UNIVERSIDAD DE MURCIA

FACULTAD DE ECONOMÍA Y EMPRESA

Organizational Capabilities for Innovation Development: An Empirical Approach

Capacidades Organizativas para el Desarrollo de la Innovación: Una Aproximación Empírica

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2014

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DEPARTAMENTO DE ORGANIZACIÓN DE EMPRESAS Y FINANZAS

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Capacidades Organizativas para el Desarrollo de la Innovación: Una Aproximación Empírica

A Dissertation

Submitted in Partial Fulfillment of the Requirements for the Degree of Ph.D. in Business Sciences

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Murcia, February 2014

This research was supported by the Spanish "Ministerio de Economía y Competitividad" under project ECO2012-37893

Acknowledgements

I am very fortunate to have had the support of two major academic supervisors, Dr. Daniel Jiménez Jiménez and Dr. Micaela Martínez Costa who have provided crucial academic support during my three years of research. Dr. Daniel is a high qualified and scholarly, academic, to whom I am indebted for his infinite academic guidance. Likewise, Dr. Micaela is an attentive, patient, and knowledgeable scholar, who never failed to offer any crucial assistance. I sincerely thank and acknowledge their tremendous efforts in aiding me to complete this dissertation.

I have also greatly benefited from close contacts with great friends, especially Dr. Alejandro Garcia Garcia, Dr. Julián Valero Torrijos, and Dr. Teresa Vicente Jiménez among others. These brilliant professors enlightened my first steps towards the academic world, providing all kinds of support and help. I offer my sincerest thanks to them.

As a requirement of international PhD, I had to carry out a part of the present thesis in a European university. My search for a consistent research background directed me to the famous French university: Univesité de Lille Nord de France (especially: Université du Littoral Côte d'Opâle). Within the Université du Littoral Côte d'Opâle, I realized a predoctoral stay at the Laboratoire de Recherche sur l'Innovation et l'Industrie. There I had had the chance to partake in intellectual exchange with recognized experts in innovation economics. I would thank all the staff of Lab.II, especially, Drs. Blandine Laperche, Dimitri Izunidis and Sophie Boutilier.

I am also eager to acknowledge and thank "la Agencia Española de Cooperación Internacional para el Desarrollo (AECID)" for the scholarship they provided me with during the last three years. Without this scholarship, I could not be able to carry out such academic work. I also would thank Universidad de Murcia, especially "Servicio de Relaciones Internacionales" for an earlier financial assistance they conceded to me, along with "Departamento de Organización de Empresas y Finanzas."

My son Ahmed Dine, who is now three years old, was born when I took my first steps towards obtaining this PhD. Since then, I have not been able to stay more than one month per year beside him in my country, so I hope he has been surmising (his way) that a matter that is susceptible to separate us should be only academic search, and that he will follow in my footsteps in the future. Certainly, my thanks go to my wife who has been waiting all these years in Mauritania until this great moment!

My older brother, Mr. Amar Rabeh has usually been enthusiastic towards accomplishing my career and getting my PhD. Likewise, all the members of my family have devoted to me everything I needed. To them, I would express my gratefulness for their infinite help and love. Same feelings are dedicated to my younger brother Lemrabott Rabeh, to whom I hope a successful professional career. Thanks to my friends and relatives: Guillem (France), Oscar (Spain), Mohamed-Abderrahmane (Bihe), Sidina Bedgue, Yahya Elkevya, Cheikhna Baba, Nagi Mohamedou, Nagi Mohamed Lemine, Mohamed Jreivine, Bah Biech, El-Hacen Brahim, and Dahane Beida (Mauritania).

My warmest thanks go also to my colleagues at the University of Murcia, which is an inspiring place to work and learn from others. Luis Villalobos, Cristina Aznar and Yolanda Castro…We all strive to contribute to a supportive academic environment, understanding at the same time the requirements for good research and learning. Finally, I thank my housemates: Mahmoud and Esmat (Egypt), Said (Tunisia), Yassine (Algeria), Wahaj Chaudhry (U.S.A), Mauricio (Colombia) and all people who have contributed, in a way or in another, in conducting this research to this satisfactory end, especially, Pilar Miranda Lopez, Leo, José Espín Mora and their lovely families.

To my supervisors: Dr. Daniel Jiménez Jiménez and Dr. Micaela Martínez Costa.

To every single member of my beloved family.

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LIST OF ABBREVIATIONS

ACAP Absorptive Capacity

ACQUIS Acquisition Capacity

AGFI Adjusted Goodness-of-Fit Index

APPLIC Application capacity

ASSIMI Assimilation Capacity

AVE Average Variance Extracted

CEO Chief Executive Officer

CFA Confirmatory Factor Analysis

CFI Comparative Fit Index

CNAE Clasificación Nacional de Actividades Económicas (National Classification of Economic Activities)

Df Degree of Freedom

ENVDYN Environmental Dynamism

EQS Structural Equation Modeling Software

EXPLOI Exploitation Capability

EXPLOR Exploration Capability

FIRMEM Firm Memory

FIRPER Firm Performance

GFI Goodness of Fir Index

IFI	Incremental Fit Index
INCRIN	Incremental Innovation
INE	Instituto Nacional de Estadistica (Spanish Statistical Office)
KMO	KAISER-MEYER-OLKIN measure of sampling adequacy
NFI	Normed Fit Index
NNFI	Non-Normed Fit Index
NPS	New Product Success
PACAP	Potential Absorptive Capacity
PDMA	Product Development and Management Association
PINSTR	Product Innovation Strategy
RACAP	Realized Absorptive Capacity
RADINN	Radical Innovation
RBV	Resource-Based View
R&D	Research and Development
RESAVA	Resource Availability
RMSEA	Root Mean Square Error of Approximation
RMSR	Root Mean Squared Residuals
ROA	Return on Assets
ROI	Return on Investment
ROS	Return on Sales
SABI	Sistema de Análisis de Balances Ibéricos (Iberian Balance Sheets Analysis system)

Sig Significance

SCR Scale Composite Reliability

SD Standard Deviation

SEM Structural Equation Modeling

SPSS Statistical Package of Social Sciences

TRANSF Transformation Capacity

VARIMAX A rotation that maximizes the sum of the variances of the squared loadings

GENERAL INTRODUCTION

GENERAL INTRODUCTION

"The enterprise that does not innovate inevitably ages and declines. And in a period of rapid change such as the present…..the decline will be fast." – Peter Drucker (1909-2005).

PROBLEM STATEMENT

Up to recent periods, an assumption considering the manufacturing activities as the main engine of growth was dominating the economic scene. The underlying idea of that theory stems in the traditional belief that industrial activities were the only factors that enable the achievement of productivity. However, this revolutionary theory interprets the performance issue otherwise. The two dichotomies that characterize modern day business (increasing environmental threats and business opportunities) oblige the companies to cope with change-related challenges. In other words, the dynamism of contemporary markets motivates companies to seek survival and growth as strategic goals, otherwise companies may "be left in vulnerable positions" (Annacchino, 2007).

Thus, in the actual knowledge-economy, innovation is considered the main key factor for companies' growth and survival (Camisón & Villar-López, 2014; Hashi & Stojčić, 2013). Furthermore, it becomes almost axiomatic that in todays' dynamic and illimitably changing environments, innovation is indisputably the main competitive advantage source for companies due to the rewards this activity offers in different manifestations such as financial payoffs, market share growth, customer satisfaction, flexibility, dynamism, long-term success and so forth (Barbosa & Faria, 2011; Bettencourt & Brown, 2013; Bunduchi *et al.*, 2011; Büschgens *et al.*, 2013; Camisón & Monfort-Mir, 2012; Damanpour & Evan, 1984; Damanpour *et al.*, 1989; Edison *et al.*, 2013; Freeman, 1997; Griffith *et al.*, 2006; Kaplan, 1999; Lyon & Ferrier, 2002; Roberts, 1999; Schumpeter, 1934; Vrakking, 1990; Wolfe, 1994). However, only learning organizations are able to deal efficiently with environmental growing requirements, which determines the pursuit of successful innovations, since innovation is the highest manifestation of knowledge (Drucker, 2002; Nonaka & Takeuchi, 1995).

Innovation-based companies usually seek to adapt themselves to change requirements, and continue by offering new products and services to their customers; gaining competitive advantages (Andriopoulos & Lewis, 2010; Baker & Sinkula, 1999a). The way firms introduce newness to their current production activities determines the extent to which they are able to carry out successful innovations. In order to introduce new outputs, firms should either abandon the familiar products, services or production systems by *exploring* and then applying new and novel ideas in order to have *completely new outputs,* or *exploiting* and *reusing* the accumulated ideas *adding new dimensions to their existing products and services* in order to obtain *enhanced* ones (Andriopoulos & Lewis, 2009; Jansen *et al.*, 2006; Kim *et al.*, 2012).

Firms' exploitation of their internal resources and competences, through dynamic processes and practices, or exploration of external potentials represent the main capabilities enabling knowledge creation within the company (Atuahene-Gima & Murray, 2007; Hernández-Espallardo *et al.*, 2011; March, 1991). Consistent with this logic, it seems to be of great importance to analyze the effects that exploration and exploitation capabilities can have on the success of the different types of product innovations (enhanced or breakthrough), and then on firm performance, studying at the same time other related key factors. Many models have been introduced seeking a consistent answer to how companies can successfully develop new products. This study is, then, a new attempt aiming at contributing in the scientific debate about this issue, presenting an empirical framework that includes, additionally, other important factors such as the absorptive capacity, firm memory, and innovation strategy implementation.

RESEARCH OBJECTIVES

Although innovation development evidently requires knowledge creation, the different nature of innovation and learning processes leads to a causal ambiguity about how the two concepts are related. In this context, the main purpose of this thesis is *to analyze theoretically and empirically the effect of organizational learning capabilities on incremental and radical product innovations success*, aiming to cover an important field of research, which is insufficiently studied. Many authors treat these issues separately within different organizational approaches, seeking a convincing answer to the main question regarding which capability is adequate when developing a special type of innovations. Therefore, this dissertation adapts, among other approaches, a relatively new capabilities-based approach, with the aim of scientifically adding a new brick to the existing literature basing on different organizational theories.

The main objective of this research is subdivided into several sub-objectives through which the achievement of the main goal and structure become easily reachable. In short, the addressed targets are summarized in the following points:

(a) Conceptualizing the product innovation and identifying the key factors that enable it to achieve success. In doing so, an overwhelming revision of innovation literature will be performed.

(b) Reviewing the literature about organizational learning capabilities as positive features in the process of product innovation. Thus, matching and analyzing the consistency between the modes and capabilities of organizational learning and the types of product innovations (incremental / radical).

(c) Analyzing some key determinants that influence the generation of learning capabilities, seeking to explain how companies opt for one type of capacity over another.

(d) Studying the main factors that influence the effect of learning capabilities on innovation success.

(e) Proposing, based on the literature review, an integrative model that explains the relationships between learning capabilities and their determinants, innovation development outcomes and conditional factors of the latter. The main research hypotheses will be formulated in the light of the proposed model that will finally be tested empirically.

(f) Contrasting empirically the research hypotheses reviewed in the preceding paragraph, using a personal survey.

(g) Proposing empirically justified strategic decisions that innovative firms must assume. These conclusions will be issued from the empirical testing of the different hypotheses using the data gathered through the personal survey abovementioned.

OUTLINE OF THE DISSERTATION

To achieve the aforementioned objectives, the present thesis is composed of two parts: theoretical and empirical. The first theoretical part deals with an in-depth review of the theoretical issues treated within this work, whereas the second part represents the different empirical analysis aspects. Concretely, the theoretical part consists of three chapters (I, II, III) undertaking the most relevant subject-related issues, whereas the empirical part consists of two chapters (IV, V) joining both the methodology and the results of the empirical analysis.

The first chapter deals with an exhaustive review of innovation in general in the first part. The rest of the thesis focuses especially on product innovation literature. After introducing the subject, the following part is about framing the product innovation. Therefore, a conceptualization of innovation, its origins, determinants and implications and impacts on companies are treated within this chapter. After defining and delimitating innovation, based on existing literature, a special focus is done on the innovation at the level of the organizations as a core subject of the present thesis. In addition to the analysis of the benefits of such crucial activity on the success and survival of modern company, a thorough classification of innovations is provided based on existing literature. The chapter ends listing the most influential product innovation process approaches and the importance of product innovation in generating performance for companies.

In turn, the second chapter analyses the organizational capabilities: conceptualization, classifications, implications, etc. Secondly, organizational learning capabilities are treated, leading to a special focus on the exploitation and exploration as systemic learning capabilities. Likewise, a review of a relatively new tendency “ambidexterity” is reviewed once these main capabilities are analyzed. Additionally, three key antecedents of exploitation and exploration activities, namely, absorptive capacity, product innovation strategy, and organizational memory are analyzed according to their relationships with exploitation, exploration and the interaction with each other. Regarding the absorptive capacity, this chapter provides the term's conceptualization, delimitation, antecedents and impacts on learning capabilities and performance. The second issue concerns organizational memory and its interactions within learning capabilities. Therefore, the correspondent part begins with a literature review about the term and its impacts upon learning and absorptive capacity of the company, ending with consistent hypotheses.

Chapter three analyzes the relationships between learning capabilities (exploitation and exploration) and product innovations. Therefore, after introducing the issue, an exhaustive literary review about the existing models linking between organizational learning and innovation was performed. It is evident that due to the extension of literature, a work like this is unable to list all of the existing models; therefore, this chapter analyzes some referential models according to available databases. The third part of this chapter attempts to point out the interactions between exploitation/exploration and types of innovations (i.e. radical/incremental). Other potential moderator and mediator effects are investigated within this chapter.

Chapter four deals with the different aspects regarding data analysis, especially the Structural Equations Modeling (SEM) technique employed herein, the targeted population and sample, as well as the operationalization of the variables that measure the constructs forming the model.

Finally, chapter five analyzes the different findings of the empirical analysis. It provides interpretations of the analysis outputs and the most salient results. In addition, it displays the main conclusions and implications of the overall study findings.

This study ends with a citation of the most significant implication, contributions as well as future research tendencies. The most important limitations that may hinder the accuracy and generalizability of the study findings are also listed at the final part prior to the appendix.

CHAPTER I: PRODUCT INNOVATION AND FIRM PERFORMANCE: A THEORETICAL REVIEW TOWARDS HYPOTHETICAL CONSIDERATIONS

CHAPTER I

“New products can help your company much more quickly and efficiently with a bit of planning before development starts.”– Robert Cooper (1990).

In a world in which the only certainty is uncertainty (Nonaka & Takeuchi, 1995), innovation seems to be vital for companies’ survival and growth. This can be recognized in terms of increasing works by both academics and practitioners aiming at deepening our understanding about the innovation phenomenon, and then approaching how firms cope with its requirements. However, a recognizable consensus indicates that there is no common method or way to understand or achieve innovations (Wolfe, 1994).

The discrepancy in innovation definitions is also accompanied by a similar discordance about how companies develop successful new outputs. For example, Davenport (1996) expressed the complexity of innovation development by asserting that it is an art rather than a mere science and therefore, there is no unique method or approach to achieve innovation success. Thus, many authors have offered different approaches they believe firms adopt when involving in innovation projects. Linear models (Cooper & Kleinschmidt, 1995), stage gate systems (Cooper, 1990) among other models represent some prominent samples in innovation literature.

Likewise, Literature offers a plethora of taxonomies of innovation. These categorizations are formed based mainly on criterions such as the domain of innovation (technological/administrative or “social” or “managerial”), the nature of the output (product, service, process, management style and marketing), degree of newness (incremental/radical), the effect of the market/technological opportunities (market-pull/ technology-push) and so forth.

In light of the previous evidences, the present chapter offers a delimitation of innovation concept as well as different taxonomies of innovations. It aims to provide an exhaustive review about product innovation literature. Therefore, the first part deals with the conceptualization of innovation in general and the different interpretations about this issue. The following parts offer a multi-perspective review of innovation, the different classifications of the same. It is argued that innovation is vital for companies’ survival and growth as well as generating new outputs that create potential demand and new markets, which in turn lead to an increase in the survival probabilities of firms and continued prosperity and growth. Thus, the final point deals with the impact of innovation’ outcomes and rewards on firm performance.

A similar importance has been given to the definition of innovation strategy as enabler of learning, innovation and organizational performance (see for instance Cheng *et al.*, 2010; Guan *et al.*, 2009; Li & Atuahene-Gima, 2001). Thus, given their argued effects, and aiming at portraying a model integrating the most influencing factors, the current chapter addresses innovation strategy as a distinctive feature for innovative companies.

The present chapter is subdivided into five parts. The first part deals with definition of the term of innovation as well as the main characteristics of an innovative company. It also classifies innovation, providing a list of the main sources and determinants of innovation. After defining innovation, the second part focusses on product innovation, delimiting the phenomena, providing its implications for companies and finally exhibiting at the same time how companies carry out new products. The third part analyzes profoundly how companies develop competitive advantages through successful product innovations, whereas the fourth part deals with factors that may shape the success of new products. The fifth part ends the chapter highlighting the most salient conclusions.

1.1. INNOVATION: A THOROUGH REVIEW

A glimpse at the history of innovative companies such as Apple, Google and Microsoft etc. is enough to recognize the importance of innovation. Furthermore, over the last decade, companies were being tasked by the intense competition due to the customer's eagerness for something new and dynamic as well as the pace of change in technology and markets. This leads companies to face a situation of do-or-die, i.e. to innovate and then deal properly with the competition and customer changing tastes and desires, or to remain on the road of ineffectiveness and declination. For these reasons, it is primordial understanding the concept of innovation and its implications.

1.1.1. Conceptualization of innovation

Innovation conceptualization has trigged a huge debate, offering several and different definitions. Pioneering work by Schumpeter (1934: 65) portrays innovation from an economic perspective as "new combinations" of new or existing knowledge, resources, equipment and so forth, which may lead to an introduction of new products or services, new methods of production, the opening of new markets, the conquest of new sources of supply and the implementation of a new organization of any industry. This means that, according to Schumpeter, innovation includes things such as: introduction of new goods or services that the customers are not yet familiar, new ways of handling production, creation of a new market, takeover of a supply source for example of raw material, and the implementation of a new model or form of organization. Innovation transcends the borders of the company to the supplier, as gaining a new supply source, for example, is considered an innovation.

Similarly, Thompson (1965) defines innovation as the generation, acceptance, and implementation of new ideas, processes, products, or services. Likewise Dosi (1988a) argue that an "innovation concerns the search for, and the discovery, experimentation, development, imitation, and adoption of new products, new production processes and new organizational set-ups". These last definitions describe the theoretical processes of innovation, as it begins from the ideation ending with development of new outputs such as products, services or organizational forms. Similar definition is offered by Rogers (1962:11) who considers an innovation to be "an idea, practice, or object that is perceived as new by an individual or other unit of adoption". This definition in addition to the delimitation of innovative scope, enclosing idea, practice, or material artefact, points out also the question of to whom innovation is new (i.e. customer, company or market). It also emphasizes the newness characteristic of innovation despite its material or immaterial nature.

In short words, Amabile *et al.* (1996) present an innovation to be the successful implementation of creative ideas within an organization. It is a process of creating new ideas and turning them into new business or a social value (Morris, 2006). Moreover, innovation is a collective process of idea generation and implementation that builds upon resources, skills, and personnel from different organizational functions (Gibson & Gibbs, 2006). Within the context of a strategic approach, Boar (1997) defines innovation as "the ability to convert novel ideas into revenue and profits by developing new products, processes, and/or business models". These definitions emphasize the *ideation*, as innovation implies the conversion of knowledge and innovative ideas into a benefit for commercial use or for public well-being. The benefit may be new or improved products, processes or services.

The European Commission (1995: 688) provides an exhaustive definition, considering an innovation as "the renewal and enlargement of the range of products and services and the associated markets, the establishment of new methods of production, supply, and distribution, the introduction of changes in management, work organization, and the working conditions of the workforce". Likewise, a summarizing definition is the one offered by Oslo Manual that states: "an innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations" (OECD, 2005: 46).

It is clear that the latter definitions enclose all the prior ones, as it widely considers innovation to be the introduction of any newness in business systems, inputs or outputs. Innovation is, then, the process of creating, developing, and implementing new product, service, process, practices or new forms that may shape organizational behaviours in the value creation course. In other words, an innovation can be a renewal or extension of a line of products, services or production processes, changes in the organization and management or changes in professional qualifications. Thus, despite the ideation dimension, an innovation can be defined as "adoption of an internally generated or purchased device, system, policy, program, process, product, or service that is new to the adopting organization" (Damanpour, 1991).

The above discussion demonstrates different interpretations of innovation provided by some authors of various backgrounds. Although, a disagreement about a unique definition is argued in the literature, table 1.1 provides an array of innovation definitions exhibiting the different referential viewpoints. The table includes some definitions that are not mentioned in the above paragraphs, and is organized according to the years of publication of the referenced works. Economic and managerial definitions can be recognized by comparing, for example, the by Schumpeter (1934) on the one hand and Damanpour (1991: 556), Andersson *et al.* (2008) among others on the other hand.

Table 1.1: Definitions of innovation as reported by literature

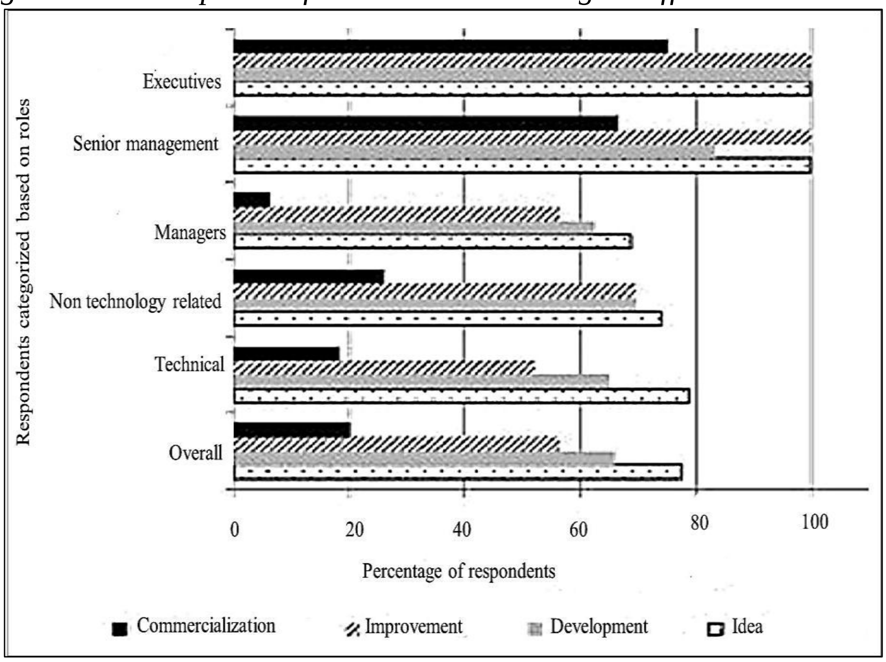
Author (s)	Definition
Schumpeter (1934)	An introduction of new products or services, new methods of production, the opening of new markets, the conquest of new sources of supply and the implementation of a new organization of any industry.
Rogers (1962:11)	An idea, practice, or object that is perceived as new by an individual or other unit of adoption.
Roberts (1988)	Invention process that creates a new idea and gets it to work plus the exploitation (develops and dissemination) of the innovation commercially.
Zaltman et al. (1997: 2)	An idea, practice or material artifact perceived as new by the relevant unit of adoption.
Dosi (1988a)	An innovation concerns the search for, and the discovery, experimentation, development, imitation, and adoption of new products, new production processes and new organisational set-ups.
Damanpour (1991: 556)	A new product or service, a new production process technology, a new structure or administrative system, or a new plan or program pertaining to organizational members.
Afuah (1998)	New knowledge incorporated in products, processes, and services.
OECD (2005: 46)	The implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations
Amabile et al. (1996)	The successful implementation of creative ideas within an organization.
Boar (1997)	The ability to convert novel ideas into revenue and profits by developing new products, processes, and/or business models.
Gibson and Gibbs (2006)	A collective process of idea generation and implementation that builds upon resources, skills, and personnel from different organizational functions.
Morris (2006)	A process of creating new ideas and turning them into new business or social value.
Badawy (2007)	Bringing something new into use.
Andersson et al. (2008)	New applications of knowledge, ideas, methods, and skills that can generate unique capabilities and leverage an organization's competitiveness.
Dibrell et al. (2008)	Innovations vary in complexity and can range from minor changes to existing products, processes, or services to breakthrough products, and processes or services that introduce first-time features or exceptional performance.
Love et al. (2011)	The commercial application of new knowledge.
Samara et al. (2012)	A complex phenomenon involving the production, diffusion and translation of technological knowledge into new products or new processes.

Source: Author's own elaboration

Definitions differ in their presentation of organizational innovation, as there is no unique way to interpret it (Wolfe, 1994). Furthermore, there is a lack of consensus about a unique definition of innovation as it is “diverse and scattered” (Armbruster *et al.*, 2008). An understanding of innovation as a process ending with an outcome is clear through the block of definitions shedding light on the ideation process, while a second view highlights the characteristic of innovation as an output. A third understanding of innovation as a capability is also offered by resource-based view of the company (Camisón & Monfort-Mir, 2012). However, most of these definitions go beyond the mere technical aspect of innovation, to include “the concepts of novelty, commercialization and/or implementation” (Popadiuka & Choob, 2006: 303).

In summary a clear lack of consensus about a unique definition among academics as well as practitioners is perceived, according to a recent study by Edison *et al.* (2013). However, casting a look at the different definitions assigned to innovation allows recognizing that *ideation* constitutes a main common denominator, and that innovation is mainly a new idea converted for commercial ends. This perception is confirmed through a recent study performed by Edison *et al.* (2013). Their interviews with different practitioners and academics point out that innovation is highly perceived as a new idea (see figure 1.1). A second range of perceptions of innovation as an improvement or a development of new outputs is also argued.

Figure 1.1: Perceptions of innovation according to different stakeholders



Source: Edison *et al.* (2013)

Figure 1.1 highlights that senior management and executives assess the commercialization dimension of innovation definition. Or, for them, an innovation is not a mere development of new idea into new products or the idea or enhancement of existing outputs, but also the commercialization of these traduced ideas or these improved familiar products and services. However, for the remaining interviewees, the dimension of commercialization is likely not of the most relevant. Instead, innovation for the non-executive and senior managers is an idea, a development of new output or an improvement of an existing one.

1.1.2. Classifications of innovation

For deepening our understanding about innovation; analyzing the different types of the same seems to be crucial, since "past research has argued that distinguishing types of innovation is necessary for understanding organizations' adoption behavior and identifying the determinants of innovation them" (Damanpour, 1991: 560). Various typologies and models have been discussed based on different criteria, such as the degree of newness, the technological-base, the nature of the domain of application and so forth. Although, an exhaustive review will be implemented, herein the focus is done on innovations developed in the companies. Based on the literature, a sort of organization will be provided and schematized in a diagram presented at the end of this point.

Classifications differ according to various criterions. For example, based on the *final outputs nature*, Schumpeter (1934) proposed five types of innovations namely: introduction of new products, introduction of new methods of production, opening new markets, development of new sources for raw materials or other inputs, and creation of new market structures in an industry (Schumpeter, 1934). Dual core theory (Daft, 1978) distinguishes between administrative and technical, or social and technical innovations (Damanpour & Evan, 1984). Based on prior works, Damanpour and Gopalakrishnan (1998) define administrative innovation to be "the type of innovation dealing with firm structure and administrative processes, whereas technical innovations are concerned by products, services and production process technologies". Technical innovation appears also in the OECD classification, as the third edition of the Oslo Manual, distinguishes between technological or technical innovation and organizational or administrative innovation. Technological innovation is the introduction of technical innovations in products or processes, and is thus associated with the change of the "technological core" or "technical system" of the company. Technological innovations are directly related to the primary activity of the organization, and its introduction is reflected by changes in products, processes, and operating systems, or technologies and physical capital for production" (Camisón & Monfort-Mir, 2012: 777). The OECD (2005) highlights the difference between technical or technological (as indicated in the above paragraph) and the non-technical innovations. The non-technical is analogous to administrative or organizational innovations indicated by Daft (1978) and Damanpour and Evan (1984) among others.

Similar taxonomy by Damanpour (1991) distinguishes between technical innovation (new process, new products or new services) and administrative innovation (new procedures, policies and administrative forms). Depending on the source of the innovation, one can differs between two main categories of organizational innovations: the one that is directed by technology (technology-push) and the other including the innovation driven by the market or (market-pull) (Brem & Voigt, 2009; Dosi, 1988b; Freeman *et al.*, 1982). Likewise, the OECD (2006) report identified four main blocs of innovations that can occur within companies: product innovation, process innovation, marketing innovation and organizational innovation. The following paragraphs analyse each type separately:

- *Product innovation*: it stands for the goods and services that are new or partially enhanced. Companies can carry out new products, with new technical specifications or made with new materials or with new components or functional characteristics. It brings to both the company and the market new products aiming at satisfying the current needs of customers efficiently, especially with innovative properties. Although, the OECD (2006) report presents product innovation to be goods plus services innovations, most of the authors consider that product innovation doesn't entangle services. Rather, they consider product and service innovations to be different and then analyse them differently (e.g. Bettencourt & Brown, 2013; John, 2006; Nijssen *et al.*, 2006; Park *et al.*, 2012; Vermeulen, 2004). Therefore, herein, new product stands for solely new good. More detailing analysis about product innovation will be provided within the following sections, as it constitutes the core of the present thesis.

- *Process innovation* (Davenport, 1996): it includes completely new or partially enhanced method of production or the use of new logistics. For example, a new way of distribution of the goods and services that a given company produces or the use of new equipment are examples of process innovation. Furthermore, is usually related to new processes or new technology that change the method of production aiming at achieving higher productivity, less material use or improving the physical characteristics or functions of the products (Gupta & Loulou, 1998). Process innovation may also have significant impacts on the costs related to innovations development through the accuracy and efficiency of the processes, which is able to reduce the probability of failure and then minimizing the associated costs. Likewise, Parisi *et al.* (2006) argued that process innovation has a large influence on firm productivity.

- *Marketing innovation* (OECD, 2005): by name, it concerns newness in how companies deal with the four Ps (Product, Place, Promotion and Price). As marketing field is dynamic due to the competition and customer taste, this type is growing perpetually and offers an important potential for companies to change and adequately perform. Product design, packaging and promotion, distribution and pricing all play important role in customer satisfaction, therefore, innovative companies usually manage to innovate in either differentiation or in pricing.

- *Organizational innovation* (Gruber & Niles, 1974), *(also called administrative innovation* (Damanpour & Wischnevsky, 2006) *or management innovation)*: it includes changes in business practices at both workplace and at the external level. The Oslo Manual defined organizational innovation as “the implementation of a new organisational method in the firm’s business practices, workplace organisation or external relations” (OECD, 2005: 51). Birkinshaw *et al.* (2008: 825) define management innovation as “the invention and implementation of a management practice, process, structure, or technique that is new to the state of the art and is intended to further organizational goals”. This type of innovation targets the effectiveness and efficiency of the business administrative activities aiming at formulating the best fit of the company’s products and services to the needs of the customers, retaining competitiveness at the same time (Pil & Macduffie, 1996). Moreover, it targets increasing firm performance and improving the working methods and labour relations in the company (teamwork and self-management teams), and improve the company’s relationships with its external environment throughout social responsibility and ethics management. The ultimate goal of management innovation is to improve the use of resources and achieve better results compared to the former experience, or imitate the best competitors. Finally, management innovation is a dynamic area that is constantly receiving new concepts, aimed at improving the performance of business management. The table 1.2 provides key information about each type.

Table 1.2: Product, process, marketing and management innovations at glance

Type	Definition	Aspects	Rewards
Product	Introduction of new or improved goods or services.	New technical specifications, New materials, New components or functional characteristics.	Opening new markets, Market share growth, Customer satisfaction.
Process	Introduction of completely new or partially enhanced method of production or the use of new logistics.	New distribution method, Use of new equipment, New production method, lines...	Efficiency of production, Diminishing production costs, Higher productivity.
Marketing	Introduction of new way whereby companies deal with the four Ps (Product, Place, Promotion and Price).	New product design, New packaging, New promotion system, New distribution politics, New pricing policy.	Overcoming existing competition, Increasing market share, Enhancing aspect of the product, Positioning.
Management	New changes in business practices at both workplace and external level.	New team chemistry, New internal organization, New relationships with external environments, Cooperation with leading companies.	Effectiveness and efficiency of business administrative activities Better fit of the company's products to the needs of the customers.

Source: Author's own elaboration

Within a different taxonomy, based on the degree of newness, scholars such as Freeman *et al.* (1982) subdivide innovation according to the impact and the effect it produces, differentiating between incremental and radical innovations.

- *Incremental* (continuous, architectural) *innovation* is the innovation in which companies utilizes their current resources and capabilities to offer enhancements in the targeted field (Dewar & Dutton, 1986). It seeks enhancing the familiar products of a company. However, its main peculiarity is the fact that is enables continued and perpetual growth with a low risk.

- *Radical innovation* refers to the innovations that rupture with firms' current practices and knowledge, offering completely new outputs (Veryzer Jr, 1998). It consists of "involving commercialization of products based on significant leaps in technological development, with the potential for entirely new features and improvement in performance or cost, compared with the existing substitutes" (Leifer *et al.*, 2000). In this context, Amara *et al.* (2008) argue that many studies use different designations such as breakthrough, disruptive, discontinuous, significant, major, pioneering to describe the radicalness of innovation. The main characteristic of this type of innovations is the high risk and costs it carries. Even though, it is a main source of growth if succeeded.

Many scholars have investigated radical and incremental innovations basing on the rewards and the specifications of each (e.g. Dewar & Dutton, 1986; Ettlie *et al.*, 1984; Vowles *et al.*, 2011), the main key features are displayed in table 1.3.

Table 1.3: Incremental versus radical innovations

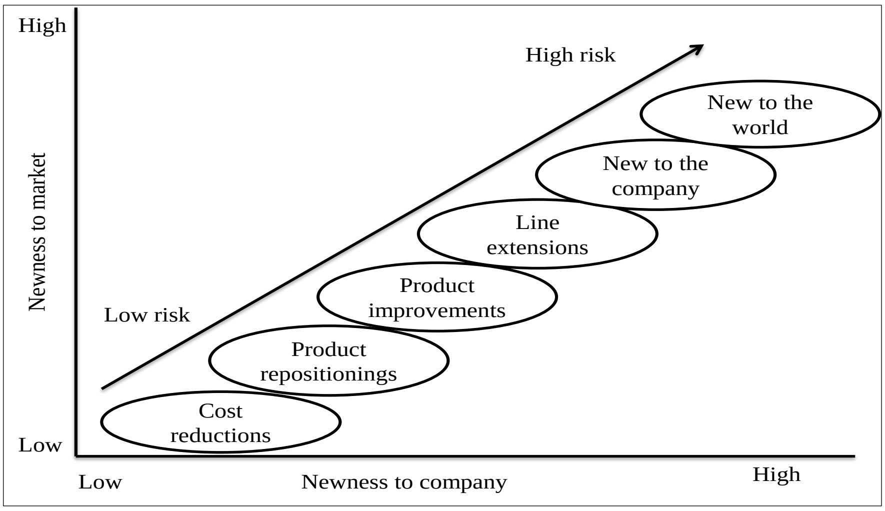
Focus	**Radical Innovation**	**Incremental Innovation**
Time frame	Long term- usually 10 year plus	Short term- 6 to 24 months
Novelty	Higher order (breakthrough)	Lower order (first order)
Idea generation and opportunity recognition	Often unexpected ideas from unexpected sources, slack tends to be required Dramatically change business practices	Repairing the old, using old knowledge and technology
Process	A formal, structured process might hinder	Formal, established, generally with stages and gates
Business case	The business case evolves throughout the development, and might change, predicting customer reaction is difficult	A complete business case can be produced at the outset, customer reaction can be anticipated
Development trajectory and risks	Discontinuous, iterative, set-backs. Confronted with high level of technological and market uncertainties	Step after step from conception to commercialization. Low uncertainties associated with technology and markets
Players	Skill areas required, key players may come and go, finding the right skills often relies on informal networks, flexibility, persistence and willingness to experiment are required	Can be assigned to a cross-functional team with clearly assigned and understood roles, skill emphasis is on making things happen
Development structure	Tends to originate in R&D, tends to be driven by the determination of one individual who pursues it wherever he or she is	Typically, a cross-functional team operates within an existing business unit
Resource and skill requirements	It is difficult to predict skill and competence requirements, additional expertise from outside might be required, informal networks, flexibility is required	All skills and competences necessary tend to be within the project team, resource allocation follows a standardized process
Operating unit involvement	Involving operating units too early can again lead to great ideas becoming small	Operating units are involved from the beginning
Scope	Create new markets	Extending the same client platform
Strategic rewards/ benefits	Leads to rapid growth	Keep companies competitive in short term

Source: Author's own elaboration based on Stamm (2003) in Popadiuka and Choob (2006)

One different but related concept is newness that explains the extent to which the output is radical. The degree of newness of innovations, to both market and companies, has widely been associated with experimentation, venturing and even risk taking (e.g. Castiaux, 2007; Chandy & Tellis, 1998; Dewar & Dutton, 1986; Ettlie *et al.*, 1984;

McDermott & O'Connor, 2002). Therefore, “the newer the products are, the greater the risk the company must bear in investing its resources for developing such products” (Prajogo & Sohal, 2001). In this logic, Davis and Moe (1997) offer a model, showing the degree of risks associated with the innovativeness of new products on both the company and the market levels. The figure 1.2 shows the risks associated with the degree of innovativeness of the outputs. As this figure depicts, the higher is the level of newness (on firm level or at the market level), the higher are the associated risks. Dealing successfully with these derived risks differentiates innovative companies, providing them with the primacy advantages.

Figure 1.2: Degrees of innovativeness and the associated risks



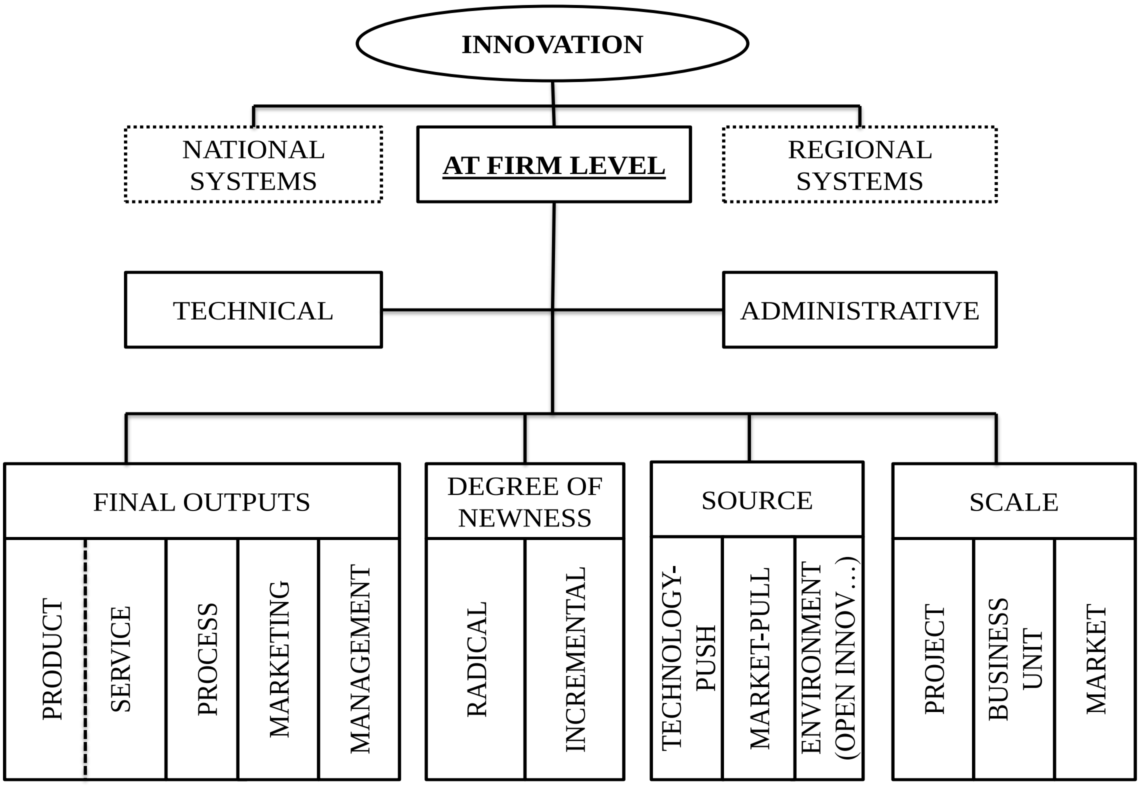
Source: Davis and Moe (1997)

An elementary classification is the one that distinguishes between *national and regional systems of innovations* on the one hand [see for example Lundvall (1988), Liu and Chen (2012), Gerasimova *et al.* (2013), Marxt and Brunner (2013), Hajek *et al.* (2013) and Lo *et al.* (2013)], and the innovations that happen on the organization level which constitutes the core of the present thesis on the other hand. Most of the references treat the latter. A national system of innovation is defined as the network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies (Freeman, 1987). This definition is applied to systems of innovation at a lower (regional) level.

Considering only *the organizational scale* on which the whole process of innovation is performed, one classification can distinguishes among project innovation (Brady & Söderlund, 2008; Kapsali, 2011; McCurdy, 2013; Moon, 2011), business unit innovation (Holthausen *et al.*, 1995; Sung, 2011), and market innovation (Martin & Scott, 2000). Project innovation is the one interested and directed especially to a definite project of the company (Blindenbach-Driessen & van den Ende, 2006; Kapsali, 2011). Likewise, business unit innovation concerns only one unit within the company (Holthausen *et al.*, 1995; Perdomo-Ortiz *et al.*, 2006), and market innovation (Kuckartz, 2001; Martin & Scott, 2000) is a broader innovation that is limited to an addressable market.

Summarizing the above categorizations, the figure 1.3 depicts the main types of innovations, especially the innovations that happen at the level of organizations as the core subject of the present thesis.

Figure 1.3: The different classifications of organizational innovation



Source: Author's own elaboration

Based on different classifications including the one offered by the OECD, the above figure 1.3 pretends portraying the different classification of organizational innovations, according to a wide array of academic viewpoints. Although the designations are various, the adoption of certain seems to be necessary, especially in the labelling of the degree of newness. The classification is rooted in four features: the nature of the output, the source of innovation, the degree of innovation and the scale on which the innovation is carried out.

Finally, it is worth highlighting that many authors have studied the different types of innovation on different levels, using different designations. Table 1.4 presents bibliographic inventory of some of the numerous articles that analyzes the different types of organizational innovations.

Table 1.4: Samples of studies dealing with the different types of innovations

	Types	**Sample references**
Scope	*National/ regional*	Freeman (1987), Lundvall (1988), Cooke and Morgan (1998), Samara *et al.* (2012), Liu and Chen (2012), Gerasimova *et al.* (2013), Marxt and Brunner (2013), Hajek *et al.* (2013), Lo *et al.* (2013).
Main functional areas	*Administrative (in some references: non-technical or social)*	Teece (1980), Kimberly and Evanisko (1981), Damanpour and Evan (1984), Damanpour (1991), Subramanian and Nilakanta (1996), Elenkov *et al.* (2005), Armbruster *et al.* (2008), Camisón and Villar-López (2011)
	Technical (technological)	Kimberly and Evanisko (1981), Freeman *et al.* (1982), Damanpour and Evan (1984), Damanpour (1991), Harabi (1995), Subramanian and Nilakanta (1996), Garcia and Calantone (2002),
Final output	*Product*	Cooper (1990), Zirger (1990), Leonard-Barton (1992), Capon *et al.* (1992), Dougherty (1992), Montoya-Weiss and Calantone (1994), Brown and Eisenhardt (1995), Cooper and Kleinschmidt (1995), Olson *et al.* (1995), LaBahn *et al.* (1996), Griffin and Page (1996), Calantone *et al.* (1997), Griffin (1997), Bayus (1997), Kusonaki *et al.* (1998), Lester (1998), Poolton and Barclay (1998), Di Benedetto (1999), Verona (1999), Roberts (1999), Lynn *et al.* (1999), LaBahn and Krapfel (2000), Ali (2000), Kessler *et al.* (2000), Li and Atuahene-Gima (2001), Baker and Sinkula (2002), Parthasarthy and Hammond (2002), McEvily and Chakravarthy (2002), Danneels (2002), Akgün and Lynn (2002), Katila and Ahuja (2002), Buijs (2003), Lukas and Menon (2004), Vermeulen (2004), Huang *et al.* (2004), Baker and Sinkula (2005), Atuahene-Gima (2005), Bestieler (2005), Chen *et al.* (2005), John (2006), Nijssen *et al.* (2006), Söderquist (2006), Atuahene-Gima *et al.* (2006), Akgün *et al.* (2006), Song and Thieme (2006), Greve (2007), Yalcinkaya *et al.* (2007), Atuahene-Gima and Murray (2007), Akgün *et al.* (2007), Annacchino (2007), Droge *et al.* (2008), Chang and Cho (2008), Kok and Biemans (2009), Molina-Castillo *et al.* (2011), Ignatius *et al.* (2012)
	Service	Weerawardena and McColl-Kennedy (2002), Van Riel *et al.* (2004), John (2006), Nijssen *et al.* (2006), Bettencourt and Brown (2013)
	Process	Dosi (1988a), Gupta and Loulou (1998), Hatch and Mowery (1998), Linton (2000), Fürnsinn *et al.* (2007)
	Management	Gruber and Niles (1974), Currie (1999), Birkinshaw *et al.* (2008), Mol and Birkinshaw (2009), Gebauer (2011), Wright *et al.* (2012), Černe *et al.* (2013)

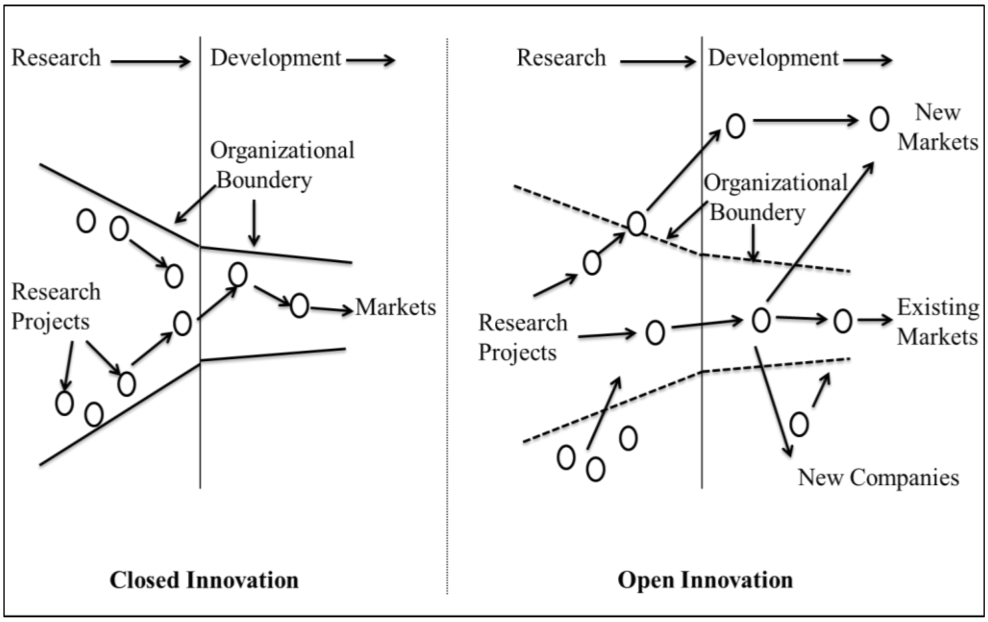
Table 1.4: continued

Degree of newness/ impact	*Incremental / radical*	Ettlie *et al.* (1984), Dewar and Dutton (1986), Banbury and Mitchell (1995), Chandy and Tellis (1998), Leifer *et al.* (2000), McDermott and O'Connor (2002), Koberg *et al.* (2003), Pil and Cohen (2006), Castiaux (2007), Song and Thieme (2009), Vowles *et al.* (2011)
	Continuous/ discontinuous (disruptive)	Lyn *et al.* (1996), Veryzer Jr (1998), Kaplan (1999), Walsh *et al.* (2002), Christensen *et al.* (2002)
	Exploitative/ exploratory	Jansen *et al.* (2006), Jansen *et al.* (2009b), Hernández-Espallardo *et al.* (2011)
	Evolutionary/ revolutionary	Utterback (1996), Patrakosol and Olson (2007)
	Minor/ major	Downs and Mohr (1976), Katz and Shapiro (1987)
	Breakthrough (radical or discontinuous innovation)	Barnholt (1997), Deszca *et al.* (1999), Mascitelli (2000), McDermott and Handfield (2000), Zhou *et al.* (2005), Phene *et al.* (2006), Baba and Walsh (2010), Gassmann *et al.* (2010)
	Architectural	Henderson and Clark (1990), Tidd (1995)
Scale	*Project innovation*	Barnes (1991), Hobbs *et al.* (2008), Brady and Söderlund (2008), Moon (2011), McCurdy (2013)
	Business-unit innovation	Holthausen *et al.* (1995), Sung (2011), Yu and Tao (2009)
	Market innovation	Martin and Scott (2000), Kuckartz (2001), Kok and Biemans (2009)
Source	*Market-pull, science-push innovations (technology-push)*	Freeman *et al.* (1982), Dosi (1988b), Schmoch (2007), Brem and Voigt (2009)
Openness	*Open/ closed innovation…*	Chesbrough (2003), Chesbrough and Crowther (2006), Chesbrough *et al.* (2006), Dahlander and Gann (2010), Huizingh (2011), Spithoven *et al.* (2011)

Source: Author's own elaboration

The latest typology differentiates between *open* and *closed innovation* (Chesbrough, 2003). The latter corresponds to the evolutionary theory (Nelson & Winter, 1982) that consider that companies innovate within an internally closed system based on internal capabilities, i.e. R&D. Emerging tendencies affirm that in nowadays dynamic business environments, firms are no longer able to innovate in isolation (Hippel, 1988). Diffusion and dissemination of innovation leads Chesbrough (2003) and others to consider innovation to be open practices that occur within open systems. In fact, authors widely differ in their definitions of open innovations, according to various perspectives (Dahlander & Gann, 2010). However, open innovation stands for the manipulation of internal and external knowledge to accelerate organizational innovation, and to expand the markets for external use of innovation, respectively (Chesbrough *et al.*, 2006). The basic assumption of this theory is that firms can and should use internal and external ideas as well as internal and external paths to market, as they look to advance their technology (Chesbrough, 2003). In contrast, closed innovation prioritizes internal closed paths and trajectories for developing new outputs. In simplistic words, closed innovation is the one companies develop inside the companies in a closed structure, whereas open innovation expands outside the companies, integrating external agents and leveraging the spin-offs and licensing. The figure 1.4 shows the main characteristics of open innovation in comparison with closed innovation.

Figure 1.4: Open versus closed innovation



Source: Kautz (2009)

Openness of innovation happens through firm use of inflowing and outflowing information (Chesbrough *et al.*, 2006). However, firms use inbound and outbound open innovations or combinative activities. Inbound open innovation refers to “internal use of external knowledge, while outbound open innovation refers to external exploitation of internal knowledge” (Huizingh, 2011). Open innovation has been used as an antagonist of closed innovation that assumes that innovation should happen in closed structures to safeguard the supremacy of the innovators (Chesbrough, 2003). Moreover, in closed innovation, companies rely on in-house knowledge, while in open innovation companies use different internal and sources for developing new outputs. The means differ accordingly as the openness does, therefore Huizingh (2011) suggests a classification based on the sources ad outcomes, distinguishing between four major types of openness, as shown in table 1.5.

Table 1.5: degrees of openness of innovation

Innovation process	**Innovation outcome**	
	Closed	*Open*
Closed	1. Closed innovation	3. Public innovation
Open	2. Private open innovation	4. Open source innovation

Source: Huizingh (2011)

The impact of open innovation on firm performance is a subject matter of many studies, and most of them argue positive relationships between them (Dahlander & Gann, 2010; Laursen & Salter, 2006). However, Laursen and Salter (2006) emphasize the fact that a loose open innovation is not beneficial, rather it could be costly for companies. Furthermore, alliances among companies have argued to be performance generator factor (Antoncic & Prodan, 2008; Arend & Amit, 2005; McCutchen Jr *et al.*, 2008; Wang, 2011), this, in turn, justifies the effectiveness of open innovation in firm performance.

1.1.3. Sources and determinants of innovation

Many scholars have investigated the phenomenon of how innovations happen and concretely the sources of the innovations. Similar attentions have been paid to the endogenous and exogenous drivers that lead companies to innovate and adopt innovative culture. The results of these academic endeavours consist of a list of potential sources and determinants that are exhibited in the following paragraphs.

In a broad approach, Drucker (2002) identified seven sources of innovation as an organized and rational activity: unexpected occurrences, incongruities, process needs, industry and market structures, demographics, change in perceptions and new knowledge. This means that unexpected success or failure and sudden external events or the perceptions of the reality may constitute innovation sources. This includes conflicts in economic realities, the conflict between the values of consumers and their expectations. Likewise, innovation can be developed based on the need to address a series of operations (process need), as different business models need different organizations such as work in groups or division of labour. In this case, the production process needs an innovative way to fit the work requirements. Innovation can also come because of the industry and market structures such as competition, customer needs and the nature of the industry itself, which offer opportunities for companies to innovate in order to adequately respond to new market needs.

Additionally, according to Drucker (2002), the demographic changes are important triggers of innovation. For example, the emerging of segmentation based on social or professional attributes has allowed marketing makers to specialize the offers based on demographic perspectives, which lead to new innovative ways for satisfying consistent market needs. In addition, the change of individual perception towards social questions allows innovative opportunities. For instance, fitness and anti-smoking are new tendencies that are rooted in change of social perceptions toward obesity and smoking. This change causes the innovation of new materials and methods dedicated to satisfy these needs. Furthermore, new knowledge constitutes the main origin of innovations as technical and social knowledge forms the main basis of product and service development (Hurley & Hult, 1998; Nonaka & Takeuchi, 1995; Nooteboom, 1999).

Another view distinguishes among internal and external sources of innovation. For example, based on prior contributions, Damanpour and Gopalakrishnan (1998: 5) pointed out three major sources of innovation: imitative, acquisitive and incubative…"the imitative source reflects a firm's disposition to copy innovations first introduced by other firms either in its own population or in other organizational populations, the acquisitive source reflects a firm's disposition to acquire innovations that have been developed by other firms through purchase, licensing, acquisition, or merger, and the incubative source reflects the firm's disposition to develop its own innovations, through internal development, e.g., R&D or joint venture". This view emphasizes the practice of generation of innovations rather than the origin of it as ideation-implementation process.

In fact, most of Drucker's (2002) variables can be seen as exogenous to companies. They originate from external factors such people perceptions and own judgments towards certain issues, that usually lead companies to innovate as they should cope with these unexpected accuracies. Moreover, this provides evidence that organizational innovations are mainly rooted in companies' endeavors to cope with external change. This, in turn, does not exclude the fact that leader companies usually innovate based on new knowledge, seeking new alternatives. Furthermore, new knowledge constitutes the main origin of innovations as technical and social knowledge forms the main basis of product and service development (Hurley & Hult, 1998; Nonaka & Takeuchi, 1995; Nooteboom, 1999). Nonetheless, the social environment remains a key determinant.

Similarly, the results of a literature review consist of a list of potential determinants that can be origins of different types of innovations. The issue of innovation determinants has been studied on different levels such as firm, national, regional or international level.

In this logic, studying the institutional differences' effect on innovation across Europe, Barbosa and Faria (2011) point out that empirical studies dealing with determinants of innovations have been performed on national and industrial levels. They also, recognize that "national innovation systems (e.g. public investment in R&D and education) as well as industry-specific characteristics largely explain differences in innovation across countries". Although, the escalation of determinants and drivers of innovation is argued, the focus herein is on the sector and company level.

On the firm level, Damanpour (1991) points out thirteen organizational variables that are determinants in innovation development. He argues that factors such as specialization, functional differentiation, professionalism, managerial attitude toward change, managerial tenure, and technical resources are conductive to innovation. In contrast, formalization and centralization hinder innovation capability. Instead, flexibility and empowerment lead to innovative solutions.

Likewise, the "*end-user*" involvement is considered to be one major determinant of modern innovation (Hippel, 1988). Thus, integrating the final customer in innovation design leads to more success. Such an action implies a pre-evaluation of the targeted stakeholder. Furthermore, Kline (1985) understood potential market needs as drivers of the innovation process, and describes the complex and often iterative feedback loops between marketing, design, manufacturing, and R&D. Likewise, Bhattacharya and Bloch (2004) point out that criterion such as firm size, R&D intensity, market structure and trade shares are conductive to more innovations for SMEs. The importance of R&D is also assessed by Romijn and Albaladejo (2002), who point out the key role of science base and proximity to suppliers as determinants of innovation capability. Furthermore, Wan *et al.* (2005) reckon six determinants, namely: structure decentralization, availability of organizational resources, innovativeness, risks-taking and disposition to change ideas.

This issue has recently been analysed by Edison *et al.* (2013) who enumerated a total of 244 determinants of innovation dispersed in literature. They classify these determinants, based on their sources, into two main groups: internal and external determinants. Internal determinants include all the aspects that companies can control, whereas external determinants are factors that are not easily controllable by the company, as their sources are out of reach. For example, human resources are controllable, whereas public policy such are reducing taxes for start-up companies or R&D grants for small companies are not controllable by companies (see table 1.6).

Table 1.6: Taxonomies of internal and external determinants of innovation

External determinants				**Internal determinants**	
Marketing	Knowledge and information	Technology	Empowerment	Customers	Industry associations
Tool-support	Planning	R&D	Acquisition and alliances	Suppliers	Legislations
Champions	Intellectual property	Alignment	Size	Competitors	Market dynamism
External collaboration	Structure	Financial	Culture	Financial institutions	Technology dynamism
Management	Commitment	Risk	Trust	Training institutions	Public policies
Organization resources	Individual	Customer-orientation	Strategy	R&D institutions	Corporate social responsibility
Policy	Internal collaboration	Networking	Human resources	Service providers	Other

Source: Authors own elaboration based on Edison *et al.* (2013) and Romijn and Albaladejo (2002)

Market and technological dynamism are the main protagonists of current external challenges (Jansen *et al.*, 2009b; Li & Liu, 2012; Wijbenga & van Witteloostuijn, 2007). Therefore, mastering them determines largely the successful development of innovations (Jansen *et al.*, 2009b; Wijbenga & van Witteloostuijn, 2007). In this sense, the theory of dynamic capabilities' main underlying aim is to explain how companies create competitive advantages conducing them to innovate in such an perpetual change (see for example: Cepeda & Vera, 2007; Eisenhardt & Martin, 2000; Teece *et al.*, 1997; Zahra *et al.*, 2006).

Similar underlying background of the networking and openness theory argues that companies are no longer able to innovate in closed systems due to markets dynamism, uncertainty, and continuous change, therefore, companies should inevitably adopt open innovation (Chesbrough, 2003). Furthermore, open innovation is likely an important determinant since today knowledge is widely distributed within the different entities which requires external collaboration and alliances (Rohrbeck *et al.*, 2009).

1.1.4. Characteristics of the innovative company

Since the concept of organizational innovation is revised, we proceed to analyze what an innovator means. According to the Oslo Manual (2006: 19), the innovative firm is one that has introduced an innovation during the period under review. In this context, the Spanish Instituto Nacional de Estadistica (2013) argued that 31.1% of Spanish companies with 10 or more employees were innovative in the period 2009-2011. 16.6% of these companies developed technological innovations whereas 24.5% are specialized in non-technological innovations. Table 1.7 provides additional information.

Table 1.7: Spanish innovative companies (2009-2011) by innovation outputs

	<250 employees	**≥250 employees**	**Total**
Total of technological innovative companies	25461	1741	27203
A) Products (new or enhanced goods and/or services)	11386	1060	12445
- Companies that have introduced new or improved goods in the market.	7863	814	8677
- Companies that have introduced new or improved services	6327	651	6977
B) Process	20854	1538	22392
- New methods of production.	10336	890	11226
- New or improved systems or methods of distribution logistics	3827	436	4262
- New or improved support activities for processes	13153	1071	14223
C) Product and process at the same time	6778	856	7634
Percentage of innovative companies (A, B, C) to the total	15.85	48.86	16.57
Total companies with non-technological innovations (D.E)	38545	1646	40191
D) Organizational (administrative) innovation: companies that have introduced new business practices in work organization	23589	1316	24905
- Companies that have introduced new methods of organizing workplaces	26633	1264	27897
- Companies that have introduced new methods of management of external relations	8840	596	9436
E) Marketing innovation	20839	791	21630
- Companies that have introduced significant changes to the design or packaging of the product	6247	448	6695
- Companies that have introduced new techniques or new channels for product promotion	13152	522	13674
- Companies that have introduced new methods serving product positioning in the market	8516	400	8916
- Companies that have introduced new methods for setting product prices	10409	299	10708
Percentage of non-technological innovative companies (D, E) to the total	24	46.19	24.48

Source: Instituto Nacional de Estadistica (2013)

This basic definition provides a broad frame identifying companies that are involved in innovative activities. Simply, any company that has introduced any type of innovation during a given period is considered innovative. Although the above definition is likely elementary, it may lead to question the characteristics of these innovative companies. In other words, do these companies innovate randomly; or rather, they are characterized by considering innovation as a culture, values, a history and so forth? Why do some companies innovate whereas other companies do not?

Answering the former questions, it is worth highlighting to indicate that such a subject has constituted a fertile issue in innovation literature. Scholars differ in citing the most important characteristics of an innovative company. However, it can be said that two main tendencies likely distinguish between two main blocs of characteristics: the cultural or behavioural characteristics such as the risk taking and empowerment…etc., and the structural characteristics that are related to the structure of the company itself (Hurley & Hult, 1998). In this context, based on prior researchers, Hurley and Hult (1998) enumerate a series of variables within a study enclosing the most relevant factors that distinguishes an innovative firm from another as shown in the table 1.8.

Table 1.8: Characteristics of the innovative company as reported in the literature

Structural and process characteristics	**Cultural characteristics**
➢ Organizational size and resources: are among the strongest predictors of innovation, as the bigger is the company, the easy is innovating. Similar argument is applied to resources. ➢ Age: the older is the organization, the more bureaucratic, the less infusion of new members and less receptive it is to innovation. ➢ Differentiation of the organization: enhances the cross-fertilization of ideas. ➢ Low formalization: less formalization leads to higher capacity to innovate, through flexibility and openness. ➢ Loose coupling, Autonomy, and Lack of Hierarchy: organizations that emphasize loose coupling of groups and flat hierarchy in their structures and those of higher levels of autonomy are more innovative. ➢ Market intelligence: the higher is the involvement with suppliers and customers, the easier is the innovation. ➢ Planning: firms with long-term focus, cross functional planning and market-focussed strategies are likely to easily innovate.	➢ Market focus: An external focus stimulates new ideas and responsiveness to markets. ➢ Learning and development: individual learning is crucial in generating new ideas which encourages innovations development. ➢ Power Sharing: empowerment facilitates the information sharing, encourages people to innovate and aids acceptance of new ideas. ➢ Status differential: impede innovation. ➢ Participative decision making: Increases involvement and the commitment to innovate, perceived freedom to act and innovate and information flow and communication up and down. ➢ Support and collaboration: reduces fear and increases openness and therefore encourages new ideas and risk taking. ➢ Communication: Comprehensive internal and external communications as well as cross-functional perspective sharing foster innovation. ➢ Tolerance for conflict and risk taking: conflict and tolerance for risk taking encourages innovation.

Source: Hurley and Hult (1998)

Finally, although learning, innovativeness and openness are the main characteristics of an innovative company, firms' resources and sizes remain determinant. For example, Rogers (1983) and Aiken and Hage (1971) among others emphasize the role of firm size and age as a predictor for innovation development. Likewise, Downs and Mohr (1976) argue that firm resources frame its capabilities to innovate. Accordingly, the capability of large companies to innovate is likely greater than small and medium-sized companies do, as the resources determine the innovation capability of each type.

Two aspects are relevant for innovative companies: the innovativeness as a culture and innovation strategy. Therefore, innovation-based companies prioritize the adoption of an innovation strategy that enables organizing the entire process in an efficient and structured manner. Literature also grants a similar importance to innovativeness that is considered as a key variable for companies with an innovative background. The following points offer more information.

1.1.1.1. Organizational innovativeness

The main concern of the cultural characteristics tends to be the focus on the innovativeness as a culture that usually conducts companies to innovate and achieve performance (Tsai & Yang, 2013). Innovativeness refers to the "attitudinal dimension of innovation" (Matsuo, 2006). It reflects the openness towards new ideas as an essential aspect of a firm's values and culture towards innovation (Hurley & Hult, 1998). This innovative culture is usually traduced in an orientation towards customer and markets, prioritizing their needs (Tajeddini, 2010), seeking novelty even if it carries risk-taking (Hirschman, 1980). Furthermore, innovativeness implies learning culture, empowerment, flexibility and so forth.

Garcia and Calantone (2002) recognized a lack of consistency in the use of innovation and innovativeness throughout innovation literature. They assess that innovativeness is rather a culture of a company, a characteristic of an output, while innovation is a certain result of innovativeness. Or, product innovativeness is different from company's innovativeness, as the former innovativeness is most frequently used as a measure of the degree of "newness" of an innovation, whereas the last stands for the propensity for a firm to innovate (or to adopt innovations) or to develop new products (Garcia & Calantone, 2002: 112-113).

In summary, an innovative company usually prioritizes learning and openness towards internal as external sources of knowledge (Amara *et al.*, 2008). It is a firm with flexible structure allowing decision decentralization and empowerment. Furthermore, an innovative firm emphasizes the communication and usually involve in collaboration in projects with others companies (Cohen & Levinthal, 1990).

1.1.1.2. Innovation strategy: Conceptualization and importance

The term *strategy* is widely considered to be rooted in the book "*The Art of War"* by Sun Tzu that was written 500 years before Christ. The fundaments of this book were brought to business context by Wing (1988), according to Grant (2006). Broadly, and despite the large debate about the concept of strategy, organizational and management literature provides some referential definitions within an organizational context. Chandler (1962) interpret the strategy as the definition of the company's objectives, the adoption of adequate actions and the assignation of the necessary resources for the realization of these objectives. Likewise, Porter (1985) argued that strategy guides the way a firm performs individual activities and organizes its whole value chain. In a similar logic, Grant (2006) describes a strategy as a plan or a model that integrates the main objectives, policies and actions' sequences, aiming at efficiently ordering and assigning the company's resources based on its competencies, considering external factors. In short, a strategy can be defined as a determined plan aiming at outlining, organizing and coordinating companies' activities and allocating the necessary assets in order to carry out a definite target.

Companies' innovative strategies can be categorized into two main innovative blocs: cost-based and product-based strategies (Porter, 1985). Both aim at providing significant and palpable value to the customers, offering at the same time high growth potential to the products. For example, gaining competitive advantage through costs aims at producing innovative products with lower production costs, while differentiation strategy deals with offering innovative products that are completely different from what the competitors offer in the market place.

Bringing the essence of the previous definitions to innovation context, a purposeful innovation strategy can be defined as a pre-elaborated process, including the settlement of the main targets, the different means to reach the fixed targets and the timetable necessary to carry out the related works. It is a plan and resources defined by a company aiming at carrying out new-targeted outputs. Such a plan addresses organizational specific interests and needs, while defining and organizing the different innovation activities (Gary, 2005).

Innovation strategy is then the first step towards the development of innovations, and is essential for innovation success and performance (Dess *et al.*, 1997; Gary, 2005). Concretely, Li and Atuahene-Gima (2001) argued a positive relationship existing between an innovation strategy and organizational innovation performance. Moreover, studying the innovation strategies of Asian firms in the United States, Poon and MacPherson (2005) found that innovation strategies aiming at applied research, new product development and marketing capabilities are positively related to innovation performance in terms of the number of patents and annual growth in sales. Finally, literature provides many studies emphasizing the involvement of strategy in competitive advantages creation for companies (Barney, 1991).

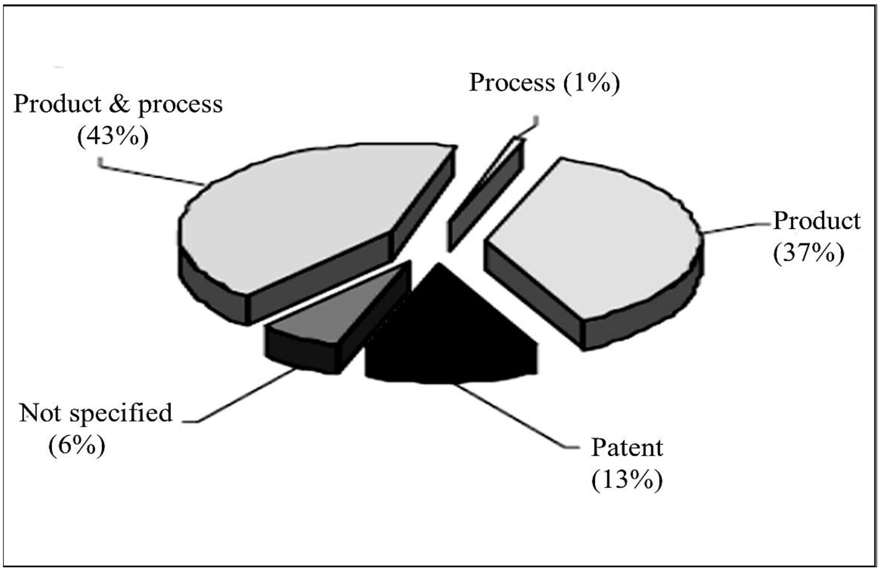
1.2. PRODUCT INNOVATION

As indicated earlier, one of the major classifications of innovation bases on the nature of the outputs. Under this classification, product innovation is one of the most crucial types of innovation to the future of the business (Becheikh *et al.*, 2006; Damanpour, 1991; Subramanian & Nilakanta, 1996). Forming the core of the present thesis, product innovation will be treated from its different aspects. A preliminary section will provide a set of definitions, delimiting the meaning of a product innovation. Successively, issues such as the importance, implications and rewards, and how companies develop this type of innovation are also analyzed.

1.2.1. Definition of product innovation

The Oslo Manual defines product innovation as "the introduction of a good or service that is new or significantly improved regarding its characteristics or intended uses, including significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics" (OECD, 2005). Product innovation has constituted a core subject for both practitioner and academics, as offering new products to customers is crucial for companies' survival and growth (Akgün *et al.*, 2007; Brown & Eisenhardt, 1995; Danneels, 2002). Such importance has been traduced by the increasing number of publications about aspects related to product innovation such as generation processes, fostering variables, inhibitors, rewards and so forth. In a systematic review of empirical articles published in three databases, namely ABI/INFORM of Proquest, Business Source Premier (BSP) of EBSCO, and ScienceDirect of Elsevier, between 1993 and 2003 on technological innovations in the manufacturing sector, Becheikh *et al.* (2006) argued that studies about product and process innovations represent 80% of the total of empirical articles analyzing innovation, and that 37% of these studies deal with solely product innovations, as depicted in the figure 1.5.

Figure 1.5: Distribution of empirical articles on innovation published in 1993-2003



Source: Becheikh *et al.* (2006)

Product innovation is seen as "among the essential processes for success, survival, and renewal of organizations, particularly for firms in either fast-paced or competitive markets" (Brown & Eisenhardt, 1995: 344). In the light of the previous evidences about the importance and necessity of new product development and commercialization in nowadays economy, this thesis focusses more on new product innovations.

A product innovation stands for the introduction of any new product or service to meet a market need (Damanpour, 1991). Danneels (2002) understood a new product as a new combination of firm's different competences relating to technologies and customers. This means that a new product is the physical interpretation of the incorporation of different organizational competences such as technology, customer and supplier feedbacks and so forth. Depending on these competences, a new product can be either totally new or partially enhanced (Dewar & Dutton, 1986). As previously indicated, herein the word product designates solely goods. Thus, new products stand for radical or incremental goods developed by the company and that are perceived as new for both the customer and the market. Henceforth, in the remaining parts, the focus will be limited to the different aspects of product innovation, as a subject-driven logic. Specifically, the different aspects of how companies launch successful new product as well as how they gain performance through these products will be discussed. This includes a definition of what is meant by developing a new product, the implications of doing so, how companies develop new products (the different approaches is about this issue) and so forth.

1.2.2. Importance and implications of product innovation

At the very beginning, it seems to be important to highlight the importance of product innovations at the macro level, before introducing the firm level. The development necessity of the world has led to the actual economic model. Such a model has passed by several periods, all of which knew the presence of product innovations as a predominant priority. Many reasons justify the importance of product innovations. For satisfying the needs of their populations, as well as for their economic growth, developed countries invest thousands of billions of euros to develop new products. In Spain, for instance, the expenditure on technological innovations (products and processes) in 2011 was about 14.756 million euros, which encourages companies to involve in carrying out new products (Instituto Nacional de Estadistica, 2013). Thus, the number of companies that introduced any type of innovations was about 41, 1 % of the overall operating companies during the period included in 2009-2011. Whereas the number of companies dedicated to product innovations during the same period reaches 8677 firms. The rate of innovations differs from region to region. In particular, Murcia region accounts with almost the average of both technological and non-technological innovations as shown in table 1.9.

Table 1.9: Spanish innovative companies by type of innovation, cities and regions in which the headquarters are located (2009-2011)

	Innovative companies		**Companies with technological innovations**		**Companies with non-technological innovations**	
	Total	*%*	*Total*	*%*	*Total*	*%*
Total National	50982	31.05	27203	16.57	40191	24.48
Andalucía	6365	26.95	2909	12.32	5115	21.66
Aragón	1710	34.64	984	19.93	1308	26.5
Asturias	917	28.44	504	15.61	700	21.71
Balears	960	22.41	465	10.86	755	17.63
Canarias	1789	26.77	960	14.36	1311	19.61
Cantabria	519	28.09	338	18.3	334	18.06
Castilla y León	2260	30.75	1308	17.79	1662	22.62
Castilla-La Mancha	1773	28.07	978	15.48	1404	22.23
Cataluña	10967	34.55	5434	17.12	9114	28.71
Comunitat Valenciana	5755	33.57	2876	16.78	4601	26.84
Extremadura	610	22.15	354	12.87	426	15.46
Galicia	2557	28.26	1643	18.15	1857	20.52
Madrid	8711	33.11	4556	17.32	7094	26.96
Murcia	1465	28.11	797	15.29	1181	22.66
Navarra	954	33.52	633	22.25	681	23.92
País Vasco	3134	33.85	2119	22.89	2258	24.38
La Rioja	467	35	312	23.43	332	24.87
Ceuta	32	22.21	20	13.85	25	17.38
Melilla	37	27.86	13	9.61	34	25.47

Source: Instituto Nacional de Estadistica (2013)

Product innovation is considered vital for modern companies, as it is a main manner of delivering value to both the consumer and the firm. Moreover, by means of new product innovations, a firm, in addition to the conventional goal of producing new products and services, is able to achieve several business objectives:

First, *improving firm performance*: Many scholars have argued that innovation generates firm performance (e.g. Adner & Kapoor, 2010; Banbury & Mitchell, 1995; Bunduchi *et al.*, 2011; Calantone *et al.*, 1997; Damanpour & Evan, 1984; Damanpour *et al.*, 1989; Schumpeter, 1934; Subramanian & Nilakanta, 1996). Performance improvement happens within different innovative aspects. For example, new product may lead to customer satisfaction and increase market share (Hooley *et al.*, 2005). In addition it is a financial performance source (Calantone *et al.*, 2002). Damanpour *et al.* (1989) studied the relationship between adoption of administrative and technical innovations over time and its impact on organizational performance, finding positive effects.

Second, product innovation increases also *firm productivity*. Furthermore, "measuring the effects of innovative activities on firms' productivity has been an active area for research for several decades, both as a policy concern and as a challenge for econometric applications" (Hall *et al.*, 2008: 15). Studying the productivity of Argentine innovative firms during the period included between 1992-2001, Chudnovsky *et al.* (2006) argued that innovators attain higher productivity levels than non-innovators. Likewise, analysing the relationship between innovation and productivity growth in the chemical, textile and machine tool industries, Chakrabarti (1990) argued a direct link between innovation and productivity fluctuations. He empirically argued that innovative firms tend to have higher productivity as labour competencies become more efficient. Likewise, analysing (at the firm level) the role innovation plays in productivity across four European countries, Griffith *et al.* (2006: 493) argued that "product innovation is associated with higher productivity in France, Spain, and the UK." Although there is a common agreement about the positive effect of innovation on the productivity and growth (Banbury & Mitchell, 1995; Becheikh *et al.*, 2006; Birkinshaw *et al.*, 2008); authors differ in how product innovation affects firm productivity. The main tendency emphasizes the role of R&D as main innovation root which is derived from the production-function in general (Hall *et al.*, 2008).

Third, new products create also *new opportunities* (Damanpour & Wischnevsky, 2006), such as new markets and new jobs. Although this is one of the main goals of product innovations, the context in which firms operate is determinant in market-oriented innovation process (Kok & Biemans, 2009). For example, radical innovations tend to produce completely new products, which in turn, may lead to new services, new processes, business models and of course opening new markets. Likewise, incremental innovations may lead to market extension or even new markets based on the degree of enhancements in functionality and characteristics. Finally, product innovation may create new jobs opportunities, as the evident result of opening new markets is the creation of new product lines or new related-services, which may require new management teams and new stakeholders' implications, which is a trigger for new jobs, consistently to the new entrants.

1.2.3. Product innovation development

After defining the notion of *product innovation*, analysing its importance, implication and the different rewards the innovative companies generate due to the involvement in product innovation projects, the following section deals with how companies carry out new products. Concretely, the main steps companies follow to develop product innovations and their implications in the entire process. In doing so, a preliminary definition of the notion is also offered.

1.2.3.1. Conceptualizing new product development

The traditional industrial understanding of new product development is a mere process of carrying out and launching new products, satisfying the needs of consumers. Since the focus was on the product itself, little attention was conceding to the hidden attributes of innovation development. In simple terms, a new product development is "the process by which an organization uses its resources and capabilities to create a new product or improve an existing one" (Cooper, 2003: 117). New management tendencies present new product development to be a holistic process that includes almost all the stakeholders of the company. In this sense, product development is seen as a process in which the company uses its expertise for responding to the needs of its customers and markets (Wind & Mahajan, 1997). It is also considered to be a new combination of technology and customer needs (Dougherty, 1992). Furthermore, integrating operations and market perspectives is necessary for developing new products (Tatikonda & Montoya-Weiss, 2001). The underlying ideas behind these definitions is that a new product can no longer be developed solely based on the tradition of developing new outputs, rather, for playing its *new* role, it should be designed based on the feedbacks of customers and suppliers, emphasizing, at the same time, the role of crucial variables such as technology-related status-quo and marketing dimensions.

Some authors consider that the process of a product innovation is mainly a market-centric process that begins with an understanding of the emerging market and its needs, and then proceeds to a search for how the company might meet those needs, offering corresponding products (Kusonaki *et al.*, 1998). Others consider that, not only market needs drive companies to develop new products, but also technological opportunities may lead them to involve in new product projects (Brem & Voigt, 2009; Schmoch, 2007). New approaches emphasize the role of the different stakeholders as well as market and technological capabilities in the involvement of product innovations as well as within the successful implementation and diffusion of the products in question.

In summary, a new product development is an organized process that begins with the ideation and ends with diffusion of the newly developed product (Utterback, 1971). It includes several tasks such as: research of innovative ideas and opportunities, design engineering and conceptualization of the ideas, manufacturing and concretization of the concept into material outputs, and marketing (Parthasarthy & Hammond, 2002). These intricate tasks are entangled in a purposeful process aiming at generating final successful products. Thus, the following part focuses on the different approaches portraying new product development as a process. Various models that are rooted in such approaches will be analysed.

1.2.3.2. Phases constituting the development process of new products

Broadly, innovation generation (including new product innovations) is similar regardless the nature of the final output. This idea is widely assessed throughout literature. In this logic, Damanpour and Wischnevsky (2006) compiled many studies that portrayed innovation process within companies, distinguishing at the same time between what they called innovation generation and innovation adoption. Thus, as the focus herein is on the innovation that is developed, not generated, the table 1.10 provides different studies that present some conceptions about the process that companies follow to generate innovations. Most of the conceptions indicated are linear, understanding innovation development as a process that begins with the perception of the need to innovate to find solutions for a given problem through new outputs production and introduction to markets.

Table 1.10: Studies defining phases of the innovation development process

Study	Innovation generation
Rothwell and Robertson (1973)	Idea generation → project definition → problem solving → design and development → production → marketing
Kanter (1988)	Idea generation → coalition building → idea realization→
Roberts (1988)	Recognition of opportunity → idea formulation → problem solving → prototype solution → commercial development→
Tornatzky and Fleischer (1990)[a]	Research → development → deployment
Rogers (1995)[b]	Needs/problems → research (basic and applied) → development → commercialization→
Klein and Sorra (1996)[c]	Research → development → testing → manufacturing → packaging → dissemination
Angle and Van de Ven (2000)	Initiation → development→ marketing
Lichtenthaler and Lichtenthaler (2009)	Discovery → concept → development → test → market introduction
Von der Gracht and Stillings (2013)	Visualize different futures → recognize markets → find solutions and applications → derive options

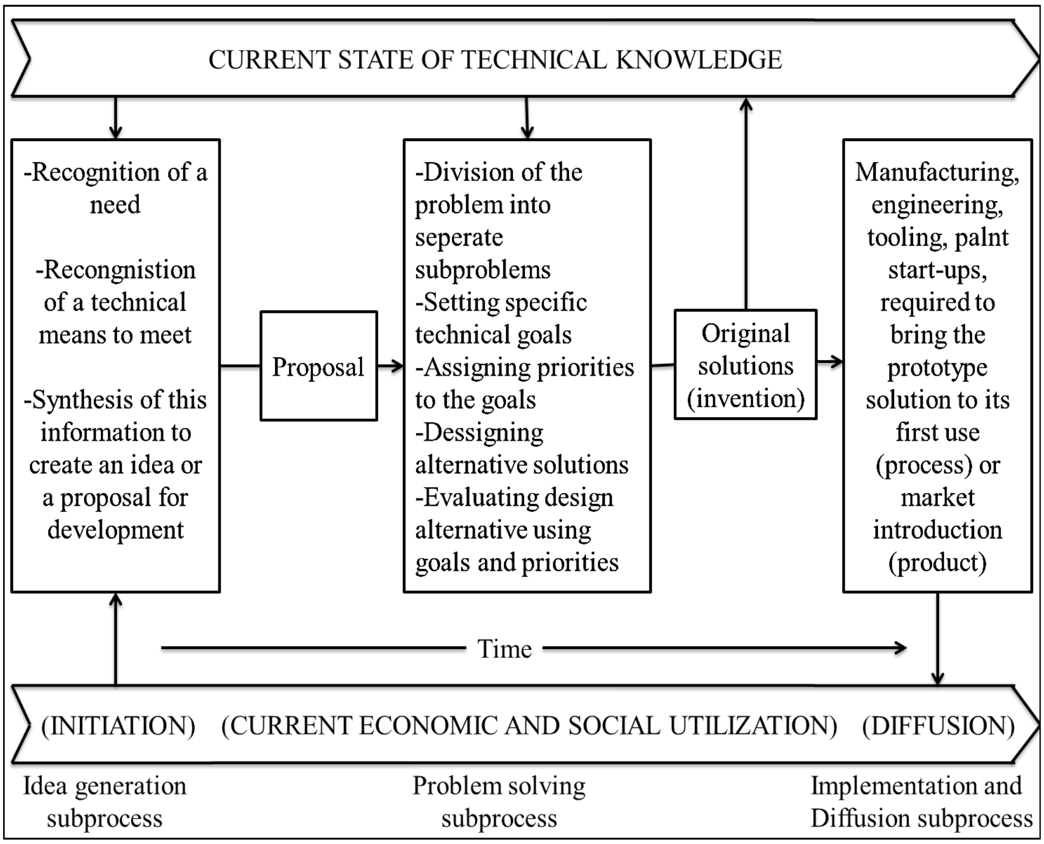
a- Tornatzky and Fleischer (p. 32) categorize the innovation process into “developing” and “using,” similar to generation and adoption in this paper.
b- Rogers (1995) presents two innovation processes: 1) innovation development process (p. 133), which mostly falls under the generation process, and 2) innovation process in organizations (p. 392), which falls under the adoption process.
c- Klein and Sorra categorize the innovation process into “source-based” and “user-based.”

Source: Author’s own elaboration based on Damanpour and Wischnevsky (2006)

As indicated above, most of the models enumerated in table 1.10 are linear. This means that once the need is defined, the following step deals with how companies should carry out the related activities and then proceed to perform the operational interpretation of such a perception and the diffusion of the final output of the entire process. In this logic, Utterback (1971) proposed a model highlighting the development of technological innovation within firms. This author highlights that the development process of new products is more than the mere conversion of ideas into products. Concretely, in addition to the previously mentioned conventional stages, his model underlines the importance of the current state of technology and the economic and social conditions in which a company is operating (see figure 1.6).

According to figure 1.6, the first stage (initiation) includes the recognition of the need to satisfy and the technical means to meet that need followed by the interpretation of these in applicable ideas, whereas, the second step is operationalizing this idea, simplifying it and subdividing into sub-tasks. Once the idea and its application are materially concretized, the manufacturing and commercialization of the products represent the aspects that end the process. All of which should be developed within a definite timeframe.

Figure 1.6: The development of technological innovation: Utterback (1971)



Source: Utterback (1971)

Similarly, Cooper and Kleinschmidt (1986) propose a model (a description) of how 252 new products were developed at 123 firms. They make a distinction among the activities as being technical or marketing, arguing that the processes are composed of a set of 13 activities, which formed a general “skeleton” of a new product creation process. The first step is initiation, in which the ideas are generated, matured, interpreted and made available to the staff, whereas the second and third step deal with market and technical assessments. Once companies recognize the value of their own technical assets and its ability to carry out technically the product, the third step stands for launching a pre-test, through which the markets is being assessed objectively. In the fourth step companies decide, based on the assessment of market and technical aspects as well as the results of the market test, whether to continue in the cancel the project. Then, if decided, companies go ahead in developing the project as a sixth step. In the seventh, eighth and ninth and tenth steps companies involve in a series of internal and external tests for the product that will be financially analysed, produced and launched to markets in the following steps. The table 1.11 provides more information.

Table 1.11: New product development phases

Activity	Description
Initial Screening	Once an idea springs up, a meeting is called of the people in charge of the different departments, who evaluate it according to their experience. This activity involves the initial decision to: 1) begin the project or not, and 2) reserve resources (human and financial) or not for the new product project.
Preliminary Market Assessment (M)	To do so, preliminary market research is carried out: a rapid and shallow assessment about the possible acceptance of the product in the market and its competitive situation. This is a non-scientific activity that is based mainly on internal resources.
Preliminary Technical Assessment (T)	This is the first technical assessment of the new product project that is carried out. It is a question of identifying the technical difficulties and advantages of the project by means of meetings, assessment of internal resources and secondary information.
Detailed Market Study (M)	This implies market research with a reasonably representative sample, a formal design and a reliable data collection system.
Pre-Development Business and Financial Analysis	This analysis allows for taking the decision to continue with or cancel the product before going on with its development. It includes tasks such as financial analysis, risk assessment, qualitative business assessment and evaluation of market attractiveness.
Product Development (T)	Here, we refer to the actual design and product development, obtaining a prototype or a sample product.
In-House Product Tests (T)	This contemplates the internal testing of the product under controlled or laboratory conditions, putting reliability and prototype adequacy as well as functionality to test and verifying specifications.
Customer Product Tests (M)	These tests are made under the most authentic conditions possible. Normally it implies the cession of a product sample or prototype, free-of-cost, to a possible group of purchasers to test it.
Trial Sell or Test Market (M)	This consists of an attempt to reproduce the buying and selling situation of the product with a limited number of purchasers, either in fictitious environments or offering the product in a limited geographical area.
Trial Production (T)	A limited production is decided on for the purpose of testing the production facilities. The two forms of approaching this activity are: a test of the very production system and a quality test of the product that the production system generates.
Pre-Commercialization Financial Analysis	This activity comprises a financial or business analysis after product development but before its launch into the market on a large scale.
Production Start-Up	This is the start-up of large-scale production. This activity requires good co-ordination, a committed management and suitable resources, both tangible and intangible.
Market Launch (M)	This includes a group of marketing activities that go with the market launching of the product in order to facilitate its commercialization.

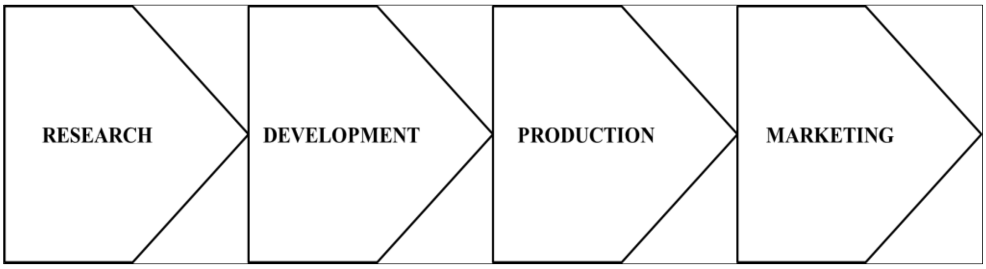
(M) Marketing activities, (T) Technical activities.

Source: Cooper and Kleinschmidt (1986) cited by Varela and Benito (2005)

Theoretically, product innovation has constituted a large debate, resulting in many conceptions. For developing new product innovations, companies follow different strategies. Therefore, different studies reveal that product development methods vary in their ability to achieve corporate objectives towards the enhancement of existing products, or carrying out new products. Moreover, the description of the stages taken for an idea to be turned into a tangible product and commercialised in a definite market has resulted in many approaches. In general, two main trends are argued: The linear approach that describes the traditional model and the non-linear approach that takes in account several players in new product development. Edquist and Hommen (1999) pointed out two main blocs of approaches, namely: the linear model of innovations, and the system-oriented methods.

- First, *the linear models*: This method does not suggest a specific a concrete mechanism to get new and innovative ideas, rather the main assumption of this theory is that learning creates knowledge and knowledge, in turn, creates innovations. Linear model innovation may "start with the identification of a market need first, followed by technology and product development, production, and marketing" (Parthasarthy & Hammond, 2002: 78). Moreover, in the linear model "there is no feedback from the several later stages of the innovation process (i.e., product development, production, and marketing) to the initial stage of research, nor is there feedback between any of the other stages" (Edquist & Hommen, 1999). Instead, companies use all available means to get innovative ideas randomly from internal and external sources. This method neglects the important sources such as feedbacks derived from distributors, and customers. The figure 1.7 shows details about the new product development linear model.

Figure 1.7: The linear process of innovation



Source: Parthasarthy and Hammond (2002)

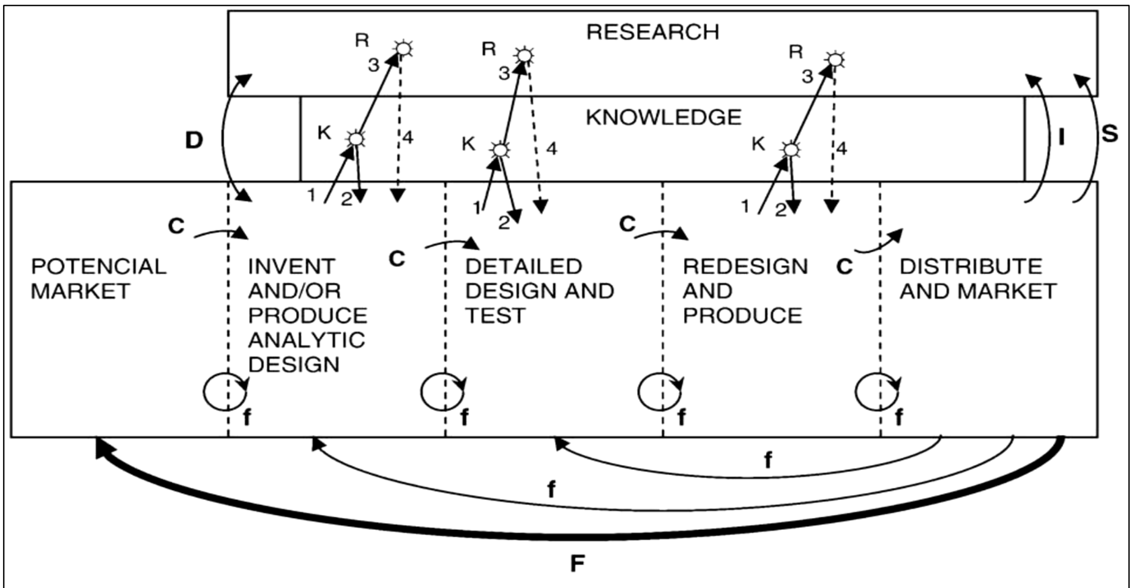
- Second, *the systems-oriented models* consider that innovators occur due to exchanges of knowledge and information among interdependent actors. Moreover, this view is more systemic innovation process and explicitly recognizes the potentially complex interdependencies and possibilities for multiple sorts of interactions (Edquist & Hommen, 1999). However, according to Edquist and Hommen (1999), and in contrast with the linear model, the systemic innovation approaches are characterised by "having innovation and learning processes placed at the centre of focus". In addition, they adopt a holistic and interdisciplinary perspective and employ historical perspectives. These systems also stress the differences between systems, rather than the optimality of systems. Likely, they emphasize interdependence and non-linearity. Similarly, they encompass product technologies and organizational innovations and emphasize the central role of institutions. And finally, these systems are still associated with conceptual diffuseness and constitute conceptual frameworks rather than formal theories".

Moreover, studying the innovation systems perspectives, Edquist and Hommen (1999) shed light on key issues, concerning the interdependencies and interaction between users, producers, and other actors within an innovation system, distinguishing between chain and distributed models.

- *Chain-linked model* (Kline & Rosenberg, 1986): It is a scientific and structural method to enhance existing products or to carry out new innovative ones. The main assumption of the chain-linked model is that innovation process begins with the identification of an unsatisfied market needs, and, in contrast with the linear model, knowledge is not obviously the trigger towards innovation development. Furthermore, chain-linked model assess the importance of feedback loops and the interactions among the different innovation stages. Thus, the organizational character of this method permits to more efficiently deal with the organization's goals, and better satisfy its customer needs. This method is the most appropriated for modern researches in science and technology and recently management (Edquist & Hommen, 1999), as the rapid and progressive evolution in innovation area requires a method scientifically and methodologically more framed and sustainable, aiming at creating new ideas, evaluating them and converting them into new products.

The chain-linked innovation is composed of basic stages: a concept of the conceived product, design and concretization of the concept, prototype, evaluation of the prototype, and pilot production. These processes are linked with each other, providing feedbacks and assessments of the different stages. Thus, the designation of this model is clearly inspired from its nature, as the entire process forms a chain-like of successive and interlinked steps. Furthermore, the main assumptions of this model is that different knowledge is required in the different stages, feedbacks should usually be integrated when available, and that processes should usually be improved (Edquist & Hommen, 1999) (see figure 1.8).

Figure 1.8: The chain-linked model



Chain-linked model showing flow paths of information and cooperation.
Symbols on arrows: **C** = central-chain-of-innovation; **f** = feedback loops; **F** = particularly important feedback.

K-R: Links through knowledge to research and return paths. If problems solved at node K, link 3 to R not activated. Return from research (link 4) is problematic - therefore dashed line.

D: Direct link to and from research from problems in invention and design.

I: Support of scientific research by instruments, machines, tools, and procedures of technology.

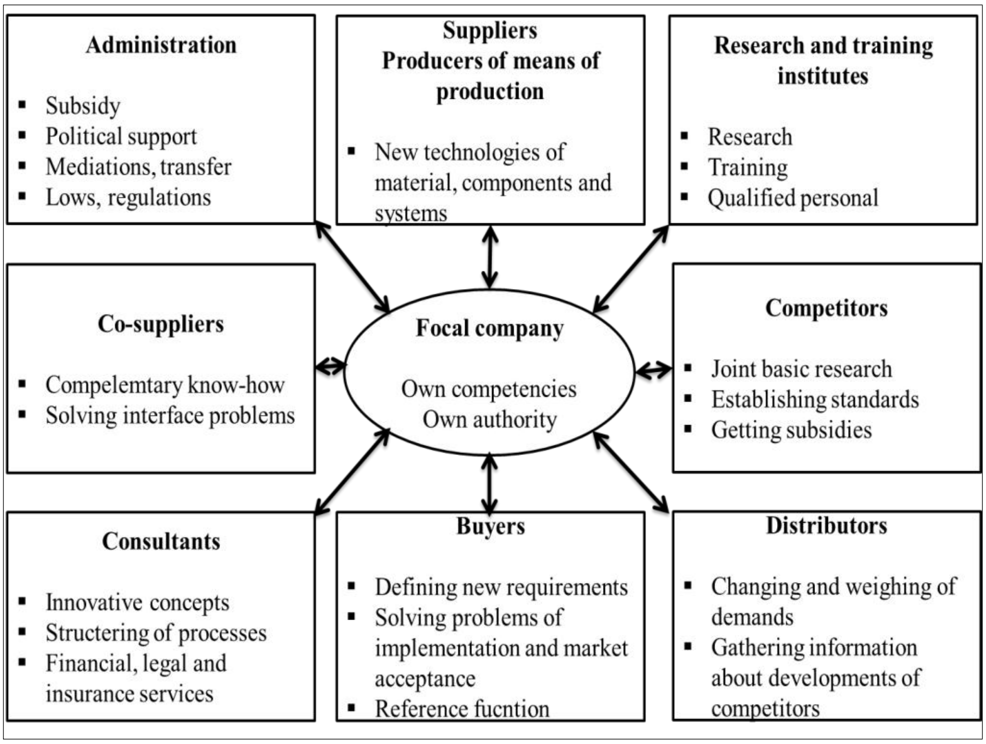
S: Support of research in sciences underlying product area to gain information directly and by monitoring outside work. The information obtained may apply anywhere along the chain.

Source: Kline and Rosenberg (1986).

- *Distributed process model* (Edquist & Hommen, 1999): The main assumption of this approach is that innovation sources are various and that there are mainly three potential origins of innovations, namely: the supplier, the user and the producer (Hippel, 1988). Therefore, the traditional thinking centralizing the product development in the manufacturer is not accurate according to this view. The “economic rents” forms a basic and decisive factor in the success of the distributed innovation processes (Hippel, 1988).

This approach is consistent with the logic of open innovation and in contrast with closed innovation, companies are ought to integrate the different stakeholders in their innovation portfolios. In other words, innovation may come from everywhere, therefore, supplier, customer, experts’ feedbacks and so forth are important to consider. Thus, in addition to user integration in innovation process, there is a common agreement that a successful and innovative process of new product development should include market viability studies and internal resources and capabilities assessment. Moreover, “prior research suggests that a firm can advance its product innovation by interacting with different collaborators, primarily including suppliers, customers, competitors, and research organizations" (Tsai, 2009). The figure 1.9 summarizes the underlying ideas of this approach.

Figure 1.9: Main factors intervening in new product development according to distributed process model



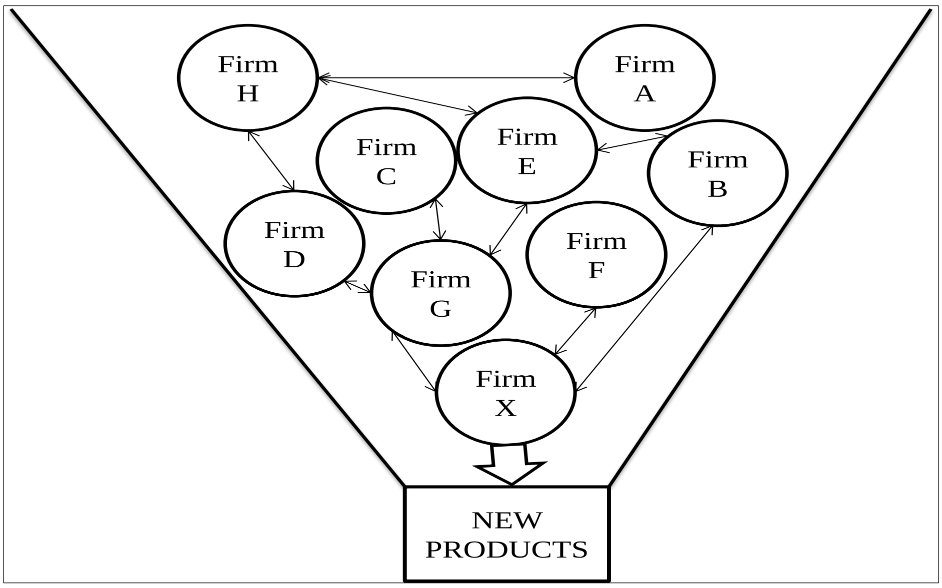
Source: Gemünden *et al.* (1996) cited by Ritter and Gemünden (2003)

Interactive learning theory (Lundvall, 1988)*:* This approach places greater emphasis on learning through user-producer interactions. Emphasizing the role of the user implies prioritizing the quality of demand than its quantity as a strategic principle within de development process (Edquist & Hommen, 1999). This theory is deemed to limit the bargaining power of the producer in the process of innovations and then gives more credit to the different users. In his book entitled "democratizing innovation"; Hippel (2005) argues the effectiveness of the *lead-user* based innovation, as the user is the core of the whole innovation process. Likewise, current producers increasingly focus on operational and tactic measures rather than strategic thinking, prioritizing customers, and thus many companies develop new products based on the specific needs of the customers. An example, the new product development process that bases on customers feedbacks may consist of the following steps:

1) Determining the needs of the customer.
2) Translating the needs of the targeted customer in specifications and attributes.
3) Generating ideas and concepts for the new product.
4) Choosing a new product concept and evaluation.
5) Developing a plan of production and a cost estimation chart.
6) First form (pilot) implementation.
7) Production and delivery.

Finally, *the network analysis theory* (Freeman, 1991; Osborn & Hagedoorn, 1997) emphasizes the role of the collaborations among organizations. These relationships can be formal contractual such as strategic alliances and joint ventures, or informal such as inter-organizational flow through people: director interlocks, employee mobility, social networks that cross-organizational boundaries. Innovation, according to this theory is a process of search and discovery of newness from unlimited sources. However, the networking implication is claimed. Yet "some analysts argued that a focal organization providing vertical linkage between users and producers is often necessary to overcome a *low-level equilibrium trap* facing networks formed around emergent technologies. Especially where further development of a given technology could be shown to have beneficial consequences for economic welfare" (Edquist & Hommen, 1999). Figure 1.10 portrays network-based approach.

Figure 1.10: New product network-based development



Source: Author's own elaboration

Based on the nature of product innovation process, McCarthy *et al.* (2006) frame the previous perspectives in three main frameworks, namely: linear, recursive, and chaotic system perspectives. As indicated previously, linear frameworks consider the development of new products as a series of events and activities, which are dependent, sequential and discrete in nature. While recursive frameworks emphasize the feedback loops, the chaotic frameworks prioritize the linkages and flows, as in table 1.12.

Table 1.12: Linear, recursive, and chaotic frameworks of new product development

Model	Descriptive Interpretation	Benefits	Limitations
Linear	A process with relatively fixed, discrete and sequential stages. The connections, flows, and outcomes of the process are comparatively deterministic.	Provides a simple and effective representation of the structural logic and flows. Suited to incremental innovation activity with relatively reliable market push or strong market pull forces.	Does not consider the dynamic behaviours and relationships associated with agency, freedom, and resulting innovations.
Recursive	A process with concurrent and multiple feedback loops between stages that generate iterative behaviour and outcomes that are more difficult to predict.	Represents the dynamic and fluid nature of the process. Suited to more radical innovations with push–pull market force combinations.	Assumes similar behaviour across the whole process and does not represent the structural and behavioural instabilities of the process.
Chaotic	A process where the linkages and flows are greater during the initial stages, resulting in different degrees of feedback across the process. The initial stages exhibit chaotic dynamics and outcomes that appear to be random and unpredictable, whereas the latter stages are relatively stable and certain.	Recognizes different system behaviours across the process and acknowledges the effects of highly cumulative causation. Suited to the search and exploration aspects of very radical innovations or really new products.	Focuses on differences between the stages and presupposes that the overall process configuration is fixed (i.e., does not consider process adaptability).

Source: McCarthy *et al.* (2006)

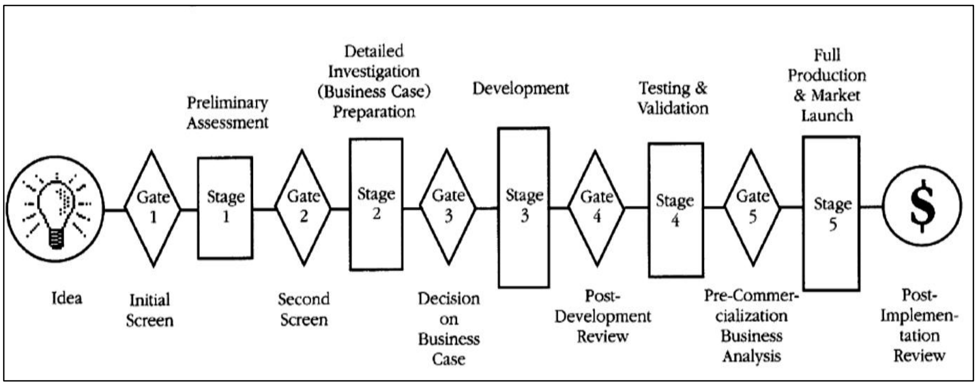
The different main theoretical approaches provided above indicates that a conventional product development follows a process including decisive steps, beginning from the generation of innovative ideas, evaluation and conceptualization of these ideas, marketability, testing, and finally the implementation of technical aspects and commercialization. The locus of the main difference among these approaches is mainly the pre-implementation step (i.e. the idea generation) and inter (dependency) of the different stages. Authors describe these main steps variously.

Although, literature offers plenty of conceptual models, an overwhelming classification distinguishes among three new product development processes, conventionally known as: first-generation, second-generation and third-generation (Varela & Benito, 2005).

First generation models are linear (previously explained), whereas the *second-generation schemes* fit the meaning of recursive models, in which there are loops and feedbacks (Cooper, 1990). The *third-generation processes* emphasize the role of time to market and flexibility (Varela & Benito, 2005).

An example of second-generation processes is the model proposed by Cooper (1990) who underline the importance of "management of NPD as a process". It is a stage-gate system, which is aimed at highlighting that innovation should be managed and controlled within certain logic. It consists of five "gates". The initial screen gate corresponds to the preliminary assessment of the process, whereas the second gate represents the beginning of detailed preparations of the development process. The decision on business case is the third gate that opens to the first application of the former stages into practice, the fourth gate is the post-development review and analysis, while the fifth and final gates goes about the full production and market launch. These five gates and stages are followed by a post-launch evaluation and review. According to this view, the different gates can be differently managed and then enhanced for a better process performance, which positively affects the success of the final outputs (see figure 1.11).

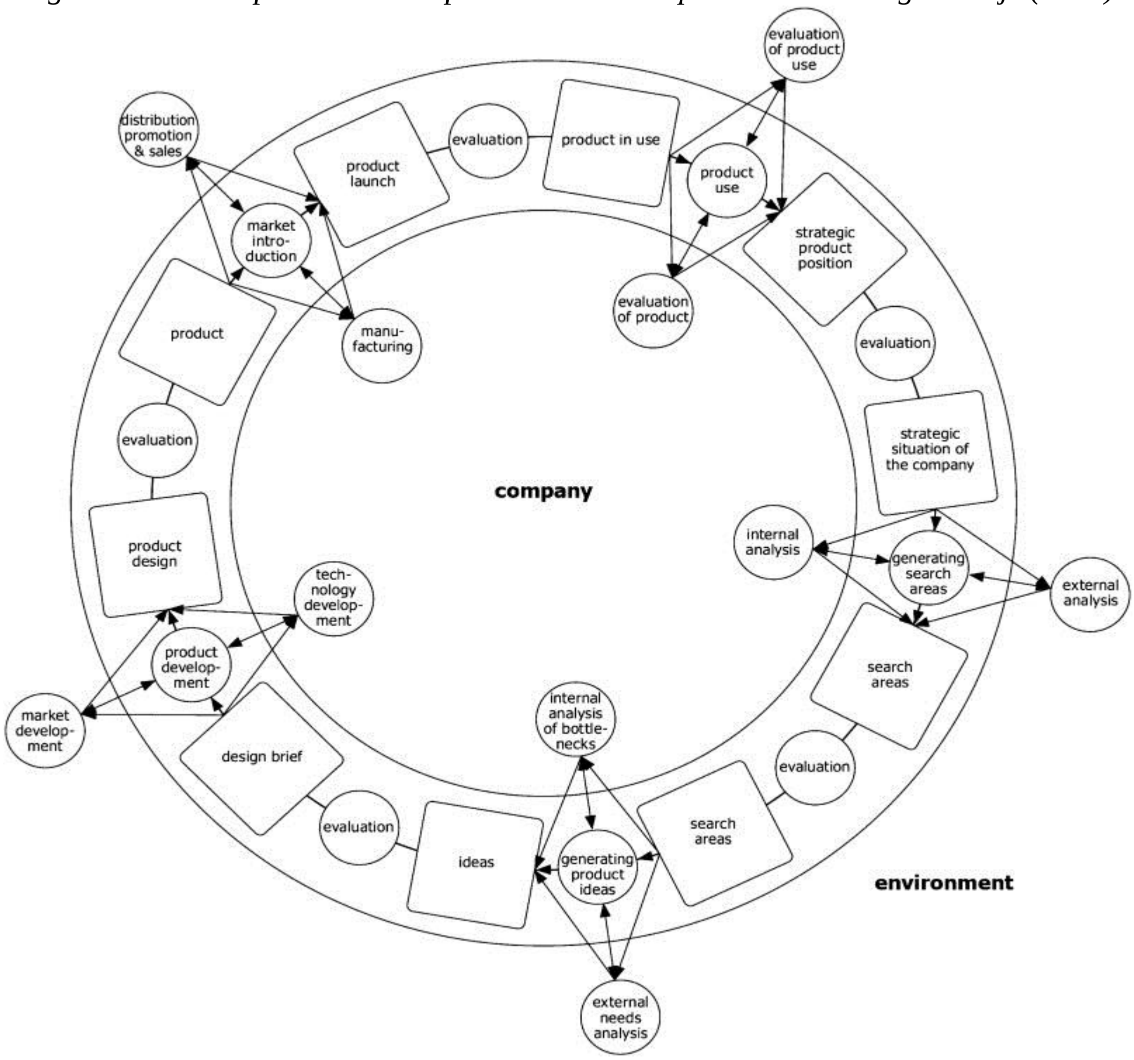
Figure 1.11: The five stage-gate system



Source: Cooper (1990)

Likewise, pretending to overcome the linearity of the innovation processes and its implications, the model proposed by Buijs (2003) is likely more exhaustive than its preceded model. It is built based on previously introduced models, and takes into account strategic and tactic measures that the process of launching new products includes. According to such an approach, "product innovation processes are intended to help companies design and introduce new products, which customers are willing to buy and use. Therefore, in product use the innovation process ends, but at the same time this forms the starting point of a new product innovation process" (Buijs, 2003). Such an approach presumes that innovation is circular process that accounts with neither beginning nor end. It also sheds light on the important feedbacks of both the customer and the competitors, placing more emphasis on the dynamism of innovation development within the journey of competitive advantage creation. The model includes 17 key factors that an innovating firm should manage in order to be successful and then keep competitive, as shown in figure 1.12.

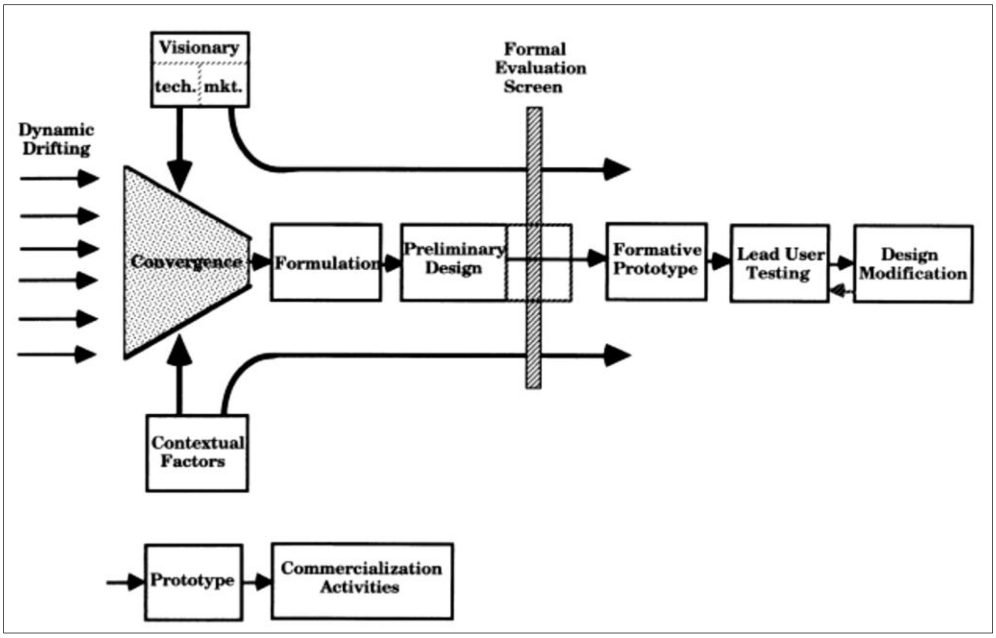
Figure 1.12: New product development "circular" process according to Buijs (2003)



Source: Buijs (2003)

Finally, some authors consider that the process of radical product innovation differs from that of incremental or architectural one, as launching a product on existing bases differs from inventing new different product. Broadly, radical innovation development deemphasizes the traditional protocols of incremental innovation, as it may require new organization form, new materials and in some cases new experts. In this logic, Veryzer Jr (1998) offers the model shown in figure 1.13. His model highlights the role of the contextual factors and the vision of the company about the market as well as the current technology. Once these factors are converged, the main steps comprising this process are formulation of the need, preliminary design of the product to be evaluated in the next stage, prototyping, lead-user testing, design acceptance (modification if needed), releasing a final prototype and launching the product to be marketed.

Figure 1.13: Radical product development process

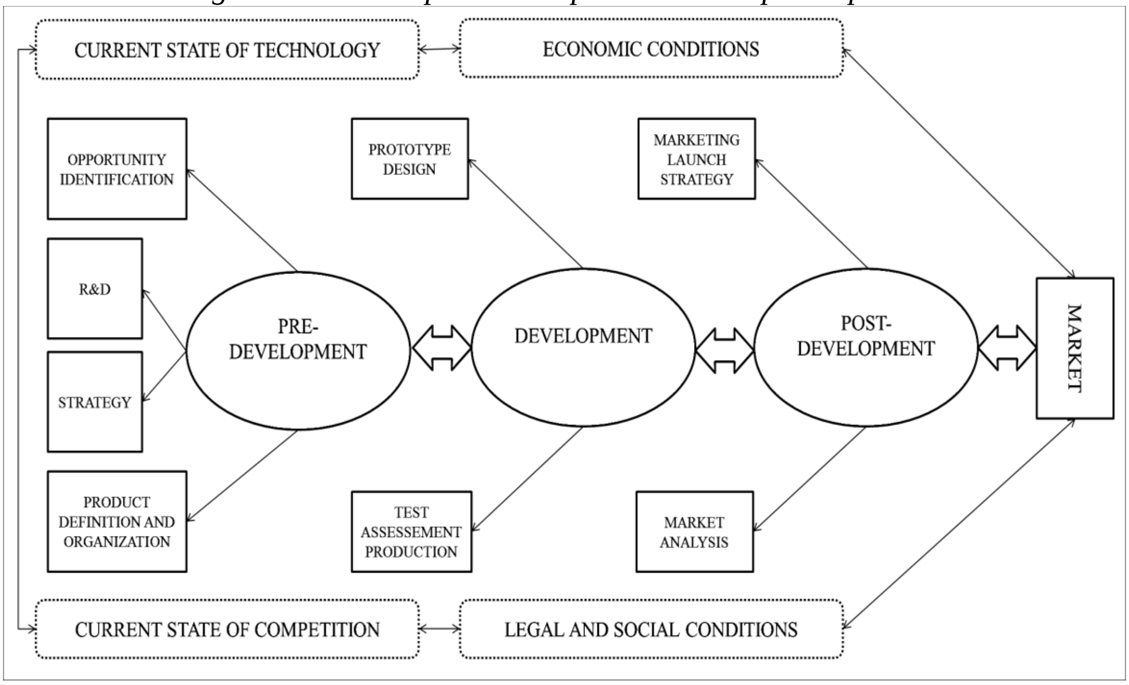


Source: Veryzer Jr (1998)

In summary, authors differ in approaching the product innovation process. However, all of them stress main stages that companies implement when developing new products. Broadly, the emphasis is about four main steps. The first step is screening, which implies the searching for new ideas and customer needs. The second stage deals with concretizing the ideas resultant of screening step. This includes designing the new product and assessing its different characteristics. In the fourth step the company begin producing the new product to be marketed within the fifth main stage of this process.

In this context, a simplistic approach can stress three main phases constituting a product development and commercialization, despite its relative novelty (incremental/ radical). These phases consist of main blocks of activities that can be seen as the preproduction “fuzzy front end”, the development and the post-production or “commercialization” phases. Such an approach is also argued by Product Development Management Association (PDMA) and adopted by a growing body of literature (Durmuşoğlu & Barczak, 2011). The figure 1.14 provides more information about a generic conception on how companies develop new product.

Figure 1.14: A simplistic new product development process



Source: Author's own elaboration

As shown in the figure 1.14, four main stages can be distinguished when developing new products. The first stage is characterized by the preparations to the project, including the R&D activities, the identification of the opportunity as well as the definition of the target product. The second stage is the development and testing of a prototype, leading to a decision about the feasibility or not of the product in question. The third stage is the marketing and market analysis to finally launching the product as an ultimate step towards market entry.

Broadly, product development has known three main phases. The first emphasizes the dimensions of the product itself. This stage is product-oriented, within a technology-driven view. The second stage is mainly marked by the presence of the market dimension in the strategic thinking of developing a new product, whereas the third and actual stage mingles both of the previous dimensions. Furthermore, the third phase considers that product development is a complex phenomenon that needs joining the different aspects of both theories, such as marketing issues and technical characteristics of the product itself (Poolton & Barclay, 1998). Furthermore, a successful new product development should reflect a process linking technology and the stakeholders' feedbacks, especially the customers (Dougherty, 1992), and the suppliers (LaBahn & Krapfel, 2000). The integration of these factors among others in the production process may enable companies to carry out successful products, gaining then competitive advantages.

1.3. THE COMPETITIVE ADVANTAGE OF PRODUCT INNOVATION

The intrinsic meaning of innovation is transforming creative ideas into new products or services, or into new processes and technologies. These creative ideas certainly aim at effectively producing marketable products. A product can be considered as the life blood that broadly keeps the performance and regeneration of organizations (Alegre & Chiva, 2008). Therefore, the development of innovations is considered to be a strategic activity that allows the attainment of competitive advantage for companies (Calantone *et al.*, 1997; Zheng-Zhou, 2006). Moreover, most of the empirical studies have demonstrated the positive effects of product innovation on firm performance (e.g. Calantone *et al.*, 1997; Damanpour, 1991; Damanpour & Evan, 1984; Guan *et al.*, 2009; Harmancioglu *et al.*, 2010). In addition, product innovation reflects the production, marketing and innovation capacities; and is widely linked to other important organizational capabilities (Catila & Ahuja, 2002; Chang & Cho, 2008; Chen *et al.*, 2005). Therefore, it determines the organization's ability to innovate and achieve sustainable competitive advantage of innovation of its products. However, to serve this, a new product should be successful.

1.3.1. Product innovation success

Although innovation is crucial for companies, as it is the most important competitive advantage source (Garcia & Calantone, 2002; Griffith *et al.*, 2006; Guan *et al.*, 2009; Hall *et al.*, 2008), only successful innovations fit this target. This is due to the abundant costs and risks associated with innovation activities. In this context, innovation literature offers many contributions dealing with this issue. For example Freel (1999: 708) considers that "successful product innovation is likely to involve research and development activities (though, not necessarily formally), and these activities, in turn, will involve a larger or smaller amount of sunk costs”. Likewise, developing product innovation implies many risks that companies face during this process. Concretely, Köhler and Som (2013: 2) identified two main types of risks that are associated with new product development: tangible such as “the assessment of technical and electrical safety, fireproofing, and biocompatibility, etc.” and the intangible risks that are related to emerging technologies and unexpectedness derived mainly from the uncertainty and dynamism of markets.

The term *success* stands for many things according to the different perspectives. Therefore, this section aims at providing a thorough delimitation of new product success, based on the related literature. Such a definition will be assumed along the present doctoral dissertation.

Literature offers different approaches regarding the success of a new product. For example, Cooper and Kleinschmidt (1995) distinguish between two types of success in developing new products: at the firm level and at the project level. The latter type of success can be measured through time to market, product profitability and achieved market share, whereas the success at the firm level can be judged through the percentage of current sales from new products and the rate of success of new products. Likewise, Hart (1993) pointed out three project-level success dimensions, namely: “beating the competition technologically,” “beating the competition to market,” and “providing a technological breakthrough.” His underlying difference is that he emphasizes the competition dimension, since new products targets overcoming operating companies throughout launching significantly better products. Despite the level on which the success of the newly developed products is measured, the former dimensions include two main aspects, financial and non-financial.

Broadly, two main dimensions may lead a product to be successful, namely the financial and the non-financial rewards. Financial rewards can be traduced by the rate of sales, benefits to sales, ROI and so forth, while the non-financial rewards includes things such as: the acceptance by target customers and markets, including customer satisfaction and time-to-market (Moorman & Miner, 1997). A successful product is the one that, in addition to the financial benefits it offers, provides also strategic rewards to companies. To fit this aim, it should be interpreted by customers as physically innovative and especially satisfy their needs. In other words, the attributes of products determines its success. In summary, the table 1.13 displays many dimensions forming the NPS according to referential literature.

Table 1.13: Dimension of new product success as reported by literature

Dimensions	Author
Financial profits	Hauschidt (1991), Griffin and Page (1993), Moorman and Miner (1997), Huang *et al.* (2004), Millson and Wilemon (2006), Akgün *et al.* (2006), Chang and Cho (2008), Samra *et al.* (2008), Stanley Kam Sing and Canon (2012)
Technical performance	Hauschidt (1991), Hart (1993), Griffin and Page (1993)
Sales volume and market share	Cooper and Kleinschmidt (1987), Hart (1993), Huang *et al.* (2004), Millson and Wilemon (2006), Akgün *et al.* (2006), Chang and Cho (2008), Samra *et al.* (2008), González and Palacios (2002)
Customer acceptance	Griffin and Page (1993), González and Palacios (2002), Akgün *et al.* (2006)
Launching frequency and time to market	Moorman and Miner (1997), González and Palacios (2002), Chang and Cho (2008)

Source: Author's own elaboration

Based on the information offered in the table above, the word success of new product refers to a multidimensional terms, transcending the mere financial dimensions. Rather, the financial benefits can be considered as a *by-product* of the non-financial rewards. According to this logic, herein NPS refers to the calculated rate of success in terms of customer acceptance and sales, the degree of differentiation of the new product in comparison with the competitors (inimitability rate), the ability of the competitors to copy the same product and the development time of new products. This definition is coherent with the different scales used in the literature as the table 1.13 indicates.

1.3.2. New product success and firm performance

As previously discussed, the development of successful new products is crucial for companies due to the derived outcomes. Furthermore, literature sustains that although innovation is risky; in order to obtain a competitive advantage it has to be successful. Therefore, successful new product is considered a source of competitiveness (Song & Thieme, 2006). NPS is understood in terms of financial success, market share growth, customer satisfaction…etc. (Montoya-Weiss & Calantone, 1994). However, Baker and Sinkula (2007) distinguish between NPS and financial performance. This means that a NPS is a concept that includes successfully introducing a distinctive difficult-to-imitate product that "fit with market needs" (Brown & Eisenhardt, 1995), considering criteria such as development time, reduction of related-costs, customer satisfaction and increase in market share (Hooley *et al.*, 2005). In addition, performance is also financial, and product innovation is locus of the that performance (Calantone *et al.*, 2002).

Furthermore, literature sustains that a new, unique and superior new product allows obtaining competitive advantages which is the key for firm performance generation (Droge *et al.*, 2008; Griffin & Page, 1996; Hult & Ketchen, 2001), which is the first performance source (e.g. Adner & Kapoor, 2010; Banbury & Mitchell, 1995; Bunduchi *et al.*, 2011; Calantone *et al.*, 1997; Damanpour & Evan, 1984; Damanpour *et al.*, 1989; Schumpeter, 1934; Subramanian & Nilakanta, 1996). Furthermore, the successful introduction of new products into the market is a critical factor for companies' survival and growth (Wind & Mahajan, 1997). Hence, company growth is the underlying meaning of perpetual performance, due to consumer satisfaction (Hooley *et al.*, 2005), market shares growing and financial rewards (Calantone *et al.*, 1997). Furthermore, "when advantages are built into new products, the products should be better received in the marketplace" which leads to customer satisfaction and loyalty as he perceived more value incorporated in these products (Nakata *et al.*, 2006). In addition, new product development *per se* is considered as a knowledge-intensive activity (Davenport & Prusak, 2000). Knowledge, in turn, is the main performance source (Argote *et al.*, 2003; Coombs & Hull, 1998; Nonaka, 1994; Nonaka & Takeuchi, 1995).

Organizational performance is a broad term that can describe effectiveness, efficiency or financial viability. In the present paper, we refer to the perceived organizational performance, which is related to customer satisfaction, product quality and productivity and profitability of a firm in a given period (e.g. Delaney & Huselid, 1996). Although organizational performance is the main operational target of a company, there is a consensus that companies adopting innovations usually gain higher performance (e.g. Adner & Kapoor, 2010; Aiken & Hage, 1971; Andriopoulos & Lewis, 2010; Antoncic & Prodan, 2008; Baker & Sinkula, 2002; Banbury & Mitchell, 1995; Blindenbach-Driessen & van den Ende, 2006; Boeker & Huo, 1998; Brockhoff & Guan, 1996; Bunduchi *et al.*, 2011; Calantone *et al.*, 1997; Camisón & Villar-López, 2010; Chakrabarti, 1990; Chudnovsky *et al.*, 2006; Damanpour & Evan, 1984; Damanpour *et al.*, 1989; Dewar & Dutton, 1986; Guan *et al.*, 2009; Harmancioglu *et al.*, 2010; Jiménez-Jiménez & Sanz-Valle, 2011; Kimberly & Evanisko, 1981). However, these innovations should be successful to serve the main aim of performance generation (e.g.

Akgün *et al.*, 2006; Chang & Cho, 2008; Chen *et al.*, 2005; Droge *et al.*, 2008; Huang *et al.*, 2004).

The success of new products can have different manifestations. For example, Cooper and Kleinschmidt (1995) highlighted that it can be perceived through the speed to market, the profitability and revenues in financial terms, the growth in market share, percentage of current sales and so forth. Likewise Griffin and Page (1996) provided a different measurement of new product success according to three dimensions: financial success which stands for the achievement of foreseen financial gains, customer acceptance of the new outputs and the degree of suitability of the new product itself. A fourth-dimensional measurement was offered by Huang *et al.* (2004) subdividing market acceptance to subjective and objective success. Subjective success stands for the customer perceptual satisfaction, while customer objective market success is expressed in monetary terms.

Indeed new product success contributes to the financial performance through more sales volume and then incomes, which increases the gains ahead of the associated costs. For example, when a company produces a new product it may be commercialized based on the quality it carries (differentiation) or the quantity derived from the new markets it may open. Both offer new markets or increasing new market shares and then carry new incomes for companies. Likewise, non-financial rewards of new products, such as customer satisfaction in usually interpreted by fidelity and more earned goods. This, in turn, leads to alter the competitiveness and financial performance.

In summary, organizations that develop successful new product innovations will be able to improve their performance fostering several key issues for companies, such as customer satisfaction, financial rewards, market shares, competitive advantage and sales volume, thus:

> *H_1: New product success is positively related to firm performance.*

1.3.3. Product innovations and new product success

Yet argued that a product development is a process in which the company uses its expertise to respond to the needs of its customers and market demands (Wind &

Mahajan, 1997). As discussed above, it depends on a firm's competences and knowledge on the one hand, and on the firm's strategic vision and the market on the other hand. Furthermore, some researchers, such as Akgün *et al.* (2006) and Kessler *et al.* (2000) consider new product success to be characterized by a high level of senior management support and organizational issues.

Innovation literature highlights the different roles of incremental and radical innovations in a firm's growth if successful. Furthermore, many studies have argued the extent to which innovations provide competitive advantage for companies (Calantone *et al.*, 1997; Danneels, 2002; Dewar & Dutton, 1986). However, the newness and intrinsic characterizes of product innovations have various and different implications and rewards.

As mentioned earlier, incremental innovations produce small changes in the products and services of the companies (Baum *et al.*, 2000; Nelson & Winter, 1982). They are considered to be a result of a continuous learning process, leading to continuous improvements of familiar products (Banbury & Mitchell, 1995). This, allows making small changes in the existing products based on customer needs or small technological improvements (McDermott & O'Connor, 2002). Thus, an incremental product innovation manifests mainly in reshaping an existing product, incorporating new dimension in it or re-orientating it in order to fit new functions.

Incremental product innovations are easily accepted by clients, since the switch from a *cannibalized* product to a new one that is produced based on the former is not severe (Banbury & Mitchell, 1995). Likewise, these type of products carry less development cost (Brown & Eisenhardt, 1995; Dewar & Dutton, 1986) and involve less risks (Brown & Eisenhardt, 1995). Furthermore, incremental product innovation reaches the markets faster since the time frame of their production and deliverance is relatively reduced (McDermott & O'Connor, 2002).

In a similar vein, Kaplan (1999) argued that incremental product innovation is critical in market share growth, which is deemed to be an indicator of success for a new product. Likewise, Banbury and Mitchell (1995) argued empirically that the introduction of incremental product innovations preserves a firm's market share. In addition, as incremental product innovation means mainly reshaping or enhancing the functionalities of the familiar products, it likely maintains customer fidelity Varadarajan (2009). Furthermore, as mentioned earlier, the rewards of developing incremental product innovation may be multiplied as new lines of product are being introduced in market in which companies already exist. Similarly, the financial benefits gained are likely higher, since the lower costs of developing incremental innovations provides significant margin (Dewar & Dutton, 1986).

In contrast, radical product innovations involve major changes in the products' developed systems incorporating great novelty (Garcia & Calantone, 2002), following the introduction of a totally new knowledge (Dewar & Dutton, 1986). This innovations can be new to the company or to the market, which introduces a more innovative character (Ettlie *et al.*, 1984). This type of innovation, as previously indicated, is risky and involves major research efforts, but also carries higher strategic rewards in comparison with incremental enhancements. Furthermore, radical product innovation provides important rewards to companies if implemented successfully (Danneels, 2002; Dewar & Dutton, 1986). It enables companies to be in monopolistic or favorable positions (Ettlie *et al.*, 1984), creating new markets and dealing with new alternatives (Dewar & Dutton, 1986). In contrast with incremental product innovation, this type of innovation may involve greater risks for established firms (Henderson & Clark, 1990).

Radical innovations require substantial investment (Brown & Eisenhardt, 1995), longer development time, and slowly destroy the companies' current knowledge. As a result, innovation literature provide dichotomous information about radicalness of new products (e.g. Abernathy & Clark, 1985; Chandy & Tellis, 1998; Ettlie *et al.*, 1984; Henderson & Clark, 1990). On the one hand, it is strategically crucial, since it updates knowledge base, rejuvenating firms and situating them ahead of their competitors (McDermott & O'Connor, 2002). On the other hand, it is risky and destroys firms current capabilities (Veryzer Jr, 1998). Furthermore, it "implies a higher probability for delays, unpredictability of results, context dependency, and complexity" (Keupp & Gassmann, 2013: 1457).

In this context, O'Reilly and Tushman (2004), argue that radical (discontinuous) innovations offer considerable advantages such as customer satisfaction which is an indicator of the success of the of new products. Similar arguments were offered by Varadarajan (2009), who argued that radical innovation gets success through substantially providing “higher customer benefits relative to current products in the industry” (Varadarajan, 2009: 21). Likewise, radical product innovation is a source of positioning as “it can catapult firms to positions of great success” (Chandy & Tellis, 1998: 479). Favorable position, in turn, favors the marketability of the new products of the company, which contributes to their success.

Many authors have also analyzed empirically radical product innovation success. For example Verhees *et al.* (2010) argued empirically that the adoption of radical product innovation positively influences a small firm’s performance expectations. Similarly, in on an international level, Tellis *et al.* (2009) argued that radical innovation is a major source of financial performance. Likewise, the success of radical product innovation which is due to the benefits it offers is also argued empirically by authors such as Lawless and Anderson (1996), Cho and Pucik (2005), Sorescu *et al.* (2003) and Zahra (1996) among others.

In conclusion, “radical innovation represents a greater challenge for organizations than incremental innovation” (Büschgens *et al.*, 2013: 138). The latter is considered a main source of instant benefits, whereas the former provides strategic rewards rather than short-run payoffs. In addition, according to literature, incremental product innovation tends to have higher success rate than radical product innovation. Literature sustains also that although both types contribute to successful development of new products, incremental innovation is argued to be more successful. Hence:

H_2: Product innovation is positively related to new product success.

H_{2a}: Incremental product innovation is positively related to new product success.

H_{2b}: Radical product innovation is positively related to new product success.

H_{2c}: Incremental product innovation has a major effect on new product success than radical product innovation.

1.4. CONDITIONAL FACTORS IN NEW PRODUCT SUCCESS

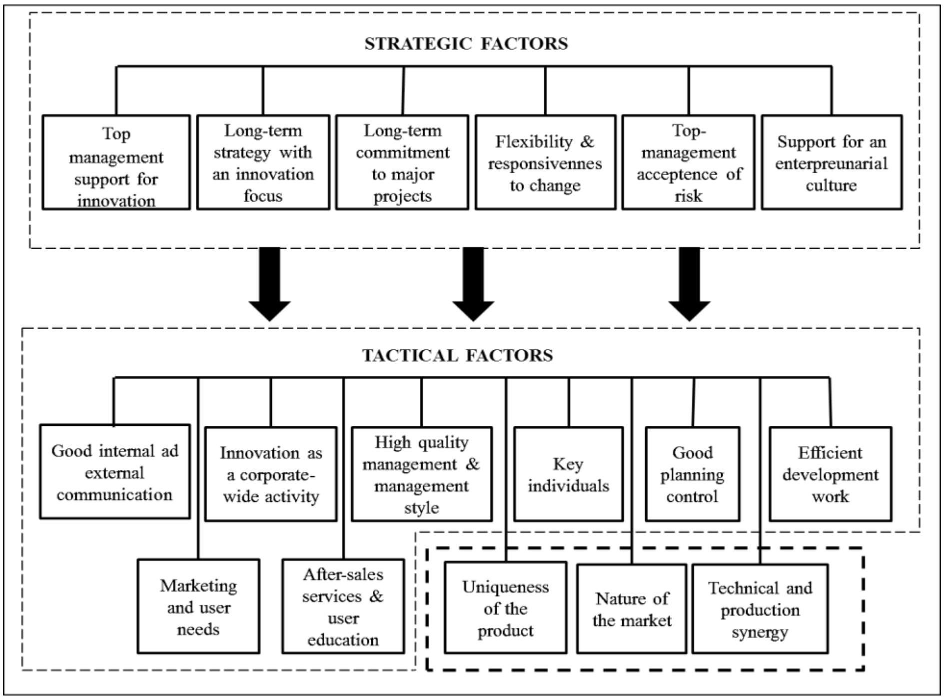
Developing new products has constituted a challenge for companies, as it is conditioned by a series of key variables. Although some variables such as good team chemistry, sufficient resources and so forth clearly favour innovations in general, literature enumerates some factors that may condition the success of new products innovations. The following parts provide a deep analysis of the most considered criterion as reported by the literature dealing with product innovations.

1.4.1. Factors affecting new product success

The importance of studying the good practices that affect NPS is rooted in the importance of product innovation (previously discussed) as well as in the fact that the rate of failure in new products is argued to be higher (Barczak *et al.*, 2009). In fact, innovation literature provides numerous set of factors that may affect product innovation development. Some of these factors are related to the human aspects, others are technical and financial, whereas a third group of factors is of organizational nature (e.g. Lester, 1998; Lynn *et al.*, 1999; Poolton & Barclay, 1998). In general, issues such as top management support for innovation, R&D, marketing and manufacturing competence and coordination, suppliers and customers' involvement in the design process, product quality, the suitable nature of market and development time are largely argued in innovation literature to be supportive for the success of new products (González & Palacios, 2002). Likewise, strategic orientation such as the settlement of a product strategy as well as the learning and market orientation among other factors are argued to have positive impact on NPS (Baker & Sinkula, 2002; Li & Atuahene-Gima, 2001).

In this context, based on a variety of empirical and theoretical contributions, Poolton and Barclay (1998) point out two main categories of factors that may affect new product success. The first category is *strategic*, and includes six main key values, namely; top management support, strategic focus on innovation, long-term commitment to major projects, flexibility and responsiveness to change, top management acceptance of risk and the entrepreneurial culture. The second category is characterized by its *tactic orientation*, and includes factors such as internal and external communications, the consideration of innovation as a corporate activity, management salient styles, the existence of key individuals within the staff developing innovation, effective planning and control and teamwork. Another bloc of tactic factors that affect product innovation development includes marketing effectiveness, after-sales servicing and the user education, the uniqueness of the product itself, nature of the market and production synergy, as highlighted in figure 1.15.

Figure 1.15: Factors affecting new product success: Poolton and Barclay (1998)



Source: Poolton and Barclay (1998)

This view subdividing factors affecting new product successful launching is adopted by Di Benedetto (1999), who argued the existence of positive interactions among successful new products launches and "the perceived superior skills in marketing research, sales force, distribution, promotion, R&D, and engineering". He also consider that "cross-functional teams making key marketing and manufacturing decisions and getting logistics involved early in planning" to be strategic activities that are strongly related to successful launches. By the way, he argued that tactical activities such as "high quality of selling effort, advertising, and technical support, good launch management and good management of support programs, and excellent launch timing relative to customers and competitors" have significant effects on successful launches of new products. Furthermore, "information-gathering activities of all kinds (market testing, customer feedback, advertising testing, etc.)" are very important to successful launches according to him. Finally, they also shed light on the crucial role of the activities involving logistics personnel in strategy development and the timing of the launch in improving launching success.

Likewise, Lester (1998) points out 16 critical factors within five areas that may affect new product success, namely: 1) Senior management commitment, 2) Organizational structure and processes, 3) Attractive new product concepts, 4) Venture teams with appropriate staffing and resources, able to communicate effectively with management and markets, 5) Project management able to focus on reducing uncertainties. Accordingly, he argued that emphasizing these key factors during the early stages of new product development is susceptible to increase the process performance, avoiding potential delays and associated risks.

Finally, at the project level, Montoya-Weiss and Calantone (1994) argued four key drivers that may leads to a successful launch of new products. as shown in table 1.14.

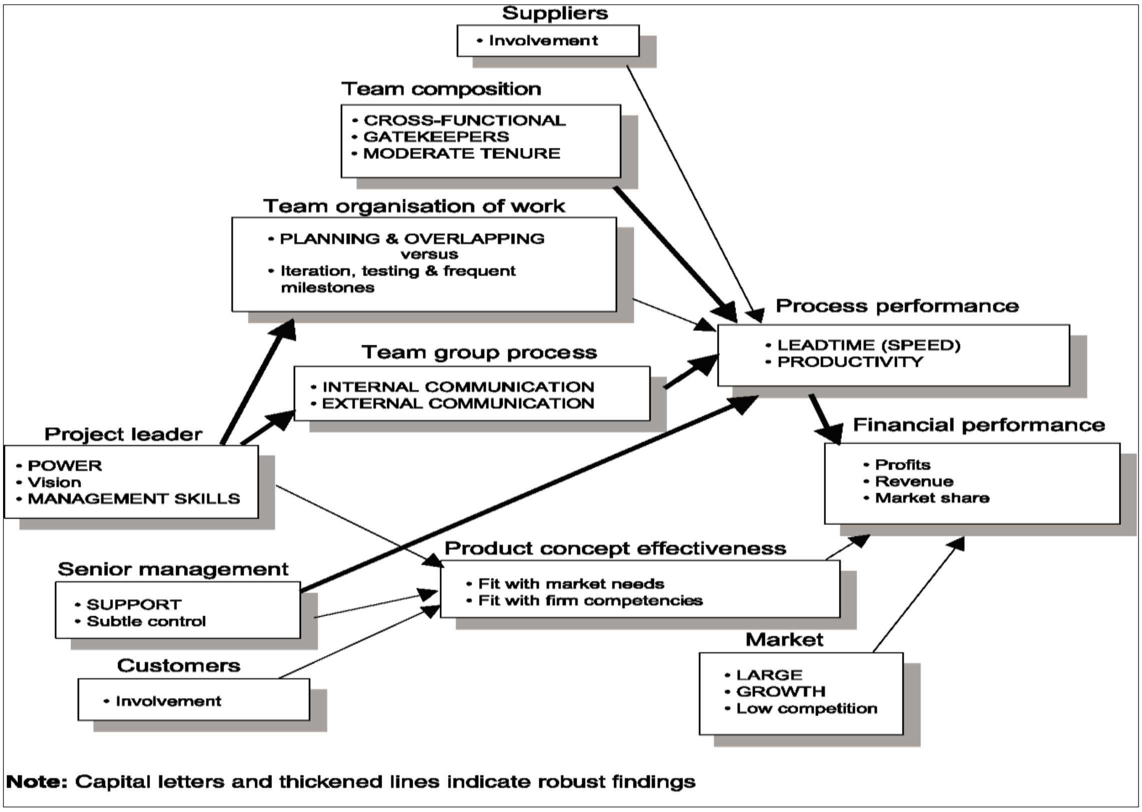
Table 1.14: Factors that drive new product success at the project level

Strategic factors	➢ Product advantage ➢ Marketing synergy ➢ Technological/Manufacturing synergy ➢ Availability of resources ➢ Strategy of the new product
Development process factors	➢ Proficiency of technological activities ➢ Proficiency of marketing activities ➢ Proficiency of up-front (homework) activities ➢ Top management support ➢ Speed to market ➢ Proficiency of financial/business analysis
Market environment factors	➢ Market potential/size ➢ Market competitiveness ➢ External environment
Organizational factors	➢ Internal/external relations (of team) ➢ How team was organized

Source: Montoya-Weiss and Calantone (1994)

Likewise, Lynn *et al.* (1999) emphasized the role of team chemistry, development process, learning of prior experiences and leveraging the market unique opportunities. In a different approach, Brown and Eisenhardt (1995) offer a model in which they assess two main issues. Firstly, they distinguish between the new product process performance on one hand and the product effectiveness on the other and. Secondly, they the highlight the importance of agents, including team members, project leaders, senior management, customers, and suppliers, whose behaviour affects both process performance and product effectiveness (referring to success), as in figure 1.16.

Figure 1.16: Factors affecting product success and process performance



Source: Brown and Eisenhardt (1995)

Ending and summarizing this part, the following table provides some samples of articles dealing with the most critical factors that may lead to a successful development of new products. These peer reviewed samples, deal with the main important critical success factor and practices that may help companies in developing and launching new product to marketplaces. As can be noted, a variety of organizational, human, and technical variables may enhance this process leading to offering new product with a palpable distinction in comparison with similar products existing in the targeted market. Table 1.15 displays more information.

Table 1.15: Samples of new product critical success factors as reported by literature

Authors	Critical success factors
Lester (1998)	- Senior management commitment - The culture of the organization - Cross-functional teams - Focus on adding value to the efforts of the venture team - Provide strategy and fundamental guidelines - Share a common understanding of the process - Innovation requires expertise, skills, and motivation - Generating good ideas - Team formation events - A detailed project tactical plan - Clear goals and milestone measurements - Shift to an external focus to run the new product venture - Understanding in the venture team - Communication to management - The insight gained through reassessment efforts
Poolton and Barclay (1998)	- Top management support for innovation - Long-term strategy with innovation focus - Long-term commitment to major projects - Flexibility and responsiveness to change - Top management acceptance of risk - Support for an entrepreneurial culture
Cooper (1999)	- Solid up-front homework to define the product and justify the project - Build in the voice of the customer - Seek differentiated, superior product - Sharp, stable, and early product definition - A well-planned, adequately researched, and proficiently executed launch - Build tough go/kill decision points into your process - Dedicated, supported cross-functional teams with strong leaders - An international orientation: international teams, global products - Provide training on new product management - Define standards of performance expected - Cut back the number of projects underway - Install a process manager
Lynn et al. (1999)	- Having a structured new product development process - Having a clear and shared vision on the team - Developing and launching a product within the proper time frame - Refining a product after launch and having a long-term view - Possessing the optimal team skills - Understanding the market and its dynamics - Securing top management support for the team and the team's vision - Applying lessons learned from past projects - Securing good team chemistry - Retaining team members with relevant experience
Gruner and Homburg (2000)	- Customer interaction at different stages of the new product process
Jensen and Harmsen (2001)	- Knowledge and skills embedded in individuals - Values and norms
Akgün et al. (2006)	- Team learning process (information acquisition, information dissemination, information implementation, unlearning, thinking, intelligence, improvisation, sense-making, and memory)
Prisana and Speece (2010)	- The use of marketing research - Internal communication in the NPD process - Supplier linkages
Molina-Castillo et al. (2011)	- Competence exploitation through objective quality - Competence exploration through innovativeness of the firm
Stanley Kam Sing and Canon (2013)	- R&D and marketing cooperation - Customer orientation

Source: Author's own elaboration based on Sun and Wing (2005)

1.4.2. The key role of knowledge in new product innovations

The importance of knowledge in product innovation is a subject matter of a growing body of literature. Therefore, a profound analysis of the different factors that may influence innovation requires reviewing the knowledge-related theories (Grant, 1996b; Kogut & Zander, 1992; Nonaka & Takeuchi, 1995; Tsoukas, 1996) for deepening our understanding about how knowledge influences innovation. The underlying assumptions linking knowledge and innovation are rooted in different theories. For example, the resource-based view (Wernerfelt, 1984) considers that the heterogeneity of the firms in producing innovations and rents is rooted not only in the strategic resources they hold, but also in the capabilities of combining and bringing these resources to use. Capabilities, in turn, are “composed of knowledge” (Verona, 1999: 133).

These theories highlight also the crucial role of knowledge management in enabling companies to obtain information from their environments and transform it into knowledge. This, in turn, implies re-orientating and enhancing their resources and capabilities for developing new and competitive products or improving their production processes. Moreover, they consider that the ability of the organization to mobilize knowledge residing in individuals for creating new knowledge, and thus generating innovations, is a major source of competitive advantage.

Indeed, “the knowledge-based view posits that knowledge is a unique resource and that firm performance depends on how well organization members can enhance the firm’s knowledge base, integrate different knowledge areas, and apply the knowledge to the development of new products” (Durmuşoğlu & Barczak, 2011: 322). Likewise, knowledge management theorists such as Spender (1996a) and (Grant, 1996b) argue that knowledge is one of the most important companies’ assets, whereas the theory of knowledge creation (Nonaka, 1991) explains the process of creating new combinations of knowledge for carrying out new innovations. Furthermore, the core idea of open innovation is that knowledge and innovation coevolve and that “the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation” (Chesbrough, 2006: 1) seems to be crucial.

In this context, innovative companies are identified as those organizations that continuously learn, adapt themselves to change requirements and develop successful innovations (Shepard, 1967). Consequently, to innovate companies need creating new and different knowledge for developing innovative products, services, or new methods of production (Johnson *et al.*, 1996; Kazanjian & Drazin, 1986). This new knowledge is to be generated, developed, and accumulated and transformed into a firm asset. Companies learning capabilities determine this process. Certainly, the scope and depth of this knowledge determines the newness of the innovation. Therefore, the most innovative organizations will be those that have effective learning systems (Tushman & Nadler, 1986).

In summary, knowledge indisputably affects the process of carrying out successful innovations. Furthermore, new knowledge is a source of competitive advantage. In this context, Grant (1996a) argued that knowledge resides in the members of the organization. Therefore, the different approaches abovementioned tend to uphold a fundamental principle that innovative companies are likely a knowledge-creating companies, defined by Nonaka (1991), in which each employee becomes a knowledge worker and, ultimately, an entrepreneur.

Finally, it is important to highlight that although this point is introductory, the following chapter II deals profoundly with organizational learning, emphasizing its role and that of knowledge in the success of new products and thus disusing the correspondent models.

1.5. CONCLUSION

Undeniable importance of innovation has been widely argued (Abernathy & Clark, 1985; Baker & Sinkula, 1999a; Damanpour & Wischnevsky, 2006; Schumpeter, 1934). The key role of innovation in companies' survival and growth has led to an increasing number of researches about this topic in the recent decades. However, a lack of consensus about the conceptualization, determinants and outcomes of innovation is easily recognizable in the literature. Definitions differ. Some authors define innovation focusing on the nature and potential origins of innovation, whereas others emphasize the procedural generation of innovations. The definition offered by OECD likely encloses exhaustively the different aspects of the innovation phenomenon, as it considers the same to be any innovative idea converted in new products, new services, new organization form or new management style (OECD, 2006).

Similarly, literature offers a variety of taxonomies of innovation, based on different perspectives: the origin, impact, newness, final output and so forth. In this context, the most salient classification of product innovation differentiates between incremental and radical. Incremental product innovation occurs when companies perform enhancements in their familiar products, whereas radical product innovation is characterized by being completely new. Although each type involves different capabilities, literature sustains their importance in success and performance generation.

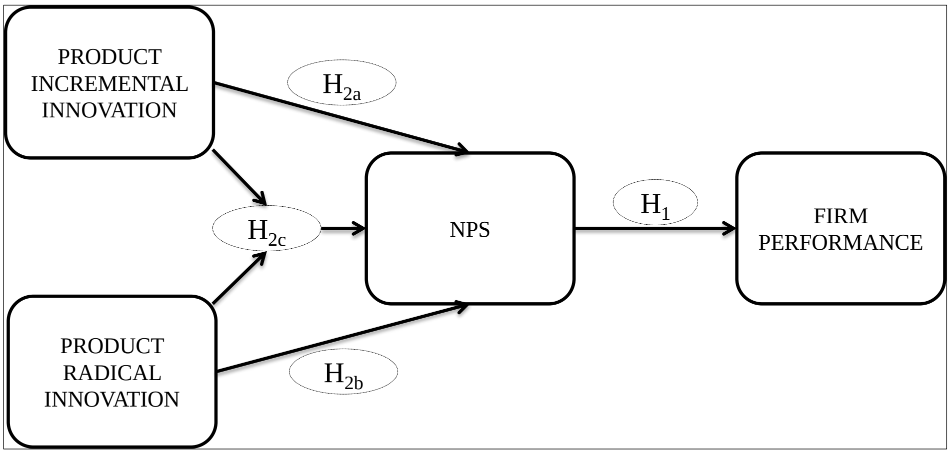
Several authors have analyzed innovation determinants. The most salient determinants are internal, since companies own systems and capabilities shape their trajectory on the different levels. Therefore, an innovative company is characterized by being oriented towards learning, markets and clients and usually strives to cope with their changeable needs. Furthermore, innovativeness enables organizations leveraging infinite opportunities such as renewing their knowledge assets, developing new outputs and dealing successfully with market dynamism requirements.

Although all innovation types are important, product innovation is considered crucial in nowadays markets, as it is a main competitive advantage source. This is due to the important rewards product innovation offers, such as financial benefits, clients' satisfaction and fidelity as well as the firm image. Literature offers many theories dealing with new product process. Product development can be either linear, which follows a fixed plan with no significant feedback among the different stages, or non-linear. The latter encompasses different approaches with different designations such as chain-linked or stage-gate models. An overwhelming view at the different models permits recognizing that product development process consists of three main stages: the ideation, the technical development and the commercialization.

This debate may be rooted in the conceived rate of failure of new products, which has led to researching for potential new factors that new markets have introduced. For example, based on prior works, González and Palacios (2002) argued that "recent studies show new product success rates at launch of less than 60%: 54.3% for the UK, 59% for the US, 59.8% for Japan and 49% for Spain". Therefore, the aim herein is to analyze possible factors that could contribute to the success of product innovations. In this vein, learning capabilities are studied, since knowledge is widely argued to be crucial in brining newness and generating firm performance.

In addition, an in-depth analysis of the different factor that may affect the successful development of new products was done. Broadly, literature dealing with new product success factors emphasizes the role of customer, supplier, team characteristics, management leadership, technical characteristics of the concerned company and so forth. One of these factors is the importance of new knowledge for product innovation. A NPS is widely seen as companies' knowledge payoff, as the greater and efficient is the knowledge input, the greater is the chances of the success of new products. Authors such as Nonaka (1991), Nonaka and Takeuchi (1995), Inkpen and Crossan (1995) argued that knowledge allows more than launching successful new product, rather it is the guarantee against markets uncertainty and dynamism. Finally, the hypotheses presumed along this chapter are depicted in the figure 1.17.

Figure 1.17: The hypotheses developed in the chapter I



Source: Author's own elaboration

CHAPTER II: ORGANIZATIONAL CAPABILITIES: A REVIEW OF THEIR RELATIONSHIP WITH INNOVATION AND PERFORMANCE

CHAPTER II

"To survive, organizations must execute in the present and adapt to the future. Few of them manage to do both well."– Eric Beinhocker (2006).

As already argued, nowadays companies operate within different and multiple economic and social structures that are characterized by being dynamic and complex especially in nowadays economy. This dynamism is due to the intense competition and rapid change in the markets (Eisenhardt & Martin, 2000). Consequently, "to survive, organizations must execute in the present and adapt to the future" (Beinhocker, 2006). Companies strive for survival and supremacy by adopting themselves to change in their environments through competitive advantages. That is, by matching organizational core competencies to the opportunities existing in its environment, a company can successfully compete by either providing the same value than the competitors with a lower price or offering superior value through differentiation.

Companies' searching for a sustainable competitive advantage has been a fertile subject matter that has triggered many theories. Broadly, two main strategic trends have been identified: the one considering the management of external economic factors to be key competitive advantage sources, and the other calling for internal scanning and reorientation of firms own assets and capabilities for the strategic target of being competitive. The first trend is mainly industrial, emphasizing the role of industrial external actors, while the second compasses firm's own resources, capabilities and knowledge economies. Moreover, the recent approaches focus internally on the company itself. They emphasize the resources and capabilities (including knowledge) companies hold as a competitive advantage sources, instead of considering the effects of threats and opportunities offered by external economic players as described in the model by Porter (1980). In contrast with the strategic approach focusing on external factors, the recent theories consider that companies' routines, internal resources and capabilities form the ongoing source of sustainable competitive advantages (Amit & Schoemaker, 1993; Barney, 2001; Wernerfelt, 1984).

The present work puts more emphasis on the latter view, in which firm's own resources and capabilities are considered the real basis of its competitive advantages, survival and growth. Namely, the resource-based, the capability-based and knowledge-based views are the main theories dealing with such an issue. These theories are sequential, as organizational authors consider the latter view as an advancement of the previous one. Additionally, another approach named "competence-based management" that is closely linked to the capability-based approach is recently debatable. All of which evokes objective reflections about the different aspects of these strategic management approaches.

Likewise, organizational knowledge has recently become a key issue, receiving increasing special interest as it seen as a strategic behavior that companies continuously should adopt. Therefore, theorists have dealt with the issue of how companies manage the addressable knowledge from different views. The capacity of taking advantage of internal competences and that of sensing the external valuable knowledge (absorptive capacity) forms the corn-stone of the strategic learning and innovation approaches within the organizational context. Moreover, such a capability has been studied from different perspectives, such as conceptualization, determinants and measurements (e.g. Adler, 1965; Camisón & Forés, 2010; Jansen *et al.*, 2005; Lane *et al.*, 2006; Murovec & Prodan, 2009; Todorova & Durisin, 2007; Tu *et al.*, 2006; Volberda *et al.*, 2010; Zahra & George, 2002) its antecedents (e.g. Fosfuri & Tribó, 2008; Poh-Lin, Winter 2009), its effect on learning and innovation performance (e.g. Cohen & Levinthal, 1990; Chen *et al.*, 2009; Kostopoulos *et al.*, 2011; Lane & Lubatkin, 1998; Lane *et al.*, 2001; Lichtenthaler, 2009; Murovec & Prodan, 2009; Peter *et al.*, 2001; Sun & Anderson, 2010; Tsai, 2001; Tseng *et al.*, 2011).

Similarly, absorptive capacity has been studied from the perspective of how companies can develop it (e.g. Lenox & King, 2004; Spithoven *et al.*, 2011), how firm antecedents interact with it as well as the role it plays as a moderator factor (e.g. Rothaermel & Alexandre, 2009; Zahra & Hayton, 2008). All of which demonstrate the dynamic nature of such matter, as t is seen as a key variable in learning management and innovation literatures.

Likewise, organizational memory has received great attention by many scholars dealing with its delimitation and modeling (e.g. Jackson, 2012; Nevo & Wand, 2005; Stein & Zwass, 1995; Walsh & Ungson, 1991), the role it plays in knowledge creation (e.g. Chang *et al.*, 2004), its effect on product success and performance (Chang & Cho, 2008; Moorman & Miner, 1997), and even as an antecedent to sustainable performance (Camisón & Villar-López, 2010). However, “more research is needed on how knowledge is embedded in an organization’s memory and the effect of where knowledge is embedded on performance outcomes” (Argote *et al.*, 2003: 579). Furthermore, more research is needed on the relationship between organizational memory and firm absorptive capacity.

Thus, this chapter deals with the previously mentioned theories as an academic reflection aiming at understanding the different approaches of important schools of thought about the origin and the organizational competitive advantage sources and how companies gain performance and growth. A sequential citation of these theories will firstly be provided. Concretely, the first part deals with the different approaches such as Porter’s model, resource-based, competence-based, capabilities-based and knowledge-based views, whereas the second part focuses on firm capabilities, especially, how organizational learning capabilities influence firm performance. The chapter ends with an analysis of how key factors such as absorptive capacity, innovation strategy and organizational memory affect learning capabilities (i.e. exploitation and exploration), concluding with the salient ideas issuing from the discussions of the different parts.

2.1. COMPETITIVE ADVANTAGE SOURCE: FROM INDUSTRIAL FOCUS TO KNOWLEDGE LOCUS

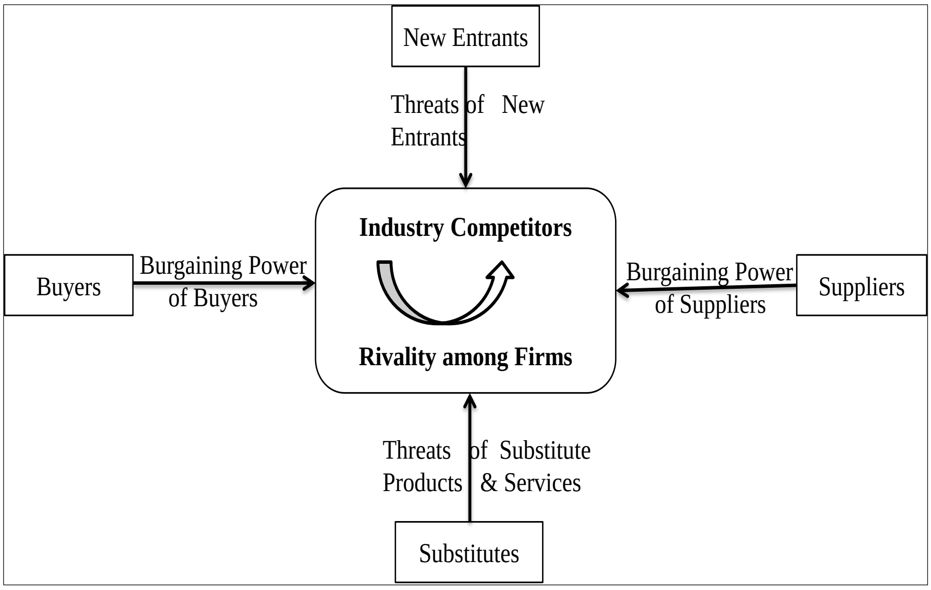
In strategic management, competitiveness has been a dynamic subject matter, on which many authors have provided several theoretical and empirical contributions (e.g. Barney, 1991; Camisón & Villar-López, 2010; Cockburn *et al.*, 2000; Chen *et al.*, 2009; Dehning & Stratopoulos, 2003; Fahy, 2002; Kaleka, 2002; Weerawardena & McColl-Kennedy, 2002). Thus, the sake of formulating theories about the development and maintenance of competitive advantage have led to two main organizational philosophies: The one emphasizing the external factors as determinants of company's success (Porter, 1980; 1991), and the other focusing on the organization itself, its own heterogeneous resources and capabilities. These resources and competences should be oriented towards a continuous reorganization and reorientation processes for addressing the market turbulence and the intense competition consequences (Penrose, 1959; Peteraf, 1993; Teece, 2007; Wernerfelt, 1984).

2.1.1. Porter's approach

The sake of discovering how companies achieve and sustain competitive advantage leaded Porter (1980; 1991) to develop his "five competitive forces" theory, based on two main factors: market structure and the nature of competition in industries. The central idea behind such a theory is that companies must evaluate their objectives and resources considering these forces that frame the industrial competition. Therefore, he aimed at defining tools for understanding the hidden causes behind the success of some firms and industries and the failure of others (Cockburn *et al.*, 2000).

According to Porter's industrial-economic perspective, the strategic competitive advantage is basically determined by the characteristics of the external environment such as the bargaining power of suppliers, the bargaining power of customers, the threat of new entrants, the threat of substitute products or services, and current competition within the industry (Porter, 1980). This suggests that the degree of adaptation to market/industry conditions determines the success or failure of the company, and that the structural characteristics of the market/industry are key features that a successful company should cope with in order to survive and growth, as highlighted in figure 2.1.

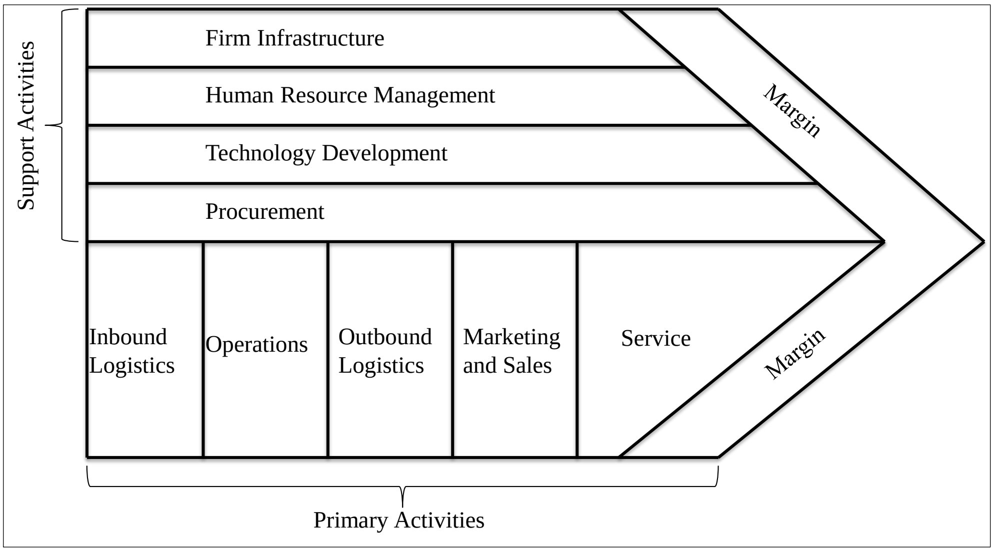
Figure 2.1: Porter's "five forces" model



Source: Porter (1980)

Too much external strategic focus neglects firm's internal conditions, therefore, Porter (1985) included the value chain model as a look at configuring company's internal assets to fit with the selected positioning strategy (Perren, 2013). In this logic, "Porter (1985) portrays competitive advantage as the organizational condition of superior performance which arises when a firm successfully competes either on price or by charging a premium for differentiation" (Harris & Ogbonna, 2001). The value chain analysis is used as a criterion to identify the capabilities of a company from the desegregation of their activities. It aims at, systematically analyzing the entire process from fabrication of the product until purchasing it by the consumer, including all services that may occur (distribution, customer service...etc.). Within this model, Porter (1985) distinguishes between primary activities and support activities. Primary activities referred to the activities that are related to the transformation of inputs and to the relationship with the customer, while support activities are more related to the structure of the company enabling it developing the entire production process. He claims that for gaining competitive advantage, companies should track these activities at an optimum level, and that by doing so the generated value of these activities should exceed their different costs, enabling then customers' satisfaction, as shown in figure 2.2.

Figure 2.2: Porter's "value chain" model



Source: Porter (1985)

However, working in concrete segments and in different industry groups in the same sector evokes many critics about Porter's strategic approach. Furthermore, the static mood of Porter's two previously indicated models lead to a dynamic approaching attempting to match the requirements of nowadays markets' dynamism and intense rivalry. Concretely, it is claimed that this model fails to consider the increased intensity of competition caused by the rapid technological development and the internationalization of the economy and so forth (Hill, 1988; Murray, 1988). It ignored the inside-out core competence of the company, and the interdependencies of corporations and the resulting synergies of such interdependencies. It is also applied to established industries and does not consider new markets. This is somehow understandable as the economies of the eighties differ widely from the actual ones in terms of the evolution of thoughts and business practices.

The fact that Porter's (1985) model also neglects the impacts of internal and external dynamism results in the emergence of recent models supposed to correspond more to the nature and requirements of actual business scene. The most relevant of these approaches are the resource-based, dynamic capabilities, knowledge-based and more recently transaction-costs views. The following sections provide overviews of the resource-based and knowledge based-views as they frame the actual thesis. Such approaches that "shifts the focus of analysis from players to resources and highlights the role of several capabilities employed in the development process" (Verona, 1999: 138).

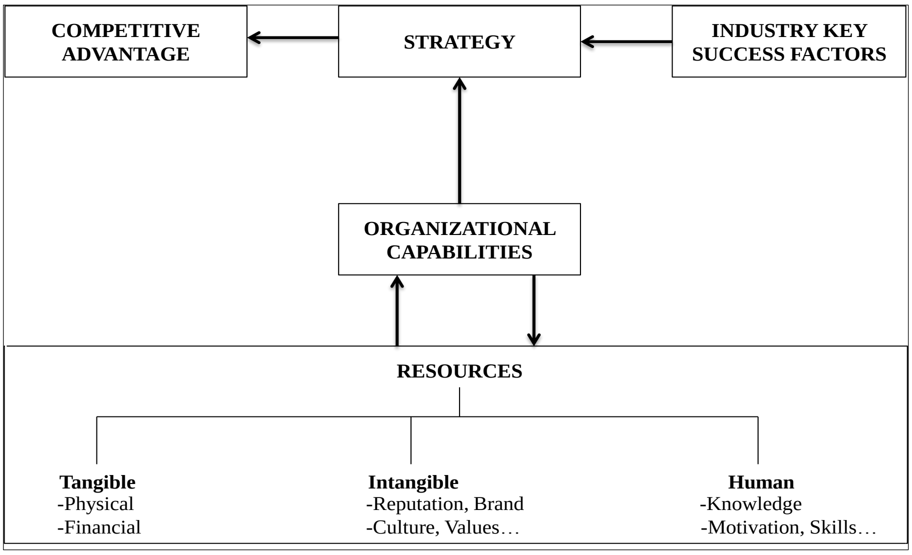
2.1.2. The resource-based view

The tenet of the resource-based view (Barney, 1991; Penrose, 1959; Wernerfelt, 1984) is to define the real potential of the companies, through the identification and assessment of their resources and capabilities, for establishing competitive advantages based on this potential (resources and capabilities). Furthermore, the key idea of such an approach is that companies are not equal, and that they differ mainly according to the resources and capabilities they have at a concrete time, allowing the interpretation of differences among companies belonging to a same sector. These resources and capabilities contribute in defining the corporate identity, which will determine its success or not in specific situations imposed by the external environment as well as to achieve internal goals.

Resources include all of the tangible and intangible assets owned by the company, such as brands, technological knowledge, skilled personnel, trade contacts, machinery, efficient procedures, capital and so forth (Wernerfelt, 1984). Furthermore, a resource stands for “an asset or input to production (tangible or intangible) that an organization owns, controls, or has access to on a semi-permanent basis” (Helfat & Peteraf, 2003: 999). Tangible resources are the physical assets such as raw materials and facilities owned by a company, while intangible resources encompass: human capital, organizational capital, technological capital, and relational capital (Hall, 1992). According to Hall (1992), human capital resources include all of the people-dependent, while relational capital consists of all people-independent. Value creation and flexibility represent strategically the main difference between tangible and intangible resources (Chatterjee & Wernerfelt, 1991). This means that intangible resources are more valuable than tangible ones in the process of business value creation. These intangible resources are known as intellectual capital and are represented by the assets that don’t appear in the balance sheets, such as reputation and all people-dependent resources (Carmeli, 2001). It is then a specific capital (not materially measured) that offers a real value to the company.

The nature and types of resources have been widely analyzed within management literature. In this context, many classifications have been provided. Some authors classify resources according to their marketability nature. For example, Dierickx and Cool (1989) distinguish between two major blocks of resources: tradable that can be normally acquired in markets and non-tradable resources that cannot be bought or sold in these markets. Machinery is an example of marketable resources, while the company's image, culture and culture are examples of non-tradable resources. Likewise, other authors assess the strategic importance of the resources. In this context, Grant (2006) offered a prevalent classification, distinguishing among three types of resources: tangible resources (referring to physical and financial assets), intangible resources (including reputation, values, culture, brands, trademarks and so forth), and human resources (that enclose the knowledge, skills and motivation of the staff of a given company), as shown in the following figure. These different resources together with capabilities determine the effectiveness of the corporate strategy, leading to sustainable competitive advantage generation (see figure 2.3.).

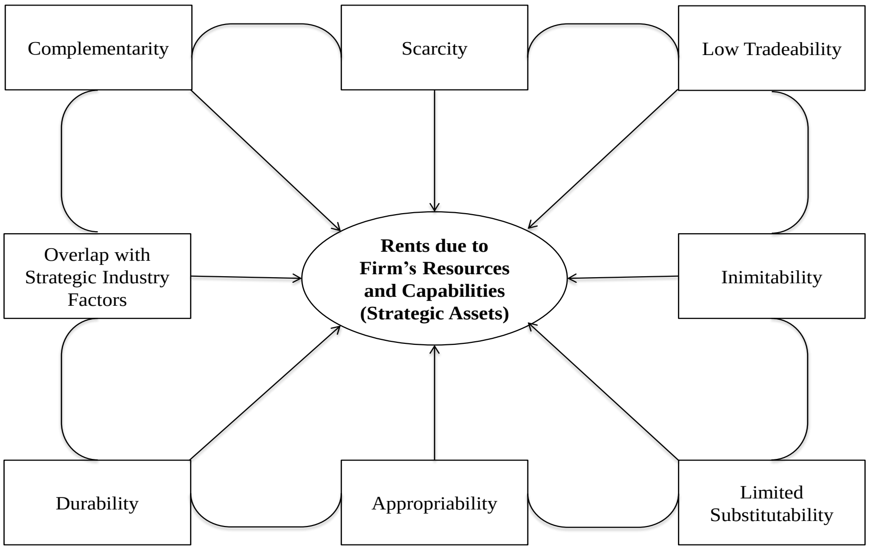
Figure 2.3: Resources classification and their relationship with corporate strategy



Source: Grant (2006)

Although, the RBV deals with firm's competitive advantage, considering that companies' success depends on the different resources they possess, only companies that have Valuable, Rare, Inimitable and Non-substitutable resources (the so-called "VRIN attributes") are able to gain sustainable competitive advantages (Barney, 1991). However, authors such as Amit and Schoemaker (1993) consider more characteristics of firm's resources for being able to gain competitive advantages and rents. According to these authors, in addition to the "VRIN attributes", core resources also should be durable, not easily traded and with an argued complementarity in deployment or application, as portrayed in figure 2.4.

Figure 2.4: Desired characteristics of the firm's resources



Source: Amit and Schoemaker (1993)

The static character of the resource-based view leads scholars to think over the incompatibility of this approach with the highly perceived dynamism of business environment, especially how companies work and survive in such a circumstance. Thus, as a further development of the resource-based view, other scholars proposed "dynamic capabilities" as an advanced management framework that reflects the need of dealing with the increasing business environmental dynamism (Eisenhardt & Martin, 2000; Teece *et al.*, 1997). Since the introduction of the notion "dynamic capabilities" by Teece *et al.* (1997), many scholars have been focusing on the organizational activities that enable a company to cope with changing business environments, throughout enhancing or renewing its resources and capabilities bases. The basic assumption of dynamic capabilities theory is that a firm should use its "core competencies (Prahalad & Hamel, 1990)" to create short-term competitive positions that can be used to create longer-term competitive advantage. A dynamic capability is "the firm's ability to integrate, build, and reconfigure internal and external capabilities to address rapidly changing environments" (Teece *et al.*, 1997).

2.1.2.1. Competence-based view

The competence approach was firstly adopted as a new organizational approach by scholars Prahalad and Hamel (1990) and Hamel and Heene (1994) respectively under the umbrella of core competence and later on through the competence-based competition theory. The core idea of this view is that companies differ in their assets and mechanisms to deliver value to customers. Therefore, they have to put emphasis on their valuable, inimitable and versatile distinctive competences to address change and compete successfully with their competitors. Consistent with this logic, Sanchez and Heene (1997)'s model offers insights towards identifying potential sources of competitive advantage through "a superior ability to coordinate flows of intellectual assets and other resources within and between firms that function like open systems" (Sanchez & Heene, 1997: 304).

Since then a plethora of terms has been used for defining and delimiting the term "competence" and then identifying firms' competences at the different levels. In this context, Danneels (2002) defined a competence as "an ability to accomplish something by using a set of material (e.g., equipment, machinery) and immaterial resources (e.g., manufacturing know-how, understanding of market and customer needs)". Likewise, McGrath *et al.* (1995: 254) defined an organizational competence to be: "a purposive combination of firm-specific assets (or resources) which enables it to accomplish a given task". Moreover, Grant (1991), who is one of the earlier adopters of the term within the organizational management field, defined a competence as the capacity for a set of individual resources (e.g., patents, know-how, brand names, equipment) to perform some task or activity: "the capabilities of a firm are what it can do as a result of teams of resources working together" (Grant, 1991: 120). He uses capability interchangeably with competence. These designations are also consistent with the dictionary definitions given to the term "competence" referring to things such as the ability, skill, or capacity necessary to do a definite task (Crawford, 2005).

The above descriptions put in evidence important observations. Firstly, firm competences must be of great value for participating in sustaining the competitive advantage (Hamel & Heene, 1994). A competence should be "core" in order to serve the aim of participating in competitive advantage and performance generation (Prahalad & Hamel, 1990). Secondly, competence is mainly composed of both skills and knowledge to coordinate company's resources and thus adopts a holistic and integrative view of the firm. However, Nanda (1996) and Hafeez *et al.* (2007) argue that competences are rooted in firms' capabilities rather than resources. This implies a different view of the one adopted by Amit and Schoemaker (1993) and Makadok (2001) who consider competences to be a special type of resources, but corresponds to the competence understanding of many authors such as Sanchez (2004) and Danneels (2002) among others.

Thirdly, joining the necessary skills and knowledge leads to an important conclusion which is firm, according to competence-based approach, works as an open system, as its scanning-in and scanning-out seems to be necessary for acquiring the knowledge and skills in question (Sanchez, 2004). However, companies can acquire valuable competences by enhancing, combining, protecting and transforming or reconfiguring their tangible and intangible assets and capabilities (Eisenhardt & Martin, 2000; Teece *et al.*, 1997). Similar arguments are offered by Amit and Schoemaker (1993) who claim that nowadays markets require the ability to reconfigure the firm's asset structure and to accomplish the necessary internal and external transformation as a change requirement.

The competence-based also deals with skills or capabilities that are rooted in organizational knowledge, which resides in organizational "routines", or patterns of behaviors presenting successful solutions to specific problems. These interactive patterns can be individual or collective. Different learning approaches have been subjects of many researches, distinguishing between internal and external learning sources (Hoang & Rothaermel, 2010; Kessler *et al.*, 2000). External alliances is one of the main techniques used in seeking knowledge existing in the environment of the organization (Yamakawa *et al.*, 2011), whilst March (1991), for example, consider taking advantage of internal certainties is a securer learning mechanism. A third trend considers necessary acquiring and integrating both internal and external stakeholders-based learning; as to link between customer and suppliers feedbacks. This hybrid approach is beneficial as Zahra and Nielsen (2002) argued, justifying empirically that internal and external human and technological resources are directly related to technology commercialization performance.

Levels or taxonomy of firm competences has been subject of many studies. Scholars distinguish between different competences within companies. For example, Hamel and Heene (1994) consider that production, marketing and product/service development represent the different key areas in which firm' competences are rooted. Therefore, a company may have a competence in production systems without having another competence in marketing for instance. Additionally, they also, argue that these sub-components of competence form together the entire competence of a firm. Likewise, Fleury *et al* (2012) point out that, in addition to the aforementioned areas, finance and human resources management represent additional key competences to be strategically considered. However, Sanchez (2004), distinguishes between five “modes” of firm competences. According to this author, firms should maintain and develop these modes altogether within their business activities in order to generate competitive advantages. He considers that cognitive flexibility of the managers for sensing the alternative valuable opportunities and management processes on the one hand, and the flexibility in coordination and in companies’ resources, skills and capabilities in using the valuable resources on the other hand, all represent the key competence modes. These modes differently create some strategic portfolios, and consequently work with different strategic logics that determine the companies’ focus and the adequate resources and capabilities use. The development processes of these five modes altogether help companies to create “positions”, maintaining performance within open system logic.

2.1.2.2. Capabilities-based view

Due to the increasing dynamism and complexity of the organizational environments, companies are continuously confronted with new challenges. Therefore, they need a continual renewal of their knowledge bases and resources (Eisenhardt & Martin, 2000). This, in turn, requires a special focus on the creation and continuous development of firm specific organizational capabilities that enable them to adequately cope especially with organizational short-term problems, acquiring missing competences. Thus, in the following sections, a special focus is done on the definition and implications of organizational capabilities, investigating in a next step firm learning capabilities.

- *Definition of a firm capability*

To acquire missing competences, companies need the necessary tools. These tools are embedded in organizational capabilities (Kogut & Zander, 1992; Kusonaki *et al.*, 1998; Leonard-Barton, 1992), that play the role of an adhesive of resources (Verona, 1999). In fact, the capability-based view is considered as an evolution of the previously analyzed approach (competence-based view). Therefore, Zollo and Winter (2002) considered that the evolution of capabilities is rooted in the "distinctive competence" by Selznick (1957), evolving into the notions of organizational routines (Nelson & Winter, 1982), absorptive capacity (Cohen & Levinthal, 1990), architectural innovation (Henderson & Clark, 1990), combinative capabilities (Kogut & Zander, 1992), and recently, dynamic capabilities (Teece *et al.*, 1997).

Literature provides many definitions of organizational capabilities. Grant (1996a: 377) presented organizational capabilities as the "ability to perform repeatedly a productive task which relates either directly or indirectly to a firm's capacity for creating value through effecting the transformation of inputs into outputs". Amit and Schoemaker (1993) defined capability as a firm's capacity to deploy resources**,** usually in combination, using organizational processes, to effect a desired end. Moreover, capabilities are seen as a set of differentiated skills, complementary assets, and routines that provide the basis for a firm's capacities in a particular business (Teece, 2007). They are developed by combining and manipulating resources (and/or other capabilities) with the aid of organizational routines (Andreu & Ciborra, 1996). In other words, capabilities are repeatable patterns of action in the use of assets to create, produce and/or offer products to a market (Sanchez, 2004).

According to Teece *et al.* (1997: 515) capability "emphasizes the role of strategic management to adapt, integrate, and reconfigure internal and external organizational competences, resources, and functional competences to meet the needs of a changing environment". This implies that the business strategic planning should involve long-term insights for developing competences towards creating distinctive and inimitable competitive advantages. Furthermore, "developing capabilities involves organizational learning: learning how to combine and use resources, and also the learning already embedded in the organizational routines employed" (Andreu & Ciborra, 1996: 113). This implies that capabilities and learning coevolve, or even one is resultant of the other.

Other authors see an organizational capability as an ability of a company to "perform a coordinated set of tasks, utilizing organizational resources, for the purpose of achieving a particular end result" (Helfat & Peteraf, 2003: 999). Furthermore, a capability reflects "a high-level routine (or collection of routines) that, together with its implementing input flows, confers upon an organization's management a set of decision options for producing significant outputs of a particular type" (Winter, 2000). This definition put in evidence that capability is reproduced in the companies' key activities enabling firm's ongoing success and development.

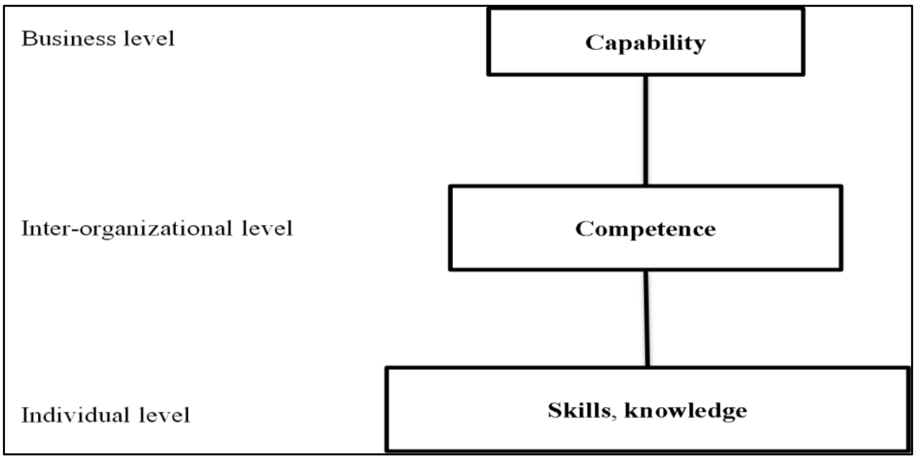
Amit and Schoemaker (1993) consider that capabilities are a specific sort of resources. According to them, a resource is easily exchangeable so is not firm-specific while a capability is a special type of resource, but is a "firm-specific since it is embedded in the organization and its processes, while an ordinary resource is not" (Makadok, 2001). Due to the fact that capabilities are intangible assets that determine the uses of tangible assets and other kinds of intangible assets, they are considered to be an important and special category of assets (Sanchez, 2004). Moreover, capabilities are the abilities, skills or competencies that can develop adequate organizational activity from a combination and coordination of available resources. Therefore, they are distinctive and embedded in firm's processes and cannot neither easily be copied nor bought or sold (Teece *et al.*, 1997). In this sense, organizational capabilities are considered to be valuable resources "whose purpose is to improve the productivity of the other resources possessed by the firm" (Makadok, 2001:389).

The essence of the "capability-based approach" is that companies differ in how to carry out their projects and deal with the different challenges they frequently face (Andreu & Ciborra, 1996), therefore dynamic routines are able to provide strategic solutions. Companies thus differ because of the heterogeneity of their "organizational capabilities" that enable them to effectively cope with the different challenges and problems (Leonard-Barton, 1992). Moreover, these organizational capabilities shape firm's trajectory, determining its strategic and tactic choices (Andreu & Ciborra, 1996).

Emphasizing the environmental effects, Teece *et al.* (1997) introduced the notion *dynamic capabilities* adding the dimension of flexibility to firms capabilities to meet change requirements. Dynamic capabilities deal with innovative forms of resources combination and practices aiming at meeting competitive advantages, considering at the same time the environmental changing characteristics. Likewise, core capabilities tendency (Andreu & Ciborra, 1996) emphasize the effect of market openness and the process transformation of a capability to be a core capability.

In ending this part, it is important to highlight that literature provides many related concepts that are not clearly distinguished from the “capability concept” as, for example, “core competencies”, “competences”, “organizational capacities”…etc., and that authors sometimes use them interchangeably. For example, Grant (1991) and others clearly use “capability” interchangeably with “competence”. This has trigged a causal ambiguity and inconsistent use in some cases. Thus, Duhan (2007) argued the existence of such an ambiguity regarding the definitions or a misuse of both, suggesting at the same time “the need for further tools for defining core competences and for investigating the use of information systems and information technology in leveraging and building them”. One of the closest meanings to capability is “competence” that explains the role of technology competences in the generation of core products and services (Prahalad & Hamel, 1990). However, “the application of resources including skills and knowledge through organizational routines and processes has more usually been described through a *capabilities* terminology” (Duhan, 2007). The model of Duhan (2007) sorts capability, competence and skills as different and corresponding to three different levels. Based on prior works, he considers that skills and knowledge happens at the level of individuals, whereas competences are purely intern-organizational, and that capabilities guide companies strategies at the business level (see figure 2.5).

Figure 2.5: A distinction among capability, competence and skills



Source: Duhan (2007)

Finally, clarifying the differences among the above-mentioned concepts, the table 2.1 provides some definitions reported by literature. A first glance at the various notions highlights that authors widely differ in presenting competence, capability and other closer terms.

Table 2.1: A set of definitions of key concepts

Concept	Definition	Authors
Capability	The ability for a set of different resources (tangible or intangible) to carry out a given task or a definite activity.	Grant (1991)
	A high-level routine (or collection of routines) that, together with its implementing input flows, confers upon an organization's management a set of decision options for producing significant outputs of a particular type.	Winter (2000)
	Repeatable patterns of action in the use of assets to create produce and/or offer products to a market.	Sanchez (2004)
	A particular form of "organizational knowledge" that enable an organization to perform its core operations.	Dosi *et al.* (2000), cited by: Bredin (2008)
	A firm's structures, processes and knowledge that are needed in carrying out productive operations effectively.	Jantunen *et al.* (2012)
Competence	The capacity for a set of individual resources (e.g., patents, know-how, brand names, equipment) to perform some task or activity.	Grant (1991)
	A purposive combination of firm-specific assets (or resources) which enable it to accomplish a given task".	McGrath *et al.* (1995)
	A superior ability to coordinate flows of intellectual assets and other resources within and between firms that function like open systems.	Sanchez and Heene (1997: 304).
	A firm's competence is its ability to meet demands put on it by the actors with whom it interacts.	Awuah (2007)
	The underlying attributes of individuals, in terms of the diverse knowledge, skills or abilities they possess.	Omorede *et al.* (2013)
Skill	Special forms of capability usually embedded in individuals or teams, which are useful in specialized situations or related to the use of a specialized asset.	Sanchez (2004)
Routine	Complex patterns of coordination of resources.	Nelson and Winter (1982)
Abilities	Abilities refer to what a person can do now, or will be potentially able to do in the future.	Gati *et al.* (2006)

Source: Author's own elaboration

- *Classification of organizational capabilities*

Although the above definitions indicate that organizational capabilities are various, the literature dealing with distinction among firms' capabilities is indeed scarce. However, some authors propose the need to differentiate between two major blocs of organizational capabilities. For example Zollo and Winter (2002) and Helfat and Peteraf (2003) differentiate between operational capabilities (operating routines) and dynamic capabilities. *Operational capabilities* generally "involve performing an activity, such as manufacturing a particular product, using a collection of routines to execute and coordinate the variety of tasks required to perform the activity" (Helfat & Peteraf, 2003: 999), while *dynamic capabilities* build, integrate, or reconfigure operational capabilities (Teece *et al.*, 1997). The same classification was adopted by Cepeda and Vera (2007) who clarify that operational capabilities reflect “how companies earn their living”, while dynamic capabilities deal with “how companies change their operational routines”.

Likewise, Zahra *et al.* (2006) distinguish between *substantive capability* and the *dynamic ability* to change or re-configure existing substantive capabilities (firm’s dynamic capabilities). As an example, they define developing new product as a substantive capability, while reforming the way the same company produce such product is argued to be a dynamic capability.

Another typology by Verona (1999) distinguishes between *functional* and *integrative* capabilities. Based on prior works, he defined functional capabilities as the set of routines that allow companies to deepen their technical knowledge, while integrative capabilities deal with the absorption of external critical knowledge as well as the combination of companies own technical competencies. It is clear that, by definition, both capabilities include knowledge activities such as R&D activities, absorptive capacity, exploration and exploitation, which imply that capabilities’ wellspring resides in knowledge. The table 2.2 clarifies the classification of Verona (1999).

Table 2.2: Classification of firm capabilities

Technological capabilities	**External integrative capabilities**	**Internal integrative capabilities**	**Marketing capabilities**
➢ R&D (Scientific) ➢ Manufacturing (process innovation) ➢ Design ➢ Technological complementarities	➢ Managerial processes (external communication, socialization) ➢ Managerial systems (empowerment, incentives, recruiting) ➢ Absorptive structures (networks of collaborations) ➢ Culture and values for external absorption	➢ Managerial processes (internal communication, integrative strategies, political and financial support, subtle control) ➢ Managerial systems (job training, collective brainstorming, incentives) ➢ Integrative structures (process integration, organization reengineering)	➢ Market research tools (empathic design) ➢ Strategic marketing management ➢ Marketing mix policies ➢ Marketing complementarities

Source: Verona (1999)

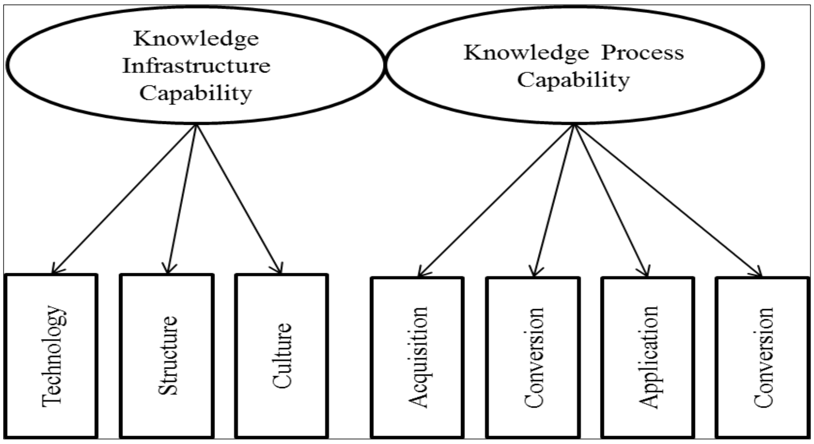
Although the former classification tends to broadly enclose all the capabilities, some scholars offer field-based classifications. For example, Yalcinkaya *et al.* (2007) and Lisboa *et al.* (2011) distinguish between exploitation and exploration capabilities, while, based on previous works, Ortega (2012) distinguishes among firm capabilities, managerial capabilities, marketing capabilities and technological capabilities. Likewise, Lee *et al.* (2001) pointed out some internal capabilities to be entrepreneurial orientation, technological capabilities, and financial resources invested during the development period. Likewise, Teece *et al.* (1997) pointed out four key “dynamic capabilities” that a company should develop in order to maintain competitiveness and growth. Namely: learning capability, building and recombination capability of strategic assets and the transformation of the existing assets when needed.

Based on the abovementioned, a broad classification can divide among *technological*, *social* and *organizational* capabilities. The technological capabilities enfold the different technical and infrastructural capacities of a company. Social capabilities involve all the human dimension capabilities, while the organizational capabilities hew about the set of processes and strategic orientation towards an efficient development.

In addition, literature has pointed out the learning and knowledge management capabilities, assessing the role of knowledge in value-creation for companies. Therefore, Leonard-Barton (1995) pointed out a knowledge-creation model based on the assumption that the knowledge-related activities can build up a firm core capability. Likewise, Nevo *et al.* (2007) differentiate between internal information technology (IT) capabilities such as related infrastructure, change management and planning, and external capabilities that deal mainly with leveraging external knowledge. Likewise, Gold *et al.* (2001) determined two major blocks of capabilities, namely: knowledge management *infrastructure* and *process* capabilities. According to them, cultural, structural, and technological infrastructures represent the *infrastructure capability*, while *process capability* is embedded in knowledge management activities and consists of knowledge acquisition, knowledge conversion, knowledge application, and knowledge protection as shown in figure 2.6.

The infrastructural side capability related to culture represent the sum of beliefs, values, practices and contexts shared among employees of a company. While the structural and technological capabilities are comprised of firm’s technical and normative assets (Leonard-Barton, 1995). However, the other bloc of capabilities deals with knowledge management practices, and tightly analogous to Zahra and George (Zahra & George, 2002) absorptive capacity subsets, and somewhat to the central ideas of the works by Cohen and Levinthal (1990), Lane *et al.* (2001), Kostopoulos *et al.* (2011), and Lichtenthaler (2009) among others.

Figure 2.6: Knowledge management capabilities



Source: Gold *et al.* (2001)

Knowledge acquisition capability (for Zahra and George is a part of the potential absorptive capacity of the company) refers to "a firm's capability to identify and acquire externally generated knowledge that is critical to its operations" (Zahra & George, 2002). It encompasses all the activities oriented towards obtaining knowledge from external sources (Gold *et al.*, 2001). In addition, the capability of companies to realize the usefulness of existing knowledge represents another key factor capability. However, knowledge conversion capability can be seen in the company's ability to integrate, combine, structure, coordinate, or distribute knowledge within the different knowledge repositories. Knowledge application is the following step after the acquisition and conversion of knowledge. As the word indicates, this step goes about applying processed knowledge to the different commercial ends (Cohen & Levinthal, 1990). Finally, there is a common agreement in the literature assessing the vitality of protection capability of the acquired knowledge for maintaining its superior value (De Faria & Sofka, 2010; Gold *et al.*, 2001; Harabi, 1995). Patents, trademarks and copyrights all represent the legal and formal side of knowledge protection mechanism (Encaoua *et al.*, 2006; Harabi, 1995), while the processes impeding the knowledge spillovers represent the strategic method.

Furthermore, organizational capabilities are reflected in the company's knowledge and skill depth and width through organizational learning processes (Andreu & Ciborra, 1996). Although capability creation and maintenance within firms is fundamental for companies' survival and growth, environmental factors influence companies' attempt to develop and maintain their organizational capabilities. Therefore, some scholars view the possibility of building dynamic capabilities (Eisenhardt & Martin, 2000; Teece *et* *al.*, 1997) through continuous commitments to R&D activities. Thus, this sheds light on learning capabilities in business growth and performance.

2.1.3. The knowledge-based approach

According to company knowledge-based view, a company is a *repository* or a *creator* of knowledge, which transcends the mere material and organizational assets to knowledge-underlying effects and attributes. In this logic, the following part sheds a new light on such an approach that is widely cited as consistent with actual economic scene. In doing so, the conceptualization of organizational knowledge and the different types of knowledge, as well as the key role of knowledge in firm performance are analyzed. Additionally, how companies create, maintain, integrate, use and protect knowledge within knowledge management frameworks will also be discussed.

2.1.3.1. Conceptualization of knowledge

The argued importance of knowledge in the era of knowledge-based economies has been aligned with an increasing number of academic works dealing with knowledge identification and characteristics. In organizational field, the term *knowledge* stands for the sum of companies' experiences, values, information and expert viewpoints, that provide an analytical framework for evaluating and incorporating new experiences and information (Davenport & Prusak, 1998). It includes in addition to information: "procedural, which characterizes how to do something, and reasoning, which characterizes the extent to which particular conclusions are valid under particular circumstances" (Holsapple & Singh, 2001). In other words, knowledge is justified and true belief, resulting of a human dynamic justification process of personal beliefs to make them something factual (Nonaka & Takeuchi, 1995). Furthermore, knowledge stands for relevant information that are able to be processed, and based, at least partially, on the experience (Leonard-Barton & Sensiper, 1998). Or, knowledge is a fluid mix of framed experience, values, contextual information, and expert insight (Trkman & Desouza, 2012).

Knowledge is also defined as “highest order manifestation of information that includes both data and information” (Kebede, 2010). Data stands for information in unorganized form, while information “is the name commonly given to one type of knowledge: descriptive knowledge, which refers to characterizations of past, current, or hypothetical states of some world of interest” (Holsapple & Singh, 2001). Furthermore, Davenport and Prusak (2000) pointed out that data stands for a set of discrete and objective facts about specific events, while knowledge is found in common agents such as humans, animals, companies etc., whereas information takes a mediating role between data and knowledge. This implies that data is raw and elementary facts that through processing become information, which, in turn, to be converted in knowledge. Additionally, the same authors consider that information can be seen as significant data or message characterized by the existence of a transmitter and a receiver. This relevance is acquired when the creator of such a data contextualize, categorize, edit, calculate or gather it. Finally, Kebede (2010) presents a series of knowledge definitions (see table 2.3).

Table 2.3: Samples of definitions given to knowledge

Definition	**Authors**
Knowledge stands for the valuable information combined with experience, context, interpretation and reflection, which allows making decisions and actions.	Davenport and Prusak (1998)
The combination of information, context, and experience. Context is an individual’s framework for viewing life. This includes influences like social values, religion, cultural heritage, and gender. Experience is previously acquired knowledge.	Ponelis and Fairer-Wessels (1998: 2)
The accumulation and integration of information received and processed by a recipient.	Meadow and Yuan (1997: 701)
A collective entity, a summation, integration and transformation of many bits of information organized in a coherent way. It exists privately in the minds of people, and it can be made external and public through being recorded in some way.	Todd (1999: 862)
Knowledge is created in the minds of humans through accretion and integration of many increments of information over different exposures to information at different times.	Todd (1999: 859), citing Brookes (1974)
Larger structures of related information.	Oppenheim *et al.* (2003: 160)
Information that has been given meaning and taken to a higher level. Knowledge emerges from analysis, reflection upon, and synthesis of information.	Donald Hawkins, cited in Zins, (2007b: 483)
Information given meaning and integrated with other contents of understanding.	Bates (2005)
The combination of data and information, to which is added expert opinion, skills, and experience, to result in a valuable asset which can be used to aid decision making’.	Rowley (2007: 172), citing Chaffey and Wood (2005)
Data and/or information that have been organized and processed to convey understanding, experience, accumulated learning, and expertise as they apply to a current problem or activity.	Rowley (2007:172), citing Turban *et al.* (2005)
Knowledge is information processed by individuals including ideas, facts, expertise, and judgments relevant for individual, team, and organizational performance.	Wang and Noe (2010)
Knowledge is a fluid mix of framed experience, values, contextual information, and expert insight.	Trkman and Desouza (2012)

Source: Author’s own elaboration based on Kebede (2010)

2.1.3.2. Taxonomy of knowledge

A wide range of taxonomies has appeared since the introduction of organizational learning, to classify knowledge based on its nature and implications. According to Nonaka and Takeuchi (1995) knowledge manifests in two different forms: implicit and explicit. Explicit knowledge may appear within firm's infrastructure, experts, knowledge stored in computers, books, production equipment, audio tape library, while implicit (tacit) knowledge (Polanyi, 1966) may manifest in hidden attributes in companies' culture and processes. Moreover, Polanyi (1966) who coined the term tacit knowledge, summarizes the essence of the same in the phrase: *we know more than we can tell*, providing further clarification through examples such as the ability to recognize faces, ride a bicycle or swim, without the slightest idea to explain how these things are done (Polanyi, 1966: 4).

Likewise, Spender (1996a) presented a matrix model, making a clear distinction between individual-explicit knowledge (conscious) and social-explicit knowledge (objectified), on the one hand, and individual-implicit knowledge (automatic) and social-implicit knowledge (collective) on the other hand. They also argue that each of these categories implies different learning mechanisms and special memory processes. According to him, when knowledge can be explicitly reported by individual members then it is conscious, and when they are unable to report the knowledge they apply in practice in this case knowledge is being automatic. Moreover, objectified knowledge is a scientific knowledge such as operating procedures and different rules adopted within the different parts of the company, and is entirely explicit (see table 2.4).

Table 2.4: The different types of organizational knowledge

	Individual	**Social**
Explicit	Conscious	Objectified
Implicit	Automatic	Collective

Source: Spender (1996a)

Similar classification distinguishes between individual knowledge, which is the different knowledge existing in the humans brains, and collective knowledge that stands for the corporate knowledge stored in the different repositories of the company despite the individual awareness (Kogut & Zander, 1996). Likewise, the model by Lundvall and Johnson (1994) highlights four categories of knowledge: know-what, know-how, know-who, know-why. According to them, Know-what refers to information or knowledge about evidences and realities, while know-how involves the ability or skills to do a definite task or mission. Also, know-who stands for information about “who knows what and who knows what to do”, involving also the social ability to co-operate and communicate with different kinds of people and experts, while know-why “refers to knowledge about principles and laws of motion in nature, in the human mind and in society”.

Likewise the model by Collins (1993) proposes five types of knowledge, embrained, embodied, encultured, embedded and encoded. Each category differs, since “embrained knowledge is knowledge that is dependent on conceptual skills and cognitive abilities… Embodied knowledge is action oriented and is likely to be only partly explicit. Encultured knowledge: refers to the process of achieving shared understandings. Embedded knowledge: is knowledge that resides in systemic routines. Encoded knowledge is information conveyed by signs and symbols” (Blackler, 1995). Finally, based on the aforementioned discussions, the table 2.5 provides the different categorization of knowledge as reported by the different authors.

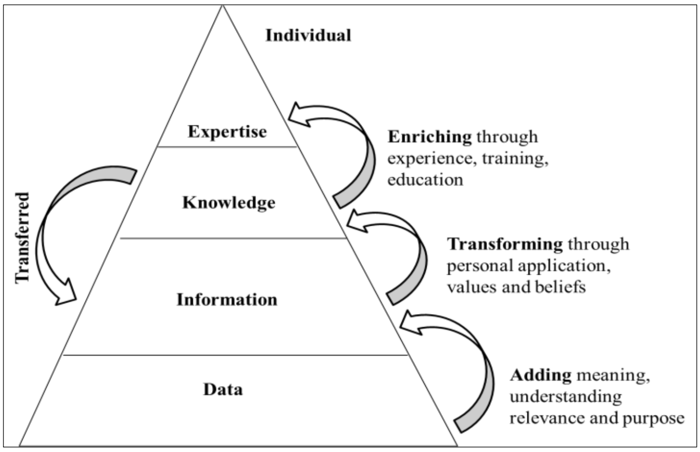
Table 2.5: Different taxonomies of knowledge as reported by literature

Categorization	**Authors**
Explicit and implicit (tacit)	Polanyi (1966) and Nonaka and Takeuchi (1995)
Individual and collective	Kogut and Zander (1996)
Conscious, objectified, automatic and collective	Spender (1996a, 1998)
Know-what, know-how, know-who, know-why	Lundvall and Johnson (1994)
Embrained, embodied, encultured, embedded and encoded	Collins (1993)

Source: Author’s own elaboration

In summary, company’s overall knowledge, which is the sum of its individual knowledge, can be understood as a continuous and hierarchical processing of data and information. Thus, orderly, data, information, knowledge and expertise are all manifestations of knowledge in its different conversion stages. For example, adding a meaning to lower basic level, which is data, enables its conversion into information, but the latter, in turn, becomes knowledge through the application and use. Experiences of personal of companies and the benefit of training all convert knowledge into the highest value which expertise. Thus, understanding raw data, applying knowledge and reapply and re-manipulate it enables companies having the expertise in the related matter, as in the figure 2.7.

Figure 2.7: Knowledge hierarchy



Source: Bender and Fish (2000)

2.2. ORGANIZATIONAL LEARNING CAPABILITIES

As indicated earlier, a firm performance occurs due mainly to its capabilities to combine their resources, deploy them and renew their potential. In this logic, learning capabilities are likely determinant of firm's ability to update their knowledge-based and then innovate. It is known that learning targets knowledge creation and manipulation in the company's different ends, as for companies, the importance of knowledge is evident for an ongoing competitive advantage creation and maintenance (Nonaka, 1991). Thus, it seems to be necessary to provide definitions and analyze the most salient aspects of learning before addressing the related capabilities, for a better understanding of the issue.

2.2.1. Intellectual capital

The concept of intellectual capital is rooted in the analysis of which types of assets provide more value for companies, whether tangible or intangible. According to literature, there is a consensus that intangible assets, especially those based on knowledge, are more valuable and provide more competitive advantages than hard ones do (Amit & Schoemaker, 1993; Barney, 1991; Peteraf, 1993).

The great importance given to knowledge-rooted assets has led to the emergence of a series of works that seek evaluating these assets and defining how to increase their value. The following paragraphs are to deepen the concept of intellectual capital, analyzing its different components.

Defining the intellectual capital frequently calls for the metaphor proposed by Edvinsson y Malone (1999) in which the company is depicted as a tree, where the trunk, branches and leaves are what is described in the organizational charts used, annual reports, company brochures and other documents. The fruits of the tree are the profits earned by investors or products offered to customers, whereas the roots reflect the hidden value of the company. The latter represents the intellectual capital, i.e. the roots of a company's value are the hidden valuable features of the companies.

Authors have provided a variety of definitions of intellectual capital. Broadly, intellectual capital can be understood as knowledge, applied experience, organizational technology, customer relationships and professional skills of a company, which provides it with a competitive advantage in the marketplace. (Edvinssson & Malone, 1999). Likewise, Stewart (1997) presented it as the intellectual material (knowledge, information, intellectual property and experience) that has been formalized, captured and directed to create wealth to produce a high-value assets. Likewise, one of the most exhaustive and agreed definition (Bontis, 1998; Brooking, 1996; Edvinssson & Malone, 1999; Kaplan & Norton, 1992; Roos & Roos, 1997; Sveiby, 1997) is provided by Sveiby (1997) who considers that "the difference between the market value of a publicly traded company and its official book value corresponds to its intangible assets, which is usually higher than the value of the tangible assets in most companies", i.e. their intellectual capitals.

Thus, intellectual capital is the set of *knowledge-based* intangible assets that pertain to a company at a given time enabling to gain a competitive advantage. Or, according to Bueno (1998), intellectual capital reflects the knowledge-based assets that enable generating value for companies. Therefore, the intellectual capital management focuses on renewing and maximizing the value of intellectual assets of the company (Wiing, 1997). Finally, given the recognized importance of intangible assets, literature has identified mechanisms and tools to identify the real values to the companies under the premise that financial measures cannot give the real operational value of the company (Kaplan & Norton, 1992).

2.2.2. Knowledge management

Benchmarking the “inimitability” and “tacitness” characteristics of the resource-based view, knowledge-based approach considers knowledge to be the most significant resource in strategic terms. This is because of the complexity and inner characteristics of intellectual capital, which offers a highly perceived heterogeneity from a company to another. Theorists of the knowledge-based approach consider the company to be a body that creates and applies knowledge, or a machine for information processing (Grant, 1996b; Kogut & Zander, 1992; Nonaka, 1994; Nonaka & Takeuchi, 1995). The company is then a specialized unit that produces and transfers internally the different knowledge it produces, and that while the new knowledge is developed by individuals within companies, the same organizations play an important role in the development of this knowledge (Kogut & Zander, 1992).

Knowledge management seeks the identification, creation and development of knowledge within organizations (Grant, 1996b; Spender, 1996b), to gain competitiveness (Revilla, 1998). In other words, it aims at managing effective knowledge processes (Wiing, 1997), through organization, coordination and control of the flow of knowledge produced in the companies regarding their activities and their environment in order to create a social skills (Bueno *et al.*, 2001).

Furthermore, the main aim of knowledge management is to create synergies and added value that arise when sharing tacit and explicit knowledge within the general frame of the mission and strategy of the company (Williams, 2001). To do this, companies store and manipulate data and information, converting them from a human asset to institutional knowledge that can be distributed throughout the organization to be accessible to all individuals (Marshall *et al.*, 1996). Furthermore, according to Inkpen (2000), the ultimate goal of knowledge management through the activities outlined above is the creation of new knowledge and innovations that can be used to obtain a competitive advantage.

In this sense, knowledge management approach focuses on the analysis of the process through which companies capture knowledge to foster innovation through organizational learning spiral. (Nonaka, 1991, 1994; Nonaka & Takeuchi, 1995; Ordóñez, 2002) that will be discussed later. To achieve these aims, knowledge managers use information technologies such as data warehousing, expert systems and intranets (Von Krogh, 1998).

Theoretically, different authors have provided many frameworks and model. In this context, Rubenstein-Montano *et al.* (2001) provided a list of frameworks about knowledge management. The table 2.6 presents some of the samples these authors have provided.

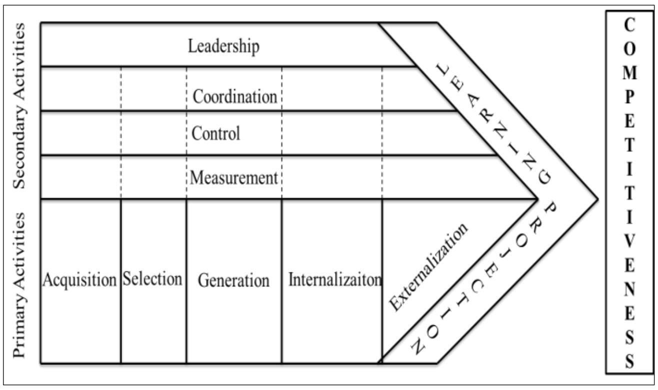
Table 2.6: Sample of frameworks of knowledge management

Framework	**Description**
Wiig (1993)	1) Creation and sourcing, 2) compilation and transformation, 3) dissemination application and 4) value realization
Nonaka (1994)	The conversion cycle between persons and groups: 1) socialization, 2) externalization, 3) combination, 4) internalization.
Marquardt (1996)	1) Acquisition, 2) creation, 3) transfer and utilization and 4) storage
O'Dell (1996)	1) identify, 2) collect, 3) adapt, 4) organize, 5) apply, 6) share and 7) create
Holsapple and Joshi (1997)	1) Managerial influences [including leadership, coordination, control, measurement], 2) resource influences [including human, knowledge, financial, material], 3) environmental influences [including fashion, markets, competitors, technology, time, climate] 4) activities [including acquire, select, internalize, use], 5) learning and projection as outcomes
Ruggles (1997)	1) Generation [including creation, acquisition, synthesis, fusion, adaptation], 2) codification [including capture and representation] and 3) transfer
Price Waterhouse Coopers (1997)	1) Find, 2) filter [for relevance], 3) format [to problem], 4) forward [to right people] and 5) feedback [from users]
Monsanto Company (1997)	Formal knowledge management methodology: use learning maps, values maps, information maps, knowledge maps, measurements, and information technology maps.
The Mutual Group (1998)	Capital framework: 1) gather information [building an explicit knowledge infrastructure], 2) learn [tacit knowledge development], 3) transfer and 4) act [developing capability through values deployment]
Van der Spek and Spijkervet (1998)	1) Developing new knowledge, 2) securing new and existing knowledge, 3) distributing knowledge and 4) combining available knowledge.
American Management Systems (1999)	1) Find [create knowledge centers], 2) organize [motivate and recognize people] and 3) share
Liebowitz (2000)	1) Transform information into knowledge, 2) identify and verify knowledge, 3) capture and secure knowledge, 4) organize knowledge, 5) retrieve and apply knowledge, 6) combine knowledge, 7) learn knowledge, 8) create knowledge [loop back to 3)] and 9) distribute/sell knowledge
Massa and Testa (2009)	1) Knowledge creation/acquisition, 2) storage and retrieval, 3) transfer and sharing, 4) application
Dorasamy et al. (2013)	1) Create, 2) capture, 3) codify, store, 4) share and 5) apply knowledge effectively.

Source: Author's own elaboration based on Rubenstein-Montano *et al.* (2001)

One of the above mentioned frameworks is by Holsapple and Singh (2001) who offered a *Porter's value chain-like model*, describing a knowledge management framework to be "comprised of five primary activities that an organization's knowledge processors perform in manipulating knowledge resources, plus four secondary activities that support and guide their performance". According to this model, acquisition is the first step towards managing external knowledge, and is similar to potential absorptive capacity according to Zahra and George (2002). Once acquired, this knowledge is to be selected or filtered according to the company's needs based on its relevance, reliability and importance, then the selected knowledge need to be categorized and orientated toward the different services. Finally, begins the process of internalization/ externalization of the new knowledge, as highlighted in figure 2.8.

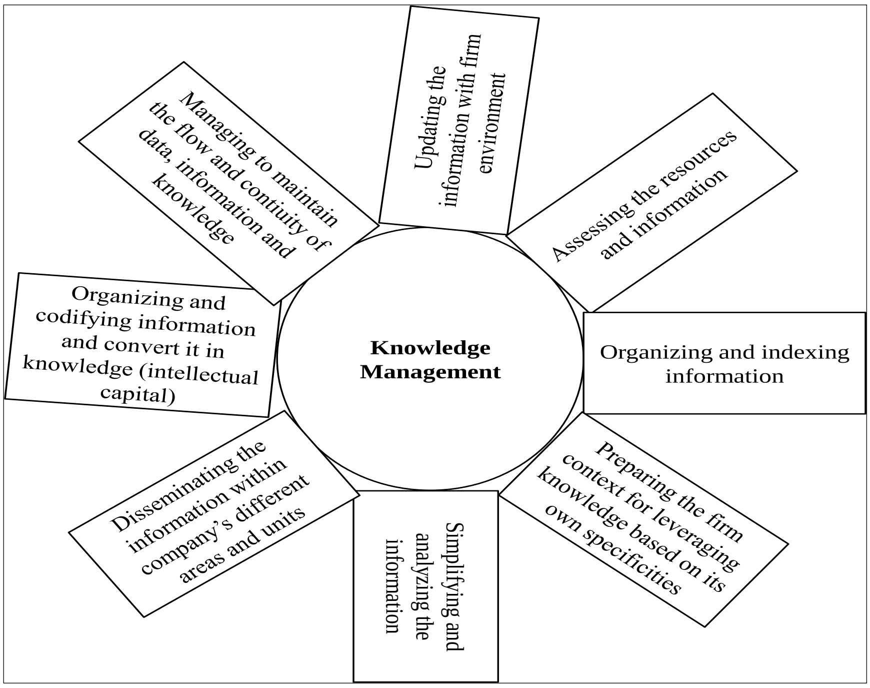
Figure 2.8: Knowledge management activities



Source: Holsapple and Singh (2001)

In summary, based on the above-listed frameworks, knowledge management is an integrated and coherent system of values and principles, skills, expertise and technologies that targets maintaining the continuity and flow of data, information and knowledge, ensuring the update of company's knowledge base with its external environment. In addition, knowledge management assesses the sources and quality of information, organizing and indexing at the same time such information. Likewise, it target making the information understandable and analyzing and disseminating it within company's different areas and units. This information is organized in a codified way for easy future reuse for being converted into intellectual capital and thus in a highly valuable intangible resource. It targets "retaining valuable knowledge within corporate enterprises and furthering business performance and competitiveness" (Floyde *et al.*, 2013: 70), facilitating "the achievement of higher performance and efficient responses to customers' needs and requirements" (Villar *et al.*, 2014: 38). In summary, knowledge management is an organizational activity that includes, identifying, acquiring, diffusing among stuff, institutionalizing, leveraging the sum of knowledge available for companies. In this logic, the figure 2.9 aims at simplifying the notion, enabling our understanding about knowledge management.

Figure 2.9: A summary of knowledge management main activities



Source: Author's own elaboration

The aforementioned targets of knowledge management help companies in realizing strategic aims such as creation of new business opportunities, changing the company's image and fostering the feedbacks and efficiency of the personal of the companies. All of which makes the company more flexible and responsive to change requirements. In this context, the spiral model by Nonaka and Takeuchi (1995) explains the mechanisms of transformation of the different types of knowledge within companies which leads to renovation of knowledge base and innovation development. This model will be analyzed in chapter III.

2.2.3. Organizational learning

Closer to the tenet of knowledge management, organizational learning is also a dynamic strategic subject. It is rooted in the imperativeness of coping with change and leveraging internal and external knowledge to overcome actual problems and prepare for future.

The following paragraphs exhibit more information about this issue. The following paragraphs deal with how the organizational process that begins from the identification of knowledge and ends with storage of this knowledge within companies' repositories.

2.2.1.1. Conceptualization of organizational learning

It is claimed that the issue of organizational learning is rooted in the work by Cyert and March (1963) and that since the end of the 1970s it has gained great attention by researchers (Dawes *et al.*, 2007). Recently, organizational learning has become a dynamic research subject-matter, as it is seen as a key strategic activity for companies' growth and sustainability over time (Crossan & Guatto, 1996; Crossan *et al.*, 1999; Dodgson, 1993; Huber, 1991; Hung *et al.*, 2011; Jiménez-Jiménez & Sanz-Valle, 2011; Lei *et al.*, 1996; Nooteboom, 1999). This increase is consistent with the outlook of Senge (1990) who expected in his *Fifth Discipline* an increase in the interest in organizational learning at the beginning of the last decade, due to organizations' openness and environmental exigencies.

A basic definition can present learning as the process of assimilation and appropriation of knowledge by individuals and companies. Argyris and Schön (1978) defined organizational learning as a process of errors detection and correction, whereas Huber (1991) argued that it is a combination of four processes: information acquisition, information distribution, information interpretation and organizational memory. Likewise, Senge (1990) assesses the dimension of experience and its transformation into available and important knowledge to organizations. Broadly, literature sustains that organizational learning implies the acquisition and application of new knowledge. However, the transformation, diffusion and use of acquired knowledge are key elements in sustaining a competitiveness and success (Lei *et al.*, 1996; Miner & Mezias, 1996).

In this context, DeGeus (1988) portrays organizational learning to be the ultimate source of competitive advantage. Likewise, Crossan and his colleagues (Bontis *et al.*, 2002; Crossan *et al.*, 1999; Crossan *et al.*, 1995) offered a learning process model. Furthermore, Kim (1993) analyzes the relationship between individual and organizational learning, whereas Garvin (1993) emphasizes highlights the importance of measuring learning in organizations for assessing the real scope of learning in companies. In a similar vein, Cohen and Levinthal (1990) assess that the ability to absorb new knowledge is a key factor of organizational learning.

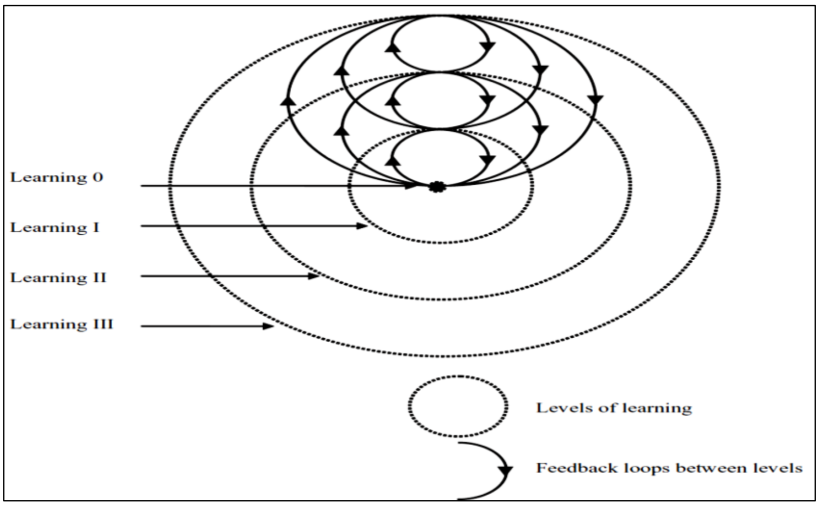
Finally, it is almost axiomatic that organizational learning was borrowed from conventional learning of persons (Shrivastava, 1983). However, learning on the level of organization is more complicated that on the personal level, due to the complexity of structures of organizations. Furthermore, organizational learning is a process of changing or modifying companies' knowledge and processes (Argyris & Schön, 1978; Senge, 1990). Furthermore, based on prior works, Huber (1991) argued that organizational learning is a dynamic process encompasses different levels of actions, such as individual, group and organizations. This implies that learning is a process of change related to how companies deal with business management.

2.2.1.2. Levels and typology of organizational learning

Since Bateson's (1973) contribution, academic works dealing with organizational learning has burgeoned within practically all the fields including management and organization sciences. Thus, many scholars propose different typologies and levels, in which the common denominator is the dichotomous nature. Single-loop and double-loop (Argyris & Schön, 1978), lower-level and higher-level (Fiol & Lyles, 1985), adaptive and generative learning (Senge, 1990), exploitation and exploration (March, 1991), incremental and radical (Miner & Mezias, 1996) and first-order and second-order (Arthur & Aiman-Smith, 2001) all represent referential typologies of organizational learning levels. "These dichotomous terms stem in different perspectives on organizational learning, a reasonable consensus seems to have been established that they refer to comparable learning processes and outcomes" (Tosey *et al.*, 2011). The following paragraphs offer more details about these typologies separately.

One widely influencing contribution that presents a classification of learning levels was by Bateson (1973) who argued a five-level learning model. Within the notion *learning to learn*, he assumed that learning levels fluctuate from zero to five. Level "0" is characterized by specificity of response, which -right or wrong- is not subject to correction, whereas level "I" happens when there is a change in specificity of response by correction of errors of choice within a set of alternatives. Level "II" of learning occurs when there is a change in the process of Learning "I", and so forth for "III". However Learning IV is difficult to happen according to the author. The levels are interrelated with a feedback loop, which means that the happening of one level leads to the next one and vice-versa. This can be understood more with the following model that explains Bateson's view about learning and the interdependencies of its different levels as shown in the figure 2.10.

Figure 2.10: Bateson learning levels



Source: Bateson (1973)

Based on Bateson's approach, years after, Argyris and Schön (1978) argued that learning happens through two fundamental patterns: single-loop and double-loop. These patterns are completely different in nature and mechanisms. Single-loop learning is a type of learning aiming at maintaining the current system through error detection and correction duality. Therefore, it seeks correcting the errors rather than questioning the cause of the errors. In contrast, double-loop learning goes further than the error detection and correction, searching for the underlying causes behind the problem, such as organizational norms, individual behaviors…etc., seeking at the same time correcting such a problem. Likewise, Argyris and Schön introduce the term "deutro learning" that means "to learn how to carry out single-and double loop learning" (Argyris & Schön, 1978: 27).

Other scholars coin a triple-loop learning level (Tosey *et al.*, 2011) that targets not only, error detection and correction or the direct causes, but also a systemic reflection on the entire system of organizational learning. Moreover, triple-loop learning occurs when firms learn how to effectively carry out single- and double-loop learning, therefore, it is stands mainly for "learn how to learn", by identifying the various individual and organizational factors that may help in facilitating organizational learning.

Another distinction between lower-level and higher-level learning was offered by Fiol and Lyle (1985). They consider that "lower-level learning occurs within a given organizational structure, a given set of rules, and usually leads to the development of some rudimentary associations of behavior and outcomes, with distant impacts and that it is a result of repetition and routine and involves association building while higher-level learning, on the other hand, aims at adjusting overall rules and norms rather than specific activities or behaviors. The associations resulting from higher-level learning have long-term effects and impacts on the organization as a whole. This type of learning occurs through the use of heuristics, skill development, and insights. It therefore is a more cognitive process than is lower-level learning, which often is the result of repetitive behavior" (Fiol & Lyles, 1985: 807-808).

Senge (1990) proposed a different typology, distinguishing between adaptive and generative learning. As the designation indicates, adaptive learning is the one that targets satisfying specific needs and requirements, so it can be designed as a *survival learning*, while generative learning goes beyond the satisfaction of actual needs or survival requirement. Rather, generative learning aims at generating and creating new knowledge for mastering companies' future.

Similarly, Miner and Mezias (1996) put emphasis on two types of organizational learning: incremental and radical. Incremental learning stands for architectural learning that targets fixing problems and increasing efficiencies in organizations, whereas radical learning is goes against the existing rules and standards, targeting completely new knowledge. Radical learning targets carrying out a radical change, conversely, incremental learning aims at producing continuous small changes to existing processes. Incremental and radical learning has been brought to innovation to form a core construct of numerous works analyzing the two patterns of innovation development: the one beginning from no technological base, and the other that takes firm's existing technology and broadly previously acquired knowledge as a base for future innovations (e.g. Banbury & Mitchell, 1995; Castiaux, 2007; Chandy & Tellis, 1998; Dewar & Dutton, 1986; Ettlie *et al.*, 1984; McDermott & O'Connor, 2002; Song & Thieme, 2009; Subramanian & Nilakanta, 1996; Vowles *et al.*, 2011; Yalcinkaya *et al.*, 2007).

Likewise, based on the previous literature, Arthur and Aiman-Smith (2001: 739) distinguishes between “first-order learning that “consists of a routine, incremental, conservative process that serves to maintain stable relations and sustain existing rules, which is expected to be incremental change or adaptation to further exploit existing technologies, routines, and processes in ways which don’t alter underlying assumptions or values, while the second order has been described behaviorally as “the search for and exploration of alternative routines, rules, technologies, goals, and purposes”.

Finally, a widely cited distinction, which is adopted in this dissertation is the one by March (1991) and Levinthal and March (1993). It claims a dichotomy between two main learning mechanisms: the exploitation and the exploration. In short, exploitation learning is the one prioritizes internal reuse and reorientation of existing assets for creating knowledge and innovations, while explorative learning is rooted in outsourcing and prospection of external knowledge sources. This issue is widely debated along the thesis, especially in the following parts of the present chapter.

2.3. THE KEY ROLE OF LEARNING CAPABILITIES IN ORGANIZATIONAL PERFORMANCE

Monitoring business environment is susceptible, not only to reduce the effects of different potential risks existing in firm’s surroundings, but also to update organizational knowledge-bases as a fruit of learning. Therefore, organizational learning is considered as a key source of firm performance (i.e. Darroch & McNaugton, 2002; Nonaka & Takeuchi, 1995; Stata, 1989), The basic assumption in the relation between learning, and performance is rooted in the key role learning plays in enabling companies to achieve speed, flexibility and efficiency in their different operations (Brown & Eisenhardt, 1995; Miles & Snow, 1978; Weerd_Nederhof *et al.*, 2002). Therefore organizational learning may itself reflect a key dynamic capability (Teece *et al.*, 1997).

According to Bontis *et al.* (2002), in nowadays turbulent environment, learning capability of a company may be its main competitive advantage source. Therefore, the importance of knowledge has led to deepening the research in organizational learning over the recent decades (Crossan & Guatto, 1996). Moreover, the most successful companies are those that consistently create new knowledge, disseminate it through the organization and quickly incorporate it into new technology and products, allowing continuously developing innovation (Nonaka, 1991).

As it has been previously exposed, Yalcinkaya *et al.* (2007) subdivided the learning capabilities into two main categories: exploitation and exploration capabilities. A similar adoption was assumed by Lisboa *et al.* (2011) and Auh and Menguc (2005), Kim *et al.* (2012) and Tu (2010) among others. However, a new tendency consider that an ambidextrous position through which a company reuse its internal assets to discover new ways to produce new outputs, at the same time, the same company seeks external addressable sources for better taking advantage of both internal and external knowledge (Andriopoulos & Lewis, 2009; Gibson & Birkinshaw, 2004; O'Reilly & Tushman, 2008; Rothaermel & Alexandre, 2009; Tushman & O'Reilly, 1996). The following sections deal especially with exploitation, exploration and ambidexterity as models of organizational learning capabilities.

2.3.1. Exploitation capability

Analyzing the exploitation and exploration as two facets of organizational learning, March (1991) stated that exploitation "includes such things as refinement, choice, production, efficiency, selection, implementation, execution" (March, 1991: 71). Furthermore, it involves alignment, control, constraints, and short-term orientation" (Andriopoulos & Lewis, 2010; Gibson & Birkinshaw, 2004). Likewise, Koza and Lewin (1998) argued that exploitation focuses on increasing the productivity and efficiency of capitals and assets through standardization, systematic cost reductions, and improvements of existing technologies, skills, and capabilities.

Furthermore, exploitation consists of taking advantage and continuously improving firm's existing assets base (March, 1991; Molina-Castillo *et al.*, 2011). It stems in the logic of manipulating firm's actual resources and capabilities. Moreover, exploitation is a type of organizational learning gained through internal search, refinement of the existing competences, and ongoing use of firm's existing routines (Baum *et al.*, 2000), or enhancements in existing competences and build on firm's familiar technology (Benner & Tushman, 2003).

The abovementioned definitions put in evidence the nature, characteristics and implications of exploitation. The main characteristics of organizational exploitation as activity and capability at the same time can be underlined in the following. Firstly, exploitation is the use of existing assets and capabilities, or “the use and development of things already known”(Levinthal & March, 1993: 105). This means that it mainly is a refinement, i.e. by assuming exploitative strategy, a firm is not only filtering its resource-base but also improving them. Thus, exploitation is an underlying assessment of firms’ resources and capabilities aiming at leveraging them. Secondly, exploitation is a choice and selection: the repetitive character of exploitation leads companies to select only the efficient assets that work according to their trajectory. It is a kind of path learning, which implies that firms recognize the efficient resources, select them and then reuse them in their commercial ends. Thirdly, as exploitation bases on organizational old knowledge and experiences, manipulating firm’s existing resources, thus it is a process characterized by a direct realization of exploitative projects.

Furthermore, exploitation involves alignment, which means that it is a planned activity including allocation, organization and linkage of different factors. This, in turn, implies consistency between the organizational goals and its different means used to reach these goals. Furthermore, it involves control: as exploitation is a structured process, companies can easily control their activities aiming at taking the greatest possible advantages of their internal certainties. This means that achieving the exploitative goals throughout an established mechanism within the companies can be controlled, as it is a pre-set agenda. Additionally, exploitation needs tight organizational cultures and an efficiency-minded centralization (Benner & Tushman, 2003).

Many authors have investigated the impact of exploitation on firm performance, pointing out almost a common consensus about the existing of a positive effect. The table 2.7 provides some referential empirical sample studies analyzing such relationship. It presents a summary of the findings of each study about the influence of exploitation and the results of the companies, such as how financial benefits, innovation orientation and rates as well as the relative quality of the outputs, since reusing familiar assets leads to correcting the imperfections and avoiding future errors and then performing better than before.

Table 2.7: Sample of empirical studies analyzing exploitation-performance

Authors	The impact of exploitation on firm performance
Auh and Menguc (2005)	For "defender" companies, exploitation is negatively related to efficient firm performance as competitive intensity increases. Conversely, for "prospector" companies, exploitation is positively associated with efficient firm performance as competition intensifies.
Andriopoulos and Lewis (2009)	Exploitation enables firm success.
Hoang and Rothaermel (2010)	Alliance exploitation experience has positive effects on R&D project performance.
Yamakawa et al. (2011)	Although exploitation orientation of an alliance portfolio may benefit firm performance depending on how such an orientation fits the firm's internal organizational characteristics, strategic orientations, and the industry environment.
Molina-Castillo et al. (2011)	Exploitation positively affects firm performance through increasing product objective quality. The impact increases in high turbulent markets.
Kim et al. (2012)	Exploitation is positively associated with innovation rates, but negatively associated with impact. Innovation, in turn, affects firm performance.

Source: Author's own elaboration

Indeed, many authors consider that exploitation capability is necessary for companies to be productive in the short term (March, 1991; Yalcinkaya *et al.*, 2007). In other words, "the returns derived from exploitation are typically positive, proximate, and predictable" (Auh & Menguc, 2005). These instant benefits are fruit of short term orientation that prioritizes tactic commercial rewards ahead of strategic and long-distant rewards (March, 1991). In addition, this capability keeps on the organizational status-quo, as the non-strategic orientation rarely implies new organizational structure. Furthermore, "exploitation is associated with increasing the productivity of employed capital and assets-improving and refining existing capabilities and technologies, standardization, routinization, and systematic cost reduction" (Koza & Lewin, 1998: 256). In summary, literature supports that continuously manipulating, re-orientating and enhancing firm's existing assets and knowledge base increases significantly its performance. In this line, the third hypothesis of the present research is posed:

H_3: Exploitation capability positively affects firm performance.

2.3.2. Exploration capability

In organizational learning literature, exploration is widely considered as opposite to exploitation (Auh & Menguc, 2005; Benner & Tushman, 2003; Gilsing & Nooteboom, 2006; Greve, 2007; He & Wong, 2004; Hernández-Espallardo *et al.*, 2011; Hoang & Rothaermel, 2010; Kim *et al.*, 2012; March, 1991; Nielsen & Gudergan, 2012; Raisch *et* *al.*, 2009; Soosay & Hyland, 2008; Tu, 2010; Uotila *et al.*, 2009; Yamakawa *et al.*, 2011). Thus, in contrast with exploitation, exploration "includes things captured by terms such as search, variation, risk taking, experimentation, play, flexibility, discovery, innovation" (March, 1991: 71). Furthermore, in contrast with exploitation, exploration begins from the logic of creating new knowledge and strategic competences and new tools, and require fresh organization (Benner & Tushman, 2003; Lynn *et al.*, 1996). It relies basically on outsourcing (March, 1991), and reflects the experimentation of totally different technological trajectories (Benner & Tushman, 2003), or with new alternatives (Yamakawa *et al.*, 2011). In addition, it requires a flexible organizational form, a creativity-stimulating culture, an ability of appreciating longer-term and uncertain outcomes, and a decentralization cultures (Benner & Tushman, 2003), and results from research-grounded culture, flexibility, and divergent thinking (March, 1991).

According to the aforementioned definitions, exploration goes in the opposite direction of exploitation in many issues. For example, it is the searching for new and strategic knowledge and assets existed in firm's external environments. It requires a variation and an experimentation culture: this means that performing exploration, a firm is varying methods, resources, and values. This includes an underlying assessment of experimentation and opportunity seizing cultures. Additionally, it requires flexibility, as the nature of outsourcing needs an organizational flexibility for a necessary adaptation with different situations. Likewise, exploration is a kind of discovery and innovation: the inherent essence of exploration implies being innovative, searching for outstanding issues and bringing newness in the adequate moment. This newness is conditioned by the level of explorative efforts and resources inverted by companies.

Furthermore, exploration involves risk taking, as it seeks newness in an indefinite and uncontrolled sources, firms likely search in a *black box*, so the results are uncertain (March, 1991). These risks are derived from the threats in the environments, and therefore, differ in nature and scope. For example, Molina-Castillo *et al.* (2011) argued a positive relationship between exploration and firm performance by enhancing product innovativeness, however, they assessed also that this impact increases in lower turbulent markets, which implies that in may decrease in higher turbulent markets.

Exploration is also considered as a strategic assets building: in fact, many scholars consider that exploration activities leads to long terms success (March, 1991; Yalcinkaya *et al.*, 2007). Therefore, the benefits gained through exploration are fruit of long-term tenet that prioritizes strategic rewards ahead of distant and short-term rewards (Levinthal & March, 1993; March, 1991).

The effects of exploration have been analyzed within learning and innovation literatures. Many authors have argued positive effects that exploration has on organizational performance as a process of knowledge development. However, others consider that it is a risky and uncertain activity, claiming that a too much focus on exploration involves many risks of losing instant rewards (March, 1991). In this sense, Raisch *et al.* (2009) pointed out that a focus on exploration activities likely fosters the development of new knowledge and processes, while March (1991) points out that firms that neglect exploration and focus on exploitation may lack the capability to adapt to an evolving environment. Furthermore, exploration is associated with the discovery of new opportunities for wealth creation and above-average returns through innovation, new capabilities, and investments in absorptive capacity" (Nielsen & Gudergan, 2012). Additionally, the table 2.8 provides some empirical dealing with this issue.

Table 2.8: Sample of empirical studies analyzing exploration-performance

Authors	The impact of exploration on firm performance
Auh and Menguc (2005)	Exploration is positively related to effective firm performance for "defender" companies, and negatively related to effective firm performance for "prospector" companies.
Uotila et al. (2009)	Relative exploration orientation of the company exhibits a curvilinear (inverted U-shaped) relationship to the future financial performance of the company. Industry technological dynamism positively moderates this relationship.
Andriopoulos and Lewis (2009)	Exploration enables firm success and survival.
Hoang and Rothaermel (2010)	Alliance exploration experience has positive effects on R&D project performance.
Yamakawa et al. (2011)	Although exploration orientation of an alliance portfolio may benefit firm performance depending on how such an orientation fits the firm's internal organizational characteristics, strategic orientations, and the industry environment.
Molina-Castillo et al. (2011)	Exploration positively impact performance by enhancing product innovativeness. The impact increases in lower turbulent markets.
Kim et al. (2012)	Exploration is positively associated with innovation impact, but negatively associated with rates. Innovation, in turn, affects firm performance.

Source: Author's own elaboration

Concluding the main ideas the literature offers, exploration capability targets the acquisition of new knowledge, new organization forms, and other new competences.

This, in turn, forms the basis of innovativeness and successful launching of new outputs, which may lead to more customer satisfaction, efficient and innovative methods of doing things and thus increasing the outcomes and performance. In summary, exploration capability increases firm performance through renewing firms' competences. Hence, it is stated that:

H_4: Exploration capability positively affects firm performance.

2.3.3. Ambidexterity capacity

Management literature claims that in order to adequately face change, a company should assume an ambidextrous position (Andriopoulos & Lewis, 2009; Chandrasekaran *et al.*, 2012; He & Wong, 2004; Lubatkin *et al.*, 2006; O'Reilly & Tushman, 2008). This signifies being versatile and implies being involved in both exploration and exploitation at the same time. Ambidexterity is defined as "an organization's ability to be aligned and efficient in its management of today's business demands while simultaneously being adaptive to changes in the environment" (Raisch & Birkinshaw, 2008: 375). Although Raisch and Birkinshaw (2008) consider that Duncan (1976) was the first in introducing the term *ambidexterity*, it mainly stems in the trade-offs between exploitation and exploration (March, 1991), as "the tensions that are brought about by conflicting task demands and competing firm design requirements were initially thought of as insurmountable trade-offs forcing firms to choose either explorative or exploitative innovation pathways" (Chang & Hughes, 2012). Therefore, the underlying assumption of ambidexterity is joining both exploitation and exploration activities to be perfectly able to face with change requirements. However doing so is a challenging task; therefore, scholars have put forward different approaches to overcome such a problem.

Organizational ambidexterity is considered beneficial or even essential for organizations to survive and grow (O'Reilly & Tushman, 2004). Many empirical studies have dealt with this concept analyzing the effects and trade-offs of the ambidexterity on the organizational long and short-run performance (Andriopoulos & Lewis, 2009; Atuahene-Gima, 2005; Gibson & Birkinshaw, 2004; He & Wong, 2004; Lubatkin *et al.*, 2006).

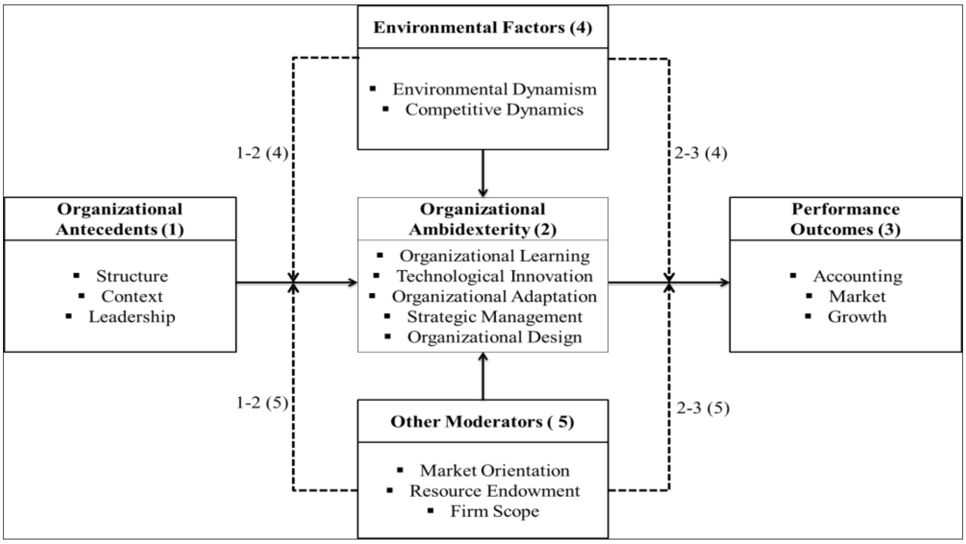
The trade-offs between exploitation and exploration constitutes the source of an ambidextrous attitude that joins both strategies and tackles the embedded advantages of both. Therefore, the ambidexterity occurs when integrating exploitation and exploration in firms' routines and processes. It is reflected in "the routines and processes, by which organizations mobilize, coordinate and integrate dispersed exploratory and exploitative efforts, and allocate, reallocate, combine and recombine resources" (Jansen *et al.*, 2009a :799). Many scholars consider organizational ambidexterity to be a dynamic capability (Eisenhardt & Martin, 2000; Jansen *et al.*, 2005; O'Reilly & Tushman, 2008) necessary for organizational learning and innovations (Andriopoulos & Lewis, 2009; O'Reilly & Tushman, 2008). Others (Gupta *et al.*, 2006; He & Wong, 2004; Lubatkin *et al.*, 2006; O'Reilly *et al.*, 2009) studied the effects of the ambidexterity on firm performance (Alpkan *et al.*, 2012; Lubatkin *et al.*, 2006). The synergy offered through ambidexterity, by managing exploitative and explorative behaviors at the same time, may partially justify the positive impact on firm effectiveness and performance that the aforementioned studies, among others, demonstrate.

The achievement of ambidexterity is a strategic goal, and to create ambidextrous position; firms must employ mechanisms able to stimulate such an integrative tendency (Raisch & Birkinshaw, 2008; Tushman & O'Reilly, 1996). Even this question is still subject of many studies, past research on ambidexterity has indicated different mechanisms that may foster an ambidextrous position of the company such as top-management team behavioral integration (Lubatkin *et al.*, 2006), contextual alignment and decision risk (Chandrasekaran *et al.*, 2012), formalization (Jansen *et al.*, 2006), and cross-functional interfaces (Mom *et al.*, 2009). In addition Chang and Hughes (2012) argued that "shaping right international organizational structures and adopting appropriate leadership styles" is able to foster organizational ambidexterity within small and medium-sized firms.

Likewise, many studies investigate the antecedents of ambidexterity. Chandrasekaran *et al.* (2012) argued that decision risk and contextual alignment affect ambidexterity competency for high tech organizations, while Gibson and Birkinshaw (2004) argues the importance of the contextual features, stating: "a context characterized by a combination of stretch, discipline, support, and trust facilitates contextual ambidexterity."

Finally, a widely cited study by Raisch and Birkinshaw (2008) provides an important review including contributions that were published in leading management journals since 1991. The result of their review is a framework that "integrate the antecedents, environmental influences, moderators, and performance outcomes of organizational ambidexterity" as depicted in the figure 2.11.

Figure 2.11: The influential factors for organizational ambidexterity



Source: Raisch and Birkinshaw (2008)

2.4. KEY FACTORS IN ORGANIZATIONAL LEARNING CAPABILITIES

In fact, literature suggests many forms of organizational learning depending on the various sources of knowledge. For example, Amara *et al.* (2008) distinguish among learning by doing, learning by training and learning by interacting. These types can be subdivided in intra-organizational learning, in which the knowledge source is inside the organization, and inter-organizational learning in which the target knowledge source is outside the organization. The first type occurs through doing things, using materials and acquiring knowledge form these actions, whereas the second type of learning happens through extramural networking and as well as through training, and development of skilled personnel.

Obviously, both types are conditioned by a series of endogenous and exogenous factors. Thus, based on a prior literature review, three main features are crucial: internal conditions and extramural factors. In this vein, company's absorptive capacity of external knowledge on the one hand and firm memory for preserving and leveraging the acquired knowledge on the other hand are addressed herein as key variables in learning performance. Thus, in this thesis, the focus is on the absorptive capacity of companies, their strategies for developing product innovations as well as their corporate memories.

2.4.1. Absorptive capacity

A key feature in management is how companies leverage knowledge spillovers. In this logic, absorptive capacity has revived an increasing importance, forming a core matter for numerous works. It has been studied on different levels; in different context and by different theorists. The focus herein is on the managerial aspect. Thus, the following paragraphs analyze such key factor that may determine the entrance and leveraging of knowledge capability, which could influence organizational learning outcomes and then innovation.

2.4.1.1. Concept and dimensions of absorptive capacity

The concept of *absorptive capacity* is rooted in macroeconomics, in which it refers to "the total amount of capital, or the amount of foreign capital, or the amount of foreign aid (capital plus technical assistance) that a developing country can use productively" (Adler, 1965), or to the overall ability of an economy of a country "to utilize capital productively" (Feeny & de Silva, 2012). So, originally, the term absorptive capacity was introduced to qualify the broad capacity of a given economy to leverage external material or/and financial resources. This reflects the philosophy of industrial economics era, as capitals and material resources were considered to be pivotal for growth and ongoing development. Therefore, companies that were able to absorb and manipulate external assets were considered to be competitive.

Recently, the notion absorptive capacity has become a core construct in most of the researches that adopt theories of resource-based view, knowledge-based view, dynamic capabilities, learning, innovation, managerial cognition and co-evolutionary (Volberda *et al.*, 2010). Furthermore, this construct has widely been examined within different fields, such as managerial cognition (Lenox & King, 2004), strategic management (Lane *et al.*, 2006), innovation (Cohen & Levinthal, 1990; Fabrizio, 2009; Rothaermel & Alexandre, 2009) technology management (Rothaermel & Alexandre, 2009; Schilling, 1998), international business (Kedia & Bhagat, 1988), organizational economics (Glass & Saggi, 1998; Luo, 2013) and open innovation (Lichtenthaler, 2009; Spithoven *et al.*, 2011). However, despite the huge increase in the absorptive capacity literature, there is no common consensus about a unique definition, determinant dimensions, antecedents and even about measurement scales of such a construct (e.g. Camisón & Forés, 2010; Cohen & Levinthal, 1990; Lane *et al.*, 2006; Lane & Lubatkin, 1998; Murovec & Prodan, 2009; Sun & Anderson, 2010; Todorova & Durisin, 2007; Volberda *et al.*, 2010; Zahra & George, 2002).

Many contributions within these approaches have been formulated assessing the role of absorptive capacity in the processes whereby companies acquire and leverage knowledge existing in their environments (Czarnitzki & Kraft, 2004; Hurmelinna-Laukkanen & Olander, 2014; Lavie & Rosenkopf, 2006; Zahra & George, 2002). Thus, the resource-based, knowledge-based and the dynamic capabilities approaches describe absorptive capacity as a strategically valuable capability for creating competitive advantage and higher organizational performance through "knowledge selection and linkage" (Larrañeta *et al.*, 2012). Furthermore, in the context of organizational learning, it allows companies to acquire the latest market knowledge, which is considered a key antecedent of successful innovation development.

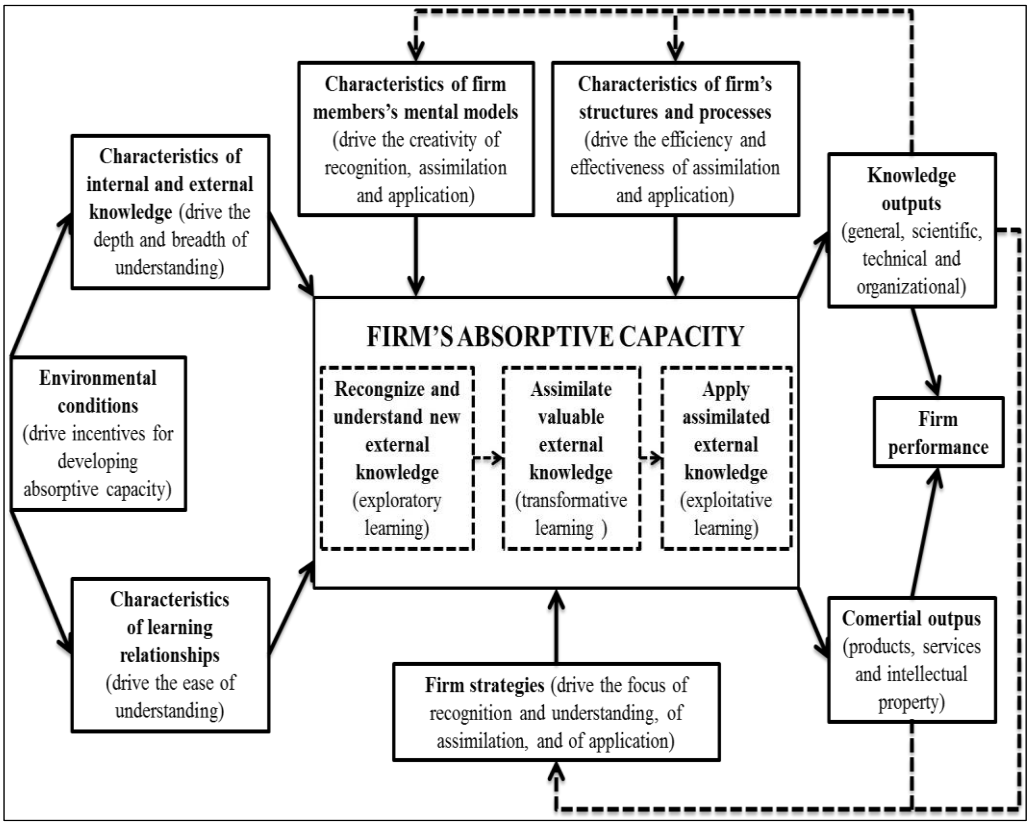
A plethora of definitions has been provided aiming at defining and delimiting the concept of absorptive capacity. Within organizational context, a pioneer definition was introduced by Cohen and Levinthal (1990) as a firm's "ability to recognize the value of new information, assimilate it, and apply it to commercial ends". The endogenous driver of their emphasis on absorptive capacity is the fact that they consider "external knowledge does not equally benefit all firms, and that the benefits enjoyed by the firm are determined in part by the firm's own actions and resources" (Fabrizio, 2009: 255). Therefore, according to them, acquiring just external assets and information is not enough. Instead, companies' ability to manipulate the acquired knowledge and capabilities determines its real absorptive capacity.

Such a definition encloses, in holistic terms, the processes of identification of knowledge existing in companies external environments, acquisition of such a knowledge, convert it and insert it in value creation systems within companies. However, in a further development of the term, Zahra and George (2002) re-conceptualize and present this construct as a compound of two different, but complementary subsets: potential absorptive capacity (PACAP) and realized absorptive capacity (RACAP). They identify potential absorptive capacity as the capacity of a company to acquire and assimilate knowledge, while the realized absorptive capacity explains the capacity to transfer knowledge into the company and exploit it in the different commercial purposes.

Amongst the relatively recent contributions about the absorptive capacity the one presented by Lane *et al.* (2006) in which they assessed 289 articles selected from 14 indexed journals addressing differently this issue. They state that "absorptive capacity is a firm's ability to utilize externally held knowledge through three sequential processes: recognizing and understanding potentially valuable new knowledge outside the firm through exploratory learning, assimilating valuable new knowledge through transformative learning, and using the assimilated knowledge to create new knowledge and commercial outputs through exploitative learning" (Lane *et al.*, 2006: 856).

According to these authors, the characteristics of knowledge itself and those of learning mechanisms facilitate knowledge understanding and absorption. This means that although knowledge is available in companies' environment, the degree of leveraging depends on three key variables. It depends directly on the nature of the targeted knowledge and the intrinsic specificities of learning mechanisms adopted by the company in question. Furthermore, environmental conditions such as technological and market dynamism steer companies' intentions towards knowledge acquisition, shaping their capability to leverage such knowledge. The effect of environmental dynamism on learning outcomes was also analyzed and assessed by Jansen *et al.* (2009b). Likewise, organizational internal variables such as firm's structure, processes and characteristics of staff and the adopted strategies affect its capacity of knowledge absorption. These principles are depicted in the model these authors propose, including the processes, antecedents and outcomes of absorptive capacity within companies as shown in figure 2.12.

Figure 2.12: The model of Lane et al. (2006)



Source: Lane *et al.* (2006)

Studies differ in determining the absorptive capacity sources. The *first-generation understanding* of the absorptive capacity goes mainly around R&D, manager experience and capabilities, patents and inter-organizational relationships in explaining firm's absorptive capacity sources (Adler, 1965; Cohen & Levinthal, 1990). Recent studies, instead argue that absorptive capacity is a multidimensional concept, and therefore it goes beyond the aforementioned criterion. Instead, it is rooted partially in other elements related to the environment, the process and the organizational structures, etc. (e.g. Jansen *et al.*, 2005; Lane & Lubatkin, 1998; Lane *et al.*, 2001; Lichtenthaler, 2009; Minbaeva *et al.*, 2003; Van den Bosch *et al.*, 1999). Consequently, there is a greater tendency to measure absorptive capacity considering, apart from knowledge base, aspects like motivation, personal abilities and management mechanisms. Based on different studies, Camisón and Forés (2010) highlighted the dimensions of absorptive capacity, according to the information shown in the table 2.9.

Table 2.9: Dimensions of absorptive capacity

Dimensions	Definition	Authors
Acquisition	Acquisition capacity is a firm's ability to locate, identify, value and acquire external knowledge that is critical to its operations.	Lane and Lubatkin (1998), Zahra and George (2002), Liao *et al.* (2003)
Assimilation	Assimilation capacity refers to a firm's capacity to absorb external knowledge. This capacity can also be defined as the processes and routines that allow the new information or knowledge acquired to be analyzed, processed, interpreted, understood, internalized and classified.	Szulanski (1996), Zahra and George (2002)
Transformation	Transformation capacity is a firm's capacity to develop and refine the internal routines that facilitate the transference and combination of previous knowledge with the newly acquired or assimilated knowledge. Transformation may be achieved by adding or eliminating knowledge, or by interpreting and combining existing knowledge in a different, innovative way.	Kogut and Zander (1992), Van den Bosch *et al.* (1999)
Application	Application or exploitation capacity refers to the organizational capacity based on routines that enable firms to incorporate acquired, assimilated and transformed knowledge into their operations and routines not only to refine, perfect, expand and leverage existing routines, processes, competences and knowledge, but also to create new operations, competences, routines, goods and organizational forms.	Lane and Lubatkin (1998), Zahra and George (2002)

Source: Camisón and Forés (2010)

The relationship between firm dimensions (potential and realized) has been studied and many contributions have dealt with this issue. For example, in their model, Zahra and George (2002) defended a relationship between the subcomponents of the absorptive capacity, arguing that the potential affects positively the realized since knowledge transformation and exploitation is prior to its acquisition and assimilation. Furthermore, they presumed that "political and social integration mechanisms are determinant in this interaction. In this logic, it is considered that potential absorptive capability offers an organization a stock of knowledge, whereas realized absorptive capability is the next logical step to harness the knowledge base through discussions and employee engagement (Setia & Patel, 2013: 413). Likewise, Lev *et al.* (2009) argued empirically that the higher is the potential stocks the higher is the realized ones, arguing in addition a positive relationship between the different dimensions of first and the corresponding dimensions of the last. Similar results were found by Setia and Patel (2013: 413), who considered that "together, acquisition and assimilation capabilities create the internal knowledge base of an operations management department. To realize the business potential of such a knowledge base, organizations build realized absorptive capability that helps to transform operations management strategies and to establish rules and routines to exploit the new knowledge". In conclusion, the acquisition and assimilation of knowledge is logically prior to the knowledge base creation and manipulation (Malhotra *et al.*, 2005). Thus:

> *H_5: A firm's potential absorptive capacity positively affects its realized absorptive capacity.*

2.4.1.2. Absorptive capacity and exploitation capability

The capacity of a company to acquire external knowledge is a determinant of knowledge renovation and reconfiguration, and therefore performance (Martínez-Cañas *et al.*, 2012; Tseng *et al.*, 2011). Cohen and Levinthal (1990) suggest that absorptive capacity is an organizational capability developed through the process of internal R&D in a specific domain of knowledge, so making the organization more receptive to absorbing knowledge from external sources. They argue that, in contrast with *learning-by-doing*, absorptive capacity allows the company to leverage external knowledge and then to learn how to do different things. Zahra and George (2002) redefine the dimensions of this construct, assessing the role of internal exploitation of resources and capabilities. Analyzing the work by Cohen and Levinthal (1990), they claim that absorptive capacity is a dynamic capability with two distinct dimensions. Potential absorptive capacity reflects the ability to acquire and assimilate external knowledge, while transformation and exploitation of the acquired knowledge explain realized absorptive capacity. Potential absorptive capacity enhances the reception of knowledge by a company, while realized absorptive capacity represents the set of organizational routines related to transformation and use of the acquired knowledge.

Cohen and Levinthal (1990)'s work also stresses the fact that the organizational history of learning serves as a pre-requisite for the absorption of knowledge. For effective absorption to occur, it is necessary for organizations to have followed an appropriate prior path of learning in the relevant domain. According to this view, an absorptive capacity is linked to specific domains of knowledge, rather than being an organization-wide capability. Scholars have presented many different factors that may increase a firm's absorptive capacity. For instance, Lenox and King (2004) consider that the mere provision of information within the company constitutes a relevant source of development of absorptive capacity, while others (e.g. Cohen & Levinthal, 1990; Griffith *et al.*, 2004; Kneller & Stevens, 2006) consider it to be a result of self-enhancement through abundant and continuous engagement in R&D over time. Hoang and Rothaermel (2010) argue that absorptive capacity is built through repeated experience and activities. This, in turn, fits the definition of exploitation, which is the reconfiguration and reuse of a firm's current resources and capabilities to generate performance (Benner & Tushman, 2003; March, 1991). These path-specific learning approaches suggest that organizational absorptive capacity is closely related to internal exploitative activities. Furthermore, considering the approach by Zahra and George (2002), realized absorptive capacity which is a firm's capability to develop and improves the routines that facilitate combining existing knowledge and the newly acquired and assimilated knowledge, may directly impact exploitation capacity of the same firm. Thus, through a firm's realized absorptive capacity, the reuse and reconfiguration of existing certainties may be enhanced. Hence:

H_6: Realized absorptive capacity positively affects a firm exploitation capability.

2.4.1.3. Absorptive capacity and exploration capability

In today's rapidly changing environments, companies should know how to act appropriately and rapidly. The ability to respond to the surrounding challenges reflects the effectiveness of a firm's organizational responsiveness and pioneering (Garrett *et al.*, 2009). Daft and Weick (1984) argued that the fundamental processes involving the "recognition and interpretation" of environmental changes influence organizational responsiveness to those changes. "Recognition and interpretation", in turn, reflects the main part of potential absorptive capacity, according to Zahra and George (2002). Furthermore, the ability to diagnose adequately the surroundings and take advantage of the available knowledge in the area conditions the responsiveness, or the capacity to adapt, which explains the other subset of absorptive capacity according to the approach of Zahra and George (2002).

Many researchers have studied absorptive capacity from different perspectives (e.g. Cohen & Levinthal, 1990; Lane & Lubatkin, 1998; Murovec & Prodan, 2009). As a dynamic and organizational capability, Zahra and George (2002) argue that improving realized absorptive capacity may lead to instant rewards, while enhancing potential absorptive capacity may lead to a renewal of the firm's knowledge (Jansen *et al.*, 2005; Zahra & George, 2002). The renewal of a firm's stock of knowledge is the main target of exploration, which, according to March (1991), seeks diversification and new options. This is because exploration begins from the logic of creating new knowledge and strategic competences, and tends to invent new products or services with new tools and fresh organization (Auh & Menguc, 2005; Molina-Castillo *et al.*, 2011).

Investigating the effects of exploration and exploitation in alliance formation, Lavie and Rosenkopf (2006) argued that absorptive capacity enhances exploration. Rosenkopf and Nerkar (2001) express the same idea, considering that absorptive capacity encourages entrepreneurship and the discovery of novelty. Although Rosenkopf and Nerkar (2001) explained the relationship between absorptive capacity and exploration as the intersection between the effects of "having the ability to identify acquire and use external knowledge and the research of that knowledge", Lavie and Rosenkopf (2006) considered that higher absorptive capacity encourages firms to explore and seek new potential sources of knowledge.

Absorptive capacity is, basically, a result of self-enhancement through abundant and continuous engagement in research over time (Cohen & Levinthal, 1990; Tu *et al.*, 2006). Hoang and Rothaermel (2010) argued that absorptive capacity grows through repeated exploratory activities. Furthermore, firms probably have a consistent absorptive capacity when they assume a prospective strategy, which leads them to adopt an exploratory position.

Although Zahra and George (2002) maintain that firms should manage all their absorptive capacity successfully to obtain higher performance, Jansen *et al.* (2005) draw a clear distinction between the effects the two dimensions may have on organizational performance. According to them, firms focusing on potential absorptive capacity, which fits the essence of exploration, are able to renew their knowledge stock continually. Conversely, firms focusing on realized absorptive capacity (transformation and use may lead to more exploitation rather than exploration) may achieve short-term benefits, but could suffer strategic losses.

Overall, exploration targets the acquisition of external knowledge (Gilsing & Nooteboom, 2006; March, 1991), which requires a prior identification and assimilation (potential absorptive capacity) as a prerequisite. Moreover, the ability of a firm to transform and use acquired knowledge can be seen as a path-dependent experience, which is the essence of realized absorptive capacity. Thus, higher realized absorptive capacity may encourage firm to explore new alternatives more efficiently as path-dependency argues. Consequently, the seventh hypothesis of the present research is established as follows:

H_7: Realized absorptive capacity positively affects a firm exploration capability.

2.4.1.4. Antecedents of firm's absorptive capacity

Antecedents of companies' absorptive capacity have been treated by many authors, arguing the effect of different key variables on firm's AC. Cohen and Levinthal (1990) suggest that absorptive capacity development is a path-dependent process, which implies that prior related knowledge and experience about technical and infrastructure development process and tasks condition the enhancement processes of absorptive capacity. Jansen *et al.* (2005) argued that cross-functional interfaces, participation in decision-making, and job rotation improve company's potential absorptive capacity on the one hand, and that connectedness and socialization tactics enhance firm's realized absorptive capacity on the other hand. Likewise, Fabrizio (2009) pointed out that the firms collaboration with universities and with scientists of the universities improve their absorptive capacities of knowledge, providing at the same time "advantage in terms of both the timing and quality of search outcomes".

In a study aiming at exploring the implications of companies identification of their R&D approaches, Wiethaus (2005) argued that "identical broad R&D approaches 'connect' firms with their R&D environment and maximize absorptive capacities, the opposite holds for idiosyncratic R&D approaches".

In summary, absorptive capacity-enhancing constitutes the subject of an important amount of studies, indicating several factors that may contribute to firm's absorptive capacity development. Broadly, prior knowledge (Cohen & Levinthal, 1990), combinative capabilities (Kogut & Zander, 1992; Van den Bosch *et al.*, 1999) and adaptive capabilities of the companies among other variables all have previously been appointed in the literature as antecedents of absorptive capacity. The table 2.10 summarizes the results of many relevant studies in this subject.

Table 2.10: Antecedents of absorptive capacity according to referential contributions

Authors	**Antecedents of absorptive capacity**
Cohen and Levinthal (1990)	Investments in R&D and related activities.
Lane et al. (2001)	Trust and cultural compatibility between acquiring firm and source of knowledge.
Jansen et al. (2005)	Cross-functional interfaces, job rotation, and socialization of tactics, connectedness, participation in decision-making processes.
Rosenberg (1990), *Lane and Lubatk (1998)*	Firm's basic research activities.
Zahra and George (2002)	Routines of the firm.
Wiethaus (2005)	Identical broad R&D approaches maximize absorptive capacities, the opposite holds for idiosyncratic R&D approaches.
Vinding (2006)	Employees skills
Mowery et al. (1996)	Technological commonality between the acquiring and origin companies or and the relatedness of their research.
Kogut and Zander (1992)	Combinative capabilities
Lenox and King (2004)	Individuals' abilities and motivations

Source: Author's own elaboration

Finally, despite the increasing number of empirical researches (Cohen & Levinthal, 1990; Lichtenthaler, 2009; Volberda *et al.*, 2010; Zahra & George, 2002), there is no common agreement about which internal and external variables that may have major impacts on the development of companies' AC and vice-versa. However, major part of literature tends to affirm that prior investments in R&D and related activities (Cohen & Levinthal, 1990) as well as routines of the firm (Zahra & George, 2002), which constitute the organizational memory matter as antecedent of firm's absorptive capacity.

2.4.2. Product innovation strategy and learning capabilities

As previously analyzed in chapter I, an innovation strategy is a planned process aimed at developing successful innovations. Furthermore, it emphasizes the innovativeness as well as the perpetual inversion in R&D aiming to develop newness and being ahead of its competitors. Yet, argued that learning can occur based on internal or external researching or by involving in both. Herein an emphasis is put on the influence of a product innovation strategy on exploitation and exploration capabilities as in the following parts.

2.4.2.1. Innovation strategy and exploitation capabilities

In the process of searching for novel applications, companies' managers stimulate new ideas generation, assessing old ones while planning a systemic innovation roadmaps converting "raw ideas" into commercial values. This learning-like activities is the other face, together with innovation, of R&D activities (Cohen & Levinthal, 1989). Furthermore, the repetition of the various processes makes the employees' ideas more developed and mature. Since experience argues that iterative processes yield results that are much better than linear processes because they are built on natural human attributes, the capacity to improve workers competences through learning significantly increases.

In this context, companies that are oriented towards bringing new products likely attempt to continue exploiting what they know, targeting productivity, continuous improvement, quality management and other process or technique which enable to make improvements to their existing products. In other words, companies that establish innovative strategies usually leverage their existing knowledge to make improvements and innovations in their products.

Furthermore, organizations that do no clearly adopt an innovation strategy may favor the re-manipulation of their familiar processes and competences, ahead of venturing (Miles *et al.*, 1978). In addition, the maintenance and evolution of firm's familiar competences depends on innovation strategy it adopts (Brockhoff & Guan, 1996). Therefore, the adopted of an innovation strategy may influence exploitative learning through re-manipulation of internal competences (Akgün *et al.*, 2006). Thus:

> *H_8: A firm's product innovation strategy is positively related to its exploitation capability.*

2.4.2.2. Innovation strategy and exploration capabilities

As a systemic process, an innovation strategy targets organizing and converting valuable ideas into advantageous products. It shapes the process of conversion of individual ideas into palpable outputs. Furthermore, it involves searching for, and systematically filtering, new ideas, applying processes for turning the best ones into innovations, and using tools to bring these innovations to markets (Cheng *et al.*, 2010).

Broadly, a company can adopt an innovation strategy, imitate other leading companies or assume the attitude of no-innovation. Although having a strategy established favors innovation, the impact varies according to many features. In this logic, Miles *et al.* (1978) postulated four broad strategies, arguing that companies develop their adaptive strategies according to their perception of their environments. According to them, organizations that adopt prospector strategy prioritize new product and service development and innovation to meet new and changing customer needs and demands and to create new demands. The main characteristic of this strategy is that often leads the company to burgeon in changing and dynamic business environments, and succeed in discovering new opportunities. Moreover, they often foster creativity. In contrast, defender organizations function best in stable environments. These organizations achieve success by specializing in particular areas and using established and standardized technical processes. Because their environments change slowly, defender organizations can rely on long-term planning. The analyzer organizations share characteristics with prospector and defender organizations, thus, they face the entrepreneurial problem of how to maintain their shares in existing markets and how to find and exploit new markets and product opportunities. These organizations have the operational problem of maintaining the efficiency of established products or services, while remaining flexible enough to pursue new business activities. Consequently, they emphasize new product and service development to remain competitive when the market changes. Although organizations that assume reactor strategy are not prepared for change occurring in their business environments, they do not have a systematic strategy, design, or structure. Their new product or service development fluctuates in response to the way their managers perceive their environment (Miles *et al.*, 1978). The lack of strategy leads this last kind of companies to have instant and limited objectives, while the strategies, as in the former types, offer important rewards, depending on firm's competences.

Consequently, companies that are characterized by being the pioneers in adopting pro-innovation strategies (e.g. prospector organizations) may have to develop additional measures, favoring exploration of competences that enable them to develop new products for potential future markets (Miles *et al.*, 1978). This, in turn, sheds light on the relatedness between explorative behaviors and the adoption of innovation strategy. Furthermore, Zheng-Zhou (2006), argued that an innovation strategy requires investments in R&D which implies the exploration of new technologies for developing innovative products. Thus:

> *H_9: A firm's product innovation strategy is positively related to its exploration capability.*

The previous discussions highlight the key role of establishing an innovation-strategy in strengthening both learning capabilities. This is because an innovation strategy prioritizes knowledge identification, acquisition and manipulation, which is consistent with the underlying reason of organizational learning. Furthermore, companies adopting strategies that enhance the development of new products may explore new distinctive competences (Zheng-Zhou, 2006). Furthermore, companies that follow an exploitative tenet these companies likely use to strengthen their exploitative capabilities to face potential challenges. Thus, the influence of innovation strategy on exploration capability is likely higher than exploitation capability since the latter focuses on the internal reuse rather than prospecting extramural knowledge opportunities as an innovation strategy targets. Thus:

> *H_{10}: A firm's product innovation strategy is more related to its exploration capability than its exploitation capability.*

2.4.2.3. Innovation strategy and absorptive capacity

Likewise, an innovation strategy includes also pioneering in involving in innovative actions such as new products development and new forms of commercializing these products…etc. However, developing and commercializing successful innovations require leveraging the valuable knowledge existing inside and outside the company (Andriopoulos & Lewis, 2009; Atuahene-Gima & Murray, 2007; Baker & Sinkula, 1999a; Chen *et al.*, 2009; Gilsing & Nooteboom, 2006). This, in turn, requires an effective absorptive capacity (Camisón & Forés, 2010; Cohen & Levinthal, 1990; Peter *et al.*, 2001; Zahra & George, 2002). Thus, an effective strategy aiming at successfully carrying out innovations may strengthen firm identification and acquisition of the external information on the one hand, and the transformation and exploitation of the acquired knowledge on the other hand.

According to the model by Morris (2006), the second stage after the strategy setting is research and ideation, which implies R&D involvement in the innovation process, as companies expose new missing knowledge enabling the generation of the useful new ideas. Research and development have been considered as the main activities able to strengthen absorptive capacity (Cohen & Levinthal, 1990). Furthermore, the mere implementing of an innovation strategy explains a certain level of preparation for acquiring and managing knowledge. This ability would be translated into concrete mechanisms leading to leveraging the available knowledge from outside the company.

Likewise, the involvement in an innovation strategy is able to generating an innovative environment inside the company (Li *et al.*, 2006). This leads to the spreading and exchange of knowledge among companies' staffs. Therefore, knowledge disseminates, and thus firm memory grows.

In addition, developing innovation strategies, companies are likely aiming at responding to environmental challenges and finding solutions to these challenges (Naman & Slevin, 1993). This happens through prioritizing innovative behaviors aiming at gathering and coordinating lacked knowledge and organization forms. Such a burden becomes difficult as environments are becoming dynamic and complex. In summary, an innovation strategy creates knowledge-based valor and innovation.

Innovation strategy establishment leads companies to seek new knowledge, which influence their identification and assimilation capability. It entails also exploiting knowledge once acquired. In doing so, firms are fostering their realized absorptive capacity. Consequently, researching for and creating knowledge for innovation purposes increases the capability of companies to be receptive, strengthening at the same time their knowledge base. This receptiveness is rooted in personal experiences acquired during the knowledge creation and dissemination process, which positively affect a firm's future absorptive capacity. In other words, when companies emphasize knowledge searching for having their knowledge base updated as well as for innovating, they are likely improving their absorptive capacity. Thus:

H_{11}: Product innovation strategy has a positive relationship with a firm's overall absorptive capacity.

H_{11a}: Product innovation strategy has a positive relationship with a firm's potential absorptive capacity.

H_{11b}: Product innovation strategy has a positive relationship with a firm's realized absorptive capacity.

2.4.3. Organizational memory

A wide range of scholars sustains the necessity of institutionalizing firm's former experiences and knowledge. Furthermore, the path-dependency approach argues that firm past determines its present as well as its future. Thus, firm memory may determine its capability to absorb and leverage new information. In this sense, a review about the relationship between firm old experiences and knowledge on the one hand and its absorptive capacity is thoroughly analyzed.

2.4.3.1. Concept and implications of organizational memory

One of the main concerns of knowledge management is the creation and maintenance of an effective "organizational memory" or a knowledge repository in which intellectual assets including the collective experience of the organization will reside in an organized and structured mode. In other words, storage, organization and retrieval of organizational knowledge are key aspects of effective knowledge management (Stein & Zwass, 1995). Organizational memory (sometimes called corporate or institutional memory) refers to the "collective beliefs, behavioral routines, or physical artifacts that vary in their content, level, dispersion, and accessibility" (Moorman & Miner, 1997: 93). It can be also defined as the accumulated body of data, information, and knowledge created during the course of an organization's life and stored in the firm's individuals, culture, transformation, structure, ecology, and external archives (Walsh & Ungson, 1991). In addition, organizational memory stands for companies prior knowledge including market factors and knowledge about competitive environment, so, it is a key factor, as this type of knowledge is a core asset (Camisón & Villar-López, 2011).

Organizational memory includes all knowledge residing in firms' various repositories, such as written documentation, structured databases, codified human knowledge, culture and documented organizational procedures and processes, and can be divided into two subsets: the organization's databases and individuals' memories. Individual memory stands for personal observations, experiences and actions (Argyris & Schön, 1978), while organizational memory deals with the way in which knowledge of the past and experiences influence present organizational activities (Stein & Zwass, 1995).

Moorman and Miner (1997) offer a different categorization, considering that organizational memory exists in three main forms: the cognitive elements such as organizational beliefs, knowledge, frames of reference, models, values, and norms, the organization's experiences that are determined in its formal and informal behavioral routines, procedures, and scripts, and finally the physical aspects that include organizational structure and physical layouts. Likewise, Stein and Zwass (1995) distinguish between semantic memory, which stands for general explicit and articulated knowledge of an organization, and episodic memory that refers to knowledge located in a specific context within specific circumstances.

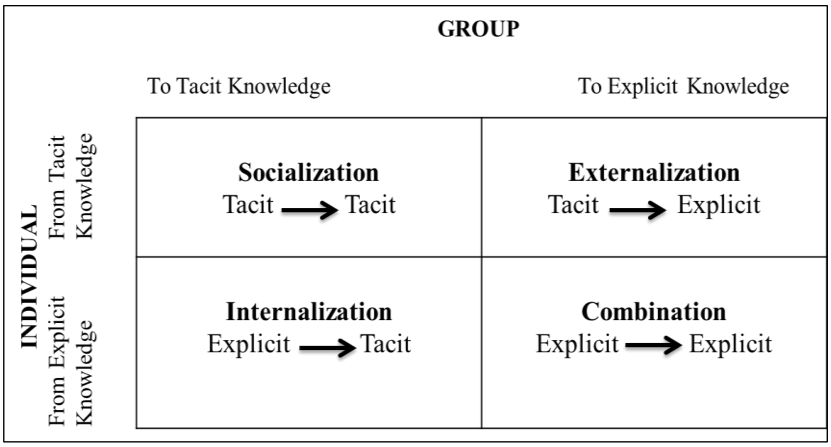
The above definitions offer an evident delimitation of organizational memory. Broadly, organizational memory can be seen in three sub-sets. The first subset includes data, information and knowledge. The second is the behavioral part, including firm experiences, while the third subset tackles the physical and structural issues. Data refers to information in unorganized form that refers to ideas or objects, while information stands for contextual and organized data. Knowledge, in turn, results from the interpretation and understanding of the data, information and experiences, and is divided into two main categories: explicit and implicit (tacit) (Polanyi, 1966).

Explicit or skilled knowledge refers to "codified knowledge articulated in words, figures, and numbers. It is objective, and relatively easy to share in the form of specifications, standard operating procedures, and data" (Anand *et al.*, 2010: 304). Moreover, explicit knowledge refers to "more objective, rational and technical knowledge. It is articulated knowledge, which can be specified verbally or in writing such as computer programs, patents, drawings, concepts or formulas" (Hau & Evangelista, 2007: 1154). It is "a type of knowledge which can be articulated in formal language including grammatical statements, mathematical expressions, specifications, manuals, and so forth" (Nonaka & Takeuchi, 1995).

Tacit knowledge is "knowledge that has not been codified and is relatively difficult-to-codify. It is subjective and based in individual experiences" (Anand *et al.*, 2010: 304). It also can be defined as "knowledge which is intuitive, unarticulated, non-verbalized or even non-verbalizable" (Hau & Evangelista, 2007: 1154). Tacit knowledge reflects the implicit knowledge that is obtained through individual experiences, reflection, internalization or individual intuitions and viewpoints. It is normally difficult to manage in the same manner as explicit knowledge, therefore most of the organizations depend highly on the explicit knowledge as an advantage source (Nonaka & Takeuchi, 1995).

The conversion of knowledge from tacit to explicit is an important aspect of knowledge management in companies. Therefore the underlying principle of knowledge-creation by Nonaka (1994) depicts a model of patterns of practices that are able to transform individual knowledge to group knowledge which is a step towards organizational memory creation or improvement if yet existed. The framework presents the process of knowledge institutionalization as cycles of conversions between two types of knowledge-explicit and tacit (see figure 2.13) from individuals to groups and then to the organizational different bins.

Figure 2.13: Nonaka's (1994) model of knowledge transformation and creation



Source: Nonaka (1994)

In sum, one of the main targets of knowledge management is the creation of an organizational memory, institutionalizing individual knowledge and corporate experiences and retaining them for future use. Such a process is presented in different manner by different authors such as the previous example of Nonaka (1994), and the one of Walsh and Ungson (1991) among others. Finally, a bibliography-like contribution by Chang *et al.* (2004) proposes a list of organizational memories studied in various researches in different fields. Broadly, they analyze human, computer and systems stored knowledge. Although these memories differ physically, the common denominator among them is that they stand for an identic storage system of knowledge that be used in the future in different purposes. Table 2.11 provides additional information.

Table 2.11: A comparison between organizational memories

Group	Research	Definition	Storage layer
Technology	Walsh and Ungson (1991)	Stored information from an organization's history that can be brought to bear on present decisions	N/A
	Bannon and Kuutti,1996,Chen *et al.*, 1994 and Schmidt and Bannon, 1992	Stored information during project	Common information space
	Conklin,1993and Conklin, 1996	The record of an organization that is embodied in a set of documents and artifacts in order to amplify assets	Hypertext repository Artifct-oriented Process oriented
System	Stein and Zwass (1995)	Means of memory about organizational knowledge for organizational effectiveness	Mnemonic layer
	Morrison, 1993 and Morrison and Weiser, 1996	Means of memory about organizational knowledge for organizational effectiveness	Memory base Mnemonic function
	Burstein *et al.* (1998)	Means of memory about organizational knowledge for organizational effectiveness	Pragmatic Conceptual Process
Human	Heijst *et al.*, 1996 and Heijst *et al.*, 1998	An explicit, disembodied, persistent representation of knowledge and information in an organization	Storage Work experience
	Nonaka and Konno (1998)	N/A	ART model Action Reflection Trigger
	Brooking (1999)	A physical mechanism of computer storage for knowledge asset	N/A
	Schwartz *et al.* (2000)	N/A	AOD model Acquire Organize Distribute
Harmony	Kuhn and Abecker (1998)	A comprehensive computer system which captures a company’s accumulated know-how and other knowledge assets and makes them available to enhance the efficiency and effectiveness of knowledge-intensive work processes	Computer support KM Artifact centered Process centered

Source: Chang *et al.* (2004)

Scholars consider that organizational memory is an important source of competitiveness and efficiency for companies. For example, Stein and Zwass (1995) argued that firm memory increases organizational effectiveness by supporting the coordination of work, management of information, the organization's responsiveness to changes, and the definition and pursuit of organizational goals. Likewise, Wilkins and Bristow (1987) argue the effectiveness of change based on past organizational experiences and credentials, as reapplying past solutions and standards is able, not only to facilitate the implementation of new measures, but also to avoid wasting of companies resources.

Similar reasons, shedding light on the importance of creating an organizational memory, are offered by Huber (1991) who emphasizes the key effect of building an organizational memory in the process of creating and maintaining knowledge in companies. Although, he focuses on the importance of computer systems, the need of establishing mechanisms to store and retrieve information is also highlighted through his contribution in question. Concretely, he approaches that organizational memory plays a critical role in the process of organizational learning. Likewise, Walsh and Ungson (1991) also indicate that organizational memory may contribute to the efficiency and effectiveness of decision-making, particularly in the pre-selection case scenario. This displays the impact on any decision. Furthermore, Senge (1990) argues that learning builds on existing knowledge and past experience, i.e. organizational memory.

However, different negative consequences of organizational memory were discussed along literature. In this logic, Argyris and Schön (1978) argue that firm memory-based management can lead to maintain a single cycle learning through a process of *error-detection-and-correction-like* style, leading to a static and resistant to change organizational culture. This is, in turn, similar and coherent with March's (1991) view about exploitation and exploration learning mechanisms, as he considers that an overemphasis on exploitation that mainly bases on memory and existing assets' use may lead companies to a sort of *success trap,* and then negatively impacts strategic learning based on exploration of external sources. Similar presumptions, but on personal level are proposed by Starbuck and Hedberg (1977), considering that the personal memory overuse may lead to a somehow predisposition in decision-making.

Finally, it seems to be important to highlight that many problems associated with the formulation and design of firm memory were highlighted within knowledge management literature. Nevo and Wand (2005) suggest five reasons hampering the establishment of such a system, namely: contextualization and interpretation problem, location of knowledge, the tacit character of the major part of the knowledge, the vitality of knowledge and the retainer's reliability. All of these variables are susceptible to hinder the settlement of an organizational memory able to form an accessible and available repository of usually needed knowledge.

2.4.3.2. Organizational memory and exploitation capability

Being on the cutting edge is usually the result of consistent learning throughout a company's history (Senge, 1990). Experience and success co-evolve. So, retrieving and manipulating the firm's past experience is important, not only to avoid new mistakes, but also to exploit valuable old knowledge. Walsh and Ungson (1991) offer a deeper insight into how former experiences of a company can affect its present decision making. They examine how the formal and tacit or "embedded" knowledge, acquired through firm's working history, can be stored and affect current decisions. Firm performance is path dependent, which explains the continual use of products or services based on the previous commitment of the company. In other words, a firm's history influences its subsequent behavior (Teece *et al.*, 1997). This is because continuing along an already set path is easier and more cost effective than creating an entirely new path. In this paper, organizational memory refers to old knowledge related to a given type or brand of product or service.

Since exploitation "includes things such as refinement, choice, production, efficiency, selection, implementation and execution of old certainties" (March, 1991: 71), it includes the reuse, reorientation and strengthening of the existing competencies of the company to enhance performance. Therefore, the subject of exploitation is the previous and present knowledge and capabilities of the company.

Investigating the effects of heterogeneous competence in pharmaceutical research, Henderson and Cockburn (1994) argue that a firm's previous or cumulative success can be a basis for future success. Exploitation and reuse of valuable old expertise may bring firms to new successes. The organizational competences that are needed are related to the knowledge created and accumulated by a firm through human capital and organizational routines, processes, practices and standards (Soosay & Hyland, 2008). A firm's old knowledge is important in the efficiency of the exploitation of the standard competences and assets. So:

> *H_{12}: A firm's organizational memory has a positive relationship with its exploitation capability.*

2.4.3.3. Organizational memory and exploration capability

It is vital that organizations change their actual behavioral patterns, providing opportunity for new knowledge creation, especially when these patterns have proved ineffective or outdated. This change happens via internal restructuring or through external sourcing, directed toward a fixed target (Molina-Castillo *et al.*, 2011). Numerous factors intervene in such change among which are the human and material credentials of the company, which creates a role for organizational memory as a background to external knowledge seeking endeavors.

Organizational memory, as previously argued, refers to the accumulated body of data, information, and knowledge created during the organization's course of action (Jackson, 2012), or "means by which knowledge from the past is brought to bear on present activities, thus resulting in higher or lower levels of organizational competitiveness" (Stein & Zwass, 1995). It reflects the sum of know-how acquired through the company's life, and plays an important role in future decisions (Huber, 1991; Walsh & Ungson, 1991). Moreover, Chang and Cho (2008) operationalized organizational memory, describing it as the pre-existing body of knowledge and experience with regards to a category of products or services. Many studies have linked organizational memory to a firm's ability to advance steadily towards a prosperous future.

According to Ignatius *et al.* (2012), knowledge and past experience constitute the basis for future learning. Learning, in turn, occurs using one of a number of different strategies focusing on: exploitation of the firm's internal knowledge to change organizational aspects and then gain rewards, exploration of knowledge in the company's environment to develop new ventures (March, 1991), or less frequently, adoption of a hybrid strategy joining certain levels of both (O'Reilly & Tushman, 2004). Thus, to experience new alternatives and explore external knowledge, companies need an existing body of knowledge as a basis to build on (Huber, 1991). Otherwise, companies are exposed to risk because of their lack of experiential trajectory, which constitutes a critical part of organizational memory, according to Walsh and Ungson (1991), and may lead to highly uncertain results. Thus:

> *H_{13}: A firm's organizational memory has a positive relationship with its exploration capability.*

2.4.3.4. Organizational memory and absorptive capacity

The path-dependence approach (Arthur, 1989; Dosi, 1982; Nelson & Winter, 1982) claims that firm's past, present and future trajectories are highly dependent, and that "the capital stocks are path-dependent. In this logic, prior knowledge (memory) is essential for recognizing the value of new knowledge and technologies for being acquired and manipulated later (Cohen & Levinthal, 1990). Moreover, within their model, Levinthal and March (1993) accentuate the importance of already acquired and stored knowledge in the exploitative learning, which fits realized absorptive capacity according to (Zahra & George, 2002). This, in turn, sheds light on the interdependencies among firm's memory and its capability to perform an identification-acquisition-manipulation process of external knowledge.

In addition, in their seminal work, Cohen and Levinthal (1990) argued that absorptive capacity is path-dependent, which implies that the lack of investment in absorptive capacity would limit the future development of firm capabilities. Based on this assumption, firm's accumulated knowledge and experiences (memory) derived from its investments in R&D are determinant in its capability to absorb and leverage the knowledge existing it its environments. In other words, companies would not be able to develop successful acquisition and exploitation of external knowledge unless they have significant knowledge repository. Furthermore, "the more extensive the scope of firms' prior search activities has been, the more familiar they become with their external environments, and the more effectual their channels and mechanisms for exploring external opportunities become" (Lavie & Rosenkopf, 2006: 803).

Likewise, in an empirical contribution Lichtenthaler (2008) expands knowledge storage to encompass external inter-temporal organizational relationships. He argued that "relative capability" offers external dynamic knowledge retention through alliances capabilities. Although, it is a type of virtualized memory, it depends on the AC of the company.

Yet argued that absorptive capacity is composed of two main subsets: potential and realized absorptive capacities (Zahra & George, 2002). According to such an approach, the realized absorptive capacity includes organizational routines targeting the ability of transforming the acquired knowledge making it available and accessible and leveraging it in the different commercial ends. The transformation capability explains the internalization process of this knowledge which is to be stored within the different repositories of organizational memory system (Nevo & Wand, 2005). In addition, the use of the internalized information in companies' projects should have repercussions on the socialization of such knowledge and then on the organizational memory in general.

In summary, organizational memory facilitates that companies know where and how to seek new knowledge existing in their environments. Likewise, the use of memory enables companies to know their customers as well as their supplier behaviors, which is a main locus of valuable information (Cegarra-Navarro, 2007). The existent knowledge will facilitate the acquisition of new knowledge because it is easier to understand something new if the subject is yet known. Therefore, firm memory favors potential absorptive capacity. In addition, current knowledge will complement the new one and thus a richer knowledge is obtained to exploit the same. Thus, corporate memory favors also the realized absorptive capacity. Hence:

> *H_{14}: A firm's organizational memory has a positive relationship with its absorptive capacity.*
>
> > *H_{14a}: A firm's organizational memory has a positive relationship with its potential absorptive capacity.*
> >
> > *H_{14b}: A firm's organizational memory has a positive relationship with its realized absorptive capacity.*

2.5. CONCLUSION

Recent periods have known a significant development in management science, which results in many research approaches seeking at identifying how companies can develop and maintain competitive advantages and thus survive and grow. Concretely, in the last 20 years, there has been an explosion of frameworks for evaluating the determinants of differential performance, such as Porter's five forces framework, the resource-based view, competence-based view, transaction-cost economics and so forth. Although these frameworks offer different explanations of a firm performance sources, they have two underlying assumptions in common: "that competitive advantage arises through earlier or more favorable access to resources, markets, or organizational opportunities, and that exploiting such opportunities reflects some degree of active interpretation of internal and external environmental signals by managers" (Cockburn *et al.*, 2000). For example, Porter (1980, 1985)'s models pretend to explain differently the performance issue. His five forces' model highly prioritize the external forces of the market such as customer, supplier and so on in determining the strategy effectiveness of a company, whereas his value-chain is characterized by being internally oriented for creating values and then competitiveness.

A second approach is that of the resource-based view (Barney, 1991; Penrose, 1959; Wernerfelt, 1984) that argues that only firm's own resources and capabilities are able to make the difference. However, only the valuable, rare, inimitable, and non-tradable resources enable the primacy. Additionally, literature offers other approaches based on competences, "dynamic" capabilities and knowledge-based view. The common denominator of the recent approaches is that they emphasize the role of knowledge in the value-creation.

Although many classifications of "performance generators" have been identified through learning and innovation literature [e.g. core capabilities (Leonard-Barton, 1992), corporate distinctive competences (Hitt & Ireland, 1985; Snow & Hrebiniak, 1980), organizational competencies (Prahalad & Hamel, 1990), firm specific competence (Pavitt, 1991)], firm capabilities are the underlying knowledge base, related abilities, and the basic set of skills that enable a company to, effectively, carry out its activities (Prahalad & Hamel, 1990). In other words, "capabilities arise from the coordinated activities of groups of people who pool their individual skills in using assets" (Sanchez, 2004). Or, a company's competitive advantage is in its managerial and organizational processes, its current technological and intellectual property endowment, complementary assets, clients, and external relationships with suppliers and partners on the one hand and the alternative strategies available to the company, and the presence or lack of growing returns on the other hand (dynamic capabilities) (Teece *et al.*, 1997).

In this context, learning has been seen as a strategic activity that is able to generating primacy through knowledge and related capabilities. Exploitation and exploration as learning capabilities (Yalcinkaya *et al.,* 2007) successively consist of the capacities of internal and external scanning and reorientation, enabling companies to reorganize and re-orientate their assets or acquire satisfactorily missing knowledge and competence form business environment.

Scholars have studied the trade-offs between exploitation and exploration capabilities based on the nature of both activities and on the needed resources and structures. Exploration requires more planning and effort, and involves higher cost and risk of failure, while exploitation privileges the reuse of existing "certainties" and is more certain and less risky (March, 1991). Both capabilities frequently offers greater rewards improving firm performance if their implementation is successful (Harmancioglu *et al.*, 2010). Therefore, companies usually face a dilemma: whether to invest their scarce resources in exploitation or to privilege exploration (March, 1991). This implies devoting their efforts to get profitability of firms' current activities to the detriment of their future, or instead, investing their resources to develop innovations enabling them to survive, even if it don't generate instant benefits. Although part of the literature argues the rewards and importance of exploitation, others consider that too much focus on exploitation carries some strategic risks. March (1991) points out that firms that neglect exploration and focus on exploitation may lack the capability to adapt to an evolving environment. Likewise, Levinthal and March (1993) consider that exploitation is inherently self-reinforcing, causing a "success trap", which hinders exploration activities. However, most organizations focus more on exploitation than on exploration (Uotila *et al.*, 2009) although literature argues positive relationships of both capabilities and firm performance.

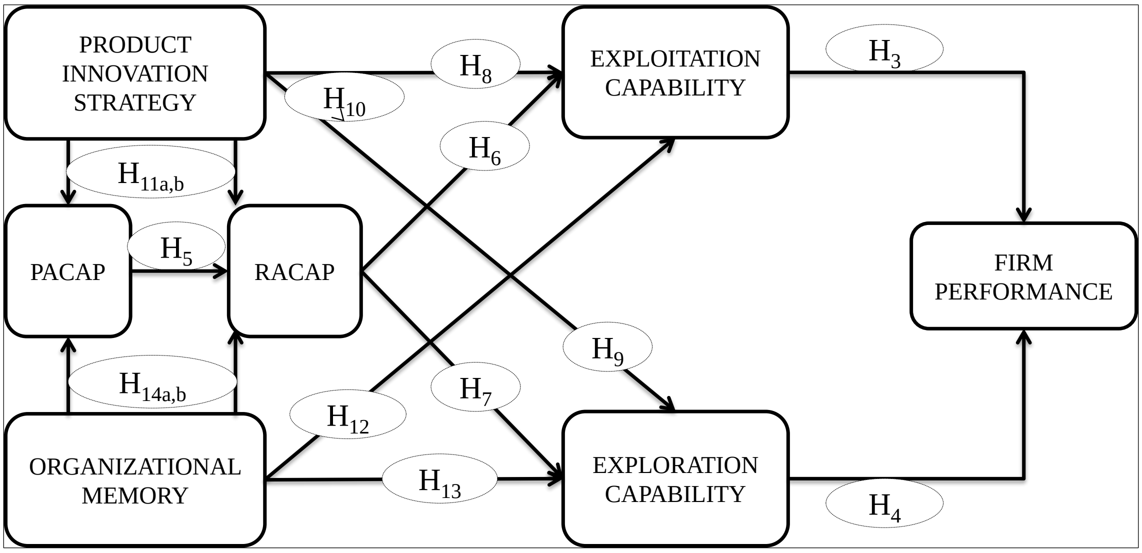
In this chapter, three key variables have been studied within a broad frame of learning and knowledge-based approaches. Concretely, the capacity of the company to liverage external knowledge, its innovation strategy and its memory are analyzed from different perspectives such as their nature *per se*, their relationships with each other and especially their interactions respectively with exploitation and exploration capabilities.

The scope of a strategy based on the traditional *in-house* R&D seems to be limited according to a good part of literature. Therefore, companies need to search for knowledge existing in their environments in order to generate competitive advantages. In this logic, scholars coined a new construct named absorptive capacity, which measure the extent to which firms leverage addressable knowledge. Despite the history of the term, one of the most cited works by Cohen and Levinthal (1990) defines absorptive capacity as the "ability to identify, assimilate, and exploit knowledge from the environment", and later on Zahra and George (2002) who re-conceptualize the former construct, subdividing it into two main subsets as previously discussed. Broadly, the increasing number of publications about the absorptive capacity adopts the previously mentioned two models. Moreover, despite the critics assigned to this construct definition and operationalization, there is a common consensus about the positive effect of such a key learning variable and the organizational learning capabilities effectiveness.

Likewise, organizational memory forms a fertile subject matter and a key construct that is widely treated within management sciences. Herein, it was analyzed as a construct as well as a crucial variable able to significantly affect exploitative and explorative capabilities of companies. Broadly, literature tends to strengthen the relation between firm memory and exploitation ahead of exploration, as the latter seeks new and fresh knowledge outside the company's facilities and likely pay little attention to organization's memory use.

These variables are widely considered as key features that may impact and even condition learning and knowledge acquisition, storage and manipulation, therefore they were treated in a holistic and dynamic approach, formulating the chapter correspondent hypotheses that will empirically be analyzed within the analysis part. Finally, the different hypotheses presumed inn this chapter are resumed in the figure 2.14.

Figure 2.14: The hypotheses developed in the chapter II



Source: Author's own elaboration

CHAPTER III: ORGANIZATIONAL LEARNING AND INNOVATION

CHAPTER III

"Learning and innovation go hand in hand. The arrogance of success is to think that what you did yesterday will be sufficient for tomorrow." – William Pollard (1928–1989).

The prior second chapter has provided a synthetic frame about how companies create the competitive advantages. Although that frame sheds light on the different economic and managerial school of thought, it emphasizes some models such as the approaches by Porter (1980; 1991) ending with the actual tendency that prioritizes organizational capabilities as a main source of firm competitive advantages. Thus, learning capabilities (i.e. exploitation/ exploration) are not only sources of competitiveness but also assured mechanisms enabling firm renewal.

In this context, the present chapter analyses specific patterns of learning capabilities (exploitation and exploration), expecting to decipher their relationships with innovation. In doing so, it seems to be necessary to study some referential theoretical and empirical models aiming at clarifying such interaction. These models differ in how organizational learning affects innovation. Some of them pretend a direct relationship, whereas others shed light on some key variables that mediates such a relationship.

Therefore, the main objective of this chapter is to understand how learning capabilities have become a fundamental element for the development of innovation in companies. To accomplish this goal, this chapter is structured into six sections. The first part deals with the different theories and models linking between organizational learning in general and innovations, whereas in the second part, a special focus is done on the firms' exploitation and exploration capabilities aiming at both renewing their knowledge-base and developing successful innovations. The third part analyzed a possible mediator effect of developing incremental and radical innovations on the relationship between exploitation and exploration on the one hand and new product success on the other hand. The fourth part of the present chapter analysis a potential moderator effect of market dynamism and resource availability on learning capabilities-NPS relationship. The chapter ends with a summary of the whole thesis model and a conclusion of the most significant ideas, within the fifth and sixth parts.

3.1. ORGANIZATIONAL LEARNING AND INNOVATION: BRIDGING THE GAP

Innovative firms usually adopt strategic thinking aiming to diagnose the most adequate mechanism for both surviving and growing. This occurs through the duality of knowledge and innovation. The literature identifies two main theories dealing with knowledge as a tool: knowledge creation and organizational learning-based. Both theories emphasize the role of knowledge creation, diffusion inside the companies and conversion of this knowledge into useful outputs, such as products, services and management styles. Moreover, their common aim is to create new organizational knowledge for growth and sustainability targets. Therefore, they can be understood as complementary rather than substitutes. It is also important to highlight that these theories differ significantly, as recognized through the pioneering works by Cyert and March (1963) and those of Cangelosi and Dill (1965).

Broadly, companies build competitive advantage through knowledge by improving daily operations, exploiting synergies existing between organizations, introducing innovations, as well as by knowing the stakeholders needs and aspirations. Furthermore, it is widely argued that knowledge management should pay particular attention to the innovation process, as the information-based activities create tacit and explicit knowledge through organizational learning (Pérez, 1999). In this logic, the main goal of knowledge creation processes is to enhance the potential of generating innovations (Von

Krogh *et al.*, 2001). Furthermore, knowledge creation is considered to be a social dynamic process involving interactions of various organizational levels (Inkpen, 1996) that targets mainly creating new knowledge, disseminate it and incorporate into innovative outputs.

One of the main authors of knowledge creation is Nonaka Ikujiro who has performed several referential contributions alone as well as with other authors (see for example Nonaka, 1991, 1994; Nonaka & Takeuchi, 1995). He argued that knowledge creation is considered to be a dynamic process involving interactions of various organizational levels and covers communities of individuals that extends, amplifies and disseminates their knowledge (Inkpen, 1996). In this regard, the process of creating new knowledge is a cognitive and multilevel.

In turn, learning-based theory analyzes the process of companies learning, considering the uncertainty in the business environments and the strategic need to adapt to them (see, for example, the work by Crossan *et al.*, 1999). Therefore, the main idea in this sense is that companies must adapt its internal system, such as structure, staff and culture to achieve this end and, ultimately, to adapt more quickly to the changing environments. This is, according to Ulrich *et al.* (1993), because learning capacity represents the ability of the managers to generate and generalize significant ideas, and thus create organizational knowledge.

In the present turbulent environment, learning ability of a company may constitute its main potential competitive advantage source (Bontis *et al.*, 2002). Thus, a considered body of academic contributions linking learning to innovation has been performed (e.g. Coombs & Hull, 1998; Darroch & McNaugton, 2002; Forrester, 2000; Griffith *et al.*, 2004; Hernández-Espallardo *et al.*, 2011; Hurley & Hult, 1998; Ignatius *et al.*, 2012; Kostopoulos *et al.*, 2011). Moreover, many scholars consider that knowledge is the pillar of innovations success (Leonard-Barton, 1995), and that organizational learning is the primary process by which the innovation occurs within companies and that the learning of individuals and organizations may become the only source of competitive advantage, especially in knowledge-intensive industries (Stata, 1989). Thus, organizational learning’s main target is retaining and improving competitiveness, productivity and innovation capacity, especially in actual circumstances of technological and market uncertainty (Dodgson, 1993).

Innovation and learning are rather considered to be two sides of one coin, as innovation can be understood as a process of learning (Ayas, 1999) in which ideas are generated, assimilated and applied. It is considered that organizations learn and create innovations through communication and combination of new knowledge (Kogut & Zander, 1992). In this sense, the ability of the company to lead innovation and individual initiatives is to focus on learning and developing new skills in order to create capabilities that are flexible and less costly (Lei *et al.* 1999). Furthermore, the lack of knowledge is a major inhibitor of innovation (Daghfous & White, 1994).

The important place that knowledge occupies in nowadays markets has led to a deepening of the research in organizational learning over recent decades (Crossan & Guatto, 1996), seeking tools for producing and updating knowledge, throughout identifying high-leverage change opportunities, training company's workforce and synergizing the knowledge and skills of the team members (Barba Aragón *et al.*).

In summary, given the risks and benefits associated with innovation development, companies usually scan their internal and external environments aiming at leveraging the existing knowledge. Therefore, organizational learning is broadly cited as antecedent of innovations (i.e. Darroch & McNaugton, 2002; Nonaka & Takeuchi, 1995; Stata, 1989). An underlying idea behind the existence of a relationship between learning and innovation bases on the key role that organizational learning plays a key role in enabling companies to achieve performance, speed and flexibility within the innovation processes (Brown & Eisenhardt, 1995; Coombs & Hull, 1998; Miles & Snow, 1978; Weerd_Nederhof *et al.*, 2002), which in turn, may contribute in improving firm performance if innovations are successful. In this context, several models have been proposed throughout organizational learning and innovation literatures.

3.1.1. Models linking organizational learning with innovation

The important place that knowledge occupies in nowadays markets has led to deepening the research in organizational learning over recent decades (Crossan & Guatto, 1996). Therefore, many scholars have brought different models linking organizational learning and innovation due to the axiomatic influence of learning over innovation performance (e.g. Baker & Sinkula, 1999b; Cohen & Levinthal, 1990; Hurley & Hult, 1998). The following paragraphs provide a review of the most cited of these models. A special emphasis is done on the works by Cohen and Levintal, March, Kogut and Zander, Leonard-Barton, Leonard-Barton and Sensiper, Hendlund and that of Nonaka and Takeuchi.

3.1.1.1 Theoretical models:

- *Model by Cohen and Levinthal (1990)*

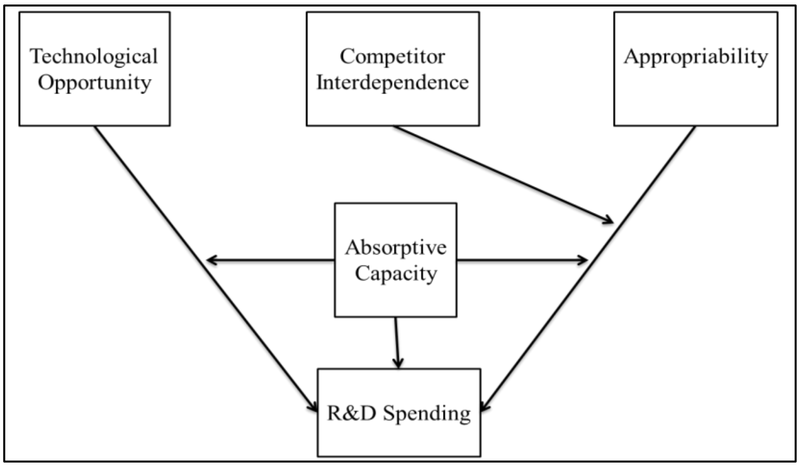
In their article entitled *absorptive capacity: a new perspective on learning and innovation*, Cohen and Levinthal (1990) claim that the capability of a company to recognize the value of new external knowledge, assimilate it and use it in the different commercial ends (absorptive capacity of the firm) is critical to its innovation performance. According to them, strengthening the absorptive capacity of the company, and then its innovative capacities, begins from the higher investments in R&D activities. The capacity of the company to add new knowledge to the existing one depends on its own combination capability. The new combinations of knowledge that lead to learning are created to establish new links of existing knowledge, and it is argued that effective communication increases the potential to create such relations (Dyer & Singh, 1998).

They also argue a path-dependency character of absorptive capacity development, depending on the investments in resources and development activities of the firm, considering that the ability to assimilate information depends on the existing knowledge structure and, therefore, learning performance is greater when the subject matter is already known. Additionally, they consider that the ability to solve problems and learning ability are closer to each other. In this sense, while learning capabilities involve the development of a skill to assimilate existing knowledge, problem solving skills represent the ability to create new knowledge (Cohen & Levinthal, 1990). As clearly portrayed in the figure 3.1, these authors' proposed model assumes that the absorption capacity, along with the R&D activities are key determinants of innovation in its wide manifestation, therefore companies should continuously stimulate and promote such activities and associated capacities. It is worth highlighting that the model analyzes

R&D and related innovative activities including "basic research, the adoption and diffusion of innovations and decision to participate in cooperative R&D ventures" (Cohen & Levinthal, 1990: 128).

In summary, technological awareness acquired from the different sources existing within company's environment and the degree of the ability to leverage such a technological knowledge, considering the effect of the competition, all have positive interaction with the absorptive capacity of the company, which in turn, determines the R&D spending. Consequently, the scope of activities of R&D determines the success of innovation and facilitates the organizational learning as previously mentioned.

Figure 3.1: The model by Cohen and Levinthal (1990)



Source: Cohen and Levinthal (1990)

- *Model by March (1991)*

As previously discussed, March (1991)'s model focuses on the tensions that may happen between exploitation and exploration as learning activities that are able to generate knowledge and create competitive advantages for the learning organizations. He defines exploration as a concept including terms such as research, variation, risk taking, experimentation, play, flexibility, discovery and *innovation*. These activities are able to generate fresh knowledge. Furthermore, exploitation encompasses terms such as refinement, selection, production efficiency, selection, implementation and execution (March, 1991). Exploitation activities according to March lead to the re-manipulation and refinement of existing knowledge.

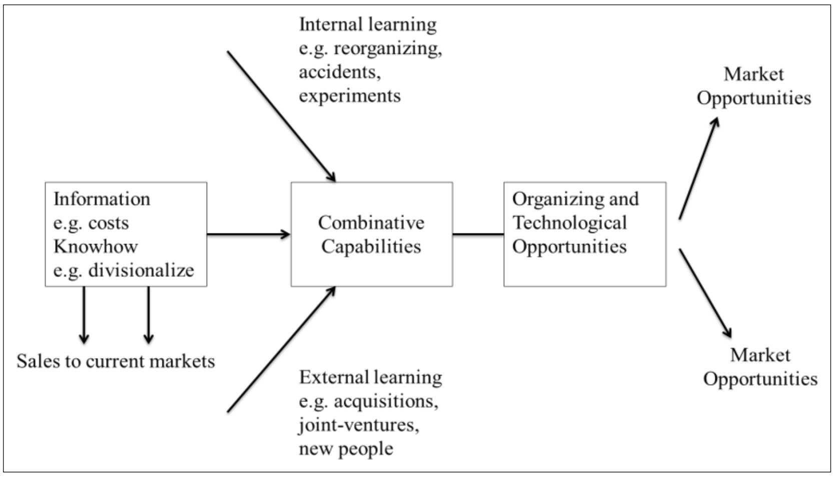
One central idea this model proposes is that although both exploration and exploitation are central for the company, the two activities usually compete for scarce resources (March, 1991). Furthermore, comparing the results of both, exploration tends to have long-term rewards, while exploitation usually has tactic and instant benefits. However, he claims that an overemphasis on exploitation ahead of exploration may cause a success trap for companies, which is negative, as exploration is strategically necessary for successful adaptation the environmental requirements and then for continual development of updated and new outputs.

It is clear that the model of March (1991) links between exploitation and exploration as learning capabilities or mechanisms and organizational innovation, as he argues that exploration is a main source of innovation and newness seeking. This happens through discovery of new things, experimentation of new alternatives as well as through research for new knowledge that is externally held.

- *Model by Kogut and Zander (1992)*

Kogut and Zander (1992) begin from the idea that the knowledge possessed by a company is considered property of the workers who are organized in a somewhat social community (working groups, organizations or networks), and that internal and external learning transform the information and knowhow into organizational knowledge. Additionally they argue that what distinguishes firms from their competitors is the creation and transfer of information and know-how within the organization through groups and networks. Furthermore, they argue throughout their present model that innovation is no more than a combinative process of knowledge and different capabilities of the company. They identified what they call a “paradox”, claiming that the efforts of a firm for growing by the replication of its current technology enhance the potential for imitation deterring innovation in this case. Therefore, they propose that recombining its existing capabilities, a firm is likely enhancing the innovation tendency ahead of imitation one (see figure 3.2).

Figure 3.2: The model by Kogut and Zander (1992)



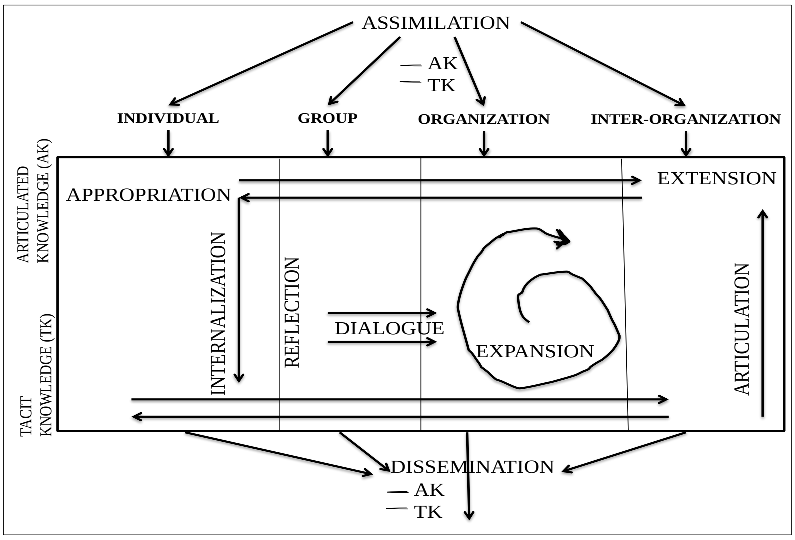
Source: Kogut and Zander (1992)

According to figure 3.2, knowledge is composed of information and know-how. This distinction is the basic framework to explore how knowledge is recombined through learning both internally (reorganization, accidents or experiments) and externally (acquisition, joint-ventures or new recruited people), resulting in what they call combinative capabilities. These capabilities are understood as the intersection between the company's ability to exploit their knowledge and the potential of unexplored technological opportunities. Through these capabilities, organizations enhance their organizational and technological opportunities, which lead to better market opportunities. Consequently, this model presumes that new innovations (new combinations of capabilities) represent a type of learning that results through firm's combinative capabilities of generating new applications based on the existing knowledge (Kogut & Zander, 1992).

- *Model by Hedlund (1994)*

Based on prior studies performed by the same author with others, Hedlund (1994) distinguishes between articulated and tacit knowledge on the one hand, and the individual, group, organizational and inter-organizational levels of knowledge and assimilation of such a knowledge on the other hand (see figure 3.3). Based on these classifications, he defines a set of processes of knowledge management within companies, especially the transformation and dissemination of the acquired knowledge throughout the different units of the firm.

Figure 3.3: The model by Hudlund (1994)



Source: Hedland (1994)

The first of the processes of knowledge management is *articulation*, which stands for the process of transformation of tacit knowledge into explicit one. *Internalization* happens when tacit knowledge becomes articulated, while reflection represents the interrelationship between tacit and explicit knowledge.

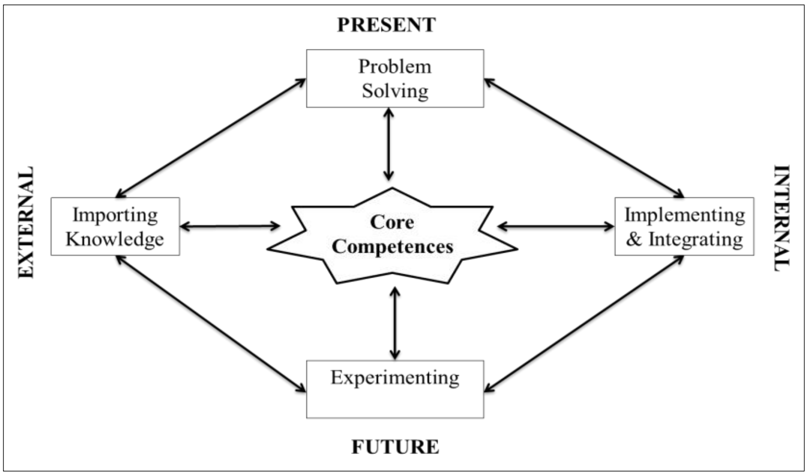
On the other hand, *extension* is knowledge transfer (tacitly or articulated) from the lower levels to the upper levels. They also define *appropriation* as the opposite process of extension, and *dialogue* to be the interaction between extension and appropriation. Finally, they distinguish between *assimilation* and *dissemination* presenting them as the input and output of knowledge (ie, product or skills). In summary, the model by Hedlund (1994) considers that the creation of new knowledge that allows the development of innovations occurs through the transformation of knowledge from tacit to explicit and vice-versa, along the different levels of the company.

- *Model by Leonard-Barton (1995)*

In her book "*Wellsprings of knowledge*", Leonard-Barton (1995) argues the vitality of organizational learning in the ongoing development of innovations, stating that companies should preserve their core competences that "embody proprietary knowledge that is unique to the organization and is superior to the knowledge of its competitors" (Johannessen & Olsen, 2003). Another main idea of this model is that knowledge potentially resides in all the employees, therefore it should be managed within a determined approach (see figure 3.4) in order to participate in the core competences creation and maintenance.

It is clear that through her book entitled “Wellsprings of Knowledge: Building and Sustaining the Sources of Innovation” Leonard-Barton (1995) aimed at shedding new lights on the main strategic source of innovation with companies, which is their own competences. These competences can be considered as manifestations of knowledge that companies hold. Furthermore, the more valuable, inimitable and rare is the company’s knowledge; the difficult is the replication of these competences, which implies maintaining firm’s primacy ahead of the competitors.

Figure 3.4: The model by Leonard-Barton (1995)



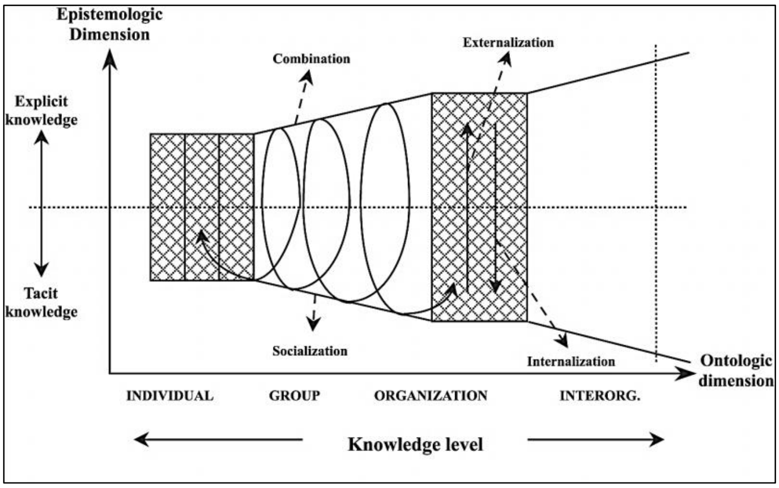
Source: Leonard-Barton (1995)

In summary, human skills, knowledge physical systems, management systems and the set of values framing the accumulation of knowledge are the main competences of a company. As knowledge management processes are defined as a continuous set of practices embedded in the social and physical structure of the organization, considering knowledge as an end product, Leonard-Barton (1995) distinguishes between different activities within his knowledge management model, such as: acquisition (importing knowledge), collaboration (problem solving), integration through implementation and testing via experimentation. All of which interact with the main competences of the companies leading to create competitive advantages, sustaining then “innovation sources”.

- *Model by Nonaka and Takeuchi (1995)*

Studying how Japanese' companies innovate, Nonaka and Takeuchi (1995) portrayed a model explaining the role of knowledge in competitive advantages creation in a world where the *unique certainty in uncertainty*. They argue that an organization creates new knowledge through the *conversion* and *interaction* between tacit and explicit knowledge. This in turn, is a complex social process between individuals or groups within organizations. It happens in an endless process, differentiating learning organization from unlearning companies, and even being the main challenge that innovative companies should manage successfully for reaping its certain fruits. Figure 3.5 demonstrates the knowledge conversion model by Nonaka and Takeuchi (1995).

Figure 3.5: Knowledge process spiral: Nonaka and Takeuchi (1995)



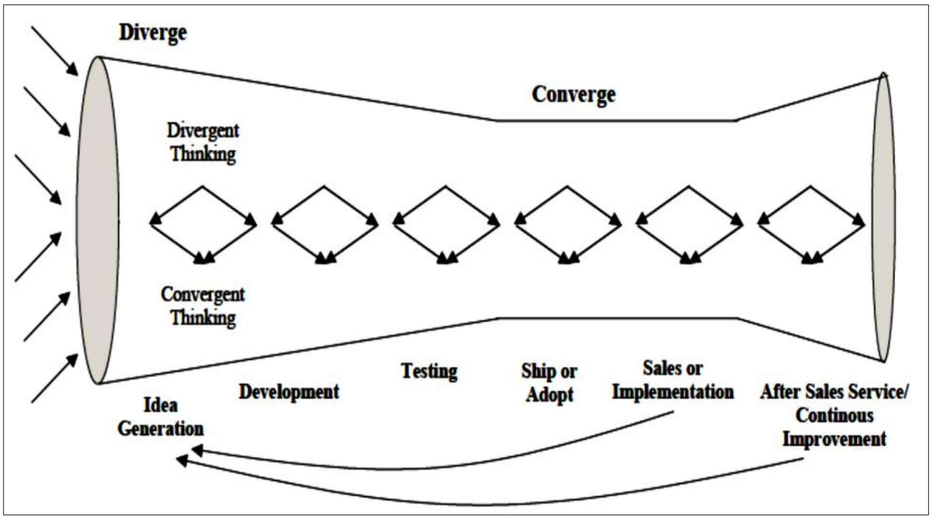
Source: Nonaka and Takeuchi (1995)

The leveraged tacit knowledge in the organization is improved through the four forms of knowledge conversion: socialization, externalization, combination and internalization, and crystallized in higher ontological levels, which is called knowledge spiral, where the scale of knowledge interaction tacit and explicit will increase according to the progress through the ontological levels. Therefore, organizational knowledge creation is a spiral process that begins from the individual level and moves forward through the growing interaction communities, crossing the boundaries of sections, departments, divisions...etc. This happens via a complex social spiral These authors argue that innovation occurs when converting tacit knowledge into explicit knowledge through creating new combinations and then new applications. Furthermore, creating- by conversion or by other mean- new knowledge is the first step towards innovation development, as innovation consists mainly of conversion of new and innovative ideas into palpable and valuable outputs (Schumpeter, 1934).

- *Model by Leonard-Barton and Sensiper (1998)*

Adopting the work by Wheelwright y Clark (1992), Leonard-Barton and Sensiper (1998) consider that innovation is a process starting with idea generation to be ended with after-sales activities. Such a process comprises: the search, selection, exploration, synthesizing, combination of divergent thinking cycles followed by another convergent thinking (see Figure 3.6).

Figure 3.6: The innovation funnel: Leonard-Barton and Sensiper (1998)



Source: Leonard-Barton and Sensiper (1998)

According to these authors, innovation is considered as a process of cycles of divergence followed by others of convergence, in other tacit knowledge plays a crucial role. The periods of divergence are characterized by being the episode of new ideas generation and creativity, while the convergence periods is shaped by invention of solutions that allow the creation of new innovations. They, also, consider that tacit knowledge residing in employees' brains is the key source of company's competitive advantage, and that this tacit knowledge, throughout the divergence and convergence, lead to the emergence of new ideas to be transformed into a new knowledge and later on diffused within companies parts. Therefore, they emphasize the need for mechanisms for managing such knowledge with innovative motives.

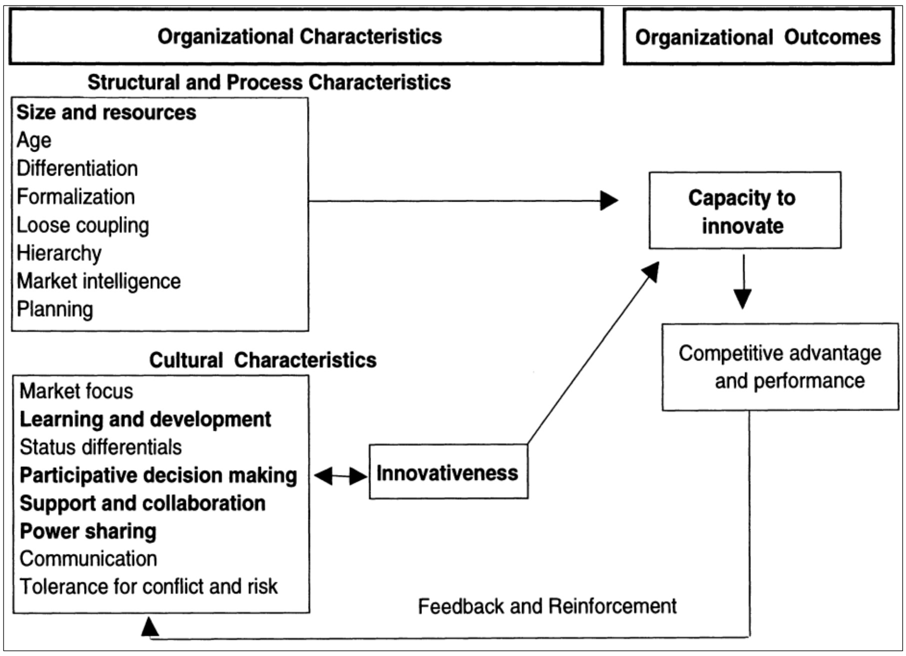
3.1.1.2. Empirical Models:

In fact, literature offers numerous contributions analysing empirically the relationship between learning and innovation, therefore a selection of the most cited models is done. The following points deals summarily with the underlying ideas of such contributions.

- *Model by Hurley and Hult (1998)*

The model proposed by Hurley and Hult (1998) suggests that market orientation and organizational learning are antecedents of innovation. Their empirical analysis argues a positive relationship between higher levels of innovativeness in the firms' culture and both the superior capacity for adaptation and the success of implemented innovations. They also found that higher levels of innovativeness are significantly associated with cultures that emphasize learning, development, and participative decision-making and vice-versa. So, an interaction or a "feedback" type relation among cultural characteristics, such as learning and empowerment, and innovation capacity and innovativeness is argued. This means that a learning company is likely an innovative one and vice-versa. Additionally, they highlight the role of structural and process characteristics in innovation capacity, as in the following figure 3.7.

Figure 3.7: The model by Hurley and Hult (1998)

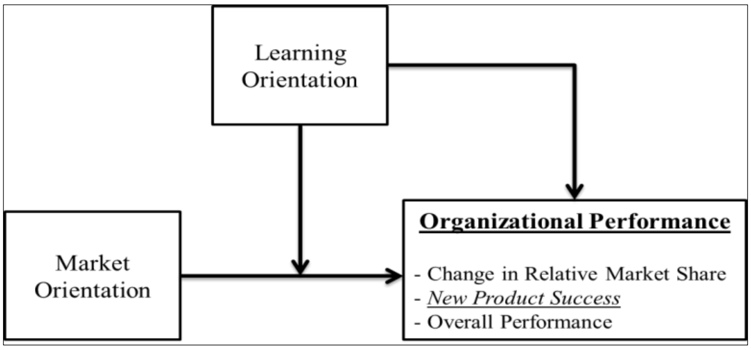


Source: Hurley and Hult (1998)

- *Model by Baker and Sinkula (1999a)*

In short, the model by Baker and Sinkula (1999a) addresses two main important questions: how market and learning orientations affect firm performance. They consider that these orientations affect firm performance through three key variables: market share growing, new product success and financial performance. Herein, a focus on the part of this model that deals with how companies gain performance through the interaction between learning and new product innovation. Although the model by Baker and Sinkula (1999a) analyses empirically the effect of learning and market orientation on the firms overall performance, it emphasizes also the positive role of learning product innovation, which leads to performance. They analyzed a total of 411 US companies. The findings confirm the literature base, suggesting that both market orientation and learning orientation can independently lead to successful new product development activity. Figure 3.8 summaries the proposed model.

Figure 3.8: The model by Baker and Sinkula (1999a)



Source: Baker and Sinkula (1999a)

- *Other empirical models*

Similarly to Baker and Sinkula (1999a), Keskin (2006) offered an empirical model linking between learning and market orientations on the one hand and "innovativeness", which is according to him the capability of a company to introduce new innovations and performance on the other hand. Studying a total of 157 Turkish SMEs, he argued among other findings that learning-orientation positively influences firm innovativeness.

A study by Mavondo *et al.* (2005) analyzing 227 Australian firms, assess similar findings. Their contribution investigates the relationships among learning and market orientation, human resource practices and innovation and their association with organizational performance. Highlighting human resources practices as the main bulk through which learning is transformed into value; they also assess the role learning plays in developing innovations, finding empirical evidences.

Likewise, Jiménez-Jiménez and Sanz-Valle (2011) presented an empirical model linking among organizational learning, innovation and firm performance, considering, at the same time, the moderator effects of industry turbulence and firm size and age. They carried out their study analyzing 451 Spanish manufacturing firms. Their model is an empirical attempt analyzing the interactions of these factors simultaneously, as an attempt to cover a consistent literary gap. However, they found that even organizational learning affects both innovation and performance, the relationship between learning and innovation is stronger than the relationship existed between learning and firm performance. This put in evidence that learning organizations tend to develop innovations as a likely culture-related attitude. Another finding of such a contribution is that the studied relationships "remain significant and positive regardless of the level of the moderators but the intensity of these relationships changes". In summary, they found that organizational learning is an efficient engine for carrying out organizational innovations.

3.1.2. Summarizing the previously discussed models

The aforementioned models shed light on the links between organizational learning and innovation, pointing out clear evidences about this relationship. Evidences that are also emphasized by Nooteboom (1999) who analyses the links among innovation, learning and organization from a combinative and holistic perspective. In his theoretical contribution, he suggests that firms adapt themselves to change through organizational learning and that they need a "logic of abduction" or a "heuristic" to move from present competence to a novel competence while surviving in the process. Moving from familiar competence to new one implies innovations. Thus, he is assessing the effectiveness of carrying out innovations by means of organizational learning.

As already discussed, organizational learning is a process leading to organizational knowledge (Argyris & Schön, 1978). A complex process which evolves many players, therefore, "creating new knowledge is also not simply a matter of learning from others or acquiring knowledge from the outside. Knowledge has to be built on its own, frequently requiring intensive and laborious interaction among members of the organization" (Nonaka & Takeuchi, 1995:10). Thus, organizational learning can be shortly defined as the process of knowledge creation.

In this logic, and based on a revision of literature, Popadiuka and Choob (2006) links between the main outcome of organizational learning, which is knowledge creation, and assimilation. Concretely, they recognize that a major part of literature suggests a clear dependency of innovation on knowledge creation, concluding that, "innovation consists of new ideas that have been transformed or implemented as products, processes or services, generating value for the firm. Ideas are formed through a deep interaction among people in environments that have the conditions to enable knowledge creation" (Popadiuka & Choob, 2006: 309).

According to this comparison, innovation and knowledge creation are both dynamic processes in which the human attributes persist as key features. Both occur by means of novel ideas of skillful persons. Each of them has different manifestations and various typologies. Furthermore, both processes depend on a series of internal and external enablers, such as firm economic conditions, culture and values. The main objective of knowledge creation process is providing knowledge for carrying out innovative outputs. Furthermore, knowledge creation is sometimes seen as an ex ante process for developing innovation, or even an innovation in itself. In this context, it is worth mentioning that some authors consider R&D and related knowledge activities as innovations, since the target is creating *new knowledge* which leads to new outputs [see for example the model by Cohen and Levinthal (1990)].

In this vein, table 3.1 provides an overwhelming comparison between innovation and knowledge creation, with additional information that helps in highlighting the inter-dependency between these two strategic activities.

Table 3.1: A comparison between innovation and knowledge creation

	Innovation	**Knowledge creation**
Definition	Generating ideas and implementing them to produce value for the organization, suppliers and consumers	Sharing mental, emotional and active knowledge in such a way that the results lead to aggregated value
Generic classification	Technological: product, process, service, Market: product, price, promotion, place, Administrative: strategy, structure, systems, culture	Tacit Explicit Cultural
Specific selected classification	-Two dimensions: Market knowledge + technical capabilities Component + architectural knowledge Market orientation + Change in technology -Radical, incremental, architectural, regular, niche	Individual – collective Based on value chain Procedural, causal, conditional, relational
Perspective	Technological—Market— Administrative	Individual, group, organizational, inter-organizational
Principles	Combination of resources and capabilities aiming at the generation of sustainable competitive advantage	Sharing experiences, learning
Process	Idea phase, feasibility phase, capability phase, launch phase	SECI Model: Socialization, externalization, combination, and internalization—creating concepts, justifying concepts, building prototype, cross-leveling knowledge
Time frame	Continuous or ad hoc—short or long term	Continuous
Drivers	Competitive environment, dynamic of the market, leadership, positioning, differentiation, politics, strategy, effectiveness, changes, crisis	Planning, decision making, learning, sensemaking, understanding, adapting, interacting, need to be innovate, crisis
Where does it happen?	Usually in functional areas of companies—more localized	The whole company including technology, processes, management, implantation, culture, systems, structure
How does it happen?	Planned process considering the micro and macro social, cultural, political, and economic impacts. Meeting, discussions, seminars	A continuous process of learning. Training, meeting, discussions, seminars, lateral thinking, brainstorms
Enabling conditions	Organizational intention, autonomy, fluctuation and creative chaos, information redundancy, requisite variety, core capability, systems, processes, structures, resources and capabilities	Organizational intention, autonomy, fluctuation and creative chaos, information redundancy, requisite variety, core capability
Sources of:	Internal value chain, external-added chain of suppliers, customers, universities, government, private laboratories, competitors, related industries	Internal value chain, external-added chain of suppliers, customers, and universities, government, private laboratories, competitors, related industries
Outputs	New concrete products, processes, services	New ideas, challenges, innovativeness
Measurement	Profit, revenues, market share, consumer satisfaction, image	Employee satisfaction, climate, training hours/employee, employee retention, autonomy, new ideas

Source: Popadiuka and Choob (2006)

In summary, organizational learning is then a dynamic process of creating knowledge within organizations through individual members and the groups they form, leading to the generation and development of skills, improve organizational innovative competences as well as firm performance. It is widely considered as the most crucial factor through which knowledge is created, enabling thus innovation generation (Bontis *et al.*, 2002). Also, yet argued that the present thesis subdivides learning capabilities into two main categories: the ones related to exploitation and the others dealing with exploration. Therefore, concertizing the previous presumed relation, the following points aims at shedding new light on the interaction among the types of learning capabilities and those of innovations (herein an incremental/radical typology is adopted).

3.2. LEARNING CAPABILITIES AND PRODUCT INNOVATION

As widely discussed in the first chapter, product innovation is one of the most important types of innovations that happen at companies' level. In addition to process, marketing and administrative (or management) innovations, a product innovation represents the cornerstone of nowadays innovations. Furthermore, it is one of the most important types of innovations (Becheikh *et al.*, 2006).

As discussed earlier, the development of new products is crucial to the growth and prosperity of nowadays businesses. However, it is claimed that a large number of new product fails (Tyagi, 2006). A successful product is simply the one that is produced and sold with profit (in its wide manifestation). The amount and duration of these rewards depends on many factors. Of these factors, we can mention for example the efficiency of the process by which the product is developed, the assets performance, the staff and leadership characteristics and so forth. The influence of leadership occur mainly through making the personal feel evaluated (Iszatt-White, 2009), which influences their capacities to make the difference.

Product innovation is important for companies for many reasons. Product quality enhancement, market share growth, the production cost all are achieved when developing new products become a tenet for companies targeting efficiency and effectiveness. Furthermore, innovative products may affect the time to market and the income returns, as products are likely to be sold faster (Hart, 1993). Similarly, the cost of developing new products may be affected by previous experiences regarding new products. Finally, the capacity development can be seen as a heritage of the company's past activities, thus, more development of new products implies effectiveness and efficiency is future experiences.

In summary, the development of innovations is considered to be a strategic activity that purports the attainment of competitive advantage for companies (Zheng-Zhou, 2006). However, achievement of this is not easily reachable and involves making a series of organizational decisions and also implementing a series of organizational skills that should lead to the successful launch of new products (Atuahene-Gima, 1996).

Although literature sustains the importance of developing new products for companies, there is no clear consensus about the variables that enable their success. In this context, some authors focus on the characteristics of the market, others emphasize the specifications of the product itself, whereas other group highlights the role the organizational aspects. Learning and knowledge capabilities have also been considered as key variables in launching successful innovations. Furthermore, how this occurs is a fertile subject matter in innovation literature. However, the success of companies endeavor towards developing successful new product widely argued to depend on its ability to learn. Thus, organizational learning capabilities herein are tackled in terms of exploitation of existing assets or external exploration of missing ones.

As widely discussed in the second chapter, learning capabilities herein are subdivided into exploitation and exploration. The learning activities are either focusing on the international reuse and reorientation of firm’s assets for generating new combinations of knowledge, or seeking outsourcing. Although literature broadly argues the importance of organizational learning in developing and launching new products in general, there is still a need to redirect the research in this issue considering exploitation and exploration as the two main learning capabilities.

Exploration and exploitation are commonplace for companies that, either through necessity of their markets or according to their own cultures, clearly prompt innovation (Gupta *et al.*, 2006). Thus, Chesbrough (2003) considered that firms engage in exploitation or exploration as a necessary organizational adaptation to change in business environment. As a result, the adoption of a learning mechanism that favors the development of new products will enhance innovation (Dougherty, 1992; Van Riel *et al.*, 2004; Zheng-Zhou, 2006). The following sections will analyze the relationship between each of the capabilities and the two innovation types studied herein, i.e. incremental radical product innovations.

3.2.1. Exploitation capability and product innovation

Firm's organizational routines are key factors for implementing innovative activities (Benner & Tushman, 2003). These routines enable the interaction between resources and firm's capabilities which provides the spark of learning, innovation and value creation within a firm (Collis & Montgomery, 1995). Accordingly, repeatedly exploit firms' internal competences, may foster the error detection and correction of the daily operations, which shape the main trajectory of the innovation outputs. This is because the tenet of exploitation is reusing and re-orientating the familiar assets and competences of companies aiming to producing enhanced outputs. Thus, the re-manipulation of these assets causes the detection and reparation of the loopholes of the system.

Incremental innovation, in turn, stands for minor improvements of the current products or small adjustments in a firm's familiar technology (Dewar & Dutton, 1986). It is considered to be more certain and easily reachable, since it builds on familiar products knowledge base. Furthermore, Banbury and Mitchell (1995) argued that firm's ongoing ability to introduce relevant incremental innovations positively affects its market share and also its survival in the relative industry. Likewise, Abernathy and Clark (1985), considered that incremental innovations enhance the applicability of existing knowledge.

Some authors consider that these types of innovation depend on firm organizational competences and knowledge (Benner & Tushman, 2003; O'Reilly & Tushman, 2004), and that improving the existing products in order to launch new reshaped ones depends on firms capabilities (Levinthal & March, 1993). Exploitation, that applies known technology, is frequently used when developing incremental innovations.

By definition, an incremental innovation builds on existing knowledge and resources of the company, meaning that it will be competence-enhancing, which fits the essence of exploitation (Baum *et al.*, 2000; Benner & Tushman, 2003). In addition, Atuahene-

Gima (2005) argued empirically that competence exploitation is likely related to incremental innovation. In summary, “incremental innovation is managed on the basis of feedback provided by the exploitation” (Castiaux, 2007: 38).

Furthermore, since exploitation is competence enhancing, it is likely determinant in improving he capabilities of the workers of a company as human assets (Koza & Lewin, 1998). In this logic, the problem-solving ability of personal of the companies through the learning-by-doing that occurs through exploitation tends to be enhanced. Thus, having a well-formed human capital helps companies in facing successfully the challenges derived from opting for performing radical products in the future. Therefore, a company’s exploitation capability may positively affect its ability to develop radical innovations. Likewise, the improvements to existing technologies, skills, and capabilities exploitation offers (March, 1991) may affect positively the future projects that target developing radical innovations, since the present of companies determines their future (Ruttan, 1996).

Although exploitation is theoretically argued to influence both incremental and radical product innovations, the effect is likely more on incremental innovation. This is because the latter may require new competences, which implies extramural searching for novel knowledge and organizational forms, whereas incremental innovation is almost generated by exploiting firms’ familiar technologies, staff, machinery and organizational forms. Thus:

H_{15}: A firm’s exploitation capability is positively related to product innovation.

H_{15a}: A firm’s exploitation capability is positively related to incremental product innovation.

H_{15b}: A firm’s exploitation capability is positively related to radical product innovation.

H_{15c}: A firm’s exploitation capability is more related to incremental product innovation than radical product innovation.

3.2.2. Exploration capability and product innovations

Developing a specific type of innovation is argued to be dependent on a firm's level of knowledge (Dewar & Dutton, 1986). For example, a company that develops radical innovations may have its knowledge base new and updated. In this logic, the rapid obsolescence of technology as a result of high competition and environmental dynamism leads some authors to consider that external sourcing is becoming more important for companies seeking new information for developing significantly novel innovations (Chesbrough, 2003). Furthermore, it has become almost axiomatic that companies focusing only on internal sourcing suffer the consequences of not renewing their knowledge base (Benner & Tushman, 2003). Therefore, exploration which is considered to be the appropriate tool for acquiring cutting-egged technology and business-related knowledge (March, 1991), is becoming crucial for renewing the firms' production systems aiming at developing breakthrough products (Molina-Castillo *et al.*, 2011).

As indicated earlier, despite the higher cost and risk of failure (March, 1991), exploration frequently offers greater strategic rewards and performance improvement if successful (Harmancioglu *et al.*, 2010). This payoff mainly occurs in terms of new knowledge and fresh organization, which clearly prompts innovation in general. Concretely, as the main outcome of exploration is new knowledge and novel organization forms, it should influence positively all types of innovations since knowledge and innovation coevolve with each other (Coombs & Hull, 1998). In other words, exploration capability likely influences both incremental and radical product innovations in general.

Furthermore, radical innovation consists of producing a new product that incorporates significantly different core technologies, providing substantially higher newness compared with the existing products in the industry (Chandy & Tellis, 1998). This, in turn, requires the exploration of different technology (Dewar & Dutton, 1986) since companies are no longer able to carry out radical innovation based solely on their own knowledge (Chesbrough, 2003). Rather, the need of involvement in spanning-out programs such as cooperative and collaborative projects is becoming crucial for acquiring fresh knowledge (Chesbrough & Crowther, 2006; Dahlander & Gann, 2010).

As mentioned before, radical innovation begins from newness background, which needs new ideas and new organizational measures, which is usually obtained through exploration (Benner & Tushman, 2003). In this logic, Atuahene-Gima (2005) pointed out that competence exploration is positively related to radical innovations rather than to incremental innovation. Likewise, Rosenkopf and Nerkar (2001) and Benner and Tushman (2003), argued that it fit the targets and the essence of exploration, since "radical innovation finds its origin in the exploration of uncertain and complex environments" (Castiaux, 2007: 38). Thus:

> *H_{16}: A firm's exploration capability is positively related to product innovation.*
>
> > *H_{16a}: A firm's exploration capability is positively related to incremental product innovation.*
> >
> > *H_{16b}: A firm's exploration capability is positively related to radical product innovation.*
> >
> > *H_{16c}: A firm's exploration is more related to radical than incremental product innovation.*

3.3. NEW PRODUCT RADICALNESS AS A MEDIATING FACTOR BETWEEN LEARNING CAPABILITIES AND NEW PRODUCT SUCCESS

The success of product innovation was defined as the introduction of a product that fits three main conditions: being acceptable for customers, offering financial and non-financial rewards and being technically competitive. It was argued that it could be generated through learning capabilities and product innovations. Thus, after analyzing the relationship among exploitation, exploration, incremental and radical innovations, this part deals with how companies can get successful new product by prioritizing a special type of capabilities and a special type on innovations. In other words, the mediator roles of incremental and radical innovations on successively the relationships among learning capabilities and new product success are analyzed.

3.3.1. Incremental new product design as a mediating factor between exploitation and new product success

As previously argued, the resource-based view suggests that focusing on internal resources and capabilities and, reorganizing, reorienting and reemploying them is an efficient and certain manner to generate competitive advantage (Barney, 2001). Moreover, despite the critics of being only short-termly beneficial, exploitation of internal certainties is likely the most reasonable and least risky mechanism to produce novelty and gain performance (March, 1991).

Analyzing organizational learning, March (1991: 73) states that, "the certainty, speed, proximity, and clarity of feedback ties exploitation to its consequences more quickly and more precisely than is the case with exploration". Moreover, the path-dependency that characterizes exploitation implies less cost, less time to market and less risk related to current clients' loyalty than engaging in new, uncertain alternatives. Therefore, many researchers have argued that leveraging a firm's own resources and capabilities is probably the safer route to improved performance, rather than venturing (Hoang & Rothaermel, 2010; Jansen *et al.*, 2006; March, 1991).

Broadly, exploitation of a firm's own resources and capabilities is argued to increase its innovation performance (Gilsing & Nooteboom, 2006; Jansen *et al.*, 2006; Kim *et al.*, 2012; March, 1991; Soosay & Hyland, 2008). However, this effect may be greater if companies develop innovation that consists of improvement of the firm's current products (incremental innovation).

Indeed, exploiting existing assets and capabilities is a capability that can differentiate one company from another throughout an incremental logic (Barney, 2001; Wernerfelt, 1984). Therefore, the reuse of a firm's familiar certainties is important, not only for fine-tuning and increasing the efficiency of an existing technology, but also for creating new knowledge based on prior one (Katila & Ahuja, 2002) that can be used to generate some types of product innovation. Thus, exploitation can foster the improvement of a company's products, especially within incremental enhancements.

Incremental product innovation, in turn, consists of improving and adding new values to companies' familiar products. The knowledge required to create an incrementally innovative product builds on existing knowledge (Jansen *et al.*, 2006). It uses also existing and resources to leverage the whole innovation process (Ettlie *et al.*, 1984). It involves modest technological change, which implies that the existing products will remain competitive in the market (Dewar & Dutton, 1986). Moreover, it improves competitiveness in current markets, and carries low levels of risk and less time to market. In addition, it secures higher firm performance with less costs and steady business growth.

Based on the aforementioned, two main conclusions can be underlined. On the one hand, the exploitation helps companies in generating successful innovations. This is because of enhancement and the learning effect since reusing and re-orientating implies correcting former errors and thus ameliorating the whole system, which influence innovation performance. Therefore, it is expected that exploitation be related to the success of new product.

Furthermore, as previously noted, the exploitation has a positive effect in developing incremental innovations (H_{15}) more than other types of innovations. It was also claimed that incremental innovations are strongly related to the success of new products (H_{2a}) due to the instant rewards related to system improvement, customer fidelity and low costs it offers. Therefore, the incremental innovation is likely the mechanism by which the exploitation will achieve successful innovations. Consequently, a mediating effect of incremental innovation on the relationship between exploitation and success of new products is expected. Thus:

> *H_{17}: Incremental innovation positively mediates the relationship between a firm's exploitation capability and new product success.*

3.3.2. Radical new product design as a mediating factor between exploration and new product success

Within the last two chapters, it was demonstrated that nowadays companies are not able to innovate in a closed system; rather the need of openness seems to be persistent. Furthermore, it is necessary for companies to control external threats and spillovers in order to keep updated. In this context, the underlying idea behind the *open innovation* is that external sourcing is becoming more common than internal sourcing (Chesbrough, 2003). This is due to the rapid obsolescence of technology because of high competition and environmental dynamism. Thus, it has become almost axiomatic that companies focusing only on internal sourcing suffer the consequences of not updating their know-how base (Benner & Tushman, 2003). Exploration is considered to be the appropriate tool for acquiring cutting-egged technology and business-related knowledge (March, 1991), and thus updating the firm's production system for developing breakthrough products (Molina-Castillo *et al.*, 2011).

The relationship between exploration and innovation success has been only partially studied. Laursen and Salter (2006) provide empirical evidence that firms that adopt external search tendencies enhance their innovative performance. In addition, Eisenhardt and Martin (2000) argue that firms that successfully reconfigure their capability base to reach emerging market opportunities before their rivals are likely to achieve superior performance. As emerging market opportunities always co-evolve with new customer needs, exploration is the appropriate mechanism to satisfy those emerging needs. Auh and Menguc (2005) argue that exploration involves the acquisition of new information about alternatives and thus leads to the improvement of product delivery and customer satisfaction. He and Wong (2004) and Gibson and Birkinshaw (2004) found evidence that exploration, joined with a certain level of exploitation, affects a firm's sales growth rate. In conclusion, prior research (Molina-Castillo *et al.*, 2011; Tsai & Huang, 2008) suggests a positive interaction between exploration of new alternatives and fresh know-how and the success of new products.

New products can be either totally new or partially enhanced, which means they can be incremental or radical (Dewar & Dutton, 1986). Exploration will enable the development of successful innovations, but depending on what types of products companies develop (either similar to or different from existing ones) the transformation of newly acquired competences into successful innovations will more or less be easy. The essence of exploration is acquiring new tools and fresh knowledge (March, 1991) which can support the production of radically new outputs. Radical innovations involve major changes in production (Garcia & Calantone, 2002), following the introduction of totally new knowledge by "exploring uncertain and complex environments" (Castiaux, 2007), destroying the firm's current knowledge (Henderson & Clark, 1990). Consequently, destroying the firm's current knowledge implies the implementation of new organizational measures and a new knowledge base, which may lead to innovative ventures.

Exploration causes a rupture with the firm's current practices, destroying the familiar knowledge of the company (March, 1991) which leads to the development of new and different products. Hence, radical innovations are likely to fit the main targets of exploration, which begins from the logic of creating new knowledge and strategic competences, and tends to invent new products or services with new tools and fresh organization (Benner & Tushman, 2003; Lynn *et al.*, 1996). Moreover, it requires greater diversity of knowledge and a different set of capabilities (Nonaka & Takeuchi, 1995). Thus, it calls for less attention to the current organizational credentials, lower conformity to current organizational practices, and more emphasis on "improvement and creation of new organizational efficiencies" (Vowles *et al.*, 2011).

Although many researchers argue that innovation development requires the integration of both external ideas and internal knowledge (Arora & Gambardella, 1994; Cohen & Levinthal, 1990), external sourcing seems to be more efficient in developing radical products than internal re-exploitation (Hoang & Rothaermel, 2010). Similar evidence was offered by March (1991) who considered exploration to be risky external sourcing, but a key to organizational learning if the company is to acquire new knowledge for achieving primacy.

Likewise, innovation literature argues that radical innovations provide greater success but also carry higher risks. O'Reilly and Tushman (2004) argued that "discontinuous" or radical innovations offer great customer satisfaction, which influences fidelity, sales growth and market share. This partially implies a positive relationship between radical innovation and new product success. Furthermore, exploration that implies discovery and new venturing and seeks originally new alternatives and competencies will have a greater effect on radical innovations. Accordingly, it is expected that exploration strongly contributes to the success of new products through the development of radical innovations:

Furthermore, as previously noted, exploration has a positive effect in developing radical innovations (H_{16}) more than other types of innovations. It was also claimed that radical product innovation is significantly related to the success of new products (H_{2b}) due to the strategic rewards related to system renewal, new markets and market shares and it offers. Therefore, the radical innovation is likely the mechanism by which the exploration will achieve successful innovations. Consequently, a mediating effect of radical innovation on the relationship between exploration and success of new products is expected. Thus:

> *H_{18}: Radical innovation positively mediates the relationship between a firm's exploration capability and new product success.*

3.4. THE MODERATOR EFFECT OF ENVIRONMENTAL DYNAMISM AND RESOURCE AVAILABILITY

Innovation literature lists many factors that affect the development of radical and incremental innovations within the companies. These factors can be divided in two groups: the elements that are related to the organization itself and those associated with its environment. Size, age and structure processes and management all represent the main important factors that are internally associated with the company itself. While, different external changes in the market place and in the economies and technological dynamism are considered the major variables that may shape the innovations development.In this thesis, more emphasis is put on the availability of the resources the companies assign to innovations and the dynamism of markets.

3.4.1. Environmental dynamism

Environmental dynamism refers to speedy change and unpredictability of market conditions (Goll & Rasheed, 1997). Furthermore, it includes the perceived speed of change in product preferences, customer demand and the emergence of new customer segments in the industry (Jaworski & Kohli, 1993). Milliken (1987) defined uncertainty as the unpredictability of an environment, the inability to predict the impact of environmental change, and the inability to predict the consequence of a response choice. In other words, market uncertainty refers to the instability or unpredictability of markets, changes in the market structure, or in the degree of competition (Bestieler, 2005). Generally, high market uncertainty results from a fast-changing market or an emerging one (Chen *et al.*, 2005).

One of the most relevant factors causing market uncertainty is technological dynamism. Jaworski and Kohli (1993) defined technological dynamism as the speed of change in the technological environment of the firm. Consequently, the critical factors defining the organization's market environment for new products demands rigorous investigation monitoring. In particular, the effects of technology that reduces the life cycles of a firm's products and services, which, in turn, leads to more exploration, must be closely monitored (Atuahene-Gima, 2005). Bestieler (2005) argued that the effects of changing information technology will continue to alter the way organizations innovate, design, manufacture, and market new products, as well as the way consumers and other stakeholders respond to those products.

The atmosphere of a business environment determines to a high degree, to what extent the company is able to generate innovations (Bestieler, 2005). Furthermore, according to Bayus (1997) and Jansen *et al.* (2006), environmental dynamism is a pivotal factor that shapes the development of new products. The dynamism of the market generates uncertainty, which is one of the most important determinants that should be investigated before implementing any innovation project (Chen *et al.*, 2005).

Sidhu, Volberda and Commandeur (2004) argued that environmental dynamism might foster an exploration orientation (yet discussed the effect of exploration on radical innovation), in which companies attempt to acquire updated knowledge. Likewise, Atuahene-Gima *et al.* (2006) argued that in technological dynamic markets, exploration might enhance radical innovations, because of the fact that the competition will be stronger and the product life cycle will be shorter. This, therefore, stimulates the company to prioritize explore new ways to introduce newness, which enhances radical innovation success. This last evidence originates from the fact that in dynamic markets, the information becomes obsolete rapidly, and then firms have to explore new knowledge in order to generate innovations. Christensen (1997) pointed out that in uncertain environments the exploitation of the current knowledge would not produce important results even for innovations, suggesting a discovery-driven learning process instead of the familiar development process. The antithesis to this is, in contrast, if there is no technological change, it is easier to take advantage of firm's actual routines, rather than examine new methods accuracy (March, 1991).

Some researches on new product issues indicate that environmental uncertainty originating from markets and technologies may have an impact on product development and, ultimately on product success and performance (Bestieler, 2005; Jaworski & Kohli, 1993). On the one hand, firms usually employ innovation activities in situations in which environmental dynamism is higher more than in other situations (Goll & Rasheed, 1997). However, in dynamic marketplaces, change is a major feature, and changes in any area of a marketplace can affect that market (Millson & Wilemon, 2002). This opens new possibilities for carrying out radical innovations, such as the incorporation of technologically different products, market demand of completely different products, incorporation of new materials, or changes in the utility of existing products, etc. Thus, radical innovations perform better in turbulent markets. This is because dynamic markets make the current products obsolete, which obliges companies to develop radical new ones (Jansen *et al.*, 2006) to respond to new markets that dynamism creates. The fact that familiar products become obsolete in dynamic markets disfavors incremental innovations, which relies on existing products and technologies and, in contrast favors radical innovations driving companies to develop new alternative products. As a result, market dynamism should positively influence radical product success since it influences the time to market and the perceived differentiation of new products produced in comparison with the competitors, and negatively incremental product success. Thus:

> *H_{19}: Environmental dynamism moderates the relationship between product innovation and new product success.*
>
> > *H_{19a}: The effect of incremental innovation on new product success is weaker in dynamic environments than in non-dynamic environments.*
> >
> > *H_{19b}: The effect of radical innovation on new product success is stronger in dynamic environments than in non-dynamic environments.*

3.4.2. Resources availability for innovations

As previously discussed, the adoption of innovation is influenced by several factors. One of these variables is the availability of resources that companies allocate for innovative products. Obviously, innovation development requires availability of resources and capabilities (Teece, 1992). These assets have been the subjects of many researches and studies. For example, Gupta *et al.* (1985) argued the importance of learning capabilities for coordination between internal departments of companies . Balkin and Gómez-Mejía (1984) viewed the issue from a human resources perspective, accentuating the importance of human resources procedures as a determinant factor in the innovation success. Other scholars consider the weight of firm's size on its market behaviors (Cohen & Klepper, 1996). Grabowski (1968) argued the importance of financial resources.

The infrastructural requirements for innovation play an important role in the success of learning, leading to new product innovations (Akgün *et al.*, 2006). Although larger companies may have more resources available for innovation than smaller companies do, the allocation of these resources may not be proportional to the firm's size. Many theoretical and empirical studies have been conducted to examine the correlation between firm's size and innovation, obtaining contradictory results. Some papers argue a positive relationship between a firm's size and availability of resources to innovate (For example, Aiken & Hage, 1971; Ettlie *et al.*, 1984; Kimberly & Evanisko, 1981; Pierce & Delbecq, 1977). Similarly, Damanpour (1992) performed a meta-analysis, observing a significant and positive relationship between both dimensions, but this was sensitive to the type of business activity (manufacturing or service companies, profit or nonprofit companies,…). On the contrary, other studies identify a negative relationship between firm size and allocation of resources for innovations (Quinn, 1985; Utterback, 1974). Additionally, some researches have concluded that there is no clear relationship between firm size and innovation success (Boeker & Huo, 1998).

The literature suggests contradictory results concerning the effect of resources availability for innovation on exploitation and exploration capabilities. Some authors argue that resources availability enables companies to invest in exploration (yet argued that foster radical innovations) and engaged then in new risky radical innovations (Voss *et al.*, 2008). However, Levinthal and March's (1993) model suggests the opposite, arguing that more abundant are resources, less attention companies give to exploration (yet argued the stronger relationship it has on radical innovations). They also consider that this approach is argued only in competitive environments. Similar findings were provided by Keupp and Gassmann (2013) who argued empirically that abundant resources usually leads firms to opt for the certain and familiar ahead of the uncertain, and the unfamiliar, the less costly instead of the costly, which implies developing incremental innovations rather than radical innovations.

Likewise, analyzing a sample of 208 technology intensive US manufacturing firms, Geiger and Makri (2006) argued that the available potential resources can facilitate the process of exploration and experimentation. This is due to the fact that "because of the highly uncertain nature of science search, the availability of slack would provide the necessary flexibility for consistently allocating resources to long term R & D projects" (Geiger & Makri, 2006: 100). Following the same logic, this allows concluding that the availability of resources may negatively affect exploitation, as it tends to foster exploration. Likewise, the same study concludes that resource availability affect positively the novelty of innovations, as the resonance of the companies to external innovators is likely to be greater in this case.

In summary, there is no clear agreement about the effect of the availability of the resources allocated for innovation on the choice of the capability and innovation type to be developed. However, literature tends to affirm a moderating effect of the availability of resource on the relationship between exploration and radical innovation. Thus, resource availability encourages exploration to obtain new radical innovations, whereas it may be disincentive in the case of pursuit of incremental innovations through exploitation. Hence:

> *H_{20}: Resources availability for innovation moderates the relationship between learning capabilities and product innovation.*
>
> > *H_{20a}: The effect of exploitation on incremental product innovation is weaker when resources for innovation are abundant.*
> >
> > *H_{20b}: The effect of exploration on radical product innovation is stronger when resources for innovation are abundant.*

3.5. CONCLUSION

Broadly, innovation consists of new combinations of the available knowledge through the organizational learning, which involves the acquisition, dissemination, and use of new knowledge (Damanpour, 1991; Johnson *et al.*, 1997; Verona, 1999). Many works have been performed; analyzing the different aspects of the relationship between organizational learning and the development of innovations. The result consists of different models and interpretations. For instance, "core competence" is Prahalad and Hamel (1990)'s definition to the ability of the company to coordinate and integrate the different competencies of production and technological flows. Furthermore, Kogut and Zander (1992) present "combinative capability" as the ability to combine different types of individual knowledge of different parts of the organization to achieve product innovation. Similarly, Teece *et al.* (1997) use the term "dynamic capability" to refer to the subset skills and competences that allow the company to create new products and processes and respond to changing market circumstances. However, despite the different terminology, literature seeks to establish the ability of the company to coordinate and orientate its individual knowledge towards innovation.

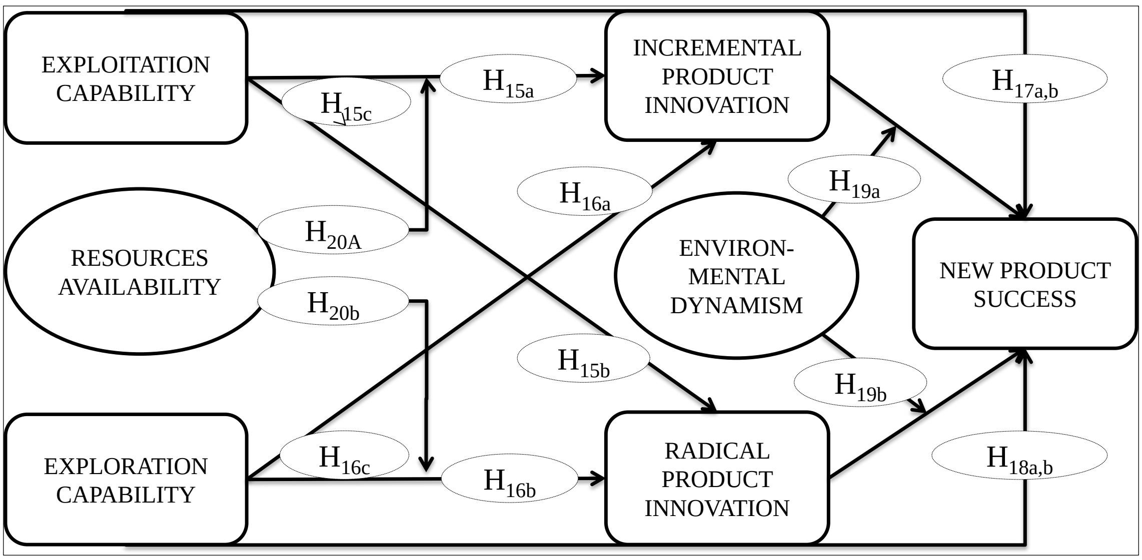
Literature dealing with knowledge identifies two approaches: knowledge creation theory and organizational learning-based models. The first emphasizes the role of knowledge creation, diffusion inside the companies and finally conversion of this knowledge into innovative outputs, whereas the second is rooted in learning. The latter theory analyzes the process of organizational learning based on the uncertainty in the business environments and the strategic need to adapt to them. Therefore, the main idea in this sense is that companies must adapt its internal system, such as structure, staff and culture to achieve this end and, ultimately, to adapt more quickly to the changing environments. In summary, the underlying aim of both theories is analyzing how companies create new knowledge for innovation, growth and sustainability.

Based on literature, learning determines innovation capability and outcomes. Accordingly and in approaching such causal relationship between innovation and learning, exploitation and exploration capabilities are argued to influence differently the types of innovations (incremental/radical). Literature tends to affirm the consistency of exploitation and incremental innovations on the one hand and exploration and radicalness of innovation on the other hand. In this logic, companies that adopt explorative learning likely have the potential to create radical product innovation, whereas companies that adopt exploitative learning are those who develop incremental or hierarchical innovations.

Incremental and radical product innovations are widely consented to contribute to new product success. This is due to the instant benefits and competence-enhancing nature of the first type on the one hand and the strategic rewards of the last on the other hand. However, this relationship is conditioned by dynamism of today markets, which determines the customer preferences and product success. Likewise, in situation of dynamism and uncertainty radical innovation tend to be more successful, whereas contrarily incremental innovations perform better in non-dynamic situations.

Introducing exploitation and exploration capabilities and their effects on innovations' success evokes examining the dimension of availability of resources assigned for the innovation activities, as companies' financial and material assets are determinant. A review of the literature suggests that when resources are available, companies tend to carry out successful radical innovations through exploring extramural environment for novel knowledge, whereas the relationship between exploitation and incremental innovation decreases in this case. Finally, based on the discussions undertaken in chapter III, the hypotheses abovementioned are resumed in figure 3.9.

Figure 3.9: The Hypotheses developed in chapter III



CHAPTER IV: EMPIRICAL ANALYSIS METHODOLOGY

CHAPTER IV

The literature review conducted in the previous chapters has served in framing theoretically the present research, enabling, at the same time, the literary justification of the different hypotheses. However, these presumptions need to be empirically argued. Therefore, as a beforehand process of testing empirically the different hypotheses, this chapter analyses the characteristics of the studied population and sample, the operationalization of variables and the processing of data. It deals with the design of the empirical research including the development of measurement scales previously mentioned in theoretical concepts, the sample design, questionnaire development, data collection and analysis techniques for evaluating both properties of the scales, and for analysis of the research hypothesis. Consequently, the first part of the chapter four exhibits a summary of the model and hypothesis to be analyzed, then the studied population, the sampling, and the questionnaire and data collection is studied in the second part. The third part deals with the operationalization of measurement scales, based on the literature review.

Having defined the analysis technique for implementing the data analysis aiming at testing the hypothesis established in the different chapters of the theoretical part, the next step is to determine the sample characteristics, the data collection methodology and the operationalization of manipulated variables. The last part deals concretely with the different aspects of data processing within structural equation modeling techniques, such as measurements' validity and reliability check, factor and CFA analysis and descriptive analysis.

4.1. MODEL AND HYPOTHESES TO BE TESTED

The model offered herein is a result of a thorough literature revision. Such a revision has been synthesized in three chapters including twenty hypotheses. This part summarizes the underlying ideas leading to establishing the model and exhibits the nomological network of relationships presumed based on innovation and learning literatures.

Nowadays companies operate in highly competitive and dynamic environments. This is due to the fast pace of technological change, the customer changing needs and globalization of markets. Consequently, companies face a variety of challenges that should be overcome successfully, in order to achieve performance. However, firms' performance generation depends on many key factors that monitor the actual business scene. Amongst these factors, literature assesses the vital role of innovation in survival and growth of contemporary firms.

Innovation is undoubtedly a critical activity for modern businesses, and indisputably a key determinant of the performance generation. This is due to the payoffs it offers such as financial benefits, customer satisfaction, firm image and positioning, market share growth and environment monitoring. However, the development of innovation is considered risky and costly, which constitutes a discouraging barrier that impedes the involvement of many firms in innovation projects. Such challenges differentiates companies depending on how their manage it.

Only those innovations whose development is carried out successfully contribute to the improvement of the company's results. The type of innovation developed influences the success of the new product. Traditionally two types, of new products are distinguished based on the incorporated technology and the degree of newness, i.e. incremental and radical innovations. Incremental innovations stands for the new products that are developed based on familiar ones using almost the same assets, whereas radical innovations build on breakthrough technology and novel organization. An important part of literature sustains that incremental innovation tends to be more successful than radical innovation does, since the latter involves higher costs and risks.

Although both types of product innovations contribute to the success of the newly developed product, they are conditioned by dynamism of the environment and the resources scarcity or abundance, among other variables. Thus, according to literature, market dynamism influences customer preferences, opting for new offers, which influences positively the radical products. Likewise, resources scarcity determine the vocation of companies to engage in research and venturing for acquiring new knowledge and then developing breakthrough outputs, or rather to keep on their internally-oriented philosophy, favoring small enhancements of their familiar products.

For the development of these types of innovations, companies are obliged to learn for acquire and use lacked knowledge. Traditionally literature recognizes and differentiates between two types of learning capacities: exploitation and exploration. These capabilities are fundamentally different. Exploitation focusses on internal assets and competences use, whereas exploration is usually associated with experimentation and venturing with the aim of acquiring new knowledge and technology. In any case, both are competitive and related to the results of the company. Likewise, they affect incremental and radical innovations differently. Furthermore, exploitation capability strengths incremental innovation more than radical innovation, whereas exploration capability is likely to be more related to radical product innovation more than incremental product innovation.

The relationship existing between types of innovation and learning capabilities is conditioned by the existence of resources that are devoted especially to innovation projects. In this sense, the available are the resources for innovation, the greater is the likelihood of companies to involve in explorative researches and then develop radical innovations ahead of exploiting and developing incremental ones.

To develop exploitation and exploration capabilities, companies have to create new knowledge and leverage the existing one. In this context, many factors intervene in such an endeavor. Broadly, external and internal credentials are determinant, which can be understood as follows.

First, the generation of new knowledge is explained by the absorption capacity of the company. The absorption capacity consists of the ability of companies to identify, assimilate, acquire and apply knowledge existing in their environments. Many theorists have operationalized absorptive capacity and the term is still gaining increasing interest in strategic management. In turn, literature distinguishes between potential and realized absorptive capacity. Evidently, both subcomponents of the absorptive capacity are complementary and interlinked.

Absorptive capacity clearly influences exploitation and exploration abilities. Regarding exploitation capability, this effect is probably because the realized absorptive capacity serves and stands for exploitation of the already acquired knowledge, whereas the potential absorptive capacity is likely favoring to exploration since the identification and assimilation of knowledge condition the capability to acquire such knowledge.

Second, another component that influences the generation of the capacity of exploitation and exploration and likely determine the absorptive capacity is the organizational memory. The organizational memory stands for the old knowledge and accumulated experiences that companies lay up for future use. Companies leverage the stored knowledge mainly for exploitative purposes, although such knowledge may serve as a knowledge base for future exploration of novel information.

Thirdly, defining a strategy for managing the strategic vision towards innovation sets the path that leads companies to achieve competitive advantage. In this case, the commitment to innovation strategies to the detriment of imitation of leading innovators or even no-innovation will support clearly exploration ahead of exploitation. Thus, a well-defined innovation for encouraging product innovation enables companies to leverage existing knowledge in their environments. Likewise, it will encourage a firm’s knowledge absorptive capacity.

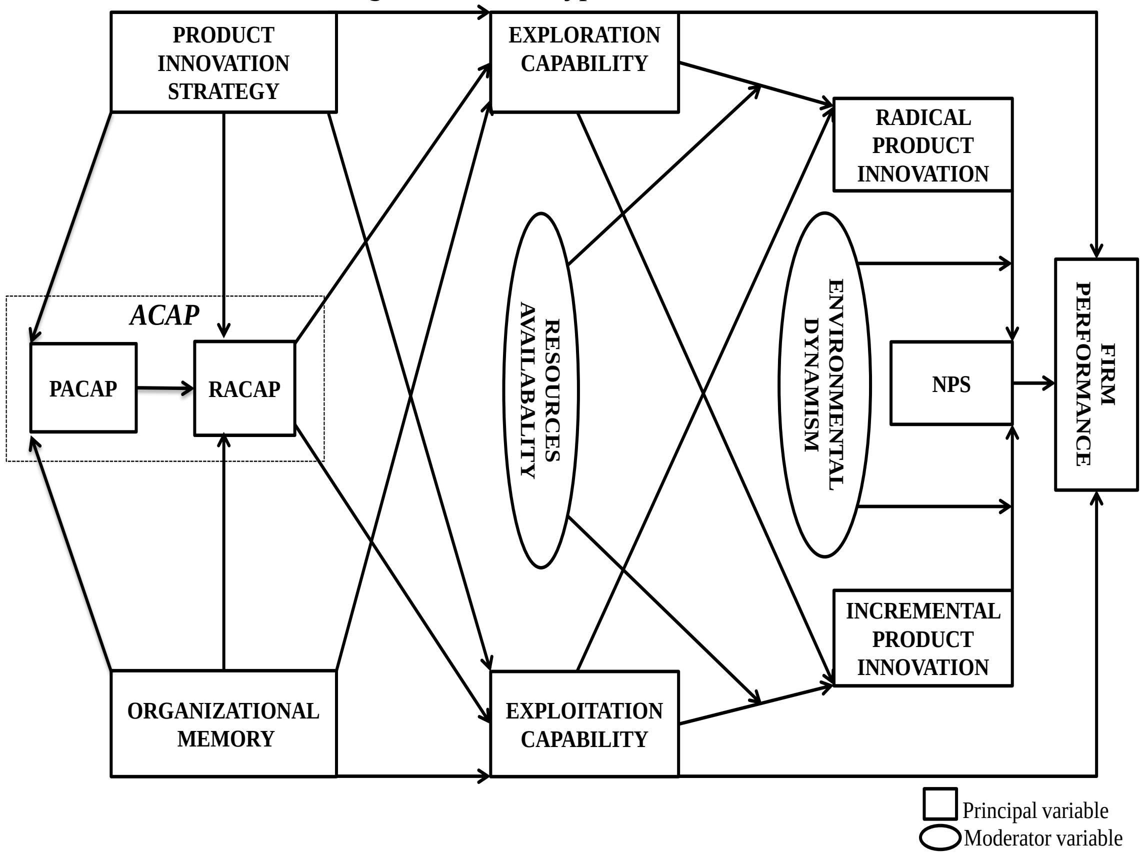
The above discussion summarizes the roots of the model presumed herein, which is interpreted in a series of hypotheses about the interaction of the studied variables. Finally, the above arguments, that have been compiled based on a thorough literature review, has led to formulating the different relationships (paths) that have been enumerated and justified in the previous chapters. Twenty hypotheses presumed in this thesis are listed in table 4.1.

Table 4.1: The different hypotheses forming the thesis model

Designation		Hypothesis
H_1		New product success is positively related to firm performance.
H_2	H_{2a}	Incremental product innovation is positively related to new product success.
	H_{2b}	Radical product innovation is positively related to new product success.
	H_{2c}	Incremental product innovation has a major effect on new product success than radical product innovation.
H_3		Exploitation capability positively affects firm performance.
H_4		Exploration capability positively affects firm performance.
H_5		A firm's potential absorptive capacity positively affects its realized absorptive capacity.
H_6		Realized absorptive capacity positively affects a firm exploitation capability.
H_7		Realized absorptive capacity positively affects a firm exploration capability.
H_8		A firm's product innovation strategy is positively related to its exploitation capability.
H_9		A firm's product innovation strategy is positively related to its exploration capability.
H_{10}		A firm's product innovation strategy is more related to its exploration capability than its exploitation capability.
H_{11}	H_{11a}	Product innovation strategy has a positive relationship with a firm's potential absorptive capacity.
	H_{11b}	Product innovation strategy has a positive relationship with a firm's realized absorptive capacity.
H_{12}		A firm's organizational memory has a positive relationship with its exploitation capability.
H_{13}		A firm's organizational memory has a positive relationship with its exploration capability.
H_{14}	H_{14a}	A firm's organizational memory has a positive relationship with its potential absorptive capacity.
	H_{14b}	A firm's organizational memory has a positive relationship with its realized absorptive capacity.
H_{15}	H_{15a}	A firm's exploitation capability is positively related to incremental product innovation.
	H_{15b}	A firm's exploitation capability is positively related to radical product innovation.
	H_{15c}	A firm's exploitation capability is more related to incremental product innovation than radical product innovation.
H_{16}	H_{16a}	A firm's exploration capability is positively related to incremental product innovation.
	H_{16b}	A firm's exploration capability is positively related to radical product innovation.
	H_{16c}	A firm's exploration is more related to radical than incremental product innovation.
H_{17}		Incremental innovation partially mediates the relationship between a firm's exploitation capability and new product success.
H_{18}		Radical innovation positively mediates the relationship between a firm's exploration capability and new product success.
H_{19}	H_{19a}	The effect of incremental innovation on new product success is weaker in dynamic environments than in non-dynamic environments.
	H_{19b}	The effect of radical innovation on new product success is stronger in dynamic environments than in non-dynamic environments.
H_{20}	H_{20a}	The effect of exploitation on incremental product innovation is weaker when resources for innovation are abundant.
	H_{20b}	The effect of exploration on radical product innovation is stronger when resources for innovation are abundant.

All these arguments are displayed in the figure 4.1, in terms of hypothesis global behavioral model of business decisions for developing successful innovation based on the generation of certain learning capabilities, which leads to generating firm performance and sustainable development.

Figure 4.1: The hypothesized model



Source: Author's own elaboration

4.2. SAMPLE AND DATA COLLECTION

4.2.1. Population

Population studied in this thesis is composed of Spanish manufacturing firms located in the region of Murcia, with more than 40 employees. These companies were chosen according to the conventional process that similar studies used to adopt. At the beginning, a list of 475 companies selected randomly from the database of Iberian Balance Sheets Analysis System [Sistema de Análisis de Balances Ibéricos (SABI)] were located and invited to participate. The search has allowed getting almost all the companies that are operating in Murcia, with more than 40 employees. The business area is delimited using the codes of economic activities related to manufacturing activities (CNAE -93).

Broadly, the target population is characterized by innovativeness and dynamism of the related sectors, as their data indicated. This aligns with the mainly adopted theoretical frameworks (knowledge-based perspective and resource-based views) that begins from the premise that nowadays' business environments are characterized by a high rate of change and discontinuity, which requires flexible and rapid responses through ongoing learning and continual innovation. The following paragraphs provide more information about the population through the sample analysis.

4.2.2. Sample

Drawing on industrial companies, the sample studied in this study is representative, and belongs to different sectors. A routine check for industry bias indicated no significant differences in the mean responses on any construct across firms from different industries. The table 4.2 displays the activities of the sample by sector.

Table 4.2: Sample by economic sectors

CNAE93	DESCRIPTION	%
01	Agriculture, animal breeding and related activities	0.4
11	Extraction of crude oil and natural gas; activities of the services related with oil and gas extraction, excluding surveying	0.4
14	Extraction of no-metalized minerals, no energetic	2.8
15	Food and beverages industry	22.5
18	Clothing and fur industry	2.8
19	Preparing, training and dressing of leather. Manufacture of leather goods, travel goods, horse harness goods and footwear	2.4
20	Industry of wood and cork, except furniture, basketwork and goods of esparto	2.0
21	Paper industry	0.4
22	Publishing, printing, reproduction of recording media	4.0
24	Chemical industry	6.4
25	Industry of rubber and plastics	7.2
26	Manufacture of other non-metallic mineral products	8.4
27	Metallurgy	0.8
28	Manufacture of metal products, except machinery and equipment	11.6
29	Industry of machinery and metal instruments	2.8
31	Industry of electrical machinery and equipment	1.2
33	Manufacture of medical and optical instruments and watches	0.4
34	Industry of motor vehicles, trailers and half-trailers	0.4
35	Manufacture of other transport equipment	0.4
36	Manufacture of furniture; other manufacturing industries	12.9
37	Recycling	0.4
40	Production and distribution of electricity, gas, vapor and hot water	0.8
41	Collection, purification and distribution of water	1.2
45	Construction	2.8
50	Sale, maintenance and repairing of motor vehicles, motorcycles and mopeds, …	0.4
51	Wholesale trade and trade interveners, except motor vehicles and motorcycles	3.6
52	Retail trade, except motor vehicles, motorcycles and mopeds, …	0.4

From the 475 companies invited to participate, 249 usable questionnaires were received (a response rate of 52.42%). This rate is above that of other research studies in the same field (e.g. Atuahene-Gima *et al.*, 2006; LaBahn *et al.*, 1996; Lukas & Menon, 2004; Zheng-Zhou, 2006). The responding companies belong to different sectors of Spanish economy, which implies a good representation of the sample. In general, food and beverage industry, furniture industry and metal production have the highest representation in the sample. Oil industry, animal breeding, paper printing and motor vehicle sector among other represent the lowest rate.

In addition, Chi-square distribution analysis revealed no significant differences between the sample and the population, which it was drawn from in terms of industry distribution, the number of employees and sales volume. In summary, the sample is significantly representative to the population, which is mainly characterized by the features discussed in the following paragraphs.

The age of the company is a key variable that determines the relevance of the data issued. The working courses of the studied companies differ, and there is a clear heterogeneity in companies' ages, which means a better distribution in this regard. The table 4.3 shows a categorization of the ages of the different companies forming the studied sample.

Table 4.3: Ages of the studied companies

Ages interval (years)	**Percentage in the sample**
2-10	8.4%
10-20	35.8%
20-30	29.7%
30-40	19.7%
40-87	6.4%

The randomly drown sample is dispersed geographically throughout the province of Murcia (Spain). The studied companies are subdivided among 31 localities. These localities differently hold dissimilar numbers of companies due to their economic importance and number of population in each. A proportionally good distribution over the different cities, correspondingly to the city size, can clearly be recognized in the table 4.4.

Table 4.4: Geographical distribution of the studied population

LOCALITY	Nbr. companies		LOCALITY	Nbr. companies
Abanilla	3		*Fuente Alamo de Murcia*	1
Aguilas	1		*Jumilla*	4
Alcantarilla	14		*Las Torres de Cotillas*	6
Alguazas	4		*Librilla*	1
Alhama de Murcia	4		*Lorca*	14
Archena	4		*Lorqui*	4
Beniel	2		*Mazarrón*	1
Bullas	2		*Molina de Segura*	24
Campos del Rio	1		*Moratalla*	3
Caravaca de la cruz	7		*Murcia*	56
Cartagena	16		*Puerto Lumbreras*	1
Cehegin	5		*Santomera*	4
Cieza	2		*Torre-Pacheco*	8
Ceuti	4		*Totana*	8
Fortuna	5		*Yecla*	35
Fuente Alamo	5			
Total: 249 companies				

Companies' legal form is also checked (see table 4.5). Our studied population is distributed differently according to the legal forms. Limited liability and joint-stock companies represent the highest percentage, while cooperatives and limited partnership business entities form the rest of the sample that, in turn, represents the total population.

Table 4.5: Companies legal forms

Company's legal form	Percentage %
Cooperatives	0.4
Joint-stock companies	47.0
Limited partnership business entities	0.4
Limited liability companies	52.2

4.2.3. Data collection

The data was collected using a structured questionnaire via a webpage designed specifically for this purpose. The process was managed by a specialized market research company. The survey was administered by telephone between May and July 2009.

Different steps were followed to carry out the data collection. We contacted the CEO or innovation executive of each organization. We explained the purpose of the survey, provided a username and password and gave the webpage address, following the practice used in similar studies in the field (Atuahene-Gima *et al.*, 2006; Li &

Atuahene-Gima, 2001). The market research company then tracked completion of the questionnaire and helped organizations to complete it.

All the processes were supervised and the quality of this activity was tested by contacting a randomly selected sample of firms that had answered the questionnaire. The authors monitored the performance of the companies that had completed the survey. No problems were found during the information collection process. The unit of analysis for this study was the company.

4.2.4. Questionnaire

Following the logic of similar studies, the questionnaire used herein provides information about the aim of the study, how answering the different queries as well as a general description of the same. In addition to all the variables, it includes also general questions about the target companies such as their size, operative age, the extent of their involvement in R&D, the subsidies they beneficiate for developing and promoting innovations, and so forth.

The questionnaire was designed based on the literature review conducted in the previous chapters. It was thought to be an efficient tool for collecting information. In particular, it aimed to be concise and with the question logically ordered for facilitating the respondents' answers. Furthermore, since the questions were answered through a web page, the latter was designed carefully in order to be intuitive and attractive.

Once literature was reviewed and the theoretical model was designed, it was proceeded to define items to measure each of the used variables. Due to the ambitious goal of analyzing the variables that may be related to the innovativeness of firms, and the impact of the interventions of the regional administration, a process of improvement and reduction in number of questions was made for ensure their adaptation to the web survey. After several meetings of the research team, a second draft of 5 pages, which was used in the pre-test was obtained. Three pre-tests were conducted in different companies. Finally, the final document consisting of 27 questions was developed. The pre-test was conducted with three CEOs to check the intelligibility of the questionnaire used. Based on their feedback, a number of items were reworded. This pre-test also involved five academics from different universities for improving the clarity of the questionnaire, and ensuring an effective, accurate and unambiguous communication with the interviewees. It is worth highlighting that the participants did not report any misunderstandings of the content of the questionnaire, which implies that the definitions of the different constructs were clear. For all the measurements, a 5 point Likert scale was manipulated.

In summary, the questionnaire is divided into nine parts dealing with firms' information such as addresses, activities, involvement in innovation projects, supports they beneficiate from official institutions, the nature of the outputs their carry out, their learning capabilities, the outcomes of the outputs they launch and so forth. These parts are summarized in the following points:

- General information: includes items that measure certain contingency factors, namely, the characteristics of the organization, age, size, and familial owning character. In addition, due to its importance to the research, it was considered necessary including in this part of the questionnaire questions that will be used to assess the achievement of organizational business efficiency and innovation performance. Such information is obtained from the feedbacks displayed in the questionnaire and the information obtained from the SABI database.

- Environment and industry: the sector has not been included as a question in the questionnaire since it is obtained from the SABI database. In addition, the questionnaire included questions about the dynamics of technology and industry in which the target company operates.

- Innovation activities: includes five questions, all aimed at assessing the level of business innovation. These questions include innovativeness of the company, its innovation strategy, innovation types it produces, the radical or incremental nature of this innovation, technology and the difficulties faced when innovating.

- Resources and capabilities for innovation: these questions seek to measure firms' resources allocated to innovation, the available staff to innovate, the sources of financing, the capability to generate incremental and radical innovations, the capabilities to acquire new knowledge and partnerships and cooperation.

- The public administration interventions: this contains items related to the role of the public government in the development of innovations, effectiveness of subsidies for innovation. It deals also with the grants offered by the regional administration for supporting companies to innovate, the perception of the situation of public actions in the Region of Murcia in comparison with the rest of Spanish regions, and the amount of the subsidies. More information is provided in the questionnaire that will be annexed in the appendix.

4.3. OPERATIONALIZATION OF THE VARIABLES

Once the population and sample are defined, the next step is to define the variables that will serve as the basis for empirical testing of hypotheses. Moreover, given that the operationalization of the variables is the first step towards empirically measuring the different hypotheses of this work, it also serves in clarifying the hypotheses themselves and sheds light on how to measure the used constructs.

In general, the measurement methods can be classified as quantitative (numerical) or qualitative (non-numerical), but also can be performed based on whether the measures are based on objective or subjective opinions. The first measurement type typically generates objective-quantitative numerical indicators, while the second is based on subjective assessments expressed in terms of definitions, numbers or equivalents. However, the present thesis includes both types of measurements.

Broadly, scientific research is a systematic based process; therefore, the majority of the researchers usually adopt former research findings, including the previously used variables. Thus, basing on the existing literature, this study uses mostly scales taken from related literature and have been used by different authors in similar studies. The constructs used in this thesis are:

4.3.1. Main variables

4.3.1.1. Absorptive capacity (ACAP)

Although firm absorptive capacity has formed a subject of many recent researches; different scales have been used to measure this construct. The first generation of works about this issue, such as the contribution by Cohen and Levinthal (1990) measure the absorptive capacity as one construct, evaluating firm's ability to recognize the value of external knowledge, assimilate and exploit it. These woks assess these capabilities as a product of R&D activities. The second generation of researches distinguish between potential absorptive capacity and realized absorptive capacity (Fosfuri & Tribó, 2008; Jansen *et al.*, 2005), adopting Zahra and George (2002) approach.

In this vein, Camisón and Forés (2010) provided a biographical inventory of the studies using different variables forming the subsets of the absorptive capacity (potential and realized). Camisón and Forés (2010) present the acquisition capacity as the ability of a company to establish external R&D links, to be open and flexible towards new knowledge, and to be able to leverage internal knowledge flows. The assimilation capability relies on companies' ability to assimilate technological knowledge rooted mainly in its personal as well as the awareness that are related to personals and also to be able to carry out and attend training programs. The assimilation includes also according to this study company's knowledge management capacity.

The transformation capability is measured by the bulk of the studies analyzed by Camisón and Forés (2010) through transmission of technical knowledge, the ability of companies to renew their knowledge-base, the exchange of scientific knowledge and the integration of R&D activities within companies agenda. Finally, these studies present the application capability as the ability to exploit knowledge and leverage experiences, the likelihood to develop patents and the ability to be pioneer in initiating significant knowledge-based actions. Table 4.6 highlights scales measuring the absorptive capacity subcomponents, as reported by a good part of literature.

Table 4.6: Scales and items of potential and realized absorptive capacities

	Items	Studies
Potential absorptive capacity (PACAP)	***Acquisition capacity***	
	1) Knowledge of the competition	Lane *et al.* (2001), Nieto and Quevedo (2005),Tu *et al.* (2006)
	2) Openness towards the environment	Caloghirou *et al.* (2004), Lane *et al.* (2001),Jansen *et al.* (2005), Nieto and Quevedo (2005), Soo *et al.* (2007), Tu *et al.* (2006)
	3) R&D cooperation	Arbussà and Coenders (2007), Caloghirou *et al.* (2004), Jansen *et al.* (2005), Liao *et al.* (2003), Mangematin and Nesta (1999), Zahra and George (2002)
	4) Internal development of technological competences	Arbussà and Coenders (2007), Tu *et al.* (2006)
	Assimilation capacity	
	1) Assimilation of technology	Jansen *et al.* (2005), Matusik and Heeley (2005), Wong *et al.* (1999)
	2) Human resources	Caloghirou *et al.* (2004), Hayton and Zahra (2005), Liao *et al.* (2007), Nieto and Quevedo (2005), Tu *et al.* (2006), Vinding (2006)
	3) Industrial benchmarking	Tu *et al.* (2006)
	4) Involvement in spreading the knowledge	Arbussà and Coenders (2007), Caloghirou *et al.* (2004), Fosfuri and Tribó (2008), Soo *et al.* (2007)
	5) Attendance at training courses and professional events	Caloghirou *et al.* (2004), Jansen *et al.* (2005), Soo *et al.* (2007)
	6) Knowledge management	Matusik and Heeley (2005), Szulanski (1996)
Realized absorptive capacity (RACAP)	***Transformation capacity***	
	1) Transmission of IT-based knowledge	Jansen *et al.* (2005), Nieto and Quevedo (2005), Wong *et al.* (1999)
	2) Renewal capability	Jansen *et al.* (2005)
	3) Adaptation capacity	Jansen *et al.* (2005), Nieto and Quevedo (2005)
	4) Exchange of scientific and technological information	Jansen *et al.* (2005), Lenox and King (2004),Szulanski (1996), Soo *et al.* (2007), Tu *et al.* (2006)
	5) Integration of R&D	Vinding (2006)
	Application capacity	
	1) New knowledge exploitation	Jansen *et al.* (2005)
	2) Application of experience	Lenox and King (2004), Soo *et al.* (2007)
	3) Development of patents	George *et al.* (2001), Mangematin and Nesta (1999), Zahra and George (2002)
	4) Technological proactiveness	Jansen *et al.* (2005)

Source: Camisón and Forés (2010)

The present study adapts the two-subcomponents logic developed by Zahra and George (2002). These subcomponents of absorptive capacity was measured using the scales developed by Jansen *el al.* (2005). The first measures the capacity of companies to acquire and assimilate external knowledge (see table 4.7). Thus, interviewees were asked about the extent to which employees as well as senior management are involved in acquiring informally or formally new knowledge (acquisition capability). Regarding the assimilation capability, CEOs were asked to evaluate their identification and understanding abilities to opportunities that the markets offer.

Table 4.7: Potential absorptive capacity (PACAP) measurement scale

(**Acquisition): In your company...**
1. Units or departments relate to senior management to acquire new knowledge
2. Employees regularly visit other branches of the company
3. Information is collected by informal means (meals with friends in other sectors, talks with teammates.…)
4. Employees frequently visit other areas or parts of our company
5. Usually arranging special meetings with customers or third parties to acquire new knowledge
6. Employees meet regularly with external professionals as consultants, managers or consultants
(Assimilation): In your company...
7. You quickly identify changes in the market (competition, laws, demographic change.…)
8. You quickly identify new opportunities to serve customers
9. You quickly analyze and interpret the changes originating from the market
10. You analyze and interpret rapidly changes in our customers' tastes

Likewise, the other subcomponent which is the realized absorptive capacity (RACAP) was used adapting the same measurements by Jansen *el al.* (2005), as depicted in table 4.8. It mainly measures the extent to which companies transform and apply the identified and assimilated knowledge.

Table 4.8: Realized absorptive capacity (RACAP) measurement scale

***(Transformation)*: In your company...**
1. The consequences of changes in the markets about new products are usually considered
2. Employees retain and store the new information for future use
3. The value of new acquired knowledge over the existing one is understood
4. Employees often share with each other the experiences on the job
5. Leveraging opportunities arising from new acquired knowledge is usual
6. You meet regularly to discuss market tendencies and new product development
***(Application)*: In your company...**
7. You clearly know how business activities should be improved
8. The customer complaints never fall on deaf ears
9. There is a clear division of roles and responsibilities
10. How to exploit the knowledge of the best possible way is constantly studied
11. There are no major impediments to developing new products
12. Employees have a common language regarding new products

Source: Jansen *el al.* (2005)

4.3.1.2. Exploitation (EXPLOI) / Exploration (EXPLOR) capabilities

Different procedures have been used for measuring exploration and exploitation capabilities (e.g. He & Wong, 2004; Katila & Ahuja, 2002; Rosenkopf & Nerkar, 2001; Sidhu *et al.*, 2004). Some authors have used a combined continuous measure for exploration-exploitation (Lavie & Rosenkopf, 2006) based on the assumption that exploration inhibits exploitation and vice versa (March, 1991). However, most of the literature indicates that they are compatible (Andriopoulos & Lewis, 2010; O'Reilly & Tushman, 2008) and has conceptualized them as orthogonal variables as in (Katila & Ahuja, 2002).

In this thesis, exploration and exploitation capabilities have been operationalized using an indicator composed of five items taken from the scales used by Atuahene-Gima (2005). Such a scale was adapted by this author from the contribution by Zahra *et al.* (2000). One item of each scale was eliminated in the process of testing the scales. Table 4.9 shows the items of the scale used to measure exploitation capability.

Table 4.9: Exploitation capability (EXPLOI) measurement scale

During the last three years, to what extent your company, in comparison with its competitors, has…
1. Updated the knowledge and skills about close products and technologies?
2. Improved the ability to exploit traditional technologies for its current innovation operations?
3. Improved the capacity to solve customers' problems with solutions not so different the current solutions?
4. Updated the skills to develop products that already the company has enough experience?
5. Strengthened their knowledge for projects that improve the efficiency of existing innovation activities?

Source: Atuahene-Gima (2005)

Similarly, exploration capability was operationalized based on the same authors mentioned in exploitation measurement. The scale used to measure firm's exploration capability stems in learning and acquisition of new knowledge as shown in table 4.10.

Table 4.10: Exploration capability (EXPLOR) measurement scale

During the last three years, to what extent your company, in comparison with its competitors, has…
1. Acquired technologies and production skills that are completely new to the company?
2. Learned skills and product development processes that are completely new to the industry?
3. Acquired new managerial and organizational skills and (tendencies ...) that are important for innovation?
4. Learned new skills in areas such as support for new technologies, recruiting staff for R&D, training and development of R&D and engineering staff, for the first time?
5. Strengthened the innovation related skills in areas where there was no experience?

Source: Atuahene-Gima (2005)

4.3.1.3. Organizational memory (ORGMEM)

In fact, organizational (corporate) memory has been studied within different field of knowledge, such as technology, systems, human…etc. Therefore, dependently on the specific area, researchers define such a construct. Chang *et al.* (2004) made a comparison of organizational memories studied in different researches, providing additional information such as the layers and the implications of the same.

Within the strategic knowledge management, organizational memory has been operationalized in different ways. For example, Camisón and Villar-López (2010) defined firm memory as a latent variable formed by nine reflective items that measure "valuable knowledge stored by a firm about the competitive business environment, markets and current clients and market factors". Likewise, Jackson (2012) delimited such a construct asking the interviewed people about: “the content of organizational memory, sharedness of organizational memory and characteristics hindering this, and also about the retainers of organizational memory.

In the present context, organizational memory refers to the old know-how and experience acquired by the company regarding a category of products or services. In this study, we adopt the scale developed by Chang and Cho (2008). This scale considers organizational memory to be indicated by the amount of knowledge, experience, familiarity and R&D investment in a specific kind of production. They assume that firm memory is determined by the expenditure of knowledge and research activities, as knowledge accumulation and memory coevolve, on the one hand, the experiences and familiarity with the process of carrying out new products on the other hand (see table 4.11).

Table 4.11: Organizational memory (ORGMEM) measurement scale

Prior to the development of new products, your company had…
1. A lot of knowledge regarding such products
2. A great experience regarding these products
3. A major familiarity with these products
4. Invested a lot of R&D in these products

Source: Chang and Cho (2008)

4.3.1.4. Product innovation strategy (PINSTR)

In fact, many previous studies have measured this construct in terms of the innovation strategy that favors product innovation (e.g. Atuahene-Gima *et al.*, 2006; Wijbenga & van Witteloostuijn, 2007; Zheng-Zhou, 2006). However, Wijbenga and van Witteloostuijn (2007) defined product innovation strategy by measuring “the firm’s emphasis on innovative orientation, the use of major and frequent product/service innovations, the tendency to beat competitors to market, development of new products and processes, new market development, the average costs of bringing products to market as a percentage of sales over the last three years, and the average R&D expenditure as a percentage of sales over the last three years”. Likewise, drafted from previous studies; Zheng-Zhou (2006) portraits an innovation strategy asking about: if the company is being the first in bringing innovative products to market, if it substantially invests in R&D in an attempt to be the first company into the market, and if it hardly works on being the first to introduce an innovative product to the market.

However, based on the definition by Li *et al.* (2006) and Naman and Slevin (1993), the product innovation strategy is measured herein with four items: time to market, the rate of investment in R&D, the innovativeness of the product introduced to the market and the initiation of actions that competitors can respond to (see table 4.12).

Table 4.12: Product innovation strategy (PINSTR) measurement scale

In the last three years, for the development and launching of new products our company…
1. Places great importance on being the first company in introducing new products to market
2. Invests abundantly in R & D in an attempt to be the first company in the market
3. Tries to do everything it can to be the first to launch an innovative product in the market
4. Starts actions that the competition responds to
5. Usually adopts aggressive measures against competitors, rather than adopting an approach of "live and let live"

Source: Zheng-Zhou (2006)

4.3.1.5. Incremental/ Radical innovations (INCRIN, RADINN)

Radical and incremental innovations have been studied together (Dewar & Dutton, 1986; Ettlie *et al.*, 1984; Song & Thieme, 2009) and separately (Banbury & Mitchell, 1995; Chandy & Tellis, 1998; McDermott & O'Connor, 2002; Vowles *et al.*, 2011). Accordingly, different measures have been performed on the basis of the degree of the introduced innovations.

Herein, the extent to which product innovation is radical has been measured using the scales proposed by Jansen *et al.* (2006) for exploitative and explorative innovations. This option makes it possible to test the effect of one variable on two different scales of innovation at the same time. Using a single scale (for instance, Gatignon *et al.*, 2002) would imply that organizations cannot develop incremental and radical product innovations at the same time.

Incremental innovation measurement focuses on the small improvements that companies introduce to the existing product in terms of shape and functionality. Additionally, aspects such as the frequency of product introduction to markets as well as the intensity of production measure partially aspects of incremental new products. Table 4.13 provides more information about the scale used to measure incremental product innovation.

Table 4.13: Incremental innovation (INCRIN) measurement scale

During the last three years, in comparison with your competitors, your company…
1. Frequently improves existing products
2. Regularly implement minor adjustments to existing products
3. Introduces improvements to existing products for local market
4. Improves the efficiency of its current products
5. Increases economies of scale in existing markets
6. Expands the services to existing customers

Source: Jansen *et al.* (2006)

Likewise, the extent to which a new product is radical is measured based on many criterions. The product is considered herein as radical according to both firm and market levels. Therefore, the interviewed was asked about if his company introduced during the last three years completely new products that did not exist before neither in market nor at the firm level. Similarly, we asked about some aspects that interpret the radicalness of new products such as leveraging emergent opportunities that markets offers. The table 4.14 provides additional information about the scale used to measure radical product innovation.

Table 4.14: Radical innovation (RADINN) measurement scale

During the last three years, in comparison with your competitors, in your company…
1.The demands that go beyond the current products are accepted
2. New products were invented
3. You experiment with new products in your local market
4. You commercialize products that are completely new to our unit
5. You often seize new opportunities in new markets
6. You regularly use new distribution channels

Source: Jansen *et al.* (2006)

4.3.1.6. New product success (NPS)

New product success (in some articles called new product performance or new product development success) has widely been presented within innovation literature for measuring the success of newly developed products by a given company. Moorman and Miner (1997) measure new product performance as it was reflected in: “sales relative to objective, profit margin relative to objective, return on assets relative to objective, return on investment relative to objective”. However, adopting former researches measurements; Huang *et al.* (Huang *et al.*, 2004) measure new product success using sixteen items enclosing three main dimensions: customer acceptance of the new product, product success level and sales volume.

In this dissertation, the measures of this construct were inspired from the contributions by Baker and Sinkula (2005), (2007), (1999a) and (1999b). The respondents were asked about the rate of success of their newly introduced products, the degree of differentiation of their new products, the ability of competitors to copy these new products and the development time of these products (see table 4.15).

Table 4.15: New product success (NPS) measurement scale

Compared to key competitors, during the past three years, in your company…
1. The number of new products introduced in the market is higher
2. The rate of success of new products is higher
3. The degree of differentiation of our innovations regarding our competition is high
4. The ability of competitors to copy our products is low
5. The development time of new products is lower

Source: Baker and Sinkula (2005), (2007), (1999a) and (1999b)

4.3.1.7. Firm performance (FIRPER)

In fact, firm performance is a key issue within the field of strategic management, since the improvement of organizational results is the central objective of current researches, which concerns both academics and practitioners. However, academic findings regarding firm performance have opened several debates about its terminology, level of analysis, as well as the conceptual basis for evaluation. In this logic, Martínez-Costa *et al.* (2009) considered organizational performance to be an “elusive concept to measure”. However, they measured performance through production costs, fast delivery, flexibility to change production volume and adapt stocks, cycle time, internal quality, external quality, customer satisfaction, market share, and employee satisfaction. Likewise, Curkovic *et al.* (2000) considered ROA, ROI and market share to measure firm overall performance. Others such as DeGroote and Marx (2013) and Stam *et al.* (2014) have measured firm performance through sales, market share, profitability, speed to market, and customer satisfaction. In summary, authors distinguish between financial and non-financial performance. Overall, the table 4.16 provides an overview of the different measures of firm performance used in prior researches, based on financial/no-financial character.

Table 4.16: Financial and non-financial performance

	Items	Studies
Financial performance	Sales	Corbett *et al.* (2005), Easton and Jarrell (1998), Forker *et al.* (1996), Hendricks and Singhal (2001a), Lima *et al.* (2000)
	Market share	Forker *et al.*, (1996)
	ROA or ROS	Corbett *et al.* (2005), Forker *et al.* (1996) Staw and Epstein, (2000)
	Return on equity	Staw and Epstein, (2000)
	Return on investment	Forker *et al.* (1996)
	Income	Easton and Jarrell (1998)
	Income over assets and over sales	Lima *et al.* (2000)
Non-financial and mix measures	ROA, sales and productivity.(mix: financial and non-financial)	Powell (1995)
	Product quality, timeliness and productivity, customer satisfaction, employee morale, and business performance (cash flow, innovation, market share growth, sales growth, employee growth and export growth)	Terziovski *et al.* (1997)
	Production costs, fast delivery, flexibility to change production volume and adapt stocks, cycle time, quality, customer satisfaction, market share, employee satisfaction….etc.	Everett (1994), Flynn *et al.* (1995), Ebrahimpour *et al.* (1997), Tan *et al.* (1998), Martínez-Lorente *et al.* (2000), Samson and Terziovski (1999), Martínez-Costa *et al.* (2009)

Source: Martínez-Costa *et al.* (2009)

In this dissertation, a group of variables measure company's effectiveness. In order to measure the results, self-explanatory measures of performance, such as change in market share, product success rate, growth and profitability are usually employed (e.g. Han *et al.*, 1998). It has also been shown that subjective and objective measures of performance are highly correlated (Dess & Robinson, 1984). Furthermore, the literature provides a rationale for the use of non-financial performance measures (Quinn & Rohrbaugh, 1983; Venkatraman & Ramanujam, 1986). Table 4.17 provides more information about how firm performance has been measured herein.

Table 4.17: Firm performance (FIRPER) measurement scale

Compared to key competitors, during the past three years, your company…
1. Offers high quality products
2. Has more satisfied customers
3. Is growing significantly
4. Is more profitable
5. Is more productive

Source: Baker and Sinkula (2005), (2007), (1999a) and (1999b)

4.3.2. Moderator variables

By definition, a moderator variable is the variable that moderates an existing relationship between two studied variables. In other words, "a moderator variable is a variable, which is thought to temper or modulate the magnitude of the effect of an independent variable on a dependent one" (Judd, 2001: 9937). The importance of environmental turbulence in NPS or failure and the effect resources availability for innovation projects is widely argued in innovation literature (e.g. Akgün *et al.*, 2007; Bestieler, 2005; Calantone *et al.*, 1997; Damanpour & Gopalakrishnan, 1998; Droge *et al.*, 2008; Voss *et al.*, 2008). Therefore, herein the effect of these factors is empirically checked.

4.3.2.1. Environmental dynamism (ENVDYN)

Environmental dynamism is a new factor that is widely cited in the nowadays literature. It encloses the sum of change related to the customers and market place. Operational definitions of this construct differ, however "dynamism was operationalized as a standardized measure of the volatility of industry sales and the number of employees over a specific period" (Bisbe & Malagueño, 2012). Jansen *et al.* (2009b) determines it asking the interviewed persons about: intensity and change rate of local market, if their customers regularly ask for new products and services, and about the frequency of volumes of products and services to be delivered. Likewise, Li and Liu (2012) used four items as key environmental factors, considering the effects of industrial environment, competitor behaviors, technological progresses and customer demands. This study adopts the environmental dynamism measurement offered by Jansen *et al.* (2006) (see table 4.18).

Table 4.18: Environmental dynamism (ENVDYN) measurement scale

Regarding the environment in which the company is located…
1. Changes in our local market environment are intense
2. Our customers regularly demand new products
3. Continually changes occur in our local market
4. In our market the product volumes to serve change rapidly and frequently
5. Nothing has changed in our local market in a year

Source: Jansen *et al.* (2006)

4.3.2.2. Resources availability for innovation (RESAVA)

The role of firm resources in its functioning course is widely discussed (Barney, 1991; Collis & Montgomery, 1995; Hall, 1992; Kaleka, 2002). Likewise, resources are also considered as key determinant in innovation and learning capabilities of the company (Nanda, 1996; Voss *et al.*, 2008). However, even companies widely differ in terms of resources they own; the allocation of resources assigned to innovation projects depends on the strategic innovation implication of the same company. Herein, this study analyzes an internal variable focusing on the rate of abundance of resources for developing new products in the company. However, in this thesis the measure offered by Miller and Friesen (1982) and Newbert *et al.* (2008) as adapted for such a matter (see table 4.19).

Table 4.19: Resources for innovation (RESAVA) measurement scale

In your company, the rate of abundance of the following resources is…
1. Financial resources (financial capacity, cash, liquidity, retained profits, ...)
2. Tangible resources (tangible technology, plant, equipment, geographic location, raw materials, ...)
3. Human resources (training, experience, judgment, intelligence, relationships with employees, ...)
4. Intangible resources (patents, copyrights, trademarks, confidentiality, ...)
5. Organizational resources (relationships with other companies, distribution channels, organizational culture, ...)

Source: Miller and Friesen (1982) and Newbert *et al.* (2008)

4.3.3. Control variables

A control variable stands for a variable that is held constant in order to assess or clarify the relationship between two other variables. In other words, "a control variable refers to a variable whose effects on an outcome variable are statistically adjusted in order to estimate independent effects of an explanatory variable" (Mehta, 2001: 2727). Since the history of the company and its presence in the market affect its innovation course, it seems to be vital controlling the firm's size and age when measuring the relationships among innovations and radical and incremental success. These control variables were constructed in the same way as the other variables.

4.3.3.1. Firm size (SIZE)

Many studies dealing with the same issues as the present thesis have used firm size as a control variable. Herein, firm size is estimated by the number of its employees. Furthermore, it has been coded in order to have similar structure as the rest of variables in terms of a 5 Likert scale.

The importance of controlling firm size is rooted in the interconnection between firm size and its capability to develop product innovations (Damanpour, 1992; Pérez-Cano, 2013; Shefer & Frenkel, 2005; Stock *et al.*, 2002). Therefore, large companies tend to be able to invest in innovation projects more than the small and medium-sized companies do.

4.3.3.2. Firm age (AGE)

Similarly, firm age determines to some extant its course in R&D investment. Small firm may have limited experiences in innovation activities, whereas large firms likely engage intensely in R&D activities due to their accumulated resources among other factors. Thus, it could be interesting controlling this variable in the empirical analysis, impeding the alteration of the results. Furthermore, firm’s age has been recoded in order to have similar structure as the rest of variables, in terms of a 5-point Likert scale.

4.4. DATA PROCESSING

This section presents validity and reliability of the measurement scales used to test the hypothesized model. Likewise, the correlations among the different variables and parameters are analyzed. Similarly, additional information about the interaction amongst the variables is provided.

4.4.1. Validity and reliability check

4.4.1.1. Reliability

This analysis was conducted with structural equation modeling, using the statistical program EQS 6.1 for Windows (Bentler, 1995). Following the two-stage model-building process for applying SEM (Hair *et al.*, 1998; Hoyle & Panter, 1995; Jöreskog & Sörbom, 1996).

Basically, SEM consists of two components: (1) the measurement model, which reduces observed variables to a smaller number of latent factors; and (2) the structural equation model, which defines causal relationships among these latent factors. In the following section, we analyze the measurement model with a confirmatory factor analysis (CFA). Then, in chapter V, the structural model corresponding to the work hypotheses is tested.

As a preliminary step, the issue of common method variance that might result from collecting all variables from the same respondent in the same survey is assessed. The presence of Common Method Bias with Harman’s single-factor test on our data is checked. Analysis of discriminant and convergent validity, especially the goodness-of-fit indices of the model, indicated that common method variance was unlikely to be a serious problem in our study (Podsakoff *et al.*, 2003; Podsakoff & Organ, 1986).

To assess the single dimensionality of each construct, confirmatory factor analysis under the maximum-likelihood method of the five constructs was conducted employing all the items (Anderson & Gerbing, 1988), including all independent, mediator, and dependent variables so as to analyze their dimensionality, which is the relationships between latent and observed variables.

The result of the measurement model (table 4.20) indicates that the factor loadings in the measurement model are all close to or greater than 0.70, leading to a conclusion that the reliabilities of individual items are within acceptable levels (Nunnally, 1978). The table 4.20 provides an overview of the standard loadings of the variables, the *t-values* and the indicators of reliability of the measurements.

Reliability of the measures is calculated with Bagozzi and Yi's (1998) Composite Reliability (SCR) Index and with Fornell and Lacker's (1981) Average Variance Extracted (AVE) Index. Composite reliability coefficients for the constructs in the present model are all greater than 0.70, suggesting that a high internal reliability existed in the constructs. The average variance extracted coefficients are all greater than 0.5, which suggests that the items are able to explain the variance in the constructs (Fornell & Larcker, 1981).

Table 4.20: Constructs measures: Confirmatory factor analysis and scale reliability

Item description	Std load	t-value	Reliability (α[a]; SCR[b], AVE[c])
Product innovation strategy (PINSTR)			
1. The company strives for being the first in introducing new products…	0.899	[d]	α=0.921 SCR=0.955 AVE=0.843
2. Invests abundantly in R&D in an attempt to be the first company in the market	0.895	21.245	
3. Tries to do everything it can for being the first to launch an innovative product	0.926	26.357	
4. Starts actions that the competition responds to	0.951	28.611	
(scale: 1= strongly disagree; 5= strongly agree)			
Potential absorptive capacity (PACAP)			
Acquisition (ACQUIS)			
1. Units or departments relate to senior management to acquire new knowledge	0.900	[d]	α=0.890 SCR=0.941 AVE=0.800
2. Employees regularly visit other branches of the company	0.938	32.648	
3. Employees frequently visit other areas or parts of the company	0.890	25.776	
4. Usually arranging special meetings with customers or third parties to acquire new knowledge	0.848	22.535	
Assimilation (ASSIMI)			
5. Quickly identify market changes (competition, laws, demographic change)	0.954	[d]	α=0.932 SCR=0.962 AVE=0.864
6. Quickly identify new opportunities to serve customers	0.935	32.012	
7. Quickly analyze and interpret the changes originating from the market	0.898	25.834	
8. Analyze and interpret rapidly changes in our customers' tastes	0.931	29.022	
(scale: 1= strongly disagree; 5= strongly agree)			
Realized absorptive capacity (RACAP)			
Transformation (TRANSF)			
1. Considering consequences of market changes regarding new products	0.952	[d]	α=0.971 SCR=0.971 AVE=0.894
2. Employees retain and store the new information for future use	0.956	38.445	
3. The value of new acquired knowledge over the existing one is understood	0.938	33.343	
4. Meeting regularly to discuss market tendencies and new product development	0.936	30.946	
Application (APPLIC)			
5. You clearly know how business activities should be improved	0.974	[d]	α=0.964 SCR=0.970 AVE=0.890
6. The customer complaints never fall on deaf ears	0.944	42.775	
7. There is a clear division of roles and responsibilities	0.968	44.706	
8. There are no major impediments to developing new products	0.886	25.875	
(scale: 1= strongly disagree; 5= strongly agree)			
Organizational memory (ORGMEM)			
1. A lot of knowledge regarding such products	0.894	[d]	α=0.910 SCR=0.920 AVE=0.745
2. A great experience regarding these products	0.921	21.142	
3. Major familiarity with these products	0.911	20.857	
4. Invested a lot of R & D in these products	0.708	10.680	
(scale: prior to the development of new products: 1= strongly disagree; 5= strongly agree)			

Table 4.20: Continued

Exploitation capability(EXPLOI)			
1. Updated the knowledge and skills about close products and technologies	0.936	d	α=0.939 SCR=0.941 AVE=0.800
2. Improved the ability to exploit traditional technologies for its current innovation operations	0.964	27.670	
3. Improved the capacity to solve customers' problems with solutions not so different the current solutions	0.777	17.194	
4. Updated the skills to develop products that already the company has enough experience	0.890	21.276	
(scale: during the last three years: 1=decreasing evolution; 5= rising evolution)			
Exploration capability (EXPLOR)			
1. Acquired technologies and production skills that are completely new to the company	0.939	d	α=0.965 SCR=0.969 AVE=0.885
2. Acquired new managerial and organizational skills and (tendencies...) that are important for innovation	0.975	34.948	
3. Learned new skills in areas such as support for new technologies, recruiting staff for R&D, training and development of R&D and engineering staff, for the first time	0.885	25.182	
4. Strengthened the innovation-related skills in areas where there was no experience	0.962	33.079	
(scale: during the last three years: 1=decreasing evolution; 5=rising evolution)			
Incremental innovation (INCRIN)			α=0.946 SCR=0.949 AVE=0.825
1. Frequently improves existing products	0.913	d	
2. Introduces improvements to existing products for local market	0.952	26.540	
3. Improves the efficiency of its current products	0.970	27.654	
4. Increases economies of scale in existing markets	0.788	17.392	
(scale: during the last three years: 1=decreasing evolution; 5=rising evolution)			
Radical innovation (RADINN)			
1. New products were invented	0.859	d	α=0.952 SCR=0.950 AVE=0.828
2. You experiment with new products in your local market	0.924	26.287	
3. You often seize new opportunities in new markets	0.947	23.822	
4. You regularly use new distribution channels	0.907	23.358	
(scale: during the last three years: 1=decreasing evolution; 5=rising evolution)			
New product success (NPS)			
1. The number of new products introduced in the market is higher	0.938	d	α=0.972 SCR=0.972 AVE=0.873
2. The rate of success of new products is higher	0.949	45.751	
3. The degree of differentiation of our innovations regarding competition is high	0.948	42.770	
4. The ability of competitors to copy our products is low	0.928	30.604	
5. The development time of new products is lower	0.908	29.721	
(scale: in the tree previously years: 1= decreasing evolution; 5= rising evolution)			
Firm performance (FIRPER)			
1. Offers high quality products	0.969	d	α=0.983 SCR=0.985 AVE= 0.928
2. Has more satisfied customers	0.965	49.396	
3. Is growing significantly	0.972	48.521	
4. Is more profitable	0.956	41.058	
5. Is more productive	0.955	43.153	
(scale: in the tree previously years: 1= decreasing evolution; 5= rising evolution)			

Table 4.20: Continued

Resources for innovation (RESAVA)			
1. Financial resources (financial capacity, cash, liquidity, retained profits, ...)	0.739	d	α=0.934 SCR=0.936 AVE=0.747
2.Tangible resources (tangible technology, plant, equipment, geographic location, raw materials, ...)	0.850	12.771	
3. Human resources (training, experience, judgment, intelligence, relationships with employees, ...)	0.902	15.058	
4. Intangible resources (patents, copyrights, trademarks, confidentiality, ...)	0.921	14.119	
5. Organizational resources (relationships with other companies, distribution channels, organizational culture, ...) (scale: 1= very scarce; 5= very abundant)	0.898	14.698	
Environmental dynamism (ENVDYN)			
1. Changes in our local market environment are intense	0.935	d	α=0.939 SCR=0.946 AVE=0.780
2. Our customers regularly demand new products	0.913	27.661	
3. Continually changes occur in our local market	0.948	34.496	
4. In our market the product volumes to serve change rapidly and frequently	0.737	16.226	
5. Nothing has changed in our local market in a year (scale: 1= strongly disagree; 5= strongly agree)	0.865	22.729	
Fit statistics for measurement model of 60 indicators for 14 constructs: $\chi^2_{(1619)=}$ 2733.348; RMSEA=0.054; CFI=0.951; BBNNFI=0.947; IFI=0.951. [a] Cronbach alpha; [b] Scale composite reliability ($\rho_c=(\sum\lambda_i)^2$ var (ξ)/(($\sum\lambda_i)^2$ var (ξ) + $\sum\theta_{ii}$) (Bagozzi and Yi, 1998)); [c] Average variance extracted ($\rho_c=(\sum\lambda_i^2$ var (ξ))/($\sum\lambda_i^2$ var (ξ) + $\sum\theta_{ii}$) (Fornell and Larcker, 1981)); [d] Fixed parameter			

4.4.1.2. Construct validity

Construct validity deals with the problem of knowing what the instrument really measures. The process of establishing the construct validity involves analyzing the convergent, discriminant and nomological validities (Sarabia, 1999), as explained in the following parts.

- *Convergent validity*

It refers to whether the items that measure a given concept are correlated, as they must converge to similar scores (Sarabia, 1999). To check the compliance therewith the correlations between the items (indicators) in each concept were examined and the results are satisfactory.

- *Discriminant validity*

It establishes the degree to which a measure does not correlate with other measures which is supposed to differ from (Sarabia, 1999). Two methods have been used to set the discriminant validity of the measures. First, the correlation between the variables used to measure a single concept and the others that are used to measure the rest were analyzed. This is to verify that the variables chosen to measure a construct are interrelated to a greater extent more than they do with other constructs. The results are satisfactory.

The second method used to assess discriminant validity is factor analysis. Specifically, factor analysis was performed for each of the 14 scales used. To confirm the validity of each scale, the analysis should give, as optimal solution, a single factor whose eigenvalue is greater than 1. In this work factor analyzes of each scale by the method of principal components with Varimax rotation has been performed, obtaining a single representative factor for each scale. Table 4.21 summarizes the results of the factor analysis in question.

Table 4.21: Factor analysis of the scales

Scales	**Nº indicators**	**KMO**	**Bartlett significance**	**Explained variance**
PINSTR	4	0.821	876.265***	81.126%
PACAP- ACQUIS	4	0.724	721.042***	75.939%
PACAP- ASSIMI	4	0.819	990.135***	83.140%
RACAP- TRANSF	4	0.859	1368.799***	92.012%
RACAP- APPLIC	4	0.860	1340.013***	90.346%
ORGMEM	4	0.836	721.720***	79.019%
EXPLOI	4	0.845	940.697***	84.560%
EXPLOR	4	0.862	1312.814***	90.559%
INCRIN	4	0.842	1089.584***	86.319%
RADINN	4	0.848	1051.949***	87.407%
NPS	5	0.874	1748.225***	90.001%
FIRPER	5	0.908	2160.649***	93.642%
RESAVA	5	0.887	1103.444***	79.677%
ENVDYN	5	0.890	1208.631***	80.795%

KMO is an acronym of KAISER-MEYER-OLKIN, an indicator that takes the name of his author. As table 4.21 indicates; the KMO is higher than 0.5, which means a good indicator for continue ahead in the factor analysis (Bagozzi & Yi, 1998). Rather, as the small value is 0.724, this means a very good sign towards a good fit between factor analysis and the data. Likewise, Bartlett's test is used to check the homogeneity of sample variances (Snedecor & Cochran, 1989). The table 2.21 indicates positive and significant results regarding this issue.

Discriminant validity shows the extent to which measures of a particular construct differ from others in the same model. Thus, it was also tested by three different procedures recommended by Anderson and Gerbing (1988) and Fornell and Larcker (1981). Firstly, discriminant validity is indicated since the confidence interval (± 2 S.E.) around the correlation estimate between any two latent indicators never includes 1.0 (Anderson & Gerbing, 1988). Secondly, discriminant validity was tested by comparing the square root of the AVEs for a particular construct to its correlation with the other constructs (Fornell & Larcker, 1981).

For adequate discriminant validity, the diagonal elements of the correlation matrix should be greater than the off-diagonal elements (Fornell & Larcker, 1981). Table 4.22 shows that the measurement model demonstrates adequate discriminant validity, implying that the various constructs used in the model belong to distinct and separate entities.

Operationally, this was done in simplified form showing the correlations between constructs are lower than the square root of the average variance extracted (AVE). Finally, comparing the chi-square statistic between the constrained model where the correlation of a pair of factors was fixed to unity and the unconstrained model with the correlation freely estimated (Anderson & Gerbing, 1988). The results of these three tests provided strong evidence for the discriminant validity of the constructs.

Through the analysis of data using the program EQS 6.1 for windows, significant correlations between different model constructs were obtained, revealing how they affect each other. Assessing the validity and reliability of the variables, additional analysis was carried out. Concretely, the correlations among the different variables as well as among the factors forming these variables were checked. It is important to highlight that some indicators were eliminated during the validity check process. Table 4.22 indicates that the variables used in this study are significantly correlated. In addition this table 4.22 shows also the means and standard deviations of the variables used in this study.

Table 4.22: Discriminant validity

	MEAN	SD	AVE	PINSTR	ACQUIS	ASSIMI	TRANSF	APPLIC	FIRMEM	EXPLOI	EXPLOR	INCRIN	RADINN	NPS	FIRPER	RESAVA	ENVDYN
PINSTR	3.299	1.392	0.843	**0.918**													
ACQUIS	2.928	1.008	0.800	0.857	**0.894**												
ASSIMI	3.324	1.166	0.864	0.842	0.892	**0.930**											
TRANSF	3.483	1.248	0.894	0.880	0.842	0.843	**0.946**										
APPLIC	3.620	1.470	0.890	0.879	0.834	0.815	0.824	**0.943**									
FIRMEM	2.437	0.852	0.745	0.654	0.687	0.646	0.699	0.708	**0.863**								
EXPLOI	2.434	0.887	0.800	0.748	0.782	0.758	0.764	0.762	0.675	**0.894**							
EXPLOR	3.279	1.416	0.885	0.883	0.876	0.869	0.910	0.914	0.624	0.710	**0.941**						
INCRIN	3.192	1.164	0.825	0.836	0.862	0.840	0.878	0.868	0.710	0.796	0.874	**0.908**					
RADINN	3.211	1.429	0.828	0.799	0.826	0.804	0.816	0.822	0.580	0.691	0.863	0.846	**0.91**				
NPS	3.563	1.407	0.873	0.867	0.849	0.829	0.830	0.836	0.642	0.761	0.869	0.853	0.791	**0.934**			
FIRPER	3.788	1.549	0.928	0.855	0.834	0.905	0.930	0.914	0.703	0.790	0.873	0.867	0.794	0.921	**0.963**		
RESAVA	2.571	0.991	0.747	0.708	0.738	0.742	0.734	0.718	0.674	0.660	0.659	0.672	0.652	0.689	0.722	**0.864**	
ENVDYN	3.188	1.298	0.780	0.863	0.861	0.836	0.852	0.861	0.638	0.718	0.860	0.840	0.852	0.877	0.866	0.682	**0.883**

Note: In bold, the diagonal indicates the square root of AVE for the reflective constructs.

- *Nomological validity:*

It deals with establishing whether the measuring instrument behaves as expected, i.e. measures the degree to which the scale correlates, as theoretically expected, with other measures of different concepts but theoretically related (Sarabia, 1999). This type of validity is established by confirming significant relationships between related constructs according to the theory. Therefore, this validity can be evaluated when confirming or not the assumptions made in the study.

4.4.1.3. The goodness of fit

To evaluate the measurement and structural models, a mix of recommended fit indices was used. We followed the suggestions from Chou *et al.* (1991) and Hu *et al.* (1992) for the correction of the statistics of the estimation model used. In this way, the robust statistics (Satorra & Bentler, 1988) will be used to provide a better evidence of the statistical adjustments.

The likelihood ratio chi-square statistic χ^2 shows the difference between the covariance matrix predicted from the hypothetical model and the observed covariance matrix computed from the empirical data. A significant value of χ^2 indicates that the hypothetical model deviates from data. However, significance is often achieved with larger sample sizes, even if the difference is trivial. The evaluation of a hypothetical model should therefore be based on several different types of fit measures (Byrne, 2006; Hair *et al.*, 1998; Kline, 2005): the normed chi-square (χ^2/df), the Root Mean Square Error of Approximation (RMSEA), the Goodness-of-Fit Index (GFI), the Adjusted Goodness-of-Fit index (AGFI), the Comparative Fit Index (CFI) and the Non-Normed Fit Index (NNFI). Due to the sensitivity of the chi-square test to sample size, the relative chi-square was used (it should be 3 or less for an acceptable model). Standardized RMSR should not be greater than 0.10 and GFI, AGFI, NFI, and CFI should exceed 0.80 or 0.90 to be acceptable (Segars & Grover, 1998).

The results of the confirmatory factor analysis (CFA) to test the validation of the measures Satorra-Bentler $\chi^2_{(1619)}$= 2733.348; RMSEA=0.054; CFI=0.951; BBNNFI=0.947; IFI=0.951 indicate a good fit for the model.

4.4.2. Statistical analysis for testing the hypotheses

As mentioned earlier, the technique used for analyzing the data is Structural Equation Modeling. SEM is "a collection of statistical techniques that allow a set of relationships between one or more independent variables, either continuous or discrete, and one or more dependent variables, either continuous or discrete, to be examined" (Ullman & Bentler, 2012: 661). It is used when a researcher develops a theoretical model, hypothesizing a series of relationships among the set of variables (constructs) forming the model. It targets testing the hypothesized model empirically analyzing a sample data. The main characteristic of SEM is its ability to check the relationship among multiple variables simultaneously (Jöreskog & Sörbom, 1996). Thus, it differs from other techniques, as for example, the same variable may behave in the same model as the dependent variable in an equation, and appear as an independent variable in another equation. Likewise, it allows specifying a reciprocal effect, in which two variables affect each other, through a feedback process.

Following the two-stage model-building process for applying structural equation modeling (SEM) (Hair *et al.*, 1998; Hoyle & Panter, 1995; Jöreskog & Sörbom, 1996), a confirmatory factor analysis (CFA) was carried out followed by a SEM.

In contrast to the exploratory factor analysis, the aim of CFA is to test a hypothesized factor structure or model and to evaluate its fit to the data. In other words, CFA is "the model to use to verify the appropriateness of a measurement model prior to being concerned with regressions among the latent variables (Ullman & Bentler, 2012: 677). To assess the *unidimensionality* of each construct, a confirmatory factor analysis of the 14 constructs employing 60 items was conducted.

4.4.3. Test of the different hypotheses

This part deals with how every hypothesis is estimated according to the model. Broadly, two steps testing are conceptualized, introducing gradually the effect of the different variables of the original model. The following paragraphs provide different conceptions about the equations for testing empirically the various hypotheses.

- *Testing the main relationships*

Based on the related literature, the proposed model proposes several relationships Precisely, firm's absorptive capacity is related to its main learning capabilities through its realized absorptive capacity. In turn, realized absorptive capacity depends on firm's potential absorptive capacity. Similarly, the model argues the existence of relationships between organizational memory and firm strategy for developing and promoting product innovations on the one hand and the exploitation and exploration capabilities on the other hand. Likewise, the model presumes that the success of new products and firm performance is conditioned by its learning capabilities, that in turn positively influence overall firm performance. Product incremental and radical degree is also explicative to new product success, which is considered as a key factor in generating firm performance. All of these relationships are traduced in the following equations.

Main model:

$ACQUIS = \beta_{11}PACAP + \varepsilon_{1}$

$ASSIMI = \beta_{21}PACAP + \varepsilon_{2}$

$TRANSF = \beta_{31}RACAP + \varepsilon_{3}$

$APPLIC = \beta_{41}RACAP + \varepsilon_{4}$

$PACAP = \beta_{51}PINSTR + \beta_{52}ORGMEM + \beta_{53}SIZE + \beta_{54}AGE + \varepsilon_{5}$

$RACAP = \beta_{61}PINSTR + \beta_{62}PACAP + \beta_{63}ORGMEM + \beta_{64}SIZE + \beta_{65}AGE + \varepsilon_{6}$

$EXPLOI = \beta_{71}PINSTR+ \beta_{72}RACAP + \beta_{73}ORGMEM + \beta_{74}SIZE + \beta_{75}AGE + \varepsilon_{7}$

$EXPLOR = \beta_{81}PINSTR + \beta_{82}RACAP + \beta_{83}ORGMEM+ \beta_{84}SIZE + \beta_{85}AGE + \varepsilon_{8}$

$INCRIN = \beta_{91}EXPLOI + \beta_{92}EXPLOR + \beta_{93}SIZE + \beta_{94}AGE + \varepsilon_{9}$

$RADINN = \beta_{101}EXPLOI + \beta_{102}EXPLOR + \beta_{103}SIZE + \beta_{104}AGE + \varepsilon_{10}$

$NPS = \beta_{111}INCRIN + \beta_{112}RADINN + \beta_{113}SIZE + \beta_{114}AGE + \varepsilon_{11}$

$FIRPER = \beta_{121}EXPLOI + \beta_{122}EXPLOR + \beta_{123}NPS + \beta_{124}SIZE + \beta_{125}AGE + \varepsilon_{12}$

- *Testing the mediation effect*

Yet argued that incremental and radical innovations are significantly determines the success of new products. Similarly, exploitation and exploration capabilities are key features in developing incremental and radical innovations. Therefore, a potential mediator role of incremental and radical innovations on the relationship between consecutively exploitation and exploration and new product success is presumed and traduced into equations.

Mediation model:

$INCRIN = \beta_{11}EXPLOI + \beta_{12}SIZE + \beta_{13}AGE + \varepsilon_1$

$RADINN = \beta_{21}EXPLORAC + \beta_{22}SIZE + \beta_{23}AGE + \varepsilon_2$

$NPS_1 = \beta_{31}EXPLOI + \beta_{32}EXPLOR + \beta_{33}INCRIN + \beta_{34}RADINN + \beta_{35}SIZE + \beta_{36}AGE + \varepsilon_3$

Direct model:

$NPS_2 = \beta_{41}EXPLOI + \beta_{42}EXPLOR + \beta_{43}SIZE + \beta_{44}AGE + \varepsilon_4$

- *Testing the moderator effects*

Based on the literature review, two key variables were considered to moderate the relationship between exploitation and exploration on the one hand and the incremental and radical product innovations on the other hand, and the effect of the latters on the success of new products. These variables are the dynamism of markets and the resources allocated for innovations. Concretely, the effect of incremental innovation on new product success is presumed to be weaker in dynamic environments than in non-dynamic environments, whereas the effect of radical innovation on new product success is stronger in dynamic environments than in non-dynamic environments. Likewise, the effect of exploitation on incremental product innovation is argued to be weaker when resources for innovation are abundant, whereas the effect of exploration on radical product innovation is to be stronger when resources for innovation are abundant.

Environmental dynamism: two subsamples (high and low)

Main model but β_{111} fixed in both subsamples NPS: = $\underline{\beta_{111}}INCRIN + \beta_{112}RADINN + \beta_{113}SIZE + \beta_{114}AGE + \varepsilon_{11}$

Main model but β_{112} fixed in both subsamples: NPS = $\beta_{111}INCRIN + \underline{\beta_{112}}RADINN + \beta_{113}SIZE + \beta_{114}AGE + \varepsilon_{11}$

Resources for innovation: two subsamples (high and low)

Main model but β_{91} fixed in both subsamples: INCRIN = $\underline{\beta_{91}}EXPLOI + \beta_{92}EXPLOR + \beta_{93}SIZE + \beta_{94}AGE + \varepsilon_9$

Main model but β_{92} fixed in both subsamples: INCRIN = $\beta_{91}EXPLOI + \underline{\beta_{92}}EXPLOR + \beta_{93}SIZE + \beta_{94}AGE + \varepsilon_9$

Main model but β_{101} fixed in both subsamples: RADINN = $\underline{\beta_{101}}EXPLOI + \beta_{102}EXPLOR + \beta_{103}SIZE + \beta_{104}AGE + \varepsilon_{10}$

Main model but β_{102} fixed in both subsamples: RADINN = $\beta_{101}EXPLOI + \underline{\beta_{102}}EXPLOR + \beta_{103}SIZE + \beta_{104}AGE + \varepsilon_{10}$

4.4.4. Fulfillment of the assumptions for the application of SEM

As previously indicated, the structural equations modeling (SEM) technique is adopted herein because of the multiple and complex relationships analyzed, since it allows testing simultaneously all of these interactions (Hair *et al.*, 1998). However, some conditions are to be fulfilled prior to the application of SEM. In this context, some authors argued that the sample size is influence the significance of the analysis outputs. For example, Kline (2005) considered that an adequate sample should range between 10 to 20 participants per estimated parameter. Others such as MacCallum *et al.* (1996) argued that the sample size depends on the desired statistical power to evaluate the null hypothesis and the complexity of the model (the more complex is the model, the larger should be the sample size). Likewise, Jackson (2003) suggests that the reliability of the observed measurements and the number of indicators per factor determine the model fit, and controlling these factors, the of the minimum recommended sample size for any SEM is 200. However many studies have drown on less samples (Christopher Westland, 2010). Finally, the sample size herein is 249 companies, which fulfills this condition.

Another aspect to consider when applying SEM is the multicolinearity, which deals with the extent to which variables are correlated. In other words, highly correlated variables are considered to be redundant (Kline, 2005). The correlation analysis results displayed in table 4.22 show no multicolinearity.

Finally, the normality of the data is also an important aspect to consider. Due to an indication of non-completion of normality (using 5-point Likert type scales), the Satorra-Bentler scaled chi-square is used herein to overcome the normality problems. It is considered to be the adequate method for dealing with non-normality when using this type of scales and EQS techniques (Hu *et al.*, 1992).

CHAPTER V: EMPIRICAL ANALYSIS FINDINGS

CHAPTER V

After satisfying the different requirements regarding scales operationalization, validity and reliability and the adequacy test of applying SEM, the empirical analysis using the EQS 6.1 was performed for statistically testing the thesis hypotheses. Previously, a descriptive analysis using SPSS was done, aiming to present a clear image about the studied sample.

Presenting the results of quantitative data analysis, this chapter deals with empirically testing the different hypotheses of the research model, in which arises how learning capabilities affect the innovation types that innovative companies involve in and the results thereof. Similarly, the effect of other contingent variables on learning capabilities is also analyzed. This chapter is divided into the following parts.

The first part presents the descriptive analysis that will provide relevant information about the studied sample. Concretely, it exhibited characteristics such as the innovativeness of the companies, their involvement in innovation projects, the outcomes they generate from these projects and so forth.

In the second part, the research hypotheses will be tested through the estimation and evaluation of the relationships (paths) of the proposed models. The final part deals with the discussion of the results of the empirical analysis and the salient implications and conclusions.

5.1. DESCRIPTIVE ANALYSIS

Portraying a complete and clear picture about the studied sample, in addition to the prior information presented in chapter IV, a descriptive analysis was carried out using SPSS. A cluster analysis through K-means method was performed and numerous results are reported in the following paragraphs.

Aspects related to the extent to which companies are involved in innovative projects, as well as the means by which they implement such projects represent key issues that shape the trajectory of companies. Therefore, the questionnaire included questions dealing with these aspects, and the answers are explained in the following paragraphs.

The studied companies report that they receive some official aids within governmental programs for promoting national innovation. Regarding the subsidies companies receive from the government for encouraging and fostering innovations, the cluster analysis subdivided the targeted companies into three groups. A first group that received no aid, a second group that obtained about ten percent and a third group that beneficiated from more than ten percent of the costs of their innovation projects from the government. The available data demonstrates that the non-beneficiaries represent 41% of the studied firms, whereas 53% receive about 10% or less of governmental subsidies for enhancing innovation projects within governmental programs (see table 5.1).

Table 5.1: Public subsidies

Public subsidies/ total innovation costs	Percentage % of companies
No public grants	41%
≤ 10%	53%
≥ 10%	6%

In a similar vein, the rate of investment in R&D, which is a good indicator of firms' involvement in learning and innovations, was measured. Like the previous case, three groups were identified. A first cluster that spend no money in R&D activities, a second block of companies that spent less than ten percent and a third cluster that inverted more than ten percent of their total sales in research and development activities. It is found that a great percentage of the companies spend no amounts on R&D activities, whereas the major part of these companies dedicate less than ten percent of their budgets derived from sales of last year to R&D projects. Only about seven percent of these firms spend more than 10% of their budget in R&D activities.

Table 5.2: Sample R&D expenditure

R&D spending/ total sales	Percentage % of companies
No R&D	34.1%
≤ 10%	58.7%
≥ 10%	7.2%

To measure the percentage of income derived from sales of new products to total sales obtained during the last three years, three groups were recognized through a cluster analysis. The first group indicates no revenue from the new product sales, whereas the second generates less than ten percent, and third group account with more than 10 percent of their incomes resultant of the new product sales. Analysis indicates that 31.7% of the companies did not generate income from their new product innovations sales in the previous year, more than half of the companies generated 10% or less from new product sales, whereas 13.7% of the companies generated more than 10% of their income to overall new product sales.

Table 5.3: Sample' revenues of new products sales

Incomes derived from NP sales/ total sales	Percentage % of companies
No income	31.7%
≤ 10%	54.6%
≥ 10%	13.7%

Likewise, to describe companies' technological performance situation, similar analysis was employed. The cluster analysis differentiates between two main groups. The companies that demonstrate insignificant technological credentials (cluster 1) and the rest of the companies that likely account with higher efficient technological assets (cluster 2). Concretely, 78 companies of the studied sample own deficient technology, whereas the rest of companies account with efficient technological infrastructures, as depicted in the table 5.4.

Table 5.4: Technology performance of the studied sample

	Clusters			
Dimensions	**1**	**2**	**F**	**Sig.**
Firm technology is developed internally for higher results	1	4	1063.166	.000
Firm technology put it ahead of the other companies of the sector	1	4	1280.412	.000
Firm technology is more efficient and modern	1	5	1650.759	.000
Firm technology is not available for other companies in the sector	1	3	299.485	.000
Total companies	78	170		

The sample was also analyzed in order to measure the extent to which companies hold the culture of developing innovative outputs. The Cluster analysis enables distinguishing between two main blocs of companies based on the degree of the novelty of their products, services, processes or management innovations. A total of 176 companies are considered innovative (cluster 1), whereas 73 firms demonstrate lower rates of innovativeness (cluster 2) as displayed in table 5.5.

Table 5.5: Sample innovativeness of outputs

	Clusters			
Dimensions	**1**	**2**	**F**	**Sig.**
New or enhanced goods	4	2	826.913	.000
New or enhanced production methods	4	1	1564.930	.000
Improvement in management systems	4	1	1317.647	.000
New marketing methods	3	1	328.706	.000
Total companies	176	73		

The official institutions uphold continuously the innovative programs, thus this issue was checked. The cluster analysis shows two main groups (see table 5.6). Cluster 1 represents the companies that receive little or no institutional aids, whereas cluster 2 includes all the companies that receive significant subsidies from regional institutions. The analysis shows that an important number of the companies receive subsidies from different regional institutions, however the major part of the sample receive no regional aid for enhancing their innovation programs.

Table 5.6: Regional support for innovation as perceived by the studied sample

	Clusters			
Dimensions	**1**	**2**	**F**	**Sig.**
Importance of subsidy for innovation…	1	4	1056.942	.000
Assistance of technological centers, universities…	1	4	1353.680	.000
Regional infrastructures are…	1	4	1229.982	.000
Local policies towards innovation are…	1	3	505.823	.000
Total companies	78	168		

The cluster analysis indicates also that not all the sample companies have involved in cooperative projects. Rather an important percentage of these companies have alliances with other companies for innovation purposes (cluster 2). Major part of the studied companies does not have cooperative projects or collaborative activities in common with other companies for carrying out innovation activities (cluster 1).

This collaboration varies depending on the nature of the output. Some companies cooperate in developing new products, others in promoting product innovations, whereas others in R&D related activities, design of new products, marketing related issues or even in after-sales services (see table 5.7).

Table 5.7: Sample involvement in cooperative innovation

	Clusters			
Dimensions	**1**	**2**	**F**	**Sig.**
Commercialization of complementary new products collaborating with others…	1	5	777.650	.000
Introduction of new products in the market in collaboration with others …	1	4	460.241	.000
Promotion of new product lines in collaboration with others…	2	5	238.488	.000
After-sales service in collaboration with others	1	4	456.091	.000
Design and production of new product collaborating with others	1	4	399.904	.000
R&D agreements with others	1	4	154.656	.000
Total companies	228	20		

In summary, more than half of the analyzed sample receives public funds in terms of subsidies for promoting innovation programs. Furthermore, important investment in R&D is recognized, and about 70% of the studied sample generates important flows from their newly developed products. The sample is characterized also being innovative based on the developed products, and generally account with sophisticated technological assets. The major part of the companies does not receive regional support. Finally, this sample shows low integration rate of companies' implication in cooperation and alliances for innovation purposes.

5.2. RESULTS AND DISCUSSION OF THE EMPIRICAL FINDINGS

The structural equation modeling employed has provided different findings regarding the nomological network of relationships that forms the model. The loads of the relationships of the proposed structural model, that are issued form the SEM analysis are shown in table 5.8. This table summarizes all the hypotheses. Conventional maximum likelihood estimation technique were used to test the model (Jöreskog & Sörbom, 1996). We used Satorra–Bentler scaled chi-square test, which corrects for distortions of the normal theory method when data are non-normal (Satorra & Bentler, 1994). The fit of the model is satisfactory ($\chi^2_{(1230)}$=2324.4032; RMSEA=0.061; CFI=0.939; BBNNFI=0.919; IFI=0.944), thereby a fit between the network of the proposed relationships and the data, which is also another indicator that supports the validity of the used scales (Churchill, 1979). The table 5.8 provides information about statistical indicators that measure the significance of the relationships as well as the R-squared that indicate the extent to which the independent variables explain de dependent ones. The table deals solely with the direct relationships among the different variables, excluding moderator effects that will be analyzed in additional analysis.

Table 5.8: Construct structural model relationships

Hypothesis	**Paths**	**Standardized loadings**	**Td**	**R^2**
Main relationships				
H_{11a}	*PINSTR → PACAP*	0.673***	9.261	0.780
H_{14a}	*ORGMEM → PACAP*	0.158*	2.022	
H_{11b}	*PINSTR → RACAP*	0.284***	4.026	0.955
H_{14b}	*ORGMEM → RACAP*	0.106*	2.434	
H_5	*PACAP → RACAP*	0.655***	8.683	
H_8	*PINSTR → EXPLOI*	0.138	1.129	0.672
H_{12}	*ORGMEM → EXPLOI*	0.232**	2.647	
H_6	*RACAP → EXPLOI*	0.554***	3.872	
H_9	*PINSTR → EXPLOR*	0.266*	2.184	0.894
H_{13}	*ORGMEM → EXPLOR*	-0.082	1.882	
H_7	*RACAP → EXPLOR*	0.706***	5.308	
H_{15a}	*EXPLOI → INCRIN*	0.367***	7.107	0.867
H_{16a}	*EXPLOR → INCRIN*	0.591***	10.482	
H_{15b}	*EXPLOI → RADINN*	0.150	1.870	0.782
H_{16b}	*EXPLOR → RADINN*	0.763***	8.524	
H_{2a}	*INCRIN → NPS*	0.682***	7.895	0.776
H_{2b}	*RADINN → NPS*	0.234**	2.783	
H_3	*EXPLOI → FIRPER*	0.112*	2.267	0.953
H_4	*EXPLOR → FIRPER*	0.152***	3.707	
H_1	*NPS → FIRPER*	0.780***	14.750	
Second order relationships				
	ACAP → ACQUIS	0.998	[a]	
	ACAP → ASSIMI	0.991***	26.961	
	ACAP → TRANSF	0.978	[a]	
	ACAP → APPLIC	0.970***	31.025	
Fit: $\chi^2_{(1230)}$ = 2324.4032; RMSEA=0.061; CFI=0.939; BBNNFI=0.919; IFI=0.944.				

[*] P<0.05; [**] P<0.01; [***] P<0.001; [a] Fixed parameter

For measuring the constraint hypothesis, additional analysis was carried out, giving the outputs highlighted in table 5.9. This table offers also important data about other relationships that were not studied theoretically and that provide an idea about the behavior of some key variables against other ones.

Table 5.9: Constraint hypotheses testing

Hypothesis	Constraint			$\chi^2_{(1)}$= Difference
H_{2c}	*INCRIN → NPS*	=	*RADINN → NPS*	2.6247
H_{10}	*PINSTR → EXPLOI*	=	*PINSTR → EXPLOR*	5.2986*
H_{15c}	*EXPLOI → INCRIN*	=	*EXPLOI → RADINN*	7.1717**
H_{16c}	*EXPLOR → INCRIN*	=	*EXPLOR → RADINN*	5.5291*
Additional results	*EXPLOI → INCRIN*	=	*EXPLOR → INCRIN*	0.7858
	EXPLOI → RADINN	=	*EXPLOR → RADINN*	30.823***
	EXPLOI → FIRPER	=	*EXPLOR → FIRPER*	0.7858

P<0.05; ** P<0.01; *** P<0.001; [a] Fixed parameter

The analysis provides numerous findings enabling an empirical judgment of the different hypotheses presumed along the different chapters of the thesis. In statistically testing the hypotheses, the following paragraphs discuss the findings issued from the empirical checking of the different interactions.

5.2.1. Statistical testing of the first Hypothesis

Consistent with innovation literature (e.g. Afuah, 1998; Banbury & Mitchell, 1995; Barbosa & Faria, 2011; Barnholt, 1997; Calantone *et al.*, 1997; Cheng *et al.*, 2013; Cheng *et al.*, 2010; Danneels, 2002; Vowles *et al.*, 2011), the empirical results demonstrate that a successful new product is a key source of firm performance (β = 0.780***). This may occur thanks to the new markets and the market share growing that a successful new product opens. Likewise, literature sustains that a successful new product offers important financial margins, which contributes positively to performance generation for companies. Product innovation contributes as well in the revitalization of the image of the company, which influences positively the positioning and customer satisfaction. All of which form the most influential performance indicators as widely discussed with the different parts of the thesis. Thus, the H_1 is empirically supported.

5.2.2. Statistical testing of the second Hypothesis

The success of incremental and radical product innovations has become a key issue in innovation literature. Thus, for measuring the success of new products, a scale was set in order to analyze the extent to which incremental and radical innovations contributes to the product successfulness. The empirical findings estimate that both incremental and radical product innovations are successful. In numerical terms the relationship between incremental product innovation and new product success is positive and significant (β = 0.682***), which means that H_{2a} is supported. Thus, small modifications in familiar products are argued to facilitate the success of innovative products. Furthermore, due to the limited modification in the familiar products, customer may not notice important change in the main utilities these products offer, thus he likely will keep on his fidelity. Likewise, the potential of the financial benefits these types of products increases against the reduced costs related to small enhancements.

Likewise, radical product innovation and NPS are positively and significantly related (β = 0.234**). This questions the accuracy of the main assumption that radical products usually fail. Rather, it emphasizes the role of radical product innovation as a main engine of competitiveness and growth if successfully implemented. Moreover, the fresh knowledge incorporated in radical products may satisfy the changing needs of nowadays' customers that usually opt for product newness and multi-utilities. Thus, this evidence supports the H_{2b}.

Although both types of product innovations contribute to the success of new products, it was presumed that product incremental innovation is more successful than radical product innovation. In this case, the parameter from incremental to NPS and the parameter from radical to NPS were fixed to be equal in order to analyze differences in the estimation of the Chi squared of this model in relation to the main model. However, empirical evidences do not uphold such a presumption as no significant difference was found ($\chi^2_{(1)}$=2.6247). Consequently, H_{2c} is not empirically supported.

In summary, empirical evidences support partially the H_2, since both types of innovation are successful, however no significant difference susceptible to affirm that incremental product innovation is more successful than radical innovation was found.

5.2.3. Statistical testing of third and fourth hypotheses

The third and fourth hypotheses presume that both exploitation and exploration capabilities positively affect firm performance. Since firm performance is the main conventional aim of lucrative businesses, herein the effect of these key variables is analyzed. The empirical findings provide data indicating a positive and significant impact these capabilities have on business success.

In fact, exploitation is widely argued to have positive impact on organizational performance (e.g. Andriopoulos & Lewis, 2009; Auh & Menguc, 2005; Benner & Tushman, 2003; Geiger & Makri, 2006; Gilsing & Nooteboom, 2006; Greve, 2007; He & Wong, 2004; Hernández-Espallardo *et al.*, 2011; March, 1991; Nielsen & Gudergan, 2012; Soosay & Hyland, 2008; Uotila *et al.*, 2009; Yamakawa *et al.*, 2011). Herein this effect is rechecked and reconfirmed (β = 0.112*), which upholds the H_3. This result is consistent with the tenet of exploitation since reusing implies correcting, enhancing and better performing with less risk.

Contrarily, exploration is usually seen with precaution as it is risky, costly and distant-rewarding activity (March, 1991). However empirical data confirm its positive effect on firm performance (β = 0.152***). In this logic, the strategic background of exploration may explain such result. Exploration makes companies' knowledge base updated, thus they know markets news, customer needs and competitor behaviors, which enable them performing adequately and efficiently, bettering their whole systems.

Overall, the empirical evidences provide support to H_3 and H_4. Additional analysis checked if exploitation contributes in generating higher performance ahead of exploration capability. Results show no significant difference ($\chi^2_{(1)}$=0.7858) enabling to confirm this presumption.

5.2.4. Statistical testing of the fifth, sixth and seventh Hypotheses

Presenting their model and subdividing firm's overall absorptive capacity into potential and realized, Zahra and George (2002) assumed that the first conditions the last. Herein, this relationship is empirically tested, finding positive and significant indication (β = 0.655***). This result upholds the findings by Setia and Patel (2013), Lev *et al.* (2009) and Malhotra *et al.* (2005) among others. The fact that a firm's potential absorptive capacity affects its realized absorptive one is rooted in the fact that acquisition and assimilation of knowledge are preliminary activities to the creation of knowledge base and use of this knowledge in future commercial ends. Therefore, H_5 is accepted.

The sixth and seventh hypotheses deal with the effect absorptive capacity has on exploitation and exploration capabilities. The relationship between absorptive capacity and learning capabilities was discussed in chapter II. This dissertation argues that the effect of the overall absorptive capacity on exploitation and exploration capabilities occurs through realized absorptive capacity as knowledge affects once it is processed and become an asset of the company. Empirical evidences were found to confirm these assumptions. In numerical terms, a firm realized absorptive capacity is argued to have a major effect on exploitation capability (β = 0.554***) and on exploration capability (β = 0.706***). These findings can be explained as follows: once a company is able to identify, assimilate, acquire, and manipulate knowledge existing in its environment; it likely becomes able to carry out exploitative internal as well as explorative external learning activities. In simplistic words, companies' exploitation and exploration capabilities depend highly on their capacity to absorb knowledge. Thus, a firm's ability to leverage internal and extramural knowledge is likely dependent on its identification and assimilation capability. Based on which, the analysis provide empirical evidences to support H_6 and H_7.

5.2.5. Statistical testing of the eighth, ninth and tenth Hypotheses

In the $H_{8,}$ a firm's product innovation strategy is hypothesized to have positive relationship with its exploitation capability, and the H_9 presumes a similar relationship with a firm's product innovation strategy and its exploration capability. The H_{10}, in turn, assumes that the effect of firm's product innovation strategy is stronger on its exploration capability than on its exploitation capability.

The analysis shows no significant path among product innovation strategy and exploitation capability (β = 0.138), whereas the relation between product innovation strategy and exploration capability is significant (β = 0.266*). Furthermore, the Chi-squared difference is also significant ($\chi^2_{(1)}$=5.2986*), which affirms that developing an innovation strategy is indeed more related to exploration than exploitation capabilities. This corresponds to the idea of having a strategy for developing, improving and promoting new products is rather rooted in a prospective position that companies assume (Miles & Snow, 1978) which fits the aim of exploration of environments rather than the exploitation of certainties (March, 1991). Furthermore, companies that assume an exploitative culture tend to deemphasize the establishment of well-defined strategy for developing innovative products. In other words, a firm likely adopts a strategy for developing new products when deciding to go outside its borders for acquiring new information and innovation-required competences and not necessarily in the case of exploitative strategy adoption. This data confirms the validity of H_9 and H_{10} and in turn reject the H_8.

5.2.6. Statistical testing of the eleventh Hypothesis

The eleventh hypothesis deals with the effect of product innovation strategy on the subcomponents of absorptive capacity. The table 5.8 indicates that a product innovation strategy relies positively and significantly to the components of absorptive capacity of the firm. Concretely, product innovation strategy affects potential (β = 0.673***) as well as realized (β = 0.284***) absorptive capacities. This evidence upholds the corresponding literature, since an innovation strategy purports developing newness based on external and internal information and organization, which evidently should strengthen the ability of a company to acquire and leverage knowledge for that aim (Cheng *et al.*, 2010; Guan *et al.*, 2009; Li & Atuahene-Gima, 2001). Thus, there is a significant interaction between product innovation strategy and strengthening a firm's ability to identify and assimilate external knowledge (H_{11a}) on the one hand and acquiring and applying such a knowledge (H_{11b}) on the other hand. In conclusion, data analysis supports H_{11}.

5.2.7. Statistical testing of the twelfth, thirteenth and fourteenth Hypotheses

The twelfth and thirteenth hypotheses successively correspond to a presumed relationship between corporate memory and exploitation and exploration capabilities. Empirical evidence was found to support a positive and significant effect of organizational memory on exploitation capability (β = 0.232**). In contrast, the relationship between organizational memory and exploration capability was argued to be not significant (β = -0.082). As previously indicated, a firm memory reflects the some of its prior knowledge and experience that are embedded in repositories of the company. Since exploitation is the reuse and reorientation of existing assets and competences (Benner & Tushman, 2003; March, 1991); the organizational memory should be determinant in such a capability, as upheld by the empirical analysis. However, exploration, which seeks new information, relaying on external sources may negatively be linked to memory use, as argued empirically. In other worlds the tensions (Andriopoulos & Lewis, 2009) or the leap (Mudambi & Swift, 2014) between exploitation and exploration seems to be argued as companies usually adopt one of them since the resources scarcity is determinant: exploitation which implies the use of organizational memory or exploration which deemphasizes the latter. In summary, we find evidences supporting H_{12} and rejecting H_{13}.

In turn, H_{14} hypothesizes that organizational memory influences firm's absorptive capacity. Theoretically, organizational memory is argued to be crucial in knowledge creation (Chang *et al.*, 2004; Nevo & Wand, 2005). Herein, the analysis done reveals that a firm's prior stored knowledge and experiences are significant determinants of its ability to absorb and leverage external knowledge. Precisely, it is empirically argued that organizational memory affects positively and significantly a firm's potential absorptive capacity (β = 0.158*) and that it is similarly linked to a firm realized absorptive capacity (β = 0.106*). The explanations of such a relationship may be rooted in the path-dependence theory that upholds that companies' experiences determines and shapes their present and future (Araujo & Rezende, 2003; Coombs & Hull, 1998; Ruttan, 1996). These evidences confirm the validity of H_{14a} and H_{14b} and consequently H_{14}.

5.2.8. Statistical testing of the fifteenth and sixteenth Hypotheses

It was hypothesized (H_{15}) that exploitation capability favors both incremental (H_{15a}) and radical (H_{15b}) product innovations, and that the relationship of exploitation with incremental is higher than with radical innovation (H_{15c}). The empirical analysis did uphold that exploitation is positively related to incremental product innovation (β = 0.367***), whereas the relationship between exploitation and radical product innovation is argued to be insignificant (β = 0.150). This result is consistent with the rewards of exploitation in terms of *re-enhancing* certainties (March, 1991) on *re-enhancing* familiar products. Similarly, the tenet of exploitation does not support developing breakthrough product, since the latter requires fresh information instead of old knowledge. Thus, this confirms the H_{15a} and rejects the H_{15b}. Regarding $H_{15c,}$ additional analysis in which both parameters measuring these paths are statistically different using the chi-square test of two models: the main and another in which in which both parameters are equal. The calculated difference upholds that the impact of exploitation is stronger with incremental innovation than with radical product innovation ($\chi^2_{(1)}$= 7.1717**), therefore the H_{15c} is accepted. In conclusion, H_{15} is partially accepted.

In a similar logic, the H_{16} assumes that exploration capability is related to incremental (H_{16a}) and radical (H_{16b}) product innovations, and that this relationship is stronger in the case of exploration-radical product innovation (H_{16c}). Findings affirm the H_{16a} and H_{16b}. This means that the rewards of searching for knowledge in firm external environment influences positively not only radical new products (β = 0.763***) that require such type of knowledge, but also incremental product innovation (β = 0.591***). Consistent with learning approach, exploration that aims at venturing and transcending the firm borders in order to acquire fresh knowledge may be beneficial for developing a completely new products as well as incorporating efficient modifications in the existing ones, which upholds H_{16a} and H_{16b}.

Regarding the H_{16c}, it was found that both parameters measuring the related paths are statistically different using the chi-square test of two models: the main and another in which in which both parameters are equal. A significant difference ($\chi^2_{(1)}$= 5.5291*) assesses the presumption of a greater relationship between exploration capability and radical product innovation ahead of incremental product innovation. Thus, H_{16c} is empirically argued, and H_{16} is also argued.

Comparing the relationship between exploitation, exploration on one hand and incremental, radical product innovations on the other hand, such an additional analysis shows that the difference is not significant ($\chi^2_{(1)}$= 0.7858) in the case of exploitation capability, whereas exploration is more related to radical product innovation ($\chi^2_{(1)}$= 30.823***) than exploitation does. Matching the evidences, we can conclude that incremental product innovation is being explained equally by both capabilities, and that radical product innovation is issued mainly through exploration.

5.2.9. Statistical testing of the seventeenth and eighteenth Hypotheses

To check the mediating effect of incremental on exploitation-new product success (H_{17}) and radical innovation on exploration-new product success (H_{18}), a two-steps-test was made. Firstly, we measure the indirect effects that the used software provides for secondly comparing the results of a model with and without these mediating variables.

The analysis of the mediator effects in the main model shows that exploitation capability has a significant and positive effect (μ = 0.285***) on the success of new products through the mediator variables (incremental and radical innovation). The same thing occurs in the case of exploration capability (μ = 0.581***). Thus, there is an evidence of a mediator effect.

Furthermore, the mediating effect has been verified applying the methodology of Baron and Kenny (1986) adapted to the structural equation model used herein. In order to simplify the analysis; two simplified models were performed, examining the relationships between the exploitation and exploration capabilities, the types of innovation and new product success. One of the simplified models includes all the variables in question (mediation model), whereas in the other model (direct model); incremental and radical innovation were eliminated, considering only the exploitation and exploration capabilities and success of new products as displayed in table 5.10.

Table 5.10: Results of the mediation of incremental and radical innovation testing

H_{17} and H_{18}	Mediation model			Direct model		
	Standardized loadings	Td	R^2	Standardized loadings	Td	R^2
EXPLOIT → INCRIN	0.744***	13.860	0.729			
AGE → INCRIN	0.020	0.505				
SIZE → INCRIN	0.268***	6.392				
EXPLOR.→ RADINN	0.873***	18.388	0.760			
AGE → RADINN	0.060	1.473				
SIZE → RADINN	-0.016	0.356				
INCRIN → NPS	0.271**	2.887	0.798			
RADINN → NPS	0.004	0.057				
EXPLOIT.→ NPS	0.199	1.523		0.309***	4.135	0.791
EXPLOR.→ NPS	0.508***	5.126		0.630***	8.097	
AGE → NPS	0.026	0.881		0.029	0.920	
SIZE → NPS	-0.010	0.169		0.021	0.481	
Fit	$\chi^2_{(214)}$=401.2707; RMSEA=0.060; CFI=0.976; BBNNFI=0.971; IFI=0.976.			$\chi^2_{(82)}$=138.2802; RMSEA=0.053; CFI=0.988; BBNNFI=0.984; IFI=0.988.		

* P<0.05; ** P<0.01; *** P<0.001.

The table 5.10 highlights that incremental innovation indeed mediates the relationship between exploitation capability and NPS, since in the “mediation model”; the effect of exploitation on incremental innovation is positive (β = 0.744***) and the effect of incremental innovation on NPS is significant (β = 0.271**) whereas the relationship between exploitation and NPS in this model is not significant (β = 0.199).

Although, in the “direct effect” model, that neglect the mediation effect, the relationship between exploitation capability and NPS is significant (β = 0.309***), we can affirm then that there is a total mediation of incremental innovation on this relationship. This means that H_{17} is supported.

Regarding radical innovation, the empirical evidences do not allow confirming its mediating role, because the effect of radical innovation on NPS in the mediation model is not significant (β = 0.004), although the effect of exploration capability on NPS is significant both in the mediation model (β = 0.508 ***) as well as in the “direct model” (β = 0.630 ***). Thus, no empirical evidence was found to support H_{18}.

5.2.10. Statistical testing of the nineteenth and twentieth Hypotheses

The H_{19} and H_{20} deal with the moderating effects of markets dynamism and resources availability for innovation purposes on learning and innovation outcomes and success, the SEM allows providing the information labeled in the table 5.11.

Table 5.11: Moderator effects

Hypothesis		**Moderator variable**	**Relationship**	**Moderator value**		
				Low	*High*	*$\chi^2_{(1)}$ difference*
H_{19}	*H_{19a}*	ENVDYN	INCRIN → NPS	0.671***	0.190	6485.812***
	H_{19b}		RADINN → NPS	0.011	0.186	6415.366
H_{20}	*H_{20a}*	RESAVA	EXPLOIT → INCRIN	0.494***	0.185*	6251.429***
	H_{20b}		EXPLOR → RADINN	0.341***	-0.045	6218.836***
			EXPLOR → INCRIN	0.488***	0.613***	6147.139***
			EXPLOIT → RADINN	0.578***	0.727***	6146.947**

* P<0.05; ** P<0.01; *** P<0.001.

As previously discussed, the results of the SEM analysis confirm that incremental and radical product innovations are strongly related to NPS. However, these relationships might vary depending on the atmosphere in which companies operate. Thus, environmental dynamism was hypothesized to moderate these relationships.

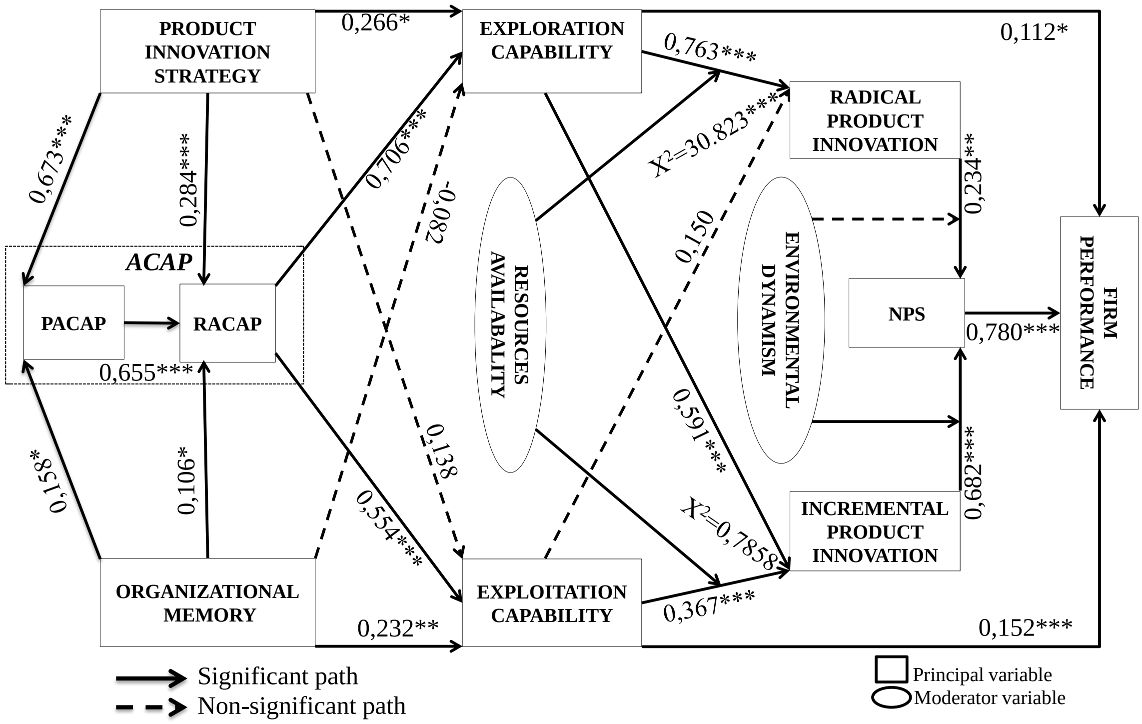
According to table 5.11, it is approved that under situations marked by high market dynamism; the relationship between incremental innovation and NPS is weaker than in a situation of technological stability (in low dynamism $\beta = 0.671^{***}$, in high dynamism = 0.190, difference = 6485.812***). This implies that incremental product innovation is likely more successful in stable markets, which confirm H_{16a}. On the contrary, results indicate no significant moderation of environmental dynamism on the relationship between radical product innovation and NPS (in low dynamism $\beta = 0.011$, in high dynamism = 0.186 / not significant). Overall, H_{19} is partially supported.

Regarding the moderator effect of resources that companies allocate especially for developing innovation; evidences support this tendency. Concretely, results indicate that when companies have higher rate of available resources for innovation, exploration capability has a non-significant impact ($\beta = -0.045$) on radical product innovation, whereas in low resources abundance exploration capability positively and significantly impacts radical product innovation ($\beta = 0.341^{***}$). In the case of exploitation capability, it is empirically argued that despite the rate of abundance, resources availability moderates the relationship between exploitation and incremental innovation significantly (in low rate $\beta = 0.494^{***}$, in high rate = 0.185*). Thus, H_{20} is empirically argued.

5.3. A SUMMARY OF THE HYPOTHESES' TESTING

The main objective of the present chapter was to test empirically the hypotheses of the thesis. According to figure 5.1, most of the twentieth hypotheses forming the proposed model are totally or partially supported.

Figure 5.1: Summary of the empirical testing of the proposed model



In short, empirical evidences demonstrate that NPS significantly leads to firm performance, which confirm H_1. Similar evidences are found to partially support H_2, meaning that both product innovations types (radical and incremental) likely contributes to the development of successful new product, whereas no significant difference was argued. In other words, it was presumed that both incremental and radical product innovation achieve success, and that incremental innovation performs better than radical product innovation, however empirical evidences support only the first part of this hypothesis, affirming that although both types are successful, no evidences favoring the one or the other. Likewise, the analysis sustains the H_3 and H_4, which means that companies can generate performance through leveraging exploitation and exploration capabilities.

Regarding the relationship between firm potential and realized absorptive capacities, the empirical analysis confirms prior researches findings: Likewise, firm realized absorptive capacity, exploitation and exploration capabilities are found to be significantly interlinked. Thus, H_5, H_6, H_7 are empirically argued. Similarly, the innovation strategy for promoting new products is argued to be significantly related to exploration, and insignificantly related exploitation capability, and the Chi-squared indicates a significant difference of innovation strategy and exploration capability ahead of exploitation capability. This could be because a strategy usually targets acquiring newness, which is consistent with the main aims and logic of exploration rather than exploitation, meaning that H_8 is not argued empirically affirming at the same time the validity of H_9 and H_{10}.Likewise, an innovation strategy positively affects both absorptive capacities, which upholds H_{11}.

Concerning H_{12}, analysis provides support for a significant relationship between organizational memory and exploitation capabilities, since the latter occurs mainly reusing the first. The analysis shows no significant relationship between firm memory and exploration capability, since exploration pays less attention about firm prior legacy. Thus, H_{13} is not empirically supported. Furthermore, organizational memory and absorptive capacity are argued to be significantly linked, which implies accepting the H_{14} as valid. Regarding the H_{15}, empirical findings provide partial support, highlighting that exploitation capability is indeed more related to incremental that radical product innovation. Rather, the relationship between exploitation capability and radical innovation is not significant. This implies that H_{15} is only partially argued. In a similar logic, exploration capability is found to foster significantly both radical and incremental innovations, but the relationship between radical innovation is higher. Thus, H_{16} is fully accepted.

As indicated earlier, H_{17} and H_{18} correspond successively to a hypothesized mediation of radical and incremental product innovations on the relationships between Exploitation-NPS and exploration-NPS. The results do uphold H_{17} providing no support for $H_{18.}$ In other words, incremental product innovation mediates exploitation-NPS, whereas radical product innovation is not empirically argued to be a mediator of exploration-NPS.

The moderator effects of markets dynamism and availability of resources for innovations were traduced in H_{19} and H_{20}. It was hypothesized that environmental dynamism moderates the relationship between incremental and radical product innovations and NPS. Similarly, resources abundance for carrying out innovations was presumed to have a moderator effect on the relationship between exploitation (exploration) and incremental (radical) product innovations. The empirical findings demonstrate a partial support for the H_{19} and a total affirmation of the H_{20}. Succinctly, the table 5.12 summarizes the findings of the empirical study.

Table 5.12: Summary of the empirical testing of the overall hypotheses

	Hypothesis		**Independent Variable**	**Dependent variable**	**Evidence**
Direct relationships	H_1		NPS	FIRPER	Supported
	H_2	H_{2a}	INCRIN	NPS	Partially Supported
		H_{2b}	RADINN	NPS	
		H_{2c}	INCRIN = RADINN	NPS	
	H_3		EXPLOI	FIRPER	Supported
	H_4		EXPLOR	FIRPER	Supported
	H_5		PACAP	RACAP	Supported
	H_6		RACAP	EXPLOIT	Supported
	H_7		RACAP	EXPLOR	Supported
	H_8		PINSTR	EXPLOI	Not supported
	H_9		PINSTR	EXPLOR	Supported
	H_{10}		PINSTR	EXPLOI = EXPLOR	Supported
	H_{11}	H_{11a}	PINSTR	PACAP	Supported
		H_{11b}	PINSTR	RACAP	
	H_{12}		ORGMEM	EXPLOI	Supported
	H_{13}		ORGMEM	EXPLOR	Not supported
	H_{14}	H_{14a}	ORGMEM	PACAP	Supported
		H_{14b}	ORGMEM	RACAP	
	H_{15}	H_{15a}	EXPLOI	INCRIN	Partially supported
		H_{15b}	EXPLOI	RADINN	
		H_{15c}	EXPLOI	INCRIN = RADINN	
	H_{16}	H_{16a}	EXPLOR	INCRIN	Supported
		H_{16b}	EXPLOR	RADINN	
		H_{16c}	EXPLOR	RADINN = INCRIN	
Media-tor effects	H_{17}		INCRIN	EXPLOI-NPS	Supported
	H_{18}		RADINN	EXPLOR-NPS	Not supported
Moderator effects	H_{19}	H_{19a}	ENVDYN	INCRIN-NPS	Partially supported
		H_{19b}	ENVDYN	RADINN-NPS	
	H_{20}	H_{20a}	RESAVA	EXPLOI-INCRIN	Supported
		H_{20b}	RESAVA	EXPLOR-RADINN	

MAIN CONCLUSIONS

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This section deals with the conclusions issued from the results of the analysis. It consists of six parts. First, it introduces a summary of the literature review about the relationships that are studied herein. Once discussed the main ideas of the literature review about the studied issues, the second part presents the results of the study as the empirical analysis provides in the light of the previous literature findings. The third part explains the different implications of the findings of the study, whereas the fourth and fifth sections deals successively with the important limitations that may shape the results of the study and the possible future research lines.

CONCLUSIONS OF THE LITERATURE REVIEW

According to the literature, innovative firms tend to demonstrate higher profitability, greater market share and higher survival probabilities (Czarnitzki & Kraft, 2004; Geroski *et al.*, 1993). Therefore, innovation has become a core construct of numerous researches, which reflects the imperativeness of innovation in a world in which the competition is everyday fiercer, the product life cycle is becoming shorter and the consumer atmosphere is illimitably changing (Calantone *et al.*, 1997; Ojah & Monplaisir, 2003). All of this require that companies permanently review and reconstitute the products and services they offer, differentiate the forms of offering them, and improve the way they produce them in order to finally get the satisfaction of the customer by offering something different from what the competitors offer (Katila & Ahuja, 2002). That, in turn, requires the implementation of a number of organizational measures to develop successful innovations.

Literature provides a variety of types of innovation. An exhaustive definition is proposed by Damanpour (1991) and distinguishes among the adoption of internally or externally generated devices, systems, policies, programs, processes, products, or services that are new to the adopting organization. Likewise, according to the Oslo Manual, four types of innovations could be identified: innovation in product or service, innovation in production process, innovation in the administrative systems and innovation in marketing (OECD, 2006). Each of these types of innovation has different implications and feedbacks for companies (March, 1991).

As mentioned earlier, the emphasis herein is on product innovation, since it is crucial due to its argued impact on organizational performance (Atuahene-Gima, 1996) and, therefore, on the survival or growth of the company (Danneels, 2002). Generally, product innovations can manifest in improving the existing products or instead creating totally new ones (Jansen *et al.*, 2006). Product innovation is argued to be crucial due to its impact on organizational performance (Atuahene-Gima, 1996) and, hence, on the survival or growth of the company (Danneels, 2002). Therefore, this doctoral thesis focuses on how learning influences product innovation success and firm performance. Generally, product innovation occurs through the improvement of the existing products or instead creating a totally new one (Jansen *et al.*, 2006). Based on this character of newness, product innovations are widely divided into incremental and radical innovations (O’Reilly & Tushman, 2004).

Literature also sustains that innovation and knowledge co-evolve with each other. (Coombs & Hull, 1998; Hurley & Hult, 1998; Moorman & Miner, 1997; Nonaka, 1991; Nonaka & Takeuchi, 1995; Nooteboom, 1999). Therefore, innovative companies usually leverage the internal and external knowledge sources to produce enhanced or completely new successful innovations. In this context, a profound literature review about innovation and learning concludes many interesting ideas explained in the following paragraphs.

Nowadays' companies operate in increasingly globalized and dynamic environments, which is susceptible to intensify the competition. This dynamism creates some needs, certain exigencies and thus new obligations. In this situation, only the dynamic and competitive companies are able to survive, since they steadily develop innovations in order to respond to changing market conditions. Consequently, innovative companies usually put more emphasis on what they find strategic. Literature concludes that knowledge and innovation constitute two key elements in modern companies for sustaining competitive advantage (Nonaka, 1991).

This highly perceived dynamism of today's markets has also fostered the tenet of leveraging internal and external endeavors for better taking advantage of firms own resources and capabilities as well as the addressable external ones, aiming at innovating and then being competitive. Furthermore, Eisenhardt and Martin (2000) argued that in dynamic markets characterized by intense competition and rapid change, dynamic capabilities become the main source of competitive advantage, by strengthening the ability to alter the basis of resources: creating, integrating, recombining and deploying them. Thus, in these environments, competitive rivalry among firms requires dynamic, flexible and different organizational forms of recombination of resources and skills (Teece *et al.*, 1997). In this context, the theoretical background that forms the basis of the present work draws on innovation development theory, the dynamic capabilities, knowledge-based and competence-based approaches and learning theory. The latters are considered further developments of the resource-based view. Dynamic capabilities theory purports offering a deep internal resources and capabilities scanning, reorientation and reuse, aiming at performing an organizational sustainable competitive advantage (Nelson & Winter, 1982; Prahalad & Hamel, 1990; Teece *et al.*, 1997). This, in turn, fosters the tenet backing the internal and external endeavors for better taking advantage of firms own resources, capabilities, and the addressable external ones (Eisenhardt & Martin, 2000). As a result, in these environments, competitive rivalry among firms requires dynamic, flexible and different organizational forms of recombination of resources and skills (Teece *et al.*, 1997).

In summary, dynamic capabilities approach, seeks explaining how a company can develop, deploy and protect the combinations of resources and capabilities it possesses, emphasizing the development of managerial, difficult-to-imitate organizational forms, as well as different functional abilities (Helfat & Raubitschek, 2000). According to this logic, an efficient exploitation of firm's current resources and capacities with the aim of generating performance can be considered as a valuable and unique dynamic capability. Therefore, the best guarantee for achieving firm performance lies in the formulation and implementation of a competitive capability able to fit internal and external requirements, through an appropriate use of internal resources and capabilities, while taking advantage of the environment.

The ability to explore external knowledge and manipulate this acquired knowledge is a determinant of the development of successful innovations (Lavie & Rosenkopf, 2006), and there is agreement that innovative firms tend to demonstrate higher profitability, greater market share and higher survival probabilities (Czarnitzki & Kraft, 2004; Geroski *et al.*, 1993). In addition, it has become evident that knowledge and innovation co-evolve with each other. Thus, innovative companies should scan the knowledge sources in their environments to produce up-to-date outputs generating successful innovations.

In this context, innovation literature has identified several factors that can facilitate the development of product innovations (e.g. Hernández-Espallardo *et al.*, 2011; Leonard-Barton, 1992; Olson *et al.*, 1995; Söderquist, 2006; Song & Thieme, 2009). One of these key factors consists of the learning capabilities that enable the acquisition of the required knowledge. However, the relationships between these capabilities (exploitation, exploration) and the different types of innovations remain unclear and how to determine different internal and external factors to these relationships differs widely (Benner & Tushman, 2003). As innovations development requires available resources, it has been configured as a possible moderator of the relationship between exploration/exploitation and radical/incremental innovations. Market conditions are determinant in business performance, this, in turn, leads us to believe that market dynamism can affect positive or negatively the success of new products, so we investigate its effect over radical/incremental innovations and the success of the newly developed products.

Numerous works link broadly between exploitation/exploration and innovation (Greve, 2007), others emphasize the tradeoffs between exploitation and exploration and their effects on business outcomes in general (March, 1991). In addition, the knowledge-based (Wernerfelt, 1984) and dynamic capabilities approaches (Teece *et al.*, 1997) emphasize the role of knowledge in growth generation and maintenance. According to this logic, absorptive capacity to "identify, assimilate and exploit knowledge from the environment" is a key determinant of learning performance (Cohen & Levinthal, 1990). Although originally the focus of attention was on R&D, some researchers consider over other potential areas in which the investment could lead to developing absorptive capacity. For example, Zahra and George (2002) and Murovec and Prodan (2009) introduce other potential absorptive capacity strengthening factors such as routines, receptiveness, training of personnel, innovation co-operation and attitude towards change. In sum, there is a consensus about a positive effect of absorptive capacity on firm innovation and performance (Camisón & Forés, 2010; Cohen & Levinthal, 1990; Chen *et al.,* 2009; Kostopoulos *et al.*, 2011).

Studying absorptive capacity and its effects on learning is inspired of the axiomatic truth that knowledge re-appears on the economical scene as the key capability that a modern firm should continuously develop. This is due to the fact that knowledge is the driving force of value creation and competitive advantage within companies (Grant, 1996b; McEvily & Chakravarthy, 2002). Furthermore, it enables companies to understand their surroundings, and then act appropriately. This logic emphasizes the importance of external knowledge management, especially the extent to which a company is able to identify, acquire and assimilate external knowledge (potential absorptive capacity), or to transform and use this acquired and processed knowledge to its commercial ends (realized absorptive capacity) (Zahra & George, 2002).

As firms build innovation capabilities by exploring external knowledge sources (Laursen & Salter, 2006), they need higher absorptive capacity to take advantage of external knowledge. Consequently, the development of absorptive capacities tends to be crucial to take advantage of external awareness. Likewise, taking advantage of firm memory may alter the organizational use of assets, which is susceptible to increase the organizational performance. Therefore, the present dissertation focuses also on the effect that absorptive capacities and firm memory may have on exploration and exploitation capabilities.

According to the resource-based view, a firm is a unified collection of resources and capabilities that should be organized effectively to get the optimum revenue (Conner, 1991; Wernerfelt, 1984). Capabilities, in turn, are organizational competences by which firms organize their resources in an efficient manner for getting higher performance (Amit & Schoemaker, 1993). The capacity of exploitation and exploration are fundamental for firms to acquire and reuse knowledge (Gupta *et al.*, 2006). They allow firms to ameliorate their familiar products and, at the same time, are the sources of "competitive advantages" creation within the company through innovations (Benner & Tushman, 2003; Molina-Castillo *et al.*, 2011; Song & Thieme, 2009). However, these competences to occur need an efficient organization, implementation and reorientation of firm's potential resources and capabilities in order to generate performance in its wide manifestations, which fits the aim of innovation strategy.

Literature sustains that companies may need an innovation strategy aimed at the successful generation, development and implementation of new and novel ideas for developing new products, services or processes. In this paper, the focus is on the innovation strategy that targets the development of new products. However, adopting an innovation strategy implies the application of organizational knowledge, on one hand, and the use of firm's resources and capabilities on the other hand. Literature argues that having an innovation strategy implemented, a firm is likely strengthening its likelihood to learn and innovate, which remains critical in new product success.

Finally, literature assesses that organizational memory is important for companies to build a knowledge-base (Chang & Cho, 2008; Chang *et al.*, 2004; Jackson, 2012; Nevo & Wand, 2005; Stein & Zwass, 1995; Walsh & Ungson, 1991). Furthermore, the impact of organizational memory on innovation has been partially studied (Chang & Cho, 2008; Moorman & Miner, 1997), whereas its relationship with exploitation and exploration has insufficiently been analyzed. Therefore, this gap is to be fulfilled within this thesis, since deepening our understanding about this important issue seems to be necessary.

Thus, a model conceived to join the most influential variables of organizational learning is offered, considering explorative and exploitative capabilities as drivers of innovation success and hence of firm overall performance. The model includes other key variables that influence learning capabilities such as firm absorptive capacity, memory and innovation strategy. Concretely, the literature review enabled proposing 20 hypotheses, which are analyzed within the second part of the thesis.

CONCLUSIONS OF THE EMPIRICAL ANALYSIS

In the light of the literature, this part outlines the outputs of empirical testing of the different hypotheses. The approach herein is that, given the key role of exploitation and exploration as learning capabilities in innovation and performance generation, a deep analysis was done to test these issues.

The empirical study focused on a sample of companies operating in Murcia with more than 40 workers aiming at contrasting the established hypotheses. Overall, the results indicate that there are relationships among learning capabilities, innovation types and success and firm performance, but that these relationships are more complex than what is initially expected. Below, a summary of the results obtained for each relationship is provided:

(I) The findings of the analysis uphold the hypothesis arguing positive relationship between successfulness of new products and firm performance. In other words, innovative companies greatly generate performance through successful products development and commercialization, by enlarging their market shares or gaining new market (Banbury & Mitchell, 1995; Barbosa & Faria, 2011; Danneels, 2002; Vowles et al., 2011). Thus, consistent with literature (e.g. Afuah, 1998; Barnholt, 1997; Calantone et al., 1997; Cheng et al., 2013; Cheng et al., 2010) we reaffirm that a successful new product offers high organizational performance.

(II) Since knowledge has become the most consistent basis of performance generation for a company (Schiuma, 2012), literature suggests that knowledge can be acquired through different mechanisms. In this logic, the exploitation and exploration capabilities have been being core subjects of many research studies, as learning-based mechanisms, as organizational capabilities or as a dynamic capability that enables the company to alter its knowledge base. A company may take advantage of internal assets and capabilities to stimulate sustainable growth (March, 1991), but also absorb missing knowledge that is crucial for performance and innovation (Tseng *et al.*, 2011). A positive relationship between firm's capability to exploit and reuse current knowledge assets and explore the external sources on one hand and the organizational performance on the other hand has been found. This is consistent with literature that argues that both exploitation of certainties and exploration of extramural competences are considered main performance generators (Gilsing & Nooteboom, 2006; Greve, 2007; Hernández-

Espallardo *et al.*, 2011; Jansen *et al.*, 2006; Lavie & Rosenkopf, 2006). Likewise, Laursen and Salter (2006) provide empirical evidence that firms that adopt external search tendencies enhance their innovative performance. In addition, Eisenhardt and Martin (2000) argued that firms that successfully reconfigure their capability base to reach emerging market opportunities before their rivals are likely to achieve superior performance.

(III) Regarding the adoption of an innovation strategy, the analysis argued that organizations require a strategic plan for encouraging learning and innovations. An innovation strategy is likely accurate to introduce new products via the renewing firms' competences through explorative learning. Furthermore, although product innovation strategy could foster exploitation and exploration, innovative companies tend to promote more exploration than companies with an exploitative tendency do. This can be understood as external searching for missing knowledge and competences may require a special organization and resources usually offered in terms of a concrete strategy favoring new products development. Conversely, companies that follow an exploitative tenet, for example, will opt more for the enhancement of existing competences, which may not necessarily need the establishment of an innovation strategy as exploitation prioritizes reuse and targets enhancements of familiar outputs. This can be understood in consistency with the contributions by Li and Atuahene-Gima (2001), Cheng *et al.* (2010) and Guan *et al.* (2009) among others.

(IV) Exploration usually occurs when companies decide to go beyond their own resources and capabilities, for example when they seek a new, performance-enhancing venture (Jansen *et al.*, 2006; March, 1991). However, many factors may affect such an endeavor. This study investigated, among other issues, the effect of a dynamic capability that has been related to learning and innovation (Jansen *et al.*, 2005; Tsai, 2001), namely absorptive capacity, on exploration. The results confirm the expectation that absorptive capacity positively affects exploration capability. This means that the ability of a firm to absorb external knowledge is a key determinant in the effectiveness of exploration for external knowledge sources. Thus, a company's internal and external competences and its ability to take advantage of the knowledge that can be found in its environment co-evolve positively, so that the stronger the absorptive capacity is, the wider the scope for external sourcing and increased organizational effectiveness. Most of the prior works about these issues such as contributions by

Cohen and Levinthal (1990), Gebauer *et al.* (2012), Lane and Lubatkin (1998) and Peter *et al.* (2001) among others go in this sense.

(V) Similar results indicate a positive relationship between the capacity of a firm to absorb and take advantage of external knowledge and its capacity to exploit its own knowledge. Eisenhardt and Martin (2000) consider dynamic capabilities to be “best practices”, therefore, the efficient practice of external knowledge acquisition may lead to better exploitation of internal knowledge. Nelson and Winter (1982) emphasize the same idea, considering the evolution of a firm’s capabilities to be strongly path-dependent. Thus, the capability of a firm to absorb external information could be related to its competence in manipulating current knowledge.

(VI) Consistent with literature, developing new products successfully constitutes the most important dynamic capability and competitive advantage for product-developing companies; however, it requires the implementation of a number of measures leading to the creation or absorption of new needed knowledge. This knowledge can be acquired from two major sources: internal reuse and reformulation of old knowledge, or external sourcing (Benner & Tushman, 2003; Jansen *et al.*, 2006; March, 1991). As the competition and obsolescence of knowledge and technology are characteristic of the present economic scene, external sourcing becomes a priority (Chesbrough, 2003). According to this argument, managers who aim at developing new products should adopt an exploratory attitude enabling the scanning of firm’s environment in an endeavor to gather the latest knowledge from the market. In other words, for exploration to succeed, managers should strengthen their firms’ absorptive capacities prior to lead off explorative actions.

(VII) Similarly, the effect of organizational memory on exploration capability was checked. Empirical results confirm prior findings indicating that organizational memory use has no significant relationship with exploration capability, since exploration destroys firm’s current knowledge and capabilities (e.g. Benner & Tushman, 2003; Gupta *et al.*, 2006; March, 1991). Consequently, old knowledge and information do not figure significantly in fostering new knowledge through exploration. This can be concluded from the fact that a firm’s current knowledge may perform better for local and short term enhancements through exploitation rather than through exploration (e.g. Atuahene-Gima & Murray, 2007; March, 1991; Yamakawa *et al.*, 2011). This may imply that less attention can be paid to the firm’s old knowledge when a firm is implementing an exploratory strategy for developing breakthrough products. Although organizational memory can contribute to the success of new products, this is usually through exploitation, which depends on the manipulation and reuse of existing knowledge, and usually has more predictable outcomes (Gupta *et al.*, 2006; March, 1991). Likewise, a positive interplay between existing knowledge, related to specific brands of products, and the exploitation of familiar assets and capabilities aimed at the development or refreshment of competitive advantage was proposed. Whatever its domain, using current knowledge enhances the exploitation capability of the company. This emphasizes the importance of path-dependency in terms of experience and process-enhancing.

(VIII) Likewise, the findings demonstrate that although exploitation and exploration capabilities are both related to incremental innovations, this is not the case regarding radical product innovation. Alternatively, exploitation does not influence significantly radical innovation. Different explanations can be assigned to these findings. For example, re-orientating and reusing existing resources and capabilities (exploitation) as well as seeking new knowledge and new forms of doing things (exploration) are both susceptible to affect the small enhancements that a company undertakes to offer improved products (incremental innovation). However, no empirical evidence was found relating exploitation and radical innovation. This is because the latter require more than the introduction of small enhancements, rather major and new measures as required to develop radical innovation. Thus, exploitation has a stronger impact on the achievement of incremental innovations than radical innovation, whereas exploration explains better the development of radical innovations. These results are consistent with the underlying ideas and the findings of the studies by Atuahene-Gima and Murray (2007), Greve (2007), Hernández-Espallardo *et al.* (2011), Kim *et al.* (2012) and many other works in this context.

(IX) Furthermore, literature sustains that both radical and incremental innovations are significantly related to the success of new products. Radical innovations is considered as risky and not usually successful, however the analysis herein demonstrates that it is significantly related to NPS. Additionally, incremental innovation is argued to generate new product successfulness. This implies that new products may achieve success if they are incrementally improved or completely new, and that the radicalness of new product does not hinder the success of that product.

(X) The empirical analysis shows that exploration positively affects the success of new products. The advantages that exploration offers in terms of fresh knowledge and organization provide an obvious interpretation of this positive relationship. Since exploration usually co-evolves with emerging markets or with the need to adapt to new market conditions, customer satisfaction is a primary target of exploration. Consumers' satisfaction can be observed through their feedback, interpreted by a palpable increase in the purchasing rate of the new product. This, in turn, can be reflected in the rate of success of newly introduced products (Baker & Sinkula, 2005). Moreover, exploration, which seeks new knowledge and differentiation, corresponds to an important element in the definition of NPS (Baker & Sinkula, 1999a, b, 2005, 2007). In summary, enhancing competence exploration is crucial, as it is essential in acquiring the knowledge a company needs in order to develop new products successfully as many authors have argued (e.g. Molina-Castillo *et al.*, 2011; Tsai & Huang, 2008; Yalcinkaya *et al.*, 2007; Yeung *et al.*, 2007).

(XI) The fact that exploration positively contributes to the success of new products may increase the probability that radical product innovation [which are the main target of exploration according to Benner and Tushman (2003)] may mediate such relationship. Therefore, the mediating role of radical innovation on this relationship was empirically analyzed. The analysis provides no empirical evidence concerning this effect. This means that the radicalness of product innovation does not mediate the relationship between exploration and NPS. Contrarily, incremental innovation is empirically argued to mediate the relationship between exploitation and NPS. Thus, incremental product innovation transmits fully the effect of exploitation on the success of new product, whereas radical product innovation does not perform the same way. This may mean that incremental innovation is mainly produced by exploitation of existing certainties, thus the main objective of exploitation is developing incremental innovation, whereas exploration occurs frequently as a strategic learning orientation aiming at renewing firm assets, which may affect the success of new products by different manners including (but not exclusively) the radicalness of the outputs.

(XII) The moderator effect of markets dynamism on the relationship between radical and incremental innovations and new product success were tested. It was found that incremental product innovation performs better in non-dynamic environments, whereas the persistence of environmental dynamism does not moderate the relationship between radical product innovation and NPS. This may mean that the success of radical product innovation may depend on other variables rather than the dynamism of markets, since the moderator effect of the latter is not significant. For example, in non-dynamic situations, customer preference remains relatively unchangeable, the associated costs of incremental products are normally constant and many associated things are predictable which may contribute to the competitiveness and success of the new enhanced products. In contrast, the fact that market dynamism appears to be insignificant in the success of radical innovations may be because success depends mainly on the new product utility and technical performance ahead of dynamic circumstances.

(XIII) Finally, the availability of resources is found to moderate the relationship between the exploitation-incremental innovation and exploration-radical innovation. When resources are available (despite the degree) for developing product innovations, companies likely tend to prefer using these resources in making enhancements in their existing assets. Likewise, a low rate of resource availability moderates positively the relationship between exploration and radical product innovation; however, a high-level rate of resource availability negatively moderates the relationship between exploration for novel information existing in external environments and the development of radical product innovation. This last evidence is coherent with the findings of a recent study by Keupp and Gassmann (2013) and Scopelliti *et al.* (2013), in which they argued a positive influence of resource constraints on firms likelihood to develop radical innovations.

IMPLICATIONS FOR MANAGERS

This study addresses important implications for managers or those in charge of innovation. First, the analyses demonstrate that when carrying out an innovation strategy, a firm is likely upholding and fostering its exploration capability. This implies that investment in innovation, and hence, the adoption of an innovation strategy, as opposed to no-innovation or imitation strategy for instance, is highly demanded for favoring exploration capability of the company. Thus, the election of an innovation strategy will imply the adoption of several routines that encourage the exploration of new knowledge.

Second, innovating companies should potentiate exploration capabilities in order to generate radical new products. Although exploitative capability should also be fostered as a necessity in sustainable organizational ambidexterity (Tushman & O'Reilly, 1996), it does not significantly favor the pursuit of radical innovation. Rather, exploitation capability should be enhanced when companies developing incremental innovations. In summary, the election will turn around the choice of what capability could be potentiated to foster the type of innovation that company wants. Those companies that aim at pursuing radical innovation should mainly foster exploration capability, whereas, if the target is developing incremental innovation it is recommended to enhance exploitative capability. Although literature sustains that both postures may be compatible and desired, the emphasis on one of them imply prioritizing one of the two types of innovation. However, this election could be conditioned by several factors such as market dynamism that fosters the interaction between exploration capability and the creation of radical innovations.

Incremental versus radical innovations have been considered as almost dichotomous. Incremental is considered certain and successful, whereas radical represents risk taking and failure. Contrary to this assumption, this study demonstrates that both types of innovation contribute to explain the success of the newly developed products. Thus, managers should likely mutually develop both types of product innovations to gain the resultant tradeoffs, since a total focus on the one may influence the other. For example, too much focus on incremental innovation may become a trap impeding that companies experience and look further for fresh knowledge. This is conditioned by the environment, which implies that in turbulent environments incremental innovations perform better than in situations of stability.

The analysis of the previous statements allows affirming that companies should carefully examine their main objectives as well as their organizational and environmental conditions around the new product development. Thus, it is recommended that firm’s innovation philosophy includes market foresight (Millson & Wilemon, 2002; Teece, 1992), and self-internal evaluation and scanning.

In the light of the results of the empirical analysis, additional implications for both practitioners and researchers can be deduced. Exploitation has been argued to be less costly, highly rewarding and less risky, thus for innovative companies it is important that they strengthen their absorptive capacity and take advantage of old knowledge. Additionally, researchers may found useful the fact that exploitation and incremental innovations are strongly correlated for assessing the path dependency form another perspective. This, in turn, evokes insights about profiling innovative company based on the degree of newness of innovations they carried out (i.e. radical, incremental) and the strategy they assume (i.e. exploitative, explorative). As exploitation is positively related with incremental innovations for alter firm performance, exploration [which is considered as a somewhat dichotomy of exploitation (Andriopoulos & Lewis, 2009; March, 1991)] may have similar effects on radical innovation (which is seen as an opposite of incremental innovation in terms of characteristics, rewards and development-related-issues).

MAIN CONTRIBUTIONS OF THE STUDY

Exhaustively, this thesis analyses two main important management phenomena, which are innovation and organizational learning. Despite the below limitations, this study has made contributions including:

(I) First, an exhaustive review about innovation has led to revitalizing this term by offering a wide range of definitions and viewpoints about such a crucial activity. This revision has provided a pool of information about the importance of innovation, models explaining how companies carry out innovations, the significant determinants of innovation and the characteristics of innovative companies.

(II) Likewise, dealing with innovation has led to providing a list of classifications, distinguishing among the different types of innovation based on various criterions as presorted by referential literature.

(III) A similar revision to that of innovation has enabled providing a coherent theoretical framework about learning and related terms such as knowledge (management), information or data. Different models have been analyzed aiming to understand how organizational learning matters in generating innovation and performance, and how and why companies learn.

(IV) In developing the second point, a review of the different management theories and approaches was also provided, exhibiting how firms generate and sustain competitive advantage according to the different theories.

(V) The literature review indicated a need to study learning capabilities (exploitation and exploration) and product innovations, introducing other key variables. The proposed model links among exploitation/ exploration capabilities and incremental/ radical product innovations and NPS. Likewise, important key variables were determined and examined, namely: absorptive capacity, organizational memory and innovation strategy.

(VI) Similarly, the moderator effect of market dynamism on the success of incremental and radical product innovations was analyzed, arguing that incremental product innovation performs better in non-dynamic environments and contrarily radical product innovation achieve more success in dynamic markets.

(VII) In order to empirically testing the nomological network of relationships forming the model, an empirical study of a 249 Spanish companies was carried out. Different results have been provided and discussed. SEM technique was applied.

(VIII) Finally, the findings resultant from the empirical analysis conclude that learning capabilities are determinant in product innovation success and firm performance, confirming the majority of the presumed relationships, as explained in empirical results' part.

(IX) Finally, based on the findings of this work I have had the opportunity to enrich, direct or indirectly, the management literature with many empirical contributions, and most of them were published in JCR (indexed journals) or presented in international conferences. Although other contributions are still under peer review processes, the already (and the imminently will be) published works are referenced as:

a) Ahmed-Dine Rabeh, H., Jimenéz-Jimenéz, D., & Martínez-Costa, M. (2013). Managing knowledge for a successful competence exploration. ***Journal of Knowledge Management***, 17(2):195-207.♠

(♠Indexed in Emerald Management Reviews, Elsevier Scopus, Social Sciences Citation Index (SSCI)...etc. Impact Factor: 1.474, in 2012 Journal Citation Reports® Thomson Reuters, 2013).

b) Ahmed-Dine Rabeh, H., Jimenez-Jimenez, D., Martínez-Costa, M. (2014). **Absorptive capacity, organizational memory and new product success: The role of exploration reviewed**. In: Alegre, J., Chiva, R., Fernández-Mesa, A., & Ferreras-Méndez, J. L. (Eds.) **Shedding New Lights on Organisational Learning, Knowledge and Capabilities**: 263-287. Cambridge Scholars Publishing, Newcastle (UK).♥

(♥ISBN (10): 1-4438-5375-5, ISBN (13): 978-1-4438-5375-0. This work was originally presented in the OLKC2012 conference that was held at Universidad de Valencia (Spain), 25th -27th of April 2012 and published in its proceedings, to be selected among other contributions to form the cited edited book).

c) Jiménez-Jiménez, D.; Martínez-Costa, M., Martínez-Lorente, A. L., Ahmed-Dine Rabeh. H. (2014). Total quality management performance in multinational companies: a learning perspective. ***TQM Journal*** - Special Issue- Emerald.♦

(♦Under publication process. Journal SJR: 0.63 according to 2013 Scopus® evaluation. This work was awarded as the best paper presented at the 7th International Working Conference "Total Quality Management – Advanced and Intelligent Approaches'', 4th – 7th June, 2013, Belgrade, Serbia.)

d) Ahmed Dine Rabeh, H., Jimenez-Jimenez, D., Martínez-Costa, M. (2012) Exploitation and organizational performance; the role of old knowledge and absorptive capacity.**13th European Conference on Knowledge Management (ECKM 2012) proceedings**. Held at Universidad Politécnica de Cartagena (Spain), 6th-7th of September 2012.♣

(♣Proceedings indexed in Thomson Reuters ISI Web of Science, Elsevier Scopus, EBSCO database, Google Books and Google Scholar…etc.).

e) Ahmed Dine Rabeh, H., Jimenez-Jimenez, D., Martínez-Costa, M. (2012). Innovation strategy and organizational performance: An empirical review of the role of exploitation and exploration. **13th European Conference on Knowledge Management (ECKM 2012) proceedings**. Held at Universidad Politécnica de Cartagena (Spain), 6th-7th of September 2012.*

*(*Proceedings indexed in Thomson Reuters ISI Web of Science, Elsevier Scopus, EBSCO database, Google Books and Google Scholar…etc.).*

f) Ahmed Dine Rabeh, Hammady. (2013). Firm resources’ entanglement determines its absorptive capacity: A review towards a new reconceptualization. Seminal paper presented at Laboratoire de Recherche sur l’Industrie et l’Innovation “Lab.RII”. Université du Littoral Côte D’opale/ Université Lille Nord de France (FRANCE): http://riifr.univ-littoral.fr/wp-content/uploads/2013/06/doc-270.pdf

LIMITATIONS

Although the present study has followed the conventional logic and steps that similar studies usually assume, it has a number of limitations. The most influential limitations are resumed in the following points:

(I) Self-reporting by the CEOs may be a significant limitation, as it may influence the credibility of the database used in this study. Moreover, a common shortcoming of online surveys is that there is never absolute certainty about who has completed them. There is no clear evidence that the people who completed the questionnaires were the CEOs, or whether they delegated this task to other people. Furthermore, the fact that only the CEO is concerned by the survey may also introduce bias as the manager can has a subjective and partial reality about the company.

(II) In addition, the local character of the firms included in the study means that they may not accurately represent a wide spectrum of European and American economies, and this may make limit the generalizability the results of this study.

(III) Another limitation deals with the cross-sectional design of this research. Thus, even though the structural equation modeling technique was employed and the model was based on an existing theory and past results, interpretation of the causality between the constructs should be treated cautiously. In order to examine the causality of these relationships, future research should use longitudinal studies.

(IV) Likewise, the cross-sectional design does not allow us to observe the short and long-term impact of organizational main learning mechanism and competences on new product development. Although the model proposes sequenced relationships, the measurement of all these constructs is done at the same time. Thus, it can be considered that the measurements employed herein do not directly capture dynamic change in innovation.

(V) Finally, it is important to highlight that, in this study, the performance measures were subjective. Complementary studies should also include objective measures of firm performance. Same remark is applied to the measurement of NPS.

FUTURE RESEARCH LINES

This study suggests some new directions for future researches:

(I) As we have focused on exploration, radical innovation, exploitation, incremental innovation and NPS, other models including dynamic capabilities, such as innovativeness or flexibility of human resources, might also be developed in future studies. A variety of models analogous to the one developed here could be used to examine other dynamic capabilities of companies, and developed to investigate in greater depth the relationships between firms' self-building capabilities in their endeavors to achieve market pre-eminence. The present study also questions the significance of path-dependency theory in the exploration-adoption case, as it was found that firm memory has no significant effect on exploration capability. Furthermore, this study can serve as a reference for similar studies that deal specifically with the development of new services, in contrast with the focus here, which has been on the development of new products.

(II) This contribution also raises other issues to be investigated. For example, it is an introduction for studying the relationships between firm's organizational learning capabilities and the revenue of new products and services in varying new product development stages (initiation, development, implementation and launch) or contexts. Likewise, the tension between exploitation and exploration in situations of resource scarcity likely affects firm ambidexterity, which is important to reconsider in future studies.

(III) This study also evokes interesting questions about the effects of organizational learning and other factors. Researchers observe that the routines of producing new products constitute a continuous learning, which produce an accumulated knowledge throughout the production processes (Kusonaki *et al.*, 1998; Söderquist, 2006). New product development is, then, a process of learning, which influences the success of the development of future products. These learning processes are supporting for both the human and social capital of the company. Therefore, issues such as how social and human capitals affect the success of new product development are to be analyzed in future works. In addition, one potential direction of future research is the distinction of short-term success versus long-term success. Thus, exploitation and exploration can be studied distinguishing between their tactic and strategic effects on innovation development success.

(IV) Finally, the theory of innovation networks, in its various representations (Cooke & Morgan, 1998), maintains that companies are seldom able to innovate individually and that the introduction of new products or processes on the market depends on its ability to establish strong links with external actors. Similar arguments have been offered as well from the field of strategic management business, where it is noted that the search for new products, ideas, new forms of organization and even solutions to existing problems, has transcended the boundaries of the organization itself, encompassing every time further exploration of the capacity available to other companies or institutions (Teece, 1992). On the contrary, others (e.g. Barney, 2001; Fahy, 2002; Grant, 1991; Wernerfelt, 1984) argued that internal company resources and knowledge are the main determinant of innovative performance and networking with external actors has a limited effect. A firm’s environment remains the main protagonist in today’s business world (Ali, 2000; Millson & Wilemon, 2002). All of the aforementioned highlight important new tendencies for future researches emphasizing on the role of external networking tendencies versus in-house strategies. Although, the present dissertation studies the effects of some of these variables, such as market environments, this theme remains fertile subject matter for potential researches.

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APPENDIX

THE QUESTIONNAIRE USED IN THE SURVEY (IN SPANISH)

UNIVERSIDAD DE
MURCIA

ENCUESTA SOBRE CULTURA ORGANIZACIONAL, INNOVACIÓN Y RESULTADOS EN LA EMPRESA

INSTRUCCIONES

No existen respuestas correctas, sólo queremos conocer su percepción sobre las cuestiones planteadas.

Si de alguna de las preguntas no está totalmente seguro de la respuesta, no importa, nos interesa su estimación. Por favor, conteste todas las preguntas.

En la mayoría de las preguntas se le proponen una serie de afirmaciones y se le pide que las valore puntuándolas entre 1 (si está en total desacuerdo con la afirmación) y 5 (si está totalmente de acuerdo con ella).

Si desea que se le envíe un resumen de los resultados obtenidos y/o un informe comparando la situación de su empresa con la de su sector, por favor indíquenos una dirección de correo electrónico a la que poder enviar dicha información:

____

P1.- En los últimos 3 años, para el desarrollo y lanzamiento de nuevos productos nuestra empresa...	**Desacuerdo Acuerdo**
1. Da mucha importancia a ser la primera compañía en introducir al mercado nuevos productos	1 2 3 4 5
2. Invierte sustancialmente en I+D en un intento de ser la primera compañía en el mercado	1 2 3 4 5
3. Trata de hacer todo lo que se está en su mano para ser la primera en lanzar un producto innovador en el mercado	1 2 3 4 5
4. Inicia acciones a las que responden la competencia	1 2 3 4 5
5. Suele adoptar medidas agresivas contra los competidores, en lugar de adoptar una postura de "vive y deja vivir"	1 2 3 4 5

P2.- Con respecto a las empresas de su sector, en los últimos 3 años ha introducido en mayor grado...	**Desacuerdo Acuerdo**
1. Bienes nuevos o mejorados	1 2 3 4 5
2. Métodos de producción nuevos o mejorados	1 2 3 4 5
3. Mejoras en los sistemas de gestión (sistemas de información, organización del trabajo,…)	1 2 3 4 5
4. Nuevos métodos de ventas o distribución (venta por Internet, franquicias,…) o relaciones con empresas	1 2 3 4 5

P3.- En los últimos 3 años, con respecto a su competencia, su empresa ...	**Desacuerdo Acuerdo**
1. Frecuentemente *mejora* los productos existentes	1 2 3 4 5
2. Regularmente implementa *pequeñas adaptaciones* a los productos existentes	1 2 3 4 5
3. Se introducen mejoras en los *actuales* productos para su mercado local	1 2 3 4 5
4. Mejora la eficiencia de sus productos *actuales*	1 2 3 4 5
5. Se incrementan las economías de escala en los mercados *actuales*	1 2 3 4 5
6. Se expanden los servicios para los clientes *actuales*	1 2 3 4 5

P4.- En los últimos 3 años, ¿en qué medida su empresa, con respecto a su competencia, ha...	**Menor grado Mayor grado**
1. Actualizado el conocimiento y las habilidades sobre productos y tecnologías *cercanos*?	1 2 3 4 5
2. Mejorado la habilidad para explotar las *tecnologías tradicionales* en sus *actuales* operaciones de innovación?	1 2 3 4 5
3. Mejorado la capacidad para resolver problemas de sus clientes con soluciones *no muy distintas* a las *actuales*?	1 2 3 4 5
4. Actualizado las habilidades para el desarrollo de productos sobre los *ya se disponía* de bastante experiencia?	1 2 3 4 5
5. Reforzado su conocimiento para proyectos que mejoren la eficiencia de las actividades de innovación *existentes*?	1 2 3 4 5

P5.- En los últimos 3 años, con respecto a su competencia, en su empresa…	**Desacuerdo Acuerdo**
1. Se aceptan las demandas que *van más allá de los actuales productos*	1 2 3 4 5
2. Se inventan *nuevos* productos	1 2 3 4 5
3. Se experimentan con *nuevos* productos en nuestro mercado local	1 2 3 4 5
4. Se comercializan productos que son *completamente nuevos* para nuestra unidad	1 2 3 4 5
5. Se utilizan frecuentemente *nuevas* oportunidades en *nuevos* mercados	1 2 3 4 5
6. Se usan regularmente *nuevos* canales de distribución	1 2 3 4 5

P6.- En los últimos 3 años, ¿en qué medida su empresa, con respecto a su competencia ha...	**Menor grado Mayor grado**
1. Ha adquirido tecnologías y habilidades de producción *completamente nuevas* para la empresa?	1 2 3 4 5
2. Ha aprendido habilidades y procesos de desarrollo de productos *completamente nuevos* para la industria?	1 2 3 4 5
3. Adquirido *nuevas* habilidades de gestión y organizativas (tendencias,…) que son importantes para la innovación?	1 2 3 4 5
4. Ha aprendido *nuevas* habilidades en áreas como apoyo a nuevas tecnologías, contratación de personal para la función de I+D, formación y desarrollo de I+D y personal de ingeniería por primera vez?	1 2 3 4 5
5. Ha reforzado las habilidades de innovación en áreas donde *no se tenía experiencia*?	1 2 3 4 5

P7.- La tecnología de mi empresa, con relación a la competencia	**Desacuerdo Acuerdo**
1. Se desarrolla internamente con el fin de obtener mejores resultados	1 2 3 4 5
2. Posiciona a la empresa por delante de las empresas del sector	1 2 3 4 5
3. Es más eficiente y moderna	1 2 3 4 5
4. No está disponible para el resto de las empresas del sector	1 2 3 4 5

P8.- Para el desarrollo de la innovación en los últimos 3 años, en qué medida se han utilizado…	**Bajo Alto**
1. Fondos públicos de Administraciones Locales o Autónomas	1 2 3 4 5
2. Fondos públicos de Administraciones Estatales	1 2 3 4 5
3. Fondos públicos de la Unión Europea	1 2 3 4 5
4. Financiación bancaria	1 2 3 4 5
5. Proveedores de inmovilizado	1 2 3 4 5
6. Ampliaciones de capital (aportaciones de los socios)	1 2 3 4 5
7. Beneficio no distribuido	1 2 3 4 5
8. Capital riesgo	1 2 3 4 5

P9.- Las subvenciones para la innovación realizadas por la Administración Regional se han dedicado a...	**Bajo Alto**
1. Equipos e instrumentos	1 2 3 4 5
2. Terrenos y edificios	1 2 3 4 5
3. Adquisición de software específico para I+D (incluye licencias)	1 2 3 4 5
4. Retribuciones de investigadores	1 2 3 4 5
5. Retribuciones a técnicos y auxiliares	1 2 3 4 5
6. Otros gastos corrientes	1 2 3 4 5

P10.- En comparación con otras comunidades autónomas…	**Inferior Superior**
1. Las subvenciones al desarrollo de la innovación ofrecidas por la Administración Regional son	1 2 3 4 5
2. La presencia de Centros Tecnológicos, Universidades o centros privados que apoyan la innovación es	1 2 3 4 5
3. La infraestructura (carreteras, comunicaciones, …) de la Comunidad Autónoma es	1 2 3 4 5
4. Las políticas llevadas a cabo desde la Administración Regional en apoyo a la innovación son	1 2 3 4 5

P11.- En su caso, en los últimos 3 años la cuantía obtenida en concepto de ayudas públicas para el desarrollo de la innovación fue de un:____ % de los gastos totales invertidos para crear la innovación

P12.- En su empresa ...	**Desacuerdo Acuerdo**
1. Las unidades o departamentos se relacionan con la alta dirección para adquirir nuevos conocimientos	1 2 3 4 5
2. Los empleados visitan con regularidad otras sucursales de nuestra empresa	1 2 3 4 5
3. Se recoge información con medios informales (comidas con amigos de otros sectores, charlas con compañeros…)	1 2 3 4 5
4. Frecuentemente se visitan otras áreas o partes de nuestra empresa	1 2 3 4 5
5. Es habitual organizar reuniones especiales con clientes o terceros para adquirir nuevos conocimientos	1 2 3 4 5
6. Los empleados se reúnen regularmente con profesionales externos como asesores, gestores o consultores	1 2 3 4 5
7. Somos rápidos en identificar cambios en el mercado (competencia, leyes, cambios en demografía, …)	1 2 3 4 5
8. Se identifican rápidamente las nuevas oportunidades que surgen para servir a los clientes	1 2 3 4 5
9. Analizamos e interpretamos rápidamente los cambios que proceden del mercado	1 2 3 4 5
10. Analizamos e interpretamos rápidamente los cambios en los gustos de nuestros clientes	1 2 3 4 5

P13.- En su empresa, el ratio de abundancia de los siguientes recursos para la innovación es ...	**Muy escaso Abundante**
1. Recursos financieros (capacidad financiera, dinero en efectivo, liquidez, beneficios retenidos,…)	1 2 3 4 5
2. Recursos tangibles (tecnología tangible, planta, equipamiento, localización geográfica, materias primas,…)	1 2 3 4 5
3. Recursos humanos (formación, experiencia, juicio, inteligencia, relaciones con los empleados,…)	1 2 3 4 5
4. Recursos intangibles (patentes, copyrights, marcas, secreto profesional,…)	1 2 3 4 5
5. Recursos organizativos (relaciones con otras empresas, canales de distribución, cultura organizativa,…)	1 2 3 4 5

P14.- En su empresa ...	**Desacuerdo Acuerdo**
1. Se consideran habitualmente las consecuencias de los cambios en los mercados sobre los nuevos productos	1 2 3 4 5
2. Los empleados conservan y archivan la nueva información para un uso futuro	1 2 3 4 5
3. Se entiende el valor del nuevo conocimiento adquirido sobre el ya existente	1 2 3 4 5
4. Con frecuencia los empleados comparten entre sí experiencias sobre el trabajo	1 2 3 4 5
5. Es habitual aprovecharse de las oportunidades que surgen a partir de un nuevo conocimiento adquirido	1 2 3 4 5
6. Nos reunimos periódicamente para discutir sobre las tendencias del mercado y desarrollo de nuevos productos	1 2 3 4 5
7. Se conocen claramente cómo deben ser mejoradas las actividades de la empresa	1 2 3 4 5
8. Las quejas de los clientes nunca caen en saco roto	1 2 3 4 5
9. Existe una clara división de roles y responsabilidades	1 2 3 4 5
10. Se estudia constantemente cómo explotar el conocimiento de la mejor forma posible	1 2 3 4 5
11. No existen grandes impedimentos a la hora de desarrollar nuevos productos	1 2 3 4 5
12. Los empleados tienen un leguaje común respecto a los nuevos productos	1 2 3 4 5

P15.- Con <u>anterioridad</u> al desarrollo de los nuevos productos, su empresa tenía...	**Desacuerdo Acuerdo**
1. Una gran cantidad de conocimiento acerca de este tipo productos	1 2 3 4 5
2. Una gran experiencia con este tipo de productos	1 2 3 4 5
3. Una gran familiaridad con este tipo de productos	1 2 3 4 5
4. Invertido una gran cantidad de I+D en este tipo de productos	1 2 3 4 5

P16.- Con relación al entorno en el que se encuentra su empresa...	**Desacuerdo Acuerdo**
1. La tecnología en nuestra industria cambia muy rápidamente	1 2 3 4 5
2. Los cambios tecnológicos proporcionan grandes oportunidades en nuestra industria	1 2 3 4 5
3. Un gran número de nuevas ideas de producto han sido posibles por los avances tecnológicos en nuestra industria	1 2 3 4 5
4. Ha habido grandes cambios tecnológicos en nuestra industria	1 2 3 4 5

P17.- Con relación al entorno en el que se encuentra su empresa...	**Desacuerdo Acuerdo**
1. Los cambios en el entorno de nuestro mercado local son intensos	1 2 3 4 5
2. Nuestros clientes regularmente exigen nuevos productos	1 2 3 4 5
3. Continuamente se producen cambios en nuestro mercado local	1 2 3 4 5
4. En nuestro mercado los volúmenes a servir de productos cambian rápida y frecuentemente	1 2 3 4 5
5. Nada ha cambiado en nuestro mercado local en un año	1 2 3 4 5

P18.- En comparación con sus competidores clave, su empresa en los últimos 3 años …	**Desacuerdo Acuerdo**
1. Ofrece productos de mayor calidad	1 2 3 4 5
2. Cuenta con clientes más satisfechos	1 2 3 4 5
3. Está creciendo más	1 2 3 4 5
4. Es más rentable	1 2 3 4 5
5. Tiene mayor productividad	1 2 3 4 5
6. El número de productos nuevos introducidos en el mercado es mayor	1 2 3 4 5
7. La tasa de éxito de nuevos productos es mayor	1 2 3 4 5
8. El grado de diferenciación de nuestras innovaciones respecto a la competencia es alto	1 2 3 4 5
9. La habilidad de los competidores para copiar nuestros productos es baja	1 2 3 4 5
10. El tiempo de desarrollo de nuevos productos es menor	1 2 3 4 5

Ventas nuevos productos

P19.- Las ventas de los nuevos productos sobre el total de las ventas del ejercicio anterior fue de un :____ % sobre las ventas

Gasto I+D

P20.- El gasto en actividades de I+D sobre las ventas del ejercicio anterior fue de un :______ % sobre las venta

RESUMEN (EN ESPAÑOL)

RESUMEN EN ESPAÑOL

En el entorno dinámico actual la innovación es fundamental para la supervivencia empresarial. Numerosos estudios ponen de manifiesto que las empresas innovadoras tienden a mostrar mejor rentabilidad, mayor cuota de mercado y mayores probabilidades de supervivencia.

Una empresa puede innovar de diferentes maneras: introducir nuevos productos, nuevos servicios, nuevas formas de hacer las cosas y nuevas prácticas de marketing. Cada una de estas formas de innovar tiene sus ventajas, requerimientos y desventajas. En este contexto, la literatura destaca la importancia de la innovación de producto, como una fuente fundamental de creación de ventajas competitivas para la empresa.

Por otro lado, la literatura afirma que el aprendizaje organizativo es una necesidad primordial para que las empresas estén a la altura de las exigencias del mercado. Una empresa que no es capaz de aprender no puede actualizar sus conocimientos; algo necesario para desarrollar innovaciones con éxito. Sin embargo el efecto del aprendizaje organizativo en la innovación de producto es un tema que aún necesita ser investigado en profundidad.

Para llevar a cabo este trabajo de investigación se utilizan distintos marcos con el objetivo de analizar teóricamente estas relaciones. Principalmente las bases teóricas que forman el marco en que se analizan dichas relaciones son las capacidades dinámicas (Dynamic-Capabilities), las teorías basadas en el aprendizaje y el conocimiento organizacional (Learning and Knowledge-Based Theories), la teoría basada en las competencias (Competence-Based View) y la teoría de los recursos y capacidades

(Resource-Based View). Estas teorías se caracterizan por un dogma común, la creencia de que las empresas son capaces de hacerlo todo si sus recursos y competencias se utilizan de manera adecuada. En este sentido, la teoría de los recursos y capacidades establece que una empresa es en realidad un conjunto de recursos y capacidades que deben ser utilizados, reconfigurados y reorientados de manera óptima para lograr el éxito empresarial. La teoría de capacidades dinámicas sostiene el mismo principio, considerando que los recursos y capacidades de la empresa deben de ser profundamente orientadas y utilizadas para lograr ventajas competitivas tácticas y estratégicas. Argumentos similares ofrece la teoría de competencias que afirma que la empresa debe identificar las formas en que la ventaja competitiva puede obtenerse a través de una mayor capacidad para coordinar los flujos de activos intelectuales y otros recursos, dentro y entre las empresas que funcionan como sistemas abiertos.

Estas teorías vienen influenciadas por el dinamismo de los mercados contemporáneos, en los que las nuevas tecnologías, la abundancia de ofertas y la competitividad de los mercados han causado que la satisfacción de los clientes sea más difícil de conseguir y requiere formas innovadoras para responder a sus necesidades y deseos. En otras palabras, las empresas de hoy día trabajan en un mundo complejo y dinámico, y por tanto deben desarrollar capacidades dinámicas para responder a las exigencias de la competencia. Estás capacidades están integradas en las actividades principales de la empresas que dirigen la evolución de las rutinas organizativas y la configuración del stock de los recursos.

Por otra parte, la teoría del aprendizaje organizativo sostiene que una empresa debe adaptarse a su entorno, y por tanto ha de aprender. Este aprendizaje le ofrece la posibilidad de actualizar sus conocimientos, de adquirir nuevas competencias y de aprovechar la retroalimentación de los clientes. Además de la teoría de aprendizaje, la teoría de la gestión del conocimiento se encarga de estudiar cómo las empresas pueden identificar, crear, distribuir, almacenar y manipular los conocimientos de los trabajadores y convertirlos en conocimientos que pertenecen a las empresas.

De acuerdo con lo anterior, una explotación eficiente de los recursos y capacidades de la empresa con el objetivo de generar nuevas combinaciones de conocimiento conducentes a una rentabilidad inmediata o una exploración de competencias existentes en los entornos de la empresa para adquirir nuevos conocimientos para el mismo fin, se pueden considerar como unas capacidades dinámicas, valiosas y únicas que permiten generar conocimientos, algo vital para el desarrollo de innovaciones exitosas.

A la luz de lo mencionado anteriormente, y tras revisar profundamente la literatura correspondiente a estas teorías, se ha formulado un modelo acerca de cómo el aprendizaje organizativo influye en el desarrollo de la innovación y los resultados de la empresas. Dicho modelo viene encaminado a resolver algunas dudas acerca de cómo las capacidades del aprendizaje organizativo contribuyen en el desarrollo exitoso de las innovaciones de producto y los resultados empresariales. De manera concreta se han analizado dos capacidades principales que reflejan dos vías de aprendizaje: la explotación y la exploración. Estas capacidades se han estudiado desde diferentes aspectos antes de examinar sus relaciones con cada tipo de innovación de producto (incremental y radical). De la misma manera se analizan factores claves que influyen en estas capacidades como la capacidad de absorción, la memoria organizativa y el establecimiento de una estrategia de innovación que favorece el desarrollo de nuevos productos.

En este contexto, la literatura tiende a confirmar que la capacidad de explotación está más vinculada con la innovación incremental que con la radical, mientras que la capacidad de exploración favorece más la innovación radical que la innovación incremental, por lo que se han estudiado empíricamente estas relaciones. Por otra parte, la literatura destaca que la innovación incremental es más exitosa y que la radical suele fracasar, por ello se ha analizado en primer lugar el efecto de la innovación incremental y radical sobre el éxito de nuevos productos y en segundo lugar el efecto del último sobre los resultados de las empresas. El modelo además incluye los efectos de las capacidades de explotación y exploración sobre los resultados empresariales. Dado que la literatura ha identificado varios factores que favorecen el aprendizaje organizativo, se han estudiado factores menos analizados como la capacidad de las empresas para absorber los conocimientos y aprovecharlos, la memoria organizativa y la estrategia de las empresas para desarrollar nuevos productos.

Dado que el desarrollo de innovaciones requiere disponibilidad de recursos, se estima que existe un posible efecto moderador de este factor sobre la relación entre la exploración / explotación y las innovaciones radicales / incrementales. De la misma forma, las condiciones del mercado se consideran como factores determinantes en el rendimiento empresarial. Esto, a su vez, nos lleva a pensar que el dinamismo del mercado puede afectar positiva o negativamente el éxito de nuevos productos, por lo que se investiga su efecto sobre las innovaciones radicales / incrementales y el éxito de nuevos productos.

Para contrastar esas relaciones se ha desarrollado un modelo traduciendo las mismas en una serie de hipótesis. Se ha realizado un estudio empírico con una muestra de 249 empresas españolas en la región de Murcia. El estudio se llevó a cabo utilizando una serie de medidas empleadas en estudios similares en este campo. En primer lugar, utilizando la base de datos Sistema de Análisis de Balances Ibéricos (SABI) se hizo una elección de manera aleatoria de la muestra estudiada. En segundo lugar, mediante una encuesta electrónica diseñada y revisada por expertos y profesores de la universidad de Murcia, se contactó con los directivos de las empresas en cuestión pidiéndoles su colaboración, explicándoles los objetivos del estudio. En tercer lugar se ha llevado a cabo un análisis empírico de los datos mediante ecuaciones estructurales (SEM) utilizando el software EQS 6.1 para Windows.

Este análisis permitió examinar el conjunto de las relaciones simultáneamente, extrayendo una serie de conclusiones. En general se ha encontrado evidencia empírica que confirma la mayor parte de las hipótesis que forman el modelo global de la tesis. Las conclusiones del contraste de las diferentes hipótesis se resumen enseguida continuación.

Ambas capacidades de aprendizaje (explotación e exploración) están relacionadas diferentemente con los tipos de innovación de producto. De manera concreta, se ha encontrado que la explotación favorece la incrementalidad de los nuevos productos, sin embargo su relación con la innovación radical no es significativa, mientras que la exploración está relacionada positiva y significativamente con ambos tipos de innovación de productos. Por otra parte, se ha evidenciado que las innovaciones incrementales y radicales están relacionadas con el éxito de nuevos producto, en contra del juicio general de que la innovación radical siempre fracasa y que solo las innovaciones incrementales logran éxito. Se ha encontrado también evidencia acerca del impacto de las capacidades de explotación y exploración y el éxito de nuevos productos en los resultados de la empresa.

El análisis concluye que las organizaciones requieren la adopción de una estrategia para fomentar el aprendizaje y la innovación. Una estrategia de innovación condiciona la introducción de nuevos productos a través de la capacidad de exploración de las empresas. Además, si bien la estrategia de innovación de producto podría fomentar las capacidades de exploración y explotación, las empresas innovadoras tienden a promover mayoritariamente la de exploración que las empresas con una tendencia explotadora. Esto se puede entender como: la búsqueda externa de conocimientos y competencias necesarias requiere una organización especial de recursos que por lo general se ofrecen en términos de una estrategia concreta que favorece el desarrollo de nuevos productos. Por el contrario, las empresas que siguen un principio de explotación, por ejemplo, optan más por la mejora de las competencias existentes, algo que no necesita obligatoriamente el establecimiento de una estrategia de innovación ya que la explotación prioriza la reutilización y mejor uso de los recursos y capacidades existentes.

La exploración por lo general ocurre cuando las empresas deciden ir más allá de sus propios recursos y capacidades, por ejemplo, cuando buscan un nuevo conocimiento para mejorar su rendimiento. Sin embargo, muchos factores pueden afectar a tal esfuerzo. Este estudio investigó, entre otras cuestiones, el efecto de una capacidad dinámica que se ha relacionado con el aprendizaje y la innovación, es decir, la capacidad de absorción, en la exploración. Los resultados confirman la expectativa de que la capacidad de absorción afecta positivamente la capacidad de exploración. Esto significa que la capacidad de una empresa para absorber el conocimiento externo es un factor determinante en la eficacia de la exploración de fuentes externas de conocimiento. Por lo tanto, las competencias internas y externas de la empresa y su capacidad para aprovechar el conocimiento que se puede encontrar en su entorno coevolucionan positivamente, de modo que cuanto más fuerte es la capacidad de absorción, mayor será la posibilidad de aprovechamiento del conocimiento exterior y mayor eficacia logrará la empresa mediante sus capacidades internas. En este sentido, Eisenhardt and Martin (2000) consideran que las capacidades dinámicas son las "mejores prácticas", y por tanto, la práctica eficiente de adquisición de conocimiento externo puede llevar a un mejor aprovechamiento del conocimiento interno. También Nelson and Winter (1982) hicieron hincapié en la misma idea, teniendo en cuenta la evolución de las capacidades de una empresa para ser fuertemente dependiente de su trayectoria. Por lo tanto, la capacidad de una empresa para absorber información externa puede estar relacionada con su competencia en el desarrollo y manejo de sus competencias internas.

En resumen, el desarrollo de nuevos productos con éxito constituye la fuente más importante de ventajas competitivas para las empresas desarrolladoras de productos. Sin embargo, eso requiere la implantación de una serie de medidas que conduzcan a la creación o la absorción de nuevo conocimiento. Este conocimiento se puede adquirir a partir de dos fuentes principales: la reutilización interna y reformulación del conocimiento antiguo, o la adquisición de conocimientos pertenecientes a fuentes externas (Benner & Tushman, 2003; Jansen *et al.*, 2006; March, 1991). A medida que la competencia y la obsolescencia de los conocimientos y la tecnología son características del actual escenario económico, la búsqueda de fuentes de conocimiento externo se ha convertido en una prioridad (Chesbrough, 2003). De acuerdo con este argumento, los gerentes que tienen como objetivo el desarrollo de nuevos productos deberían adoptar una actitud exploradora que permite el escaneo del entorno de la empresa, en un esfuerzo para reunir los conocimientos más recientes en el mercado. En otras palabras, para que exploración tenga éxito, los gerentes deben fortalecer la capacidad de absorción de sus empresas antes de dar lugar a acciones de carácter exploratorio.

Del mismo modo, se comprobó el efecto de la memoria organizativa sobre la capacidad de exploración. Los resultados empíricos confirman los hallazgos previos que indican que el uso de memoria de la organización no tiene una relación significativa con la capacidad de exploración, y más bien la exploración destruye el conocimiento y las capacidades actuales de la empresa (Benner & Tushman, 2003; Jansen *et al.*, 2006; March, 1991). En consecuencia, el conocimiento y la información antigua no ocupan un lugar importante en el fomento de nuevos conocimientos en el caso de la exploración. Esto conduce a la conclusión de que el conocimiento antiguo de una empresa tiene que utilizarse para mejoras pequeñas y a corto plazo a través de la explotación en lugar de exploración (Atuahene-Gima & Murray, 2007; Yamakawa *et al.*, 2011). Esto puede implicar que se puede prestar menos atención al antiguo conocimiento de la empresa, cuando éste está implementando una estrategia exploratoria para el desarrollo de productos radicalmente innovadores. Aunque la memoria de la organización puede contribuir al éxito de nuevos productos, esto es por lo general a través de la explotación, que se basa en el uso y la reutilización de los conocimientos existentes, y tiene resultados más predecibles (Greve, 2007; Gupta *et al.*, 2006; Hernández-Espallardo *et al.*, 2011; March, 1991).

Igualmente, se propuso una interacción positiva entre la memoria de la empresa y la explotación de los recursos y capacidades. Cualquiera que sea su dominio, el uso del conocimiento antiguo aumenta la capacidad de explotación de la empresa. Esto pone de relieve la importancia de la dependencia de la trayectoria en términos de experiencia y procesos anteriores.

El hecho de que la exploración contribuye positivamente al éxito de nuevos productos puede aumentar la probabilidad de que la innovación radical de productos pueda contribuir al éxito mediante factores concretos. Por lo tanto, se analizó empíricamente el papel mediador de la innovación radical en esta relación. El análisis demuestra que la radicalidad de la innovación de productos no media la relación entre la exploración y el éxito de nuevos productos. Siguiendo la misma lógica, se ha comprobado si la innovación incremental tiene un efecto mediador sobre la relación entre explotación y el éxito de nuevos productos, confirmando dicha hipótesis.

Por otra parte, las relaciones entre de las innovaciones radicales e incrementales y el éxito de nuevos productos fueron analizadas omitiendo, en un primer momento, el efecto del dinamismo de los mercados. En un análisis adicional, esta variable se introdujo con el fin de comprobar si moderaba las relaciones anteriores. Se ha encontrado que la innovación incremental se comporta mejor en ambientes no dinámicos, mientras que la persistencia del dinamismo de mercados no modera la relación entre la innovación de producto radical y el éxito de nuevos productos. Esto puede significar que el éxito de innovación radical puede depender de otras variables más que el dinamismo de los mercados, ya que el efecto de este último no es significativo.

Por último, se ha encontrado que la disponibilidad de los recursos destinados a la innovación modera la relación entre la innovación incremental-explotación y la innovación radical-exploración. Esto significa que cuando los recursos están disponibles (independientemente del grado de disponibilidad) para el desarrollo de innovaciones de productos, las empresas probablemente tienden a preferir el uso de estos recursos para llevar a cabo pequeñas mejoras en sus productos existentes. Por último se ha demostrado que una baja disponibilidad de recursos modera positivamente la relación entre la exploración y la innovación radical, sin embargo, un alto nivel de disponibilidad de recursos negativamente modera la relación entre exploración de información novedosa que existe en ambientes exteriores y el desarrollo de la innovación radical. Esta última evidencia es coherente con las conclusiones de un estudio reciente realizado por Keupp and Gassmann (2013) y Scopelliti *et al.* (2013) en la que destacan la influencia positiva de la escasez de recursos en la vocación de las empresas a desarrollar innovaciones radicales.