. Operating within clusters SMEs could both take advantage and facilitate the widespread diffusion of know-how, innovations. knowledge sharing and learning processes. From the review of the literature on business networks we suggested in chapter three, that '*business networks appear to affect positively the innovative performance of SMEs and their competitiveness'*.

As we presented above, the empirical data from our case studies verify the positive effect that business networks have on the innovative performance of SMEs and their competitiveness. Moreover, the two-dimensional model provided for exploring and explaining differing nature of clustering/networking activities between the different types of SMEs. Thus the 'path-breaker' type of SME aims more towards the exchange of knowledge, R&D activities and internationalisation of their operations and sales, while the 'collaborator' engaged in networking activities to enter new markets and internationalisation. In both cases business networks affect positively the competitiveness of the companies and their internationalisation. Furthermore, our model highlighted the lack of governmental/public regional and local support and activities that could assist companies of the 'survivor' and 'classical entrepreneur' type to engage in networking/clustering activities. Cooperation/networking amongst businesses in same or adjacent industrial sectors provided the Greek SMEs of the 'path-breaker' and the 'collaborator' type the opportunity to reach markets that could not be reached individually, to collaborate with other companies in developing new products and services, to use research institutes and universities to conduct their R&D, and to form dynamic global networks and alliances with other companies.

Performance/Growth

Focusing on the dependent variable, namely the performance/growth of the company, what emerges from the following figure 7 is that the SME named 'path-breaker' has the most impressive human resource growth in the period between 1999-2003 of 135%, with the 'collaborator' and the 'classical entrepreneur' following with a growth rate of 23% and 33% respectively. The 'survivor' has only managed a 9% growth over the examined period of time.

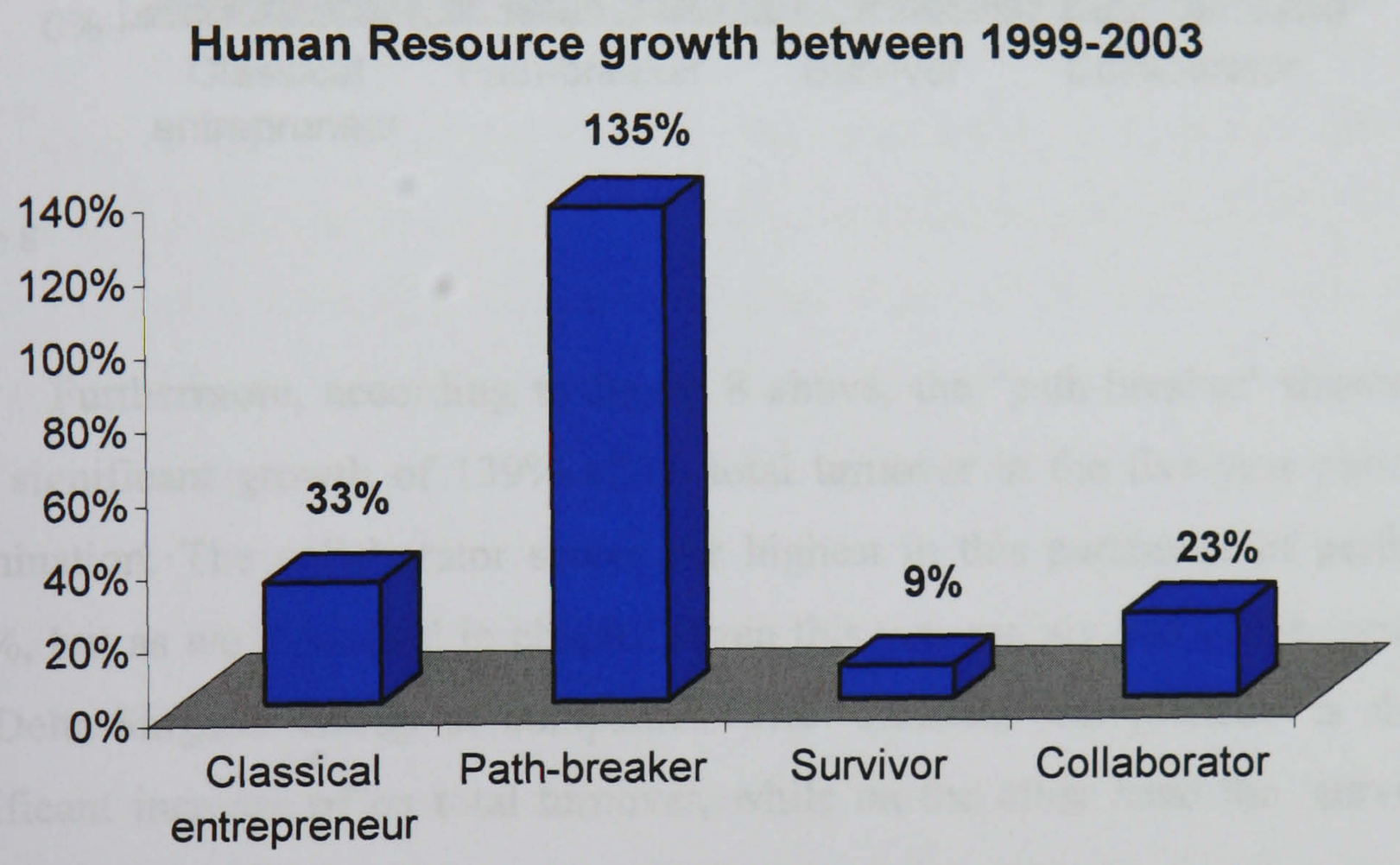


Figure 7

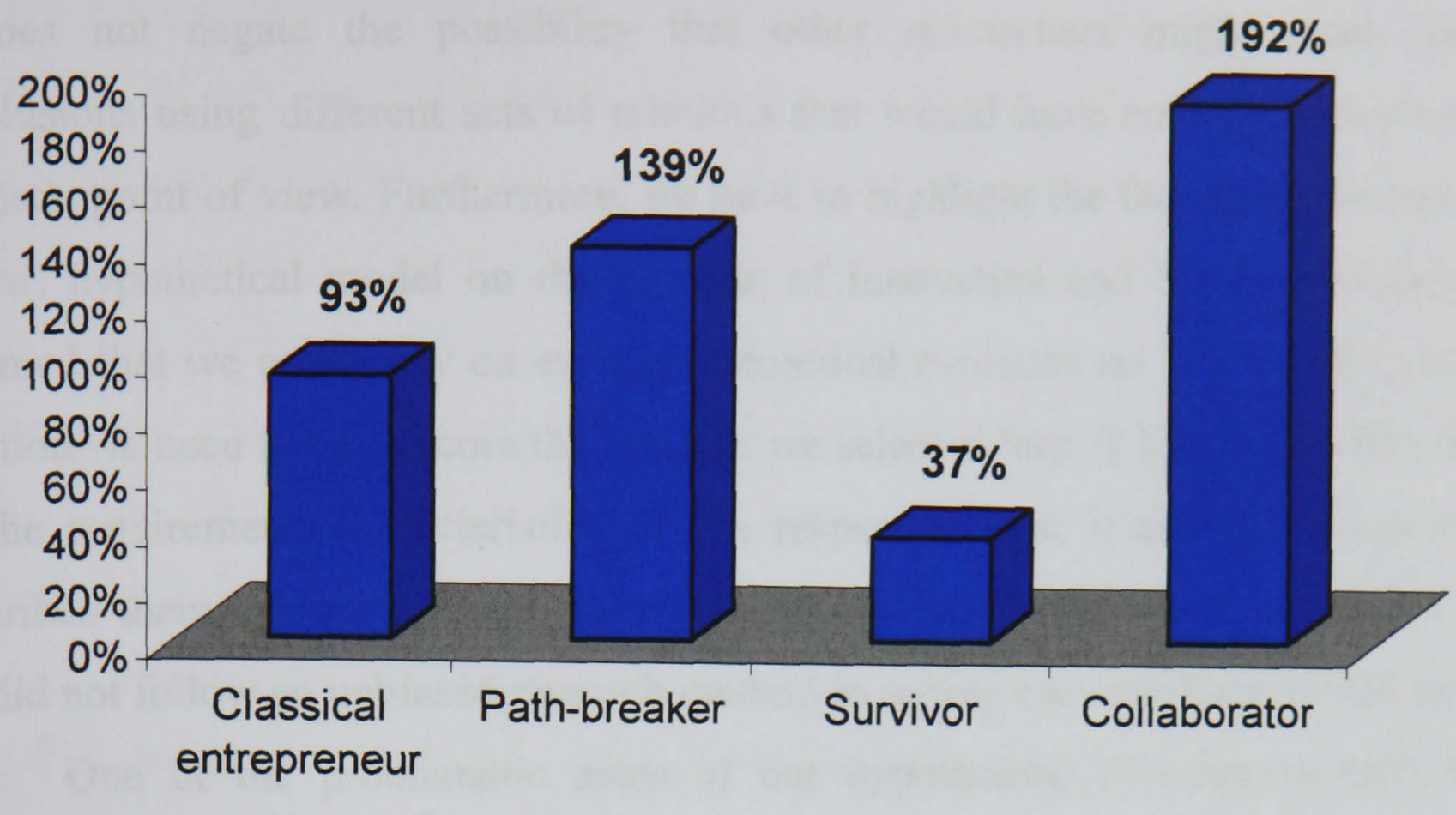


Figure 8

Furthermore, according to figure 8 above, the 'path-breaker' shows again a very significant growth of 139% of its total turnover in the five-year period under examination. The collaborator scores the highest in this parameter of performance, 192%, but as we discussed in chapter seven this was mainly due to the formation of the Delta-Singular Group of companies. The 'classical entrepreneur' is showing a significant increase of its total turnover, while on the other hand the 'survivor' has managed just a 37% increase.

Weaknesses of the two-dimensional model

In appraising our hypothetical, descriptive two-dimensional model at the conclusion of our empirical research we can identify some weaknesses that need to be brought forth. The model we presented is a hypothetical schematic description encompassing the concepts of innovation and clustering and how these could affect SMEs performance and competitiveness. The end result is the formation of four squares each representing a different type of SME based on the relations between the three concepts of innovation and business clustering and the relative scores of the companies in the two axes. It does not presume to be an all-conclusive typology of SMEs concerning innovation and networking but rather a hypothetical model of four

illustrative cases. The critical reader has to realise that this is a hypothetical model of how these concepts relate and affect the performance and competitiveness of an SME; it does not negate the possibility that other researchers might reach similar conclusions using different sets of relations that would have emerged from another heuristic point of view. Furthermore, we have to highlight the fact that in introducing a new, hypothetical model on the subjects of innovation and business clusters we assumed that we could rely on existing theoretical evidence up to a certain point. In addition we need to underscore the fact that we selected four IT companies that would fit the requirements/characteristics of the respective four illustrative cases as we described them in chapter three. This presents another weakness of our model since we did not follow an unbiased research method in testing our two-dimensional model.

One of the problematic areas of our hypothetical two-dimensional model emerges in the process of identifying the four illustrative types of SMEs in the real business world. Specifically, what emerge as easier to identify are the "survivors" and the "path-breakers" type of SMEs. This is so because the first type of company comprises the vast majority of all SMEs while the second type seems to be easily identified by managers and owners operating in the same or adjacent business sectors. On the other hand, the "classical entrepreneur" type of SMEs turns out to be very innovative but is confined to a small size due to management's refusal or reluctance to loose control of their company as growth might demand. The most bewildering case appears to be the 'collaborator' type of SMEs and this could be seen as a handicap of our model. These types of SMEs tend to gather around a cluster and/or group of companies, public or private and use the networks in order to promote their products, but fail to be innovative. Managers in the same or adjacent sector have some difficulty not so much in identifying this type of SMEs but more in appraising correctly their future status since, despite their low scores on innovation, they seem to prosper by exploiting the network they belong to.

Another weakness of our model relates to the strategy needed in identifying the four types of SMEs and proceeding with appraisal of their status. In this respect we have identified two possible approaches, namely, first, it may be necessary to circulate a relevant questionnaire to the whole sector and then identify the various types for in-depth evaluation. Second, one may use the path of mailing the relevant questionnaires we constructed and present in this thesis, which relate to innovation

and clustering/ networking and then identify the four types of SMEs of our model for in-depth study and analysis.

Furthermore, our research and case study structuring was limited in its application to only one business segment, namely that of IT. Understandably, more data on the process by which innovation due to collaborations and strategic alliances for R&D happen would have been very useful to our effort, however, we could not access such data since this process would require disclosure of data considered confidential by the companies examined. If we could override the limitations relating to writing a Ph.D. thesis we would bypass time and resources limitations aiming toward a study that would encompass multiple business sectors and, certainly, cross country comparisons in the application of our two dimensional model. Finally, existing data from Greek agencies and the Community Innovation Survey I (CIS-I) do not differentiate between business segments and, unfortunately, do not provide facts concerning networking/clustering, nor how innovation and clustering relates to improving competitiveness for Greek SMEs.

Future research and policy implications

From the review of the literature considered in chapters one to three of this dissertation, we have traced two significant interrelationships between entrepreneurship, innovation and business clustering; i.e. that innovation and entrepreneurship are intertwined concepts affecting SMEs competitiveness; and that business networks appear to be associated with the innovative capabilities of SMEs and their competitiveness. In chapter three, we demonstrated that our hypothetical, descriptive two-dimensional model and the resulting four case illustrations, which are based on the above hypotheses possesses some of the needed theoretical validity. Beyond this point the empirical research we conducted in the IT sector of the Central Macedonia Region in Northern Greece (chapters 6 to 9) provided on the one hand some verification of the validity of our hypothetical model and the two distinctive themes/relations and on the other hand a small but hopefully useful contribution to existing management literature theory on these subjects. As we examined previously in this chapter (pp. 434-438), our hypothetical, descriptive two-dimensional model provided answers as to how the concepts of innovation and business networks/clusters and their interrelationships affect the SMEs performance, competitiveness and

growth. It also added insights to a comparison and contrast between the four different case illustrations and their relative scores on the areas of innovation and business networking/clustering activities, which were closely related to the chosen strategies followed by the owners and/or entrepreneurs of each type of SME and the particular characteristics and peculiarities of the Greek business world.

This thesis makes a further small addition to the scientific knowledge concerning the concepts of entrepreneurship, innovation and business clustering by linking the concepts together and validating their relations and influence in businesses performance/competitiveness by presenting in chapter three (section four pp. 136-147), our own definitions of the three concepts as outlined below:

First, in addition to the definition on innovation we have presented in chapter one, pages 5-22/28, our own definition, which encompasses several of the key concepts proposed by Schumpeter 1934; Schumpeter 1942; Drucker 1985; Porter 1990; Nelson and Rosenberg 1993; and Commission of the European Communities 2000:

"Innovation is creating value by implementing new ideas. It is the process of taking ideas, needs and opportunities to the market. Innovation is the conversion of knowledge, creative ideas and information, into a benefit, a competitive advantage for the organisation; under risk and uncertainty for the outcome of the innovation. Innovation then concerns the puprosefull, focused, strategic search for and the conception, development, adoption and implementation of significantly improved or new processes, organizational structures, methods of production and products/services in order to defferentiate the company from its competitors by creating and sustainig superior performance, and increased productivity."

Second, following the analysis of entrepreneurship in chapter one (pages 7-22) and chapter two (pages 60-67) we come to the realisation that entrepreneurship is often viewed as a function, which involves the purposeful identification and exploitation of opportunities, knowledge and information that exist within a market. Entrepreneurs usually are considered to bear risk while pursuing opportunities, and often are associated with commitment to creativity and innovation. Our definition presented immediately below derives from the influential writings of Schumpeter

1934; Schumpeter 1942; Lehman and Roth 1993; Swedberg 1998; Dollinger 1999; Knight 1921; Hoselitz 1952; Cole 1959; McClelland 1961; Casson 1982; Gartner 1985; Weber 1930; Drucker, 1985; and Porter, 1990:

> *"Entrepreneurship is a creative process in which opportunities are perceived and resources mobilised in order to bring about change in pursuit of financial benefits. Entrepreneurship involves a broad range of activities necessary to create organizations, carry out new processes, organizational structures, methods of production, products and services, identify opportunities within the economic system, and bring together factors of production, aiming at the accumulation of wealth, under conditions of risk and considerable uncertainty."*

Third, our definition of clusters is based on the influential writings of Enright and Ffowcs-Williams 2000; Porter 1998, Nassimbeni 2003; Marshall 1922; Zeitlin 1992; Beccatini 1990; Piore and Sabel 1984; Day 2000; Scott 1998; Stroper and Salais 1997; Padmore and Gibson 1998; Steinle and Schiele 2002; Lyon and Atherton 2000; Pyke and Sengenberger 1992:

> *"Clusters are networks of competing, collaborating, complementary and interdependent businesses (including suppliers and service providers), associated agents and institutions, linked formally and informally, vertically and/or horizontally that work in common, similar and/or related industries and located in a geographically bounded space."*

Our Ph.D. thesis delved into an area up-to-now neglected in Greece and could serve as a prototype in benchmarking and in setting some future research recommendations which would encompass, but not be limited to, the need for proper elaboration on the national innovation system of Greece, the application of our hypothetical, descriptive two-dimensional model in several different business segments as well as in different regions of Greece and by extension within the EU regions in existing clusters and SMEs out of clusters.

Management theory scholars, in the past, have provided a variety of growth models. For example, more than three decades ago, Greiner (1972) developed a model

of business growth based on evolution and revolution stages. It would be wrong to render this or other models as worthless but it will also be wrong to keep thinking that these models, as they stand, can apply usefully in today's economies. We should use these models as any other theory that tries to explain, forecast and predict the growth of a business, more for the creation of new models and less as explanatory paradigms. As we saw in chapter two, classical models, such as Greiner's model (1972) seem to be inadequate in an economy that is based largely nowadays in the 'internet' and information and communication technologies. The decreasing cost of accessing the Internet and its wide penetration both in home-users and businesses expands literally minute by minute, while more and more businesses see the advantages of being based locally and yet conduct their businesses in a global market.

As the 'internet' becomes more and more a means to conduct businesses, as it creates wider and more competitive marketplaces, what is needed is the development of theories that can explain how companies start-up and grow not only in the physically "real" but also in the 'virtual' WWW environment in which, for example, people work from their home in a small town in China for a company in Germany when they actually don't even know where the company is located. Furthermore, such operational management techniques as outsourcing, i.e. putting some operations and services out to specialists which allows a company to concentrate on what directly wins it business in the market place, and subcontracting, i.e. using people and/or other businesses on a contract basis for specific jobs/tasks, need to be included in the equation.

As the internationalisation of businesses becomes more and more a reality even for the smallest of SMEs, which may be open to competition from anywhere in the world, Nations need to focus on regional economies and to encourage the university-business-government relations towards the creation of regional clusters. As we described in chapter seven of this thesis, in presenting the case of the "path-breaker" type of SME cooperation/networking amongst businesses in same or adjacent industrial sectors provides SMEs the opportunity to reach markets that could not be reached individually, to collaborate with other companies in developing new products and services, to use research institutes and universities to conduct their R&D, and to form dynamic global networks and alliances with other companies.

We have shown in detail in this thesis and we summarize here the findings that substantiate Greece's failure to industrialise in line with Western European countries

as being the result of the 'wrong' choices made by the numerous governments. the highly unstable political environment, the lack of the mentality of Greek people toward joint efforts and cooperation in order to develop a strong and competitive economy, the myopic sight of businessmen and investors who were only interested in maximum profit with the less possible effort, and the lack of coherent organised long-term economic growth policies. The Greek governments have neglected to look after the vast majority of SMEs and to construct policies for the encouragement of competitiveness, innovation, and clustering. We also bring forth the lack of a tradition in university-business relations.

Since as we said and investigated, little is done in Greece in terms of the concepts we are dealing with the ground is offering great potential to contribute knowledge and help set-up properly innovation systems and re-orientate the Greek economy to a knowledge, innovation and networking economy. According to the analysis presented in chapter one (pages 23-39), firms rarely innovate in isolation, rather in their pursuit of innovativeness they interact with other organisations, such as other firms but also universities, research institutes, investment banks, schools, government ministries, etc. to exchange, develop and gain knowledge, information and other resources. Furthermore, social patterns and social institutions, not necessarily economic in their nature may operate positively or negatively giving rise to constraints and/or incentives for innovation; these can be laws, health regulations, cultural norms, social rules and technical standards which also shape the behaviour of firms. Interaction and relations between the various agents, institutions and actors shape the system of innovation. According to Edquist (1997), the various actors and organisations that operate under certain institutional contexts are the elements of the 'system' that creates and uses knowledge for economic purposes, while innovation emerges in such a system. Innovation processes are influenced by many factors; they occur in interaction between institutional and organisational elements, which together may be called 'systems of innovation'. Thus if we want to describe, understand, explain and even perhaps influence processes of innovation, we must take all important factors shaping and influencing innovations into account.

One of the major findings of our empirical research is the lack of properly set up regional business clusters in Greece. In an effort to overcome the lack of regional clusters, the Greek SMEs engage in business networking activities mainly through the Internet. From the findings of our empirical research and in relation to the literature

review described in the first three chapters of this dissertation we highlight a series of handicaps of the Greek business world.

Greek businesses do not properly utilize chances for networking / inter-firm collaboration that could provide them with the possibility of improving knowledge and information sharing and enriching available resources. Furthermore, Greek SMEs operating in isolation deprive themselves of access to strategic knowledge and, in some cases even when rudimentary forms of clusters may exist the individual members may not properly identify existing potential or benefits that could evolve from synergies.

The role of local institutions authorities and the government in promoting business clustering and university-business relations is not only very important but it has the specific characteristic, since universities and technological institutes are public, to create the need for Governmental authorities to act as intermediaries and provide the necessary support and permission for such cooperation. Such an example, which we encountered in our research for this thesis is SEPVE (the Association of Information Technology Companies of Northern Greece), which if properly assisted by regional and central governmental authorities, could bring positive results toward this objective.

Policy actions from regional governmental authorities and agencies aiming to promote business-to-business cooperation, and university-business-government relationships are urgently needed and, indeed, it appears necessary to device a national innovation system that would steer the whole of the Greek economy towards a knowledge economy, clustering and regional competitiveness, especially with the new emerging market realities of the Balkan-Asian prospects and the challenges created by the addition of the 10 new EU member states.

Based on the international literature review as used throughout this thesis and on the findings of our empirical research it is felt that in closing the following policy implications could serve both our thesis goals and the Greek economy's SMEs in a productive march toward the future. Strengthening of networking, including vertical or horizontal collaborations among firms and collaborations between firms and technological or research organisations it appears as a central policy issue. Suitable policies to address the problem include, policies promoting clusters; collaborative research among enterprises and research and technological organisations; and support for the creation of Learning Networks and other collaborative forms of learning.

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Appendices

Appendix 1 – European Innovation Scoreboard

No	Indicator	EU	S	FIN	UK	DK	NL	IRL	D	F	A	B	L	E	I	GR	P
1.1	‰ S&E grads/20-29 pop	10,4	9,7	10,4	**17,8**	*4,7*	*5,8*	**15,6**	8,6	**15,8**	*7,8*	*5,1*		9,6	*4,7*		*5,5*
1.2	% pop with 3rd education	21,2	**29,7**	**32,4**	**28,1**	**25,8**	25,0	22,2	23,8	21,6	*14,2*	**27,1**	18,3	21,8	*9,6*	*16,9*	*9,8*
1.3	Life-long learning	8,4	**21,6**	**19,6**	**21,0**	**20,8**	**15,6**	*5,2*	*5,2*	*2,8*	7,8	6,8	*4,8*	*4,9*	*5,2*	1,1	*3,3*
1.4	% empl. H-tech manuf	7,8	8,3	7,2	7,6	6,4	*4,7*	7,3	**10,9**	7,2	6,6	7,2	*1,8*	*5,5*	7,6	*2,4*	*3,6*
1.5	% empl. H-tech services	3,2	**4,8**	**4,3**	**4,2**	**4,5**	3,6	**4,0**	2,8	3,8	2,7	3,2	3,6	*2,1*	2,7	*1,5*	*1,2*
2.1	Public exp. R&D / GDP	0,66	**0,86**	**0,95**	0,59	0,71	**0,87**	*0,35*	0,75	**0,80**	0,65	*0,50*		*0,43*	*0,48*	*0,38*	*0,40*
2.2	BERD / GDP	1,19	**2,85**	**2,14**	1,20	1,26	1,05	1,03	**1,63**	1,36	*0,84*	1,28		*0,47*	*0,56*	*0,13*	*0,14*
2.3a	EPO h-tech pats /pop	17,9	**22,9**	**80,4**	18,9	**21,5**	**35,8**	*13,3*	**29,3**	20,2	*9,8*	17,6	*9,2*	*2,5*	*4,8*	*0,5*	*0,4*
2.3b	USPTO h-tech pats /pop	11,1	**29,5**	**35,9**	**14,4**	**17,3**	**19,6**	*3,8*	**14,4**	13,3	*5,6*	12,8	*2,3*	*1,0*	*4,2*	*0,5*	*0,1*
3.1	% SMEs innov in-house	44,0	44,8	*27,4*	35,8	**59,0**	51,0	**62,2**	58,7	36,0	**59,1**	*29,4*	*24,5*	*21,6*	44,4	*20,1*	*21,8*
3.2	% SMEs innov co-op	11,2	**27,5**	**19,9**	**15,7**	**37,4**	**13,8**	**23,2**	**14,7**	12,0	12,9	*8,9*	9,6	*7,0*	*4,7*	*6,5*	*4,5*
3.3	% innov exp /total sales	3,7	**7,0**	4,3	3,2	**4,8**	3,8	3,3	3,9	3,9	3,5	*2,1*		*2,4*	*2,6*	*1,6*	*1,7*
4.1	‰ vent capital / GDP	1,08	**2,04**	**1,38**	**2,56**	*0,64*	**1,62**	*0,65*	*0,68*	*0,74*	*0,11*	**1,65**		*0,36*	*0,41*	*0,04*	*0,01*
4.2	% new capital / GDP	1,1	*0,5*	*0,3*	*0,6*	**4,5**	**5,6**	0,9	*0,6*	*0,6*	*0,3*	0,9	*0,6*	**4,4**	*0,1*	**1,5**	
4.3	% new-to-markt products	6,5	6,9	7,3	6,7	*5,1*	6,9	**8,4**	7,1	**7,9**	5,6	*2,6*		**9,8**	**13,5**		7,2
4.4	% home internet access	28	**54**	**44**	**41**	**52**	**55**	**36**	27	*19*	**38**	29	**36**	*16*	24	*12*	*18*
4.5	% ICT markets / GDP	6,0	**7,4**	6,0	6,5	6,1	6,6	*4,8*	5,7	6,1	5,8	5,6		6,3	5,3	6,0	6,6
4.6	% h-tech value added	8,2	**18,8**	**12,5**	**11,8**	7,9	7,5	**20,5**	*5,7*	9,7				*5,0*	*5,9*		
	Summary Index		*6,5*	*4,7*	*4,4*	*3,5*	*2,9*	*1,2*	*0,6*	*-0,6*	*-2,5*	*-2,5*	*-4,4*	*-5,9*	*-5,9*	*-7,9*	*-8,7*

Figure Annex I, Source: Commission of the European Communities (2001, p.26). Indicators that are more than 20% above or below the EU average are highlighted in blue bold and red italics respectively.

Appendix 2 – Questionnaire on Innovation

➢ **<u>What does not constitute innovation (according to the OSLO manual)</u>**

Minor changes (of either technological or aesthetic nature) affecting characteristics of a product, which are not considered to be significant, cannot be judged as innovations. For example, one cannot consider as innovation the change of a fabric's colour or the change of the percentages of mixing natural and synthetic fibres.

Adding new machinery or replacing some machinery with newer models which are already available and used by competitors does not constitute innovative management action in contrast to managerial action in which the company acquires and introduces in its production process machinery or accessories which is unknown to the rest of the sector.

➢ **<u>Types and definitions of innovations (according to the OSLO manual)</u>**

Process innovation is judged to be the significant alteration of technological production processes or products, which aim at the improvement of production levels or the improvement in our products. In this respect is usually included new machinery and know how, new techniques and strategies or both.

As technological innovation is considered the significant change in production processes or products; and concerns its application to the production process (process innovation) or introduction of new products to the market (product innovation).

Product innovation is considered the manufacturing or introduction of a technologically new product so that the consumer has significantly or totally new benefits in using the specific product.

At this point our commitment to keeping absolute anonymity and preserving the identification of you and your company in presenting our findings in the thesis is provided along with our deepest gratitude in granting us part of your valuable time in acquiring the data needed for our research.

Thank you for your kind cooperation
Panagiotis Piperopoulos

OBJECTIVES OF INNOVATIVE ACTIVITIES

1. Were there innovative activities in your company in the 5 year period between 1998-2003;

❑ **Yes**

If the answer is yes did they concern:

A. Products/ Services

Number as Appropriate

i. Introduction of new products/services

α) In the Greek market .....

β) Internationally .....

ii. Creative improvements of specific characteristics and properties of products/services already produced by your company

α) In the Greek market .....

β) Internationally .....

iii. Copying other products/services

α) Copying products/services available in the Greek market .....

β) Copying products/services available in the Greek market but not produced locally .....

B. To the production process

i.	Revamping existing machinery	.....
ii.	Raw materials	.....
iii.	Utilizing intermediate products or by-products	.....
iv.	Organization & rationalization of production phases	.....
v.	Energy conservation	.....
vi.	Lessening percentage of defective products	.....
vii.	Improving working conditions	.....
viii.	Lowering warehousing costs	.....
ix.	Lowering labour costs	.....
x.	Lowering product design costs	.....

❑ **No**

SOURCES OF INNOVATIVE IDEAS

2. Listed below are some of the various sources from which companies usually derive ideas for process or product/service innovations. Please check the appropriate degree in which the various sources contributed to innovative ideas in the 5-year period examined (1998-2003).

	Not Important				**Very Important**
A. Internal sources	**1**	**2**	**3**	**4**	**5**
▪ Company management	☐	☐	☐	☐	☐
▪ R & D Department	☐	☐	☐	☐	☐
▪ Marketing & Sales Dept	☐	☐	☐	☐	☐
▪ Production Department	☐	☐	☐	☐	☐
▪ Other	☐	☐	☐	☐	☐

……..(specify)

B. External sources

▪ Research programs financed from external sources (e.g.,EU)	☐	☐	☐	☐	☐
▪ Research programs financed from internal sources	☐	☐	☐	☐	☐
▪ Innovation support programs (small Bus. Adm.)	☐	☐	☐	☐	☐
▪ Government sources	☐	☐	☐	☐	☐
▪ Customer requests	☐	☐	☐	☐	☐
▪ Suppliers	☐	☐	☐	☐	☐
▪ Introduction of competitive products	☐	☐	☐	☐	☐
▪ Exhibitions	☐	☐	☐	☐	☐
▪ Scientific /technical bibliography	☐	☐	☐	☐	☐
▪ Cooperation with other firms	☐	☐	☐	☐	☐
▪ Cooperation with university related or other Research institutes	☐	☐	☐	☐	☐
▪ Other (specify)	☐	☐	☐	☐	☐

……

DRIVING FORCES FOR INNOVATIONS

3. Listed below are some of the various driving forces for the introduction of process or product/service innovations. Please check the appropriate degree in which the driving forces contributed to the introductions of innovations in the 5-year period examined (1998-2003).

	Not Important				**Very Important**
	1	**2**	**3**	**4**	**5**
▪ Replacement of product	☐	☐	☐	☐	☐
▪ Quality improvement of products	☐	☐	☐	☐	☐
▪ Increase/expand product capabilities	☐	☐	☐	☐	☐
▪ Entering new markets or increase market share	☐	☐	☐	☐	☐
▪ Comply with regulations	☐	☐	☐	☐	☐
▪ Flexibility of production (organisation & rationalisation)	☐	☐	☐	☐	☐
▪ Lowering labour costs	☐	☐	☐	☐	☐
▪ Lowering consumption of raw materials	☐	☐	☐	☐	☐
▪ Energy conservation	☐	☐	☐	☐	☐
▪ Environmental issues	☐	☐	☐	☐	☐

QUANTIFIABLE ASPECTS OF INNOVATIVE PRODUCTS

(All responses relate to the time period of 1998-2003)

4. *What percentage of sales do innovative products represent? (List products/ percentage)*

.....

.....

5. *Are the innovative products sold abroad?*

.....

.....

If yes, what percentage of company exports do they represent?

.....

.....

6. *What is the percentage of funds allocated for innovative activities as part of the total turnover?*

.....

.....

7. *What percentage of funds does R&D expenditure represent as part of the total turnover? (If the company has an established R&D department)*

.....

.....

Appendix 3 – Questionnaire on Clusters/Networks

➢ Operational definitions of networking/clustering

Since these two concepts cover a variety of cases we proceed by adopting an operational definition capable of measuring the performance of the SMEs in networking/clustering as follows:

i. Business cooperation (agreement) for combined research and development of new products and services.
ii. Networking (cooperation) with the local/regional/national technological and educational institutes and research centres for R&D purposes, as well as for the attraction and employment of young scientists.
iii. Strategic alliances with other firms for the purpose of entering new markets; sales and logistics; and/or extending distribution networks.
iv. Collaborating with government agencies and public institutions for R&D purposes.
v. Part of an establish network of interrelated companies belonging in the same or adjacent industrial sectors.

Thank you for your kind cooperation
Panagiotis Piperopoulos

NATURE OF CLUSTERNG/NETWORKING ACTIVITIES

1. Did your company engage in clustering/networking activities during the 5 year period between 1998-2003?

❑ **Yes**

If yes, did they concern:

		Number as Appropriate
i.	Equity holdings	.....
ii.	Marketing agreement	.....
iii.	Licensing agreement	.....
iv.	Development agreement	.....
v.	Research agreement	.....
vi.	Joint venture	.....
vii.	R&D agreement	.....
viii.	Manufacturing agreement	.....
ix.	Grant/research funding	.....
x.	Supply agreement	.....
xi.	Distribution agreement	.....
xii.	Unspecified agreement	.....
xiii.	Other	
	(Please specify)	.....

.....

❑ **No**

FIELDS AND OBJECTIVES OF CLUSTERING/NETWORKING

2. Listed below are some of the various fields and objectives of business clustering, networking and strategic alliances. Please check the appropriate degree in which the various fields and objectives concern the clustering/networking activities of the company in the 5-year period from 1998 to 2003.

	Not Important				**Very Important**
	1	**2**	**3**	**4**	**5**
▪ Business cooperation for R&D (Of new products and services)	☐	☐	☐	☐	☐
▪ Networking/cooperation with Educational institutes for R&D	☐	☐	☐	☐	☐
▪ Networking/cooperation with Research institutes for R&D	☐	☐	☐	☐	☐
▪ Networking/cooperation with Educational institutes in order to attract and employ young scientists	☐	☐	☐	☐	☐
▪ Strategic alliances with firms for Entering new markets	☐	☐	☐	☐	☐
▪ Strategic alliances with firms for Sales and logistics	☐	☐	☐	☐	☐
▪ Strategic alliances with firms for Extending distribution networks	☐	☐	☐	☐	☐
▪ Cooperation for Access to new technologies	☐	☐	☐	☐	☐
▪ Cooperation for Risk diversification	☐	☐	☐	☐	☐
▪ Cooperation for Cost reduction	☐	☐	☐	☐	☐
▪ Other (Specify)	☐	☐	☐	☐	☐

QUANTIFIABLE ASPECTS OF CLUSTERING/NETWORKING

(All responses relate to the time period of 1998-2003)

3. *What was the number of companies, universities and research institutes that the company was cooperating/networking with in base year 1998 and what are the respective numbers in year 2003?*

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4. *What percentage of total sales do co-developed products represent? (List products/ percentage)*

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5. *How many products has the company successfully developed and launched in the market through business cooperation agreements?*

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.....

6. *How many products has the company successfully developed and launched in the market by cooperating with educational and research institutes?*

.....
.....

7. *How many new markets has the company entered as a result of cooperating with other businesses and/or from being part of an established network of interrelated companies belonging to the same or adjacent industrial sectors?*
(This includes first time foreign markets penetration and diversification of market fields)

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Appendix 4 – Case Study I – "Classical Entrepreneurs"

The case study was conducted at Techneco's Headquarters-Offices, 3 Nikiforou Ouranou Str. Thessaloniki. It lasted 7 days and included interviews with the executive team of the company and the financial director:

- Mr. Evangelos Chatzikos, Founder, CEO and senior Director. Interviewed about innovation and business networks/clustering.
- Mr. Dimitris Chatzikos, General Manager and executive Director. Interviewed on Human Resource issues, ISO certification, and business strategies. Interviewed about the range of products and services as well as.
- Mrs. Stella Chatzikou, President and executive Director. Interviewed about the range of products and services, as well as innovation and business networking issues.
- Mrs. Chaido Tsaknaki, Financial Director. Interviewed about the financial situation of company, provided the relevant charts and figures.

The company's CEO answered the questionnaires on innovation and clustering/networking with the appropriate aid from the rest of the executive directors and management teams where it was felt necessary. The methods used during the case study, were observation, interviewing and collection of secondary material. The information given to us by the executive directors and management teams has been to some extent tape-recorded while some is kept in the form of notes.

Appendix 5 – Case Study II – "Path-Breakers"

The case study was conducted at Compucon's Headquarters, 14th Km Thessaloniki/Moudania Highway. It lasted 7 days and included interviews with the management team of the company:

- Mr. Vasileios Thomaidis, President and CEO. Interviewed about innovation and business networks/clustering.
- Mr. Dimitrios Routos, Vice President, General Managers. Interviewed about innovation and business networks/clustering.
- Mr. Dimitris Tiliaveridis, Sales & Marketing Director. Interviewed about marketing and sales issues, provided the relevant tables and charts.
- Mr. Sotiris Dourdoumas, Financial Director. Interviewed about the financial situation of company, provided the relevant charts and figures.
- Mr. Pericles Alexandrides, Technical Director. Interviewed about the range of products and services, as well as innovation and business networking issues.
- Mr. Costas Demopoulos, Quality Manager. Interviewed on Human Resource issues, ISO certification, and business strategies.

The company's CEO answered the questionnaires on innovation and clustering/networking with the appropriate aid from the rest of the management team where it was felt necessary. The methods used during the case study, were observation, interviewing and collection of secondary material. The information given to us by the management team has been to some extent tape-recorded while some is kept in the form of notes.

Appendix 6 – Case Study III – "Survivors"

OKTABIT Partners Network

The case study was conducted at Oktabit's Northern Greece Offices, 7 Frixou Str. & Nikiforou Ouranou, Thessaloniki. It lasted 7 days and included interviews with the executive team of the company and the financial director:

- Mr. Antonis Papaioannou, Founder of Oktabit, Managing Director of Oktabit S.A. in Central and South Greece. Interviewed about innovation and business networks/clustering.
- Mr. Dimitris Papaioannou, General Manager. Interviewed on Human Resource issues, ISO certification, and business strategies.
- Mr. Anlexandros Papaioannou, Commercial Manager. Interviewed about the financial situation of company, provided the relevant charts and figures. Also interviewed about marketing and sales issues, provided the relevant tables and charts
- Mr. Antonis Gialamaidis, Founder of Victor Hellas, Managing Director of Oktabit S.A. in Northern Greece. Interviewed about innovation and business networks/clustering. Interviewed on Human Resource issues as well.

The company's Managing Director answered the questionnaires on innovation and clustering/networking with the appropriate aid from the rest of the executive directors and management teams where it was felt necessary. The methods used during the case study, were observation, interviewing and collection of secondary material. The information given to us by the executive directors management teams has been to some extent tape-recorded while some is kept in the form of notes.

Appendix 7 – Case Study IV – "Collaborators"

The case study was conducted at Singular's Headquarters, 10A Dodekanisou Str. Thessaloniki. It lasted 7 days and included interviews with the management team of the company:

- Mr. Anastasios Tzikas, Founder, Managing Director and Member of the BoD of Delta Singular Group of Companies. Interviewed about innovation and business networks/clustering.
- Mr. Ioannis Charalambidis, Deputy General Manager. Interviewed about innovation and business networks/clustering. Also interviewed on Human Resource issues, ISO certification, and business strategies.
- Mr. Dimos Aravanis, Commercial Director. Interviewed about the range of products and services, as well as innovation and business networking issues. Also interviewed about marketing and sales issues, provided the relevant tables and charts.
- Mr. Michalis Chavouzis, Financial Director. Interviewed about the financial situation of company, provided the relevant charts and figures.
- Mrs. I. Staiou, Quality Manager. Interviewed on Human Resource issues, ISO certification, and business strategies.

The company's Managing Director answered the questionnaires on innovation and clustering/networking with the appropriate aid from the rest of the management team where it was felt necessary. The methods used during the case study, were observation, interviewing and collection of secondary material. The information given to us by the management team has been to some extent tape-recorded while some is kept in the form of notes.