To my beloved parents,
Gemma and Francesco

Index

Preface

During the last five years of my life I gradually shifted my research interests from the ICT technical world and its revolutionary protocols for wireless communication, towards the study of the creation of new ventures that exploit those (or other) technological innovations, in order to create new markets and to achieve competitive advantages. This change led me to study and to explore a complex and multilevel phenomenon commonly called high tech entrepreneurship. Therefore at the end of my doctoral work, I can borrow these ancient words: *alea iacta est*. Of course I am not in front of the Rubicon River, ready to fight against the Roman Senate, but I can say that I am at the beginning of a challenging journey. In fact I found a research field with the following characteristics: extremely stimulating, rich of questions that still need to be answered, open to multidisciplinary contributions. A field where both qualitative and quantitative methodologies, both neo-deterministic and constructivist paradigms, different epistemological approaches, and multidisciplinary perspectives are relevant parts of a collective investigation process. The community of scholars, researchers and professors who are actually investigating entrepreneurial phenomena are contributing to build a young discipline and to shape a research field which is central for the evolution of local and world economies. And I really hope to give my little contribution - with this work and my future activities - to this path.

I consider myself quite lucky, because, during last years, I had the opportunity of both deepening the exciting debate on entrepreneurship (scope, definition, outcomes, sources, evolution and so on) and spending lot of my time in the high-tech companies, by interviewing and interacting with entrepreneurs, who are often recognized the central agents of economic development. The special report of the Economist, recently published and completely dedicated to entrepreneurs with the title "Global Heroes" is the evidence of a renaissance of a particular attention to these fundamental

economic actors. “The Entrepreneurial Idea has gone mainstream, supported by political leaders on the left as well on the right, championed by powerful pressure groups, reinforced by a growing infrastructure of universities and venture capitalists and embodied by widly popular business heroes. Entrepreneurialism need to be rethought: in almost all instances it involves not creative destruction, but creative creation”.

This process of creative creation is thus the core of this doctoral thesis. Exploring the behaviours, the motivations, the goals and the strategies performed by technological entrepreneurs means focusing on the real origin of the market. Since the beginning of my doctoral studies I have been fascinated by the theories and the works by professor Scott Shane. Not only his clearness and synthesis are models and inspirations for young scholars and researchers, but his attempt to build a general theory of entrepreneurship can be considered a milestone in the development of the discipline. Since the beginning of my research activities I decided that the nexus (the fathers of this lucky term are Shane and Venkataraman) between enterprising individuals and opportunities, should be central part of my thesis. Therefore I started to explore this nexus within the subset of high-tech entrepreneurs. This doctoral dissertation, thus, contributes to open the black box of the nexus, by exploring two axis. The first one is the axis of motivations, while the second one is the nature of the technological opportunities exploited or recognized by the entrepreneurs.

Motivations are relevant antecedents of the entrepreneurial behaviours and actions. Classical motivational theories like those by Ajzen, Herzberger and Vroom, can be partially exploited as interpretative framework for the entrepreneurial process. Furthermore, this work starts from the contributions by Carter et al. (2003) and Shane et al. (2003) and presents a hierarchical assessment of entrepreneurial motivations.

Today’s theories on opportunity are based on the theories of the Austrian School; on the works by Joseph Schumpeter and Israel Kirzner. The Schumpeterian view follows the opportunities discovered ontology; while the Kirznerian view leads towards the ontology proposed by the opportunities enacted view. Thus, what is the real nature of entrepreneurial opportunities? The debate is still open. According to Shane (2000) opportunities are simply recognized and discovered by alert entrepreneurs. Baron (2004, 2006) says that they are recognized and that entrepreneurs simply connect the dots. Opportunities are enacted through retrospective sense making in Gartner and Carter’s view

(2003), they are socially constructed in Sarason et al. 's perspective (2005), and constructed and intentionally perceived according to Krueger (2000,2003). This doctoral work aims to contribute to this exciting debate.

Recently even the theories on effectuation captured my attention. The work by professor Sarah Sarasvathy can be considered a new promising lens not only for understanding entrepreneurial behaviours, but also for explaining human actions and the some mechanisms that drive the decision making process. Through this thesis, I take into account both the "discovery" view and the "creative" view. I demonstrate how, as far as high-tech entrepreneurship is concerned, both paradigms emerge from the complex empirical reality, calling for a reconciliation between the two schools.

The study of the potential relations and effects of the nature of opportunities on motivations and on the contrary, the effects of motivations on opportunity creation/recognition patterns, are not part of this doctoral dissertation. More time would be needed in order to deepen these relations which are probably moderated by many different variables that are particularly difficult to isolate and to be measured. This work will be part of my future effort in this research field.

This doctoral thesis is organized as follows. The first chapter introduces the scope of this research: it presents the problem statement through four mini-case studies, and focuses on some relevant definitions: entrepreneurship, high-tech entrepreneurship, the "nexus". Two chapters are dedicated to selective literature reviews on two streams of research. From one hand, motivations in psychological and entrepreneurship research are presented, from the other, the debate on the nature of entrepreneurial opportunities is introduced. The fourth chapter highlights the gaps in the literature, the research questions and their relevance. The method adopted and the research protocols are presented in chapter 5. The following part is dedicated to the seven case studies carried out in order to answer to the research questions. They are the output of the interaction and in depth interview of seven entrepreneurs, founders of the following high-tech companies: Microlife srl, Telea Engineering srl, Telsey SpA, Work-Up srl, M-31 srl, H-Farm Ventures srl, It+Robotics srl. Cross case analysis, discussions and main findings of this work are presented in chapter 7. The last part of the thesis, is dedicated to the conclusions and the future research suggestions.

Generally speaking a piece of research is good if it presents two features

1) if it answers to the research questions, and it offers new conclusions and a critical discussion of the results.
2) if it generates and shapes new questions and opens future research directions

I really hope that both these features can emerge from the reading of my work.

Aknowledgments

While this work presents part of the activities carried out during three intensive years of my life, I would like to take the opportunity to thank the many people – professors, colleagues and family – without whom none of this work would have been possible.

First of all I want to thank my family. Without their support I could not have dedicated part of my life to doctoral studies. Despite our physical distance, their daily encouragement and concrete help have been fundamental. A particular thank is for my grandmother Annamaria.

I would like to thank professor Moreno Muffatto, supervisor of my doctoral studies. From the very beginning he taught me a keen methodology and I appreciated his personal skills. I want to thank him for the suggestions and insights concerning my research activity. Every day I knew that I could find an open door at the end of the corridor of the first floor of my department: I am grateful for the time that professor Muffatto dedicated to me during these years.

A special thank to the leading scholars that I had the opportunity to meet and that discussed with me part of my research activity: Shakeer Zahra, Ray Oakey, Sarah Cooper, Per Davidson, Dean Shepherd, James Hayton, Angelo Ditillo.

I would also thank all the researchers and professors who are teaching members of my Doctoral School: Giuseppe Stellin (general coordinator), Andrea Vinelli (former coordinator), Cipriano Forza (coordinator), Giovanni Bernardi, Stefano Biazzo, Roberto Panizzolo, Alberto Felice de Toni, Maria Rita Tagliaventi, Ettore Bolisani, Mariolina Longo, Giorgio Petroni, Alberto Petroni, Chiara Verbano, Roberto Filippini, Pietro Romano, Giorgio Gottardi, Enrico Scarso, Andrea Zanoni, Alessandro Grandi.

I would also thank the rector of the University of Padua, professor Giuseppe Zaccaria and professors Paolo Francesco Bariani and Alessandro Beghi for their encouragement.

Thank you very much to my doctoral colleagues Erika Bernardi, Giorgia Dal Pont, Igor Kalinic: I deeply appreciated their personal and research skills. I wish them all the best for their career.

Of course I cannot forget my younger colleagues Flora Bernardel and Davide Martinazzo. I thank them for our friendship, for the daily coffee breaks and for the mutual encouragement. Their suggestions and critics have been always appreciated. I would also thank other doctoral colleagues: Ilaria Bernardi, Federica Destro and Sven de Cleyn and all other doctoral students I had the opportunity to meet.

I want also thank all the blind reviewers and the discussants of the papers that I presented at doctoral workshops and international conferences. The last acknowledgment is for all the entrepreneurs that I met and interviewed during these years of research. Their thoughts, experiences, and words have been the main source of the novel ideas presented in this thesis.

Abstract

This doctoral thesis aims to contribute to open a black box called "nexus". Shane and Venkataraman (2000) assert that entrepreneurship consists of "*the nexus of two phenomena: the presence of lucrative opportunities and the presence of enterprising individuals*". Since their work, few authors tried to describe the "nexus" because its complexity and because it can be considered the real 'ignition spark' of every entrepreneurial experience. In this thesis, we will try to explore this nexus, focusing on two main components. The joint investigation of individuals and opportunities is a critical research path in order to better clarify the mechanisms and the essence of entrepreneurial behaviours and actions (Davidsson 2008). Therefore from one hand we explore the relevant entrepreneurial motivations that drive the entrepreneurial choices within high-tech emerging ventures. On the other hand we investigate the nature of entrepreneurial opportunities, by asking if high-tech entrepreneurs recognize or create the technological opportunities that they exploit.

In this work a motivation is defined as the activator of a goal oriented behaviour. From a selective review of the literature we note insufficient consideration of the role of the human motivations in the entrepreneurial process within the recent entrepreneurship research. Environmental factors being held constant, human motivation plays a critical role in the entrepreneurial process (Shane et al. 2003). Classical motivational theories like those by Ajzen, Herzberger and Vroom, can be partially exploited as interpretative frameworks for the entrepreneurial process. According to Shane, Collins and Locke (2003) and to Davidsson (2008), the specificity of entrepreneurial phenomena requires dedicated investigation.

The first research question is thus the following. What are the relevant entrepreneurial motivations that drive the entrepreneurial choice within high-tech emerging ventures? How and why motivations change in the phases of life of the firm? We investigate the main motivational driver of high-tech entrepreneurs and eventually we want to identify the mechanism that lead the eventual change of entrepreneurial motivations.

Recent Entrepreneurship research dedicated great attention to the construct called "entrepreneurial opportunity". (Shane and Venkataraman 2000, ,Sarasvathy et al. 2003, Alvarez and Barney, 2006, Plummer et al. 2007, Davidsson 2008, Harms et al. 2009) Entrepreneurial opportunities are defined as those situations in which new goods, services, raw materials, and organization methods can be introduced in the market and sold at greater than their cost of production (Casson 1982). As far as their epistemological and the ontological features are concerned, two opposite views are available. Opportunities are like mushrooms in the forest (Davidsson 2008) Because of individual differences and information asymmetries all actors do not have access to exactly the same opportunities. This is the core of the "Discovery school": although recognition of opportunities is a subjective process, the opportunities themselves are objective phenomena that are not known to all parties at all time (Venkataraman 1997, Shane and Venkataraman 2000 AMR, Shane and Eckhardt 2003) The second view is called Creative School: opportunities are created in the entrepreneur's mind and it is not meaningful to talk about these opportunities separated from their creators. Venture ideas are internally generated based on more or less explicit and correct perceptions of external conditions. (Baker and Nelson 2005,) opportunities do not exist objectively , but are subjectively enacted (Gartner et al. 2001, Sarasvathy 2001,2008)

. Is any reconciliation between the two schools possible? The second question is, thus, the following. Do entrepreneurs recognize or create technological opportunities?. How the two processes – recognition and creation – come off? We are not going to propose a reconciliation theory: our aim is to demonstrate that both the perspectives are practically relevant and thus a general theory of entrepreneurship should take into account the dichotomous nature of entrepreneurial opportunities, distinguishing between objective opportunities and effectually created opportunities.

Both qualitative (case studies) and quantitative (survey) approaches have been planned in order to answer to the research questions presented by this doctoral thesis. Quantitative data should be collected through a survey, sent to the firms of the database Veneto High-Tech (which is described in this thesis). Unfortunately the response rate has been too low.

Case studies accord to the suggestions proposed by Eisenhardt (1989), Yin (2002), Gummeson (2006) and Flyvberg (2006). The exploratory nature of this study suggests the use of a qualitative methodological approach, and in particular the multiple case studies . Multiple case studies research is a useful tool to understand the complex nature of entrepreneurship, as recommended by Gartner and Birley (2002). The cases have been strategically selected within the considered population (Veneto High-Tech database), according to Flyvberg (2006) on basis of size, industry, products, innovative

activities, geographical equilibrium and personal knowledge of the entrepreneur. The main limit of this approach is the possibility to present general determinants of phenomena through a limited number of cases.

As we will see below, the cases are based of semi-structured interviews with entrepreneurs. A single case study for every enterprise by the researcher, in order to summarize and better fix the interviews and the entrepreneur words. A feedback mechanism: every single case should be read , rectified or amended by the people who has been interviewed. The Nvivo 8 software tool has been used in order to collect and analyze qualitative data.

The cross case comparison lead us to propose a hierarchical assessment of the motivational drivers. At individual level the basic motivations that emerge from the cases are the following: a) family environment, b) necessity (lack of job or not satisfying job alternatives), c)McClelland (1961) indicators (N-Pow, N-Ach, N-Aff), d) financial return. Once one or more of these motivations are considered relevant from a potential entrepreneur, other motivational aspects can enrich the reasons for the Entrepreneurial Choice and the daily effort of the entrepreneur. We asses them as

1) product level motivations: desire to demonstrate the feasibility of the technology applied in the product, f) desire to demonstrate the profitability of the technology applied in the product
2) strategy-level motivations: , g) desire to be innovative h) desire to diversificate and increase the portfolios of products, i) intention to maintain the technological leadership,
3) personal responsibility motivations: l) creation of wealth (jobs, legacy, knowledge), m) corporate social responsibility issues.

From a practical point of view the hierarchical assessment of the entrepreneurial motivations can be used for many purposes: 1)as tool for the self-evaluation of motivations, 2)as reference scheme for entrepreneurship education

From the cross comparison we identified three wide categories of entrepreneurial opportunities:

1) technological paradigms with a broad spectrum of potential application
2) niche technologies or specific applications of general technological paradigms that solve a particular problem, leading to a new product or process
3) the market. The case studies suggest that the market is viewed by entrepreneurs as a differential opportunity.

Several opportunities which present an objective existence can be identified within the case studies. These opportunities have been recognized and exploited through the process described by Shane (2003). This evidence confirms the ontological and epistemological perspective offered by the so called

"Discovery School". Furthermore in some case studies is evident the presence of effectual logic (Sarasvathy 2001, 2008), as driving logic of the entrepreneurial decision making process. The entrepreneurs act both causally and effectually. This fact lead us to confirm the idea that some opportunities exist only in the entrepreneurs' mind and thus they are created by the entrepreneur herself/himself. We demonstrate, as far as high-tech entrepreneurship is concerned, the co-existence of two processes: recognition and creation. A powerful general theory of entrepreneurship should take into account both of them, and should try to reconcile the Creative and the Discovery School. Unifying two ontological and epistemological perspectives is a true challenge that the community of scholars and researcher is requested to face.

Chapter 1

Introduction

'Entrepreneurship is a human, creative act that builds something of value from practically nothing.
It is the pursuit of opportunity regardless of the resources, or lack of resources, at hand.
It requires a vision and the passion and commitment to lead others in the pursuit of that vision.
It also requires a willingness to take calculated risks.'
(Timmons, 1999)

1.a Problem Statement

Gabriele Borga, Federica Angelantoni, Michele Finotto and Paco Simone: these are the names of four emerging high-tech entrepreneurs. Their short interviews recently published on popular magazines, are useful to shape the fundamental questions that are answered by this dissertation. As introduction to this work, we want to show how, even without considering the gaps of the specific literature, some questions emerge directly from the words and the stories of entrepreneurs, and thus they constitute relevant issues from a practical point of view.

Gabriele Borga, 19 years old, is the youngest member of Confindustria, the Italian association of entrepreneurs. He founded his first company Innit (Innovazione Italiana) when he was only 17 years old commercializing an original software for managing calendars and appointments for swimming clubs and teams. The year before, he built and set up a wireless network in his high-school, Liceo Martin Luther King in Genova, Italy. Nowadays, he creates social networks: he had just launched myWorkid, a webtool for professional networking where people can share professional data with collaborators and colleagues. "If you asked to my friends what they want from their life, most of them would simply answer "I do not know", - Mr Borga says. "The majority of them wants to be employed with a permanent position. And they are waiting something but I do not know what. I am different,

because I like to bet." We ask to him how he received the money to start-up the company. "I had no money. I used the first returns, obtained by selling my first software. I like to have no debts." When is he going to sell his company? "Never. I like my job and I like to develop new projects with my collaborators. The value of my company is not a financial value. Your job defines who you are."

Federica Angelantoni is the CEO of Archimede Solar Energy, an high-tech company that designs and produces the tubes that receive the energy collected by solar thermal plants, thanks to an innovative chemical mix at 550 C degrees. She is the daughter of an entrepreneur working in the biomedical sector. "Our potentialities are impressive, - she says to Gianemilio Mazzoleni, a popular journalist - in next two years we planned to hire more that 180 people. And we actually employ 15 collaborators. We are going to produce more than 100.000 tubes. For next year the expected turnover is about 130 millions of euro." How did she decide to invest in a technology so specific and advanced? "In 2004, ENEA – a national public research agency on energy – were doing research on this new technology and they need particular tubes. We started to collaborate, because they need to build a machine for the production of the tubes. We immediately understood the importance and the opportunities of that project. At the beginning of the life of the company we had some problems to find the right investors, but, at the end, we found in Umbria – an Italian region – a good ecosystem in order to support our entrepreneurial activity, with the help of local institutions".

Michele Finotto has been recognized in 2007 by the American review Business Wekk as one the most promising young entrepreneurs, actually active in Europe. When he was a student at the university, he created 16bugs, an open source software able to find errors and defects in other software. A worldwide success product, sold in many countries. With two friends he founded Wonsys, a software house. "We are going to present a project for phone services over networks. – Mr Finotto explains - A revolutionary idea for medium and big companies. A sort of evolution of Skype: we promise an easy tool and immediate results in terms of savings." Is he looking for an investor who can support next activities? "I will be looking for a commercial partner. Until now I have always worked by myself, I could never work under someone. When Google wanted to hire me I understood that they would have controlled even my personal projects, and this is something that I could not admit."

Paco Simone is partially responsible of the success of Milan as main city of the EXPO 2015: in fact the 30 years old entrepreneur, created the metavisual map of the city that impressed the

international Committee. A new tool where new projects are represented as coloured holograms in a 3D screen. Simone founded Arpanet ten years ago, with the aim to exploit the transfer of technological innovations from ICT to the art and cultural context. With the help of ICT new tools and trough the daily effort by seven collaborators and two interns, the company creates virtual worlds for museums and cultural institutions and it publishes the debut books of young promising writers. By exploiting an original system of selection that uses the comments of anonymous readers about parts of the books in the Arpanet website. "This year our turnovers was about 1 million of Euros. Not only we use special effects to promote the products, but we match the cultural contents and data with the right technologies. I am partially inspired by Google: their valued added is the service that they provide to the communities. The start-up phase of my company has been particularly difficult. When I was 19 years old I have been mentored by an older entrepreneur, who was a friend of mine. I used my personal savings and earnings for financing my entrepreneurial activity: I have never looked for external investors."

The four short stories/interviews can be read using different lenses. For example we could try to analyze the technological strategies adopted by the four companies. We could deepen the relationship between the emerging entrepreneurs and the external environment, highlighting enabler factors and barriers. Otherwise we could be interested on the investigation of the role or the lack of external specialized financial investors during the start-up phase of the firms. In summary we could analyze all factors that are traditionally considered key elements for the success of the company. The main aspects that emerge from previous interviews and that we want partially investigate through this dissertation are the motivations that drive the Entrepreneurial Choice (we use capital letters to identify the particular choice to found the new venture) and those motivations that daily drive the commitment and the goals of high-tech entrepreneurs. What are the personal reasons the lead the entrepreneur towards the decision to exploit an entrepreneurial opportunity? As we can read from the short stories and as we will show in next sections, money is not the only driver. In the first mini-case there is a strong identification between the person/entrepreneur and his role and social status. The need of achievement and the low risk aversion are particularly evident within the words by Gabriele Borga. His motivations seems to be radically different from those that drive young Italians. In the second mini case study the inputs received by the family – which can be considered the first crucial ecosystem for potential entrepreneurs – are important motivators. In the third case the desire for autonomy emerge as relevant factor that influence the decision to start-up and to continue an entrepreneurial career. The desire of

carrying out effective technology transfer towards the art and cultural institutions is a potential relevant driver for Paco Simone, the fourth entrepreneur presented in this section. Even the inspiration/emulation of Google can be considered a motivator of the entrepreneurial dream.

Form the short interviews emerge, thus, interesting motivational aspects that can be considered the ignition sparks of an entrepreneurial process. Their study, from a theoretical point of view contributes to the effort of conceptualizing and deepening the process and mechanisms of the emergence of new ventures. From a practical point of view, the focus on motivations and entrepreneurial intentions can be useful in order to complete the fundamental issues of the recent discipline called entrepreneurship education. This consideration leads us to give a preliminary formulation of the first research question of this doctoral research. *What are the relevant entrepreneurial motivations that drive the entrepreneurial choice within high-tech emerging ventures? How and why motivations change in the phases of life of the firm?* This question will be justified and refined in next chapters, considering the contributions by leading scholar on this topic and highlighting the gaps in the literature.

Motivations seems to be relevant drivers of the entrepreneurial behaviour. Futhermore they are not the only factor that contribute to the entrepreneurial process. From the short mini interviews emerge the role and the importance of the nature of the particular technological or market opportunity pursued by the young high-tech entrepreneurs. In the first case study Gabriele Borga recognized the opportunity to commercialize a product that he created for non commercial purposes. What he made for the club, could be sold to other teams and clubs. In the second case Federica Angelantoni build up a company, starting from the expertise and the alertness developed in their family context. In this case the opportunity was the joint research collaboration between some researchers of her family firm and a big company. She understood that the results obtained from the collaboration could be relevant from an entrepreneurial point of view: she created a new company, by transforming technological knowhow into real products. Michele Finotto literally created his business opportunity: in fact he was the creator of the software and he decided to commercialize it worldwide . In some sense he has been the real and unique creator of his success. Paco Simone linked the potentialities of ICT technologies with the need of innovation coming from the world of art and culture. A joint recognition of a demand side and a supply side that his company matches. These considerations about the four interviews, lead us to offer a preliminary formulation of the second research question answered by this doctoral work. *Do*

entrepreneurs recognize or create technological opportunities?. How the two processes – recognition and creation – come off? It is important to point out that this question will be justified and refined in next chapters, considering the contributions by leading scholar on this topic and highlighting the gaps in the literature. From a practical point of view this question is relevant because the real nature of entrepreneurial opportunities influence the behaviour, the choices and the attitudes of potential or actual entrepreneurs. Should they be more alert on objective and external opportunities? Or should the entrepreneurial effort be guided by the aim of fabricating and creating commercial and technological opportunities?

1.b High-Tech Entrepreneurship

Innovative technologies, new business models, ambitious challenges shaped by the knowledge economy and finally the tremendous international competition generate in our countries the need of new people ready to manage successful ideas and founding new business ventures. A novel effort is required to the academic communities and to practitioners in order to describe, highlight and encourage the new generation of high-tech small entrepreneurs who are the real engine of the most successful and innovative businesses in Europe.

It is widely recognized that entrepreneurship is the key to a higher standard of living and to more and better jobs for local and national communities (Birch 1987, Acs & Adreutsch 1992, Audretsch 2002*)*. Becoming an entrepreneur is a fulfilling and satisfying career. Entrepreneurship is about making our societies more responsive to today's challenges, it's about making own ideas real, it's about a self-determined way of life and overall, it's about taking over responsibility, for her/himself, and also for others. Entrepreneurs are, thus, the corner stone of the economic and social development. In his famous lecture, Nobel laureate Romer Phelps (2006) assert that entrepreneurs play a "*human role over a vast range of activities, involving management, judgment, insight, intuition, and creativity. They take on risk, with only their own judgment as protection against failure; and although some do indeed fail as individuals, together the entrepreneurs reduce the economic risk for society*". Entrepreneurs that operate in high-tech industries are crucial "agents of change" (Schumpeter 1934) In fact they are able to think different and use alternative perspectives to imagine their business, to create and sell their products, to run their firms and to accomplish their mission. More recently, Casson (1982) argues that entrepreneurs can create gaps through their personal characteristics, beliefs and perceptions: '*The*

essence of entrepreneurship is being different – being different because one has a different perception of the situation'.

Borrowing a famous Apple advertising, we could say that high-tech entrepreneurs are *"The ones who see things differently. […] They change things. They invent. They imagine. They heal. They explore. They create. They inspire."* According to Venkataraman (2004), technological entrepreneurship plays a central role in regional transformation. High-tech small firms compete at the frontiers of science and knowledge, not only by creating new products and technological innovations in new or traditional industries, but by experimenting with new organizational paradigms, marketing and growth strategies. High-tech small firms are an important source of profit and employment, an at the end, the real locus of innovation: some of their entrepreneurs/managers/engineers create new technology and contribute to the progress of science, while all of them include scientific applications in products or processes

1.c The High-Tech Entrerpreneur

If high-tech companies can be considered a crucial resource for the economic systems, high-tech entrepreneurs are the main actors of this system. The figure and the role of the high-tech entrepreneur have always attracted not only journalists, media experts and story writers, but even many academics and scholars. Is there a thin red line which links James Watt and Bill Gates? Guglielmo Marconi and Sergej Brin? Benjamin Franklin, and Robert Swanson? All of them have been real pioneers: they had a great idea, they started in a small firm context and at the end, they have been real agents of change , thus innovators.

Economic circumstances are important, marketing is important, finance is important, even public agency assistance is important . But none of these will, alone, create a new venture. For that, we need a person, in whose mind all of the possibilities come together , who believes that innovation is possible, who has the motivation to persist until the job is done. (Shaver and Scott 1991)

Studying high-tech entrepreneurship means finding why and how technologically innovative small and medium firms grow, compete, collaborate and adapt to change in their environments. High-tech entrepreneurs are knowledge creators, agents of change, both pragmatic and visionaries: they usually present long range planning ability and a high degree of flexibility, because they are problem solvers who need to cope with an ever changing environment (Dosi and Malerba 1996). Innate talent or balanced acquired skills (Silva 2006)? The debate is still on. They have been studied through different

theories, research paradigms, methodologies and models. In this section we shortly present the following contributions: the "traits" perspective, the "single industry" perspective, the frequency perspective, the hagiographic approach, the constructivist approach, the Lazear's theory and the Oakey's model.

Why it is so difficult to study entrepreneurs? Because they are complex units (constructivists maybe would use the words human being) acting on a complex system. The need of high technology management adds complexity to the entrepreneurial research field. Complexity, turbulence, uncertainty (McGee and Sawyer 2003) are some of the main environment conditions who make difficult studying the HT entrepreneurship. Especially in Italy, where some dominant influencing factors are: the role of family, the influence of occupation experience and career, the availability of information and knowledge networks and finally the gender, age, social class, education, marital status and the ethnicity of the entrepreneur (Di Minin et al. 2003).

Since the famous citation by Say, Cantillon and the physiocratic school, the entrepreneur has been recognized as a key actor in the economies and societies. While Kirzner (1973) recognizes her/his ability to spot opportunities by creative alertness, the main role assigned by Schumpeter to the entrepreneur is being agent of change, thus innovator. The Schumpeterian entrepreneur changes the technological possibilities, alters convention through innovative activity and, hence move production constraints (Deakins and Freel 2006). Many other contributions focus their attention on some traditional entrepreneurship topics: the responsibility ,the willingness to calculate and accept risks: the imagination and the creation, the pro-activity (McClelland 1961). Deakins and Freel collected many suggestions about the characteristics of technology intensive entrepreneurs, both from empirical research and different theories : need of achievement , calculated risk taking, high internal locus of control, creativity, innovation, need for autonomy, tolerance of ambiguity, vision, self efficacy. As far the author knows, no contribution states that those elements have been falsified in the subset composed by the high-technology entrepreneurs.

Human wisdom tends to categorize. Phenomenon are classified, taxonomies are created. This conceptual routine is useful for learning and for a rational comprehension of the economic and social behaviours. Following this assumption scholars and academics tried to describe and predict the characteristics, traits and skills of the successful entrepreneur. Many "traits" theory, born after the seminal work by McClelland (1961) tried to describe and fix the core traits of entrepreneurs (his work will be presented in Chapter 2). During last years these proposals have been criticized by other theories which assert the uniqueness of every enterprise/entrepreneur and highlight the importance of

environmental factors despite fixed and predictable personal skills. According to this perspective MCPhee (2000) says that "Each business start-up takes place against a backdrop of uniquely intertwined events and the personality of each individual entrepreneur is unique", while Delmar (2000): "the research results have been poor and it has been difficult to discover any specific traits of entrepreneurial behaviour. And finally Glancey and McQuaid (2000) "Research has failed to identify any traits which are associated specifically with entrepreneurs". If from one hand we agree with the impossibility to set definitely the traits of the successful entrepreneur, using a nomothetic approach, to the other hand, we should admit the importance that research activity contributes to design robust and shared models. Traits and models are useful to summarize, predict and explain the behaviour, the choices, the reasons and the ways entrepreneurs act, even if they focus only on some aspects of the entrepreneur 's ontology.

Technology intensive firms are often considered as a unique set, because they present common problems and behaviours (risk of technological obsolescence, financing, continuous need of research and innovation, marketing strategies, knowledge and intellectual property rights management). Sometimes problems which are typical of a particular industry, does not affect another. For example the time needed to develop a new drug is not comparable with the time to design and develop a new electronic device. So many academics studied technology intensive entrepreneurship adopting a single industry perspective. For example cyber-entrepreneurship (Carrier et al 2004), nanotech-entrepreneurship, or biotech founders or managers (Mueller et al. 2004), internet based business owners (Colombo and Delmastro 2004), green-tech entrepreneurs. This (industry-based) distinction can help on focusing on the different problems of each industry.

Another traditional classification of the entrepreneurial landscape, considers the frequency in the process of business creation of start-ups. Focusing on what kind and how often start-ups are founded by the entrepreneur, it is possible to divide the subset of the high-tech entrepreneurs in: novice, serial, and portfolio entrepreneurs. (Westhead and Whright 1998, Westhead et al. 2005). Novice entrepreneurs are individual with no prior business ownership experience as a business founder (or inheritor or purchaser) of an independent business, but who currently owns an independent business that is either new (purchased or inherited). Serial entrepreneurs are individuals who have sold or closed a business in which they had minority or majority ownership stake, and they currently have an ownership stake in a new single independent business. Portfolio entrepreneurs are individual who have ownership stakes in two or more independent businesses.

Another research flow on the technology intensive entrepreneurship adopts a quasi hagiographic approach, describing single entrepreneurs as myths or geniuses. The role, the importance and the behaviour of such individuals have been often celebrated by non academic literature, media and popular wisdom. Some name, for example Bill Gates, Steve Jobs, Herbert Boyer and Robert Swanson, became worldwide known and models for young generations of entrepreneurs. It is very important to know their stories in order to encourage young people. This approach, is called by the constructivists the "Schumpeterian legacy": "in mainstream entrepreneurship research, it is customary to understand entrepreneurship as something extraordinary, and entrepreneurs as superheroes" (Karp 2006). While the rationalistic theory study the personality factors, the background, the choices and the behaviour, the skills of the successful entrepreneur, constructivism exploits different epistemologies and methodologies for exploring "the interior condition of the individual entrepreneur, and the perceived inner realities from which his or her entrepreneurial actions originate" (Karp 2006). Following the suggestions by Gartner (2001) these two completely different paradigms, rationalism and constructivism (Guba 1990), applied in the entrepreneurship field seems to be complementary. Even if this thesis doesn't adopt the constructivist paradigm, we recognize that entrepreneurship and therefore high-tech entrepreneurship are not the fields of icy rationality. Therefore researchers should take in account that sometimes "entrepreneurs act subjectively in accordance with their own perception of reality, they act on the basis of feelings, intuition, and cognition, they engage in construction of a future they believe in and they develop and create according to their convictions and dreams" (Karp 2006) There is another perspective and theory which is gaining attention from the academic world and the communities of practice. It has been proposed by Lazear (2004,2005) and confirmed in different contexts and situations by some interesting studies (Wagner 2003, 2006, Silva 2007). Studying the career evolutions of Stanford alumni, Lazear asserts that entrepreneurs must be jacks of all trades who need not excel in any single skill but are competent in many. He asserts that individuals with balanced skills are more likely than others to become entrepreneurs. "Those who have varied work and educational backgrounds are much more likely to start their own businesses that those who have focused on one role at work or concentrated in one subject at school." (Lazear 2005) He describes the entrepreneurs like polymaths, who put people together in particular ways and combine them with physical capital and ideas to create a new product or to produce an existing one at a lower or competitive cost. "An entrepreneur must posses the ability to combine talents and manage those of others." (Lazear 2005). His main idea is that entrepreneurs differ from specialists: the first have a comparative disadvantage in a single skill but have more balanced talents that span a number of

different skills. On the contrary specialists can work for others who have the talent to spot and combine a variety of skills. Although entrepreneurs can hire others, the entrepreneur must be sufficiently well versed in a variety of fields to judge the quality of applicants.

The last model of this review is the contribution by Oakey (2003), which is one of the most balanced and grounded analysis of the skills required by an high-tech entrepreneur. In Oakey's model technical management skills (ability to create and develop the product, ability to lead R&D teams, technical knowledge), business management skills (accounting, marketing, human resources, strategy, fundraising) and motivation are the three main balanced elements of the high tech entrepreneur. The Oakey's perspective fits better than Lazear's theory (Giacon 2008a) . In fact, although technical ability has often provided the scientific knowledge necessary for an individual to become a successful technical entrepreneur, it is important the balanced presence of "the ability to develop business management skills with which to exploit such expertise" (Oakey 2003).

1.d What is the "nexus"?

"Inside the nexus" is the short title of this doctoral thesis. If we pretend to go inside something, first of all we are requested to explain what we want to investigate. Thus, what is the "nexus"? The term has been used for the first time in the context of entrepreneurship research by Shane and Venkataraman (2000). The two authors define entrepreneurship as "*the nexus of two phenomena: the presence of lucrative opportunities and the presence of enterprising individuals*". Since their work many authors tried to describe the "nexus": it can be considered the real 'ignition spark' of every entrepreneurial experience. In this thesis we will try to explore this nexus, focusing on two main components. As Shane and Venkataraman suggest: "subsequent to the discovery of an opportunity, a potential entrepreneur must decide to exploit this opportunity". We are, thus, going to analyze the nature of the opportunities and the motivations that lead entrepreneurial decisions, because the choice of the entrepreneur is a crucial issue in the business creation process

Many contributions focalized on entrepreneurial individuals : entrepreneurship has been studied as function of core human attributes : willingness to bear uncertainty (Khilstrom and Laffont 1979), tolerance for ambiguity (Schere 1982), need for achievement (McClelland 1961), entrepreneurial orientation (Lumpkin and Dess 1996) which differentiate entrepreneurs from the rest of the society. In addiction, many scholars identified situations in which entrepreneurial activity, often measured as new firm formation, is more likely to happen: competence destroying technological change (Tushman and

Anderson 1986), industry dynamics (Hannan and Freeman 1987), and market structure (Acs and Audreutsch 1990). Modern views of the entrepreneurial phenomena, tend to present entrepreneurship as a self directed activity that does not occur spontaneously from the presence of technological or industrial change. It requires the action of individuals who identify and pursue opportunities (Shane 2003). The first contribution presented as general theory of entrepreneurship has been published by Shane (2003). In his view entrepreneurship involves the nexus of two phenomena: the presence of lucrative opportunities and the presence of enterprising individuals. "The entrepreneurial process begins with the perception of the existence of opportunities or situations in which resources can be recombined at a potential profit. Alert individuals called entrepreneurs discover these opportunities and develop ideas for how to pursue them, including the development of a product or service that will be provided to customers. These individuals then obtain resources, design organization or other modes of opportunity exploitation, and develop strategies to exploit the opportunities". The assumptions of his theory are the followings:

1) the objective existence of opportunities: situations in which people believe that they can use new means-ends frameworks to recombine resources to generate profit (Kirzner 1973, Schumpeter 1934) He asserts that opportunities have an objective component that does not exist solely in the minds of the entrepreneurs

2) entrepreneurship requires differences between people: in the absence of variation across people, everyone would recognize and act upon all opportunities, making it possible for any one person to gain access to resources at a price at which recombination could yield a profit.

4) entrepreneurship requires a decision by a person to act upon an opportunity because opportunities themselves lack agency (we call this decision "the Entrepreneurial Decision")

5) risk bearing is a necessary part of the entrepreneurial process

6) the entrepreneurial process requires some form of innovation (Baumol 1968)

7) entrepreneurship is a dynamic process (Venkataraman 1997, Shane and Venkataraman 2000, Shane and Eckhardt 2003)

In Shane's perspective, three major sources of change create entrepreneurial opportunities:

1) technological change (the introduction of solutions to problems makes it possible for people to allocate resources in different and potentially more productive ways),

2)political/regulatory change (they alter the relative rewards gained from or costs incurred to undertake particular opportunities),

3)social/demographic change (they facilitate the creation and the transmission of information about ways to satisfy wants and needs)

Entrepreneurial opportunities take five different forms: new products or services, new ways of organizing , new raw materials, new markets, new production processes.(Schumpeter 1934)

Entrepreneurial decisions are considered as non optimizing decisions, that require the formulation of new means-ends frameworks (Shane 2003, Sarasvathy et al. 2003)

The decision to start-up and to innovate is based from conjectures (or hypotheses) (Hamilton and Harper 1994, Harper 1996) . If the entrepreneur's conjectures about such things as production, market opportunities, new ways of producing existing products, or new products that satisfy customer's wants and needs, are proved right, the entrepreneur earns profit; otherwise she incurs a loss. (Shane 2003). According to Shane's theory

entrepreneurial opportunities= technological innovation + personal conjecture

In general people discover opportunities that others do not see for two reasons: first they have better access to information about the existence of the opportunity through priori life experience, their social network structure, or through information search. Second they are better able to recognize opportunities in a given amount of information about the opportunity because they have better absorptive capacity or cognitive process. (Cohen and Levinthal 1990).

People make decisions to exploit opportunities because the gap between the expected utility of exploiting opportunities *is higher than the expected utility gained from an alternative use of their time.* (Shane 2003)

Sarasvathy (2008) agrees with Shane and Venkataraman (2000) – that we need to look into the nexus of enterprising individuals and valuable opportunities. Furthermore, as we will see in the next chapter, there is a fundamental difference in the logical frame used by Shane's entrepreneur, who is engaged in the discovery and exploitation of opportunities, and the effectual entrepreneur, who fabricate them from the mundane realities of his/her life and value system.

1.e About Entrepreneurship: perspectives and definitions

Before starting the analysis, we emphasize some definitions and perspectives adopted. In the recent special issue by the Economist about entrepreneurialism, the classical (and for some aspects

mythological) view on entrepreneurs is reported: "*Entrepreneurs operate in all kind of ways. Some see a market opportunity and draw up a business plan to take advantage of it. Others are more like the captain, driven by an inner force to start a business and unwilling to take "no" for an answer. […] They are convinced that, against all the odds, they will be able to turn their dream into reality. This sometimes allow them to do something at which most people fail, but it also means they hardly ever hit the forecasts in their business plans*." From a narrow economic perspective entrepreneurs have been often reduced as simple economic functions that undertake optimizing and rational decisions. Economists often concentrated on the traditional factors of production and on the price mechanism. Schumpeter has been almost alone in arguing that the most vital competitive weapon was not low prices but new ideas.

In a knowledge based economy entrepreneurs play a central role

1)in creating new companies,

2) in commercializing new ideas

3) in sustained experiments in what works and what does not (innovative activities)

William Baumol has put entrepreneurs at the centre of his theory of economic development, while Nobel Laureate Paul Romer, recently asserted: "economic growth occurs whenever people take resources and rearrange them in ways that are more valuable". In his Nobel lecture, Edmund Phelps confirmed that entrepreneurship have a big impact on economic growth. Their thesis are daily confirmed by the indefatigable activities by the Kauffmann Foundation which supports entrepreneurship both as research field and as societal phenomenon.

There are many different definitions of entrepreneurship. We can consider it a societal phenomenon or as research field. Since the beginning of this dissertation we want to declare the definition of entrepreneurship that we adopt: we think that the definitions of Per Davidsson (2004) can be considered those that receive large consensus within the scholars community. They encapsulate and enrich the classical definition by Shane and Venkataraman (1997,2000, 2003) and seems to be more precise and complete.

The starting point of Davidsson definition are the following words by Shane and Venkataraman. "*Entrepreneurship is an activity that involves the discovery, evaluation and exploitation of opportunities to introduce new goods and services, ways of organizing markets, processes and raw materials through organizing efforts that previously had not existed* (Venkataraman 1997, Shane and Venkataraman 2000). According to Kirzner (1973) and the Austrian school, Davidsson proposes that entrepreneurship consists of the competitive behaviours that drive the market process. And he defines

the research area as follows. "*The academic field of entrepreneurship incorporates, in its domain explanations for why, when and how entrepreneurial opportunities exist, the sources of those opportunities, and the form that they take, the processes of opportunity discovery and evaluation, the acquisition of resources for the exploitation of these opportunities, the act of opportunity exploitation, why, when and how some individuals and not others discover, evaluate, gather resources for an exploit opportunities, the strategies used to pursue opportunities , and the organizing efforts to exploit them*" Therefore, starting from assumptions of uncertainty and heterogeneity, the domain of entrepreneurship research encompasses the study of process of emergence of new business ventures, across organizational contexts. This entails the study of

1) the origin and characteristics of venture ideas as well as their contextual fit

2) the behaviours in the interrelated processes of discovery and exploitation of such ideas

3) how these ideas and behaviours link to different type of direct and indirect antecedents and outcomes on different levels of analysis.

Entrepreneurial decisions are non optimizing decisions because, to optimize prices and quantities need to be known; market participants must be able to differentiate low effort or low quality from bad luck; and people must male decisions about resources on the basis of something other than the same information that every one else has (Davidsson 2008). As Casson (1982) remembers: "The essence of entrepreneurship is being different – being different because one has a different perception of the situation".

"*Entrepreneurial decisions are made by formulating new means-ends frameworks for the use of resources: New means-ends frameworks are created when something - such as information about previous errors in decision making, knowledge in new demand or a technological invention – leads to a person to believe that prices do not accurately represent the value of goods and services, and that the potential exists to generate a better alternative to buying or selling resources than the current one*." (Shane 2003)

In summary the creation of new means-ends frameworks exploit non optimizing decisions, also called judgmental decision making and thus creativity. Often entrepreneurs are request to work with hypothesis or conjectures (Hamilton and Harper 1994, Harper 1996) that are necessarily uncertain, because the validity and the correctness of the conjecture can not be proven before future events occur. Shane points out that entrepreneurial decision making can involve creativity even if opportunities exist as an objective reality because the identification of those opportunities requires the creation of a new means-ends framework. The individual-opportunity nexus argues that "opportunities have an objective

component, but that the process of discovery and exploitation requires creativity to formulate new frameworks, by recombining resources. Hence, the Entrepreneurial profit can be considered the reward that the entrepreneur earns for the judgments about new means-ends frameworks.

Chapter 2 – Selective Literature Review

Rediscovering Entrepreneurial Motivations

2.a Relevance of Motivations

St. Peter's Basilica is the centre of the Catholic Church and is regarded as one of the holiest Christian sites. It is the greatest of all churches of the Christian world. In 1505, Pope Julius II, in order to glorify Rome and his personal power, made a decision to demolish the ancient building of St.Peter's church and replace it with something grander. A competition was held, and a great number of projects were presented. A succession of popes and architects followed in the next 120 years, their combined efforts resulting in the present building. The site has been a yard for many years and thousands of people worked on it. If we would ask to three different workers the motivations of their effort they probably answer with different words, offering different motivations for the same commitment. The first worker would answer "I am working here because I want to have my salary at the end of the month". The second one would say: "I am working here because I want to get some money for my family and I hope that my sons can achieve a better job than mine". The third one could answer : " I am working here because I want to contribute to the building of the greatest and holiest place of Christendom". Those are all good purposes. Those are all right answers. In summary: One job, three different potential answers and three different motivations.

Human actions and behaviours are influenced and driven by external and personal factors such as the legal and economic environment, the social networks, the needs, the background, the traits, the attitudes of human beings. From psychology we know that personal motivations play a relevant role. The example shows how, being constant the output, the motivations can be different: (in the Saint Peter's yard the job of the three operators are the same, while the motivations are very different).

In the working environment money is a central motivator. As reported by Sethi and Saxena (2003)

"Entrepreneurs are after money and they engage in profit making. True, profit- as understood in terms of the residual income of the owner after meeting all the expenses incurred on the engagement and utilisation of other factors of production-is the reward of entrepreneurship just as salary is to men and women in employment and professional fees is to those in profession. So everybody works for money. But people certainly don't work for money alone. After all, money is required not for its own sake, but for the sake of the needs of the person that it can fulfill. Money, thus, is not the need as such. It is teleological (to put it more simply, distantly) related to the internally felt needs (such as need for food) and socially acquired needs (such as status symbols)."

Not only what motivates an entrepreneur, is money. Nor needs. To confirm this second hypothesis we can remember the basic distinction between necessity based entrepreneurs (those who create new ventures because the loss of their job or because they have no other options for working).

Why do people become entrepreneurs? This is the question that professor Scott Shane has recently answered in his weblog. *"Researchers have identified myriad reasons why people start their own businesses, but across all of the surveys, interviews, and other efforts to understand entrepreneurial motivation, one reason stands out above all others: People start businesses because they don't want to work for someone else. It's interesting that the desire not to have a boss is the primary motivator of entrepreneurs because "being one's own boss" appears to be the prime source of entrepreneurs' job satisfaction. To understand why, you need to know that entrepreneurs are happier with their jobs than people who work for others. A lot happier. Research shows that you would have to pay an entrepreneur 2 ½ times as much for that person to have the same job satisfaction as an employee that he or she has as an entrepreneur. But employees tend to be better off than entrepreneurs in terms of compensation, job stress, and hours worked. People who work for themselves are more likely than those who work for others to report that their jobs are stressful and exhausting and make them unhappy or depressed. Moreover, the typical American who works for himself or herself works 4.4 more hours per week than the typical person who is employed by someone else. And studies show that the typical entrepreneur earns less and has more variable income than the typical employee. So, the greater job satisfaction of entrepreneurs isn't because they work fewer hours, and have less stressful jobs than nonentrepreneurs. Rather, they are more satisfied with their jobs in spite of having more work and more job stress and less pay than nonentrepreneurs. For many people, it seems, not having a boss is worth a lot."*

Without a strong motivation that leads a potential entrepreneur, and without a brilliant business idea which is the ignition spark that let to recognize and exploit opportunities, no innovative

technology or science based companies can be created (Shane and Venkataraman 2000, Shane 2003). Nevertheless entrepreneurial motivations are not the only enablers and engines of an entrepreneurial project. Having a smart entrepreneurial idea is not enough to found a successful technological venture. Market failures and imperfections can be dangerous obstacles for young entrepreneurial projects (Storey and Tether 1998, Colombo and Delmastro 2002, Von Zedtwitz and Grimaldi 2006). Accessing to capital is often one of the most difficult step for potential entrepreneurs or entrepreneurial teams: in fact business angels and venture capitalists receive a great number of business proposals and they invest only after a tremendous selection of the projects, leaving many of them unfunded. Even knowledge and intellectual property management can be sometimes an obstacle because of the costs of the protection and the specific legal and bureaucratic issues that need to be managed. Sometimes new technology based firms need complementary or supplementary resources in order to complete ad optimize products, creating marketing plans, feeding the continuous process of research and development or exploiting wider networks of knowledge and contacts.

2.b The seminal work by McClelland

McClelland identified three types of manifest needs, namely, Need for Achievement (N-Ach.), Need for Power (N-Pow) and Need for Affiliation (N-Aff.). The achievement motivation has been so successful in the literature that it is often considered synonymous to entrepreneurial motivation. We would be describing N-Ach. In greater detail after having discussed N-pow. and N-Aff.

1) Need for Power (N-Pow.): If a man "speculates about who is boss", he has a concern for power, notes McClleland. Need for power, in effect, is the "concern for influencing people" or the behaviour of others for moving in the chosen direction and attaining the envisioned objectives. In common perception, politicians, social-religious leaders Chief Executive Officers, Government Bureaucrats/Civil Servants typify the need for power. Such a perception seems more based on the belief that the source of power lies in the "position" a person occupies in organizational/societal context. In the same vein, business ownership too may imply a need for power. Moreover, you would appreciate that the process of founding a business, one has to win the commitment of capital providers, suppliers of equipment and materials, the employees and that of the customers. Link this aspect of entrepreneurial motivation to the competencies related to Assertiveness, Persuasion and Influence Strategies.

2) Need for Affiliation: If a man "readily thinks about interpersonal relationships", he has a concern for affiliation, wrote McClleland. It implies, among other things, "a tendency of the people to conform to the wishes and norms of those whom they value." Apparently, social activists, environmentalists, teachers, and doctors and nurses may seem as predominantly driven by these needs. Entrepreneurs are believed to be low on affiliation, as they are and expected to be, innovative, trendsetters and tradition breakers. However, it is not necessary that affiliation should only interfere with achievement. In certain cultures, family comprises the bedrock on which the successful careers are built. One works, as if, not for personal gratification but for family. Desire to carry on the tradition of business in the family and the community to which one belongs, may be interpreted as reflecting need for affiliation as well. Some industries are particularly suitable for person with high need for affiliation and having distinct competencies in Empathy and Concern for Employees.

3) Need for Achievement: Entrepreneurial behaviour is so much singularly attributed to this need that one may just stop short of taking entrepreneurial motivation and achievement motivation as synonymous. N-ach. Concerns issues of excellence, competition, challenging goals and overcoming difficulties. A complete achievement sequence would comprise, "… defining the problem, wanting to solve it, thinking of means to solving it, thinking of difficulties that get in the way of solving it (either in one's self or in the environment), thinking of people who might help in solving it, and anticipating what would happen if one succeeded or failed." Accordingly, a person with need for achievement would want to take personal responsibility for solving problem. One is goal oriented, that is, one sets moderate, realistic, attainable goals. One also seeks challenge, excellence, and individuality, one takes calculated/ moderate risk and is willing to work hard for that. One is always keen to find out how well one is doing and likes concrete feedback on performance. In fact, it is the "feedback" value of profit/money that often results in incorrect attribution of motive to behaviour. In market economies, profit is probably the best indicator of business performance just as the salary drawn is a measure of one's status and competence and professional fees charged a measure of one's creditability. Entrepreneurs may appear to be chasing profit for its own sake, the fact of the matter could be that they derive a feedback satisfaction from the amount of profits earned and are more concerned about achieving the goals they set for themselves. Should other measures of performance become paramount, the amount of profit earned would cease to be the sole feedback on performance. In fact, as the society progresses, measures such as respectability, ethicality, quality, employee involvement, customer satisfaction eco-friendliness and overall business/corporate citizenship etc. assume increasing importance as regards business performance. Affirmative action, responsible and responsive business

behaviour is the talk of the day. Sometimes, people lament that the amount of money earned and wealth in one's possession confound other important aspects of one's performance so much so that money becomes the end and not the means. A stereotypical image of the entrepreneurs is that they engage in reckless pursuit of profit even at the expense of legitimate expectations of the customers of quality, employees of fair wages and as regards payment of taxes. However, research is inconclusive about entrepreneurs being neither more nor less ethical than those in other occupations in this regard.

McClelland's research methodology sought to identify the dominant need through projective techniques. We would like to say, however, that it is rarely if ever that we are trying to satisfy just one type of need through our behaviour. As a person, we try to simultaneously satisfy multiple needs economic, social, and psychological. Hence, for example, quest for a "respectable," "growth oriented," "challenging," "fun," job/career. In fact, as regards entrepreneurship, one often hears "Need for Autonomy" or N-Aut. also being an important driver of behaviour.

4) Need for Autonomy: The need for autonomy is a desire for independence which, in effect, becomes a desire to do work of one's choice and at one's pace, defining one's own rules of the game, taking initiative, making independent and innovative choices and being responsible and accountable to oneself rather than some external authority for performance. Research evidence too seems to suggest desire for independence as the prime motivator of entrepreneurial behaviour. Hence, in the context of entrepreneurship it may be interpreted as the determination not to work for someone else. A career departure form employment to entrepreneurship may also be interpreted as 'Desire to be on one's own' as one becomes so much dissatisfied with present employment that rather than seeking another job, entrepreneurship seems a more preferred alternative. Further, it is the absence of this autonomy in jobs rather than other factors that seem to be driving people into starting their own ventures- for a distant observer such a decision may appear "risky" given the job security and compensation package.

Recently Davidsson (2008) highlights how personal characteristics do not force the individuals' behaviour into specific directions. He agrees with Baron (2006) who showed how many studies that compared the characteristics of entrepreneurs with non entrepreneurs failed to arrive to strong conclusions. He emphasizes some weak features: "weak theoretical basis, focus on few or wrong personal characteristics and weak measurement". Work characteristics that appeal to some people are not exclusive to the choice of self employment; not all self employment shares the same characteristics and in many cases there is no match between the jobs and the people. So the relationship between personal or job characteristics and being owner/manager of a firm is very far from deterministic. He

concludes his analysis asserting that stable, innate characteristics of individuals will never be the major explanation of single events like starting a new firm. (Delmar 1996, Rauch and Frese 2000).

2.c Relevant results from previous psychological research

Abraham Maslow (1943) developed a theory of personality that has influenced a number of different fields, including education. This wide influence is due in part to the high level of practicality of Maslow's theory. This theory accurately describes many realities of personal experiences. Many people find they can understand what Maslow says. They can recognize some features of their experience or behaviour which is true and identifiable but which they have never put into words. Maslow is a humanistic psychologist. Humanists do not believe that human beings are pushed and pulled by mechanical forces, either of stimuli and reinforcements (behaviourism) or of unconscious instinctual impulses. Humanists focus upon potentials. They believe that humans strive for an upper level of capabilities. Humans seek the frontiers of creativity, the highest reaches of consciousness and wisdom. This has been labelled "fully functioning person", "healthy personality", or as Maslow calls this level, "self-actualizing person."

Maslow has set up a hierarchic theory of needs. Humans start with a very weak disposition that is then fashioned fully as the person grows. If the environment is right, people will grow straight and beautiful, actualizing the potentials they have inherited. If the environment is not "right" (and mostly it is not) they will not grow tall and straight and beautiful. Maslow has set up a hierarchy of five levels of basic needs. Beyond these needs, higher levels of needs exist. These include needs for understanding, esthetic appreciation and purely spiritual needs. In the levels of the five basic needs, the person does not feel the second need until the demands of the first have been satisfied, nor the third until the second has been satisfied, and so on. Maslow's basic needs are as follows:

Physiological Needs

These are biological needs. They consist of needs for oxygen, food, water, and a relatively constant body temperature. They are the strongest needs because if a person were deprived of all needs, the physiological ones would come first in the person's search for satisfaction.

Safety Needs

When all physiological needs are satisfied and are no longer controlling thoughts and behaviours, the needs for security can become active. Adults have little awareness of their security needs except in times of emergency or periods of disorganization in the social structure

(such as widespread rioting). Children often display the signs of insecurity and the need to be safe.

Needs of Love, Affection and Belongingness

When the needs for safety and for physiological well-being are satisfied, the next class of needs for love, affection and belongingness can emerge. Maslow states that people seek to overcome feelings of loneliness and alienation. This involves both giving and receiving love, affection and the sense of belonging.

Needs for Esteem

When the first three classes of needs are satisfied, the needs for esteem can become dominant. These involve needs for both self-esteem and for the esteem a person gets from others. Humans have a need for a stable, firmly based, high level of self-respect, and respect from others. When these needs are satisfied, the person feels self-confident and valuable as a person in the world. When these needs are frustrated, the person feels inferior, weak, helpless and worthless.

Needs for Self-Actualization

When all of the foregoing needs are satisfied, then and only then are the needs for self-actualization activated. Maslow describes self-actualization as a person's need to be and do that which the person was "born to do." "A musician must make music, an artist must paint, and a poet must write." These needs make themselves felt in signs of restlessness. The person feels on edge, tense, lacking something, in short, restless. If a person is hungry, unsafe, not loved or accepted, or lacking self-esteem, it is very easy to know what the person is restless about. It is not always clear what a person wants when there is a need for self-actualization.

The hierarchic theory is often represented as a pyramid, with the larger, lower levels representing the lower needs, and the upper point representing the need for self-actualization. Maslow believes that the only reason that people would not move well in direction of self-actualization is because of hindrances placed in their way by society. He states that education is one of these hindrances. He recommends ways education can switch from its usual person-stunting tactics to person-growing approaches. Maslow states that educators should respond to the potential an individual has for growing into a self-actualizing person of his/her own kind. Ten points that educators should address are summarized:

1. They should teach people to be *authentic,* to be aware of their inner selves and to hear their inner-feeling voices.

2. They should teach people to *transcend their cultural conditioning* and become world citizens.
3. They should help people *discover their vocation in life,* their calling, fate or destiny. This is especially focused on finding the right career and the right mate.
4. They should teach people that *life is precious,* that there is joy to be experienced in life, and if people are open to seeing the good and joyous in all kinds of situations, it makes life worth living.
5. They must *accept the person* as he or she is and help the person learn their inner nature. From real knowledge of aptitudes and limitations we can know what to build upon, what potentials are really there.
6. They must see that the person's *basic needs are satisfied.* This includes safety, belongingness, and esteem needs.
7. They should *refresh consciousness,* teaching the person to appreciate beauty and the other good things in nature and in living.
8. They should teach people that *controls are good,* and complete abandon is bad. It takes control to improve the quality of life in all areas.
9. They should teach people to transcend the trifling problems and *grapple with the serious problems in life.* These include the problems of injustice, of pain, suffering, and death.
10. They must teach people to be *good choosers.* They must be given practice in making good choices.

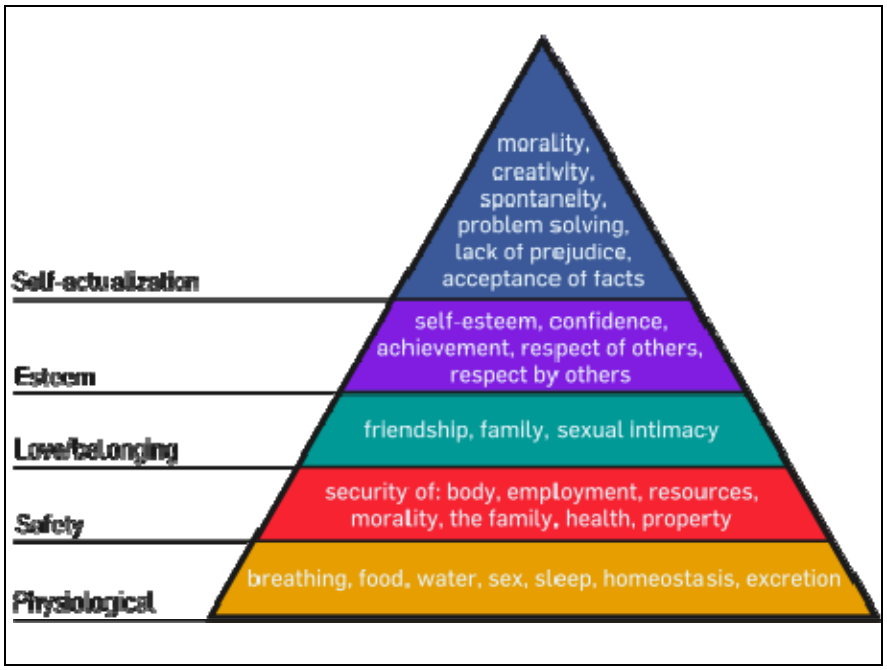


Fig. 1 Maslow's hierarchy of needs

The ERG Theory of Clayton P. Alderfer is a model that appeared in 1969 in a Psychological Review article entitled "An Empirical Test of a New Theory of Human Need". In a reaction to Maslow's famous Hierarchy of Needs, Alderfer distinguishes three categories of human needs that influence worker's behaviour; existence, relatedness and growth. These ERG Theory categories are:

- *Existence Needs*: physiological and safety needs (such as hunger, thirst and sex)(Maslow's first two levels)

- *Relatedness Needs*: social and external esteem (involvement with family, friends, co-workers and employers)(Maslow's third and fourth levels)

- *Growth Needs*: internal esteem and self actualization (desires to be creative, productive and to complete meaningful tasks)(Maslow's fourth and fifth levels)

Contrarily to Maslow's idea that access to the higher levels of his pyramid required satisfaction in the lower level needs, according to Alderfer the three ERG areas are not stepped in any way. ERG Theory recognizes that the order of importance of the three categories may vary for each individual. Managers must recognize that an employee has multiple needs to satisfy simultaneously. According to the ERG theory, focusing exclusively on one need at a time will not effectively motivate. In addition, the ERG theory acknowledges that if a higher level need

remains unfulfilled, the person may regress to lower level needs that appear easier to satisfy. This is known as the frustration-regression principle. This frustration-regression principle impacts workplace motivation. For example, if growth opportunities are not provided to employees, they may regress to relatedness needs, and socialize more with co-workers. If management can recognize these conditions early, steps can be taken to satisfy the frustrated needs until the subordinate is able to pursue growth again.

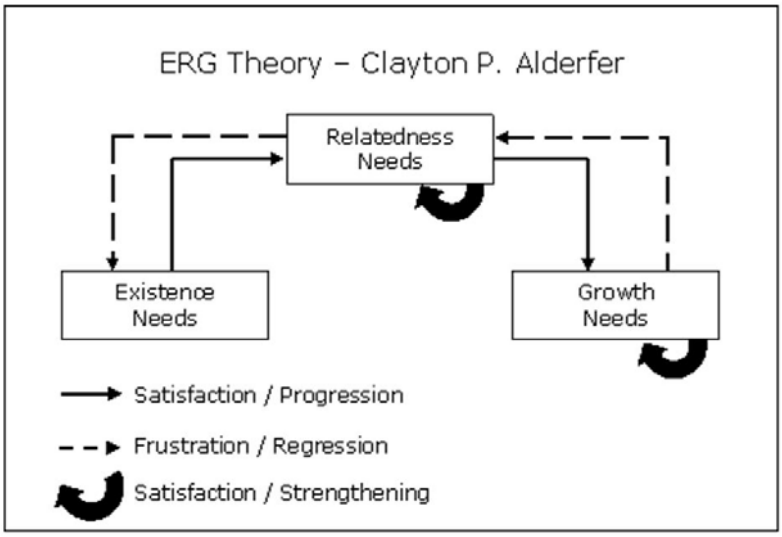


Fig. 2 ERG Theory

According to the Two Factor Theory of Frederick Herzberg (1964, 1968) people are influenced by two factors. Satisfaction and psychological growth was a factor of motivation factors. Dissatisfaction was a result of hygiene factors. Herzberg developed this motivation theory during his investigation of 200 accountants and engineers in the USA.

Hygiene factors are needed to ensure an employee does not become dissatisfied. They do not lead to higher levels of motivation, but without them there is dissatisfaction.

Motivation factors are needed in order to motivate an employee into higher performance. These factors result from internal generators in employees.

Typical Hygiene Factors are:

- Working conditions

- Quality of supervision
- Salary
- Status
- Security
- Company
- Job
- Company policies and administration
- Interpersonal relations

Typical Motivation Factors include**:**

- Achievement
- Recognition for achievement
- Responsibility for task
- Interest in the job
- Advancement to higher level tasks
- Growth

Combining the hygiene and motivation factors results in four scenario's:

- High Hygiene + High Motivation: The ideal situation where employees are highly motivated and have few complaints.
- High Hygiene + Low Motivation: Employees have few complaints but are not highly motivated. The job is perceived as a paycheck.
- Low Hygiene + High Motivation: Employees are motivated but have a lot of complaints. A situation where the job is exciting and challenging but salaries and work conditions are not up to par.
- Low Hygiene + Low Motivation: The worst situation. Unmotivated employees with lots of complaints.

Herzberg suggests that often work can and should be arranged in the following ways: job enlargement, job rotation, and/or , job enrichment.

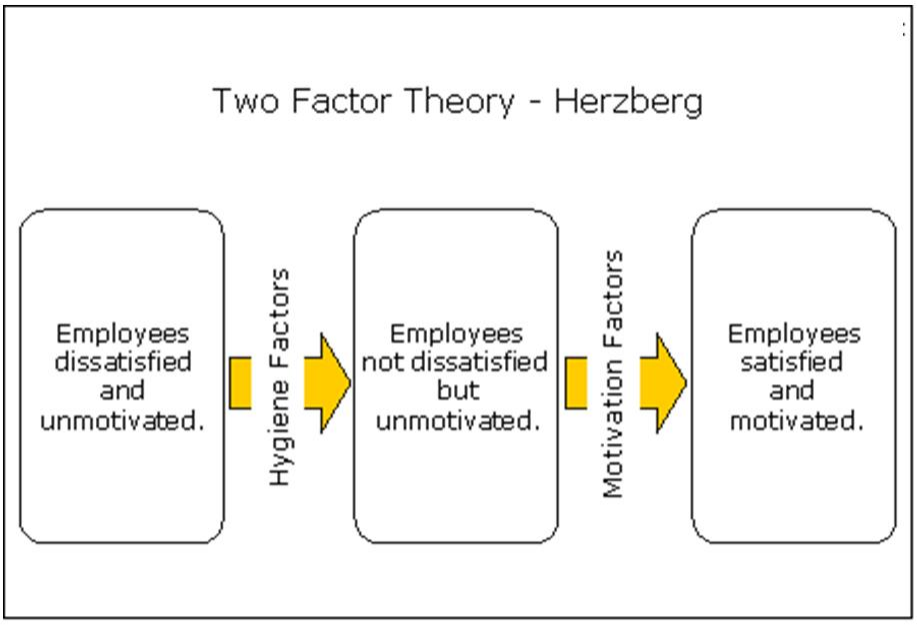


Fig. 3 Herzberg's theory

Douglas McGregor, an American social psychologist, proposed his famous Theory X and Theory Y models in his book 'The Human Side Of Enterprise' (1960).

	Theory X	Theory Y
Assumptions	Humans inherently dislike working and will try to avoid it if they can.	People view work as being as natural as play and rest. Humans expend the same amount of physical and mental effort in their work as in their private lives.
	Because people dislike work they have to be coerced or controlled by management and threatened so they work hard enough.	Provided people are motivated, they will be self-directing to the aims of the organization. Control and punishment are not the only mechanisms to make people work.
	Average employees want to be directed.	Job satisfaction is key to engaging employees and ensuring their commitment.
	People don't like responsibility.	People learn to accept and seek responsibility. Average humans, under the proper conditions, will not only accept but even naturally seek responsibility.
	Average humans are clear and unambiguous and need security at work.	People are imaginative and creative. Their ingenuity should be used to solve problems at work.
Application	Shop Floor, Mass Manufacturing - Production Workers	Professional Services, Knowledge Workers - Managers and Professionals

Conducive to	Large scale efficient operations	Management of Professionals, Participative Complex Problem Solving
Management Style	Authoritarian, Hard Management	Participative, Soft Management

Tab. 1 X-Y Theory - main findings

McGregor sees Theory Y as the preferable model and management method, however he felt Theory Y was difficult to use in large-scale operations.

The Expectancy Theory of Victor Vroom (1964) deals with motivation and management. Vroom's theory assumes that behaviour results from conscious choices among alternatives whose purpose it is to maximize pleasure and minimize pain. Together with Edward Lawler and Lyman Porter, Vroom suggested that the relationship between people's behaviour at work and their goals was not as simple as was first imagined by other scientists. Vroom realized that an employee's performance is based on individuals factors such as personality, skills, knowledge, experience and abilities. The expectancy theory says that individuals have different sets of goals and can be motivated if they believe that:

- There is a positive correlation between efforts and performance,

- Favourable performance will result in a desirable reward,

- The reward will satisfy an important need,

- The desire to satisfy the need is strong enough to make the effort worthwhile.

Vroom's Expectancy Theory is based upon the following three beliefs:

1. *Valence* (Valence refers to the emotional orientations people hold with respect to outcomes [rewards]. The depth of the want of an employee for extrinsic [money, promotion, time-off, benefits] or intrinsic [satisfaction] rewards). Management must discover what employees value.
2. *Expectancy* (Employees have different expectations and levels of confidence about what they are capable of doing). Management must discover what resources, training, or supervision employees need.
3. *Instrumentality* (The perception of employees whether they will actually get what they desire even if it has been promised by a manager). Management must ensure that promises of rewards are fulfilled and that employees are aware of that.

Vroom suggests that an employee's beliefs about Expectancy, Instrumentality, and Valence interact psychologically to create a motivational force such that the employee acts in ways that bring pleasure and avoid pain. This force can be 'calculated' via the following formula:

Motivation = Valance x Expectancy(Instrumentality).

This formula can be used to indicate and predict such things as job satisfaction, one's occupational choice, the likelihood of staying in a job, and the effort one might expend at work.

The Theory of Planned Behaviour was proposed by Icek Ajzen in 1985 through his article "From intentions to actions: A theory of planned behaviour". The theory was developed from the Theory of Reasoned Action, which was proposed by Martin Fishbein together with Icek Ajzen in 1975. According to the Theory of Reasoned Action, if people evaluated the suggested behaviour as positive (attitude), and if they think their significant others wanted them to perform the behaviour (subjective norm), this results in a higher intention (motivation) and they are more likely to do so. A high correlation of attitudes and subjective norms to behavioural intention, and subsequently to behaviour has been confirmed in many studies

The Theory of Planned Behaviour assert that the volitional behaviour of the entrepreneurs is presumed to be the product of intentions, which are a function of the person's overall attitude and the subjective norm that represent social pressure either to perform or not perform the action. Intentions are exercised only if the actor believes that she or he has perceived behavioural control.

$$B = I \ \alpha \ [\omega_1 Ab + \omega_2 SN + \omega_3 PBC]$$

B= behaviour
I = intention
Ab= attitude toward action
SN= social norms
PBC=perceived behavioural control

The attitude toward the behaviour is often considered the sum of beliefs about the object. With each belief multiplied by its perceived goodness. The social norm component is also a sum of the judgments of any person whose opinion matters, with each judgment multiplied by the motivation to comply to

the opinion. The perceived control component is subdivided into the constraints as they exist and as they are perceived. PBC has been demonstrated to be best estimated by self efficacy (Bandura 1986).

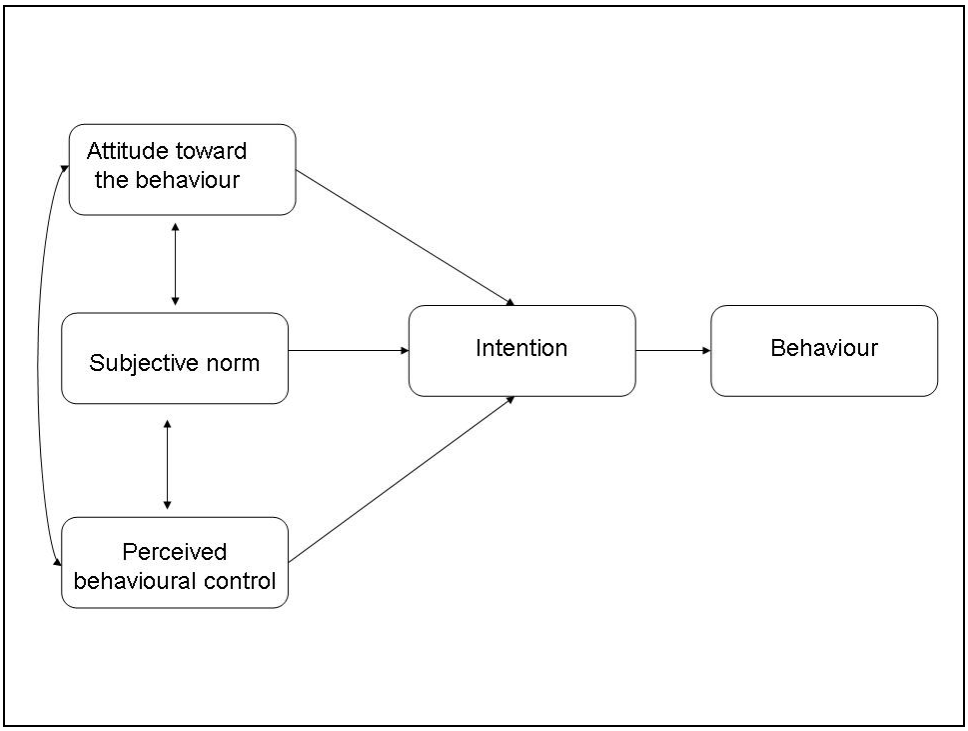


Fig. 4 Ajzen's Theory

2.d Motivations in Entrepreneurship Research

Investigating about why people start a business may be useful in understanding the motivation that entrepreneurs exhibit during start-up as a link to the sustaining behaviour exhibited later. (Naffziger et al. 1994) Herron and Sapienza (1992) wrote "because motivation plays an in important part in the creation of new organizations, theories of organization creation that fail to address this notion are incomplete." Johnson (1990) in his review about the topic of need of achievement asserts: " It remains worthwhile to carefully study the role of the individual, including his/her psychological profile. Individuals are, after all, the energizers of the entrepreneurial process.

There are four different categories of studies regarding entrepreneurial motivations

- there are studies that investigate deep psychological attributes and needs. The seminal works are both by McClelland (1961 and 1965) about N-ACH and N-POW. These types of studies suggest that there is a small, but relevant, positive relation between the two needs and entrepreneurship

- there are studies that try to explain the decision to create a new venture (Douglas and Shepherd 2002). In their view material and immaterial risks and gains are brought into some decision function
- there are general studies about the reasons and the motives to start a firm. They led to distinguish between opportunity and necessity entrepreneurship (Reynolds et al. 2001). The most common pull factors are autonomy (independence, freedom), income and wealth, challenge, recognition, status. (Kolvereid 1996, Carter et al. 2003, van Gelderen and Jansen 2006).
- Multi – country level studies like Hassels et al. (2008).

Lets' start from some descriptive evidence. From a sample of high-tech Indian entrepreneurs Subdoh Bhat and McCline (2005) obtained some preliminary results on the basic motivation of entrepreneurship. The respondent entrepreneurs were motivated primarily by the desire to create something new, the desire for autonomy, wealth and financial independence, the achievement of personal objectives and the propensity for action. The excitement of entrepreneurship was another major motivator -- this was nicely captured by one comment: "We are not sure what's coming down the curve but it is a thrill." Importantly, most entrepreneurs stressed that the objective was never money for its own sake. They wanted to leave a legacy in the form of a profitable long-lasting business.

Motivator	***% mentioning***
Rewards of entrepreneurship	
Autonomy	57
Making money/financial indipendence	43
Saw business opportunity/ impact on industry	27
Recognition of self or organization	23
Desire to create something new	20
Building something important/making the difference	17
Grow a business from scratch	17
Desire to be entrepreneur	3
Personal traits	
Intellectual challenge/achieve potential	27
Instinct	10
Others	10
Career motivators	
Career growth/diversification/satisfaction	13
Others	3
Expertise	
Exploit previous experience	6

Technology/industry vision	3
Non-monetary factors	
Help your country	23
Personal satisfaction	7
Create wealth/jobs/wealth in society	3

Tab. 2 adapted from Bath and McCline (2005)

The sample: An overwhelming majority (93 per cent) was male, with close to two-thirds in the 26- to 39-year range. A quarter had just undergraduate degrees, while 69 per cent had master's degrees. More than 63 per cent of the respondents' businesses had been in existence for three to six years and the median annual revenue of the businesses was 1.5 million Euros. The median number of employees was 15, with 84 per cent having less than 100 employees. Parents or close relatives of 28 per cent of the respondents owned their own businesses and the average number of people whom the respondents could call for help was 10. he respondents had been employed for five to eight years before starting their first business. They were members of an average of three business or professional association and attended five seminars and trade fairs every year.

A large number of scholars tried to the explain the entrepreneurial phenomenon by identifying those members of society who could be considered enterprising individuals or potential enterprising individuals. There are many studies who try to study and highlight the differences between populations of. entrepreneurs and non-entrepreneurs. From this point of view entrepreneurship has been considered a function of 1) the willingness to bear uncertainty (Khilstrom and Laffont 1979), tolerance for ambiguity (Schere 1982), need for achievement (McClelland 1961) and others traits that differentiate entrepreneurs from the rest of society. This approach has been unsuccessful and criticized (Gartner 1990) for many reasons

1) entrepreneurial activity is episodic (entrepreneurship is not an attribute or a state, but is is a temporal role that generates a process)

2) people engage in entrepreneurial behaviour only at particular points in time and in response to specific situations

Let’s now consider a particular sub-set of high-technology entrepreneurs, Shane (2004) highlighted to major categories of explanation to create a new venture within an academic context. A psychological explanation: academics found new companies to put their technology into practice or obtain wealth or independence. And a career oriented explanation: inventors found companies because of their career stage at the time of the invention that they decide to transform into a product. In this

dissertation we are particular interested in the psychological explanations reported by Shane. His results are based on anecdotal evidence because "despite the evidence provided by entrepreneurship researchers to show support for psychological explanations of the formation of new companies. The literature on university spinoffs has not explored the effect of psychological characteristics on the formation of inventor-founded spinoffs in any systematic way". The evidence reported by Shane come from personal previous work and contributions from the literature (Samson and Gurdon 1993, McQueen and Wallmark 1982).

1) Inventors often start companies because they want to bring their new technology into practice..

Many inventors want to be the part of the commercialization process and often this is not allowed by large companies. Other found companies because they are convinced that already established companies would not move the technology into practice quickly enough because they are not as passionate about technology and its applications, as the scientists are.

2) Inventors are motivated by the desire to get rich. This motivation comes from the idea that much more money could be made building a successful company than by licensing an invention to an already established firm.

3) the desire for independence is another crucial motivator. This is result is coherent with the idea (Shane 2003) that people with a strong desire for independence are more likely to found new firms that people with a weak desire for independence.

Ajzen's theory have been applied in the entrepreneurship context. In this case

1) behaviour = creating a new business venture or taking actions towards realizing a start-up
2) Intention is the willingness or a plan to act
3) Attitude and subjective norm are the extent to which individual of the context regard starting a new venture as good or bad thing
4) Perceived behavioural control is the feel that perspective entreprenurs have the knowledge, contacts, ideas and means needed to create the venture and to achieve success

Theory have been tested by psychologists but it presents a modest explanatory value. A new variable, for example could be added and called entrepreneurial potential (Davidsson 2004) which could be indicated by membership of groups with high desire and experience of independent business (for example professionals an craftsmen). Or according to Shapero and Sokol (1982) we could take into consideration a new variable called triggering event (such as unemployment , divorce, inheriting

money) as moderator between intention and entrepreneurial potential on the one hand and behaviour on the other. Or, more deeply, someone could ask where do attitudes, norms and control perceptions come from. Therefore we could include in the model constructs like personal background and environmental variables.

Hence, an alternative reference model has been proposed and tested by Davidsson since 1995. It includes the Ajzen's insights, but it is more entrepreneurship oriented. The following Figure summarizes the relationship between variables and constructs.

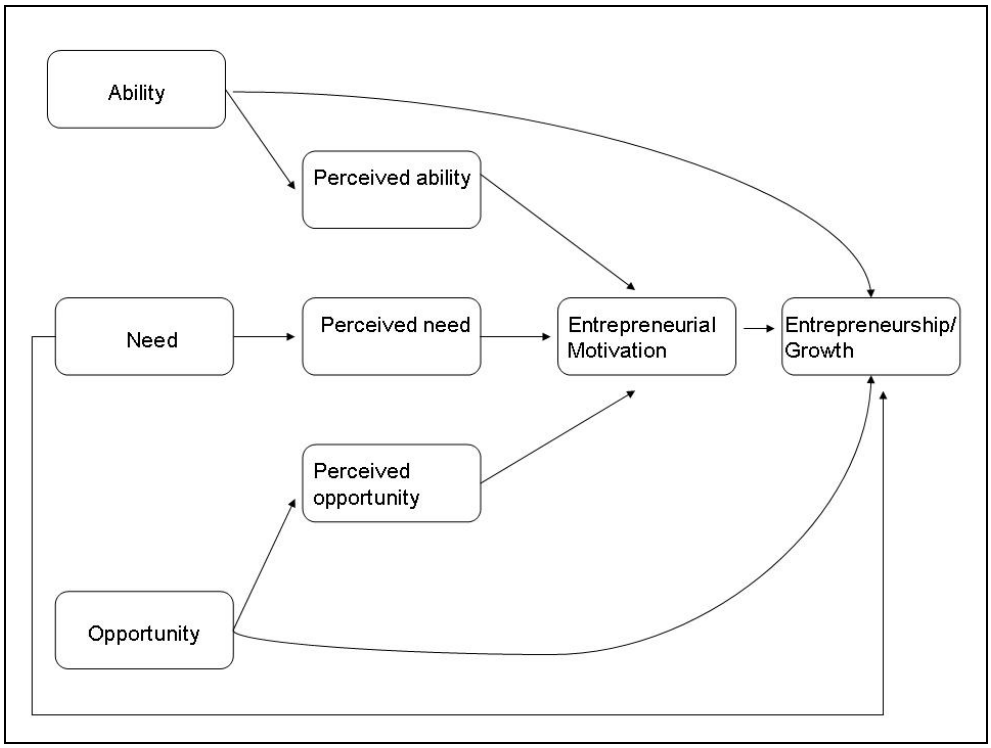


Fig. 5 Davidsson's eclectic model

The question whether and How motivations affect the entrepreneurial process has been answered by Shane, Collins and Locke (2003) in their interesting work. Because the pursuit of entrepreneurial opportunity is an evolutionary process in which people select out at many steps along the way, decisions made after the discovery of opportunities also depend on the willingness of people to ''play'' the game. Shane et al. (2003) argue that human motivations influence these decisions, and that variance across people in these motivations will influence who pursues entrepreneurial opportunities, who assembles resources, and how people undertake the entrepreneurial process.

And they add: *"Although previous researchers have rightly criticized much of the existing empirical research on the role of human motivation in entrepreneurship (Aldrich & Zimmer, 1986; Carroll &*

Mosakowski, 1987), we argue that inadequate empirical work does not negate the importance of understanding the role of human motivation in the entrepreneurial process. In fact, even sociologists who have argued strongly against the usefulness of trait-based research in entrepreneurship implicitly acknowledge that motivation must matter to this process. Aldrich and Zimmer (1986), for example, write, entrepreneurial activity ''can be conceptualized as a function of opportunity structures and motivated entrepreneurs with access to resources''

Shane et al.(2003) suggest that some or all of the motivations influence the transition of individuals from one stage of the entrepreneurial process to another. Their model is presented in the following figure. In some cases, all of the motivations might matter. In other cases, only some of the motivations might matter. The relative magnitudes of how much each motivation matters will likely vary, depending on the part of the process under investigation. In fact, it is quite plausible that motivations that influence one part of the process have all of their effects at that stage in the process and have no effects on later stages in the process. The nature of the opportunities matter, environmental conditions matter as we can see from the picture, furthermore the three authors are convinced hat these factors are important, but that it might also be interesting to know whether motivations of particular people lead to different types of entrepreneurial action under different environmental conditions.

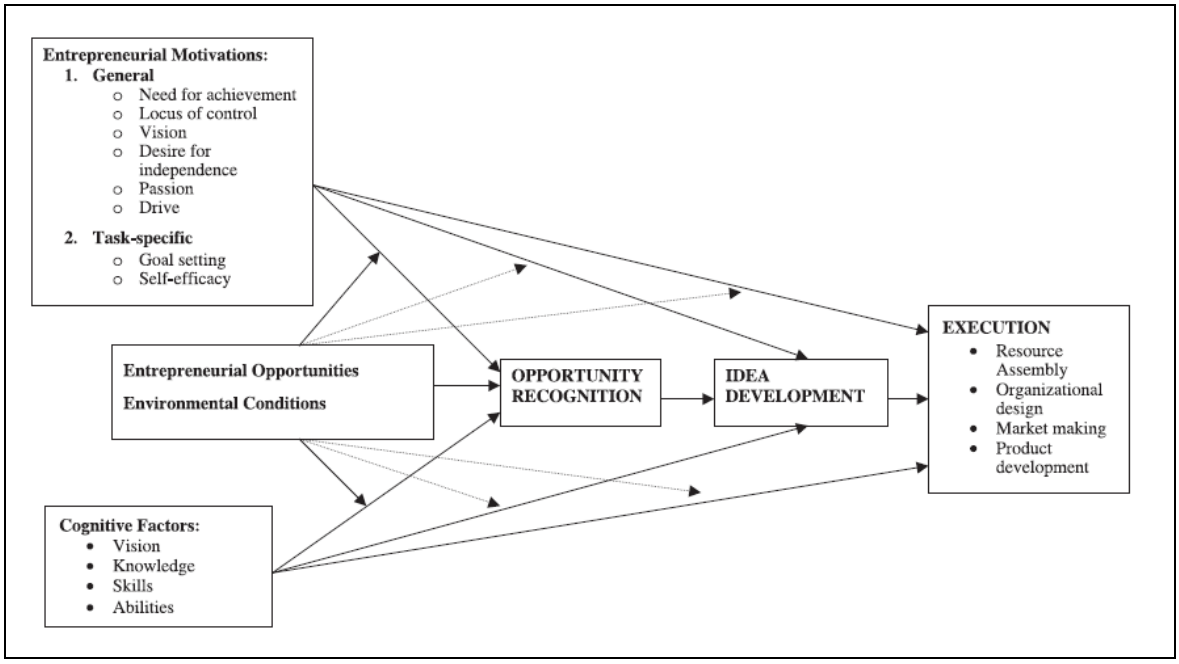


Fig. 6 Shane's perspective: how motivations influence the entrepreneurial process

They also propose some interesting suggestions for future research. Researchers could incorporate motivations into a dynamic evolutionary perspective on entrepreneurship by using motivations to distinguish those individuals who select out at different steps in the entrepreneurial process. "*For example, motivations could separate those individuals who positively evaluate opportunities from those who do not, those who obtain outside funding from those who do not, those who continue to pursue opportunities from those who abandon the effort, or those who pursue rapid rather than slow growth*." They think that researchers and scholars could theorize more deeply about how motivation might impact entrepreneurial decisions. "*Rather than falling back on the stock idea that firm founders must be fundamentally different types of people from other members of society, we suggest researchers consider how motivations might influence some people to make different decisions from others in the entrepreneurial process. For example, inventors higher in self-efficacy might found firms to exploit their inventions while inventors lower in self-efficacy might license their technology to others. Similarly, entrepreneurs with a greater need for independence might self-finance new firms, whereas those with a lesser need for independence might seek venture capital*."

They also suggest that it is not necessarily important for entrepreneurship researchers to show that specific motivations influence the financial performance of new firms. "*If financial performance of a new firm is conditional on the ability of an entrepreneur to create the firm, and that act of creation depends heavily on human motivation, then human motivation matters to entrepreneurship even if motivation has no direct effect on the performance of the newly founded firm. In fact, we would expect that the more significant a firm that an entrepreneur founds, the less their motivations influence the firm formation process. For example, the more significant the new firm that an entrepreneur builds, the less influence they will have personally on day-to-day operations, and the less that we would expect the financial performance of the firm to be affected by their personal motivations*."

In their theoretical work, based on their personal research activities and previous contributes Shane et al. (2003) review the past literature identifying several human motivations that influence the entrepreneurial process. Their article can be considered a crucial turning point in the filed of research on entrepreneurial motivation.

motivation	**source**	**literature**	**notes**
Need for achievement	Quantitative approach	McClelland 1961, Johnson 1990, Fineman 1977, Collins, Locke and Hanges 2000	McClelland (1961) argued that individuals who are high in nAch are more likely than those who are low in nAch to engage in activities or tasks that have a high degree of individual

			responsibility for outcomes, require individual skill and effort, have a moderate degree of risk, and include clear feedback on performance. Further, McClelland argued that entrepreneurial roles are characterized as having a greater degree of these task attributes than other careers; thus, it is likely that people high in nAch will be more likely to pursue entrepreneurial jobs than other types of roles. Johnson (1990) conducted a traditional review of 23 studies, which varied regarding samples, measurement of nAch,, and definitions of entrepreneurship. Based on this group of studies, Johnson concluded that there is a relationship between nAch and entrepreneurial activity—in this case, nAch distinguished firm founders from other members of society. In a similar review of 19 studies, Fineman (1977) concluded that both projective and questionnaire measures of nAch significantly predict firm founding. Collins et al. (2000) concluded that nAch is an effective tool for differentiating between firm founders and the general population but less so for differentiating between firm founders and managers. Further, they concluded that nAch might be particularly effective at differentiating between successful and unsuccessful groups of firm founders. Thus, nAch could play a very useful role in explaining entrepreneurial activity.
Risk taking	Quantitative approach	McClelland 1961, Liles 1974, Venkataraman 1997, Atkinson 1957, Begley 1995, Low and MacMillan 1988	Risk-taking propensity is another motivation of interest, which emerged from McClelland's (1961) original research on entrepreneurs. McClelland claimed that individuals with high achievement needs would have moderate propensities to take risk. Liles (1974) argued that entrepreneurs often must accept uncertainty with respect to financial well-being, psychic well-being, career security, and family relations. Moreover, several theories of entrepreneurship view the entrepreneur as bearing residual uncertainty (Venkataraman, 1997). Atkinson (1957) argued that individuals who have higher achievement motivation should prefer activities of intermediate risk because these types of activities will provide a challenge, yet appear to be attainable. On the other hand, individuals who score high on the motive to avoid

			failure will avoid intermediate risks. Instead, they will prefer easy and safe under- takings (because there is a high chance of success) or extremely difficult and risky ones (because it will be easy to explain failure without accepting personal blame). Following the lead of Atkinson, risk-taking propensity has been defined in the entrepreneurship literature as the willingness to take moderate risks (Begley, 1995). Despite these theoretical claims, previous research suggests that firm owners do not differ significantly from managers or even the general population in risk taking (Low & Macmillan, 1988).
Tolerance for ambiguity	Quantitative approach	Schere 1982, Budner 1982, Begley and Boyd (1987), Miller and Drodge (1986)	Schere (1982) argued that tolerance for ambiguity is an important trait for entrepreneurs because the challenges and potential for success associated with business start-ups are by nature unpredictable. Budner (1982) defined tolerance for ambiguity as the propensity to view situations without clear outcomes as attractive rather than threatening. Because entrepreneurs continually face more uncertainty in their everyday environment than do managers of established organizations, entrepreneurs who remain in their jobs are likely to score high on tests for this trait than would managers.
Locus of control	Quantitative approach	Rotter 1966, Shapero 1977, Durand 1975, Babb and Babb 1992, Brockhaus 1982	Rotter (1966) argued that individuals with an internal locus of control would be likely to seek entrepreneurial roles because they desire positions in which their actions have a direct impact on results. The research on locus of control suggests that firm founders differ from the general population in terms of locus of control. While locus of control orientation differs between firm founders and the general public, most studies have not found a difference between firm founders and managers on locus of control, a result similar to the situation with studies on nAch.
Self efficacy	Quantitative approach	Bandura 1997, Baum 1994	Self-efficacy is the belief in one's ability to muster and implement the necessary personal resources, skills, and competencies to attain a certain level of achievement on a given task (Bandura, 1997). In other words, self-efficacy can be seen as task-specific self-confidence. Self-efficacy for a specific task has been shown to be a robust predictor of an

			individual's performance in that task and helps to explain why people of equal ability can perform differently.
Goal setting	Quantitative approach	Trace, Locke and Renard (1998), Baum, Locke and Smith (2001)	Tracy, Locke, and Renard (1998) conducted a study of the owners of small printing firms. Both concurrent and longitudinal measures of four aspects of performance were obtained: financial performance, growth, and innovation. The quantitative goals the entrepreneurs had for each outcome were significantly related to their corresponding outcomes, both concurrently and longitudinally (nAch in this study was unrelated to performance). Baum, Locke, and Smith (2001) also found that growth goals were significantly related to the subsequent growth of architectural woodworking firms.
Indipendence	Qualitative approach	Hisrich 1985, Hornaday and Aboud 1973, Aldrige 1997	Independence entails taking the responsibility to use one's own judgement as opposed to blindly following the assertions of others. It also involves taking responsibility for one's own life rather than living off the efforts of others. Many investigators have observed that the entrepreneurial role necessitates independence. First, the entrepreneur takes responsibility for pursuing an opportunity did not exist before. Second, entrepreneurs are, in the end, responsible for results, whether achieved or not achieved. Further, individuals may pursue entrepreneurial careers because they desire independence.
Drive (ambition, goals, energy, stamina)	Qualitative approach	Locke and Latham 1990	We differentiate the four aspects of drive: ambition, goals, energy and stamina, and persistence. Ambition influences the degree to which entrepreneurs seek to create something great, important, and significant when they pursue opportunities. The nature of the entrepreneurial ambition may include making money or the desire to create something new, from conception to actuality.
Egoistic passion	Qualitative approach	Baum et al. 2001	it is a passionate, selfish love of the work. Some commentators like to pretend that businessmen's core motive is to selflessly serve their employees and society. We argue, in contrast, that ego is a central motive. The true or rational egoist passionately loves the work; they love the process of building an organization and making it profitable. They are motivated to do what is actually in their own interest—that is, to do everything

			necessary.

Tab. 3 Literature review

The recent contribution from De Clerq et al. (2009) tries to extend prior research that studied the role of entrepreneurial intentions in new venture creation. They ask what factors affect entrepreneurs' determination to exert high levels of effort to reach the goal of establishing a company. They combine Vroom's expectancy theory (Gatewood 1993 and Vroom 1964) with goal setting theory (Austin and Vancouver 1996; Locke and Latham 1990) "*to create a conceptual lens for examining factors associated with nascent entrepreneurs' goal commitment or the extent to which they exhibit attitudes that prioritize devoting substantial energy to their start-up activities*". In their framework the goal commitment can justify the relationship between personal characteristics and the way people act (Hollenbeck and Klein 1987; Klein et al. 1999), because it results from people's intention to pursue a goal and their persistence in achieving that goal. The same theory suggests that a person who can be considered highly motivated to achieve a goal is more likely to persist in achieving that goal compared with other subjects. Vroom's theory suggests to the researchers the following insights:

1) people select a level of effort to attain an outcome depending on their motivational force
2) this motivational force depends on expectancy, instrumentality and valence (Klein 1991, Vroom 1964).
3) Expectancy is the goal driven actions will result in goal attainment
4) Instrumentality is the perceived probability that attaining the goal will lead to the attainment of other goals in the future
5) Valence is the attractiveness of its attainment.

They found that

1) nascent entrepreneurs self efficacy relates positively to their goal commitment;
2) there is no support for the hypothesis that nascent entrepreneurs perception of available external financial support positively influences their goal commitment;
3) the attractiveness of entrepreneurship as career choice, based on personal preferences or normative pressures from the ecosystem, influences nascent entrepreneurs' willingness to invest energy in setting up their business. It is important to emphasize that "*internal factors have stronger effects on the level of commitment than external factors perhaps because prospective entreprenurs experience their personal preferences as more immediate factors*" (De Clerq et al., 2009)

Other contributions are relevant in order two systematize prior research on entrepreneurial motivations. If someone makes a decision to exploit an opportunity and to create a new venture, then we could label this decision as the Entrepreneurial Choice. Usually people undertakes this decision because they believe that the expected value of the entire process (monetary and psychological) exceeds the opportunity cost for alternative use of their time plus the premium " that they would like for bearing uncertainty and illiquidity".

This expected value is influenced by three different families of factors

1) the nature of the opportunity and the industry and institutional environment
2) psychological factors
3) non psychological characteristics of the entrepreneur

Inside Families 2 and 3 can be considered the motivation that drive the decision to exploit an entrepreneurial opportunity. In Shane's (2003) view the non psychological characteristics are:

1) income
2) unemployment
3) working spouse
4) education
5) career experience (general business experience + functional experience + industry experience + start-up experience
6) age
7) social position (social status and social ties

Shane (2003) reviewed three broad categories of psychological factors that influence the likelihood that a person will exploit entrepreneurial opportunities: aspects of personality and motives, core self evaluation and cognitive characteristics. Research has shown that five major aspects of personality and motive increase the likelihood that people will exploit entrepreneurial opportunities:

1) Extraversion (Barrick and Mount 1991, Roberts 1991) will increase the likelihood because opportunity exploitation is related to the ability to persuade others, particularly customers and employees that the opportunity that he/she has identified is valuable
2) Agreeableness (Barrick and Mount 1991) will reduce the likelihood that a person will exploit entrepreneurial opportunities because entrepreneurship requires critical and sceptical actors.

3) People who are high in need for achievement (Johnson 1990) will be more likely to exploit opportunities because the exploitation involves the following characteristics: ability to solve novel problems, goal setting, planning and information gathering
4) People higher in risk taking propensity (Stewart and Roth 2001) will be more likely to exploit opportunities because risk is central for entrepreneurship and to obtain returns for entrepreneurial activities.
5) The last factor is the desire of independence because entrepreneurship entails following one's own judgments.

Internal locus (Rotter 1966) of control and self efficacy (Bandura 1997) are two aspects of core evaluation that influence the likelihood to become entrepreneur. It is important to emphasize that they are simple traits and cannot be considered motivators. Internal locus of control has this effect because a person's willingness to exploit an opportunity depends of the self perception of the ability to influence others. Self-efficacy is relevant because exploitation of entrepreneurial opportunities requires confidence in one's subjective judgment under uncertainty. Shane adds three more cognitive factors: overconfidence, representativeness and intuition. They seem to be non relevant from a motivational point of view.

Reynolds (1992) proposed three factors that may affect the individual choice

1) the characteristics of the economic context;
2) the characteristics of the individual's life or career context;
3) the personal disposition.

By reviewing the literature, Naffziger et al. (1994) isolated five major motivational variables:

1) an entrepreneur's personal characteristics (need for achievement, locus of control and risk taking propensity + need for autonomy (Sexton and Bowman-Upton 1986), persistence and dominance (Neider 1987), desire for personal control (Greenberger and Sexton 1988), the desire to build something of one's own (Knight 1987))
2) individual's personal environment (social network). Martin (1984) is composed by five elements: (a) partial social alienation, (b) psychological disposition, (c) demonstration effects, (d) family factors, (e) precipitating events.
3) the relevant business environment
4) the specific business idea

5) the goals of the entrepreneur. Greenberger and Sexton (1988) identity the vision as a significant guiding force in the development of the new venture

The concept of entrepreneurial motivation is rare in the literature (Naffziger et al. 1994). The authors demonstrate that entrepreneurs are motivated to accomplish the goals that they set for themselves and their firms and will define their entrepreneurial experience as effective to the extent of the accomplishment of a goal or a set of goals. Their result accord with Porter and Lower (1968): entrepreneurs will be motivated to continue to behave entrepreneurially as long as they view that behaviour as instrumental in leading to goal accomplishment (as long as they view that behaviour as being effective or as long as they see entrepreneurship as the alternative with the highest expected outcome).

Park (2005) asserts that: "*All of these potential motivators could easily be realized in the technology sector, but a desire to achieve innovation and external recognition are two factors that would be well served by a technological entrepreneur. This suggest our knowledge of the internal driving forces for embarking on an entrepreneurial career is as a whole underdeveloped and a more detailed study with specific focus on career aspirations of technology entrepreneurs would deepen our understanding of the role of the individual in the foundation of high-tech ventures*".

Hessels et al. (2008) investigated entrepreneurial motivations using country level data from the Global Entrepreneurship Monitor for years 2005 and 2006. They found that countries with a higher incidence of increase-wealth-motivated entrepreneurs tend to have a higher prevalence of high-job-growth and export oriented entrepreneurship and that a country's level of social security relates negatively to the prevalence of innovative , high-job-growth, and export oriented entrepreneurship. They also found that the increase wealth motive mediates the relationship between socio-economic variables and entrepreneurial aspirations.

It is important to notice that the Global Entrepreneurship Monitor indicates only three main motivations:

1) necessity motive
2) independence motive
3) increase wealth motive.

Scheinberg and Mac Millan (1988) reported that the need for approval, the perceived instrumentality of wealth, the degree of community, the need for personal development, the need for independence and the need for escape led individuals toward new firm formation.
The contextualize view denies that personal characteristics of organization founders contribute anything of importance to the success of the venture (Aldrich 1989), regardless of whether the contribution originates in personality or in behaviour.

Shaver and Scott (1991) highlight: "the largely fruitless quest for the personality profile of the successful organizations founder is what psychologists call a personal endeavour. Such searches for transituation consistency in personality traits went out of style in psychology over twenty years ago when Mischel (1968) argued persuasively that behaviour should be regarded as the consequence of person-situation interactions".

The founders of new ventures give a variety of reasons when asked why they established their businesses. Cromie (1988) emphasize: desire for autonomy, interest in personal achievement, dissatisfaction with current job, desire to make money and unhappiness in current career. These motivators have been integrated in expectancy theory and its evolutions (Fishbein and Aijzen 1975, Vroom 1964). These theories predict that some motivational outcome will be determinated by the summed products of individual evaluative elements and individual subjective probabilities that the associated evaluative elements will be achieved by the action being considered. Two weak points are highlight by Shaver and Scott (1991):

1) the question on how particular elements – many of which are actual negative in the organizational context – should be scaled
2) If we assume that all the elements can be scaled and that – despite the uncertainties inherent in new venture creation – the subjective probabilities can also be specified, the expectancy formulations treat a highly desiderable, but low probability outcome, as equivalent to a much less desiderable, but highly probable outcome.

Van Gelderen and Jansen (2006) assert that autonomy is a primary motive for a large majority of small business starters, in fact "they like to be responsible, to decide on strategy, to decide on working methods and to regulate their own time". Studying a sample of 167 nascent entrepreneurs motivated by autonomy, they exploit the autonomy construct into three aspects: resistance towards bosses or rules, self-endorsment and power/control.

Based on previous contributions, Carter et al. 2003, they identify six categories of reasons (motivations) that individuals give for starting a business:

1) innovation, involved reasons that describe and individual's intention to accomplish something new
2) independence: described and individual's desire for freedom, control and flexibility in the usage of time
3) recognition: described and individual's intention to have status, approval and recognition from the community and his/her network
4) roles: described an individual's desire to follow family traditions
5) financial success: involved reasons that describe an individual's intention to earn money
6) self-realization: reasons involved with pursuing self-directed goals

They exploited previous studies, presented on the following table.

Authors	Findings
Scheinberg and MacMillan (1988)	Factor analysis of 38 items (based on prior research) and found six broad factors of reasons for business creation: need for approval, perceived instrumentality of wealth, communitarianism, need for personal development, need for independence, need for escape
Birley and Westhead (1994)	Survey with 23 reasons items to 405 owners. A factor analysis produced seven factors: need for approval, need for independence, need for personal development, welfare, perceived instrumentality of wealth, tax reduction, and following role models
Kolvereid (1996)	Surveyed 372 Norvegian business school graduates. 11 types of reasons fro choosing between self-employment and organizational employment: security, economic opportunity, authority, autonomy, social environment, work load, challenge, self-realization, participation in the whole process, avoid responsibility, career.
Carter et al. (2003)	They identify six categories of reasons (motivations) that individuals give for starting a business: innovation, independence, recognition, roles, financial success, self-realization

Tab. 4 Literature Review

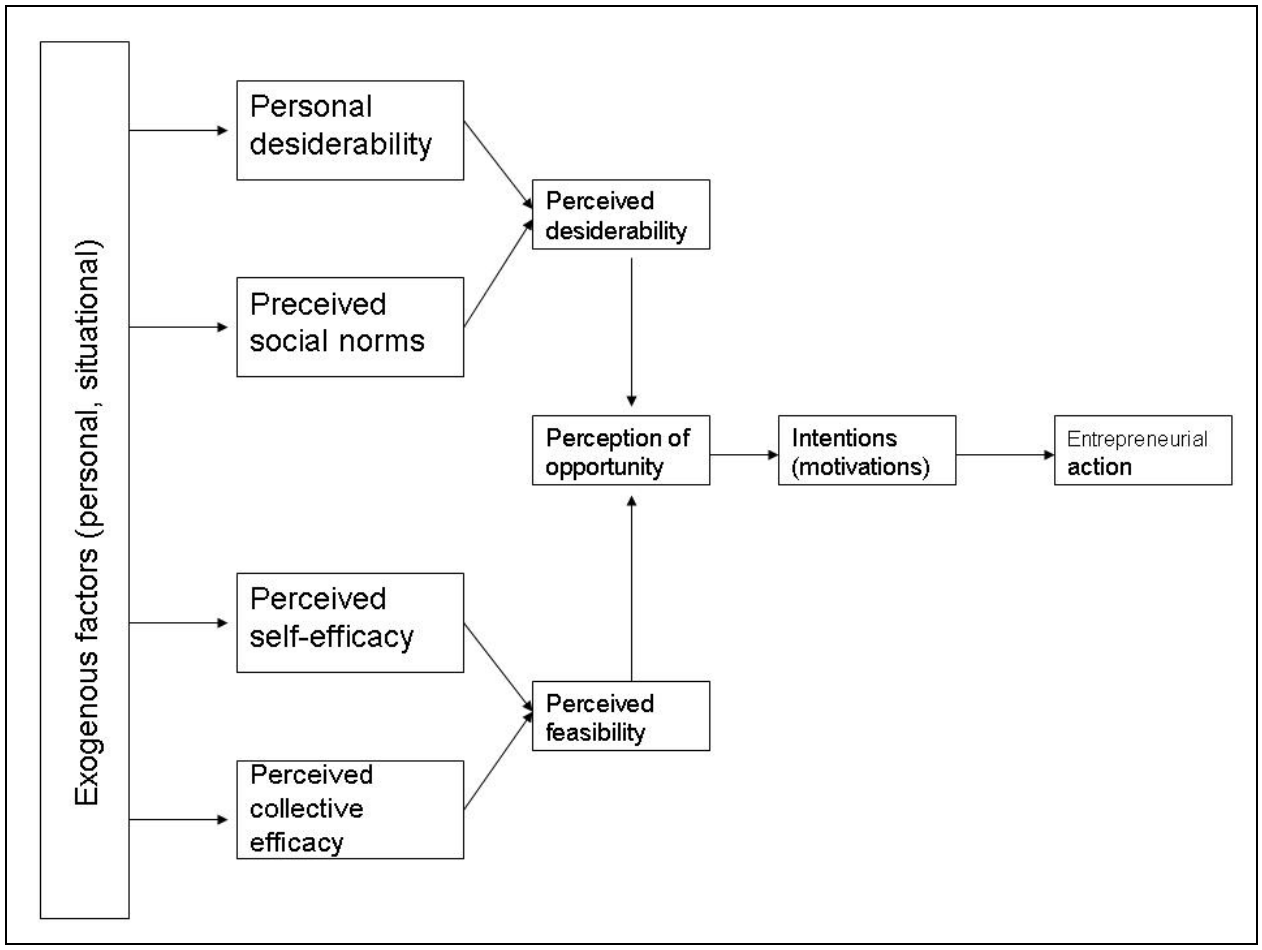
Using the Panel Study of Entrepreneurial Dynamics (PSED), a national database of nascent entrepreneurs, they surveyed 558 nascent entrepreneurs and comparison group participants. They conclude that entrepreneurs are similar to non-entrepreneurs on four scales: independence, financial success, self realization and innovation. In fact entrepreneurs and none entrepreneurs rated independence, financial success and self realization as more important than recognition, innovation or

roles. The difference are on roles and recognition: nascent entrepreneurs offer reasons for getting into a business that were less likely to take the validation of other into account.
Their findings are particularly valuable because they are based on prospective reasons, rather than prospective reasons. In fact "*nascent entrepreneurs offered prospective accounts for their choice of entrepreneurship, rather than retrospective reminiscences*"(Carter et al 2003).

The last contribution that we present within this selective literature review is the work by Kruger (2003). In his view motivations are synonymous of intentions. In cognitive psychology intention is the cognitive state immediately prior to executing a behaviour. Intentions (motivations) are thus central to voluntary human behaviour.

As Kruger (2003) asserted, if we are interesting in the phenomenon of the creation of new ventures, then we need to understand the process that lead up to their initiation. From a cognitive perspective, that entails a better understanding of the intent to undertake an entrepreneurial activity.

The starting point of Kruger's model is the Ajzen and Fishbein's theory of reasoned action. The combined impact of personal attitude and social norms have been proved not only conceptually, but it is also empirically robust. Ajzen's theory of planned behaviour added a third component called perceived behavioural control. Kruger combined these insights with the results by Shapero (1975, 1982). In Shapero's view the entrepreneurial event (defined as initiating entrepreneurial behaviour)depends on the presence of a salient opportunity. A credible opportunity depends on two crucial antecedents: perception of desiderability and perceptions of feasibility.
The following figure shows the model proposed by Kruger.



Tab. 5 Kruger's model (2003)

Chapter 3 – Selective Literature Review

Entrepreneurial Opportunities

3.a Definitions of the construct "opportunity"

Scholars and researchers dedicated greater attention and effort towards the construct called entrepreneurial opportunity. (Shane and Venkataraman 2000, Sarasvathy et al. 2003, Alvarez and Barney, 2006, Plummer et al. 2007, Davidsson 2008, Harms et al. 2009) Casson (1982) defines entrepreneurial opportunities as those situations in which new goods, services, raw materials, and organization methods can be introduced in the market and sold at greater than their cost of production Shane (2003) defines entrepreneurial opportunity as a situation in which a person can create a new means-ends framework for recombining resources that entrepreneur believes will yield a profit. A preliminary taxonomy is between Schumpeterian and Kirznerian opportunities. Schumpeterian opportunities arise out of technological , political and social changes (Schumpeter 1934), Kirznerian opportunities arise out of the errors and omissions of priori decision makers which have caused surpluses and shortages (Kirzner 1973, 1979) From one hand Kirzner (1973, 1985, 1997) asserts that the existence of opportunities requires only differential access to existing information. He explains that people use information that they possess to form beliefs about the efficient use of resources. People can male errors, during the decision making process, and they can create shortages and surpluses (Gaglio and Katz 2001) From the other hand Schumpeter (1934) shows how new information is important for the explanation of the existence of entrepreneurial opportunities. Changes in technology, political forces, regulation, macro-economic factors and social trends create new information that entrepreneurs or potential entrepreneurs can exploit to figure out how to recombine resources.

The two categories have different effects on economic activity as shown in the following table.

Effect	Notes
Market equilibrium	Schumpeterian entrepreneurship is a disequilibrating activity, while kirznerian entrepreneurship brings the economy closer to equilibrium
Information	Schumpeterian opportunities require new information, while Kirznerian opportunities does not require new information
Innovation	Schumpeterian opportunities are innovative and break away from existing knowledge, while Kirznerian opportunities are not very innovative and replicate existing organizational forms
Presence	Schumpeterian opportunities are rare, while Kirznerian are common
Creation vs discovery	The exploitation of Schumpeterian opportunities requires people who are willing to make decisions on very little evidence

Tab. 6 Kirznerian vs Schumpeterian opportunities

Previous definitions (by Casson and Shane) have been recently criticized by Davidsson. The central point is that in their view an opportunity is known to be a favourable situation. Therefore the term opportunity is fundamentally opposed to recognizing uncertainty as a fundamental aspect of the environment of the emerging activity of entrepreneurship. "At the time, the actors cannot know whether or not what they pursue is an opportunity" (Davidsson, 2005)

As far as their epistemological and the ontological features are concerned, two opposite views are available. Opportunities are like mushrooms in the forest (Davidsson 2008) Because of individual differences and information asymmetries all actors do not have access to exactly the same opportunities. This is the core of the "Discovery school": although recognition of opportunities is a subjective process, the opportunities themselves are objective phenomena that are not known to all parties at all time (Venkataraman 1997, Shane and Venkataraman 2000 AMR, Shane and Eckhardt 2003) The second view is called Creative School: opportunities are created in the entrepreneur's mind and it is not meaningful to talk about these opportunities separated from their creators. Venture ideas are internally generated based on more or less explicit and correct perceptions of external conditions. (Baker and Nelson 2005,) opportunities do not exist objectively , but are subjectively enacted (Gartner et al. 2001, Sarasvathy 2001, 2008)

Sarasvathy defines an entrepreneurial opportunity " a set of ideas, beliefs and actions that enable the creation of future goods and services in the absence of current markets for them".
Her notion of opportunity consists of: (Sarasvathy et al. 2003)

1) new idea or invention that may or may not lead to the achievement of one or more economic ends that become possible through those ideas or inventions.
2) Beliefs about things favourable to the achievement of possible valuable ends
3) Actions that generate and implement those ends through specific new economic artifacts

Both definitions (Casson's and Sarasvathy's), emphasize the concept of newness. This aspect has benne recently criticized by Harms et al. (2009) who showed how the dimensions of newness are not clearly addressed, " *For example, does an introduction of a product in a different regional market qualify as an entrepreneurial opportunity (regional dimension) ? Does a product variation qualify as an entrepreneurial opportunity (degree of newness)? And does an opportunity that is subjectively new for an economic agent but not to another quality as entrepreneurial opportunity (subjective dimension) ?* " (Harms et al 2009)

Plummer et al. (2007) found that many of the opportunities exploited by entrepreneurs may not be new objectively and that any theory of opportunity should distinguish between those opportunities that are new and those that are not. Their survey of the strategy literature suggests that Holcombe's (2003) contention that entrepreneurial activity leads to the emergence of new entrepreneurial opportunity is a compelling position from which to further investigate the origins of opportunity. They also emphasized that some opportunities born of prior exploitation are not objectively new as Holcombe suggests. They Therefore introduce the concept of underexploited opportunity, and suggest, that although such opportunities may be seen as new by future entrepreneurs, they are not objectively new at all.

More recently Casson and Wadeson (2007), starting from a resource based view, highlighted that the discovery of an opportunity generally involves a commitment of scarce resources and that in a world of scarcity these resources could have generated values if they had been deployed to an alternative use. " The exploitation of opportunities is a vital part of the economy's response to external shocks. When new scarcities arise, or existing scarcities tighten their grip, opportunities arise to economise on the scarcer resources and substitute other resources for them instead. Opportunity recognition, stimulated by the prospect of profit, encourages entrepreneurs to seek out the projects which help the economy to adapt to changing conditions.. In Austrian theory, it is the prospect of profit from an opportunity that motivates the search that leads to discovery."

By their theoretical and rich work, they present the following conclusions

1) an opportunity is defined as an unexploited project which is perceived by an individual to afford potential benefit
2) a discovery is the process of identification of an opportunity by an individual who scans the set of possible projects
3) an opportunity is discovered when a project meets the criteria established by the individual for a potentially successful project.
4) This view of entrepreneurial opportunities invokes the principle of rational action
5) An entrepreneur is someone who specialises in exercising judgment regarding the investment of scarce resources in projects

3.b Opportunities in Strategic Management Research

Outside the research field labelled as entrepreneurship the concept of "opportunity" seems to some scholars (Harms et al 2009) be underdeveloped. The core of entrepreneurship is the recognition or the creation of new opportunities. The core of strategic management is how these opportunities can be transformed and exploited in order to create a sustainable competitive advantage (Kuratko et al 2005, Zahra and Dess 2001).

Simon (1960) considered opportunities as starting point of the strategy making process. In what he addresses intelligence phase of the decision making process, every decision maker has first to perceive opportunities in order to solve economic challenges. In his view the perception of an opportunity is followed by the formulation of alternatives, the evaluation and finally the choice for one strategic action. Ansoff (1968) showed how in situations of bounded rationality, uncertainty and complex environments, entrepreneurs need to monitor the ecosystem and the external environment in order to seek potential attractive opportunities. Later, Abell (1980) refers "to the fact that there are often limited periods during which the fit between the key requirements of a market and the particular competences of a firm competing in the market are a optimum. He introduced the concept of "window of opportunity". In Porter's work (1985) the concept of opportunity is strictly connected to the concept of strategic competitive advantage. In Harms et al. (2009), the following Porter's quote is reported: "a firm should always aggressively pursue all cost reduction opportunities that do not sacrifice differentiation. A firm should also purse all differentiation opportunities that are not costly. Beyond this point, however, a firm should be prepared to choose what is the ultimate competitive advantage will be and resolve the tradeoffs accordingly". Key literature on Resource Based View seems not to deal with

the concept of opportunity. Only Foss and Knudsen define resources as " being valuable when they help seizing an opportunity in the firm's environment".

Other interesting contributions are summarized by the following table.

Theory	Foundations	Opportunity construct
Porterian structure-conduct-performance framework	Porter's five forces, structure-conduct-performance framework, firm as production function	Opportunities are objective artifacts defined by unmet needs or demands.
Resource based view	Organizational economics, firm as bundle of resources	Opportunities are objective artifacts but – in some case – may not exist outside the context of the firm. Defined as new resources or capabilities
Transaction cost economics	New institutional economics, economics of information, firm as governance structure for change	Opportunities are objective artifacts defined by possibility for reducing or exacerbating transactions
Evolutionary Theory	Evolutionary economics (Schumpeter), behavioural theory (Cyert, March, Simon), firm as repertoire of routines	Opportunities are objective artifacts to be found by search routines
Real options theory	Portfolio theories	Opportunities representative of investments today in anticipation of future investments given uncertainty

Tab. 7 adapted by Plummer et al. (2007)

Summing up we can accept the assertion of Harm et al. (2009) : the majority of authors in strategic management tends to have an implicit understanding of the concept of opportunity, which is geared towards the existent and non-context specific nature of opportunities.

3.c The "Discovery School" (or Discovery View)

The research in the entrepreneurship field can be divided into two approaches: from one hand the researchers who want the field of entrepreneurship to focus exclusively on individuals and those who want the field of entrepreneurship to focus exclusively on external environment and ecosystem conditions. Venkataraman and Shane's theory emphasize the characteristics of individuals and opportunities as the first order forces (Davidsson 2004) explaining entrepreneurship and hold that environmental forces are second order. They describe their approach as disequilibrium approach and

they highlight variations in the nature of opportunities as well as variations across individuals. In short the depict the economy as fundamentally characterized by heterogeneity.

Shane firmly believes and demonstrates that entrepreneurial opportunities exist independent of the actors in an economic system. In his view, prices, inventions, information "already engenders within itself opportunities for the creation of new ends" (Venkataraman 2003). However human creativity and some specific conditions have to exist for the objective opportunity to be brought to life. The reason why individuals (entrepreneurs) are required is because opportunities themselves lack agency: human beings can provide this agency so that when a market can come to be, it will come to be. This explicit discovery view of entrepreneurship can be considered in open contrast to an alternate view emerging in last few years, commonly called the creative view (or school). According to the creative view, opportunities do not exist in any objective form, but they are simply a social construction.

Shane's epistemological assumptions are the following:

1) entrepreneurship requires the existence of opportunities or situations in which people believe that they can use new means-end frameworks to recombine resources and generate profist (Shane and Venkataraman 2000)
2) opportunities have an objective component that does not exist solely in the minds of th entrepreneur
3) entrepreneurship requires differences between people
4) entrepreneurship requires a decision by a person to act upon an opportunity because opportunity themselves lack agency
5) risk bearing is a necessary part of the entrepreneurial process. The exploitation of an opportunity is by definition uncertainty ("Those engaged in the entrepreneurial process cannot know with certainty that their plan for recombining resources will result in a profit and not a loss at the time they make a decision to act, forcing the entrepreneur to bear risk in the entrepreneurial process")
6) the entrepreneurial process requires organizing
7) the entrepreneurial process requires some form of innovation

Shane accords with Schumpeter: the economy operates in a continual state of disequilibrium and change: situations arise in which people can transform resource into a form (new goods and services, new ways of organizing, new methods of production, new markets or new materials) and they believe will have greater value than their cost to create (Venkataraman 1997). The entrepreneurial process begins with the perception of the existence of opportunities , or situations in which resources can be recombined at a potential profit. Alert individuals, called entrepreneurs, discover these opportunities and develop ideas for how to pursue them , including the development of a product or service that will be provided by the customers. These individuals then obtain resources, design organizations or other modes of opportunity exploitation and develop strategies to exploit the opportunities. The following picture presents the process of entrepreneurship in Shane's view.

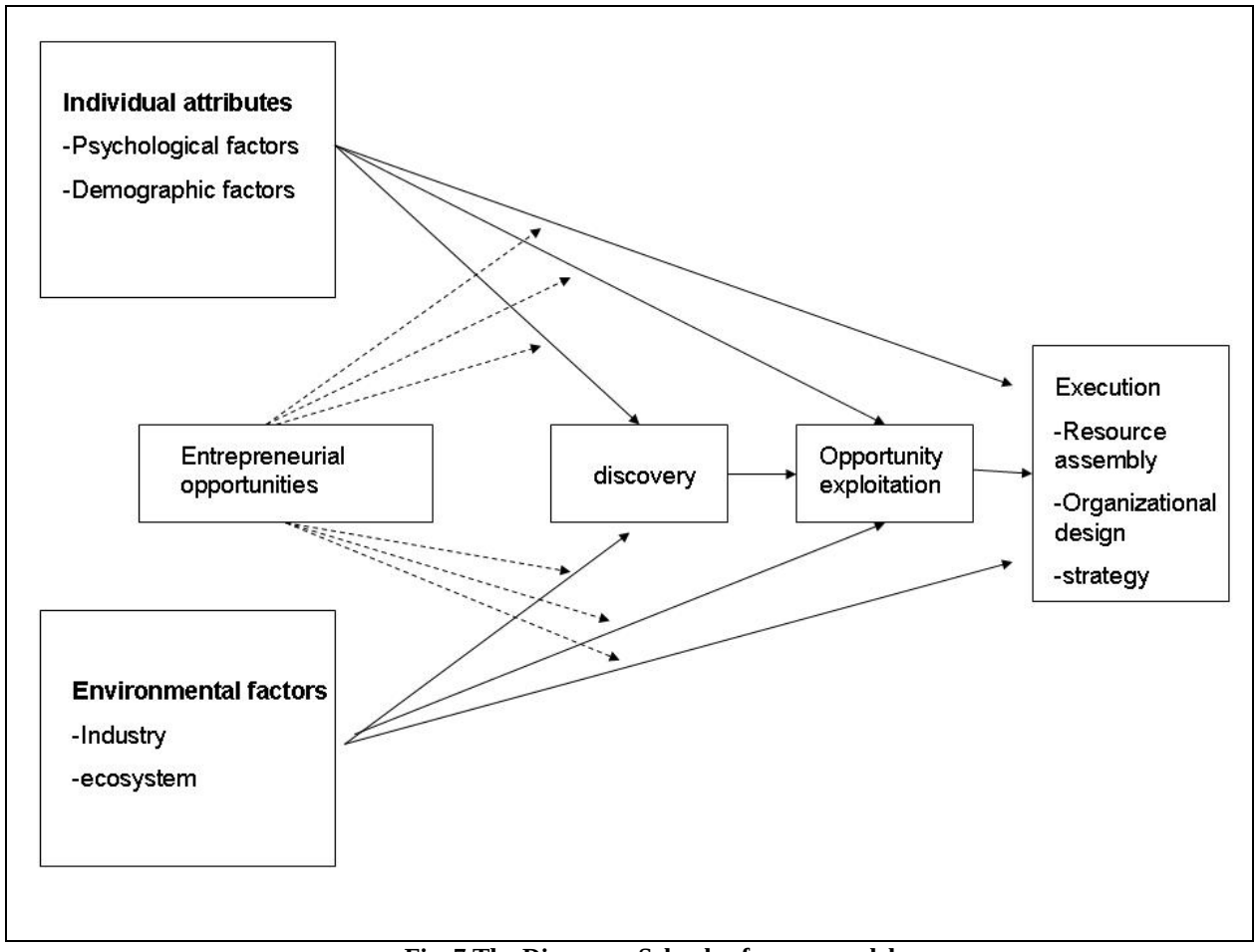


Fig. 7 The Discovery School reference model

As shown in the picture, the entrepreneurial process involves the identification and evaluation of opportunity ; the decision whether or not to exploit it ; the efforts to obtain resources, the process for organizing those resources into a new combination and the development of a strategy for the new venture. These different activities are all influenced by individual, industry and institution level factors.

As far as the term discovery is concerned, the considerations by Davidsson (2008) are particularly relevant: "*The term discovery may be suspected to reflect an objectivistic view on venture ideas. That is the term seems to suggest that they somehow exist out there, ready to be discovered. This is not a perspective I purport. Rather like Shane and Eckhardt (2003) I use the term discovery to maintain consistency with prior literature. Discovery refers to the conceptual side of venture development, from an initial idea to a fully developed business concept where many specific aspects of the operation are worked out in great detail especially as regards how value is created for the customer and how the business will appropriate some of the value (Amit and Zott 2001).* And he adds*: "Importantly, discovery is a process – the venture idea is not formed as a complete and unchangeable entity at a sudden flash of insight. Thus, it includes not only what is elsewhere called "idea generation", opportunity identification and opportunity detection, but also opportunity formation and opportunity refinement" (Bhave 1994).*

With respect to the creation of new opportunities, Discovery Theory assumes that entrepreneurs play a passive and responsive role. Such opportunities are created by exogenous shocks to an industry or market and are not created by entrepreneurs themselves. In Discovery Theory, entrepreneurs only become proactive when they begin to exploit an opportunity by bringing "agency to opportunity" (Shane, 2003).

Opportunities, in Discovery Theory, are assumed to have an existence independent of the entrepreneurs seeking to exploit them. That is, they exist, whether or not particular individuals, inside or outside an industry or market, are aware of them. In this sense, opportunities in Discovery Theory are like lost luggage at a train station. This luggage exists, whether or not it is claimed. The task of the entrepreneur is to become aware that this luggage exists and then claim it.

Discovery Theory suggests that entrepreneurship is predominantly about search—systematically scanning the environment to discover opportunities to produce new products or services.

In this search process, entrepreneurs must consider both its direction and duration, and must also guard against confusing local optima—where modest opportunities to produce new products or services exist—with more global optima—where much more substantial opportunities exist (Levinthal, 1997).

Thus, in order to explain why some people associated with an industry or market are willing and able to exploit opportunities to produce new products or services while others do not, Discovery Theory must necessarily assume that entrepreneurs and non-entrepreneurs significantly differ in their abilities to either see opportunities, or once they are seen, to exploit these opportunities, or both (Kirzner, 1973; Shane, 2003).

Shane (2003) cites six differences between entrepreneurs and non-entrepreneurs that can lead the former to perceive opportunities to produce new products or services not perceived by the latter. These include life experiences (Hayek, 1945), a person's position in a social network (Aldridge & Zimmer, 1986), the nature of the search process a person engages in (Gilad, Kaish, & Ronen, 1989), an individual's absorptive capacity (Cohen & Levinthal, 1990), intelligence (De Wit & Van Winden, 1989), and cognitive attributes (Busenitz & Barney, 1997).

Kirzner (1973) summarizes the differences between entrepreneurs and non-entrepreneurs that enable the former to be aware of opportunities about which the latter are unaware with the concept of "entrepreneurial alertness."

A variety of psychological and non-psychological differences among individuals have been identified as leading some to exploit opportunities of which they become aware, while others do not exploit these opportunities, even when they are aware of them. Some of the psychological differences identified in the literature include both personality characteristics—including extraversion (Wooten, Timmerman, & Folger, 1999), need for achievement (Begley & Boyd, 1986), risk taking propensity (Caird, 1991), locus of control (Shapero, 1975), self-efficacy (Baron & Markman, 1999), and so forth—and cognitive characteristics—including over-confidence (Busenitz & Barney, 1997), a willingness to generalize from small samples (Busenitz & Barney, 1997), and intuitiveness (Allison, Chell, & Hayes, 2000). Non-psychological factors identified in the literature include a person's age and gender (Long, 1982), their career experiences (Shane & Khurana, 2001), and the opportunity costs associated with exploiting an opportunity (Kanbur, 1980).

In general, Discovery Theory assumes that those who are aware of and seek to exploit an opportunity to produce new products or services typically operate in risky decision making settings. This assumption is closely related to the other two assumptions of Discovery Theory described here—

that opportunities are objective phenomena created by exogenous shocks to an industry or market and that entrepreneurs differ in some important ways from non-entrepreneurs.

Because opportunities to produce new products or services are objective phenomena, they can, in principle, be described by potential entrepreneurs, i.e., those individuals who are both aware of an opportunity and willing to exploit it

Armed with this information, potential entrepreneurs can apply traditional risk-based decision-making tools, including discounted present value techniques (Brealey & Myers, 1988), real options analysis (Kogut, 1991) and scenario analysis (Schoemaker, 1995) to make decisions about whether or not to exploit an opportunity. These tools all assume that potential entrepreneurs understand their opportunity costs, i.e., the value of the opportunities they forgo by exploiting one opportunity over another (Milgrom & Roberts, 1992).

3.c The "Creative School" (or Creative View)

Aspects of Creation Theory have been described by a variety of authors (Alvarez & Barney, 2005; Baker et al., 2005; Casson, 1982; Gartner, 1985; Langlois & Cosgel, 1993; Loasby, 2002; Sarasvathy, 2001; Schumpeter, 1934).

Opportunities are not assumed to be objective phenomena created by exogenous shocks to an industry or market. Rather, they are created, endogenously, by the actions of individuals exploring ways to produce new products or services (Baker et al., 2005; Gartner, 1985; Sarasvathy, 2001).

Ex ante, before an opportunity is created, its links with prior industries or markets are unknown. That is, Creation Theory suggests that the "seeds" of opportunities to produce new products or services do not necessarily lie in previously existing industries or markets. (effectuation theories, in fact, are more focused on the creation of new markets)

Entrepreneur's actions are the essential source of these opportunities. In this model, entrepreneurs do not wait for exogenous shocks to create opportunities and then provide agency to those opportunities, they act (Bhide, 1999). And in acting, they create opportunities that could not have been known without the actions taken by these entrepreneurs.

"Bringing agency to opportunities" is without meaning since opportunities do not exist independently of the actions taken by entrepreneurs to create them. Instead, opportunities only exist because of the actions of entrepreneurs to exploit them. In this sense, opportunities begin as beliefs in the minds of entrepreneurs. As entrepreneurs begin to take action to create opportunities, these beliefs

can become social constructs that guide subsequent actions of entrepreneurs and others associated with an industry or market—including customers and suppliers (Berger & Luckmann, 1967; Weick, 1979). Using the landscape metaphor introduced earlier, Creation Theory suggests that entrepreneurship is not about "climbing mountains" of opportunities, but rather, about "building mountains" of opportunities that are recognized, only after they have been exploited.

In Creation Theory, the term "search" also has little or no meaning. "Search" implies entrepreneurs attempting to discover opportunities that already exist. In Creation Theory, entrepreneurs do not search, they act, and observe how consumers and markets respond to their actions. However, ex ante, entrepreneurs and potential consumers have limited ability to know whether or not an entrepreneurial action will create a real opportunity

As entrepreneurs act upon their initial beliefs about opportunities and then observe the market responses, beliefs are transformed reflecting the acquisition and creation of information (Arrow, 1974) Creation Theory suggests that, ex ante, before entrepreneurs create opportunities, entrepreneurs may or may not be significantly different than non-entrepreneurs. However, those that take a more entrepreneurial path may find that certain cognitive attributes—including a systematic overconfidence and a willingness to generalize from small samples—are more positively reinforced than other cognitive attributes. This process can, over a period of time, create significant differences, ex post, between entrepreneurs and non-entrepreneurs. In this sense, differences between these groups may be the result of entrepreneurship, not just a cause of entrepreneurship (Hayward, Shepherd, & Griffin, 2005; Sarasvathy, 2001).

Creation Theory assumes that decisions made by entrepreneurs are usually made under conditions of uncertainty. Recall that a decision making context is uncertain when, at the time a decision is made, neither the possible outcomes of that decision nor the probabilities of those outcomes can be known.

"Creation Theory assumes that the end of an emergent process cannot be known from the beginning. In this view future outcomes are often unrelated to historical and current knowledge and information available. Possible outcomes of a stream of actions, decisions, and processes over time can generally not be anticipated, and even if they could be anticipated, the probability that these different outcomes will actually occur generally cannot be anticipated." (Alvarez and Barney, 2006)

Some elements of entrepreneurial expertise have been identified by the Creative School (Sarasvathy 2001 , Sarasvathy 2008). In summary they are

1) the bird-in-hand principle. This is a principle of means-driven (as opposed to goal driven) action. The emphasis here is on creating something new with existing means rather than discovering new ways to achieve given goals
2) the affordable-loss principle. The principle prescribes committing in advance to what one is willing to lose rather than investing in calculations about expected returns to the project
3) the crazy-quilt principle. The principle involves negotiating with any and all stakeholders who are willing to make actual commitments to the project, without worrying about opportunity costs, or carrying out elaborate competitive analysis
4) the lemonade principle. This principle suggests acknowledging and appropriating contingency by leveraging surprises rather than trying to avoid them, overcome them or adapt them.
5) the pilot in the plane principle. This principle urges relying on and working with human agency as the prime driver of opportunity rather than limiting entrepreneurial efforts to exploiting exogenous factors such as technological trajectories and socio-economic trends.

Effectuation is the inverse of causation. Causal models begins with an effect to be created. They seek either to select between means to achieve those effects or to create new means to achieve pre-selected ends. Effectual models, in contrast, begin with given means and seek to create new ends using non predictive strategies. Thus a causal logic - coherent with the discovery view - is based on the premise “to the extent we can predict the future, we can control it”, while an effectual logic is based on the premise “To the extent we can control the future, we do not need to predict it”.

The following pictures show a reference scheme of the creation theory and the comparison between the Creative and the Discovery Schools (process perspective).

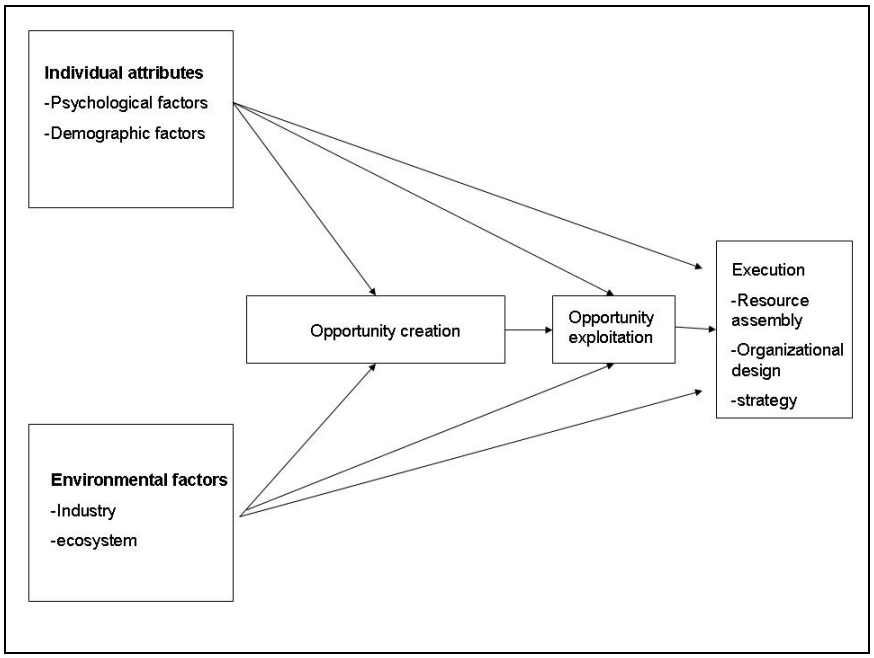


Fig. 8 The Creative School reference model

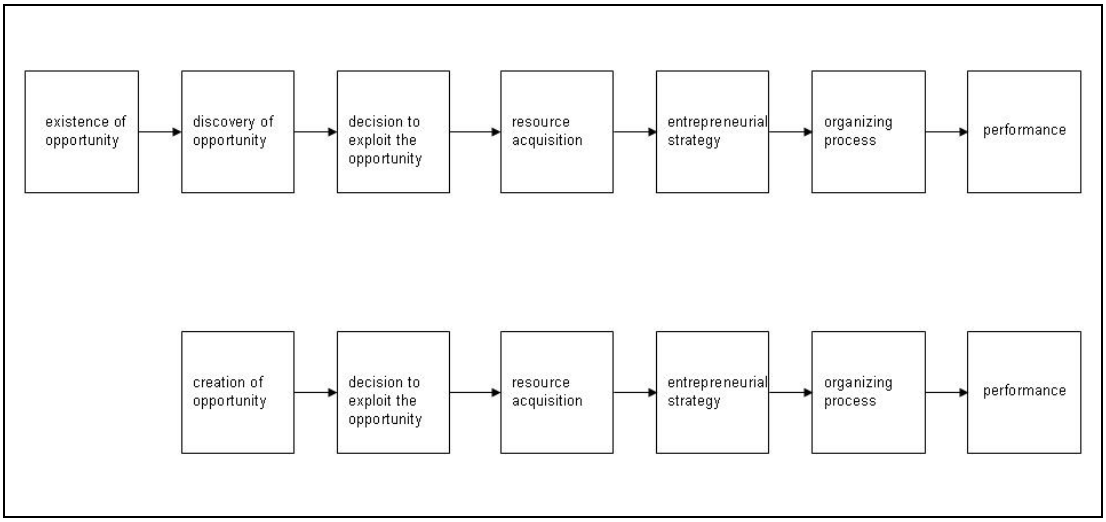


Fig. 9 Comparison between Creative and Discovery schools - process perspective

According to the pragmatist philosopher William James (1996), Sarasvathy thinks that "*entrepreneurial opportunities begin where everything of importance in human affairs begins - in the world of pure experience*.". Opportunities are as much the outcomes of what entrepreneurs do as the data on which entrepreneurs base their actions.

Sarasvathy is convinced that there exists an entrepreneurial mode of reasoning and action that creates profitable opportunities in the world. Here her fascinating words: "*Just as the scientific method enables the creation of technological artifacts from existing materials of the real world, the entrepreneurial method enables the creation of social and economic artifacts through the actions of individual entrepreneurs and their interactions with a variety of stakeholders in the real world*".

Her thesis presents a different perspective from Shane's theories. "*The question here is not whether opportunities exist objectively in the world or whether they exist primarily in the entrepreneur's mind. Instead the key debate concerns whether opportunities make entrepreneurs or whether entrepreneurs create opportunities.*" (Sarasvathy 2008)

Some follower of the theories of Simon assert that the world exists, however one perceives it or interprets it or not. But that does mean, in Sarasvathy's view, that technologies or opportunities cannot be made and can only be found. "*On the supply side technologies have to be invented , fabricated, constructed, made. So, too, I contend on the demand side: opportunities and markets have to be invented, fabricated, constructed, made – through the peculiar processes of effectual action and interaction the entrepreneurial method comprises*". (Sarasvathy 2008).

And she concludes here analysis by emphasizing that entrepreneurial opportunities are the corridors that entrepreneurs construct leading from the daily aspirations of all human beings to live well and obtain greater control over their particular destinies to the organization of preferences, utilities institutions and technologies that the social sciences seek to study under the rubric of markets.

3.c Opportunity recognition

A selective literature review on entrepreneurial opportunities would be uncompleted without crucial considerations about the process of opportunity recognition. Shane asserts that formulating a profitable conjecture about an opportunity is far from the trivial exercise of optimizing within existing means-end frameworks because it requires forming expectations about the prices at which goods and services that do not yet exist will sell (Venkataraman 1997). When these conjectures prove correct, entrepreneurs earn entrepreneurial profit, but when they prove incorrect, entrepreneurs incur entrepreneurial loss.

"*Entrepreneurs see ways to put resources and information together in new combinations. They not only see the system as it is, but as it might be. They have a knack for looking at the usual and seeing the*

unusual, at the ordinary and seeing the extraordinary. Consequently, they can spot opportunities that turn the commonplace into the unique and unexpected" (Mitton 1989).

In 2006 Baron clarified how entrepreneurs identify opportunities for new business ventures. He asserted that they use the cognitive frameworks that they have acquired through experience to "perceive connections between seemingly unrelated events or trends in the external world. In other words they use cognitive frameworks they possess to connect the dots between changes in technology, demographics, markets, government policies and other factors. The patterns they then perceive in these events or trends suggest ideas for new products or services – ideas that can potentially serve as the basis for new ventures." (Baron 2006). In his view three factors are crucial in the opportunity recognition activity:

1) engaging an active search for opportunities
2) alertness to them (Kirzenr 1973). In fact opportunities can sometimes be recongized by individuals who are not actively searching for them.
3) prior knowledge of an industry or market.

His result can be summarized by the following propositions:

(a) Opportunities emerge from a complex pattern of changing conditions – changes in technology, economic, political, social and demographic conditions. They come into existence at a given point in time because of a juxtaposition or confluence of conditions which did not exist previously but is now present

(b) Recognition of opportunities depends in part, on cognitive structures possessed by individuals – frameworks developed through their previous life experience. These frameworks , which serve to organize information stored in memory in ways useful fro the persons who possess them as templates that enable specific individuals to perceive connections between seemingly unrelated changes or events. In other words the cognitive basis for connecting the dots into patterns suggestive of new business opportunities.

Vaghely and Julien (2010) exploit the knowledge management and information processing principles in order to evaluate if opportunities are recognized or constructed. Based on a case study of ten SMEs, the show how the entrepreneur's information processing is a dynamic combination of algorithmic and heuristic information treatment. During the processes of interpretation, construction and enactment of their environment, entrepreneurs – and thus their organizations – use a trial and error

type of information processing for sensemaking and opportunity construction. They combine this behaviour with patterns of information based on their experience to identify opportunities.

Two different entrepreneurial information processing patterns are described by the authors:

1) cognitivist information processing: "entrepreneurs compare their representations of the environment in order to shape the dominant logic of their network. On the basis of available information, the entrepreneur tries to shape a model of reality which is as accurate as possible. In this sense, the entrepreneur may be compared to an information processing machine.. According to the cognitivist vision, knowledge is explicit, and formal.
2) Constructionist information process: "Entrepreneurs process new information in a interpretative way; they construct their reality by using information from their environment. Information, in turn, leads to knowledge based action. The information result from sensemaking and reconstruction."

They conclude that entrepreneurs, considered and studied as information processors use more or less both approaches to identify opportunities and thus entrepreneurial opportunities can be recognized and constructed at the dame time in a variety of combinations and recognized and constricted individually.

Finally Kruger (2003) asserts that Entrepreneurs appear to identify opportunities based on cues and signals from the environment that they filter and process through a number of mechanisms, like intentions and conjectures. Shapero (1982) used the analogy of "antennae" – we all have our antennae tuned to certain frequencies (and in different directions). Entrepreneurs are no different except in what directions, etc. their antennae are tuned.

3.f Sources of Opportunities

Schumpeter (1934) identified five different categories of change.

1) the creation of new products or services
2) discovery of new geographical markets
3) the creation or discovery of new raw materials
4) new methods of production
5) new ways of organizing

An isomorphism can be highlighted between these categories and the traditional concept of value chain.

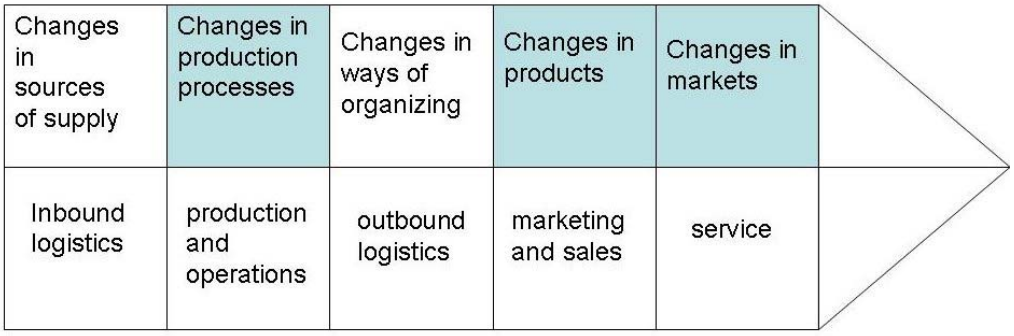


Fig. 10 adapted by Shane (2003)

Chapter 4

The Research Questions

4.a The gaps in the literature

"Economic circumstances are important, marketing is important, finance is important, even public agency assistance is important . But none of these will, alone, create a new venture. For that, we need a person, in whose mind all of the possibilities come together , who believes that innovation is possible, who has the motivation to persist until the job is done."(Shaver and Scott 1991, ETP)

Research clearly demonstrates that the profit-maximizing rationality of economic theory is not what solely or even primarily characterizes the individuals who engage in entrepreneurial action (Amit et al. 2000, Wiklund et al. 2003) .In order to really understand what goes at the micro level in the entrepreneurial domain there is every reason to study emotions, cognitions, behaviors and other characteristics of the individuals involved (Davidsson 2008). The type of individual entrepreneurial motivation may determine the goals and aspirations for the firm, which may determine macroeconomic outcome (Hessels et al. 2008). Stable and innate characteristics of individuals will never be the major explanation of single events like starting a new firm (Davidsson 2008).

From previous research we can conclude that personal motivations are not reliable predictors of entrepreneurial activities, but they are relevant element that influence the decision to start-up and the entrepreneurial status of an individual. A gap emerges from the literature review, in fact

- different contributions tried to offer a list of relevant motivations
- there is no consensus between scholars on the exact role of motivations and we are still far from a shared theory on entrepreneurial motivations

- there is no assessments of these motivations
- there has been research focused only on the decision to start-up and only few studies are focused on the decision to persist in an entrepreneurial status

Opportunity also seems to be a notion that arouses a lot of controversy among entrepreneurship researchers. Some seen to regard opportunity as objectively existing in the environment where others hold that opportunity is created by the entrepreneur (Davidsson 2003).

Is it a semantic battle ? Davidsson emphasizes the four ways in the entrepreneurship literature for the usage of the term opportunity:

1) set of external conditions known in retrospect to be favourable for the successful discovery and exploitation of new business activities
2) set of external conditions thought but not proven to be existing and favourable for the successful discovery and exploitation of new business activities
3) for specific new venture initiatives known in retrospect to be viable
4) for specific new venture initiatives that are currently being pursued but whose viability is not yet proven.

Vaghely and Julien (2010) point out that there is dichotomous interpretation on entrepreneurial opportunity. For some entrepreneurial opportunity is objective,; endogenous; discovered; exclusive; centred on the entrepreneur and the way he process information. For others it is subjective; exogenous; enacted, inclusive and social cognition based, centred on the context and the network where the entrepreneur acts. They focus exactly on our gap. Two schools are discussing and doing research. The tow perspectives are summarized by the following table

	Discovery theory	***Creation theory***
nature of opportunities	Caused by exogenous shocks	Caused by endogenous actions of individuals to produce new products or services
nature of entrepreneurs	Entrepreneurs are different than non entrepreneurs	Entrepreneurs may be the same or different than non entrepreneurs

nature of decision making	Those who are aware of and seek to exploit opportunities operate under conditions of risk	Those creating opportunities act under conditions
logic	Causation	Effectuation

Tab. 8 Discovery vs Creative School

Sarasvathy et al. (2003) assert that there exists an important area for research in the conceptual gap between a technological innovation and the markets that come into existence based on that innovation – a gap in our understanding of economics that is filled by the notion of "entrepreneurial opportunity".

Again we could focus on the same question: whether opportunities objectively exist or if the economic actor creates them. In other words: do opportunities exist "out there" independently of a person identifying and action upon the opportunity, or do entrepreneurs create opportunities where none existed before they pursue them?

Davidsson (2008) insists and presents three main views

1) objectivist: opportunities exist out there as ready to use entities. They are like mushrooms in the forest
2) objectivist-subjectivist: opportunities exist "out there" as ready to use entities. But, because of individual differences in perception, knowledge, and skills, all actors do not have access to the same opportunities (Shane and Venkataraman 2000, Shane and Eckhardt 2003). This is what we call discovery theory
3) subjectivist-creative. Opportunities are create din the entrepreneur's mind and it is not meaningful to talk about these opportunities separate from their creators (de Konig 1999, Gartner and Carter 2003 and Sarasvathy 2001).

Between the two theories it seems that "*tertium non datur*". Is the Aristotelian logic valid even in this case?

4.b The Research Questions

From the selective review of the literature we note Insufficient consideration of the role of the human motivations in the entrepreneurial process in the recent entrepreneurship research. Environmental factors being held constant, human motivation plays a critical role in the entrepreneurial process (Shane et al. 2003)

The first research question is thus the following. What are the relevant entrepreneurial motivations that drive the entrepreneurial choice within high-tech emerging ventures? How and why motivations change in the phases of life of the firm? We want to investigate the main motivational driver of high-tech entrepreneurs and eventually we want to identify the mechanism that lead the eventual change of entrepreneurial motivations.

The debate on the nature of entrepreneurial opportunities is still on. 2 main schools. Is any reconciliation possible? The second question is the following. Do entrepreneurs recognize or create technological opportunities?. How the two processes – recognition and creation – come off?

We are not going to propose a reconciliation theory: our aim is to demonstrate that both the perspectives are practically relevant and thus a general theory of entrepreneurship should take into account the dichotomous nature of entrepreneurial opportunities, distinguishing between objective opportunities and effectually created opportunities.

It is important to point out that those questions go directly into the nexus and aim to clarify the nature of this connection, that has been till today under-researched by scholar and considered like a black box.

4.c Relevance of the research questions

The first question is relevant from a theoretical point of view because it contributes to the effort of conceptualizing and deepening the process and mechanisms of the emergence of new ventures. From a practical point of view, the focus on motivations and entrepreneurial intentions can be useful in order to complete the fundamental issues of the recent discipline called entrepreneurship education

From a practical point of view the second question is relevant because entrepreneurs need to be aware and alert on opportunities. The nature of entrepreneurial opportunities, in fact influences directly their behaviour, their choices and their decision making process. Should they be more alert on objective and external opportunities? Or should the entrepreneurial effort be guided by the aim of fabricating and creating commercial and technological opportunities?

Both questions are relevant in order to describe the x-axis and the y-axis of the “nexus” between an enterprising individual and the technological opportunities that he crates or recognizes.

Chapter 5

Method and Research Protocols

5.a General Considerations

Entrepreneurship is a dynamic process and therefore demands investigative techniques that takes this dynamism into consideration (Shane 2004). The joint investigation of both factors (nature of opportunities and enterprising individuals is a critical path to research "inside the nexus" (Davidsson 2005). Both qualitative (mainly case studies) and quantitative (statistics) approaches have been planned in order to answer to the research questions presented by this doctoral thesis.. "Research includes a combination of perceptions of reality based on real world data, attitudes, received theory, and persona, whether these are expressed as numbers, equations, letters or words." (Gummeson 2006). Quantitative data should be collected through a survey, sent to the firms of the database Veneto high-tech.

Case studies accord to the suggestions proposed by Eisenhardt (1989), Yin (2002), Gummeson (2006) and Flyvberg (2006). The exploratory nature of this study suggests the use of a qualitative methodological approach, and in particular the multiple case studies . Multiple case studies research is a useful tool to understand the complex nature of entrepreneurship, as recommended by Gartner and Birley (2002). The cases have been strategically selected within the considered population (Veneto high-tech database), according to Flyvberg (2006) on basis of size, industry, products, innovative activities, geographical equilibrium and personal knowledge of the entrepreneur. The main limit of this approach is the possibility to present general determinants of phenomena through a limited number of cases.

As we will see below, the cases are based of semi-structured interviews with entrepreneurs and managers. Starting form the their personal story and career, the interview covered the following topics: story of the firm or previous work experience, the products, the market, innovation activities, networks, industrial and economic ecosystem and technology and knowledge management, the internal organization. The analysis of the annual reports, the website and other information available on the Internet .A single case study for every enterprise by the researcher, in order to summarize and better fix the interviews and the entrepreneur words. A feedback mechanism: every single case should be read , rectified or amended by the people who has been interviewed

The Nvivo 8 software tool has been used in order to collect and analyze qualitative data.

5.b Qualitative research: case studies

Case studies can capture processes. They involve direct and rich observations of real behaviours as opposed to the data that can be obtained through archival data, survey research and laboratory research. (Davidsson 2008) All in depth case approaches share the limitation that statistical generalizability cannot be obtained . We are more interested in the obtaining analytical generalizability and in the generation of new concepts.

According to Park (2005) More widespread use of qualitative research can reveal new insights into the complex and interactive process of opportunity recognition (or creation) in the high-tech start-ups.

Furthermore when cases are retrospective and interview based, there are many method issues that fundamentally threaten the validity of the findings come to the fore. We will not deal with the direct observation of behaviours, but their retrospective self reports. These reports are subject to memory decay, hindsight bias/rationalization after the fact and social desiderability problems (Davidsson 2008). Cognitive psychology suggests that memory is constructive in nature (Anderson 1990). The respondent of a survey or of an interview can be honest and careful, but it is likely that during the years he distort the image of what happened during the start-up process or during the particular temporal moments considered by the interviewer.

This problem is remedied through triangulation (other informants, written documentation, secondary data, past reports, analysis of balance sheets and business plans).

For example the stereotype of the highly independent, financially driven, self-actualized entrepreneur, may be nothing more than a distillation of the retrospective stories that entrepreneurs have told researchers in the past (Carter et al 2003). The use of multiple informants and supplementary data from documents may remedy these problems to some extent.

All existing business activities considered as research objects are eligible of retrospective studies, but such studies can be subject to severe selection and hindsight biases (Davidsson 2004).
According with his suggestion we studied some phenomena as processes as they happen. In fact Microlife (case B) is an extremely young company, while H-Farm and M31 are companies constantly involved in the process of new venture creation and thus in a particular status of "eternal youth".

In this qualitative study we are not interested to reach statistical representativeness but we are going to demonstrate the theoretical representativeness of our sample. In fact "stratified and deliberately narrow samples, and even judgment samples may on theoretical grounds be preferable in some situations" (Davidsson 2004).

Shane et al. (2003) emphasized four suggestions to researchers interested in examining the effect of motivations on entrepreneurial decisions about how to deal with variation in opportunities. We think that is important to discuss them, highlighting the recommendations that could or could not been accepted in our study. They suggest:
1) researchers could explore settings in which potential entrepreneurs pursue reasonably identical opportunities. Ant this is the example that they report "*For example, every year, many potential entrepreneurs evaluate and pursue opportunities to purchase McDonald's franchises. When a person applies to be aMcDonald's franchisee or company-owned outlet manager, one applies only to be part of the system rather than to select a particular outlet. Therefore, the opportunities to which people respond in this setting are identical. By comparing the motivations of a sample of people seek to be McDonald's franchisees with people who seek to be McDonald's company-owned outlet managers, researchers can determine the contributions of particular motivations on the decision to entrepreneur* "
2) as a variety of researchers are beginning to do, scholars could employ experimental designs in which potential entrepreneurs are asked to make a series of entrepreneurial decisions in a controlled simulation. By measuring the motivations of potential entrepreneurs and examining the correlation between the motivations and the decisions made in these simulations, researchers could determine how motivations influence entrepreneurial decisions.
3) a way controlling opportunity is to use a sample of entrepreneurs within the same industry and country (or region), and to measure aspects of the environment that might vary within industry and

region. The three authors recommend these approaches to limiting other sources of variance than motivations from studies of motivation and entrepreneurship.

4) Scholars could employ third parties to code the value of potential opportunities. For example, researchers could explore the propensity of inventors to found companies based on their inventions. Because all inventors are at risk of exploiting their inventions through firm formation, this setting provides a useful context in which to explore the decision to entrepreneur. By partialing out the externally evaluated value of the opportunities, researchers could determine whether motivations influence the decision to entrepreneur, net of the effects of the value of the opportunity.

We think that, in our case, the most useful suggestions are number one and three. The first one seems to be particularly difficult to be realized. High-tech companies are often unique, and finding the same set of opportunities that can be potentially pursued by many entrepreneurs is quite complicate within the high-tech environment. The high tech products are not the same. The lifecycle of different firms rarely coincide.

Suggestion number 3 is implemented by this research because

1) we considered only some selected industries (manufacturing high tech emerging ventures)
2) we considered a region – the Veneto region – which is quite homogenous as far as the industrial model is concerned .

Experimental design have been excluded because it requires lot of experience to be carried out successfully. Third part involvement has been excluded because motivations are personal features and their interpretation cannot be delegate.

5.c Protocol for qualitative research

In this section we present the protocol for qualitative research: the algorithms that we used in order to build the case studies, to code them with the help of Nvivo8 software and to develop new theoretical insights from the coding and the comparison procedures. NVIVO8 provides a sophisticated workspace that lets you work through your material - discovering patterns, identifying themes, gleaning insight and ultimately, delivering informed, robust findings. Qualitative research software like NVivo, helps people to manage, shape and make sense of unstructured information. It doesn't do the thinking for you; it provides a sophisticated workspace that enables you to work through your information.

With purpose built tools for classifying, sorting and arranging information, qualitative research software gives you more time to analyze your materials, identify themes, glean insight and develop meaningful conclusions. NVivo is a proprietary desktop software package for the organization and analysis of complex non numerical unstructured data, also known as qualitative data. It is primarily used by qualitative researchers working with very rich text-based and/or multimedia information, where deep levels of analysis on small or large volumes of data are required. This type of analysis can encompass academic studies, business intelligence, market research or data analysis. The software allows users to classify, sort and arrange thousands of pieces of information; examine complex relationships in the data; and combine subtle analysis with linking, shaping, searching and modelling. NVivo accommodates a wide range of research methods, including network and organizational analysis, action or evidence-based research, discourse analysis, grounded theory, conversation analysis, ethnography, literature reviews, phenomenology and mixed methods research For this doctoral thesis, NVivo8 has not been used for the selective literature review, but for the management of part of the data fro qualitative research.

The protocol for qualitative research has been the following

1) selection of the potential case studies from the database Veneto High-Tech (see the following section for a complete description of the database)

2) information retrieval about the company in order to understand who is/are the entrepreneurs potentially interested and to obtain some contact information

3) letter (email) to the company, presenting the research theme and asking for a meeting with the entrepreneur

4) meeting with the entrepreneur – interview. The interviews are semi-structured. Starting form the personal story and career of the entrepreneur, the interview covers the following topics: story of the firm or previous work experience, the products, the market, innovation activities, networks, industrial and economic ecosystem and technology and knowledge management, the internal organization. The interviewer used particular attention on both the relevant topics for this thesis: entrepreneurial motivations and entrepreneurial opportunities.

5) collection of secondary data (website, articles, other financial, public or private data about the company/the entrepreneur relevant for our purposes.)

6) transcription of the interview

7) coding using NVivo 8 (a list of items, variable is available below).

8) written case study

9) double feedback from the entrepreneur and the supervisor about the written case studies

10) analysis and comparison between case studies – recognition for main constructs and relationships.

11) comparison with the literature

12) identification of potential answers to the research questions and eventual theory development

13) empirical evidence has been systematized into theory development.

The lenses that we used to analyze the case studies and thus used for theory development are based on the following assumptions:

a) entrepreneurship is a process (Davidsson 2008), thus it is a phenomenon that have to be evaluated with a reference temporal axis
b) cross case analysis should search for similar patterns or differences (Eisenhardt 1989)
c) attention from the interviewer and the analyzer of the collected data to the motivational constructs
d) attention from the interviewer and the analyzer of the collected data to the opportunity constructs
e) entrepreneurship can be analyzed through the "nexus" theory (Shane and Venkataraman 2000)
f) the same phenomena can be analyzed exploiting the five principles of effectual reasoning (Sarasvathy 2008)

The following table show the items, variable and constructs that have been used in order to code the case studies. Part of them come from the selective literature review, while others have been built during the analysis.

Entrepreneur	Source of opportunity (technological change)
Motivation	Source of opportunity (social change)
Opportunity recognition	Source of opportunity (political change)
Opportunity identification/detection	Kirznerian opportunity
Exploitation	Schumpeterian opportunity
Network	Decision making process
Intellectual property / patents	Objective opportunity
Evolution	Finance
Enrichment	Creativity

Motivational shift	Outward looking
Milestone of the entrepreneurial career	Inward looking
Milestone (company lifecycle)	Connecting the dots
Potential bias	The Entrepreneurial Choice
Geographical aspect	Passion for technology
Background	Differential opportunity
Academic context	Human agency
Competition	Risk
Market	Locus of control
New market	Vision
Old market	Uncertainty
Revitalization	Industry specific
Team	Trait
Collaboration	Ignition spark
Agreements	Mean-end framework
Scientific insights	Personal conjecture
New product development	Expected return
Innovation	Academic return
Nexus	Profit
Eff1 (bird in hand principle)	N-Ach
Eff2 (affordable loss)	N-Pow
Eff3 (crazy quilt)	N-Aff
Eff4 (lemonade principle)	N-Aut
Eff5 (pilot in the plane)	Need
Eff6 starting point	Satisfaction
Eff7 creation	Frustration
Ability	Social norm
Goal setting	Self-efficacy
drive	Passion
Tolerance for Ambiguity	Career
Wealth	Responsibility
Recognition	Status
Over-confidence	Scenario
Entrepreneurial idea	Heuristic
Optimizing decision	Feasibility
Desiderability	Family
necessity	Specific application
General purpose technology	failure

Tab. 9 Items, variables and constructs used for coding

5.d The Veneto High-tech Database

The database includes all high-tech firms operating in the geographical area called Veneto. The database is divided into two subsets: the first one is dedicated to the most innovative firms, the second subset lists the others. In this section we point out some considerations about the definition of high-tech company and we illustrate the replicable algorithm used to build the database.

Park (2005) define as high-tech company a firm that uses or invests in rapidly emerging or evolving technology as a key part of its product development, production or marketing strategy

1) these firms are important because they are seen by many governments as having a pivotal role to play in the regeneration and growth of national or regional economies (Park, 2005)

2) these firms work in a truly extreme environment where the technology challenges are often on the edge of scientific possibility , but with the available resources generally scarce

Technological entrepreneurship plays a central role in regional transformation (Venkataraman 2004) and high tech small firms are one of the main assets of the globalized economy and the knowledge society. They are not only an important source of profit and employment, but the real locus of innovation. In fact some of them create new technology and contribute to the progress of science, while all of them include scientific applications and technologies in new products. New organizational structures, innovative market strategies, pioneer entrepreneurs, are just some of the most evident characteristics of the new technology-based business models which are the real engine of economic change.

During past years many successful high-tech industrial areas and firms have been studied (Saxenian 1994, Chadwick et al. 2003 Kodama 2005, Chorev 2006) in order to describe evolution patterns, new business models, original managerial choices. Recognizing the rising role of high-tech entrepreneurship, many governments proposed different policies for supporting research, and fostering development, innovation and collaboration between universities, public research agencies and small firms, trying to replicate the history of areas like Silicon Valley, Cambridgeshire and Boston Route 128.

Different perspectives have been used by scholars and academic researchers for describing the high-tech phenomenon: the actual body of knowledge is quite robust thanks to some seminal works (Oakey 1984) and to some reviews (Technovation, Research Policy, International Journal of

Entrepreneurship and Innovation Management, R&D Management, Journal of Business Venturing and many others) and to international seminars and workshops dedicated to the topics of new technology management, high tech entrepreneurship and innovative small business. Different sides and aspects have been explored: financing problems (Heuven, 2006; Hogan et al., 2006), the role of incubation (Mian, 1996; Hsu, 2007), technology transfer (Benneworth, 2005), new IP markets (Chesbrough, 2004), high-tech clusters (Porter, 1998), strategic alliances (Lechner & Leyronas, 2007), and so on.

Despite the huge amount of contributions, managers, consultants and the academic community are still quite far from a general theory of high-tech entrepreneurship. It depends on the heterogeneity of this aggregated industry. Researchers sometimes do not agree on the definition of "high-tech" and they do not agree on a general taxonomy on the small high-tech firms (Pavitt 1984, Koberg et al. 1996). A huge debate is still on, proposing different definitions and classifications of high-tech. Deakins (1996) for example stated that any approach to define high-technology or new technology small firms is fraught with difficulty. According to the OECD classification we consider as "high-tech" the following industries: ICT, biotech, nanotechnologies, advanced machinery, automation, robotics, advanced chemicals, green-tech (energy and environment), microelectronics, biomedical and pharmaceutical. Close to the previous definition, we consider that a single business is qualified as high-tech if it involves new and sophisticated technologies as far as the products or the processes are concerned (Steenhuis and de Brujiin 2006).
A simple matrix (Ciampi 1999) can be used in order to define the technological intensity of a firm.

	Newness (product or process)		
Complexity (product or process)		*high*	*low*
	high	*High-tech*	*Well-known technology – difficult application*
	low	*emergent technology – easy application*	*Mature technologies*

Tab. 10 Ciampi's matrix (1999)

In Italy propensity towards entrepreneurship is especially high. The ratio of research expenditures to GDP being close to 1% that is less than half the value in EU. (Colombo & Delmastro, 2004, European Innovation Scoreboard 2007). Di Minin et al (2003) assert that "Italy, despite its traditional inclusion among the most important players in the world economy is a country which lags behind in R&D investments mainly because of its large number of very small firms and an overall lack

of large R&D-based companies. Also, while the public research system has good scientific performance in terms of number and quality of publications, it does not generate a much needed intense technological transfer processes. As far as high-tech entrepreneurship is concerned, the rising role of high-tech enterprises is confirmed by the annual report by ENEA) (Ferrari et al. 2007). In fact In Italy the 7% of the whole industrial manufacturing population is composed by high-tech firms. More that 90% of the private R&D activities are performed within them. In order to complete the description of the Italian context, we highlight that The percentage of the Italian high-tech exportations over the global amount of high-tech exportations is 1,96%, , while 2,7% is the percentage of high-tech importations over the global amount of high-tech importations.

Our database is a subset of a more general and wide database ISTAT-ATECO 2002 that include all the firms operating in Italy. This latter database is available through the collaboration of the Chamber of Commerce of Vicenza.

Step 1: starting from the general database ATECO, the first step consists of a geographical delimitation: we are interested into the companies that operate in the Veneto region, thus that operate in the following provinces: Vicenza, Padova, Rovigo, Verona, Venezia, Belluno and Treviso.

Step 2: an industry selection (trough the internal ATECO codification) is needed in order to isolate the high-tech manufacturing companies. According to previous considerations we took into consideration the following industries: ICT, biotech, nanotechnologies, advanced machinery, automation, robotics, advanced chemicals, green-tech (energy and environment), microelectronics, biomedical and pharmaceutical.

The output of this second step offer a database made of about 24.000 firms, and their distribution is

- *Belluno 1300 firms*
- *Padova 5500 firms*
- *Rovigo 900 firms*
- *Treviso 3900 firms*
- *Venezia 3700 firms*
- *Vicenza 5000 firms*
- *Verona 3800 firms*

Step 3: refinement. the exploitation of ATECO codes for the selection of the firms produced the presence of many non requested firms. A cleaning step is thus necessary in order to build a more precise and reliable database. We have thus have deleted the following enterprises: companies involved in the production of glasses or jewellery, phone centres, bars, centres for photocopies, centres for data processing, professional services for enterprises, groceries, craftsmen working on small repairs, real estate agencies.

Through this step we obtained a preliminary version of our database.

Step 4: subjective evaluation. In order to differentiate the most innovative firms from the others, we evaluated every firm and we considered the following variables:

- number of employees (hypothesis: the higher is the number of employees, the more likely is the presence of a R&D unit – which means formal research activities)
- existence of the website (hypothesis: the existence of the website is necessary condition to be evaluated as innovative)
- quality of the website (hypothesis: the higher is the quality of the website, the more likely is the innovativeness of the company).
- Industry evaluation (within the subset of high-tech industries, some industries are more innovative than others)
- Specific product evaluation

The output of this fourth step lead us to identify the 800 most innovative firms actually operating in the Veneto area. The survey has been sent to 200 firms of the subsection A of our database.

5.e The survey

In this section we present the protocol followed in order to send the survey and the contents of the survey itself. A full version of the survey and the letter of presentation are available on appendix A. Appendix B collect all the companies that received the survey.

The protocol used to deliver the survey has been the following:

1) selection of about 200 companies from the database Veneto High-Tech. The selection took into consideration the two main criteria of geographical representativeness and the adequate presence of different industrial subsets. The choice to select only a narrow population of firms accords with Baum and Locke (2004). In their study of how individual level psychological variables influence the growth of young firms they use a sample not from the entire small business population and not from, for example, all of manufacturing, but from a much narrower category. From this point of view the idea of a population compose by high-tech entrepreneurs is coherent.
2) Sending an email for presenting the survey and text of the survey (notification phase)
3) Follow up phase: phone call after two days to receive a confirmation and to explain the survey (aims, questions, modalities and so on).
4) After 10 days sending email to remember the opportunity to answer
5) Collection of results
6) Evaluation of the results

The survey is divided into seven sections. Section A is focused on the profile of the entrepreneur. The aim of this section is to obtain some data about the professional background of the founder of the firm. Section B is dedicated to the genesis of the company. Some basic information are quested, for example the nature of the start-up (academic spin-off or independent business), the motivations for the location. In order to evaluate the nature of the opportunities recognized or created some open questions investigate on the original business idea, its evolution and some relevant financing aspects. Within this section is available one of the central question of the survey about the retrospective motivations (19 items and a Likert scale 1-5). The items have been carefully selected from both the preliminary evidence of the case studies and from the most cited studies available in the specific literature on entrepreneurial motivations. In particular they have been selected from the works by Shane et al. 1991, from the so called SARIE surveys (Scheinberg and McMillan 1988 and Birley and Westhead 1994), from the work by Shane et al. (2003) and from the contemporary paper by Carter et al. (2003). The idea of using a Likert scale 1-5 comes from this latter contribution.

The 19 items are:

- Availability of potential clients (presence of new/old market)
- Need for autonomy
- Desire to increase the monthly income
- Intention to exploit specific technical competences
- Transforming technological insights into business
- Creating new skills and competences
- Impossibility to innovate in the professional environment
- Unsatisfactory previous job
- Need for diversifying
- Desire to be the owner of one or more companies
- Availability of financial resources
- Risk aversion
- Need for affiliation
- Imitating some collegues
- Self-efficacy
- Support of the family
- Awareness of technological competitive advantage
- Awareness to work with the right collaborators

In order to confirm the presence of retrospective bias, we decided to divide the set of 200 companies into two different subsets on the base of the age of the company. For both subsets we ask in section C the retrospective motivations, while in section E we ask the actual motivations. In our plan, the comparison of the results into the two subsets could offer new insights and interesting results.

Section D is dedicated to the "actual" opportunities, focusing on R&D and innovative activities (budget, collaboration priorities, research policies, agreements and so son). Section E is about external sources of financing. As anticipated before, section F offers the investigation (through the same items and the same Likert scale) of actual motivations. The last section of the survey is finally dedicated to some information about the respondent/entrepreneur (age, contact data, details and so on).

5.f About the results of the survey

Unfortunately the response rate of the mailed survey has been about 7%. The collected data cannot be used to obtain statistical result, because the sample is not homogenous. We can shape some hypothesis in order to justify the failure of the survey

Hyp1: the survey has been mailed and was not available online. This feature probably discouraged the potential respondents: they had to open the file, print it, fill it and fax it, otherwise they could fill it using Word and they should send it back. An online survey could be an easier tool.

Hyp2: due to the economic circumstances, the daily effort of the surveyed entrepreneurs was not focused on answering to surveys and investigations from University

Hyp3: the construct of "entrepreneurial opportunity" that justifies part of the survey is not perceived by the entrepreneurs as relevant for their business. The construct can appear too philosophical and less operative. This fact could lead to no interest on answering to the questions

Hyp4: length of the survey. Maybe the survey present too many sections and questions. This fact usually discourage potential answers

Hyp5: The mail and the survey can be interpreted by operators or entrepreneurs as a junk mail, and thus not considered by potential respondents

Hyp6: Maybe the letter and the survey present unclear answering instructions (Roy and Tabe 2003)

Hyp7: Privacy and security issues could have inhibit potential respondents (Berry 2004).

Chapter 6

Case Studies

6.a Matteo Villa and Microlife

Microlife is a young and dynamic biotech company located just a few steps from one of the most ancient buildings of the city of Padua, the Castle of Carraresi, lords of the city during the Fourteenth Century. Its advanced research laboratories are in the heart of the city, between the shadow of an old impressive tower and a small medieval bridge. Microlife designs develops, engineers, and builds industrial scale plants for the production of microalgae used for energy, cosmetics and pharmaceuticals purposes, and for green biochemistry. The goals achieved in less than one year of activity are the following: (1) the contribution to the worldwide microbiological research on algal microbial strains most suitable for the production of biodiesel, (2) the development, design of photobioreactors for the industrial production of photosynthetic microalgae, (3) the development of an industrial scale module for the production of biodiesel from microalgae. The technologies used for the industrial production of microalgae seems to be revolutionary. In fact there is growing attention from academics, researchers, media and policy makers on this new "promised land" where easy and common products like algae can be used for many different applications. The potentialities of these technologies and the fast evolution of the research field are impressive, as Matteo Villa, founder, president and CEO of Microlife, explains. "Microalgae, including cyanobacteria, which share with microalgae a bioenergetic metabolism (oxygen photosynthesis) but differ in cellular structure, are directly responsible for 50% of photosynthesis on earth. – Mr Villa says. He is not a scientist but due to his role of high-tech entrepreneur, he developed a careful knowledge of algal technologies during last two years – "Microalgae are unicellular organisms that can live singly or in colonies. Depending on the species to which they belong, their size can vary from a few to 100 micrometers. They constitute a very heterogeneous group of heterotrophic photosynthetic microorganisms that have, for example,

extraordinary potential in the production of energy." "They can be nurtured in a wide variety of aqueous media – the CEO adds - from fresh water to the most extreme conditions of salinity and are adept at producing a wide variety of commercial products such as oils, fats, vegetable protein, carbohydrates, and bioactive compounds. They can achieve growth rates of 3.5 divisions in 24 hours. One of the most interesting aspects is that microalgae can contain significant quantities of lipids (oils and fats), which composition is similar to that of traditional vegetable oils. Some microalgae are able to produce oil in greater quantities than the best crops for oil and therefore can be a renewable source of oil for the synthesis of biodiesel. – the CEO continue the description of the main features of algal cultivation - The use of microalgae for the production of biodiesel does not affect the production of food, feed and other products derived from crops, and their cultivation can be done in areas not used in agriculture. Today we are witnessing a growing interest in micro-algae, especially in relation to their huge potential in renewable energy, although other applications such as purification of wastewater and production of food, feed, chemicals, and drugs are promising features. In fact when light and temperature conditions are adequate in bodies of water, and nutrients, especially nitrogen and phosphorus, are unlimited, microalgae can grow to reach concentrations of hundreds of millions of cells per millilitre." These conditions are pursued by artificial crops (also commercial) where the primary objective is to maintain a single dominant species, and a cellular concentration able to intercept all incident light and to maximize productivity. In nature, the accumulation of lipids in microalgae increases in specific conditions useful for the production of biodiesel. "Algae that accumulate lipids in large quantities are often found in special environments and microclimates where microalgal growth is disadvantaged by limiting conditions. - Mr Villa explains - In these microenvironments, the cells are still able to fix carbon dioxide and accumulate photosynthetics in the form of starch and lipids that act as reserve compounds to survive adverse environmental conditions. In normal growing conditions, many species of microalgae have a lipid content of between 10-30% dry weight, but in particular conditions the lipid content can be doubled or tripled. The algal biomass contains approximately 50% carbon on dry weight. That carbon is derived by carbon dioxide with which the algal cultures must be continuously fed. In the production of 100 tons of algal biomass, 183 tons of carbon dioxide are fixed. The following table presents the state of the art, the commercial applications and the research on algal technologies in USA and Europe. Microlife is interested in both research and commercialization of production plants used for the production.

Product and process	Algal Species	Cultivation system	Stadium
Food supplements, feed	Arthrospira, chlorella,	Lagoon, cellular tanks	*Commercial*

	dunaliella, haematococcus	photobioreactors	
Pigments	Dunaliella-arthrospira, haematocuccus	Lagoon, cellular tanks photobioreactors	*Commercial*
Fatty acid_3(DHA)	Schyzochitrium, crypthecodinium	fermenters	*Commercial*
Trace fluorescents, molecular markers, restrictive enzymes	Arthrospira anabaena anacystis	Fermenters, pure photobioreactors	*Commercial*
Waste water treatment	Scenedesmus	Mixed crops lagoo, raceway tanks	*Commercial*
Biomass for acquaculture	Various species	Cylinders photobioreactors	*Commercial*
Polysaccharides			*Research*
Biofertilizers			*Research*
Bioactive molecule (medicines, biopesticides, probiotics etc)			*Research*
Biosensors, sunscreens			*Research*
Bioremediation of polluted waters			*Research*
Biofission of CO2			*Research*
Energy (biodiesel and H)			*Research*

Tab. 11 State of the art for research and commercial applications of algal technologies. Source: www.micro-life.it

Scholars and researchers assert that massive algal cultures can help reduce the impact of some problems that are actually damaging our planet. In fact the conversion efficiency of solar energy in algal biomass is much greater than that achievable with traditional cultures. " For example, one hectare of sunflower or rapeseed can produce 700-1000 kg of oil per year - says the CEO of Microlife - while algal cultures, if performed in facilities with closed reactors, also called photo bioreactors may exceed 20 tons of oil per hectare per year and have a potential of over 30 tons in tropical countries. Algal crops do not compete with crops for fertile land, require no pesticides, and can be undertaken in seawater or wastewater where, in synergy with microalgae associated bacteria, they take recycled nutrients into biomass, which makes it possible to obtain protein feed and fertilizers as well as biofuels. When algal cultures seem to indicate a source of biofuels or a way to reduce emissions of greenhouse gases, based on the evidences available, it is necessary to make clear first just how complex the realization of such systems is." Some researchers, in fact, predict that in next future algae will be like a panacea and for financial investors algal technologies could be a new land for entrepreneurial pioneering. But the path from labs and their controlled experiments to the potential wide range of commercial application still need to be covered. "It is often assumed that the efficiencies obtained in laboratory photosynthesis at low irradiance are achievable even in full sunlight, and in some cases, more or less consciously, values are used in the energy and economic balance of the process of algal biomass production per area unit that surpass even the theoretical efficiency value of photosynthetic peroxide – Mr Villa explains - These problems - neglect of photo inhibition (i.e. high radiants damaging photo systems) and photo

acclimatization (i.e., that is, cells growing in dense cultivations accumulate pigments in large excess) - strongly affect the productivity of outdoor massive algal cultures. Therefore there is often an underestimation of the difficulty to maintain unialgal cultures for long periods, even in closed reactors. Only a careful resource management, the use of CO2 from combustion as a source of carbon, the adoption of low construction and management cost per unit area reactors and a careful evaluation of all the biomass constituents after oil extraction, will produce economic returns. The result will also depend on the development of specific know-how on massive outdoor cultivation for the specific algae species selected in order to support the process; on extremely favourable weather conditions; on appropriate infrastructures and on the engineering of the whole production process in suitably sized pilot and demonstration plants. Open basins, however, have serious limitations which arise from the difficulty of monitoring the contaminants, the loss of large quantities of water to evaporation and the wide variations in salinity resulting from the provision of rainwater which undermines the stability of the system. There are various types of closed systems (called photobioreactors and implemented by Microlife), distinguished by building material (glass, plastic, rigid, flexible plastic film), orientation, tilt, and agitation system. “Even if more expensive and still not optimized, algal biotechnology now seems to focus on closed systems that achieve higher area productivity and allow the cultivation of those species that do not grow on selected materials and are difficult to maintain as an unialgal cultivation in open basins”, the CEO says. There is large consensus on the fact that the production of biodiesel from microalgae is technically and (can be) economically feasible. The main advantages of producing biodiesel from microalgae are: theoretical high yields, ability to fix CO2, use of marginal lands, treatment of urban wastewater and agricultural prod, many generations in a short time, no proximity to the market of food. Matteo Villa asserts that over the last ten years, the cultivation of microalgae in photobioreactors represents the most developed example of biotechnology applied to biological photosynthetic systems: such cultivation, obtainable through the use of saline solutions, enables a fairly superior efficiency in the use of light power compared with traditional vegetable crops. “The main advantages of the indoor cultivation system, which takes place through the use of column systems in which the suspension consisting of microalgae and a culture medium is kept in motion by inflation of CO2 enriched air, are the following: possibility of containing a very low value of water loss by evaporation encouraging in this way, the crop in areas with little water; good security of supply against external pollutants; exploitation of solar energy as well as for photosynthesis, due to increased temperature of cultivation (greenhouse effect), thereby increasing the speed of growth of microorganisms and the profit period of outdoor cultivation. "We have a pilot plant in Roccasecca

(Frosinone), within the local landfill: it's a very innovative plant, where we recover carbon dioxide and nitrogen oxides, which are used to feed microalgae reared in four photobioreactors", the CEO explains. Requests of information came from both ENEA and the Institut Francais du Pétrole, which has just entered into a partnership agreement to start the cultivation of microalgae on ten acres, a small, but significant project in Europe. «We are going to close the activities of the year 2009 with four requests for patents, not just in the energy field but also in the pharmaceutical and food sector" Villa explains. The research activities carried out by Microlife are worldwide relevant: the goal is to limit the production and the usage of first generation biofuels, which are obtained mainly from sugar cane, legumes or cereals and distort the prices of the food market. These biofuels are often accused of causing a continuous rise in the prices of grains and environmental and social damages even superior to the processes of extraction of fossil fuels. Large areas of tropical forest have been destroyed to expand the cultivation of sugar cane, palm oil or soy: plant and animal species are in danger of extinction. "We are actually collaborating to the international research works on biodiesel and jetfuels obtained from lipid products." Recently media witnessed how large U.S. companies are investing exactly in the same direction: Exxon has invested $ 600 million in the company of Craig Venter, the father of mapping of the human genome, which is trying to start mass production of biofuels from algae. BP is working with DuPont. Shell HR with BioPetroleum Hawaii. Chevron has allied with Solazyme, a pioneer California biodiesel company from. Continental, Virgin and other airlines that are testing biofuels of their jets. A growing number of entrepreneurs are working on these second-generation biofuels, produced without interfering with the food chain, attracting therefore billions of investment. Even in the Silicon Valley, new biotech companies are studying microalgae, bacteria, cyanobacteria, fungi with the aim to use them as small "chemical factories". Micro work centres that seems to be efficient, inexpensive and able to produce biofuels with low environmental impact. Recently MatteoVilla, has been contacted by the Obama Administration for discussing some ideas about the green economy. "Last Wednesday I was in Paris when I received a phone call. It was the first secretary of the USA Consulate who communicated the desire of the American consul to meet the top management of Microlife for reasoning about bioenergy and biotechnology. They knew the company through our preliminary activity in Brussels, when I presented Microlife at the World Biofuel Markets International Conference. Thanks to the support office of the Veneto Region in Brussels, we were able to meet UE Commission President Barroso. The same office has also introduced and reported our company to the American Consulate. A few weeks ago, I discussed with the Consul on the economic policies of President Obama. He explained that the objectives of the Obama Administration are to reduce dependence on imported oil, to

address the global climate crisis and create millions of new jobs to overcome the economic crisis." From this point of view, the world is changing and Barack Obama is showing the route. The Green New Deal can count on U.S. $ 100 billion, equivalent to almost 13% of the economic stimulus package launched by the American Government. An challenge that even Europe must face as soon as possible. The European context is considered a strategic ecosystem for the growth of the company. The company is member of the EABA, European Algae Biomass Association. The general objective of the Association is to promote mutual interchange and cooperation in the field of algae biomass production and use, including biofuels uses and all other utilisations. It aims at creating, developing and maintaining solidarity and links between its Members and at defending their interests at European and international level. Its main target is to act as a catalyst for fostering synergies among scientists, industrialists and decision makers in order to promote the development of research, technology and industrial capacities in the field of micro algae. Mr Villa has become one of the spokesman of the Association. He is a novice entrepreneur, but he is supported by a strategic professional background as director of lobbies and external relations for Sinergie Gorup SpA where he developed an impressive knowhow on renewable energies. Thanks to the experience built up over the years within the Italian Chamber of Deputies, working as parliamentary assistant, he has a wide network of relations with private, public, institutional and governmental offices and companies in the European Union. Mr Villa, in fact, carried out consultancy work on green technologies and energy policies at the European Parliament. He has also been member of the board of APS Holding SpA, a public company specialized in urban mobility and he has been consultant for Cinecittà Holding SpA.

Before this entrepreneurial experience, Mr Villa was an emergent manager, but after the evaluation of the potentialities of algae he decided to invest and to face an entrepreneurial risk. "I was fascinated by these new technologies based on algae and since the beginning, I was surprised by their versatility. The products of our photobioreactors can be used in very different contexts. And many of these contexts are promising and expanding markets. I am aware that some difficulties and challenges need to be faced by the company and by the international research community. New technological insights should be consolidated, the products must be tested, production processes need to show a real economic advantage and to convince potential investors." But the returns could be very high. "In a few years we are going to launch an IPO. We are thinking of the Italian Stock Exchange market for small and medium-sized companies with high growth potential. But for achieving this milestone we still need to grow and find a trusted advisor. " The entrepreneurial projects of Mr. Villa are stimulating and ambitious. But the goals are clear.

As highlighted before, Mr Villa has been active in the field of renewable energies for many years due to his role of PR manager of Sinergie SpA. He was, thus, and alert subject: a perspective entrepreneur able to perceive the opportunities and the potentialities of algal technologies in the energy industry. He heard for the first time about the innovative research works on alagae in 2007 during a scientific conference at the Ben Gurion University in Israel. When he came back to Italy he started to research about the state of the art of this technology. He immediately found one of the leading researcher in Italy. After some months of incubation and the help of some academics, Villa founded in 2009 the company, with the aim to contribute to the development of a new green technology and to create value through its market application. The company has quickly grown: 4 full time equivalents are actually employed. Many research projects funded by private and public partner are ongoing. The first pilot plant has been already built. The research labs are active and are testing new features and production processes. Microlife is an interesting example of born global firm: after few months of activity a branch office has been opened in France, thanks to a collaboration agreement with one of the worldwide expert on algal biomass. "Internet is actually the most effective marketing tool: by the Internet we can find new partners, clients and researchers experimenting new applications based on algal cultures. – Mr. Villa says and adds: "Another crucial element of our strategy is the knowledge management and the protection of the intellectual property that we develop in our laboratories. It is actually our more relevant competitive advantage."

"Despite the major part of the internal researchers and the professionals and consultants involved in the company activities come from the academic world, we decided not to create an academic spinoff: - the CEO says - the huge amount of bureaucratic constraints and obligations had slowed the start up phase. But since the beginning the national and international academic centres have been considered crucial partners: the technologies that exploits algae are still under development within many academic laboratories. And they must be part of our network." Microlife is a pioneering company. "We are actually opening new markets, so we there are not many competitors in Europe. Some of them are in Northern Europe. Our competitive advantage is the ability to create new patents, and doing research, according to the market needs. We are actually planning to build new collaborations with some of our competitors, in order to strengthen the impact of green algal technologies on the market and to help each other in creating and developing new markets." Not only this effort will produce value and profit, but it will certainly contribute to the diffusion of sustainable and innovative green technologies.

6.b Enrico Pagello and It+Robotics

This time my steps are brisker and more confident. This time I am not searching for signs above a warehouse or workshop. I am not looking out for factories or plants on the industrial estate. The destination of this singular journey to a singular "company" is well-known to me. It should be, having spent five intense years of my life there. Of course, University is a particular kind of enterprise; not created for profit but for knowledge, it produces know-how, research and innovation. But above all it forms young people's minds. This huge "factory-community" of knowledge has, in recent years, been giving birth to specific entrepreneurial experiences called spin-offs. Lecturers or young researchers who choose to exploit their studies to become small businessmen, to create new companies, sometimes incubated within university structures; others who, thanks to business plan competitions such as Start Cup, or with the support of investment funds, succeed in becoming completely autonomous.

I stroll along the familiar corridors of the Department of Information Engineering of the University of Padua with a certain confidence, the sensation being almost of having gone back in time. Climbing the stairs I try to shake off the nostalgic thoughts of bygone youth. However, I realise that nothing has changed, even if the professors have slightly greyer hair or the teaching programmes have been updated. The usual brainy students, the circuit, computer and IT devotees are still here, tirelessly intent on programming and simulating; the less conscientious ones, on the other hand, still frequently abandon their classrooms or the library to go and sit in the shade of the trees in the department's gardens, idly smoking cigarettes and making plans for the coming evening or discussing the next test.

Enrico Pagello, full professor in robotics and member of the IT+Robotics board of directors, welcomes me to his study on the fourth floor. IT+Robotics is a spin-off of the University of Padua which is the owner of 5% of the Company. Set up in 2005 and founded by seven partners (academic and non academic team), at its base we can find the commitment and entrepreneurial spirit of Professor Pagello's research team. IT+Robotics it is to all effects a Vicenza-born company even though it is currently based in Padua; in fact, it is still incubating within the university department, awaiting transfer to the Vicenza area where its registered office is ready and waiting. Just a little more economic and financial independence - and hopefully a few more members of staff - and it could soon be well on its way.

It really isn't an overstatement to define this Company as a pioneering spin-off. In fact, there are two main reasons for using this definition: one tied to the technological aspect and the other to the ontological one. From the technological point of view, IT+Robotics is operating on the most extreme frontiers of innovation, i.e. humanoid robotics with its artificial intelligence and advanced vision

systems. These make up some of the most dynamic sectors of knowledge, where knowledge itself advances rapidly and turbulently. Furthermore, the Company is an industrial pioneer, moving as it does in that difficult and misty borderland between business and university, creating precious contacts, vital synergies and new paths towards innovation and encouraging collaboration between these two worlds. Generally speaking, university spin-offs, those real and proper icons of knowledge economy, are a strange mixture of university and business wherein the research aspects often outweigh the productive ones. Technology (meant as an instrument as well as knowledge) is often the pillar of this type of entrepreneurial activity.

"The core business of this Vicenza-born Company involves two main areas: on the one hand, it proposes intelligent video-surveillance systems integrating autonomous robotics with innovative technologies in the field of artificial vision and the acquisition and transmission of omnidirectional images; on the other, it deals with the marketing, development and customization of humanoid robots." Professor Pagello says. In fact, IT+Robotics' innovative products and services, are addressed at a variety of enterprises: companies operating in the field of video-surveillance; companies with specific needs regarding the control, supervision and protection of production processes; universities and research groups operating in the field of robotics or artificial vision, such as marketing, artistic production or entertainment companies; schools or training centres which intend to use robotics as an aid to their teaching programmes.

"*Omnidirectional vision technology is based on the use of sensors and television cameras which allow a 360° imaging of the surroundings without the use of mechanical parts",* explains Professor Pagello. On the wall behind him there is a blackboard covered in symbols, algorithms and formulas. He adds *"Although this technology is already mature, it is only just taking its first steps in Europe. It is IT+Robotics' aspiration to succeed in exploiting its potential to the utmost in the field of security and in the consumer world".* The omnidirectional vision system can also be successfully used for controlling and supervising production processes with the aim, for example, of protecting certain pieces of equipment. *"On the basis of studies which have been carried out in our department and by the international scientific community for years now* - claims the Professor – *our Company has put itself forward as a consultancy partner in the field of artificial vision for the realization of customized prototypes of video-surveillance, telepresence and security systems that integrate the most advanced and sophisticated technologies available on the market today. More specifically, we are looking to integrate broadband networks, high performance micro-computers and reasonably priced robotic*

platforms which not only make it possible to have extremely efficient environment surveillance systems, but also interaction with the surroundings themselves following inputs received from the outside."

The company's second activity sector is also decidedly fascinating, linked as it is to anthropomorphic robots. "*The oriental market already has many different types of robot available,* - explains Professor Pagello – *for example, football playing robots, dancing robots, robot waiters. Their prices vary from a couple of hundred Euros for basic humanoid robots up to prices exceeding a million Euro".* So, Asimov's dreams, as well as those of many science fiction fans, are apparently becoming a reality even though these robots' functions are, for the moment, essentially tied to entertainment and teaching. In fact, the industrial and academic sectors are where IT+Robotics currently markets robots produced by incredibly advanced Japanese, Chinese, Taiwanese and Korean enterprises with which this Company has had the privilege of cultivating contacts for many years now. It certainly is not a straightforward market since East-Asian producers generally try to discourage access to western companies, and in view of this, this Vicenza-based spin-off has not restricted itself to a simple import-export activity. "*Extensive university research and years of experience have, in fact, enabled these robots to be enhanced with an added value: the technicians and engineers of IT+Robotics are capable of customizing them and programming them to requirement.*" If we were not talking about machines we could almost say that they are capable of giving these robots a soul, thus making them more suitable for use in the West. Clearly, this sector is a real niche with very few competitors: in fact, there are no other companies in Europe capable of supplying the services and skills of this small start-up company from Vicenza, currently a guest of the University of Padua.

The Company has been operative for two years now. One of its activities is that of organizing brief demonstrations at companies, schools, universities and trade fairs. "*Autonomous robotics is something which appeals to adults and children alike* – says Professor Pagello – *as the fascinated expressions which inevitably appear on their faces show each time artificial intelligence is encountered, this technology still being linked to pure science fiction."* The aim of these "robotic demonstrations" is, therefore, to stimulate curiosity and spread knowledge regarding the recent developments of what, in the not so distant future, could become a part of everybody's daily life. Participating in events of different types with robotic performances created especially with the public in mind and tuned into their particular requirements is the best way to acquaint people with these new forms of technology. Among the most important events that the Company has participated in, we can mention Smau 2005, Discovery 2006 and the match between robot footballers at Humanoids 2006. In fact robots are …. fantastic football players as can be seen in the famous "RoboCup", world

championships which take place each year between humanoid robots and whose ambitious challenge for 2050 is to put together a team able to beat the best human players from the most successful football teams in the world. Will technology really be able to beat the verve and talent of our champions?

The staff of IT+Robotics mainly hail from the research sector; many are university lecturers who have been working for many years in the field of intelligent robotics and who are involved in the most important international associations such as SIRI, the Italian Robotics Association, AI*IA, the Italian Association for Artificial Intelligence, the International RoboCup Federation, the Intelligent Automomous System Society, etc. The presence of these academics means that the company has contacts with the best international research networks in Europe and the world. "*Our academic staff is flanked by brilliant engineers who make up our technical staff, boasting skills in the most up-to-date information technologies – claims Pagello.* Lecturers and engineers have experienced two years of intense activity and enthusiasm together, maybe stimulated by the desire to create innovative solutions rather than the idea of making profits at all costs: "*We have had positive financial statements two years running and we are extremely satisfied; of course, our turnover is not that high but we have had a lot of professional gratification, also from carrying out a number of projects with several Italian companies",* declares the Professor. For example, IT+Robotics has developed a system for detecting defects in irregularly-shaped glass bottles, eliminating many of the constraints posed by other commercial solutions. In particular, the Company has been concentrating its efforts on a system to inspect glass perfume bottles of all shapes and sizes, plain or satinized, for defects.

This spin-off has been included in the European research scenario thanks to the TERECoP project which sees the participation of many importation education institutes from all over Europe. The aim of this project is to implement a pilot course for the use of robotics as a didactic instrument. Thanks to the union of various experts in the fields of education, informatics and autonomous robotics, technological instruments are being developed which have become indispensable in the teaching sector. As Pagello says, "*The experts involved in the TERECoP project are currently working on the socio-constructivist approach (connected to the theories of Piaget and Papert) and, among other things, have adopted Lego Mindstorm kits as tools for their work. IT+Robotics will contribute towards this project creating didactic experiences which use humanoid robots and develop humanoid robots at costs which are accessible to schools. The objective is to simplify the current software costs of such developed robots, thus allowing the students of middle and high schools to match themselves against what will become the didactic instruments of the near future."*

The commitment of this Company is, therefore, to go beyond market targets: in fact, its mission is a fascinating mix of research and business. Once they have become part of the mechanism of competition, many university spin-offs lose their drive for research, switching their focus to the product, marketing and small incremental innovations. On the contrary, the management of IT+Robotics has chosen to create a reality capable of building a bridge – perhaps more clear-cut and solid than in the past – between universities and businesses. One of the pillars of this bridge is obviously research. The Pagello group has therefore chosen to go into business-building in order to get closer to enterprises. Perhaps the most unexpected discovery made by these lecturer-businessmen is that tied to experimenting the difficulties, the successes and the lifestyle of the Company. For example, they have even been able to extract new stimuli for researching and developing knowledge from activities closely connected to products, trade and marketing. "*We have supplied services, sold products and developed projects; these activities are radically different from those of writing scientific articles or books, the main task for people who work in university research. We have come to the conclusion that even these business activities can offer us 'food for research' and new stimuli. We have succeeded in enhancing the competences and know-how developed at University, even if our small spin-off still has a very long way to go".*

6.c Ruggero Frezza and M-31

The M31 galaxy, more commonly known as the Andromeda Galaxy [1], is about 2.3 million light years from the solar system, but the company of the same name, which has opened up in Via Tommaseo in Padua, is only a stone's throw from the Department of Engineering of the University of Padua. A great location for a young company whose focus is to supply engineering skills in the new frontier technologies and to create a network of contacts among businessmen, researchers, consultants, investors and managers, with the aim of facilitating and supporting the creation of knowledge-intensive enterprises. The name chosen for this young company is highly allusive: indeed, it was chosen by the founders in order to make specific reference to the Andromeda galaxy. But why a galaxy? And why Andromeda in particular? Professor Ruggero Frezza of the Faculty of Engineering of the University of Padua was posed these perhaps all–too-common questions; his answer was brilliant but also profound: "*We chose the name of a galaxy because we liked the image of a mass of celestial bodies, apparently*

[1] The Andromeda Galaxy, also known as M31 (the thirty-first object in the catalogue of Charles Messier, drawn up in France in the eighteenth century), and also as NGC 224, is the other giant spiral galaxy of the Local Group, together with our own Milky Way.

scattered at random, but held together by a single nucleus acting as a pole of attraction. In the same way, M31's aspiration is to become the same kind of strong nucleus, capable of attracting talents, qualified partners, ideas for sustaining innovation and economic development. Out of all the galaxies, Andromeda is a particularly interesting one in that it has two nuclei of attraction. Transferring this idea to our Company, the first nucleus represents its strong identity, anchored to ethical values of transparency, trust and honesty. The second, on the other hand, is linked to the concept of partnership. In fact, we prefer to talk about partners rather than clients. Our aim is to create a shared profit company model where relationships with our partners, suppliers, collaborators and stakeholders are based on the binomial win-win." Frezza speaks with determination and pragmatism. He is a university lecturer, in his forties, who has proved to be not only a skilful researcher with a nose for business and creator of new technological products, but also a real Schumpeterian profile, with a capacity to innovate business models.

The Company is just one year old and has succeeded in elaborating a decidedly innovative business model, surpassing the concepts of business angel and incubator, readapting ideas from the England and USA to an Italian and European context. A challenge that the M31 entrepreneurs, managers and staff are winning daily, as testified by their books showing that they closed the financial year 2007 breaking even with only 15 employed staff. And indeed, it is the hybrid business model adopted by this young company which guarantees flexibility and access to different markets.

M31 is a company whose mission is to generate high-tech enterprises. The Company itself was constituted with a joint stock equal to €350,000 and operates in three main areas. The first is made up of research and consultancy on behalf of third parties: this business has produced approximately 70% of the income in this first year. The second area regards the development of its own products and intellectual property (IP). The third one concerns the design and creation of new, knowledge and technology intensive enterprises. "*Our main aim is to become a real and proper catalyst for innovative enterprises. Our strategy is based on the exploration and creation of collaborative networks involving businessmen, universities, research centres, business angels, investors and venture capitalists,* - states Ruggero Frezza – *We have created a team of professionals with great expertise and skills in basic qualifying technologies and we have begun to assemble contacts and construct alliances with successful companies in a variety of sectors."*

Above all, M31 supplies an internal R&D service which allows it to exploit engineering and specialist know-how, as well as system know-how, in order to create and optimise new products, start up new business branches, and finally to create new companies. *"Furthermore, we are also part of a capillary,*

technological transfer network, working together with public and university research centres. In particular, we collaborate constantly with the University of Padua – some of its researchers are actually our partners – and we can boast a widespread network of contacts with first-rate research centres throughout the world." The academic world is a very important resource for M31: *"For us, universities are a pool we fish our collaborators from. Our objective is to work consistently on frontier engineering projects, that is, on the frontier of the state of the art of technological progress. The importance of a widespread network of contacts with universities and access to new technologies and to the latest results of research stem from this ambitious project. We have recently constructed a Rolodex, a series of contacts with potential business angels who can intervene and financially support some of the projects we are working on and we also have worthy contacts with early stage venture capitalists."*

However, this Company's approach is different from that of traditional business angels and venture capitalists. If the aim of this latter category of investors is that of reaching a success rate of 10 or 20%, M31's target is to have 4 out of 5 successes. But why have they set themselves such a challenging goal? *"The Italian context is radically different from that of the United States* – explains Frezza – *especially regarding risk-taking and enterprising. In Italy you have to be much more careful during the start-up phase, more prudent and far-sighted. It is for this very reason that our business model envisages a long seed phase for our start-up companies which are incubated as if they were real and proper business offshoots within M31. As the incubation period increases – during which time the product must be defined and a sturdy and sustainable business plan created – the start-up company's chances of success increase. At the end of the incubation phase the business project can "officially" create the new venture or, on the contrary, the project can be either abandoned or ceded to third parties due to a lack of technical or commercial requisites."* The long incubation phase that precedes the establishment of the company can therefore be considered an efficient key for reducing start-up risks. Perhaps it is a kind of "Italian way" of accompanying the birth of small, high-tech companies? Maybe it is too soon to give an answer to this question, but M31's results are encouraging. Frezza's analysis of the Italian context - and that of the north-eastern area in particular – is very straightforward and disenchanted: "*Some people claim that, in Italy, the proportion of ideas and innovations is not comparable to that of other countries; others complain about the absence of investors prepared to take risks in innovative and technological businesses. Both claims are partially right* – sustains Frezza – *but the core problem is cultural and fundamentally regards trust. There is a huge lack of self-trust: for example, many young people come to the end of their academic career, with a Ph.D. for example, and*

start looking for stable employment without even considering having a go at doing something entrepreneurial, taking the initiative Then there is the issue of our national culture which involves a lack of trust among the players in the economic sector which is often the result of a widespread lack of public spiritedness and sense of responsibility, both social and political." In short, ethics are also important in the fields of research and high-tech. If anybody has imagined the animal spirits as elements which are detached from an ethical dimension, they have made a serious mistake. Just listening to Frezza makes us think that another kind of entrepreneurship and management is possible. And this is exactly what is happening in M31.

In order to fully understand the business model launched by M31, let us consider the traditional concepts of business incubator and university spin-off. The essence of an incubator (often originating in universities, sometimes promoted by other public bodies or private companies) involves three elements: 1) essential work spaces and services such as Internet connections, electricity, heating, secretarial offices, reception, canteen, etc. at the disposal of the incubated firms; 2) consultancy services for business creation; 3) openness towards an international research network.

Usually companies are incubated for a period of 3 or 5 years, after which they can stand on their own two feet, no longer having to count on the support offered by the incubator itself. In the wake of the successful experience of other American and European incubators, a large number of structures have sprung up in Italy ready to host and support new companies. On the other hand, on the topic of university spin-offs, we again quote Ruggero Frezza who is not only one of the creators and protagonists of M31, but also one of the lecturers of the University of Padua who boasts the highest number of spin-off creations. *"One of the most efficient vehicles for technological transfer is the constitution of spin-off companies from university laboratories. In many countries, but especially in the English-speaking world, it is a very widespread practice. Many Ph.doctors or master students exploit the know-how gained during their studies in order to found high-tech companies which, if successful, are soon taken over by bigger companies which thus acquire the technology of a whole group of skilled, close-knit people. The presence of spin-off activities generates a vicious circle through which companies get interested in sponsoring University research, some of the more enterprising students are attracted by the prospect of becoming entrepreneurs and enrol on the University's doctorate or master courses and, in this way, the product know-how from university research is not lost. The University's returns from spin-off activities can be summarised as follows:*

- *the creation of strong ties with the entrepreneurial world*

- *impulse to research activities thanks to extremely motivated doctorate students*
- *research contracts sponsored by investors involved in the spin-off activities.*

Furthermore, spin-offs positively influence the evolution of local business towards a higher level of technology, something which Universities can only gain from."

Therefore, M31 is not an incubator in the physical sense, nor is it a traditional academic spin-off. The model is closer to that of a business accelerator, of an advanced (or second generation) incubator. It is more like an innovative way of conceiving business: a network of connections capable of producing added value and of transforming enterprising ideas into successful enterprises. The incubation of a start-up company in M31 includes its internal experimentation as a branch of the company. It is in M31 that all that research and planning which potentially lead to the start-up are carried out. The seed phase happens inside the company which thus assumes the many risks of this initial phase. Even the corporate governance of M31 is innovative; in fact it is equally divided between businessmen, researchers and managers, counting about 20 partners. So, here we are not dealing with a classic university spin-off made up of lecturers and researchers who have become businessmen, but a business project shared equally among partners with radically different "histories": management, research and business; all working together in the name of innovation and technology. This is a new version of knowledge business which could prove to be one step ahead of the tried and tested spin-off mechanism. *"We often hear that the various players in an innovation system must work as a team; well we, in our own small way, are trying to 'build a system' and to construct an efficient synergy among the various players",* says Frezza proudly. *"M31 is present throughout all the creative phases of a new business: from the initial idea to the definition of a business model; from fund-seeking to product development and, lastly, to the business's commercial launch."* An ambitious model which, however, is not the result of improvisation but of careful reflection, comparing and weighing up the high-tech entrepreneurial systems in Europe and the United States. Frezza himself loves to cite a piece from an article in the Wall Street Journal, 2006:

"*European policy makers have correctly identified the cause of this gap: an entrepreneurial deficiency. […] Three quarters of the Fortune 100 companies last year did not exist on the 1980 list. But without a vibrant entrepreneurial sector, Europe has had a similar big-company job loss as the US without offsetting robust job gains in its small and medium size enterprises. […] Entrepreneurial capitalism requires changes in cultural precepts, highly more efficient capital markets, increasing rates*

of technological development, and enormous efficiencies in the application of technology. Most important, however, it requires a commitment to expanding human capital – in particular, developing many more engineers and scientists. This transition requires long-term market incentives that will cause young people to choose advanced schooling over work and leisure."

The problem of the scarce competitiveness in the innovation system in Europe is, therefore, tied to the lack of entrepreneurship in Universities and in the social classes with the highest levels of schooling. *"Unfortunately* – admits Frezza – *there are very few students who, although having graduated with top marks and completed their studies brilliantly, decide to set up innovative enterprises. We also have to debunk the myth regarding the lack of quality in our university departments. The issue is not the quality of research carried out in university labs, which is of the highest level, but insufficient encouragement and the scanty use of research doctorates. Only too often Italy is seen as the waiting room to an academic career and not as an opportunity for high level training and technological transfer towards the enterprises in the surrounding area. It is for these many reasons that M31 aspires to be a company whose doors are open to research doctors, the best brains trained within our universities. Many already collaborate with us and others, together with their lecturers, can knock on our door at any time to put forward their ideas regarding entrepreneurship and innovation."*

In order to incubate and accelerate business development, M31 has embraced an open innovation model, proposed and identified for the first time by William Chesbrough. Open innovation involves not only exploiting one's own resources and knowledge, but also the knowledge of one's own partners and of the whole economic ecosystem in which the company works. So, where do the ideas for the creation of these new, high-tech companies come from? *"There are basically two main sources* – explains Frezza – *one is internal R&D which we implement daily, while the second comes from outside the company, that is, from proposals that other businessmen or managers or university lecturers submit to us"*. From the know-how point of view, the company's starting point is linked to the area of information and communication technology. These are transversal and qualifying skills which can be applied in all industrial sectors. These technologies represent great business opportunities, as confirmed by Susan Berger of MIT: *"In our opinion, the productive districts are currently capable of absorbing the new information technologies, even if they are not capable of producing them. It is probable that the future of the districts will not be represented by those improbable technological leaps from today's industries to the frontiers of high technology, but by the incorporation of new technologies and services*

in traditional sectors. The integration of designs and outstanding processes and products with new information technologies, all contribute towards creating high value products". Among the targets of the first year (nearly all of which have been reached) we can count: the completion of the core team, quality certification of the procedures, the creation of an investor and business angel Rolodex to support M31's activities, the production and collection of IP and start-up of activities in California and in Great Britain. The balance sheets of the M31 operation are positive, and not only from the financial point of view: after only one year's activity, the company has 17 employees who work alongside consultants to a total of approximately 23 full-time equivalents. After one year of incubation, two start-up companies are also being created as branches of M31, one in the biomedical sector and the other in the field of energy efficiency. *"Just recently* – Frezza says proudly – *we have been joined by an important partner who has purchased 20% of the Company"*. In short, M31 is proving to be a very interesting case of a catalyst for businesses and for high technology. It is a project around which some of the best resources in the academic and productive context in the Veneto area are gathering, with a very international slant. An entrepreneurial dream which pools together partners from very different backgrounds with the aim, as Frezza concludes *"of building systems and of succeeding in doing so in such a way that the players involved not only play their small part to the best of their ability, but also focus on collaborating with one another in order to obtain success and develop innovation and wealth"*.

6.d Riccardo Donadon and H-Farm

H-Farm is an innovative start-up designer and incubator, founded in 2005 near Venice, Italy, by Riccardo Donadon. Actually more the than ten firms are incubated: some of them are already legally and formally founded, other, like the buds of plants, are still in the pre-seed and seed phase. The physical structure of the incubator is composed of different country houses located in a gorgeous rural area, called Ca Tron Valley. Keywords and driving values for Donadon and his staff are passion, creativity, collaboration, humanity, rationality, simplicity and desire to innovate. He built up a wonderful place to work, with a human and pro-active climate, where the results of the employees are not measured by the number of work hours or ruled by strict constraints, but they are based and measured by the customer satisfaction and the return of the initial investment. Donadon is not only the initiator of the incubator, but even a serial entrepreneur himself and a business angel. "*The business ideas are not the only core assets of our incubators: our main assets are people and their personal and*

professional network" says the entrepreneur. Nevertheless he has got no technical academic background, and he studied classical subjects, Donadon, during the Nineties has been one of the pioneer of the Internet and e-commerce in Italy. "*I've never been a technician*, - he says – *I have been always a generator f business ideas, convinced that the Internet could be a medium able to support, promote and develop thousands of different business models*". He started his career in a big fashion group, developing in 1995 the first virtual mall on the Internet. In 1998 he founded his first company, E-Tree which in a few years became the first web agency in Italy, with more than 160 employees and an income of more than 12 billions of Euros. The following year he sold E-Tree but remained as manager in the same company. In 2005 he founded a new private business incubator called H-Farm. "*We are specialized on Internet services and Internet based media companies. By exploiting the opportunities of the Internet –* says Donadon *– firms can find everywhere potential clients or partners. Now the company has more than 150 employees, most of them are professionally involved into design, media, creativity. Our product are companies and we are proud to use only our own private funds to create and support them*."

H-Farm strategy is articulated into four main directions:

1) the incubation of new original start-ups, based both on internal ideas and bunch of innovations and external stimuli

2) the improvement ad adaptation of already existing start-ups in order to access different markets

3) the incubation "on demand" which is the incubation of innovative start-ups, under the specific request of an external parent organization

4) the creation of strategic alliances and international joint ventures in order to expand the potential market and to let foreign partners to access domestic markets.

The main goal for each entrepreneurial project is to have an economic and financial return in 36 months. It means that the first two years of incubation are dedicated to the design and the creation of an effective firm, able to generate outcomes, with clear possibilities of growth and a defined portfolio of clients and opportunities. In the first year a robust business plan is produced and the potential firm receives an initial investment. During the second year the organization is set up and the enterprise is developed especially from a commercial and marketing point of view. At the beginning of the third year the firm is "officially and legally founded." The third year is dedicated to identify the best partner for selling all the firm or just a part of it. While traditional venture capitals and business angels work with a time horizon of 72 months and a success rate of 2/10, the basic idea of this new incubation model is to reach as fast as possible a success rate of 10/10. This is well explained by the incubator

founder: "*We are not looking to build up a new Google or E-bay, or other revolutionary star companies that can globally change the marketplace. Our aim is to build robust small enterprises that can eventually compete and growth without the support of external organizations*." The model has not been yet completely tested: during five years of life, more than ten companies have been created, most of them are still incubated, while only two companies have been successfully graduated.

The support provided by the incubator is complete, in fact it includes: financial management, accounting, bookkeeping, payroll, contracts, patents, commercial and administrative support, office services and maintenance, IT and servers support, travel and secretary management, organization setup, brand management, PR and consulting, marketing, internationalization and general business support, the search for business partners and potential clients. "*We help our incubatee firms to find the first clients, by sharing our network. Creating or finding the right market for a new technology is widely recognized as one of the most difficult aspects of the whole start-up development process*". The top management of each incubatee firms is owner of part of the equity of the same firm.

Why is this particular model of incubator born? H-Farm is born from the "nexus" (Shane and Venkataraman 2000, Shane 2003) between a serial entrepreneur, whose ability is to create successful enterprises in the media industry, and the situation of the capital market of Italy characterized by few venture capitals and business angels and a low propensity to build high-tech start-ups (Colombo and Delmastro 2002, Di Minin et al. 2003).

Three aspects of the general strategy of this original incubator enrich our analysis: the internationalization process, the social corporate responsability and finally the process of idea generation.

Internationalization is one of the more recent and main strategies adopted by the incubator. H-Farm has recently opened two business units: one in India and one in USA. The idea is not only to reduce the cost of software development, but to access to wider potential markets where the innovative start-ups can be disposed. The advantage to stay in Italy and Europe is the possibility of exploiting creativity and the ability to create small and competitive start-ups. Italy seems to be a good location to access the European market and to exploit the mobile phone-media convergence. In USA H-farm can raise new capitals, focusing on new and advanced trends on communication and media industry and accessing an ideal market, ready to invest in the acquisition of high potential start-ups. In India the incubator can exploit the rapid growth of the internal demand of media and Internet base services and can build strategic alliances in order to reduce some production costs. In Donadon's mind, the ideal

pipeline is the following: creating and cultivating a business idea in Italy, developing the software in India and selling it in the American market.

Private incubation is not only the realm of profit and pure economic value creation. Even these incubators can be useful for the community and the geographical area that host them. H-Farm, for example, asks formally to potential buyers to leave all or part of the post-incubated firm in the same location, in Ca' Tron, with the aim to create a high tech cluster of firms. According to agglomeration economies, externalities and potential benefits for the hosting community are a direct consequence of the localization of the cluster.

Business idea generation is one of the key aspects of this private incubator. Not only employees and manager are invited to propose new ideas exploiting technological innovations and specific competences of the incubatee firms, but even external sources are searched and stimulated by H-farm. The company, for example, promotes idea competitions about social advertising, web television, mobile phone technologies. The incubator is therefore inward and outward looking, confirming the aim to create new buds from each technological innovation with a potential market. A strategic approach which is not far from the open innovation paradigm discussed by Chesbrough (2004). In October 2008, the first start-up campaign proposed by H-Farm closed: it focused on a particular mobile technology, which in less than a year has revolutionized the world, making internet available with a simple touch from the pockets of millions of people. "*H-Farm's goal is to discover the best ideas and projects, turning them into genuine business opportunities*, - says Donadon - *that's why in July 2008 we launched the Seed Program, a funding program aimed at fostering the best ideas to bring innovation in technology; every three months, the Seed Program will post some theme specific contests to gather and finance the best entrepreneurial ideas*." The last contest has registered a big success with more than 100 proposal: actually top management is checking and studying them all, in order to find the best one and give to those who have conceived it the chance to concretize their dream.

6.e Gianantonio Pozzato and Telea Engineering

The competitive advantage of the medical devices designed and produced by Telea Electronic Engineering comes from the daily commitment of its engineers, who research on the frontiers of technology and science, creating and applying new theories and scientific insights. A key driver that has always characterized the life of the company.

A tenuous but sophisticated link with History, allows us to turn our minds backward in time. Not because of the age of this company (in fact, founded in the late '80s, it is relatively young), but

because of a thin red line that comes from the history of medicine and, as we shall see, links the company based in Quinto Vicentino (Vicenza) with the first decades of the sixteenth century.

At those times, Europe was rediscovering the centrality of human being and the power of his creative force, but it was traversed by tensions of conservation and innovation. In this dynamic context the young Flemish Andreas van Wescle grew up: he had the opportunity to study in some of the most prestigious cultural centres of that age, including Leuven, Montpellier and Paris. Places that could not, in any way, appease the desire for knowledge and science that dwelled in the heart of Andreas.

After a few years spent in Basel, the young scholar finally arrived at the University of Padua, December 5, 1537 where he graduated in Medicine and obtained, exactly the day after his graduation, an appointment as lecturer at the chair of Surgery. “Universa Universis Patavina Libertas" (Under the university of Padua there is liberty for everyone) was the motto of the university that protected the innovative studies of Andreas and that, gave to him a professorship of Medicine in a few years.

Commonly called Vesalius, Andreas was not only a brilliant teacher but a true innovator: he was not satisfied with the state of the art of the medical sciences, at those times still locked and anchored to the old teachings of Galen. So he challenged with his new ideas and theories even the Holy Inquisition, obtaining, in the following centuries, the appellative of father of the modern medicine. His main work, called “De humani corporis fabrica”, has been a sort of revolution in anatomical sciences.

By celebrating the courage of Andreas Vesalius, physician, innovator, scientist, professor, the management of Telea Electronics decided to dedicate its first biomedical product to this father of medicine. Not only the passion for Science and knowledge, the desire to discover something new, the aim to improve the existing techniques are the key drivers that belong to the life and work of the young Dutch, physiatrist at the court of King Charles V, but also they belong to the history of "Vesalius". In fact this is the name of an innovative scalpel, based on a new theory on resonant molecules. A truly innovative product designed by Telea and worldwide distributed.

The first prototypes of the new scalpel have been made between 1992 and 1993. The company was founded in 1988 by two brothers, serial entrepreneurs, Arnaldo and Gianantonio Pozzato. During the early Nineties they start to work as subcontractors in the electro-medical sector for the design and project of electronic devices. Previously they worked as self-employed in the field of advanced electronics systems for weighing in motion systems and for computer emulation used by Intel.

"Since the first orders, our company has always had the aim to create new solutions, in order to improve applications and to target and focus more on innovative and highly customized niche products than on standard products with high-volume production," Mr. G. Pozzato explains. This "innovation

oriented" behaviour helped the two brothers to detect and understand the requirement coming from the medical world: the need to create a small scalpel with better features than the existing scalpels(laser, electric or traditional).

The main limit of the traditional electro-scalpels consists of the thermal damage on the tissues surrounding the injury, caused by high temperatures of 600 / 700 C degrees. Such damages provoke long healing times and potential complications and possible post-operative problems. With the idea of creating a product less harmful and more effective, Gianantonio Pozzato, CEO and president of Telea, carried out an extensive research activity and empirical tests, characterized by the application of physics, electronics, medical disciplines like physiology and surgery. Not only the output of his activity has been an innovative and less invasive scalpel, but new theoretical insights called theory of quantum molecular resonance.

The theory is based on three fundamental pillars coming from modern physics. The starting point, according with quantum physics, is that energy is quantized and that the value of each quantum of energy depends on the frequency. The second point is the existence of particular quantum values that can break the molecular bonds of the cells without causing heat or raising the temperature of the surrounding tissues. The third pillar of the theory of molecular resonance, applied in the innovative technology discovered and applied by Telea, regards the reaction of a molecular bond that receives the energy of one or more quantum. In the first case an increase of the kinetic energy produces an increase in the global medium temperature of the tissue, or in the second case the breakdown the molecular bond produces no increase in temperature if and only if, the energy delivered is equal to that of the molecular bonds of body tissues.

“Through the exploitation of this fundamental principles and by converting them into applied research, we made a scalpel where the target cells (the part of the human tissue that need to be lanced), are literally bombarded with quantum energy equal to the molecular bonds that need to be broken. We do not increase the global kinetic energy and thus there is no increase of the temperature of surrounding tissues. The overall result is therefore the breakdown of molecular bonds, remaining at a maximum temperature of 45 celsius degrees, without thermal damage to the cells. . The breaking of molecular bonds - says the president of Telea - allows a clean cut, leaving intact the surrounding cells as demonstrated both by histological examination performed at the microscope.” The main advantages of this technology are the following: a very low recovery time, less risk in postoperative times, and less pain for the patient. The function of coagulation has been made less harmful to the tissues, eliminating the classic diathermic coagulation. In fact in “Vesaiuls”, coagulation is obtained by keeping fairly low

temperatures (around 60 C) and triggering chemical reactions that lead to the denaturation of fibrinogen into fibrin.

Telea Electronic Engineering is now more than twenty years old and the staff is composed by 18 employees. Their average age is around 28 years. One of the member of the advisory board commented: "In our firm we like to have young and motivated employees. The atmosphere is really young. The product is technologically and commercially robust. Experts, engineers and operators seem to work with passion. Many of them smiling."

The company exploits an international supply chain, well-established over the years. Within the office and the production facility of Quinto Vicentino are located the following functions: marketing, research and development and critical functions such as testing, assembly and customization. The basic mechanical or electrical parts of Vesalius are externalized.

"Some of our suppliers are companies in the Vicenza area, others come from other nations of the world, because we need some very special components," explains one of the owners. Competitive strategy of the company, which has now reached a turnover of around 3 million - growing steadily in recent years - is also based on intellectual property protection. "The protection of our know-how is carried out not only in Europe but also in the countries that potentially could develop similar technologies such as China and the United States."

The entry to the market and the launch of Telea products in the European markets were initially difficult. The field of biomedical equipment is in fact dominated by a few large corporations that offer a wide range of high-reliable products. The strategies of customer retention, carried out by market leaders, are the factors that contribute to raising significant barriers to entry. "We initially focused on a few head phisycians and some opinion leaders to convince them of the efficiency and the advantages of our products," Pozzato said. Conscious of its innovative drive and the potential value of its innovations Telea were not afraid of the big players. From the early successes reached in the Nineties, the first product for small surgery interventions, has evolved.

Currently the product is available in six different configurations depending on the type of intervention (a version for small and medium surgery, one version for medium and large surgery interventions, neurosurgery bipolar apparatus, mono-and bipolar apparatus for spine surgery, one version for endoscopic urological operations, a monopolar and bipolar apparatus for dermatology). Telea Products are sold throughout Europe, Japan, China, Korea, Russia and in next year the company is expected to enter the U.S. market once completed all tests requested by U.S. Food and Drug Administration. The company has also obtained important certifications of quality and reliability, that

are considered essential features in bio-medical industry. In 1998 the company has been certified EN ISO 9001:2000 and in subsequent years as EN ISO 13485:2003 and CE0051.

The active collaboration with academic institutions is a key element of the competitive advantage of this company. The collaboration is not limited only to the classical experimental and clinical validation, but consists of the presence in the facility of Quinto Vicentino, of interns and graduates that work effectively with staff of Telea. In particular Telea collaborates with the undergraduate and graduated courses in biomedical engineering at the University of Padua, directed by Professor Ruggeri. Particularly valuable for the company is the link with the faculty of medicine of the same university: "We need a steady dialogue between clinical research, conducted by the university and the applied research that we perform at our laboratories," said Gianantonio Pozzato.

Not only a key driver for Telea, but for the whole electro-medical industry. Among the numerous opportunities for synergy and collaboration between medical departments and company technicians and researchers, Telea is proud of the experiments conducted at the Department of Otolaryngology, Gaslini Hospital in Genoa, Italy, which is one of the world leading centre. 600 young patients between 2 and 10 years were in fact subjected to adenoidectomy. One group was operated with Vesalius, the other group with a classic electrosclapel. The usage of the innovative Telea scalpel has resulted not only a reduction of blood loss by 50% but a drastic reduction of postoperative bleeding from 1.7% to 0.29%. Researchers noticed also a reduced recovery time by using the molecular resonance scalpel, thereby shortening the hospitalization period for the young patients.

Presenting only the scalpel called Vesalius, would merely illustrate half of the success of Telea. Studies of sudden healing process caused by the usage of the scalpel, and the relationship between the resonance frequencies and the effects on internal and external tissues, have led engineers and researchers to suppose a form of bio-stimulation caused by the molecular resonance. This supposition became applied research, experiments and finally a new product. In fact, following the principles of quantum molecular resonance, a second line of products has been designed and produced by Telea. Rexon-Age - this is the name of the new device - can provide local bio-stimulation of tissue cells with high frequency electric fields and low energy levels. It is a device with multiple adhesive electrodes and it can be used for aesthetic purposes (improvement and rejuvenation of tissue, disappearance of spots or stretch marks, increased muscle tone), for muscle and analgesic therapy (for pain caused by inflammation, muscle strains, sprain, arthritis, sciatics etc) and to improve blood and lymphatic circulation.

Electric fields at low energy levels can provoke a real biostimulation of tissues, by increasing the production of collagen and elastin, essential proteins for the construction of the cell matrix. The device is already 'on the market in many countries and it is achieving great success. Even some football clubs and sport teams choosed Rexon-Age for the treatment of some physical and muscular problems and pain of their players. The test of this new product was conducted with the constant support of the Institute of Anatomy and Physiology, University of Padua and the research team of Professor Carlo Reggiani.

Besides the collaboration with leading universities and research centres, Telea exploited the opportunities offered by regional and national institutions. It obtained the funds for a research project on bio-stimulation by the Veneto Region and the support of the Italian Ministry of Economic Development for research on the application of technology RexonAge in the field of neurodegenerative diseases, oncology and cardiology. Through these projects the company has been able to consolidate its network of research. The annual investment in research and development is nearly 25% of its revenues: on 18 employees, 5 full time equivalents are dedicated to experimentation and research.

The company collaborates actively with single specialists to achieve the improvement of its equipment and to enlarge the spectrum of potential applications for interventions or traditional medical fields

Over the years, both Vesalius and Rexon-Age have become leading products in the market but also the result of their clinical applications have become subjects for conferences and articles which appeared on national and specialized press.

Knowledge is a key driver for the designers, the engineers and the potential clients of biomedical devices. In fact knowledge management is not only part of the strategies of the company: it is essential that patients and physicians can be perfectly informed on the harmful and less invasive techniques, innovations that improve the opportunities of treatment or replace some traditional surgery tools. This case study is therefore an excellent example of how the practical applications of an innovative scientific theory and a consequent technology can become part of products commonly used in our hospitals. A case of excellence where innovation is not only a technological or business element, but, mainly on the footsteps of Andreas Vesalius, innovation can impact the quality of life of human beings.

6.f Patrizia Bizzotto and Work-Up

When creativity goes hand in hand with high technology, when anonymous algorithms become part of a broader business strategy, when simple sequences of bits or pixels are converted into value-added services for customers, then firms like WorkUp are born and develop. The company, based in Bassano del Grappa (Vicenza, Italy), is a small actor of the net economy: in 2008 it achieved a turnover of about 1.5 millions of Euros and employ 25 young, qualified professionals, web graphics, designers and marketing experts. The company was founded in 2000 with the goal of creating Internet based services, products and projects in order to make companies more competitive by exploiting all the opportunities coming from the new communication technologies and networking protocols. "Not only the Internet enables WorkUp to reach new and potential customers but also to generate qualified links, to control the costs, to track efficiently the results of a marketing strategy and to measure success strategies", Mrs. Patrizia Bizzotto, chief executive officer of Workup points.

The numbers confirming the successful story of WorkUp are truly impressive: the company operates in an industrial sector characterized by a good level of competition, by the sudden diffusion of technological innovations that change continuously the potentialities, the morphology and the essence of the Internet 800 domains under management, more than 1,200 solutions, a portfolio of customers of approximately 500 companies, over 100 complex projects completed, 600 web-marketing campaigns, more than 700 orders accepted only in the current year. Patrizia Bizzotto is proud and satisfied of these achievements. From her smile and her words come the passion for her job, for communication, organization, technology and marketing. Large dark eyes belong to this tenacious and courageous female entrepreneur who knows how to “surf” on the frontier of innovation, generating enthusiasm and exploring new horizons for her company.

The mission of WorkUp is to help the client companies to exploit the opportunities coming from the World Wide Web in order to increase sales and visibility. “Introducing itself to the market with a good website is not just a problem of external image. It can be considered something more: in fact the Internet is a great network of opportunities. According to the philosophy of WorkUp, the existence of a business on the web must be reconsidered in a strategic context strictly connected with marketing: the classic website can'and should become a valuable piece of the overall business strategy, a key element in order to generate concrete value.” Mrs Bizzotto says.

Due to its B2B nature, the company is highly customer oriented. Work Up offers an approach that allows to go beyond the traditional centrality of the customer, ensuring a continuous feedback of their work: "We are pioneering a new positive and constructive relationship with our customers .- Patrizia Bizzotto says and adds – While we operate in the field of strategy and marketing and thus with

the so-called intangible assets of our customers, we are heavily oriented to ensure measurable results achieved thanks to our intervention. Measuring intangible capital is perhaps one of the most fascinating and ambitious challenge for those who work in our field. Our strategic planning process begins and ends with metrics. During the concept development phase of the project clear performance indicators are defined according with the customer, in order to measure the expected return on the investment. Internet, in fact, is the only medium that is able to track results in an accurate and reliable way." The company also offers to each customer a sales advisor who can support it at all times, both in identifying the specifications of the offer and in verifying the achievement of agreed targets. The company also offers to the client a project manager who becomes the official interface in order to achieve effective synergies between the resources inside the company, the specialized PR and advertising agencies and the best technicians and IT vendors available in the market .

Our internal work exploits the most advanced project management techniques: a strategy that provides organizational efficiency and effectiveness in controlling costs and quality. It allows us to combine excellent results, rigor and creativity. At organizational level, the company is structured into 4 areas represented by the image of Fig.1: web marketing, design and implementation of complex applications (e-commerce management software solutions, B2B and B2C) web farm and web development (design and construction of websites).

Fig. 11 The Work-Up model

One of the most innovative area of work is the web marketing field : "The promotion of a website is a complex and constantly evolving challenge - says the CEO- In fact it requires specific technical and marketing knowledge: we take into consideration the behaviour of surfers/consumers, the meeting points and social networks on the Internet, the mechanisms for accessing to the sites, the algorithms used by search engines, the statistics on the use of the Web in our society and geographical areas."

Within the industrial area of Vicenza, there are many companies that provide services connected with IT. Despite they are extremely reliable, they generally provide low value-added services for its customers. From the creation of a website, to the simple programming, from hardware maintenance to simple advisory or distribution of products and solutions. Only a few companies are able to provide web-based applications or projects with high value added products where, in addition to technology, even marketing and strategy play key roles. The presence of this large number of IT professionals is one of the main novelties of the industrial area of North East of Italy.

Patrizia Bizzotto can be considered a privileged witness and protagonist of this fast change. By narrating his entrepreneurial history she evokes the dawn of the Internet in the Vicenza area: "Since 1996 many companies have been founded in the Veneto region with the aim of providing connectivity by enabling manufacturers to connect to the Internet." Small businesses that offer the possibility for other small or medium-sized enterprises to interconnect and exploit the potential of the first computer networks. "It was not easy to explain the new technologies of communication in Italy and in the Northeastern area of Italy, - says the CEO of WorkUp - this industrial land was not as' fertile as we thought." SHe added with irony but also with a bit of sadness, remembering when, in the second half of the nineties, some companies still confused the Internet with Eternit ... "Before being suppliers of technological products, these small business IT operators have been real pioneers within the Italian markets and society, achieving a true mission of "education" of the old economy business people and entrepreneurs, by revealing the potentialities of the information and telecommunication technologies."

The start-up phase for these IT and connectivity providers, is often characterized by the difficulty of creating a market, by a high level of competition, by a continuous and sudden technological turbulence. From the entrepreneurs' point of view, we can not forget a genuine enthusiasm for the Internet and the certainty of the quick diffusion of the World Wide Web through new generations of entrepreneurs and engineers.

The crisis of 2001 overwhelms many of these IT and Internet companies in the Veneto area. The consequences have been partially disastrous: in fact the crisis created a sort of disaffection with the

Internet, lack of confidence in new information technologies, and even loss of know-how and specialized human resources due to the radical change of the world of labour. Only few companies have been able to overcome the difficulties and the recession in this sector. The company managed by Patrizia Bizzotto is one of those who overcame the crisis and started to innovate successfully.

Born in Rossano Veneto, the place with the highest number of VAT in Europe, Patrizia Bizzotto says jokingly that " Who comes from Rossano, lives with the DNA of the entrepreneur." After graduating in electronic engineering from the University of Padua, she started to work by a public company called STET. She has been the first woman in a team of 70 top researchers of the company.

She was part of the most large innovative projects of the Eighties including the automatic management of the fault and the automatic management of the claim centre. Although being a company owned by the Italian Government, STET was the custodian of a great heritage in terms of know-how and technological knowledge. During the years spent by STET, Mrs Bizzotto also increased her managerial skills: the company in fact has been one of the first company in Italy to introduce heavily the project management tools in managing the research and development projects. With the advent of the first privatizations in the telecommunications sector, Patrizia Bizzotto followed some colleagues in some major consulting firms where she worked as senior consultant.

After some years she decided to come back to Veneto, where she realized that the industrial structure, despite an impressive economic development, was still dominated by the principles of the old economy and by an old enterprising culture. Exactly during these years the great revolution of the Internet came off: between the '94 and '95 Mrs. Bizzotto founded, together with some colleagues, a company for the resale of connectivity. Since the beginning of the Internet era, she have realized the great potential of this phenomenon able to create technological and social changes. Without any hesitation, she decided to become an entrepreneur able to exploit all the potentialities of Internet. She founded in 1996 Artelnet, one of the first companies in Italy focusing on solutions for e-commerce and e-business. From Artelnet to WorkUp: the company changed its name and the corporate structure and confirmed the leading role of Patrizia Bizzotto in 2000, the year when the number of Italians connected with the Internet were 800,000. The following year WorkUp acquired Emmenet, a company from Conegliano (Treviso), strengthening its presence in the Veneto region. The expansion continued in 2002 due to the acquisition of the customers of Tradenet, a company which signed an agreement with WorkUp for technical and commercial synergies.

In the following years WorkUp continued to grow up thanks to strategic partnerships with prestigious clients including Porsche Italy, Gruppo Carraro, Calzedonia, Le Fablier, Group Maltauro, Wimaxtop, Euronics, Baxi, Mevis, De Rigo.

Since its start-up phase, the company invested every year around 10 per cent of the turnover in research and development. "Our industry requires huge investments in research and continuous learning. Every project that we face is actually a "product development" project thanks to the 'application of languages and innovative opportunities coming from the Internet" the CEO says. Innovative Work-Up projects are characterized by the following key elements:

1) technological strategy: the choice of technology (such as the operating system, programming language, layout, graphics) is based not on intuition but on a careful analysis of potential technologies, customer needs, and consolidated trends;

2) team-working: working steadily in a group allows the staff to compare the multiple experiences . "It seems almost paradoxical, but in our field, often the most innovative insights come from the most young employees, those who shape the future development of Internet and information technology, "says the Mrs. Bizzotto;

3) attention to the open source world: "We are developing know-how in both the property software world and in the open source world", the CEO points.

“Our research and development team test all the innovations that emerge from the Internet: "We must have the courage to admit that sometimes doing research is synonymous with failure, not because we are not good researchers but because sometimes new solutions are not stable and reliable. Reliability and efficiency are two important criteria in developing web based software applications. We learn by trial and we strengthen our skills from the weakness of new languages that we test. This way of working allows us to gather relevant information about new products, to develop new skills and to obtain a good competitive advantage. "

In terms of human resources the average age is quite low, about 27/28 years. 60 percent of the employees are graduated, not only in engineering but also in social studies or humanities. "Our best software are the people," says CEO and adds "We are in a geographical area full of young experts of web and computers. On average, students who leave the technical high schools in Vicenza have a good technical background. But often we need highly specialized human resources, such as programmers and developers experts in any particular new language. These professionals are not so easy to find in the local market of labour. "Training also takes place within the company, but during the selection process carried out by the senior management , we evaluate the human qualities of candidates. "We

created a pleasant and relaxed working environment, characterized by shared ethical values," says the Bizzotto. This is an important result for an entrepreneur who is not only an innovator but also a good manager of the work of its employees.

The future of the Internet? Patrizia Bizzotto argues that every day there is something new to do or to test: “the power and the potentialities of the web are perhaps not yet fully understood by the entrepreneurs of our country and in general by the Italian companies. It 'now possible to go beyond the traditional paradigms of e-commerce, beyond the frontiers of multimedia communication, pushing towards the convergence between different media.” WorkUp is already at work in these innovative areas. With its daily commitment and its projects of exceptional quality, the company can demonstrate that the Internet is not just a set of protocols or a simple window of opportunities but a great prairie offering innovative developments and future trajectories of evolutions. Maybe revolutions. Within the markets and the European society.

6.g Andrea Bosio and Telsey

Strategy and courage: this is the combination that summarizes the story of Andrea Bosio, entrepreneur and innovator. Strategy and courage: two words that welcome the web-surfers to the homepage of Telsey Communications, a company founded by Bosio. The .insights of a "serial entrepreneur" as Bosio, the expertise gained in fifteen years of activity, the reliability of the technological solutions, the innovation as driver of the business model and finally the global market, make Telsey a leading actor of the sudden change taking place within the sector of information and communication technology.

Nowadays Telsey is a worldwide leader in the design and production of Access Gateway, IP-Video Station and Networking solutions for the distribution of broadband interactive services in the next generation access networks for both FTTx and DSL technologies. Telsey, with headquarters in Treviso, was founded in 1993 by Andrea Bosio and has always been characterized by its focus on Innovation and ability to work alongside its customers to deliver customized solutions.

Telsey's mission is to provide innovative, practical and top-quality solutions to help broadband communication service providers improve their time to market and business returns. “We have the people, the knowledge and tools to help our customers design, build, operate, maintain and manage every aspect of the next generation access networks and new service applications.”, the CEO says.

Telsey's added value goes beyond a complete, flexible and cost effective set of innovative and top-quality products. “Thanks to our unique library of hardware and software building blocks, we provide total flexibility, rapid design and cutting edge technology in the design of tailored broadband access and distribution solutions. Given our multi-year experience in the deployment of access solutions for advanced IP networks (FTTX, xDSL, Cable) we provide Consulting, Design and Support Services to help our customers reduce time to market and increase the return of investment of their broadband services distribution business.” Andrea Bosio explains.

The vision is to continuously design solutions which allow people at home and at work to have the most efficient and easiest way to access and use the advanced integrated communication, business and entertainment services using the next generation IP broadband networks. “Through innovation and flexibility we will help our customers effectively deploy and deliver, in a secure manner new communication services across any media and anywhere. We will apply our technological knowledge and experience to deliver solutions that will provide seamless integration of voice, video and data services for the development of Metro and Regional high-speed networks and future home and office intelligence automation.” The CEO says.

The story of Andrea Bosio could be the successful journey of a “first generation” entrepreneur operating in the Silicon Valley. But his story begins in Veneto, a region which shares with California only two features, the production of excellent wines and a very high rate of entrepreneurship. It was 1982 when Bosio, a twenty-two year old student of electrical engineering at the University of Padua, founded with some colleagues his first company: Racktronics srl, producing rack and aluminium alloy subrack. In 1986 he became president and CEO of the same company. Living years of commitment and enthusiasm, in 1987 founded Fact srl . industrial manufacturer of metal sheets used in electronics. The next year he founded Adel Srl, active in the pressurization of telephone cables.

He sold this company to IPM company in 1991. During the following years he founded the TMTM srl, producing devices for monitoring of telephone traffic. Since 1991 Bosio created a joint venture in Slovakia between an Italian company, Quasar srl to form a joint venture in Slovakia with the company Poprad for the production of electronic machines for the distribution of drinks. In 1998 Bosio sold his first company Racktronics. In 1993: Bosio became CEO of a new company called Telsy ,a spin-off of TMTM. The first opportunity for the young and small company (at the beginning of its life it is composed by a small group of entrepreneurs and 4 employees) was a research project promoted byPirelli Cables for the development of controls and alarms used in optical transmission at 34 Mbps.

After this successful collaboration, new prestigious and important agreements were signed by Telsey. The first was with South Urmet: the tow companies obtained by Telecom Italy the opportunity to build an innovative network system. Afterwards Telsey received by Telecom the order to build 1200 hub devices. Thanks to the cooperation with South Urmet and Necsy SpA, the company worked as subcontractor for Telecom Italy. Since the early years of activity, Telsey confirmed its international vocation: to be able to capture both the first weak signals of globalization, opening new markets and exploit the opportunities arising from the concrete and rapid development of new protocols and technologies.

In 1996 the company signed a supply contract with Pirelli Cables SVFO Groupe - France, for the distribution worldwide of TSP and LSP boards. During the same period the digital TV is introduced for the first time in Europe. Telsey manufactured the first digital front end to decode the signal to the top box. Also in 1996 a cooperation agreement was signed with Broadcom - Silicon Valley USA, market leader for the supply of highly-integrated analogical components for digital broadband solutions. Telsey also cooperated with Italtel for the supply during the years '96-'98 of about 150,000 front-end devices, used in set top box designed and distributed by Stream.

At the end of the Nineties, years characterized by a great revolutions in the world of telephony, Internet and digital communications, Telsey was able to ride the long wave of technological change with an impressive series of successes and innovations. Engineers and managers of the company based in Treviso contributed to the growth of the business through trade agreements and an intensive activity of research and development, In 1997 Telsey signed a development agreement with Tektronix for the sale of electronic devices. In the same year the company started to commercialize the set top box for markets not covered by the cables connections. In particular Telsey designed and manufactured a QAM modulator to inject signal in HFC networks, patented with the name of Qmedia. The company developed a centralized system for spreading and transmitting signals within blocks not covered by the classical cable signal. Telsey then started to work in the world of devices for the distribution of television signals. In 1998 it signed an OEM agreement with Tektronix to provide World Wide Hand Held TV Test Equipment.

New measurement devices have been designed an denominated DMA120, DMA121 and later DMA122 and DMA123. In the same year, the company signed ad agreement with Italtel for the supply of 20,000 QPSK front-ends.

With these words Bosio summarizes the early years: "from 1993 to 1999 our company worked mainly as OEM. It Grew progressively by working with important companies in the world of

telecommunications: Italtel, Techtronics, Pirelli Fotonic, by developing a range of technologies in order to support the core business of these players. In 1998 we created the first link for the transmission of signals VDSL within broadband networks. During those years the 'business focused on its core business, thanks to numerous collaborations with Telecom Italy, who was building an innovative network all over the nation, called Socrates. During this work we realized the importance of the issues relating the access to the network: At the beginning of new century, we started a deep collaboration with Fatsweb, a young and aggressive company, just listed: we proposed an innovative solution as Access Gateway. We have realized in fact the first access gateway at European level for triple communication (audio, video and data): on a single physical medium our devices were and are able to carry video data and voice signals "

The alliance between Fastweb and Telsey has been the beginning of a robust technology partnership between the two companies that grew up together over the years. In 2000 also the first joint project with the University of Sannio started.

In 2000 the progressive growth was supported by the entry of Fondo Raffaello, a private equity fund which controlled the 15.4% of the capital of Telsey. In 2001 the company won the Price "Veneto Innovazione" as the most innovative company in the Northeast of Italy, thanks to innovative Residential Gateway product. In the same year the company signed a supply contract with Hansenet first foreign broadband operator who started to use the new generation devices marketed by Telsey. The company also started to provide Fastweb with IP set top boxes. Due to the alliance Fastweb become the first worldwide triple player over IP networks.

In 2002 Telsey confirmed the trend of growth thanks to three privileged levers: knowledge, marketing and finance. In fact Telsey opened a Research and Development Laboratory in Benevento. It is part of the Cisco Service Provider Solution Ecosystem Programme for the provision of complete solutions for broadband access networks for residential and SOHO clients. From a commercial point of view Telsey signed a supply contract with Acanthus and began to analyze adjacent markets, especially those of public utilities company. From the financial point of view, Andrea Bosio seold its shares at Flitel srl, a company owend by him. A new investor, Berger Trust enterd in the company. The new corporate structure therefore became: Flitel Ltd. 48.25% 21.75% Trust Berger, Fondo Raffaello 30%. In 2003 Telsey signed a partnership agreement with BPT, on a project on the integration of home automation with the network and broadband services.

Another strategic contract was signed with Lyse Energi AS, a Norwegian multi-utility company, in order to provide Access Gateway and Media Converter. In the same year Telsey created a

partnership with the supplier National Semiconductor, a company based in Santa Clara, California, which employs about 10,000 employees around the world. Thanks to the agreement Telsey became a leader in the video telephony by designing IP Video Station which provides access to video services on demand, transmit streaming video, implement videosurvelliance systems.

Despite the problems of the ICT industry due to the crisis caused by the dotcom bubble , the management of Telsey ensured the expansion of both products and clients portfolios thanks to new technological developments and the acquisition of new customers. In 2003 the company signed a contract with Comunitel, first Spanish telecommunications operator for using the local loop xDSL to provide innovative services for the provision of CPV-ADSL. In the Same year Telsey introduced the last generation of Access Gateways devices, presenting them at the fair CeBIT in Hanover.

It Also participated, in collaboration with Bpt, at INTEL in Milan, international exhibition of electrical, electronics, lighting, industrial automation devices. Ten years after its foundation the company employed about ninety employees. Telsey participated also at the International Fair ITU Telecom World, presenting the new product family of Access Gateways: the CPVA500.

In 2004 Telsey confirmed its presence at CeBIT in Hannover presenting the new versions of Access Gateways and IP-Video Stations. It signed a new partnership agreement with Marconi (world leader in the creation and distribution of equipment, services and solutions for telecommunications – a company listed on the London Stock Exchange and on the NASDQ), a privileged partner for the residential market of broadband, particularly in Germany. The agreement focused on the development and distribution of special devices called soft-switch systems and wireless and wired access networks. This was the official comment of one of the top manager by Marconi: "We are excited to work with an innovative company as Telesey in order to achieve mutual success in the telecommunications market and to develop joint solutions for our customers." Across the Alps Antonello Madonna, CEO of Telsey echoed and declared "This partnership represents for both companies, the beginning of new and important projects in the broadband market characterized by rapid growth." The year 2004 also saw the penetration of the Spanish market through a strategic agreement with Italtel SA, a company with headquarters in Madrid. In the same year, the company presented its latest innovations for the creation, management and distribution of video solutions at IBC in Amsterdam, (a leading international exhibition on entertainment). The company achieved almost 120 employees and had an exceptional annual revenue growth. It Delivered 410,000 optical and electronic Access Gateways based on IP and DSL protocols. It Also delivered more than 140,000 IP Video Stations.

In the following years the company continued its expansion in the European market, especially in Britain, where in 2006, thanks to the contribution of UK Trade & Investment opened a laboratory for innovation and research at the Warwick Science Park . Among the main reasons for choosing England there was the opportunity of having a 150% remission of taxes for research expenditures Along this fiscal aspect the UK market was significant for Telsey who became supplier of the major competitors of British Telecom regarding access gateways and set top box. "Our company is particularly innovative - says the CEO Madonna- we usually work with universities in Spain, Norway, as well as in Italy and Great Britain. In the area that we select, we are certain to be really close to all the strategic research centres, crucial for our industry ".

1993	Telsey founded as a developer of telecommunications systems
1994-1995	Develops high bandwidth OEM products for major telecom manufacturers
1996	Develops front-end decoding units for digital cable and satellite STBs
1997	Delivers QAM modulator for HFC networks
1998	Installs VDSL link for Telecom Italia; delivers 1st portable DVB QAM Analyser
1999	Begins relationship with FastWeb; delivers 1st VoIP Triple-Play Access Gateway
2000	Signs contract with FastWeb and focuses product portfolio on broadband access solutions
2001	First IP Videostation delivered; wins "Veneto Innovazione" award
2002	Delivers 100,000th Access Gateway; business expands internationally
2003	Delivers 200,000th Access Gateway and 50,000th IP Video Station Delivers 400,000th Access Gateway and 140,000th IP Video Station
2004	Delivers 400,000th Access Gateway and 140,000th IP Video Station
2005	First to deliver High Definition IP Video Stations to Telecom Italia. 700,000th Access Gateway and 170,000th IP Video Station Products delivered Opens new Sales and Technical office in UK
2006	Delivers more than 1 MIO units

Fig. 12 Telsey's story

Telsey's success is confirmed by the progressive increase in annual turnover, as shown in the following figure: in 5 years the turnover becomes ten times the initial one. From 2004 to 2006 in just 2 years, doubles

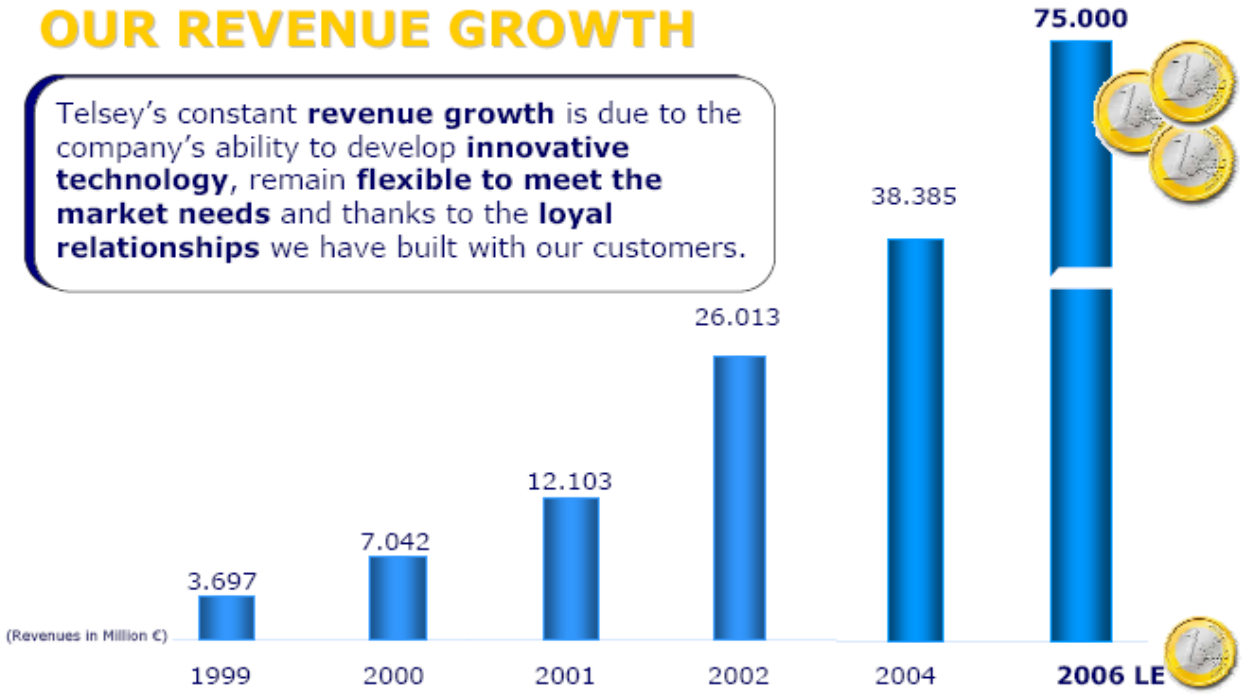


Fig. 13 Telsey's revenues

2007 is the year in which Tiscali UK and Tiscali Italy selects Telsey as exclusive Set Top Box supplier. It is also the year of the creation of Telsey CEE in Vienna to serve the market of Eastern Europe.

During the first months of 2007, Telsey expands in Central Eastern Europe with the foundation of Telsey CEE GmbH, to underline the company's willingness to preside over the mature European market extending at the same time its product range to networking devices (Switches and Media Converters).

Today Telsey has a consolidated international presence with offices and facilities in UK, Spain, Austria and Eastern Europe and cumulates over 10 years of leadership role in the development of pioneering and innovative broadband and Internet Protocol technologies. The continuous focus on innovation, the strong relationship programs with Academic Institutes, Universities, Research Centres together with over 60% of the Telsey team dedicated to Research and Development are the foundation for the Telsey growth and strategy.

Due to a dynamic and enterprising management, the specific know-how and advanced technology, Telsey became therefore world leader in the field of broadband access networks. "Through our experience in developing systems of access for IP networks, Telsey allows to minimize the time to market and improve the competitiveness of service providers in providing next generation

telecommunications services – Bosio says and adds – The company is characterized by a high degree of internationalization and a strong drive for technological innovation Telsey is supporting a significant growth process, which will further strengthen its presence within the Italian market and to expand in international market. "

The main products currently offered by Telsey can be divided into three families: access gateways, IP video stations and networking solutions for the distribution and the exploitation of multimedia broadband and interactive communication services. The Access Gateways provide multiple services to houses and offices by using an high speed IP-based broadband connection. These devices therefore offer integrated services of video, voice and data, bringing significant benefits not only to service providers but also to end users. "Thanks to our access gateways, service providers can deliver fast and innovative services to end users such as fast Internet, VoIP, Video on Demand and video streaming. – the CEO explains.. End users benefit from innovative services offered by service providers via a modern device that connects all devices, computers and telephone through a single broadband connection throughout the home or office.

"Our products present a competitive price - says Andrea Bosio - allowing service providers to make profitable their effort and to provide innovative services to end-users at low costs. In addition, our ten-year know-how on design and production results in extraordinary reliability and a high quality of service for our customers. Our goal is to bring complete solutions to home for the distribution of broadband signals. The challenge is to create an internal network in a non-intrusive way, thanks to home networking devices to offer the opportunity to take advantage of broadband signals anywhere in the house. Today there are mainly two reasons for home networking. The first one is to exploit a high speed internet connection and thus to take advantage of cable TV services with an IP based signal. This leads to the user the ability to choose what they want to see. These systems allow to implement the service called video on demand.

Telsey provides the best technology for home networking, but operators must be able to ensure the right content and efficient services that take advantage of our technology. The second reason is to use broadband connections linked to the possibility of remote control of the devices at home or in an office environment "

IPTV is one of Telsey's core business is not just "another" platform for digital TV, but also the most powerful technology platform for distributing video content by allowing the highest degree of interactivity and a number of channels theoretically unlimited. The number of IPTV customers in Europe and in Italy is constantly increasing and the combination of competitive triple-play offers that

include high value services - like video on Demand and Personal Video Recording – is for final customers a strategic choice. "In this scenario – the CEO explains - the IP Set Top Box and the Access Gateways represent elements of high performance and competitive, allowing fast access to broadband IP networks and giving users the possibility to use, with the highest quality, all the innovative services delivered over IP. The broadband transmission of data and the joint audio and video signal are the fundamental feature of all major telecommunications operators. Modern houses and offices are characterized by the presence of numerous electronic devices and computer positioned at different points. The traditional wired infrastructure and the necessary presence of various access devices represent an additional cost for end users and operators: this fact is perceived as a genuine barrier to access broadband services. Telsey's innovative approach is based on the ability to overcome these barriers through a "triple" (data, audio and video) signals distribution with integrated solutions for wired and wireless networks.

What are the technological and commercial customers of Telsey? "Telsey is a company operating worldwide: - Bosio asserts - our target is the typical 'ICT operator (incumbent or emerging) within Europe. There is a great demand for these types of services and for the appropriate technology. Telsey has facilities and research centres in England, in Spain, in Norway, in Austria and in Italy. " The assistance provided to customers is one of the competitive advantage of the Italian company. The customer care centre is reachable by phone, mail or via web. Package software updates, technical documentation, warranty over 24 months, repair services, the availability of spare parts for every Telsey device in a few days, are some of the offered services.

. "In our company employees are around 150 people – Mr. Bosio says - The 'average age is under 32 years old. Today innovation comes from boys and girls even younger. 70% of our staff are employed in R & D activities: we are a company whose strategic core is technology, we develop internally both the' hardware and software. Our organizational culture is based on an effective time to market, on the ability to be rapid developers of technology by following the needs of our customers. The organizational structure is horizontal: we can adapt very quickly to market and technological changes. It is a structure based on innovation because we are daily innovators. Of course we do pure research, even if the ultimate goal of our research effort is to create products that that can be sold in the marketplace. "

The importance of young people within the staff, and their role of creators and innovators and is also confirmed by Massimiliano Mason, executive vice president of Telsey "The company try to shape and design the future of our market and thus we focus on young people. Working with young

employees in your company means that you can exploit pure enthusiasm and innovative ideas. A concept that Telsey has adopted not only by hosting interns from high schools and university graduates, but even by hiring people. Over 40% of our workforce is first job workforce. Stimuli provided by young collaborators who enters the world of work for the first time, are very important. Innovation, determination and tenacity in pursuing results, the high preparation in specific areas, make this company ready every day to evolve and grow.

The main factors that led to both the success in the world of telecommunications and to a substantial competitive advantage are particularly relevant. In some cases these are features common to many small and medium-sized high-technology firms that compete successfully within international markets. First of all, the presence and experience of a "serial entrepreneur" as Bosio, helped by a highly qualified board, helped the company to shape and design ambitious goals. The strategy based on the construction of technological partnerships is the first driver for the growth of Telsey. Collaboration with customers and suppliers is thus an asset of primary importance. The company has also developed the awareness of its role within the value chain of ICT services. Another reason for the company's growth is also attributable to the initiatives regarding the financial assets: the presence of two investment funds helped to consolidate the financial position of Telsey and ensure adequate strength and capitals for growth

The three pillars of the business model of the company are: the problem solving orientation, the technological strategy, the ability of learning from agreements and collaboration. "The sum of these three elements – Mr. Bosio explains - allows the company to build a winning approach to the market and to maximize the return of its investments.

We depend from our technological partners: we are a part of the value chain and thus we must communicate in the best way with all the parts . Our products are situated substantially towards the end of this chain. They are like an interface with the final users: we have therefore developed the ability to interact with companies that are before us in the value chain (key relationships with Italtel, the ability to interact with Cisco) and operators in the world of 'IP TV as NDS and others. Our growth strategy is also based on the centrality of the customer, the ability to prevent its needs and be proactive. Usually we offer to our customers a range of products, and we interact with them during the design, the 'engineering and the production phases.

The competencies and commercial success certainly do not satisfy the President that outlines new goals and objectives, "The technologies we are currently focusing on - said Bosio – are ADSL 2 and ADSL 3. In fact they show better performances compared to 'traditional the ADSL. We want to

build devices more efficient and reliable. Particular attention is for the technology called VDSL a: they are networks that can be build inside apartments or offices by wiring with new plastics cables. Our research also focuses towards various non-intrusive technology for the distribution of the signals. As for the TV, we're going to developing and improving algorithms to compress the video signals. In particular, we are researching on the integration of digital terrestrial signals or satellite signals with the compression of video signals. "

The attention to the quality of our operations and product and to the environment are crucial aspects for the entrepreneurial culture that drive Telsey. The company controls and monitors all the processes in order to achieve reliable products, the systematic measurement of the degree of customer satisfaction and the involvement of all personnel in quality management. "measurable targets for quality are defined annually during the review by senior management '- the CEO explains - In order to make our policy for quality clear at all levels of the organization, the board signed a document that has been made available to all our staff. In the pursuit of continuous improvement we adopted a policy according to the laws and local regulations for the protection of the environment." Telsey requires by its suppliers to accord with the requirements of ISO14000 certification.

Besides the attention for the environment, Telsey has also developed an ethical and social dimension of its business, confirming as a virtuous example of enterprise mature and responsible.

In 2006 the Ethics Code have been approved. How to operationalize and contextualize shared values such as respect for the environment, honesty transparency, fairness, confidentiality and quality? Telsey selects different methods for implementing ethical behaviours: the selection of personnel, the development of professional staff, the protection of privacy, the avoidance of conflict of interests. The interesting self-regulatory process of the company involves many aspects of corporate life: the operating procedures and processing of accounting data, the protection of the strategic assets, the relations with public authorities, trade unions and forms of social aggregation, the relationships with customers with suppliers and the media world. Again Telsey is confirmed as a dynamic and innovative company: being an high-tech enterprise is often accompanied by relevant forms of social responsibility and an ethical dimension of its entrepreneurial commitment.

Analysis, discussion and results

7.a Summary of the case studies

Before presenting the cross case comparison, we summarize some basic data about the companies in the following Table:

company	industry	turnover	employees
Microlife	*Biotech*	-	*4 fte*
It+Robotics	*Robotics*	*70.000 Euros*	-
M-31	*ICT, Private business incubator*	*200.000 Euros*	*17*
H-Farm Ventures	*Internet and Media, private business incubator*	*4.4 mln Euros*	*110*
Telea Engineering	*Medical*	*2 mln euros*	*18*
Work-up	*Software*	*1 mln euros*	*25*
Telsey	*Electronic*	*75 mln euros*	*150*

Tab. 12 Summary of the case studies

7.b Entrepreneurial Motivations: cross case analysis and discussion

Some relevant considerations about the motivations that drove and actually drive the entrepreneurial behaviours of Matteo Villa emerge from the first case study. He is an emergent entrepreneur: he had just changed his career, in fact, he recently choose to abandon his managerial status and to became a novice entrepreneur. According with Davidsson (2008), the potential retrospective bias is negligible. The desire to increase his monthly income has not been the primary driver of the entrepreneurial choice. The financial position of Mr. Villa was, in fact quite solid. His choice is thus, not necessity driven, nor influenced by a quick financial return.

Despite he is not a leading scientist – the case study emphasizes his background is in the field of public relations – he shows an evident passion for his work and for the specific technologies that he decided to adopt and to commercially exploit. The case study, the secondary data collected, and the

transcription of the interview with the entrepreneur have been coded using the main motivations presented in Chapter 2. Three main motivations can be identified. First of all we recognize the desire to demonstrate the feasibility and the profitability of the algal technologies. Both of them are strictly connected with the product and the particular technological strategy adopted by the entrepreneur. These are the words used by Mr. Villa:

"*I was fascinated by these new technologies based on algae and since the beginning, I was surprised by their versatility. The products of our photobioreactors can be used in very different contexts. And many of these contexts are promising and expanding markets. I am aware that some difficulties and challenges need to be faced by the company and by the international research community. New technological insights should be consolidated, the products must be tested, production processes need to show a real economic advantage and to convince potential investors*."

In other parts of the interview we coded the entrepreneur's idea of achieving a competitive advantage and thus becoming leader in the research and the creation of innovations that can be sold now or in the next future in old or new markets. Thanks to the confirmation of the product feasibility and its profitability – carried out both by Microlife, by its competitors and by international research centres – he asserts that his priority is to achieve the guarantee to be innovative and leader in the market. Mr Villa often uses the term new markets, highlighting that he wants to be the first mover in the future competition base don algal technologies. We can thus conclude that the actual main motivation is the idea to create innovative products and thus adopting a technological strategy coherent with these goal. We can deduce it from the following words:

"*We are actually opening new markets, so we there are not many competitors in Europe. Some of them are in Northern Europe. Our competitive advantage is the ability to create new patents, and doing research, according to the market needs. We are actually planning to build new collaborations with some of our competitors, in order to strengthen the impact of green algal technologies on the market and to help each other in creating and developing new markets*"

By coding this case study we noted the evolution of the motivations that drove Mr.Villa and that actually feed his plans for the development and the growth of his business during next years.

The story of It+Robotics is the successful journey of some professors ,that partially shifted their career, becoming entrepreneurs. The usual motivation the drive academics to become entrepreneurs have been previously discussed in chapter 2, Shane (2004) highlighted two major categories of explanation to create a new venture within an academic context. A psychological explanation:

academics found new companies to put their technology into practice or obtain wealth or independence. And a career oriented explanation: inventors found companies because of their career stage at the time of the invention that they decide to transform into a product. The evidence reported by Shane come from personal previous work and contributions from the literature (Samson and Gurdon 1993, McQueen and Wallmark 1982). His main findings are:

1) Inventors often start companies because they want to bring their new technology into practice. Many inventors want to be the part of the commercialization process and often this is not allowed by large companies. Other found companies because they are convinced that already established companies would not move the technology into practice quickly enough because they are not as passionate about technology and its applications, as the scientists are.

2) Inventors are motivated by the desire to get rich. This motivation comes from the idea that much more money could be made building a successful company than by licensing an invention to an already established firm.

3) the desire for independence is another crucial motivator. This is result is coherent with the idea (Shane 2003) that people with an evident desire for independence are more likely to found new firms that people with a weak desire for independence.

The case study about Enrico Pagello and It+Robotics is interesting because it provides insights that are not covered by Shane's analysis. The main motivations that led and lead the choice by professor Pagello are: the presence of a potential market and the academic return (Giacon …) of the activities and the projects carried out by the spin-off company. Let's focus on the last paragraph of our case:

On the contrary, the management of IT+Robotics has chosen to create a reality capable of building a bridge – perhaps more clear-cut and solid than in the past – between universities and businesses. One of the pillars of this bridge is obviously research. The group led by Professor Pagello, has therefore chosen to go into business-building in order to get closer to enterprises. Perhaps the most unexpected discovery made by these lecturer-businessmen is that tied to experimenting the difficulties, the successes and the lifestyle of the Company. For example, they have even been able to extract new stimuli for researching and developing knowledge from activities closely connected to products, trade and marketing. "We have supplied services, sold products and developed projects; these activities are radically different from those of writing scientific articles or books, the main task for people who work in university research. We have come to the conclusion that even these business activities can offer us 'food for research' and new stimuli. We have succeeded in enhancing the

competences and know-how developed at University, even if our small spin-off still has a very long way to go".

The case study shows the evolution of a basic consulting experience towards a clear hybrid entrepreneur role. In IT+Robotics research and business sustain each other: one of the main goal of Enrico Pagello is to provide more funds and grants for his staff and junior faculty members. While the expectation of high financial returns foster academic entrepreneurs to start-up many enterprises, the academic reward seems to be one of the main driver of the decision to start-up and to commercialize academic know-how. This result is coherent with the conclusions of Fini et al. (2006) : they found that academics' decision to start-up a new company is much influenced by personal expected outcomes like the possibility to exchange scientific knowledge with outside, to gain prestige and reputation as leading academics, to generate further stimuli for research activities, to create funding opportunities fro students or research assistants. The result is partially confirmed by Shane (2004) who demonstrated that founding a university spinoff is an effective way to raise money for the development of further technological research.

We can conclude that the main motivations are

1) the development a technological leadership within the western new market. In as we read in the case study: "*Although this technology is already mature, it is only just taking its first steps in Europe. It is IT+Robotics' aspiration to succeed in exploiting its potential to the utmost in the field of security and in the consumer world"*
2) the production of wealth and funds for the research group and the academic community led by the entrepreneur

Ruggero Frezza is indeed an entrepreneur with a Schumpeterian profile. He is an individual able to swim against the current, an agent of change, an innovator. Not only in the technological context (he published in relevant international journals and reviews) but even he is a pioneer of an innovative business model. Private incubators are, in fact, not popular in the European context. He is strongly motivated from the desire to demonstrate the feasibility and the profitability of private incubation.

Let's compare professors Pagello and Frezza. Both academics are two successful and worldwide appreciated researchers: they built a strong international network and they both decided in the central part of their career to start-up an academic spin-off. First of all we consider the entrepreneurial decisional process of Ruggero Frezza and Enrico Pagello. Considering the previous

cases and comparing them with the results by Fini et al. (2006), Wright et al. (2008), Stuart and Ding (2006), it is possible to draw a reference framework for the decisional process. Both professors recognized a technological opportunity. While Pagello is more research oriented and focused on his fields of interest (distributed computing and artificial intelligence and robotics), Ruggero Frezza is ready to explore and support technological paradigms even far from his fields of interest. According to Shane (2004), we can conclude and confirm that the first step of the decisional process is the recognition of the technological opportunity. This latter is not enough to decide whether to start up or not: personal motivations are the main driver of the choice of both academics entrepreneurs. In fact Pagello wants to increase his academic return, while Frezza is strongly guided by the research of high economic returns (according to the serial nature of his entrepreneurial orientation).

The case study about Enrico Pagello shows the evolution of a basic consulting experience towards a clear hybrid entrepreneur role. In IT+Robotics research and business sustain each other: one of the main goal of Enrico Pagello is to provide more funds and grants for his staff and junior faculty members. While the expectation of high financial returns foster academic entrepreneurs like Ruggero Frezza to start-up many enterprises, the academic reward seems to be one of the main driver of the decision to start-up and to commercialize academic know-how. This result is coherent with the conclusions of Fini et al. (2006) : they found that academics' decision to start-up a new company is much influenced by personal expected outcomes like the possibility to exchange scientific knowledge with outside, to gain prestige and reputation as leading academics, to generate further stimuli for research activities, to create funding opportunities fro students or research assistants. The result is also confirmed by Shane (2004) who demonstrated that founding a university spinoff is an effective way to raise money for the development of further technological research.

The case study about M-31, presents Ruggero Frezza, and his spinoff venture. Ruggero is an hybrid pro-active entrepreneur (Giacon 2008b) because of the innovative business model and because of the strong motivations that feed his commitment and entrepreneurial enthusiasm. Dr. Frezza is not a necessity driven entrepreneur and from the words reported in the case study emerge a strong influence of two McClelland indicators (1961, 1965): need for achievement and need for affiliation.

Furthermore there is another issue that has been coded many times within the interview and in this latter case study: the research of wealth. It is not a personal wealth: professor Frezza, in fact is guided by two strong ideas

1) to help the local area and the country in order to build new high-tech enterprises

"*Our main aim is to become a real and proper catalyst for innovative enterprises. Our strategy is based on the exploration and creation of collaborative networks involving businessmen, universities, research centres, business angels, investors and venture capitalists,* - states Ruggero Frezza – *We have created a team of professionals with great expertise and skills in basic qualifying technologies and we have begun to assemble contacts and construct alliances with successful companies in a variety of sectors*

2) to exploit the best human resources "produced" by the Universities (their Ph.D.s), that, in his view, are not fully appreciated by the local industrial system

"Unfortunately – admits Frezza – *there are very few students who, although having graduated with top marks and completed their studies brilliantly, decide to set up innovative enterprises. We also have to debunk the myth regarding the lack of quality in our university departments. The issue is not the quality of research carried out in university labs, which is of the highest level, but insufficient encouragement and the scanty use of research doctorates. Only too often Italy is seen as the waiting room to an academic career and not as an opportunity for high level training and technological transfer towards the enterprises in the surrounding area. It is for these many reasons that M31 aspires to be a company whose doors are open to research doctors, the best brains trained within our universities. Many already collaborate with us and others, together with their lecturers, can knock on our door at any time to put forward their ideas regarding entrepreneurship and innovation*

These latter elements can be thus considered two relevant motivations which belong to the high-tech entrepreneur's sphere of responsibility.

Riccardo Donadon is a serial entrepreneur. Like Ruggero Frezza, founder of M-31 and Andrea Bosio, founder of Telsey. He defines himself as a "generator of business idea" , as we can read: "I have been always a generator f business ideas, convinced that the Internet could be a medium able to support, promote and develop thousands of different business models". Two factors emerge as the main motivations of his entrepreneurial career. From one hand the passion for Internet based technologies is a characteristic of the individual, and from the other hand he is motivated by the aim to obtain a quick financial return of his efforts and investments. The passion for the Internet and its potentialities is witnessed by the career of Riccardo Donadon: "*We are specialized on Internet services and Internet based media companies. Exploiting the opportunities of the Internet – says Donandon – firms can find everywhere potential clients or partners. Now the company has more than 150 employees, most of them*

are professionally involved into design, media, creativity. Our product are companies and We are proud to use only private funds to build them"

The three year incubation program developed by H-Farm is the indicator of the aim to obtain a quick return: the time horizon set by Donadon is reported here*: "While traditional venture capitals and business angels work with a time horizon of 72 months and a success rate of 2/10, the basic idea of this new incubation model is to reach as fast as possible a success rate of 10/10. This is well explained by the incubator founder: "We are no looking to build up a new Google or E-bay, revolutionary star companies, that can globally change the marketplace. Our aim is to build robust small enterprises that can eventually compete and growth without the support of external organizations*"

We can therefore conclude that as far as the fourth case study is concerned, the economic and financial return of the entrepreneurial activity and the passion for the Internet technologies (which is often synonymous of expertise on that particular field) can be identified as the main motivations.

From a motivational point of view the case study of Telea Engineering offers some interesting suggestions. In the first phase of the life of the company the entrepreneurs have been motivated by the desire to demonstrate the feasibility, applicability and profitability of their results and scientific insights.

"*The main limit of the traditional electro-scalpels consists of the thermal damage on the tissues surrounding the injury, caused by high temperatures of 600 / 700 C degrees. Such damages provoke long healing times and potential complications and possible post-operative problems. With the idea of creating a product less harmful and more effective, the engineer Gianantonio Pozzato, CEO and president of Telea, carried out an extensive research activity and empirical tests, characterized by the application of physics, electronics, medical disciplines like physiology and surgery. Not only the output of his activity has been an innovative and less invasive scalpel, but new theoretical insights called theory of quantum molecular resonance."*

Once the product has been demonstrated to be successful, they tried to apply the same scientific principles in other contexts, looking for diversificating their portfolio of products. In this case the motivation is double: from one hand they wanted to maintain a sort of technological leadership and on the other hand, they tried to create a new product as reported here:

"Studies of sudden healing process caused by the usage of the scalpel, and the relationship between the resonance frequencies and the effects on internal and external tissues, have led engineers

and researchers to suppose a form of bio-stimulation caused by the molecular resonance. This supposition became applied research, experiments and finally a new product."

We can thus recognize a motivational shift: the preliminary motivations have not been removed , but they have probably been enriched with new motivational forces that actually drive their entrepreneurial behaviour. This shift can be easily recognized also in other case studies.

From the coding and the analysis of the case study of Patrizia Bizzotto it is easy to recognize a strong personality. Being a female entrepreneur is not an easy career in Italy. her personal story let us to emphasize different motivations. The most evident are the so called McClelland indicators: Patrizia Bizzotto shows a high need of achievement, need for power and need for affiliation. Of course these motivations are the basis of her entrepreneurial choice, but another motivational element seems to be relevant. Let's read again some statements:

"Since 1996 many companies have been founded in the Veneto region with the aim of providing connectivity by enabling manufacturers to connect to the Internet." Small businesses that offer the possibility for other small or medium-sized enterprises to interconnect and exploit the potential of the first computer networks. "It was not easy to explain the new technologies of communication in Italy and in the Northeast, - said the CEO of WorkUp - this industrial land was not as' fertile as we thought." She added with irony but also with a bit of sadness, remembering when, in the second half of the nineties, some companies still confused the Internet with Eternit ... "Before being suppliers of technological products, these small business IT operators have been real pioneers within the Italian society, achieving a true mission of "education" of the old economy business people and entreprenurs, by revealing the potentialities of the information and telecommunication technologies."

The work made by Patrizia Bizzotto presents some educational aspects: her company was driven, of course, by the aim to exploit a new market and thus obtain financial returns, but it was also driven by the "responsible" idea that even the Italian firms could exploit the potentialities of Internet revolution. And Mrs Bizzotto tries to explain these potentialities to her colleagues entrepreneurs. In a wide interpretation of her words, we can connect this secondary motivation with the general motivational construct already called "wealth".

Andrea Bosio is a serial entrepreneur. This is a popular paradigm within the subset of high-tech entrepreneurs. As recognized by other entrepreneurs interviewed in this doctoral work, money is one of

the primary motivational driver for this category of entrepreneurs. Furthermore the desire to create innovative products and to guarantee a technological leadership can be considered two product-level motivators relevant also in this case. In fact the entrepreneur asserts:

*"*We have the people, the knowledge and tools to help our customers design, build, operate, maintain and manage every aspect of the next generation access networks and new service applications.", says the CEO. Telsey's added value goes beyond a complete, flexible and cost effective set of innovative and top-quality products. "Thanks to our unique library of hardware and software building blocks, we provide total flexibility, rapid design and cutting edge technology in the design of tailored broadband access and distribution solutions. Given our multi-year experience in the deployment of access solutions for advanced IP networks (FTTX, xDSL, Cable) we provide Consulting, Design and Support Services to help our customers reduce time to market and increase the return of investment of their broadband services distribution business."

Thus, while the remuneration of the shareholders, is the primary driver of the entrepreneurial commitment of Mr. Bosio, the aim to be innovative and technological leader (which is the best way to confirm the joint collaborations with incumbent operators), motivates and daily drives the entrepreneur during his decisional process.

From the mini case studies presented through the introductory section, from the analisys of the case studies presented in the previous chapter, from their cross comparison, as described by Yin (2002) and Eisenhadrdt (1989) and from the comparison with the most recent insights offered by the literature (and in particular the contributions by Shane 2003 and Carter et al. 2003) we suggest the following findings.

First of all we must confirm that the financial return is one the main driver of the entrepreneurial activity, according with many different authors. Other authors highlight the passion for the technology itself as primary driver of the entrepreneurial choice.

Secondly, the set of motivational drivers that emerge from the analysis, are the following: a) family environment, b) necessity (lack of job or not satisfying job alternatives), c)McClelland indicators (N-Pow,N-Ach, N-Aff), d) financial return, e) desire to demonstrate the feasibility of the technology applied in the product, f) desire to demonstrate the profitability of the technology applied in the product, g) desire to be innovative h) desire to diversificate and increase the portfolio of products, i) intention to maintain the technological leadership, l) creation of wealth (jobs, legacy, knowledge), m) corporate social responsibility issues.

A motivational shift during the lifecycle of the company, which is strictly connected with the personal life of the entrepreneur, can be deduced by the coding of the case studies. In particular the following Table presents the highlighted shifts. The explanation of the symbol → will be given below

Entrepreneur	Motivational shift
Matteo Villa (Microlife)	*feasibility, profitability → innovation*
Enrico Pagello (It+Robotics)	*profitability → wealth (academic return)*
Ruggero Frezza (M-31)	*N-Ach, N-Pow, N-Aff → wealth and corporate social responsability*
Riccardo Donadon (H-Farm Ventures)	*feasibility, profitability + financial return*
Gianantonio Pozzato (Telea Engineering)	*feasibility → diversification*
Patrizia Bizzotto (Work-up)	*N-Ach, N-Pow, N-Aff → wealth and corporate social responsability*
Andrea Bosio (Telsey)	*financial return → innovation*

Tab. 13 Empirical evidence of motivational shift

What is the meaning of the symbol →? We emphasize that it does not mean that the previous motivation has been abandoned by the entrepreneur, but that this motivation has been enriched by the second one. The detection of this mechanism, lead us to postulate the esixtence of an enrichment that realizes de facto the motivational shift. Enrichment means differentiation though the extension of the previous motivations. After an enrichment process, the number of the motivations should be increased. The case study about Riccardo Donadon is the only one that shows no evidence of the motivational shift.

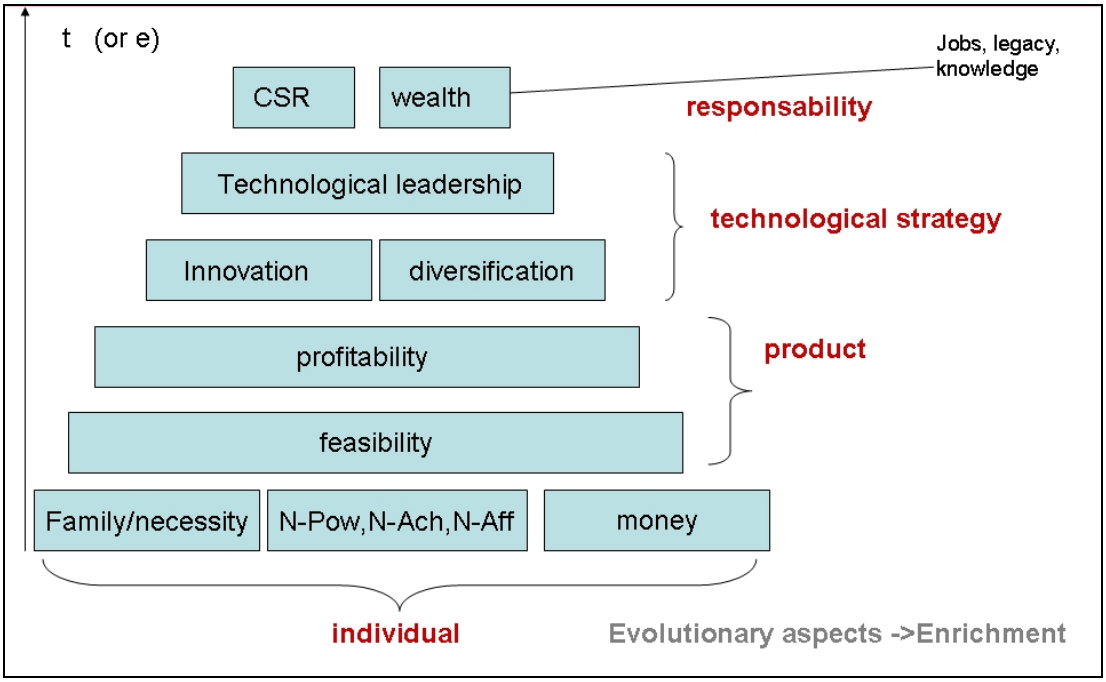
Comparing these results with the literature of chapter 2, we propose a hierarchical assessment of the motivational driver that lead the entrepreneurial choices. At individual level the basic motivations that emerge from the cases are the following: a) family environment, b) necessity (lack of job or not satisfying job alternatives), c)McClelland indicators (N-Pow,N-Ach, N-Aff), d) financial return. Once one or more of these motivations are considered relevant from a potential entrepreneur, other motivational aspects can enrich the reasons for the Entrepreneurial Choice and the daily effort of the entrepreneur. We asses them as

4) product level motivations: desire to demonstrate the feasibility of the technology applied in the product, f) desire to demonstrate the profitability of the technology applied in the product
5) strategy-level motivations: , g) desire to be innovative h) desire to diversificate and increase the portfolios of products, i) intention to maintain the technological leadership,

6) personal responsibility motivations: l) creation of wealth (jobs, legacy, knowledge), m) corporate social responsibility issues.

In order to better understand this assessment we point that the motivations are not ordered on the basis of their importance or relevance. They have been assessed by considering only the connection between the personal intention and its effect on the individual, the product, the strategy, the community. There are also no ethical considerations about the motivations. There are no good or right motivations. Nor bad or unfair motivations. The analysis of the ethical dimensions of the entrepreneurial motivations is out of the scope of this doctoral work.

It is important to point out that the following scheme should not interpreted exploiting any Maslow theory: a need can be considered a motivation for a particular behaviour, but a motivational force is not necessary a need. The idea of the gradual satisfaction of needs (or in this case, of motivations) is not the right mechanism to read the following hierarchical assessment. Trough the following picture , entrepreneurs can identify their motivations, that can evolve or change during their personal life or the lifecycle of the company, with a mechanism that exclude any satisfaction feature, and that follows the motivational enrichment described before. Finally it is important to emphasize that an y-axis has been added as complementary hypothesis that need to be tested. We can consider the simple temporal evolution of the life of the entrepreneur or the more complicated construct called lifecycle of the firm.



Tab. 14 Hierarchical assessment of entrepreneurial motivations

The obtained results are relevant from both a theoretical and practical point of view. As far as the author knows, the hierarchical assessment and the idea of a motivational enrichment pattern are described and discussed for the first time. The mechanism of motivational enrichment confirms the complexity of the psychological studies of entrepreneurship as pointed out by Davidsson (2008). Psychology is far from the rational linearity of economic sciences. This consideration is coherent with those who assert that the entrepreneurial decision making process is made of non-optimizing decisions and that pure rationality is an attribute for abstract situation and not for real life.
From a practical point of view the hierarchical assessment of the entrepreneurial motivations can be used for many purposes:

1) as tool for the self-evaluation of motivations
2) as reference scheme for entrepreneurship education. Previous contribution and this research demonstrate that motivations are crucial enablers of the whole entrepreneurial process. Therefore and educational programme should take into account this relevant aspect. Perspective entrepreneurs should learn that the financial return, despite its primary importance, is not the only factor that drive the daily process of entrepreneurial decision making.

7.c Entrepreneurial Opportunities: cross case analysis and discussion

If we were asked to give a title to the case study that presents the story of Microlife and its founder, Matteo Villa, we would probably choose: "A promised land made of…algae". Microlife in fact is doing research and developing know-how in a land of opportunities. Following the story of Matteo Villa we can identify several opportunities. The first one is recognize by Mr. Villa through the classical process described by Shane: the entrepreneur was already alert on weak signals concerning energy and green-technologies and he heard for the first time the potentialities of algal technologies in Israel. He understood that an innovative entrepreneurial effort could exploit these technologies. Here is what we can read in the case study:

"*He was, thus, and alert subject: a perspective entrepreneur able to perceive the opportunities and the potentialities of algal technologies in the energy industry. He heard for the first time about the innovative research works on algae in 2007 during a scientific conference at the Ben Gurion*

University in Israel. When he came back to Italy he started to research about the state of the art of this technology. He immediately found one of the leading researcher in Italy"

We can conclude that the strategic opportunity to invest and create a company based on these revolutionary technologies has been recognized and exploited by Mr. Villa in the sense described by Shane and Venkataraman (2000). De facto this first opportunity can be considered a portfolio of opportunities. Let's clarify this point. As described by the entrepreneur, the main decision has been the bet on a technology which is considered expensive, under-researched, but promising. Furthermore the green algal technologies - that are the object of the research and the joint research projects performed by Microlife- are a multi-purpose technology with very different fields of application. This is confirmed directly by Mr. Villa:

"*Today we are witnessing a growing interest in micro-algae, especially in relation to their huge potential in renewable energy, although other applications such as purification of wastewater and production of food, feed, chemicals, and drugs are promising features. In fact when light and temperature conditions are adequate in bodies of water, and nutrients, especially nitrogen and phosphorus, are unlimited, microalgae can grow to reach concentrations of hundreds of millions of cells per millilitre*".

There is another relevant aspect that emerges from the comparison between the lenses and the theories presented in the literature on opportunities and the story of Mr. Villa. Not only, in fact The entrepreneur is a recognizer and a simple exploiter of the opportunities, but he is also a creator, a sort of demiurge of opportunities, in the sense of Sarasvathy's theories. What is the essence and the nature of the opportunities that have been created by Mr. Villa? First of all he literally build up a network, by exploiting the support of public institutions and by joining the European Association of the companies and the leading international research centres. He is also actually working on the creation of an opportunity: achieving a sustainable competitive advantage through patenting and strategic licensing as reported here "We are going to close the activities of the year 2009 with four requests for patents, not just in the energy field but also in the pharmaceutical and food sector"

Finally the joint collaborations with single researchers, academic centres and competitors indicate the process of opportunity creation and the adoption of an effectuation (Sarasvathy 2001 and Sarasvathy 2008) logic that actually drives the entrepreneurial behaviours of Mr. Villa. In conclusion, within his story, we can recognize both causal and effectual logic: some opportunities have been recognized (with an objective and indubitable consistency) and others have been fabricating thanks to the adoption of different principles.

The description of the nature of the opportunities that emerge from the case of Enrico Pagello and its IT+Robotics, can help us in our investigation. Pagello is not an inventor. He is more and adaptor, a developer of an already diffused technology. Furthermore he had the ability to recognize the western market as a market potentially interested in the omni-directional video-surveillance systems and in the usage of robotic humanoids for multiple purposes. He decided to exploit specific technologies and to adapt them to the potential western customers. He offers the application of specific technological paradigms and products in order to solve particular problems. In this case we can emphasize the process of recognition of an objective technological opportunity. Other European professors, through the exploitation of the same research networks, could had recognized the same opportunity and thus becoming the interface between Asian producers and European customers.

The other relevant opportunity which is daily exploited by professor Pagello and his collaborators, is the know-how coming from years of study and the research activities carried out within the academic context Three times he emphasize the importance of this exploited opportunity:

"On the basis of studies which have been carried out in our department and by the international scientific community for years now - claims the Professor – *our Company has put itself forward as a consultancy partner in the field of artificial vision for the realization of customized prototypes of video-surveillance, telepresence and security systems that integrate the most advanced and sophisticated technologies available on the market today."* And again

"Extensive university research and years of experience have, in fact, enabled these robots to be enhanced with an added value: the technicians and engineers of IT+Robotics are capable of customizing them and programming them to requirement." And here

*The staff of IT+Robotics mainly hail from the research sector; many are university lecturers who have been working for many years in the field of intelligent robotics and who are involved in the most important international associations such as SIRI, the Italian Robotics Association, AI*IA, the Italian Association for Artificial Intelligence, the International RoboCup Federation, the Intelligent Autonomous System Society, etc. The presence of these academics means that the company has contacts with the best international research networks in Europe and the world. "Our academic staff is flanked by brilliant engineers who make up our technical staff, boasting skills in the most up-to-date information technologies – claims Pagello*

This emphasis on the role of academic collaborators, shared with other academic spinoffs, can be viewed with a double lens. In fact it can be considered in the same time an objective opportunity

(academic knowhow exists "out there"), but if we consider the process of construction of this knowhow and the consequent international network, it can be considered as an partial process of opportunity creation.

Even in the case study presenting the experience of Professor Frezza the identification of single entrepreneurial opportunities seems to be quite complicated and the construct of portfolio of opportunities is more suited for our analysis. Within the portfolio of opportunities we can identify objective and subjective/created opportunities, confirming the idea that both of them coexist and that, once created or recognized, they are exploited by high-tech entrepreneurs.

If we compare the case of M-31 with the previous case study, we can easily indentify two main opportunities. The first one is the technological know-how developed in the academic context, while the second one is the personal network of the two entrepreneurs. These opportunities could be associated to the construct of resource. In fact we can define a resource as an opportunity that has been pursued and exploited by the entrepreneur. From both cases emerge a strong effectual logic. The two entrepreneurs in fact started their entrepreneurial journey with "*who they are, what they know, and whom they know*" , and immediately start taking action and interacting with other people; collaborators, potential customers, potential investors. This is the starting point to apply the effectuation principles (Sarasvathy 2001, Sarasvathy 2008).

Focusing on the nature of the opportunity we highlight a particular family of opportunities that we can label *differential* opportunity. Professor Frezza is convinced that private incubators can be more efficient and effective than their public counterparts. The opportunity to create a new venture, comes, thus, from the differential comparison between two different contexts: the private one and the public one. If we accept the idea of the existence of a market of new business ventures (or start-ups), we can conclude that the founder of M-31 recognized a potential more efficient market. The efficiency can be obtained through the exploitation of the "animal spirits" that can overcome inefficiencies and failures of public incubators.

H-Farm is born from the "nexus" (Shane and Venkataraman 2000, Shane 2003) between a serial entrepreneur, whose ability is to create successful enterprises in the media industry, and the situation of the capital market of Italy characterized by few venture capitals and business angels and a low propensity to build high-tech start-ups (Colombo and Delmastro 2002, Di Minin et al. 2003).

The founder, Riccardo Donadon, recognized the potentialities of ICT applied to the business venture creation process. Also from this case study, The Internet can be considered a sort of portfolio of opportunities: a multi-purpose technology that can be used in order to create new products (on only innovative!) and thus new markets. In this case an objective opportunity has been recognized and exploited by Donadon, but his entrepreneurial behaviours and efforts are dailiy feed by the research of new opportunities. Inward and outward looking, in fact is the first rule of knowledge intensive companies as we can read:

Business idea generation is one of the key aspects of this private incubator. Not only employees and manager are invited to propose new ideas exploiting technological innovations and specific competences of the incubatee firms, but even external sources are searched and stimulated by H-farm. The company, for example, promotes idea competitions about social advertising, web television, mobile phone technologies. The incubator is therefore inward and outward looking, confirming the aim to create new buds from each technological innovation with a potential market.

And here:

"H-Farm's goal is to discover the best ideas and projects, turning them into genuine business opportunities, - says Donadon - that's why in July 2008 we launched the Seed Program, a funding program aimed at fostering the best ideas to bring innovation in technology; every three months, the Seed Program will post some theme specific contests to gather and finance the best entrepreneurial ideas."

The words by Gianantonio Pozzato and his brother, depict the story of the creation of a general purpose technology, that can be applied in different contexts. It's a story made of research, creation and experiments: the principles of quantic molecular resonance are actually applied in two families of products. Two aspects about the nature of entrepreneurial opportunities can be deduced from this case study. A latent demand of innovation was unsatisfied and the Pozzato brothers recognized the opportunity to study new products in order to answer to the demand of a batter scalpel. Thus an objective opportunity were available to every potential alert entrepreneur. On the other hand they heavily contributed to the process of creation and improvement of the new product. They formalized and implemented new scientific insights and principles, by creating new knowledge and thus new opportunities linked to this know-how

The pattern of opportunity recognition adopted by Patrizia Bizzotto, founder and owner of Wor-Up is similar to the one described in the discussion of the Ruggero Frezza'case. First of all she were aware of the potentialities of new Internet technologies and she saw a market where other potential entrepreneurs or investors did not see it. Forecast capacity? We think on another driver: the recognition of a *differential* opportunity: new Internet technologies were already successful in USA and in other countries when she decided to diffuse them in the old entrepreneurial area of the North East part of Italy. She recognized an objective opportunity: *"Internet [could be] a great network of opportunities. […]The existence of a business on the web must be reconsidered in a strategic context strictly connected with marketing: the classic website can and should become a valuable piece of the overall business strategy, a key element in order to generate concrete value".*

Patrizia Bizzotto is an alert entrepreneur, ready to recognize and exploit kirznerian opportunities. She is not looking for revolutionary technologies: she exploits the potentialities of Internet. This is coherent with the attention to the open source world. In fact she says "*We are developing know-how in both the property software world and in the open source world*".

Another interesting element about the decision making process typical of some entrepreneurs can be deduced by the case study and it confirms the ideas by Vaghely and Julien (2010) of an heuristic base on the trial and error logic.

"Our research and development team test all the innovations that emerge from the Internet: "We must have the courage to admit that sometimes doing research is synonymous with failure, not because we are not good researchers but because sometimes new solutions are not stable and reliable. Reliability and efficiency are two important criteria in developing web based software applications. We learn by trial and we strengthen our skills from the weakness of new languages that we experience. This way of working allows us to gather relevant information about new products, to develop new skills and to obtain a good competitive advantage. "

Since his first years as student of engineering, Andrea Bosio, wanted to exploit specific technological know-how in order to solve specific problems. The products made by his companies come from the continuous joint collaboration with bigger companies: the solutions created by the entrepreneurs become products.

"The strategy based on the construction of technological partnerships is the first responsible for the growth of Telsey. Collaboration with customers and suppliers is thus an asset of primary importance." And again: "

"We depend from our technological partners: we are a part of the value chain and thus we must communicate in the best way with all that parts . Our products are situated substantially towards the end of this chain. They are like an interface with the final users: we have therefore developed the ability to interact with companies that are before us in the value chain (key relationships with Italtel, the ability to interact with Cisco) and operators in the world of 'IP TV as NDS and others."

Even thorough this case study we can detect and code opportunities which show a different nature. If the opportunity to collaborate is an objective element which is recognized and exploited by Bosio, the realization of the collaboration implies creativity and the use of effectual logic principles. Within the same case study, the traditional shaneian paradigm and the strategies presented in Sarasvathy (2001, 2008) coexist.

From the mini case studies presented through the introductory section, from the analisys of the case studies presented in the previous chapter, from their cross comparison, as described by Yin (2002) and Eisenhardt (1989) and the comparison with the most recent insights offered by the literature we suggest the following findings.

Several opportunities which present an objective existence can be identified within the case studies. Those opportunities have been recognized and exploited through the process described by Shane and presented in Chapter 3. This evidence confirms the ontological and epistemological perspective offered by the so called "Discovery School". Furthermore in some case studies is evident the presence of effectual logic, as driving logic of the entrepreneurial decision making process. Let's consider, for example the stories of Microlife, Telsey and Telea Engineering. The entrepreneurs act both causally and effectually. This fact lead us to confirm the idea that some opportunities exist only in the entrepreneurs' mind and thus they are created by the entrepreneur herself/himself. Using the words by Sarasvathy (2008), opportunities can make the entrepreneur, and, on the contrary, the entrepreneur can make (Sarasvathy would use the term fabricate) the opportunities. We have demonstrated, as far as high-tech entrepreneurship is concerned, the co-existence of two processes: recognition and creation. A powerful general theory of entrepreneurship should take into account both of them, and should try to reconcile the Creative and the Discovery School. Unifying two ontological and epistemological perspectives is a true challenge that the community of scholars and researcher is requested to face.

The case studies presented in previous chapter show how the two processes of recognition and creation of entrepreneurial opportunities can be carried out starting from the nature of the particular

opportunity. From the cross comparison we identified three wide categories of entrepreneurial opportunities:

4) general purpose technologies. They can be recognized, discovered or created. Actually this third case is quite rare. Luckily, we offer the evidence of this process through the stories of Matteo Villa (Microlife) and Gianantonio Pozzato (Telea Engineering). Both companies in fact are contributing to the development of new and general purpose scientific knowledge, algal technologies and quantic molecular resonance theory;
5) application of technological paradigms in order to solve a specific problem. From the case studies emerge the relevance of joint collaborations and research agreements: they are in fact the main "corridors" used by alert entrepreneurs to recognize (or discovery) or to create the entrepreneurial opportunities. This mechanism is evident within the stories of Andrea Bosio (Telsey), Ruggero Frezza (M-31) and Enrico Pagello (It+Robotics);
6) the market. The case studies suggest that the market is viewed by entrepreneurs as a differential opportunity. We use the term *differential* because the idea to create a new venture comes: a) from the comparison of markets located in different geographical areas (see the Work Up case study) b) from the creation of innovations that renew and revitalize already existing markets (this situation is well described in Cassia et al. 2006).

Therefore those three categories answer to the question about the nature of entrepreneurial opportunities in high-tech emerging companies. Furthermore, there is another output from the comparison of the cases and the effort to understand the entrepreneurial choices and behaviours of the selected entrepreneurs. An interpretative matrix, in fact, can be drawn: let's assign to the y axis the dichotomous nature of the entrepreneurial action (under the hypothesis that between Creative and Discovery Views *tertium non datur*). Let's now assign to the x-axis the three categories presented before. The resulting matrix is thus:

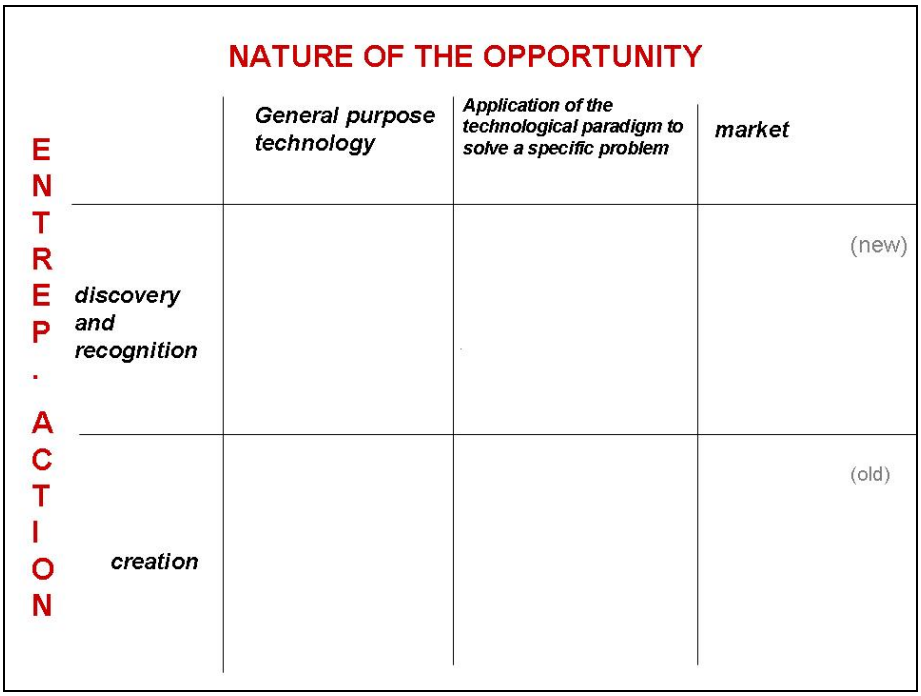


Fig. 14 Interpretative matrix

We can use it in order to classify the case studies, as depicted below.

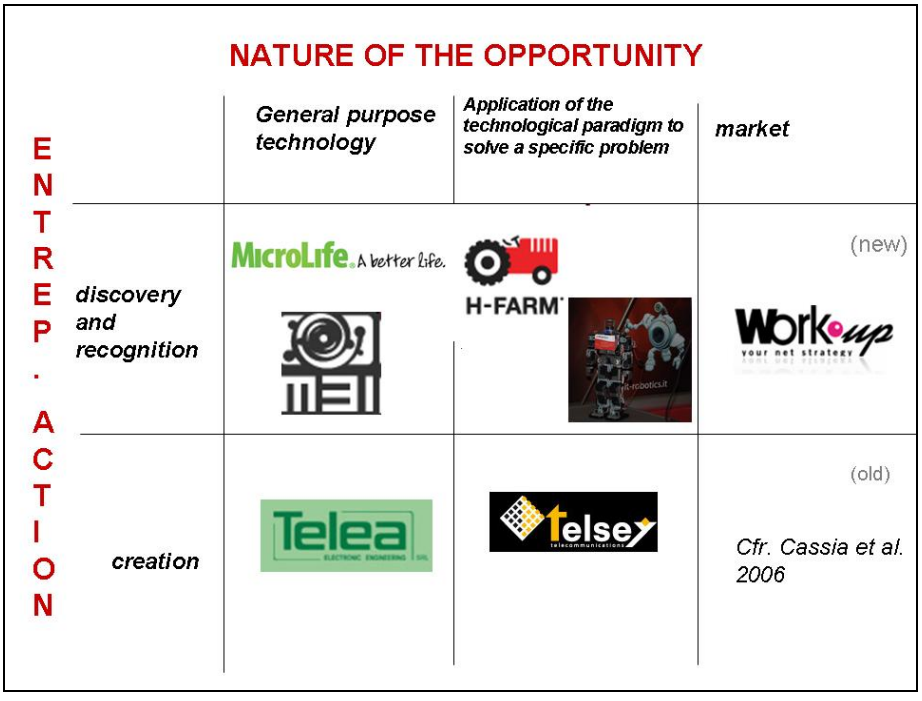


Fig. 15 Classification of the case studies through the interpretative matrix

Finally we could use this interpretative tool in a dynamic way. In fact, remembering the idea of portfolio or sequence of opportunities presented in this section, we could read the evolution of a

company through an alternate or recursive sequence of steps where both creation or recognition actions mix in order to better exploit the opportunities. This result is coherent with the hypothesis of Sarasvathy (2008) who asserts (but she doesn't demonstrate it yet) that:

"*It's important to point out, however, that the same person can use both causal and effectual reasoning at different times depending on what the circumstances call for*".

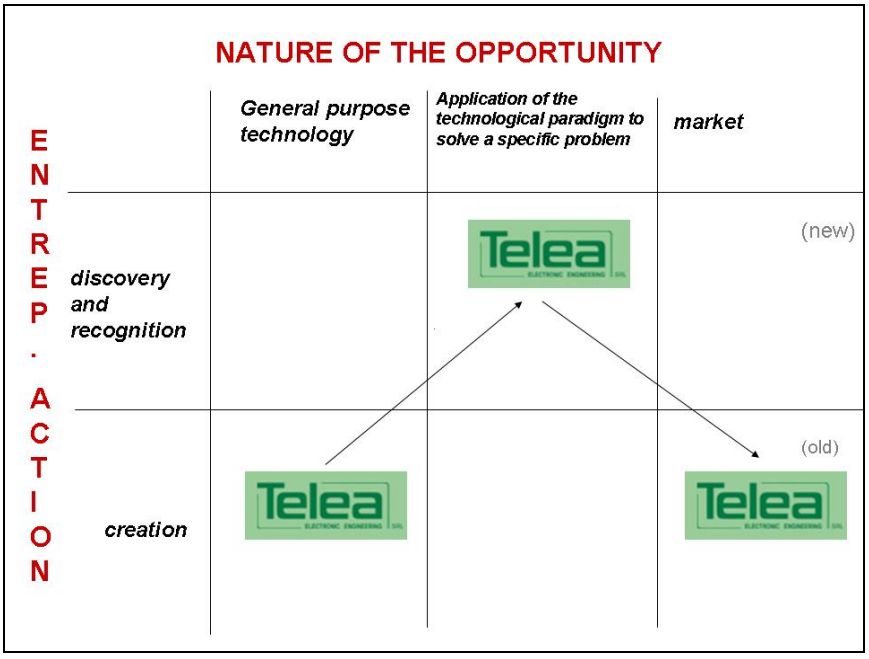


Fig. 16 Dynamic use of the matrix (1)

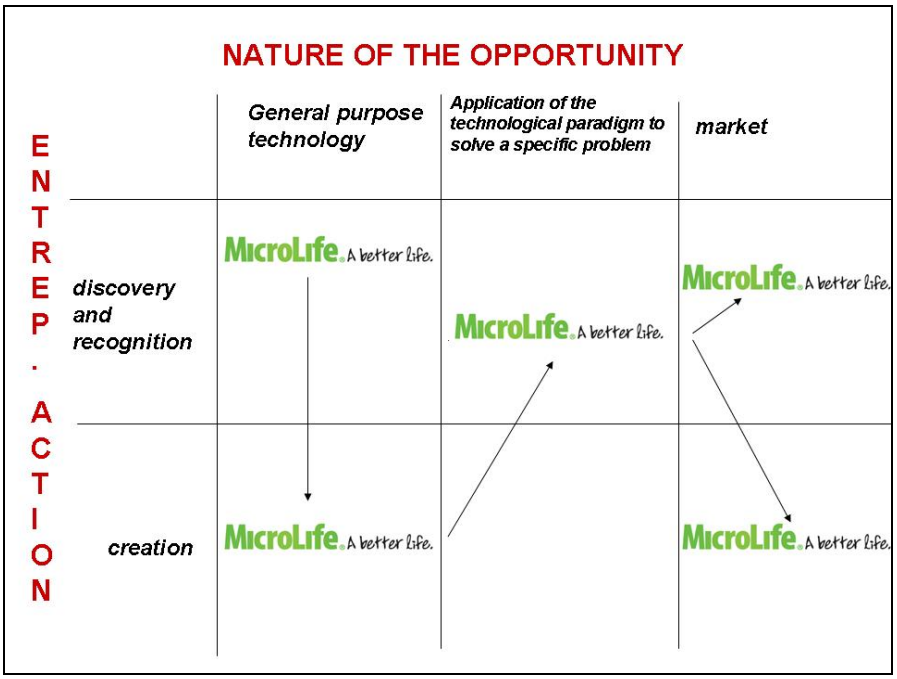


Fig. 17 Dynamic use of the matrix (2)

The main findings of this study (the study of the nature of entrepreneurial opportunities and the interpretative matrix) are relevant from both a theoretical and a practical point of view. First of all we have demonstrated the co-existence of causal and effectual decision making processes and the presence, during the lifecycle of the firm and the personal evolution of the entrepreneur, of objective opportunities and opportunities created by entrepreneurs. The idea of two schools should be overcome in order to better describe the heterogeneity of process and actions involving entrepreneurial opportunities. From a practical point of view the matrix (entrepreneurial actions versus nature of opportunities) can be a useful tool for deepening and assessing the potential relations between entrepreneurial opportunities and the behaviours of different entrepreneurs in different context. As emphasized before, its use can be static or dynamic.

7.d Limits and critical aspects

Our results are bounded by several limits and present some critical aspects. We are convinced that this research is more completed if we discuss and emphasize them. Some of the limits arise from the particular methodology chosen in order to answer to the research questions. Other come from the

specific group of entrepreneurs/companies selected for this study. As pointed out in the chapter about the method, two main potential families of bias come from the use of interviews:

1) retrospective bias
2) social desiderability bias (interviewed people try to portrait themselves in a more favourable light)

According to Yin (2002) and Davidsson (2004, 2008) In order to reduce the biases we have carried out the following actions. First of all we tried to reduced retrospective bias considering some prospective cases (Microlife, M-31, H-Farm Ventures). Some of the companies selected are quite young, and thus the retrospective bias can be considered negligible. Other companies are private independent incubators, therefore the process of emergence of new ventures is a daily commitment. This aspect confirms the freshness and the reliability of the answers obtained by Ruggero Frezza and Riccardo Donadon. Since we investigated personal motivations the use of second informant individuals has been considered impossible. Furthermore, in order to increase the reliability of our data and exploiting triangulation (Yin 2002), we used secondary data like web sites, previous interviews, news on newspapers and magazines.

Another potential limit is the representativeness of the set of the selected enterprises. It is important to point out that, adopting a qualitative approach, we are not interested in a sample which is statistically representative, but we are more interested into the guarantee of analytical representative of the set of the enterprises (Davidssson 2004, 200). Therefore we considered different sub-industries within the general set of high-tech Italian companies, we look for companies with different dimension, age and stories, and finally we looked for companies and entrepreneurs coming from different geographical area.

Generalizability is another interesting issue that should be discussed now. The aim of this doctoral work is not to test causal relationships between variables, but to provide new theoretical insights an and suggestions, starting from the grounded analysis and coding of selected data. We do not pretend to generalize our results, but we are sure that the main findings of this work can be easily transformed into hypotheses that can be tested through statistical analysis.

There are two limits that need to be emphasized. The first one is the geographical limit. Despite their international network, all the selected companies come from the same region. The second one is the industry specific limit: all companies, in fact, are technology intensive.

We conclude by highlighting the most critical aspects of this research. The first one has been the failure of the survey, as discussed in Chapter 5. The second one has been the difficulty to make

hypothesis and thus investigate the relations between motivations and the entrepreneurial opportunities. As stated in the Preface, we include this point in the future research agenda.

Chapter 8

Conclusions

8.a Main original findings

This doctoral thesis aims to contribute to open a black box called "nexus". Shane and Venkataraman (2000) assert that entrepreneurship consists of "*the nexus of two phenomena: the presence of lucrative opportunities and the presence of enterprising individuals*". Since their work, few authors tried to describe the "nexus" because its complexity and because it can be considered the real 'ignition spark' of every entrepreneurial experience. In this thesis, we will try to explore this nexus, focusing on two main components. The joint investigation of individuals and opportunities is a critical research path in order to better clarify the mechanisms and the essence of entrepreneurial behaviours and actions (Davidsson 2008). Therefore from one hand we explore the relevant entrepreneurial motivations that drive the entrepreneurial choices within high-tech emerging ventures. On the other hand we investigate the nature of entrepreneurial opportunities, by asking if high-tech entrepreneurs recognize or create the technological opportunities that they exploit.

From a selective review of the literature we note insufficient consideration of the role of the human motivations in the entrepreneurial process within the recent entrepreneurship research. Environmental factors being held constant, human motivation plays a critical role in the entrepreneurial process (Shane et al. 2003)

The first research question is thus the following. What are the relevant entrepreneurial motivations that drive the entrepreneurial choice within high-tech emerging ventures? How and why motivations change in the phases of life of the firm? We investigate the main motivational driver of high-tech entrepreneurs and eventually we want to identify the mechanism that lead the eventual change of entrepreneurial motivations. Entrepreneurship requires human agency (Shane 2003) which highlights the need and the opportunity to study the individuals who exercise such agency with the help of the psychologist's toolboxes of theories and methods. This seems to be particularly relevant if we

take into account that research clearly demonstrated that the profit maximizing rationality of economic theory is not only what characterizes the individuals who engage in entrepreneurial action (Amit et al 2000; Wiklund et al. 2003). “In order to really understand what goes on at the micro-level in the entrepreneurial domain, there is every reason to study the emotions, cognitions, behaviours, and other characteristics of individuals involved.” I would add that it means to isolate, evaluate and study the different motivations that drive the entrepreneurial behaviours.

Recent Entrepreneurship research dedicated great attention to the construct called “entrepreneurial opportunity”. (Shane and Venkataraman 2000, ,Sarasvathy et al. 2003, Alvarez and Barney, 2006, Plummer et al. 2007, Davidsson 2008, Harms et al. 2009) Entrepreneurial opportunities are defined as those situations in which new goods, services, raw materials, and organization methods can be introduced in the market and sold at greater than their cost of production (Casson 1982). As far as their epistemological and the ontological features are concerned, two opposite views are available. Opportunities are like mushrooms in the forest (Davidsson 2008) Because of individual differences and information asymmetries all actors do not have access to exactly the same opportunities. This is the core of the “Discovery school”: although recognition of opportunities is a subjective process, the opportunities themselves are objective phenomena that are not known to all parties at all time (Venkataraman 1997, Shane and Venkataraman 2000 AMR, Shane and Eckhardt 2003) The second view is called Creative School: opportunities are created in the entrepreneur’s mind and it is not meaningful to talk about these opportunities separated from their creators. Venture ideas are internally generated based on more or less explicit and correct perceptions of external conditions. (Baker and Nelson 2005,) opportunities do not exist objectively , but are subjectively enacted (Gartner 2001, Sarasvathy 2001,2008)

. Is any reconciliation between the two schools possible? The second question is, thus, the following. Do entrepreneurs recognize or create technological opportunities?. How the two processes – recognition and creation – come off? We are not going to propose a reconciliation theory: our aim is to demonstrate that both the perspectives are practically relevant and thus a general theory of entrepreneurship should take into account the dichotomous nature of entrepreneurial opportunities, distinguishing between objective opportunities and effectually created opportunities.

Both qualitative (case studies) and quantitative (survey) approaches have been planned in order to answer to the research questions presented by this doctoral thesis. Quantitative data should be collected through a survey, sent to the firms of the database Veneto High-Tech (which is described in this thesis). Unfortunately the response rate has been too low.

Case studies accord to the suggestions proposed by Eisenhardt (1989), Yin (2002), Gummeson (2006) and Flyvberg (2006). The exploratory nature of this study suggests the use of a qualitative methodological approach, and in particular the multiple case studies . Multiple case studies research is a useful tool to understand the complex nature of entrepreneurship, as recommended by Gartner and Birley (2002). The cases have been strategically selected within the considered population (Veneto High-Tech database), according to Flyvberg (2006) on basis of size, industry, products, innovative activities, geographical equilibrium and personal knowledge of the entrepreneur. The main limit of this approach is the possibility to present general determinants of phenomena through a limited number of cases.

As we will see below, the cases are based of semi-structured interviews with entrepreneurs. A single case study for every enterprise by the researcher, in order to summarize and better fix the interviews and the entrepreneur words. A feedback mechanism: every single case should be read , rectified or amended by the people who has been interviewed. The NVivo 8 software tool has been used in order to collect and analyze qualitative data.

The cross case comparison lead us to propose a hierarchical assessment of the motivational drivers. At individual level the basic motivations that emerge from the cases are the following: a) family environment, b) necessity (lack of job or not satisfying job alternatives), c)McClelland indicators (N-Pow, N-Ach, N-Aff), d) financial return. Once one or more of these motivations are considered relevant from a potential entrepreneur, other motivational aspects can enrich the reasons for the Entrepreneurial Choice and the daily effort of the entrepreneur. We asses them as it follows:

7) product level motivations: desire to demonstrate the feasibility of the technology applied in the product, f) desire to demonstrate the profitability of the technology applied in the product
8) strategy-level motivations: , g) desire to be innovative h) desire to diversificate and increase the portfolios of products, i) intention to maintain the technological leadership,
9) personal responsibility motivations: l) creation of wealth (jobs, legacy, knowledge), m) corporate social responsibility issues.

In order to better understand this assessment we point that the motivations are not ordered on the basis of their importance or relevance. They have been assessed by considering only the connection between the personal intention and its effect on the individual, the product, the strategy, the community. There are also no ethical considerations about the motivations. There are no good or right motivations. Nor bad or unfair motivations. The analysis of the ethical dimensions of the entrepreneurial motivations is out of the scope of this doctoral work.

It is important to point out that the following scheme should not interpreted exploiting any Maslow theory: a need can be considered a motivation for a particular behaviour, but a motivational force is not necessary a need. The idea of the gradual satisfaction of needs (or in this case, of motivations) is not the right mechanism to read the following hierarchical assessment. Trough the following picture , entrepreneurs can identify their motivations, that can evolve or change during their personal life or the lifecycle of the company, with a mechanism that exclude any satisfaction feature, and that follows the motivational enrichment described before. Finally it is important to emphasize that an y-axis has been added as complementary hypothesis that need to be tested. We can consider the simple temporal evolution of the life of the entrepreneur or the more complicated construct called lifecycle of the firm.

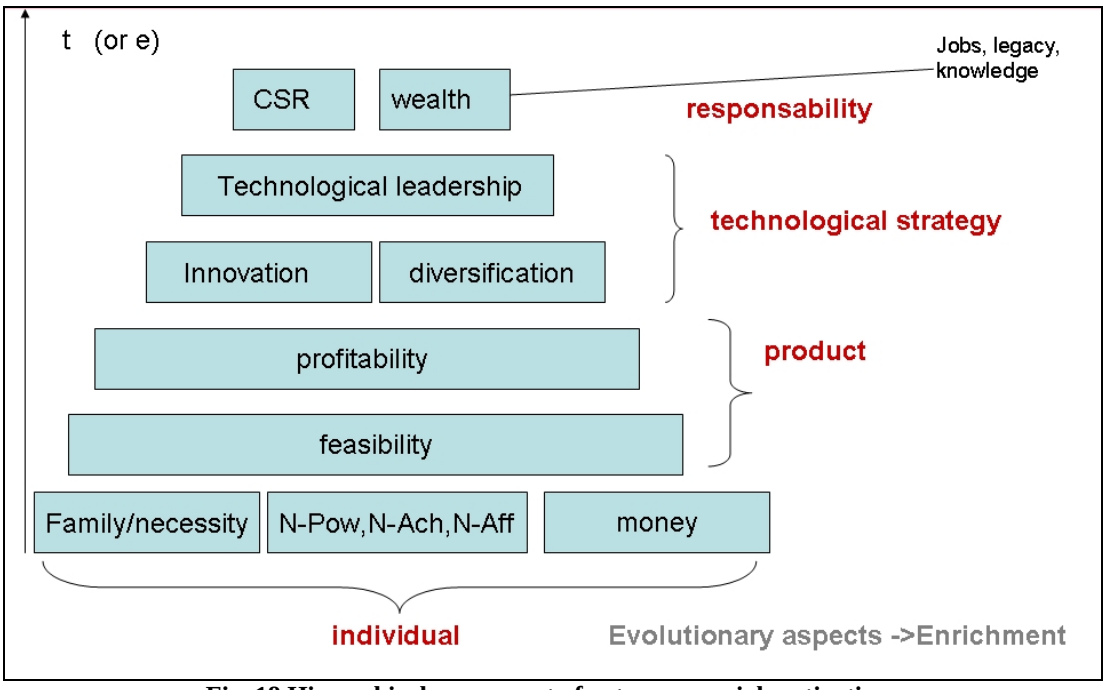


Fig. 18 Hierarchical assessment of entrepreneurial motivations

The obtained results are relevant from both a theoretical and practical point of view. As far as the author knows, the hierarchical assessment and the idea of a motivational enrichment pattern are described and discussed for the first time. The mechanism of motivational enrichment confirms the complexity of the psychological studies of entrepreneurship as pointed out by Davidssson (2008). Psychology is far from the rational linearity of economic sciences. This consideration is coherent with those who assert that the entrepreneurial decision making process is made of non-optimizing decisions and that pure rationality is an attribute for abstract situation and not for real life.

From a practical point of view the hierarchical assessment of the entrepreneurial motivations can be used for many purposes: 1) as tool for the self-evaluation of motivations, 2) as reference scheme for entrepreneurship education

From the cross comparison we identified three wide categories of entrepreneurial opportunities:

7) general purpose technologies.
8) application of technological paradigms in order to solve a specific problem.
9) the market. The case studies suggest that the market is viewed by entrepreneurs as a differential opportunity.

Therefore those three categories answer to the question about the nature of entrepreneurial opportunities in high-tech emerging companies. Furthermore, there is another output from the comparison of the cases and the effort to understand the entrepreneurial choices and behaviours of the selected entrepreneurs. An interpretative matrix, in fact, can be drawn: let's assign to the y axis the dichotomous nature of the entrepreneurial action (under the hypothesis that between Creative and Discovery Views *tertium non datur*). Let's now assign to the x-axis the three categories presented before. The resulting matrix is thus:

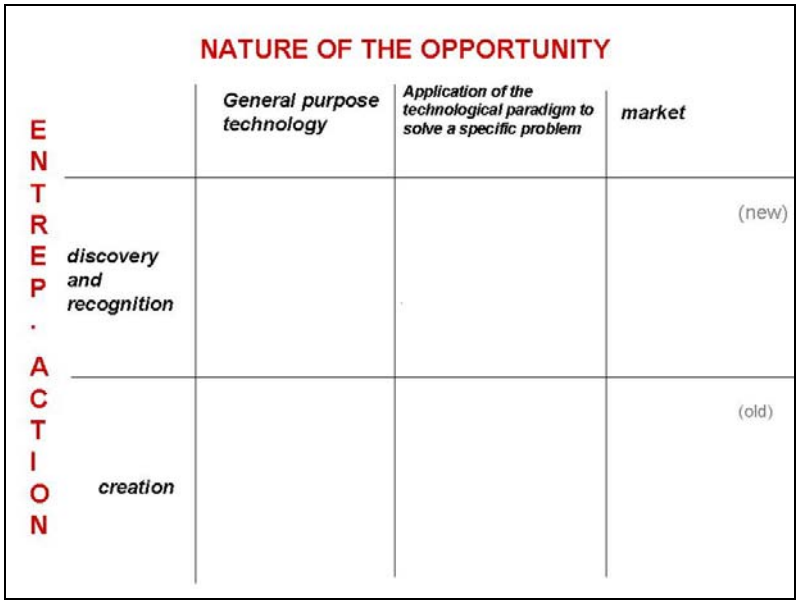


Fig. 19 Interpretative matrix

We can use it in order to classify the case studies, as depicted below.

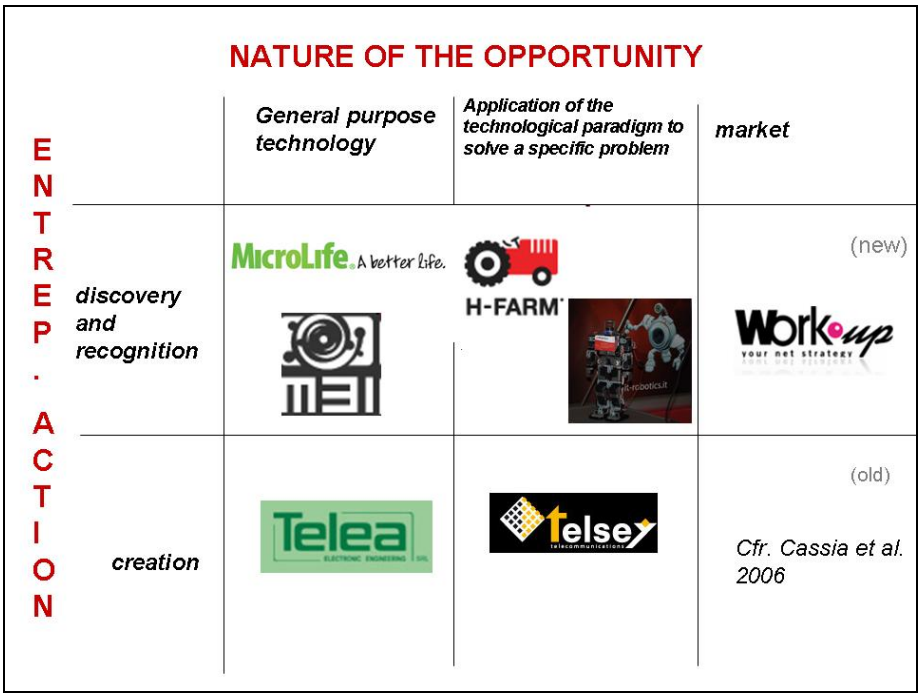


Fig. 20 Classification of the case studies through the interpretative matrix

Finally we could use this interpretative tool in a dynamic way. In fact, remembering the idea of portfolio or sequence of opportunities presented in this section, we could read the evolution of a company through an alternate or recursive sequence of steps where both creation or recognition actions mix in order to better exploit the opportunities. This result is coherent with the hypothesis of Sarasvathy (2008) who asserts (but she doesn't demonstrate it yet) that:

"*It's important to point out, however, that the same person can use both causal and effectual reasoning at different times depending on what the circumstances call for*".

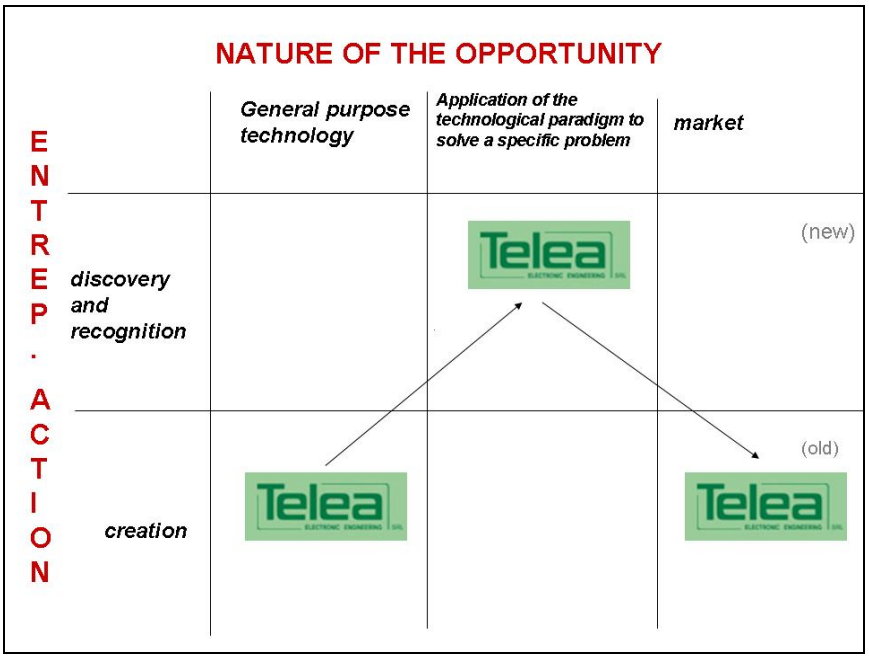


Fig. 21 Dynamic use of the matrix

Finally, several opportunities which present an objective existence can be identified within the case studies. Those opportunities have been recognized and exploited through the process described by Shane (2003). This evidence confirms the ontological and epistemological perspective offered by the so called "Discovery School". Furthermore in some case studies is evident the presence of effectual logic (Sarasvathy 2001, 2008), as driving logic of the entrepreneurial decision making process. The entrepreneurs act both causally and effectually. This fact lead us to confirm the idea that some opportunities exist only in the entrepreneurs' mind and thus they are created by the entrepreneur herself/himself. We demonstrate, as far as high-tech entrepreneurship is concerned, the co-existence of two processes: recognition and creation. A powerful general theory of entrepreneurship should take into account both of them, and should try to reconcile the Creative and the Discovery School. Unifying two ontological and epistemological perspectives is a true challenge that the community of scholars and researcher is requested to face.

8.b Ideas for future research

From the analysis of our results, we shape six different suggestions which can be used as future research fields or questions for the community of scholars interested in the entrepreneurial phenomena.

1) The first point concerns the shift between causal and effectual reasoning: why do entrepreneurs shift their decision making paradigm? What are the external/internal circumstances that influence this shift? What are the consequences and the outcomes of effectual and causal reasoning? Why, being constant the same opportunity, some people reason effectually while others reason causally?
2) The idea of a unified theory of entrepreneurship should fascinate scholars and researchers. While the discipline is still young, we call for an effort for considering holistic perspectives.
3) The hierarchical assessment of entrepreneurial motivations is one of the main output of cross-case comparison. This result should be tested and confirmed from a statistical point of view, also by taking into consideration other industries and companies located in different areas
4) The evidence of the mechanism of motivational enrichment should be tested and confirmed from a statistical point of view, also by taking into consideration other industries and different geographical areas.
5) The study of the potential relations and effects of the nature of opportunities on motivations and on the contrary, the effects of motivations on opportunity creation/recognition patterns, are not part of this doctoral dissertation. More time would be needed in order to deepen these relations which are probably moderated by many different variables that are particularly difficult to isolate and to be measured.
6) Through the case studies we identified three categories of technological opportunities. Other categories could enrich the investigation on the nature of entrepreneurial opportunities

In conclusion, both the x-axis (motivations) and the y-axis (opportunities) of the nexus offer new ideas and suggestions for future research. This is the evident indication that the black box still need to be investigated in order to clarify the common nature and the various features of the entrepreneurial phenomena

Appendix A

---

nome dell'azienda	settore/prodotti	PROVINCIA	sito Internet
OXYGEN	trasporti/ambiente	Padova	www.oxygenworld.it
TELEA	elettromedicale	Vicenza	www.vesalius.it
IRB	biotecnologie	Vicenza	www.irbtech.com
NICE	automazione	Treviso	www.niceforyou.com
TELSEY	hardware per tlc	Treviso	www.telsey.it
SOLON	energia (pannelli solari)	Padova	www.solon.it
NIDEK	biomedicale	Padova	www.nidektechnologies.it
M31	incubatore	Padova	www.m31.com
IT ROBOTICS	robotica	Vicenza	www.it+robotics.com
SVECOM ENERGY	energia,	Vicenza	www.svecomenergy.com
WORK-UP	web	Vicenza	www.work-up.it
CINEL	strumenti scientifici	Padova	www.cinel.com
TSEM	elettronica	Padova	www.tsem.com
SAET	energia, ambiente logisitca	Padova	www.saetpd.it
WEBETHICAL	software	Padova	www.webethical.it
RESEARCHINNOVATION	test genetici	Padova	www.researchinnovation.com
Phoenix	tecnologie ottiche	Padova	www.phoenix-rto.it
Media Lario	tecnologie ottiche	Padova	www.media-lario.com
India	chimica	Padova	www.indiacare.it
GHPhtononics	tecnologie ottiche	Padova	www.ghphotonics.it
Microlife	biotecnologie	Padova	www.micro-life.com
DV Tecnologie d'avanguardia	laser per prodotti ceramici	Padova	www.dvoptic.com
Cutech	biotecnologie	Padova	www.cutech.it
City Ware	elettronica /energia	Padova	www.city-ware.it
Biotronik Seda	elettromedicale	Padova	www.biotronikseda.it
Biomedin	strumenti scientifici	Padova	www.biomedin.com
Aitia	tecnologie spaziali	Padova	www.aitia.it
ABAnalitica	biotecnologie	Padova	www.abanalitica.it
Tectronik	strumenti scientifici	Padova	www.tectronik.it
Label Elettronica	automazione	Padova	www.labelelettronica.it

Trivenet.it	Internet e fonia	Padova	www.trivenet.it
Marchetti srl	nanotecnologie	Padova	
Anitec	identificazione elettronica	Padova	www.anitec.it
Agrofill	prodotti chimici	Padova	www.agrofill.it
Phidia Advanced Biopolimers	biotecnologie	Padova	www.phidiapharma.it
Bioprogramm	biotecnologie	Treviso	www.bioprogramm.it
Fabrica Spa	ricerca e sviluppo	Treviso	www.fabrica.it
MBN Nanomaterialia	nanotecnologie	Treviso	www.mbn.it
Giove	telerilevamento	Treviso	www.giove.biz
Energy4evolution	energie	Treviso	www.energy4e.it
Solaris Energy	energie	Treviso	www.solarisenergy.it
Depofarma	farmaceutica	Treviso	www.depofarma.com
Eltech	elettromedicale laser	Treviso	www.k-laser.eu
Check-up	elettronica	Treviso	www.check-up.it
Visionlab	automazione	Treviso	www.visionlab.co.it
Akuatech	nanotecnologie	Treviso	www.akuatech.it
Archeometra	web	Treviso	www.archeometra.it
Fracarro	elettronica	Treviso	www.fracarro.it
E-ambiente	consulenza ambientale	Treviso	www.e-ambiente.it
Mitan	elettronica	Treviso	www.mitan.info
Fairwinds	elettronica	Treviso	www.fairw.com
Delta System	informatica	Treviso	www.deltasystem.it
Texa	elettronica	Treviso	www.texa.it
Novation	materie plastiche	Treviso	www.novation.it
Tecnogamma	elettronica	Treviso	www.tecnogamma.it
Elettronica Veneta	elettronica	Treviso	www.elettronicaveneta.com
Gruppo Tecnoinformatica	informatica	Treviso	www.tinet.it
Lae Electronic	elettronica	Treviso	www.lae-electronic.com
Asco TlC	telecomunicazioni	Treviso	www.ascotlc.it
Siap+Micros	monitoraggio ambientale	Treviso	www.siapmicros.com
Cardin Elettronica	automazione	Treviso	www.cardin.it
Evotech	robotica	Treviso	www.evotech.it
Divitech	telecomunicazioni	Treviso	www.divitech.it
Sofitel	telecomunicazioni	Treviso	www.sofitel.it
Aton	automazione/tlc	treviso	www.aton.eu
Sacet	strumenti scientifici	Belluno	www.sacet-probes.com
Vemer	automazione	Belluno	www.vemer.it
Cell Stem Ethical	biotecnologie	Belluno	
Dixell	strumenti scientifici	Belluno	www.dixell.it
Seri Group	elettronica	Belluno	www.serigropu.it
Evco	automazione	Belluno	www.evco.it
RCE elettronica	elettronica/impianti	Rovigo	www.rceelettronica.it
Ibetech	energia	Rovigo	
Padana Resine	polimeri	Rovigo	www.padanaresine.com
Polielettronica SpA	elettronica/macchine	Rovigo	www.polielettronica.it
888 software products	software	rovigo	www.888sp.it
Esoform	farmaceutica	Rovigo	www.esoform.it
Farmastudio	ricerca e sviluppo	Rovigo	www.farmastudio.com

Pragma scientific	misura e controllo	Venezia	www.pragma.scientific.it
Cewal	misura e controllo	venezia	www.cewal.com
BPT	domotica	Venezia	www.bpt.it
Geo Net	geotermia	venezia	www.geo-net.it
Galentis SPA	farmaceutica	Venezia	
Tychon Technoglass	macchine per farmaceutica	Venezia	www.tycontechnoglass.com
Venezia Tecnologie	ricerca e sviluppo	Venezia	www.ricercaetecnologie.it
Poletto Aldo srl	chimica	Venezia	www.polettoaldo.it
Fixxilab srl	software	Venezia	www.fixxilab.it
Lab Net	domotica/controllo	Venezia	www.lab-net.it
AIVE	software	venezia	www.aive.com
Biotekna	elettromedicale	Venezia	www.niotekan.com
I.B.S.	apparecchi per codici a barrre e RFID	venezia	www.ibiesse.it
GMG sistemi	informatica	venezia	www.gmgsistemi.it
Open software	informatica	venezia	www.opensoftware.it
Lecher Ricerche ed Analisi	analisi e ricerche	Venezia	www.lecher.it
Q-WEB	informatica	Venezia	www.q-web.it
Sigma Informatica	informatica	Venezia	www.sigmainformatica.it
Star Europe	automazione	venezia	www.star-europe.com
Sipe	informatica	Venezia	www.sipe.it
Elecos	chimica energia	Venezia	www.elecos.it
Attiva Multimedia	multimedia	Venezia	www.attiva.it
Ceda Informatica	informatica	venezia	www.cedainformatica.it
Logica srl	informatica	Venezia	www.logicasrl.it
Monico Spa	vetro per uso medico	Venezia	www.monico.it
Nord Resine SpA	chimica	Treviso	www.nordresine.it
Pometon Spa	materiali	Venezia	www.pometon.com
Silcart srl	materiali	Venezia	www.silcartgroup.it
NordEst ambiente	ambiente	Venezia	www.nordestambiente.it
Neural Engineering	intelligenza artificiale	Venezia	www.neuraleng.com
N-Aitec srl	informatica	Venezia	www.n-aitec.com
Protolife	biotecnologie analisi	Venezia	www.protolife.net
Dino Paladin Advanced Biotechnologies	biotecnologie	Padova	www.abnanotec.it
Venis spa	informatica	Venezia	www.venis.it
Venicecom	informatica	Venezia	www.venicom.it
H-farm	incubatore	Treviso	www.h-farm.it
TDE MACNO	automazione	Vicenza	www.tdemacno.it
E.E.I. - EQUIPAGGIAMENTI ELETTRONICI INDUSTRIALI S.R.L.	automazione	Vicenza	eei.studioeditoriale.net
COGES S.P.A	automazione	Vicenza	www.coges.eu
SALVAGNINI ITALIA SPA	automazione	Vicenza	www.salvagnini.it
A.E.I. S.R.L.	automazione	Vicenza	www.aei-srl.com
ITACO S.R.L.	automazione	Vicenza	www.itacosystems.com
DIGITEC AUTOMAZIONE INDUSTRIALE S.R.L.	automazione	Vicenza	www.digitec.it
SERTECH ELETTRONICA S.R.L.	automazione	Vicenza	www.sertech.it

ENODIA S.R.L. SOCIETA' UNIPERSONALE	software	Vicenza	www.enodia.com
SOL WELDING S.R.L.	automazione	Vicenza	www.solwelding.com
MIDAC S.P.A.	batteria	Vicenza	www.midacbatteries.com
FENICE - S.P.A.	chimica	Vicenza	www.fenicespa.com
3F CHIMICA S.P.A.	chimica	Vicenza	www.3fchimica.com
SICIT 2000 S.P.A.	chimica	Vicenza	www.sicit2000.it
SICIT CHEMITECH S.P.A.	chimica	Vicenza	www.sicitchemitech.it
SAMIA S.R.L.	chimica	Vicenza	www.samiaitaly.com
HELVI S.P.A.	elettromeccanica	Vicenza	www.helvi.com
QUADRA MEDICAL S.R.L.	elettromedicale	Vicenza	www.gmed.it
EURONDA - S.P.A.	elettromedicale	Vicenza	www.euronda.com
ASA S.R.L.	elettromedicale	Vicenza	www.asalaser.com
F.I.M.A. - S.R.L.	elettronica	Vicenza	www.fimaweb.com
NUOVA SACCARDO MOTORI S.R.L.	elettronica	Vicenza	www.nsmgenerators.com
VIDEOTEC S.P.A.	elettronica	Vicenza	www.videotec.com
T.V.R. S.R.L.	elettronica	Vicenza	www.tvrsrl.com
E A S S.R.L.	elettronica	Vicenza	www.eas.it
ASTER ELETTRONICA S.R.L.	elettronica	Vicenza	www.asterelettronica.com
STALAM S.P.A.	elettronica	Vicenza	www.stalam.com
REEL S.R.L. - SOCIETA' UNIPERSONALE	elettronica	Vicenza	
GER ELETTRONICA - S.R.L.	elettronica	Vicenza	www.gerelettronica.com
ASTRON FIAMM SAFETY S.P.A.	elettronica	Vicenza	www.fiamm.com
QEM S.R.L.	elettronica	Vicenza	www.qem.it
ASKOLL DUE S.P.A.	elettronica	Vicenza	www.askoll.com
ROWAN ELETTRONICA S.R.L.	elettronica	Vicenza	www.rowan.it
S.M.E. - S.P.A.	elettronica	Vicenza	www.grupposme.com
METRICA - S.P.A.	elettronica	Vicenza	www.metrica.it
LAMBDA SCIENTIFICA S.P.A.	elettronica	Vicenza	www.lambdascientifica.com
G B M S.R.L.	elettronica	Vicenza	www.gbm.it
CIMA S.P.A.	elettronica - automazione	Vicenza	www.cimaspa.it
KSE S.R.L.	elettronica - automazione- software	Vicenza	www.kse.it
TRASFO-PROJECT S.R.L.	elettronica di potenza	Vicenza	www.trasfoproject.com
RETI S.R.L.	informatica	Vicenza	www.reti.eu
ZAMBON GROUP S.P.A.	famaceuticA	Vicenza	www.zamboncompany.com
ZETA FARMACEUTICI - S.P.A.	faramceutica	Vicenza	www.zetafarm.it
MARCO VITI FARMACEUTICI S.P.A.	farmaceutica	Vicenza	
VICENZA DATA S.P.A.	hardware software	Vicenza	www.vidata.it
VEGSTOR SYSTEMS S.P.A.	hardware software	Vicenza	
OPEN SOURCE SOLUTIONS sas DI FONDERICO GIACOMO & C.	informatica	Vicenza	www.opensourcesolutions.it

NUOVO PROGETTO NEXTEK ENGINEERING SOC. COOP.	informatica	Vicenza	
RONDA SPA	meccanica	Vicenza	www.ronda.it
HYDROVEN S.R.L.	meccanica	Vicenza	www.hydroven.com
MICRO ITALIANA - S.P.A.	misura	Vicenza	
SANMARCO RICERCHE S.R.L.	ricerca	Vicenza	centroricerche.sanmarcoweb.com
TECNOBIT S.R.L.	software	Vicenza	www.tecnobit.info
SANMARCO INFORMATICA S.P.A.	software hardware	Vicenza	www.sanmarcoweb.com
SYSTEMICA S.R.L.	telecomunicazioni	Vicenza	www.systemica.it
BIBLIOTHECA RFID LIBRARY SYSTEMS S.R.L.	telecomunicazioni	Vicenza	www.bibliotheca-rfid.com
GLOBAL DISPLAY SOLUTIONS S.P.A.	telecomunicazioni	Vicenza	www.gds.com
TELE SYSTEM ELECTRONIC S.P.A.	telecomunicazioni	Vicenza	www.telesystem-world.com
CALEARO ANTENNE S.P.A.	telecomunicazioni	Vicenza	www.calearo.com
IPCOMPANY S.P.A.	telecomunicazioni	Vicenza	www.ipcompany.it
C.S.G. PALLADIO S.R.L.	chimica - ambiente	Vicenza	www.csgpalladio.org
SAIV Telecomunicazioni	telecomunicazioni	Vicenza	www.saiv.it
MERCIER FRERES	macchine	Vicenza	www.mercier.it
GEMATA	macchine	Vicenza	www.gemata.it
MAIR RESEARCh	macchine	Vicenza	www.mair-research.com
CP srl	knowledge management	Verona	www.acpnet.it
Hit Internet Technologies	software	Verona	www.hit.it
PAC Circuiti srl	elettronica	Verona	www.pacpcb.com
AR Electronic sas	elettronica	Verona	www.arelectronic.com
Specchiasol	farmaceutica	Verona	www.specchiasol.it
S.I.A.	automazione	Verona	www.siavr.it
Isotecnic	elettronica subacquea	verona	www.isotecnic.it
Explogeo	Ambiente	Verona	www.explogeo.altervista.org
Troll System	elettronica	Verona	www.trollsystem.com
Silitex	chimica	Verona	www.silitex.net
Ates Medica Device	elettromedicale	Verona	www.atesdevice.it
Delta Sistemi	elettronica	Verona	www.deltasistemi.it
Fomet	chimica	Verona	www.fomet.it
MHT	elettromedicale	Verona	www.mht.it
HS Project	automazione	Verona	www.hs-project.it
Farmec	faramceutica	Verona	www.farmec.it
Telenia Software	software	Verona	www.teleniasoftware.it
Sitek	software/elettronica	Verona	www.sitek.it
Interface	macchine	Verona	www.interface-srl.com
Tecnolab	analisi e ricerche	Verona	
Futura Sistemi	informatica e ricerche	Verona	www.futurasistemi.it
Abaco srl	informatica	Verona	www.abaco-gsa.it
Add Value	informatica	Verona	www.addvalue.it

Archivia srl	archiviazione documentale	Verona	www.archiva.it
Creation	laser elettromedicale	verona	www.lasercreation.eu
Crom	ricerca biotech	verona	www.crom.it
Enco	software	Verona	www.encopro.it
Gewin	informatica	verona	www.gewin-informatica.com
Home Innovation	domotica	verona	www.hisystem.it
Ifininet	telecomunicazioni	Verona	www.ifinet.it
Infracom	telecomunicazioni	Verona	www.infracom.it
Intercomp	informatica/elettronica	Verona	www.intercomp.it
Quercia Software	software	Verona	www.quercia.com
Riello Technoware Engineering	elettronica	Verona	www.technoware.it
Sipro	automazione	Verona	www.sipro.vr.it
Sovere	compound	Verona	www.sovere.it
Tecnorad	dosimetria	Verona	www.tecnorad.it
Telefin	telecomunicazioni	Verona	www.telefin.it
WP Energy	energia	Verona	www.wpenergy.it
Galileo Servizi	ambiente	Verona	www.galileoservizi.it

Appendix B

UNIVERSITÀ DEGLI STUDI DI PADOVA

LABORATORIO INNOVAZIONE

DIMEG- Dip. di Innovazione Meccanica e Gestionale

Introduzione ed istruzioni per la compilazione

Il questionario che ha ricevuto è parte integrante di una ricerca sulle motivazioni e le opportunità imprenditoriali nelle aziende ad alta tecnologia presenti nel Veneto. Scopo dell'indagine è quella di delineare punti di forza e di criticità del sistema produttivo *high-tech*. Il presente questionario è stato inviato ad aziende venete appositamente selezionate.

IMPORTANTE: La compilazione del questionario darà diritto in esclusiva alla sua azienda di:

1) accedere in anteprima ai dati globali e al rapporto di ricerca
2) accedere ai risultati complessivi suddivisi per settore ed area geografica di riferimento
3) ricevere informazione specifiche e valutazioni sul posizionamento
4) partecipare agli eventi ufficiali di presentazione della ricerca.

E' auspicabile che la compilazione del questionario venga effettuata dal presidente o dall'amministratore delegato dell'azienda, dal presidente o dall'amministratore unico.

DURATA. La compilazione del questionario richiede circa 7 minuti.

MODALITÀ. E' possibile stampare il file, inserire una X sui punti sospensivi di fronte alla risposta prescelta ed inviare il questionario compilato al numero di fax 049.8276716. E' possibile inoltre compilare il file in formato elettronico e spedirlo alla mail paolo.giacon@unipd.it .

PER INFORMAZIONI Dipartimento di Innovazione Meccanica e Gestionale – Università degli Studi di Padova, via Venezia 1, 35131 Padova. Tel:049.8277473, www.dimeg.unipd.it;

INFORMATIVA PRIVACY. Ai sensi del D.L.196/2003 il trattamento delle informazioni che riguardano l'azienda sarà improntato ai principi di correttezza e liceità e di tutela della riservatezza e dei vostri diritti. I dati forniti verranno trattati, nei limiti della normativa sulla privacy per esclusiva finalità di indagine scientifica ed elaborazione statistica da parte del Dipartimento di Innovazione Meccanica e Gestionale

Firma per il consenso al trattamento dei dati _____

SEZIONE: Profilo dell'imprenditore

.

Domanda A1 **Il fondatore dell'azienda (o il gruppo di soci fondatori) è (sono) attualmente a capo dell'azienda?**
a) …… si
b) ……no

Domanda A.2 **Qual è il titolo di studio dell'imprenditore?** .....

Domanda A.3 **L'attuale imprenditore ha esperienze lavorative precedenti di tipo non imprenditoriale?**
a)…….. si
b)…….. no

A.4 **Se si, quale?**
a) …… dipendente pubblico
b) …… dipendente privato
c) …… ricercatore/docente

A.5 **Nel caso l'imprenditore attuale abbia gia' avuto esperienze imprenditoriali precedenti, specificare se**
a) …… imprenditore nel medesimo settore o in settore simile
b) …… imprenditore in settori diverso dall'attuale
c) …… altro (specificare) : ……

SEZIONE Genesi dell'impresa

Domanda B.1 **L'azienda è nata come**
a)……. spin-off accademico (*idea imprenditoriale maturata in ambito universitario o di centri pubblici di ricerca*)

b)……. spin-off nato da un'altra azienda (*idea imprenditoriale maturata all'interno di un'altra impresa*)
c)…… altro

Domanda B.2 **Quali elementi hanno inciso nella scelta della localizzazione dell'azienda e dei suoi impianti produttivi?**
a)…… residenza dell'imprenditore
b)…… disponibilità di risorse umane qualificate
c)…… qualità ambientale del territorio, buoni servizi ed infrastrutture
d)…… prossimità ad università o centri di ricerca
e)…… leggi a favore dell'imprenditorialità high-tech o dell'innovazione
f)…… presenza di altre aziende ad alta tecnologia
g)…… altro (specificare):……

Domanda B.2 **Descriva in maniera molto sintetica l'idea di business che è alla base del sua impresa.**
……
……
……
……

Domanda B.2 **Descriva in maniera molto sintetica come ha maturato l'idea imprenditoriale descritta nella domanda precedente.**
……
……
……
……

Domanda B.3 Pensi attentamente a quando è stata fondata/ rilevata l'azienda. **Indichi il livello di importanza per le possibili motivazioni che hanno spinto l'imprenditore o il team di imprenditori a creare/rilevare l'azienda (segnare con X)**

motivazione	***per nulla***	***poco***	***abbastanza***	***molto***	***moltissimo***
presenza di un gruppo di potenziali clienti					
desiderio di mettersi in proprio					
desiderio di ottenere maggiori guadagni					
intenzione di trasformare in business alcune competenze tecnologiche già acquisite					
intenzione di trasformare in business alcune idee innovative					
intenzione di acquisire nuove competenze allargando il proprio ambito professionale					
impossibilità di realizzare innovazioni e concretizzare nuove idee nel contesto lavorativo					
insoddisfazione del precedente lavoro					
strategia di diversificazione del business					
desiderio di possedere e gestire più di una impresa					
agevolazioni finanziarie e contributi pubblici					

disponibilità ad affrontare il rischio imprenditoriale					
raggiungere lo status sociale di imprenditore					
Imitare alcuni colleghi					
fiducia nelle propria capacità di raggiungere obiettivi					
supporto della propria famiglia					
consapevolezza del vantaggio competitivo di una tecnologia					
Consapevolezza di poter contare sui giusti collaboratori					

eventuali NOTE: ……..
……
…… ……

Domanda B.4 **Qual è stata la principale fonte di finanziamento al momento della costituzione dell'azienda (inserire la percentuale del capitale sociale)?**

a)…… risorse personali dei soci fondatori
b)…… debito bancario ordinario
c)…… investimento da parte di altre aziende
d)…… investimento da parte di Università o società pubbliche
e)…… investimento di una società di venture capital
f)…… altro (specificare):…….

Domanda B.5 **A quanto ammontava il capitale iniziale dell'azienda?**

a) …. fino a 10.000 euro b) …. da 10.000 a 20.000 euro
c) …. da 21.000 a 50.000 euro d) …. da 51.000 a 100.000 euro
e) …. da 101.000 a 200.000 euro f) …. oltre 200.000 euro

SEZIONE INNOVAZIONE & R&S

Domanda C.1 **L'azienda svolge attività di Ricerca e Sviluppo (R&S) ?**

a)….si
b)….no

C.2 **Il numero di addetti alla ricerca e sviluppo prodotto è pari a:** ……

eventuali NOTE…….
……
……

Domanda C.3 **Indicare la percentuale di fatturato investita in attività di R&S**: …….

Domanda C.4 **Le priorità di innovazione nella sua azienda per l'anno corrente e per il prossimo riguardano** (*segnare al massimo due risposte*) :

a)……tecnologie di prodotto
b)…….tecnologie di processo
c)……organizzazione
d)……tecnologie dell'informazione (ICT) per i processi aziendali.
e) ……altro (specificare) :……..

NOTE……..

Domanda C.5 **Indicare Vero (V) o Falso (F) per le seguenti affermazioni**

La collaborazione con le università ha portato a nuove linee di prodotto o a prodotti radicalmente nuovi	
La collaborazione con centri di ricerca pubblici o parchi scientifici ha portato a nuove linee di prodotto o prodotti radicalmente nuovi	
Le collaborazioni esterne sono state fonti di innovazione incrementale.	

eventuali NOTE …….
…….

Domanda C.6 **Indicare la frequenza con cui si verificano le seguenti situazioni nella sua azienda**

	spesso	**raramente**	**mai**
i dipendenti suggeriscono alcuni miglioramenti dei nostri prodotti			
i clienti della mia azienda richiedono miglioramenti tecnologici ai prodotti			
i clienti richiedono servizi migliori e piu' efficienti			
i clienti suggeriscono alcune idee importanti che ci aiutano ad innovare			
i fornitori sono in grado di consegnarci prodotti sempre piu' efficienti ed innovativi			
i fornitori suggeriscono alcune modifiche ai nostri prodotti per migliorarli			
la mia azienda ricorre a società di consulenza esterna per sviluppare nuovi prodotti			
i concorrenti sono una buona fonte di buone idee di miglioramento ed innovazione			
la comunità scientifica e le pubblicazioni internazionali sono una buona fonte di idee			

eventuali NOTE: …….
……
…….

Domanda C.7 **Nel caso i dipendenti abbiano suggerito modifiche, miglioramenti o innovazioni di prodotto le chiediamo di specificare il loro ruolo:**

a) …..ufficio tecnico,
d)……addetti alla produzione,
e)……ufficio commerciale,
f)…… unità addetta alla R&S,
g)……altro (specificare): ……

SEZIONE Finanziamenti e Progetti

Domanda D.1 **Attualmente quali forme di finanziamento vengono prevalentemente adottate per supportare la ricerca e l'innovazione?**

a)…… risorse proprio
b)……finanziamenti tradizionali (prestito bancario)
b)……bandi per usufruire di fondi europei, statali o regionali)
i) ……..altro (specificare) :……

SEZIONE Motivazioni attuali

Pensi all'attuale situazione dell'azienda. **Indichi il livello di importanza per le possibili motivazioni che la spingono a proseguire il progetto imprenditoriale**

motivazione	***per nulla***	***poco***	***abbastanza***	***molto***	***moltissimo***
presenza di un gruppo di clienti fidelizzati					
Autonomia lavorativa					
desiderio di raggiungere maggiore benessere					
Il desiderio di trasformare in business le competenze tecnologiche					
L'intenzione di trasformare in business alcune ulteriori idee innovative					
intenzione di acquisire nuove competenze allargando il proprio ambito professionale					
impossibilità di realizzare innovazioni e concretizzare nuove idee in altri contesti lavorativi					
soddisfazione per i risultati raggiunti					
Mantenimento portafoglio di investimenti – esigenza di diversificazione					
desiderio di possedere e gestire piu' di una impresa					
Possibilità di sfruttare agevolazioni finanziarie e contributi pubblici					
disponibilità ad affrontare il rischio imprenditoriale					
mantenere lo status sociale di imprenditore					
Superare i risultati di concorrenti e colleghi					
fiducia nelle propria capacità di raggiungere obiettivi					
supporto della propria famiglia					
consapevolezza del vantaggio competitivo della propria tecnologia					
consapevolezza di poter contare sui giusti collaboratori					

SEZIONE Informazioni generali

In questa ultima sezione del questionario vengono richieste alcune informazioni generali sull'azienda al fine classificare e qualificare le risposte sino ad ora fornite

Anno di costituzione della società:……..

Eta’ attuale dell’imprenditore (o eta’ media dei soci dell’azienda) : ……

Numero attuale di dipendenti:……..,

di cui laureati in discipline tecnico-scientifiche:……..

Eta’ media dei dipendenti:……..

Fatturato 2008: ……..

Previsione fatturato 2009: ……..

Sito Internet dell’azienda:…….

Ruolo di chi ha compilato il questionario:……

GRAZIE

References

Acs Z. and Audretsch D., (1992), *The social end economic impact of entrepreneurship*, in D. Sexton and J. Casarda, The state of the art of entrepreneurship, Boston, MA, US, PWS-Kent

Aldridge H. and Zimmer C, (1986), Entrepreneurship through social networks, in D. Sexton and R. Smilor, The Art and Science of Entrepreneurship, Cambridge MA, Ballinger Publishing Company.

Aldrich, H. (2000). Organizations evolving. Beverly Hills: Sage.

Aldridge Jr., J. H. (1997). An occupational personality profile of the male entrepreneur as assessed by the 16PF fifth edition. Unpublished doctoral dissertation, University of Georgia.

Amit, R., Meuller, E., & Cockburn, I. (1995). Journal of Business Venturing, 10, 95–106.

Allison C., Chell E., and Haydes J. ,(2000), Intuition and entrepreneurial behaviour, European Journal of Work and Organizational Psychology, vol 9., pp33-43.

Alvarez S.A. and Barney J. (2005), How entrepreneurs organize firms under conditions of uncertainty, Journal of Management, vol. 31, pp.776-793.

Arrow K., (1974), The Limits of Organization, New York, W.W. Norton

Audretsch D.B., (2002), *Entrepreneurship: a survey of the Literature*, prepared for the European Commission, Enterprise Directorate General, July.

Babb, E. M., & Babb, S. V. (1992). Psychological traits of rural entrepreneurs. Journal of Socio Economics, 21, 353–362.

Bandura, A. (1997). Self-efficacy: the exercise of self control. New York: Freeman.

Bates, T. (1990). Entrepreneur human capital inputs and small business longevity. Review of Economics and Statistics, 72(4), 551–559.

Baum, R. (1994). The Relation of Traits, Competencies, Vision, Motivation, and Strategy to Venture Growth. Unpublished doctoral dissertation, University of Maryland, College Park, MD.

Baum, J. R., Locke, E. A., & Smith, K. G. (2001). A multi-dimensional model of venture growth. Academy of Management Journal, 44(2), 292–303.

Baumol, W. (1968). Entrepreneurship in economic theory. American Economic Review Papers and Proceedings, 64–71.

Begley, T. M. (1995). Using founder status, age of firm, and company growth rate as the basis for distinguishing entrepreneurs form managers of smaller businesses. Journal of Business Venturing, 10, 249–263.

Begley, T. M., & Boyd, D. P. (1987). A comparison of entrepreneurs and managers of small business firms. Journal of Management, 13, 99–108.

Brockhaus, R. H. (1980). Risk taking propensity of entrepreneurs. Academy of Management Journal, 23, 509–520.

Brockhaus, R. H. (1982). The psychology of the entrepreneur. In C. A. Kent, D. L. Sexton, & K. H. Vesper (Eds.), Encyclopedia of entrepreneurship (pp. 39–57). Englewood Cliffs, NJ: Prentice-Hall.

Busenitz, L., & Barney, J. (1997). Differences between entrepreneurs and managers in large organizations: biases and heuristics in strategic decision making. Journal of Business Venturing, 12, 9–30.

Baker T and Nelson R., (2005), Creating something from nothing: resource construction trhough entrepreneurial bricolage, Administrative Science Quarterly, vo. 50, pp.329-366

Baron R., (2004), "Potential Benefits of the Cognitive Perspective: Expanding Entrepreneurship's Array of Conceptual Tools," *Journal of Business Venturing*, *19*, 169-172.

Baron R., (2006), Opportunity Recognition as Pattern Recognition: How Entrepreneurs “Connect the Dots” to Identify New Business Opportunities, Academy of Management Perspectives, February 2006, pp. 104 – 119

Baumol, W., (1968), *Entrepreneurship in economic theory*, American Economic Review Papers and Proceedings, 64-71.

Begley T. and Boyd D. (1986), Psychological characteristics associated with entrepreneurial performance, Babson Park, Babson College

Benneworth P., (2006), *Who builds Science Cities and Knowledge Parks?*, High Technology Small Firms Conference, 2006

Bhide A., (1999), How Entrepreneurs Craft Strategies that work, Boston, Harvard Business School Press.

Birch D., (1987), *Job Creation in America: how our smallest companies put the most people to work*, New York, Free Press

Casson, M. (1982), The Entrepreneur: An Economic Theory, Oxford: Martin Robertson & Co. Ltd.

Casson M. and Wadeson N., (2007), The Discovery of Opportunities: Extending the Economic Theory of the Entrepreneur, Small Business Economics, vol 28.

Carter N., Gartner W., Shaver K., Gatewood E., (2003), The career resons of nascent entrepreneurs, Journal of Business Venturing, n.18, pp.13-39

Carrier C., Raymond L., Eltaief A. (2004), *Cyberentrepreneurship: A multiple case study*, International Journal of Entrepreneurial Behaviour & Research, Vol.10, No. 5,

Caird S., (1991), The enterprising tendency of occupational groups, International Small Business Journal, vol 9, pp.75-81.

Cassia L, Fattore M. and Paleari S. (2006) *Entrepreneurial Strategies: emerging businesses in declining industries*, Edward Elgar, Cheltnham

Chesbrough H., (2004) *Managing open innovation*. Research Technology Management. V.47. 23-26.

Carroll, G., & Mosakowski, E. (1987). The career dynamics of self-employment. Administrative Science Quarterly, 32, 570–589.

Collins, C., Locke, E., & Hanges, P. (2000). The relationship of need for achievement to entrepreneurial behavior: a meta-analysis. Working paper, University of Maryland, College Park, MD.

Cooper, A., Woo, C., & Dunkleberg, W. (1989). Entrepreneurship and the initial size of firms. Journal of Business Venturing, 3, 97–108.

Corman, J., Perles, B., & Vancini, P. (1988). Motivational factors influencing high-technology entrepreneurship. Journal of Small Business Management, 26, 36–42.

Choi Y.B., (1993), Paradigms and Conventions: uncertainty, decision making and entrepreneurship, Ann Arbor, University of Michigan Press.

Chorev S. and Anderson A., (2006), *Success in Israeli High-Tech Start-ups: critical factors and process*, Technovation, vol 26, pp162-174 .

Clark B., (1998), *Creating Entrepreneurial Universities: Organizational Pathways of Transformation*, Pergamon Press, New York

Cyert R.M. and March J.G., (1963), A Behavioural Theory of the firm, Englewood Cliffs NJ, Prentice Hall

Cohen W. and Levinthal D., (1990), *Absorptive capacity: a new perspective on learning and innovation*, Administrative Science Quarterly, vol.35, n.1

Colombo M., Del Mastro M., Grilli L., (2004) *Entrepreneurs' human capital and the start-up size*

of new technology-based firms, Int. Journal of Industrial Organization 22 (2004) 1183– 1211

Davidsson P. (1995), Determinants of entrepreneurial intentions, paper presented for RENT IX Workshop, Piacenza, Italy

Davidsson P., (2004), Researching Entrepreneurship, Springer

Davidsson P. (2008). The Entrepreneurship Research Challenge, Chelthenam UK, Edward Elgar

Deakins, D., (1996), *Entrepreneurship and Small Firms*, McGraw-Hill, Maindenhead

Deakins D. and Freel M., (2006) *Entrepreneurship and small firms*, McGrawHill, London

De Clerq D., Menzies T., Diochon M. and Gasse Y., (2009), Explaining nascent entrepreneurs's goal commitment: an exploratory study, Journal of Small Business and Entrepreneurship ISSN: 0827-6331.

De Wit G. and Van Winden F., (1989), An empirical analysis of self employment in the Netherlands, Smalla Business Economics, n.1, pp.263-272.

Di Minin, A., M. Lazzeroni, A. Piccaluga (2003). *HTSFs in Peripheral, Knowledge Intensive Areas: an In-Depth Analysis in Pisa*. The Eleventh Annual HTSF Conference, Manchester

Delmar F., (2000), *The Psycology of the entrepreneur*, in Carter S. and Jones-Evans D., *Enterprise and Small Business: principles, pratice and policy*, FT/Prentice Hall, London

Dosi G., Malerba F. (1996), *Organization and Strategy in the Evolution of the Enterprise*, New York, Macmillan

Durand, D. E. (1975). Effects of achievement motivation and skill training on the entrepreneurial behavior of black businessmen. Organizational Behavior and Human Performance, 14, 76–90.

Eisenhardt K. M., (1989), *Building Theories from case study research*, Academy of Management. The Academy of Management Review*;* Oct 1989; 14, 4;

Evans, D., & Leighton, L. (1989). Some empirical aspects of entrepreneurship. American Economic Review, 79, 519–535.

Ferrarri S, Guerrieri P., Malerba F., Mariotti S., and Palma D., (2007) *L'Italia nella competizione tecnologica internazionale – Quinto Rapporto*, FrancoAngeli, Milano

Fineman, S. (1977). The achievement motive construct and its measurement: where are we now? British Journal of Psychology, 68, 1–22.

Flyvbjerg B., (2006), *Five Misunderstandings About Case Study Research*, Qualitative Inquiry, vol. 12, no. 2, April 2006, pp. 219-245

Gartner W., Bird B. and Starr J., (1992), *Acting as if: differentiating entrepreneurial from organizational behaviour*, Entrepreneurship Theory Practice, vol.16, n.3

Gartner W.B. and Birley S. (2002) *Qualitative methods in entrepreneurship research (special issue*). Journal of Business Venturing vol.17, n.5

Gaglio C.M. and Katz J.A. (2001), The Psychological Basis of Opportunity Identification: Entrepreneurial Alertness, Small Business Economics, n.16, p.95

Gartner W.B., (1985), A conceptual framework for describing the phenomenon of new venture creation, Academy of Management Review, 10, 696.

Gartner W.B., (1990), What are we talking about when we are talking about entrepreneurship?, Journal of Business Venturing, n.5

Gartner, W. B. (2001), *Is There an Elephant in Entrepreneurship? Blind Assumptions in Theory Development*, Entrepreneurship Theory & Practise, Summer 2001, 27-39.

Gartner W.B., Carter N.M., and Hills G.R., (2001), Opportunities are enacted!, Movements in Entrepreneurship Workshop, Entrepreneurship and Small Business Research Institute, Stockholm, Sweden.

Glancey K. D. and McQuaid R. W., (2000) *Entrepreneurial Economics*, Palgrave Macmillan

Guba E.C., (1990), *The Paradigm Dialog*, Newbury Park CA, Sage Publications

Gummesson E., (2006), *Quality Research in Management: Addressing Complexity, Context and Persona*. Management Decision, Vol. 44, No 2, pp. 167-179

Hisrich, R. D. (1985). The woman entrepreneur in the United States and Puerto Rico: a comparative study. Leadership and Organizational Development Journal, 5, 3–8.

Hornaday, J. A., & Aboud, J. (1973). Characteristics of successful entrepreneurs. Personnel Psychology, 24, 141–153.

Hull, D. L., Bosley, J. J., Udell, G. G. (1980). Renewing the hunt for heffalump: identifying potential entrepreneurs by personality characteristics. Journal of Small Business, 18, 11–18.

Hamilton R. and Harper D., (1994), *The entrepreneur in theory and in practice*, Journal of Economic Studies, vol 21, n.6

Hannan M.T. and Freeman J., (1977), *The population ecology of organizations*, American Journal of Sociology, vol. 82.

Harms R., Schulz A., Fink M. (2009), The conceptualization of opportunity in strategic management research, International Journal of Entrepreneurial Venturing, vol 1. n.1

Harper D., (1996), *Entrepreneurship and the Market Process*, London, Routledge

Hayek F.A. (1945), The use of knowledge in society, The American Economic Review, n.35, pp. 519-530.

Herzberger F., (1976), The Managerial Choice: to be efficient and to be human, Homewood, Dow-Jownes-Irwin.

Hébert, R. F., and Link, A. N. (1988), The Entrepreneur: Mainstream Views and Radical Critiques, New York: Praeger

Hessels J., van Gelderen M., Thurik R., Entrepreneurial aspirations, motivations and their drives, Small Business Economics (2008), vol.31.

Johnson, B. (1990). Toward a multidimensional model of entrepreneurship: the case of achievement motivation and the entrepreneur. Entrepreneurship Theory and Practice, 14(3), 39–54.

Khilstrom R and Laffont J., (1979) *A general equilibrium entrepreneurial theory of firm formation based on risk aversion*, Journal of Political Economy, vol 87, n.4

Kirzner I., (1973) , *Competition and Entrepreneurship*, Chicago: University of Chicago Press

Klevorick A., Levin R., Nelson R., and Winter S. (1995), *On the sources of significance of inter-industry differences in technological opportunities*, Research Policy, vol.24

Koberg C. Sarason Y., and Rosse J. (1996). *A taxonomic approach to studying high-technology firms: deciphering the tower of Babel*, The Journal of High Technology Management Research, Volume 7, Number 1, pages 15-35

Karp T., (2006) *The inner entrepreneur: A constructivist view of entrepreneurial reality construction* **,** Journal of Change Management, Vol 6, n. 3, September 2006 , pp. 291-304(14)

Koberg C. Sarason Y., and Rosse J. (1996). *A taxonomic approach to studying high-technology firms: deciphering the tower of Babel*, The Journal of High Technology Management Research, Volume 7, Number 1, pages 15-35

Kogut B., (1991), Joint ventures and the option to expand and acquire, Management Science, n.37, pp 19-33

Kuratko D.F. 1991. Demystifying the business plan process: an introductory guide. Small Business Forum

Krueger N. (2003), *The Cognitive Psychology of Entrepreneurship*, in Acs. Z. and Audretsch D., Handnook of Entrepreneurship Research, 2005, Springer

Langlois, R.N. and Cosgel M.M. (1993), Frank Knigth on risk,uncertainty and the firm; a new interpretation, Economic Inquiry, n.31.

Lazear E.P., (2004), *Balanced skills and entrepreneurship*, American Economic Review, Papers and Proceedings, May 2004

Lazear E.P. (2005), *Entrepreneurship*, Journal of Labor Economics 23 (4).

Loasby, B.J., (2002), The organizational basis of cognition and the cognitive basis of organization, In M.Augier and J.G. March, The Economics of choice, change and organization, essays in memory of R. Cyert, Cheltenam, UK, Edward Elgar

Lumpkin, G. T., and Dess, G. G., (1996), *Clarifying the entrepreneurial orientation construct and linking it to performance.* The academy of management review, 21(1), 135-172.

Locke, E. A. (2000a). Motivation, cognition and action: an analysis of studies of task goals and knowledge. Applied Psychology: An International Review, 49, 408–429.

Locke, E. A. (2000b). The prime movers: traits of the great wealth creators. New York: AMACOM.

Locke, E. A. (in press). Self-set goals and self-efficacy as mediators of incentives and personality. In M. Erez, U. Kleinbeck, & H. Thierry (Eds.), Work motivation in the context of a globalizing economy. London: Erlbaum.

Locke, E. A., & Latham, G. P. (1990). A theory of goal setting and performance. Englewood Cliffs, NJ: Prentice-Hall.

Low, M., & MacMillan, I. (1988). Entrepreneurship: past research and future challenges. Journal of Management, 14, 139–161.

McClelland, D. C. (1965). Toward a theory of motive acquisition. American Psychologist, 20, 321 333.

Miller, D., & Drodge, C. (1986). Psychological and traditional determinants of structure. Administrative Science Quarterly, 31, 539–560.

Maslow, A. (1943), A theory of human motivation, Psychology Review, n.50, pp.370-396.

Miles, M. B., and Huberman, A. M. (1994). *Qualitative data analysis,* (2nd ed.). Thousand Oaks, CA: SAGE

McGee J., Sawyer O., (2003), *Uncertainty and Information Search Activities: A Study of Owner-Managers of Small High-Technology Manufacturing Firms*, Journal of Small Business Management, Vol. 41 Issue 4, p385, 17p.

McMullen, J.S. and Shepherd D.A., (2006), Entrepreneurial action and the role of uncertainty in the theory of the entrepreneur, Academy of Management Review, n.31, pp.132-152.

McPhee I., (2000), *Towards an understanding of business start-ups through diagnostic finger printing*, Working Paper Series 2000 Number WP 008/00 ISSN Number ISSN 1363-6839

Müller F., Fujiwara T., Herstatt C., (2004) *Sources of Bioentrepreneurship: The Cases of Germany and Japan* , Journal of Small Business Management 42 (1) , 93–101

Malerba F. and Orsenigo L., (2000), *Knowledge, Innovative activities and industrial revolution*, Industrial and Corporate Change, vol. 5 n.1

McClelland D.C, (1961), *The Achieving Society*, Van Nostrand, New Jersey

Naffziger D.W., Hornsby J.S., Kuratko D.F., (1994), A proposed research model of entrepreneurial motivation, Entrepreneurship: Theory and Practice, Spring 1994.

Oakey R.P (2003), *Technical entreprenenurship in high technology small firms: some observations on the implications for management* , Technovation 23 (2003), pp 679–688.

Park J.S., (2005), Opportunity recognition and product innovation in entrepreneurial hi-tech start-ups: a new perspective and supporting case study, Technovation, vol. 25

Pavitt, K. (1984), *Sectoral Patterns of Technical Change: Towards a Taxonomy and a Theory.*, Research Policy, 13: pp.343-73 .

Porter M., (1980), Competitive Strategy, New York, The Free Press.

Porter M., (1998), *Cluster and the New Economy of Competition*, Harvard Business Review, Nov.-Dec.,

Phelps E., (2006), Macroeconomics for a modern economy, Noble Prize lecture, 8 december 2006, Aula Magna Stockholm University.

Plummer L., Haynie J.M., Godesiabois J., (2007), An Essay on the origins of entrepreneurial opportunity, Small Business Economics, (2007), vol 28

Sarasvathy, S. (2001), *Causation and effectuation: Toward a theoretical shift from economic inevitability to entrepreneurial contingency*, Academy of Management Review, vol.26, n.2.

Sarasvathy S. (2008), Effectuation, Elements of Entrepreneurial Expertise, Cheltenham UK, Edward Elgar

Sarasvathy S., Dew N., Velamuri S., Venkataraman S., (2003), Three views of Entrepreneurial Opportunity, in Acs.Z. and Audretsch D., Handbook of Entrepreneurship Research, Springer

Sarasvathy, D., Simon, H., & Lave, L. (1998). Perceiving and managing business risks: differences between entrepreneurs and bankers. Journal of Economic Behavior and Organization, 33, 207–225.

Sexton, D.L., & Bowman, N.B. (1986). Validation of a personality index: comparative psychological characteristics analysis of female entrepreneurs, managers, entrepreneurship students, and business students. Frontiers of entrepreneurship research (pp. 513–528). Wellesley, MA: Babson College.

Schere J., (1982), *Tolerance of ambiguity as discriminating variable between entrepreneurs and managers*, Academy of Management Best Paper Proceedings, vol.42

Shane, S. and Venkataraman, S., (2000), *The promise of entrepreneurship as a field of research* Academy of Management Review, 25(1), 217-226

Shane S. , Locke E., Collins C.,(2003), *Entrepreneurial Motivation*, Human Resource Management Review,

Shane S. (2003), *A general theory of Entrepreneurship: the individual-opportunity nexus*, New horizons in Entrepreneurship, Edward Elgar, Cheltenham UK.

Shane S. and Eckhardt J., (2003), *The Individual-Opportunity Nexus*, in Acs.Z. and Audretsch D., Handbook of Entrepreneurship Research, Springer

Shapero A., (1975), The displaced, uncomfortable entrepreneur, Psychology Today, 9, pp. 83-88.

Silva O., (2007), *The Jack-of-all-trades entrepreneur: innate talent or acquired skills?*, Econ. Letters 97.

Steenhuis H. and de Bruijn E., (2006), *High Technology revisited: definition and position*, Proceedings of IEEE International Conference on Management of Innovation and Technology

Shaver K.G. and Scott L.R., (1991), Person, Process, Choice: the psychology of new venture creation, Entrepreneurship: Theory and Practice, Winter 1991.

Schoemaker P.J., (1995), Scenario Planning: A Tool for Strategic Thinking, Sloan Management Review, n.36, pp25-40.

Schumpeter J.A. (1934), *The Theory of Economic Development*, Cambridge, Mass: Harvard Un. Press.

Sexton, D. L. (1988), The field of entrepreneurship: Is it growing or just getting bigger?, Journal of Small Business Management, 5-8..

Sorenson O., (2007), Entrepreneurship: a field of dream?, Academy of Management Annals, vol.2

Timmons J.A., (1999), New Venture Creation: Entrepreneurship for the 21st Century, Boston, Irwin McGraw-Hill

Tracy, K., Locke, E., & Renard, M. (1998). Conscious goal setting versus subconscious motives: longitudinal and concurrent effects on the performance of entrepreneurial firms. Paper presented at the meeting of the Academy of Management, Boston, MA

Tushman M. and Anderson P., (1986), *Technological discontinuities and organizational environments* Administrative Science Quarterly, vol. 31

Vaghely I.P. and Julien P.A., (2010), Are opportunities recognized or constructed? An information perspective on entrepreneurial opportunity identification, Journal of Business Venturing, vol.25.

Venkataraman, S. (1997), *The distinctive domain of entrepreneurship research, Advances in Entrepreneurship*, Firma Emergence and Growth, vol.3

Venkataraman, S. (2004), *Regional transformation through technological entrepreneurship*, Journal of Business Venturing 19 (2) pp 153 167

Wagner J., (2003), *Testing Lazear's jack-of-all-trades views of entrepreneurship with German data,* Applied Economics Letters 10

Wagner J., (2006), *Are nascent entrepreneurs jack of all trades? A test of Lazear's theory of entrepreneurship using German data*, Applied Economics 38.

Weick K.E., (1979), The social Psychology of Organizing, Reading MA; Addison-Wesley

Westhead, P. and Wright, M. (1998), *Novice, Serial and Portfolio Founders: Are They Different?* , Journal of Business Venturing 13(3): 173-204

Westhead P., Ucbasaran D., Wright M., and Binks M., (2005), *Novice, Serial and Portfolio Entrepreneur Behaviour and Contributions,* Small Business Economics, 25 (2005): pp. 109–132.

Yin R., (2002), *Case Study Research. Design and Methods*. Third Edition. Applied social research method series Volume 5. Sage Publications. California, 2002

Zahra, S. A. and Dess, G. G. (2001). *Entrepreneurship as a Field of Research: Encouraging Dialogue and Debate*. Academy of Management Review, 26(1), 8-10.