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DEVELOPING INNOVATION STRATEGIES WITHIN MULTINATIONAL ENTERPRISES

JOSÉ PEDRO BARRETO GAMITO PIRES

ORIENTAÇÃO: PROFESSORA DOUTORA CARLA MARIA MARQUES CURADO

JÚRI:

PRESIDENTE: PROFESSOR DOUTOR PAULO ALEXANDRE GUEDES LOPES HENRIQUES

VOGAIS: PROFESSOR DOUTOR PEDRO MANUEL DA SILVA PICALUGA NEVADO

PROFESSORA DOUTORA CARLA MARIA MARQUES CURADO

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JOSÉ PEDRO BARRETO GAMITO PIRES

TECHNICAL UNIVERSITY OF LISBON

SCHOOL OF ECONOMICS AND BUSINESS

Thesis' Supervisor: Prof. Dr. CARLA MARIA MARQUES CURADO

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Dedication

This thesis is dedicated to my parents, Graça and José Tomaz, and my sister Susana, with love and thanks.

Content

List of Figures, Tables and Abbreviations

List of Figures

List of Tables

List of Abbreviations

BoP	Bottom of the pyramid
CVC	Corporate venturing capital
FDI	Foreign direct investment
IPR	Intellectual property rights
IT	Information technologies
M&As	Mergers and acquisitions
MNE	Multinational enterprise
NE	National enterprise
OECD	Organization for Economic Co-operation and Development
R&D	Research and development
SUVs	Sport utility vehicles

Preface

The aim of this thesis is to analyze theoretically, which strategic options are available for managers of *multinational enterprises* with regards to *innovation* strategies. Depending on the environmental context, internal capabilities and future goals, some strategies are more advisable than others. The determinants for such options are discussed.

Innovation is an ever changing field, with both managers and scholars constantly surprising stakeholders with new points of view. The widely available literature adds complexity to the already difficult understanding of *innovation*. In the first section of this study, an attempt is made to update and summarize the main concepts of *innovation*.

In section 2, important decisions regarding innovation are discussed in terms of sourcing of ideas (internally or externally), research and development strategy (technological leader or follower), location of research and development centres, and ideas' selection processes.

Subsequently, section 3 addresses the external organizational modes, bearing in mind the environmental context and the levels of commitment, knowledge flows, control and costs.

Thereafter, in section 4, a comparison between *multinational enterprises* and *national enterprises* is established with respect to *innovation* capabilities. In addition, the rise of *born globals* is explored. Finally, three main challenges for managing *innovation* in *multinational enterprises* are presented.

The following section highlights important considerations while developing *innovation* strategies. The concepts of *robust design*, *open innovation* and knowledge sharing strategies are presented as ways to increase the chances of having new products accepted by the market place and wining as dominant designs.

In section 6, the pros and cons of *multinational enterprises* in relation to *innovation* are discussed and summarized.

Ultimately, in last section, six propositions are formulated to appeal future research tests on assertions which may further support previous findings and add some new insights to the literature.

Hopefully, this study will reveal useful both to managers and students wanting to update their knowledge on *innovation* strategies, and provide useful hints for future researchers.

Acknowledgements

I would like to express my gratitude to all the people somehow involved in the valuable academic experience, which was writing this master thesis.

My deepest gratitude is to my family – my parents, Graça and José Tomaz, and my sister Susana. They always allowed me to choose my own path while providing me their wise advices based on their experience. This thesis represents another thoughtful step in my life, which my family encouraged me to take. The long conversations with my father, English corrections my mother did and the attention to details drawn by my sister, helped me particularly to create this thesis.

Also, I would like to thank my other family members, those living and those already gone, who guide my life for their respectful achievements. Specially, I thank my uncle Jorge Baptista for his crucial contributions. The time he dedicated, correcting the linguistics and suggesting changes in the content, surely contributed to refine this thesis.

I thank Prof. Dr. Carla Maria Marques Curado for her valuable supervision. As a Professor, she has always challenged her students to give their best while establishing friendly relationships with them. As a supervisor, her useful comments and advices were always given promptly. In the different stages of this thesis, her academic experience was patent in her tranquilizing words.

Finally, I thank all my friends, especially those who lived or are living the same experience of writing a master thesis. Together we had fruitful conversations, shared our life goals and lived unforgettable experiences.

Abstract

Research on *multinational enterprises* and *innovation* is widely available and in continuous development. The issue is how to organize such amounts of information. A review of the main theories of *innovation* is presented and a model for its conceptualization is proposed. Both general and specific research and development strategies are analyzed. Moreover, external organizational modes are discussed with a main focus on the innovation perspective. In addition, the innovative capabilities of national enterprises are questioned, in terms of their limitations. Then, gradual processes of internationalization are contrasted with those of born globals and three main challenges multinationals may face while managing *innovation*, are presented. The comparison of *innovation* in *multinational enterprises* and *national enterprises* is established. Based on the literature, it seems that multinational diversity provides higher innovation levels. The propositions generated in this thesis suggest support to this assumption, which may be confirmed in future research tests.

Key Words: Multinational Enterprises, Innovation Strategies, Research and development strategies

Resumo

Existe uma extensa e crescente literatura sobre multinacionais e inovação. Para os interessados nestes temas é por vezes complicado organizar e absorver tamanhas quantidades de informação. Uma revisão das teorias principais de inovação são apresentadas bem como um modelo para a sua conceptualização. As estratégias de pesquisa e desenvolvimento são analisadas tanto a um nível geral como a níveis mais específicos. Além disso, são analisados os diferentes modos de organização externos na perspectiva da inovação. As capacidades inovadoras das empresas nacionais são discutidas em relação às suas limitações. Seguidamente, os processos graduais de internacionalização são contrastados com aqueles das *born globals*. São ainda apresentados três desafios à gestão da inovação com que as multinacionais se podem deparar. Posteriormente, as vantagens e desvantagens das multinacionais face às empresas puramente nacionais são discutidas em matéria de inovação. Com base na literatura, parece que a diversidade multinacional contribui de forma positiva para aumentar os níveis de inovação nas empresas. As proposições desenvolvidas neste estudo sugerem que o seu teste em estudos futuros poderá suportar esta asserção.

Palavras-chave: Empresas Multinacionais, estratégias de inovação, estratégias de pesquisa e desenvolvimento

1. Multinational Enterprises and Innovation

In this introductory section, important definitions of *Multinational Enterprise* (MNE) and *Innovation* will be presented. In addition, the motives that lead firms to seek foreign production will be defined and classified. The different concepts of innovation presented in the literature will be explored and a model for the *innovation* typologies will be proposed. Furthermore, the strategic importance of *innovation* perceived by companies will be highlighted with some examples. Finally, the relation between innovation performance and globalization will be briefly presented as the main focus of this study.

1.1 Multinational Enterprises and Motives for Foreign Production

According to the definition advanced by Dunning and Lundan (2008: 3) and that is widely accepted in academic and business circles, a *multinational enterprise* is an enterprise that engages in *foreign direct investment* (FDI) and owns or, in some way, controls value-added activities in more than one country. Therefore, this particular type of international company organizes and coordinates multiple activities of its *value chain* across national boundaries and incorporates those activities to deliver the final products or services it provides.

Broadly speaking, the motives for foreign production give rise to four main types of MNE activity: *natural resource seekers*, *market seekers*, *efficiency seekers* and strategic *asset or capability seekers* (Dunning and Lundan, 2008: 67-68).

The *natural resource seekers* are

> "prompted to invest abroad to acquire particular and specific resources of a higher quality at a lower cost than could be obtained in their home country (if they are obtainable at all)." (Dunning and Lundan, 2008: 68)

The *market seekers* are

> "enterprises that invest in a particular country or region to supply goods or services to markets in these or in adjacent countries. In most cases, part or all of these markets will have been serviced previously by exports from the investing company which either because of tariff or other cost-raising barriers imposed by host countries, or because the size of the markets now justifies local production." (Dunning and Lundan, 2008: 69-70)

The motivation of *efficiency seekers* is

> "to rationalize the structure of established resource-based or market-seeking investment in such a way that the investing company can gain from the common governance of geographically dispersed activities. Such benefits are essentially those of the *economies of scale* and *scope* and of risk diversification." (Dunning and Lundan, 2008: 72).

The *strategic asset seekers*

> "engage in FDI, usually by acquiring the assets of foreign corporations, to promote their long-term strategic objectives – especially that of sustaining or advancing their global competitiveness." (Dunning and Lundan, 2008: 72).

Furthermore, each type of MNE activity can be classified as *defensive* or *aggressive*. MNE actions are *defensive* when its behavior is defined in reaction to actions taken or perceived likely to be taken by its competitors. MNE actions are *aggressive* when the company is seeking to be proactive and to position itself strategically one step ahead of its competitors (Dunning and Lundan, 2008: 68).

1.2 Innovation and Definitions

In a broad definition, Bessant and Tidd (2007: 29) define *Innovation* as the process of translating ideas into useful – and used – new products, processes and services. This is consistent with most definitions by other relevant authors (e.g. Drucker, 1985) or economic associations, such as OECD[1]. More specific definitions of Innovation often include the word change. Bessant and Tidd (*idem*) reduce innovation forms to four dimensions of change, which they call the "4P's of *Innovation*": *product*, *process*, *position* and *paradigm*. *Product innovation* refers to changes in the products/services themselves whereas the *process innovation* designates changes in the ways they are created and delivered. *Position innovation* occurs when the context in which the products/services are introduced change. Finally, *paradigm innovations* are changes in the underlying mental models which frame what the organization does.

Although Albernathy and Clark (1985) define innovations in a different way than Christopher Freeman (*apud* Simões, 2007: 35) some similarities among their definitions contribute to the general consensus in the literature (see Table 1).

[1] Innovation: the OECD Definition. URL: http://www.oecd.org/document/10/0,3343,en_2649_33723_40898954_1_1_1_1,00.html (3/09/2010).

Table 1- Differences between Two Innovation Typologies

Albernathy and Clark	Freeman
Regular innovations	Incremental innovations
Revolutionary innovations	Radical innovations
Architectural innovation	New technological systems
Novel niche	New paradigms

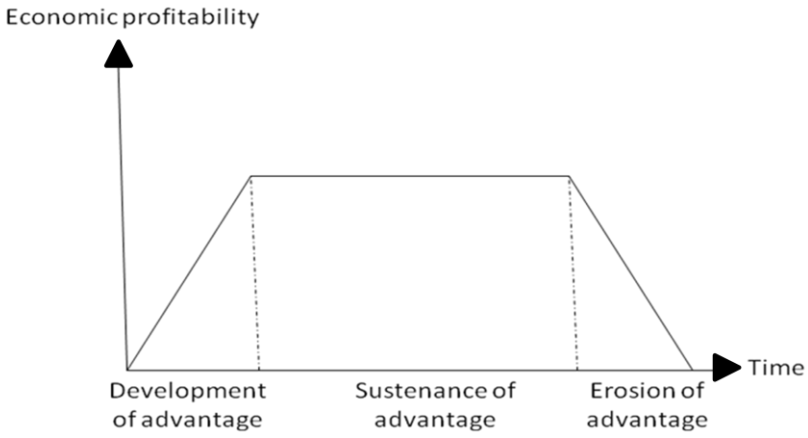
Source: Adapted from *apud* Simões, 2007: 29,35.

Regular innovations in their typology or *incremental innovations* in Freeman's typology are slightly improvements in the costs or performance of products. An example from the computer industry is the continuous improvement of microprocessors' speed performance. *Revolutionary innovations* defined by Albernathy and Clark or *radical innovations* in the Freeman typology are innovations that introduce new concepts that replace the old ones. An example is the digital photo cameras that replaced the film ones. The other two types of innovation according to Albernathy and Clark are the *architectural innovations* and the *novel niche*. The *architectural* ones consist in innovations that have a great impact in the economy as whole such as the invention of the car or the internet. The *novel niche* ones are innovations specifically oriented towards a small segment of the market like the SUVs in the car manufacturing industry. In relation to the definition of Bessant and Tidd this concept is similar to the *position innovation*. Freeman also defines two more types of innovation which are *new technological systems* and *new paradigms*. The *new technological systems* are innovations that impact several industries such as new synthetic materials which can be applied in numerous industries. The *new paradigms* comprise those innovations

that have such a high impact in the economy that changes the way of doing almost everything such as those started with the invention of the combustion motor or the computer.

According to Joseph Shumpeter innovation causes markets to have periods of advantage creation, followed by a comparative quiet while the companies are able to sustain it until sudden discontinuities erode the previous sources of advantage and create new ones. The companies which are able to exploit these opportunities/threats will benefit from another period of quiet assuring the sustainability of the business. This process, represented in Figure 1, was called *creative destruction*. (Besanko *et al*., 2007: 431).

Figure 1 – Creative Destruction Process



Source: Adapted from Besanko *et al*., 2007: 432.

An approach for defining innovations, in the spirit of Shumpeter, is advanced by Christensen (2006). In the author's view, innovations that improve product performance are *sustaining technologies*. These can either be *incremental* or *radical*. *Incremental innovations* are slight improvements within the same technological

approach whereas *radical innovations* are improvements by using a new technological approach (e.g. new composite materials).

On the other hand, innovations which result in worse performance at least in the near-term are *disruptive technologies*. By worse performance, Christensen means products that are usually cheaper, simpler, smaller, and frequently more convenient to use. In other words innovations which offer a lower benefit to the customer but drastically lower costs of production or increase convenience. As examples of disruptive technologies one can consider personal desktop computers, discount retailing stores or mobile telephony. All these products have in common the fact that they replaced the established products not due to higher performance but rather for being more convenient and less expensive.

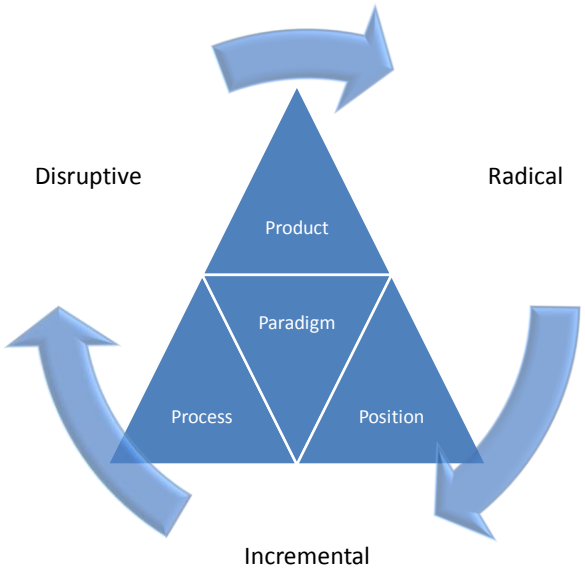
As suggested in the literature, there seems to be a consensus that *innovations* can occur at different levels (product/services, processes and organization) and that the impact of those innovations can be either *incremental* or *radical*. In a broader perspective, some innovations can also be viewed as revolutionary for their great impact in the whole economy. While other types of innovation can be observed in a relative short period of time (one or two years) the revolutionary innovation can only be observed in the medium or long term. For instance, in 1908, when Ford launched its model T, the innovation in the line production would be considered a radical process innovation at the time, but when we look back at the history of the car industry, one can say that since then this innovation was revolutionary because it made cars available to the masses. In the same way, recent developments in nanotechnology can be considered radical innovations, although this technology has enough potential to be

revolutionary. However it will only be considered as such when it can be applied to several industries, namely pharmaceutical, robotics and information technologies.

1.3 Model for Innovation Typologies

Throughout this study, the definitions advanced by Bessant and Tidd (2007) as well as the typology proposed by Christensen (2006) were the source for the model of innovation presented in Figure 2. Thus *innovations* are defined here in two dimensions: The *level dimension* can be of four types (*product*, *processes*, *position* and *paradigm*) whereas the *impact dimension* can be of three types (*incremental*, *radical* or *disruptive*).

Figure 2 – Innovation Dimensions



Considering the *level dimension*, *paradigm* is purposely in the middle of the other three concepts, namely *product*, *process* and *position* to show the interconnection that exists between them in a new paradigm. Usually a *paradigm innovation* involves all the other three types of innovation. For example, the introduction of the combustion

motor was a new product mostly used in the car manufacturing industry, a *process innovation* in the creation of electric energy (i.e. electric generators) and a *position innovation* happened when these motors started to be used in the shipping industry.

As for the *impact dimension*, the dynamic represented through the arrows is intended to show that each of the three definitions in the external triangles (*product*, *process* and *position*) can be of three types, namely *incremental*, *radical* and *disruptive*. The individual definitions provided by Bessant and Tidd (2007) and previously presented in this text are adopted in this study for the *level dimension* and the definitions by Christensen (2006) for the *impact dimension*. This model intends to capture the relation between these two dimensions, considering all the concepts involved.

1.4 Strategic Importance of Innovation

Innovation is one of the most important functions of a company. Its importance is evident in mission statements or visions that serve as background for several companies, from various business areas: the slogan of General Electric[2] is "imagination at work" and in their website imagination is defined as innovation; The mission statement of Bayer[3] includes: "(…) we aim to create value through innovation (…)"; Part of the vision of Pershing[4] is the "promotion of innovation in the yachting sector.". In the 2010 *Bloomberg BusinessWeek* annual rankings of Most Innovative Companies[5], Apple sustains the first place for the fifth consecutive year. Although this ranking is based on

[2] General Electric: Innovation. URL: http://www.ge.com/innovation/archive.html (15/08/2010)
[3] Bayer group: mission statement. URL: http://www.bayer.com/en/mission-statement.aspx (15/08/2010)
[4] Pershing-yacht: corporate: company profile. URL: http://www.pershing-yacht.com/home.php?lang=eng (15/08/2010)
[5] Bloomberg BusinessWeek: the 50 most innovative companies. URL: http://www.businessweek.com/magazine/content/10_17/b4175034779697.htm?chan=magazine+channel_special+report (15/08/2010)

a survey sent to senior managers around the globe by Boston Consulting Group, these companies share not only a respectful reputation for innovation but also the highest growth rates and value creation, measured by means of revenues and stock market performance. After all, these innovative companies excel others by introducing new ideas into successful applications that customers are looking for and which potential investors believe in.

Innovation strategies may be defined by all the commitments a company makes with regards to innovation. In the end, a company wishes to outperform its competitors by offering products with superior quality, less costly or with higher performance. All processes towards these goals should also be done in a better way than its rivals, seeking ways for improving all the internal processes, the distribution or the technologies used.

According to Freire (2000: 243), companies should consider strategic alliances in innovation if the parts involved have a better off position together than if they were alone, relative to their competitors. For example, the joint development of Microsoft Windows software and Intel processors gave both companies a superior advantage in the personal computers industry.

The organic and geographical expansion of a company is accompanied by different innovation strategies, based in FDI and diversification of businesses which create technology synergies. Freire (*idem*: 240) provides an example of Cannon's expansion from a national player centered in photography up to a world player in the image, information and communication businesses. Throughout this evolution, the innovation

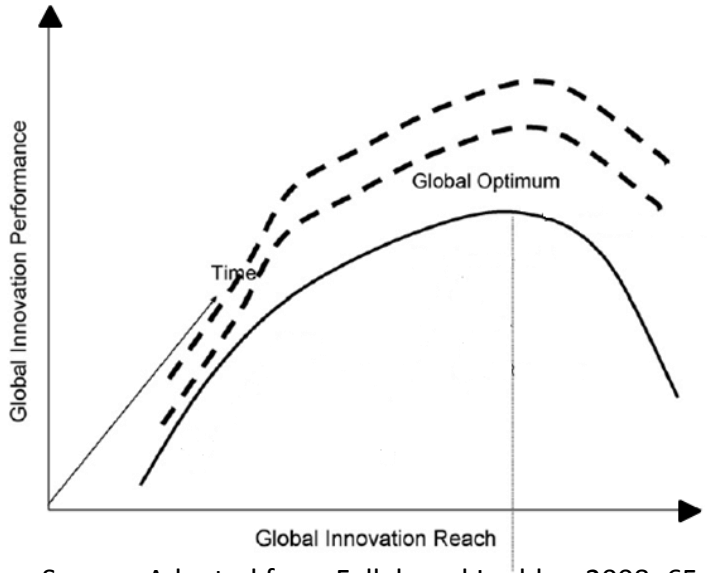
capabilities of Cannon became more sophisticated and allowed both technological and commercial synergies in different business areas.

1.5 Innovation and Globalization

In a recent study by Fallah and Lechler (2008), the same view that the innovation performance of a firm evolves with the globalization of innovation is supported up to a certain extent. Based on data from several MNEs in the telecommunication and information technology industries, the authors analyze this relation by creating two indices. The *global innovation reach* – calculated by crossing the percentage of global revenue outside home country by the percentage of R&D labs outside home region, and the *global performance index* – which measures the company performance in terms of operating revenues and growth.

Their findings are illustrated in the graph below (Figure 3):

Figure 3– Relation between Globalization of Innovation and Performance



Source: Adapted from Fallah and Lechler, 2008: 65.

The dashed curves represent the model's dynamics, since relative competitiveness is always changing. Basically, the graph shows that the more R&D centers an MNE

possesses across the world, the better its innovation performance. However, when the costs of maintaining and coordinating these centers exceed the benefits of the value captured by the MNE, its performance will fall down. The inflexion point is represented by the global optimum.

This study focus on finding evidence in the literature, like the one above, which supports the proposition that multinational diversity provides higher innovation levels.

1.6 Summary

MNEs engage in FDI mainly in search of natural resources, new markets, operational efficiencies and strategic assets. *Innovation* is a broad concept which branches into several sub-concepts. It is defined as an idea turned into a useful application. The model proposed here is intended to synthesize the different innovation typologies explored in this text. It consists of two dimensions: the *level dimension* and the *impact dimension*. The *level dimension* includes the product, process, position and paradigm innovations. The *impact dimension* consists of *incremental, radical* and *disruptive innovations*. Thereafter, the strategic importance of innovation given by companies was shown in virtue of manifestations like mission statements. In the end, it was presented a study in order to show how the innovation performance of a firm evolves with the globalization of the innovation function of a company.

2. Innovation and Strategic Decisions

This section will focus on the main unit responsible for companies' innovations: the research and development (R&D) centre. It will explore the conditions under which an MNE should make or buy technology, when MNEs should source ideas internally or externally and how MNEs are able to reach external ideas. In addition, the R&D strategic approaches will be presented, discussing their advantages and disadvantages. Another subsection will deal with the important decision on where to locate the R&D units. Finally, last subsection presents two processes of selecting and coordinating ideas, which may have the potential to turn into innovations.

2.1 Sources of Technologies

An MNE faces the dilemma of making or buying technology. According to Michael Porter's value chain, technology development is "embodied in every value activity in a firm" (Porter, 1985: 166). Moreover it is one of the main drivers of competition. Therefore, companies must be aware of what technologies are available in the market, understand their value and develop their own technologies in order to outperform competitors in a specific activity.

The make-or-buy decision may be based in several factors. First, an MNE is expected to dominate technology in its core activities. Thus it is more important to develop technologies in-house for these activities rather than for secondary activities. For example if a company specializes in juices' production, it must dominate the technologies associated whereas the development of packages may be better off relying to an outsourced company. The decision to develop technologies is tied to the decisions regarding the integration level of a company. However co-innovation

initiatives with suppliers must not be disregarded, since these can create competitive advantages for both actors. Regarding the secondary activities, the company has to balance the benefits and costs involved with integration. If suppliers can achieve *economies of scale* and possess the execution capabilities that an in-house unit cannot and if the agency and *transactions costs* do not outweigh the benefits, it is wiser to outsource those activities. Otherwise, the company should develop them in-house (Besanko *et al*, 2007: 131).

The unit responsible for the development of technology at MNEs is usually the R&D department. One of the primary tasks of this department is to develop new products or processes that either save costs or time, increase quality or any of these factors together. The focus in one of these components will depend on the company's generic strategies (Porter, 1985). In a business where a company is a cost leader, more resources should be allocated in finding ways of reducing costs in all activities, whereas in a company that follows a differentiation strategy its efforts should be put into the development of new features that increase a product or service value. How this will be achieved – through internal development, external acquisition or strategic alliances – is a decision that requires continuously external scanning. Sometimes managers focus too much in routine activities of a company and underestimate the opportunities that research outside the firm's boundaries may represent.

MNEs have several advantages over smaller companies like the resources availability. In fact, MNEs are able to allocate high amounts of capital, experience and human resources to R&D projects. The amount of money spent on R&D varies by industry. Computer software and drug industries spend an average of 11% to 13% of their sales

revenue while others such as food and packaging industries spend less than 1% (Wheelen and Hunger, 2008: 298). MNEs also face some disadvantages like the lack of flexibility due to internal bureaucracy or levels of hierarchy. R&D departments have been responsible for the creation of patents which contribute to sustain competitive advantages. Nevertheless, continuous research has to be done in order to update the company with the existing patents outdoors, the costs of licensing them and their lifecycles.

2.1.1 Acquiring Minority Equity Stakes in Other Companies

In fast paced industries like biotechnology, it is getting harder and harder to develop new products in due time. An MNE alone cannot develop products in every area it operates. Therefore MNEs have to assess whether it is worth to develop technologies internally, using strategic alliances, through acquisition of equity stakes in specialized companies or by means of their entire acquisition. It is important to know that investments in one of these types represent an *opportunity cost* of not investing in the others. For example, MNEs with diversified businesses' portfolios often buy minority equity stakes of start-up companies that specialize in areas of their interest. This concept is known as *corporate venturing capital (CVC)* (Dushnitsky and Lenox, 2005). Both companies involved are bound to benefit if the risks are carefully measured. The start-up company raises the funds necessary to grow and sometimes the knowhow or experience of the acquiring one. The MNE expands its business rapidly and it may earn high returns on investment. The R&D staff should be involved and interact with the financial department of MNEs. The scientists are the ones with the knowledge about the technical aspects of a given technology and together with the financiers can

evaluate the R&D projects of other firms. Therefore CVC should be seen as a complement to the R&D activities and not a competitive activity as Dushnitsky and Lenox (2005) find in their study. In the case of CVC the commitment towards the target company is still small because the technologies are still developing and the markets cannot be yet sized to justify an MNE entry with its own resources. The target companies are not publicly traded and therefore lack financial resources.

2.1.2 Acquiring Majority Equity Stakes in Other Companies

Some specialized companies are so attractive to MNEs for their complementarities between businesses, their potential synergies and their joint growth opportunities that it makes sense to acquire the majority of their capital to guarantee the MNE's sustainability. An example in the IT industry would be the acquisition of YouTube for 1.65 billion dollars (1.3 billion Euros) by Google[6], in 2006. The fact that Google operates in a wide range of activities in the IT industry may hinder the company to develop high quality products in specific areas, which are not part of their core business (search engines) where they allocate most of the resources, in order to sustain their competitive advantage. However, MNEs must not underestimate the rise of new technologies like the internet video broadcasting platforms that may become the new source of competitive advantage of tomorrow. By acquiring YouTube, Google assumed the commitment of investing in a promising business area which complements its related businesses. Indeed, Google could have developed a competing product, but that would have taken perhaps too much time, it could never be able to take away the earlier advantages of YouTube and it could not match the

[6] BBC NEWS: Google buys YouTube for 1.65bn. URL: http://news.bbc.co.uk/2/hi/business/6034577.stm (3/09/2010)

specific capabilities of the acquired firm's employees. Thus, even the high price paid for YouTube seems to have compensated the risks that would be involved with entering that business area with a competing product developed internally.

2.2 R&D Strategy

When formulating its R&D strategy, MNEs must decide whether to be a technological leader, pioneering innovations or a technological follower, waiting for others to innovate first (Porter, 1985: 181). According to this author, the decision to become one or another can be a way of achieving either low cost or differentiation (see Table 2).

Table 2 – Technological Leadership and Competitive Advantage

	Technological Leadership	**Technological Followership**
Cost Advantage	Pioneer the lowest cost design Be the first firm down the learning curve Create low cost ways of performing value activities	Lower the cost of the product or value activities by learning from the leader's experience Avoid R&D costs through imitation
Differentiation	Pioneer a unique product that increases buyer value Innovate in other activities to increase buyer value	Adapt the product or delivery system more closely to buyer needs by learning from the leader's experience

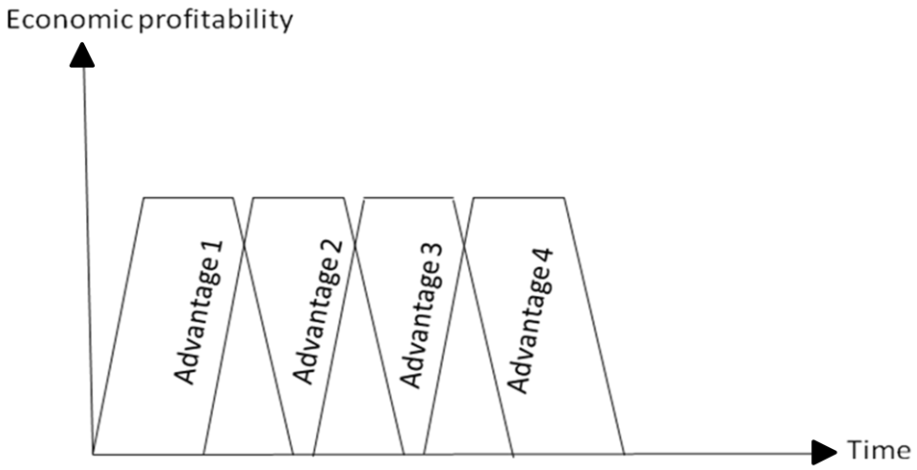
Source: Adapted from Porter, 1985: 181.

According to Porter (1985: 183) managers should choose technological leadership either if the technology lead can be sustained or if the initial lead translates into first mover advantages that overcome the costs of leadership. If the costs and the risks of being a first mover outweigh the benefits it is better to choose a technological followership approach.

From the management perspective, sustaining a given technology is becoming an increasingly difficult challenge everyday because with the globalization an innovation may emerge from an unexpected company anywhere in the world and be diffused in a

very short period of time through the latest technologies of information. According to Richard D'Aveni (1994), the period during which a company sustains an advantage is shrinking due to the high level of competition and the only way companies have to sustain its business is by continually developing new sources of advantage as shown in Figure 4(Besanko *et al.*, 2007: 432).

Figure 4 – Advantage Sustenance



Source: Adapted from Besanko *et al.*, 2007: 432.

The period of advantage sustenance is not surprisingly shorter for companies in fast paced industries such as the one studied in depth by Clayton Christensen (2006) – the hard disk drive industry. An even faster paced and complex industry is the one of internet sites of contents such as YouTube or social networks like Facebook, which may have even shorter periods of quiet advantage. By analogy with the fashion industry companies will have to reinvent their product line every season whatever the state of the economy (Allen *et al.*, 2009). A fashion company that fails to innovate at a faster pace than its competitors faces serious problems of sustainability. Some companies divest in innovation in turbulent economic periods in order to control the short term

financial situation. However this attitude which may seem rational in the daily operations perspective underestimates the consequences in the long run. Allen *et al.* (2009) suggest that each company should have a so-called "both-brain" management team, which consists of a left-brain - who is more rational, logical, and analytic - and a right-brain - who is more creative, intuitive and subjective. The authors provide examples of successful "pairs of brains" such as Hewlett-Packard whose personal characteristics, though ambiguous, complemented each other and provided a balanced management that was an explanation for their sustained businesses (*idem*: 84-85).

2.3 Location of R&D Departments

Since the sources of new ideas are spread around the world and the time period of advantage sustenance, provided by the ideas which become successful innovations, is shrinking, MNEs should abandon centralized approaches to R&D. Therefore MNEs should build interconnected R&D networks that "excel at tapping new centers of knowledge and at commercializing products in foreign markets with the speed required to remain competitive." (Bartlett *et al.*, 2008: 549). An example of a knowledge centre is the Silicon Valley knowledge cluster, which holds several informal and formal gatherings of experts from high tech companies and universities. Before deciding where to locate the new R&D sites, an MNE must think about which are their main objectives. According to Kuemmerle (1997), there are two types of R&D sites (*idem*):

1) Home-base-augmenting laboratory sites; and

2) Home-base-exploiting laboratory sites.

For simplification, these types are defined here just as *augmenting laboratory sites* and *exploiting laboratory sites*.

In Table 3, the location decisions are presented according to the types of R&D sites and respective objectives. For the scope of this thesis, only the location decision phase is presented and further phases regarding the management of the new R&D sites are not considered.

Table 3 – Location of R&D Sites

Types of R&D Sites	Location Decision
Augmenting Laboratory Sites Objectives: • absorbing knowledge from the local scientific community • creating new knowledge • transferring knowledge to the company's central R&D site	• Select a location for its scientific excellence • Promote cooperation between the company's senior scientists and managers
Exploiting Laboratory Sites Objectives: • commercializing knowledge by transferring it from the company's home base to the laboratory site abroad and from there to local manufacturing and marketing	• Select a location for its proximity to the company's existing manufacturing and marketing locations • Involve middle managers from other functional areas in startup decisions

Source: adapted from Bartlett *et al.*, 2008: 551.

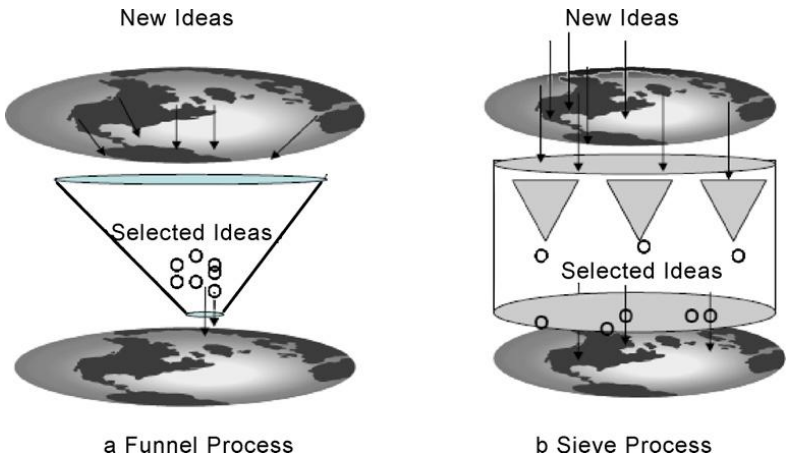
An *augmenting laboratory site* should be located in regional clusters of scientific excellence, like Silicon Valley. Researchers can absorb new knowledge through the participation in formal or informal meeting circles that exist within a certain geographic area containing useful knowledge, by way of hiring employees from competitors or by sourcing from the same suppliers that competitors use (Bartlett *et al.*, 2008: 550).

An *exploiting laboratory site* "should be located close to large markets and manufacturing facilities in order to commercialize new products rapidly in foreign markets."(*idem*: 553). The main reason for this proximity need is the fact that the manufacturing engineers have to interact permanently with product development engineers, especially in complex manufacturing processes (*idem*: 554).

2.4 Ideas and Processes

As it is described by Fallah and Lechler (2008: 68) there are at least two ways of selecting ideas depending on the MNEs structure: the *funnel* and *sieve* processes (see Figure 5).

Figure 5 – Funnel Process vs. Sieve Process



Source: Fallah, M. and Lechler, T., 2008: 69.

The *funnel process* is used by centralized companies to channel all ideas, no matter their origin, to a main R&D department, usually based in the company's headquarters. The *sieve process* is characteristic of decentralized companies, which have more than one decision centre to select ideas that make sense for the market in which they are embedded. This method of selecting ideas makes more sense in a globalized economy,

although control from headquarters is lower. An MNE should be able to coordinate all its R&D departments in a way that even if an idea wouldn't be selected by one R&D unit, if it would make sense to select it on another R&D unit, this information should flow between interested R&D departments for the benefit of the MNE as a whole and so that valuable ideas would not be lost.

2.5 Summary

Where should an MNE source its technologies from? As far as they are related to a firm's core activities they should be developed internally. However, with regards to secondary activities, if the *transaction costs* of outsourcing a given technology are lower than the costs of developing it in-house, then the firm should outsource that technology. The R&D department is a crucial unit for the development of new products, services and technologies. Nevertheless, the internal development is as important as the scanning of the external developments. Consequently, the R&D staff, together with other MNE's departments, must analyze the possibilities of acquiring in part or in full companies that have potentially relevant R&D projects, which would bring higher benefits at lower costs to the company as a whole. R&D strategies can be of two types: leadership or followership. The decision to follow one or the other will depend on a cost/benefit analysis of being a first mover. If the benefits are higher it pays off to have a leadership approach whereas if the costs are higher it is wiser to have a followership strategy. The location of R&D departments depends on their objectives. Thus, augmenting laboratories should be placed close to knowledge centres whereas exploiting laboratories should be set in the vicinity of large markets and manufacturing facilities. Between the two processes of sourcing ideas presented – the

funnel and the sieve – the sieve process is recommended for decentralized companies operating in the globalized world economy, because of the need to select and apply ideas at a faster pace.

3. Advantages and Disadvantages of External Organizational Modes

In a broad view, the external relationships with organizations located outside a firm's national boundaries are set between two extremes of a spectrum, as shown in Figure 6, from arm's length to internalization relationships.

Figure 6 – Organizational Modes

On one extreme stand market transactions of unrelated companies and on the opposite extreme stand greenfield investments in which firms involved are wholly owned by the same parent-company. Several types of inter-firm relationships can be found in between these two extremes. From the simplest mode (market transactions) to the more complex (greenfiled investments) these options are influenced by both environmental conditions and firm specific characteristics (Hagedoorn and Duysters, 2002). This section will explore the advantages and disadvantages of each type of relationship in the context of the internationalization strategies of firms, with a main focus on the innovation function of a company. These alternatives are discussed mainly in terms of environmental context, level of commitment, level of control, knowledge flows, timing of its entry and costs involved.

3.1 Market Transactions

Exports are international market transactions of products or services produced in the home country and sold to other markets of different countries. It can usually be seen as a first natural step towards internationalization. When a company realizes that there is a growing demand outside its national borders, it starts selling its products

directly to foreign customers or indirectly through distributors. Both the level of commitment to the foreign target market and the level of control of operations in that market are minimal.

According to Gomes-Casseres *et al*. (2006) knowledge flows are the sharing of technological knowledge between firms[7]. Since the relationship between firms involved is purely commercial, there is little or no transfer of knowledge. Much of the knowledge flows in this arms' length relationship will be involuntary spillovers (*idem*).

The costs involved are mainly financial and include costs of transportation to other countries and charges that depend on the type of products and countries of origin/destination. From a transaction cost economics perspective, this form can be advantageous if the costs mentioned above are lower than those required of a firm to have its own operational units in the foreign target market. However, according to Raymond Vernon's product cycle theory (Bartlett *et al*., 2008: 5), when demand in the foreign country becomes sizeable and exports already represent a relevant stake in the overall sales, a firm tends to set up production/distribution facilities in the importing country to deter competition and thereby securing market share by moving along the spectrum towards more integrated organizational forms.

3.2 Licensing

Licensing can be viewed as a "one way" transfer of knowledge, where the licensee is the one who learns, for example, how to produce a new product by paying a fee to the licenser. Empirical evidence shows that this kind of "unilateral" contract-based

[7] These authors use patent citations as a proxy for the flow of technological knowledge between firms (Gomes-Casseres *et al*., 2006).

alliances have lower (or even no) learning effects between companies than that of equity-based alliances (Mowery *et al.*, 1996, Anand and Khana, 2000). This organizational type of entering into a foreign market is preferred when the knowledge is mainly explicit and therefore the company can easily write safeguards in the contracts. However, in countries with less secure intellectual property rights (IPR), firms prefer more integrated forms of presence, such as equity joint ventures or even through wholly owned subsidiaries (Hagedoorn *et al.*, 2005), for reasons to be explained in section 3.4 Joint Ventures. The marginal costs of licensing are almost insignificant because once a company has developed a licensing agreement it can use "the same" with other foreign firms. Moreover, the more contractual agreements a company establishes, the more experience it gains in the operational activities and this allows cost savings.

3.3 Alliances

Strategic alliances are "voluntary agreements between firms involving exchange, sharing, or codevelopment of products, technologies or services" (Gulati, 1998: 293). Alliances are a typical case of hybrids (Hagedoorn, 2002), in the sense that they are neither market transactions nor a type of integration and vary in form with the control level of the chosen structure, usually represented by the sharing or not of equity (Gulati, 1998). This form of relationship already permits knowledge sharing relationships.

Among other motivations for firms to enter alliances, found in several studies (see for example Gulati, 1998), some include sharing uncertainty and costs, access to complementary technologies, learning new tacit technologies, reducing innovation

period, monitoring environmental changes, entering foreign markets and expanding product range. Most of these motivations are behind the formation of international alliances.

It is important to note that international partnerships are much more difficult to carry out due to less information available on potential "foreign" partners when compared to "domestic" ones. Plus, the costs of obtaining information on international partners are much higher (Hagedoorn *et al*., 2008).

Previous research (Gulati, 1995) suggests that alliances are more likely to be equity-based if they have a shared R&D component. The difficulty of transferring R&D know-how as well as the difficulty to establish contracts in which knowledge is fairly shared between partners leads companies to choose equity-based partnerships because of the significant transaction costs involved. When two or more companies engage in a joint R&D project, it is very hard to state in the contract which patents will be developed, to whom they will belong, and so forth because of the uncertainty and intangible nature of this activity. "Shared equity can align the interests of partners and limit opportunistic behavior by focusing attention on their stake in the alliance"(Gulati, 1995: 91). However, short-term contractual R&D partnerships (without equity sharing) are preferred by companies in high-tech industries, like the IT industry, or in industries with a high level of technological change like biotechnology, mainly because they provide more flexibility to adjust to frequent technological changes while monitoring new technologies and introducing innovations themselves (Hagedoorn *et al.*, 2005)

Trust between partners plays an important role here, since it reduces the costs associated with the fear of opportunistic behavior by the other partner. Untrustworthy behavior can lead to costly sanctions that exceed any benefits from an opportunistic behavior and include loss of repeated ties with that partner, loss of indirect ties to other companies related to that alliance and loss of reputation (Gulati, 1995). Therefore, companies are more willing to enter non-equity-based partnerships when trust is high among partners. In sum, the main advantage of alliances relies on the flexibility it provides to firms, whereas the main disadvantage is the risk of opportunistic behavior by the alliance partners.

3.4 Joint Ventures

Joint ventures are the typical way of entering an alliance with a foreign company, by creating a new firm in which equity is shared among partners. Since information is more difficult and costly to obtain, companies prefer to have more control through an equity stake (Hagedoorn *et al*., 2006). In addition, the risk of opportunistic behavior of an international partner is higher than that of a domestic player, especially because the costs of being untrustworthy are lower in an international realm due to the higher number of substitute partners.

The IPR protection of a given country can also determine the form of an alliance (Hagedoorn *et al.*, 2005). For example, a company that is considering entering a foreign market that has low IPR protection is not likely to do a licensing agreement with a company in that region in fear of patent violation but rather prefers to establish a joint venture, where it can have representation in the board of directors, which leads to higher control (Hagedoorn *et al.*, 2005). Furthermore, in some developing

economies, specific country legislation does not permit foreign firms to build up wholly owned subsidiaries forcing them to engage in joint ventures with local firms to foster knowledge transfers.

In sum, there are some advantages and drawbacks in joint ventures. This form of alliance with shared capital aligns the interests of all partners and reduces the risk of opportunistic behavior. On the other hand, equity alliances can take a long time to negotiate, organize and involve high exit costs (Gulati, 1995).

3.5 Mergers and Acquisitions

Mergers and acquisitions (M&As) refer to joint activities where two, once separate companies are combined into one company (Hagedoorn and Duysters, 2002). This combination can refer to the merging of two companies or to acquisitions where one company obtains the majority of the equity of another company (*idem*). M&As represent a strong level of commitment. Furthermore, if the needed external innovative capabilities are related to a firm's core business, an M&A might be preferred because it generates more control.

In a study carried by Singh and Montgomery (1987), related businesses are classified as those that have at least one of the following characteristics: serve similar markets using similar distribution channels, have similar production technologies, or exploit similar scientific research. The authors found out that related acquisitions provided higher returns than those that were unrelated due to synergies created through the combination of supplementary or complementary resources.

However unrelated acquisitions might also be attractive because differences rather than similarities can also produce synergies (Barkema and Vermeulen, 1998). The literature seems to suggest that acquisition of related businesses would provide higher returns, however the firms involved should not have a complete overlapping of knowledge because that would not create value, unless scale effects are sizable.

The main advantage of acquisitions is the shortcut of the process of building up a new entity in a new market (Bartlett *et al.*, 2008: 9). Moreover, the purchase of an ongoing business may be less expensive than the internal development which requires high investments during the early years and provides little or no returns in that period (Singh and Montgomery, 1987). Other important benefits generated by M&As are increased market power, economies of scale and economies of scope (Singh and Montgomery, 1987; Cantwell and Santangelo, 2002).

> "In related acquisitions market power can be achieved through horizontal acquisitions or through product or market extension where a firms' effective size is increased relative to its competitors." (Singh and Montgomery, 1987: 379).

Economies of scale can be achieved through increased production and economies of scope through the sharing of resources for two or more products (*id*em). Nevertheless, some disadvantages make this entry mode less attractive to companies. The unavailability of potential targets, the size of the premium needed to pay to the shareholders of the acquired firm, the transaction costs that will be incurred in the purchase and the difficult absorption process due to disruptive changes in routines are

the main disadvantages in M&As (Cantwell and Santangelo, 2002; Cloodt *et al.*, 2006; Hennart and Reddy, 1997; Singh and Montgomery, 1987).

3.6 Greenfield Investments

Greenfield investments represent the highest commitment towards the target market and provide the highest control. This organizational mode is used to exploit the existing capabilities of the firm (including past experience) while acquisitions would be preferred to augment knowledge (Dunning and Lundan, 2008: 287).

Multinational diversity increases the propensity of a firm to set up a new venture (greenfield investment) in a foreign country rather than to acquire an existing company (Barkema and Vermeulen, 1998). Indeed, "geographical diversity exposes it to a rich array of environments, thus leading to higher innovation levels" (*idem*: 10). In this text the same definition of geographical diversity, used by Barkema and Vermeulen (1998) is adopted: the number of different national settings in which a firm operates[8]. As for the definition of innovation levels it is used the same of Hagedoorn and Duysters (2002) for innovation capabilities, where patent intensity is the indicator of strength in product development[9].

In addition, knowledge flows between units within single firms are higher than for other types of organization (Gomes-Casseres *et al*., 2006). Moreover, start-ups allow a parent firm to hire and train a new labor force, which makes the incorporation of firm-specific advantages easier than through an acquisition. In contrast, an acquisition could

[8] Barkema and Vermeulen (1998) measured geographical diversity by the number of countries in which the firm had established subsidiaries at the time of the expansion.

[9] Hagedoorn and Duysters (2002) measured patent intensity by dividing the number of patents by a firm's turnover in its core business, adjusted for the average patent intensity of firms in their sample that operated in the same sector.

face some resistance from the target firm's employees, especially when cultural differences between firms are stronger (Barkema and Vermeulen, 1998). However the major limitation of this organizational form is the time needed to start an organization from scratch (Singh and Montgomery, 1987).

3.7 Summary

As one moves from the simplest organizational mode (exports) to the more complex (greenfield investments) the level of commitment increases, control is higher, and knowledge flows are more intense. However the time needed and the costs involved also increase proportionally. In the middle of this continuum stand balanced organizational modes like alliances. Flexibility is desired to allow firms to respond rapidly to changing environments. On the other hand, control is also wanted to cover cooperation risks. Some options simply might not be available. If there is no company for sale or if there is no attractive partner to establish an alliance, both modes are excluded. Overall, a firm has to assess its characteristics and the external environment in order to determine which mode (from those available) will provide more advantages and less disadvantages, and which will best suit its international strategy.

4. Multinational Enterprises and National Enterprises

Before starting the discussion of this chapter, the definition of national enterprises (NEs) is advanced as opposed to MNEs and the heterogeneity of NEs due to differences among countries is emphasized. Then, the innovativeness of NEs is discussed. Next sub-section deals with how an NE can have its innovation function internationalized without having to set new ventures abroad. In the end of this section the *born globals* are defined and compared to MNEs.

A *national enterprise* is a company that coordinates all or the majority of its activities of its *value chain* inside its country boundaries and does not engage in *foreign direct investment*. The term *domestic enterprise* is also used in the literature.

Countries' differences contribute for different national enterprises. One cannot always compare an NE from a small country (e.g. Portugal) with another NE from a large country (e.g. USA). Just to mention a few but important differences, their markets have very different sizes, while the infrastructures, the cultures and regulations are different as well,. In contrast, MNEs operate in the same single "stage": the world.

Theoretically, MNEs can organize their activities in any country across the world. As opposed to MNEs, NEs have their activities limited to their home countries. In large countries, like the USA, internationalization might not be a priority in the early years of operation because firms in those markets are competing for large customer bases, which can sustain their growth. Consequently, firms from small countries should have an international orientation as soon as possible in order to become competitive both inside and outside its country and guarantee a sustainable growth. Unlike firms in

small markets, those in large countries will only suffer from market stagnation in a much later stage. In addition, the further expansion to other countries might be easier due to the scale achieved in their large home markets. Economic regions, like the European Union, make commercial exchanges between countries easier, but they also open their doors to the entry of more competitive products to the home markets.

4.1 Innovativeness of National Enterprises

Usually, a country boasts a few core activities, which are supported by NEs or MNEs and by specific regulations and incentives. These activities represent a large stake in the exports of their home countries as well as in the employment and other economic contributions to that country.

Knowledge centers for these specific activities render the presence of companies in the field important for the developments that happen within the cluster of companies. This may translate in informal or formal meetings in the sector, around certain geographic areas. Knowledge centers like these have been created throughout the history for their special environmental conditions or specific capabilities of the employees in those countries. For example, the wine sector is a core activity in Portugal for the appropriate weather conditions and for the capabilities developed throughout the ages. An NE in this sector can be very competitive because it has access to important knowledge centers. However, in other domains, where the sector is not so developed or where knowledge centers are based in other countries, an NE should expand its R&D activities to those geographical areas. Even though an NE can establish R&D alliances with local companies from those areas, having their own

employees in the field, enhances the knowledge absorbed and makes the company alert to any rapid changes in that area.

From the perspective of the innovation function of the company, it is essential for the company to be close to knowledge centers. NEs can access a few knowledge centers in their country but MNEs can reach knowledge centers anywhere in the world. Therefore, unless NEs operate in sectors with relevant knowledge centers in their home country, their innovative capacity is limited.

The knowledge flows are greatest when firms are close in several dimensions: technologically similar firms, in the same geographic region and in the same industry (Gomes-Casseres *et al*., 2006). Moreover, knowledge flows between MNE's units are greater than in alliances partnerships and arm's length relationships because MNEs facilitate the knowledge flows intentionally to maximize the incentive and ability of each to share knowledge within the firm (Gomes-Casseres *et al*., 2006).

4.2 Internationalization of the Innovation Function

A company can have a considerably internationalized innovative function without having its operations or assets such as R&D departments spread around the world. In fact, even an NE can have access to innovative ideas outside its national boundaries, for example by establishing effective technology alliances with companies overseas.

Another way to sense what is happening in the world with regards to innovation would be to send directors in charge of innovation to conferences or business fairs in relevant markets, which can be costly. However, knowledge is becoming increasingly available by electronic means, through online conferences and business discussion forums,

which significantly reduce costs. Nevertheless, the experience of traveling physically is still preferred, not only because it breaks job routines and it is more enjoyable for the participants, but also because it allows personal networking with people in the same field, a very important skill of innovators (Christensen *et al.*, 2009).

The value captured by whatever international activities an NE has is limited, though. The punctual experiences in which managers bring important knowledge into the company are very positive; the existing international alliances may also help to develop new products or services mainly in the home market. However, MNEs seem to have more advantages in these matters. The presence in other countries, for example through operational units, provides a direct learning of the operating environment on a daily basis. Considering the legal system, cultural traces of its regional employees, market dynamics, and so forth, the opportunities to learn by means of direct investment are invaluable when compared to other alternatives involving softer commitments. MNEs are more likely to develop new products for different markets than just their original home market because they have embedded knowledge from foreign markets on a daily basis. Plus, the company controls the knowledge flow within its network of headquarters and subsidiaries, whereas a national company relies on other companies to acquire knowledge about a market.

Depending on the type of business the need to have operations abroad in order to be more innovative is different. For example, companies operating in the consumer goods industry may need to operate in the field. Especially in view of developing new products, the demand for this kind of products is very regional-dependent. On the other hand, for software products, which can be considered as more standard global

products, a company does not need to be present in the region where it develops its products or services.

A partnership with a foreign company would make more sense considering both costs and benefits. In other words, the understanding of the regional environment is more important for consumer goods businesses or others whose products are differentiated by regions. Although the costs involved are higher, the benefits should outweigh the costs. As for businesses with more global products where the knowledge of the local environment becomes less important, a better way to internationalize the innovation function is through inter-firm partnerships, which are less costly and where the benefits of both options (expanding operations or doing a partnership) are similar.

4.3 Born Global Enterprises

Born global enterprises are "firms that seek to derive significant advantages from the use of resources or the sale of outputs to multiple countries/continents right from their legal birth."(Madsen and Servais, 1997: 579). These are typically, but not necessarily, technology-intensive start-up firms that serve niche markets, and are able to reach suppliers and customers around the world from their inception (Dunning and Lundan, 2008: 77).

In a study by Simões and Dominguinhos (2001), evidence of Portuguese born globals is provided. Among them, two software companies, Altitude Software and Critical Software, are presented. These companies, led by visionary entrepreneurs, served niche markets from their inception, started international operations in their first year of existence and followed a unconventional process of internationalization.

MNEs are usually seen as large, aged and deep rooted firms but can *born global* firms be considered as new and small MNEs? *Born globals* are still a recent phenomenon. Although they share some traits with large MNEs, there are also considerable differences. The similarities include multinational diversity of their markets as well as their network of partners, customers and suppliers spread across the globe. On the other hand, the specialization and the organizational structure are the most visible differences.

Born globals focus on niche markets unlike large MNEs which tend to seek larger segments, most of the times in more than one business area. MNEs have high hierarchical organizational structures where the decision making is spread among several people in the organization, whereas *born globals* rely on more flexible organizational structures and the decision making is mainly influenced by the founder(s).

Born global enterprises also distinguish themselves from large established MNEs because they skipped the usual stages of internationalization like the "rings in the water" models (see for example, Vernon, 1966; Turnbull, 1987). In these models, firms internationalize in a slow and gradual manner with regard to geographical markets, market entry mode and product policy (Madsen and Servais, 1997). In contrast, *born globals* soon have foreign direct investments regardless whether markets are geographically close to the country of origin. This does not mean that the assumptions for the "rings in the water" models do not apply to *born globals*. In fact, they do. However, there are at least three driving forces that set *born globals* apart from these models (Madsen and Servais, 1997):

1) New market conditions;

2) Technological developments; and

3) Founders' capabilities.

Changing market conditions like the increasing specialization makes companies produce "very specific parts and components which they have to sell in the international marketplace, simply because domestic demand is too small – even in large countries." (*idem*: 565).

Technological developments include the more frequent and cheaper transportation of people, and the easier access to information through modern communication systems.

Finally, the founders' capabilities have changed. In the last decades, students and professionals have much more opportunities to make exchanges between schools in different countries or to work temporarily in other countries. These valuable experiences lived by founders of new firms, who were exposed to different cultures and markets, make them less risk-averse to expand abroad and foster commercial relationships with foreign companies from the start. Thus, the founders' capabilities gained prior to the start of their firms, influences the international orientation of their businesses, for example by means of their international network of contacts.

Another non-conventional manner of internationalization is when subcontractors follow domestic customers or foreign system suppliers that may have started operating in a distant foreign location.

4.4 Challenges for Multinational Enterprises

4.4.1 The Transnational Challenge

An important challenge for MNEs is their ability to engage in transnational innovation processes. Bartlett *et al*. (2008: 455) describe this challenge as follows:

> "Today the challenge is to build transnational organizations that can sense an emerging consumer trend in one country, link through a new technology in another, develop a creative new product in a third, then diffuse that innovation rapidly around the world."

Traditionally, most MNEs developed new products and services through one of two different processes:

1) New ideas would come from a central R&D department, usually in the MNE's headquarters and then it would be diffused through the MNEs' subsidiaries; or

2) New ideas would be sensed in local subsidiaries in response to local markets' opportunities.

In today's information-based, knowledge-intensive economy, this strategic "mentalities" should evolve to more transnational innovation processes. MNEs have to manage innovations captured all over the world and make them flow rapidly over the subsidiaries, exploiting its value through the application or adaptation to different markets or users. This *globally linked innovation* approach pools the resources and capabilities of the MNE in a joint effort between a central unit and other units that might be dispersed across the world (Barlett *et al*., 2008: 456). However this innovation approach may add some problems to the already difficult innovation

process carried in each single unit (central unit or local units). One major issue is “the high coordination cost required to link widely dispersed assets, resources, and capabilities into an effective, integrated network of free-flowing ideas and innovations.”(Barlett *et al*., 2008: 457). In addition, the transfer of new products and processes within the MNE’s units may be difficult due to the resistance of employees and higher organizational complexity.

4.4.2 Disruptive Technologies

Large well-established MNEs must be aware of *disruptive technologies* definition and adapt their strategies in order to sustain their leading positions in the market (Christensen and Bower, 1996). The reasons leading firms fail to adopt new technologies are not related to the lack of technical knowledge but rather rooted in myopic management.

In an extensive study of the hard disk drive industry, Christensen and Bower (1996) find evidence that most of the times the new technologies were developed previously inside large firms. However, since their customers showed little interest and the investments seemed too risky, resource allocation was kept in the mainstream markets. As a consequence, scientists who did not see their ideas approved, either because the markets were still not significant or did not exist whatsoever, created their own firms instead. Subsequently, these new firms entered smaller markets, with lower margins but with a higher potential growth. Because the hard disk drive industry had higher performance development rates than the ones demanded by the market, the new firms were able to gradually take over the upstream markets, at a time where it was too late for incumbent firms to adopt the new technologies.

Therefore, large MNEs have to be aware that focusing only on their actual customers might prove disastrous, as well as underestimating potential new markets. While the buyers of hard disk drives wanted constantly higher performance products, showing little importance for their size, a new market was emerging for customers who wanted smaller hard disk drives, even though they had less performance. In retailing, ALDI supermarkets offer a lower assortment and a worse service but the customers are satisfied to pay considerably less for that.

On this account, MNEs can avoid the "attacks" from new entrants by changing their strategies, spinning out their organization, buying new firms or creating new independent firms which better fit the new market size. These are ways to turn around the problem of the mainstream customer dependence and the resource allocation which hinder the adoption of *disruptive technologies*.

4.4.3 Innovations at the Bottom of the Pyramid

MNEs have the technology, resources, capacity and global reach required to address the issues at the bottom of the pyramid (BoP) (Hart, 2007). Traditionally, MNEs focused their innovations at the top of the economic pyramid, for their pursuit of high margins among other reasons. However there are about four billion people in low income markets whose needs are usually unmet by MNEs. Yet opportunities include "growth, profits and incalculable contributions to humankind" (Hart, 2007: 139). In these markets margins are low but scale effects are sizable and therefore profits can be obtained as well.

A few MNEs have already committed to serving the needs of the poor, such as Unilever, Procter and Gamble or Cemex. These MNEs created subsidiaries, which were

free from their companies' mind sets, in an attempt to understand the opportunities at the BoP. MNEs are challenged to change their products, distribution systems and business models, as Muhammad Yunos (Nobel Peace Prize 2006) did by creating Grameen bank, which lends money to the poor in a whole new system adapted to low income markets (Hart, 2007).

As we have seen for *disruptive innovations*, much of those in low income markets have the potential to move upmarket and can be introduced in more developed economies. For example, Trevor Baylis invented the windup radio, which targeted market was the populations without access to power grid and therefore lacked information about diseases, weather forecasts or education (Bessant and Tidd, 2007). Later on, Freeplay Energy bought the patents of that product from Baylis, and moved the product upmarket while still serving the poor in association with nongovernmental organizations. As a result, a product which was first introduced in a low income market became available in high income markets.

Finally, existing technologies in developed markets may be introduced in emerging ones, by "leapfrogging" technologies (Hart, 2007). By skipping inferior, less efficient technologies, MNEs can introduce directly better and cleaner ones. For example, telecommunication companies have recognized the benefit of avoiding prohibitively expensive landlines, through satellite, cellular and radio systems which enables them to reach previously unserved rural areas, decreasing the differences among regions and nations in their access to information (Hart, 2007: 54).

4.5 Summary

National Enterprises from different countries operate in very different markets, with regards to size, regulations and culture. Their ability to innovate is somehow limited when compared to MNEs. Unless there exists an important knowledge center in the firm's business area, inside their home market, the opportunities to follow and access the evolution of a given technology are limited. Even though an NE can have its innovation function very internationalized, through inter-firm partnerships, it cannot match the benefits brought by multinational diversity. Usually NEs are smaller than MNEs but the rise of *born globals* makes size and age less relevant when it comes to be multinational. There are three main driving forces that influenced companies to skip conventional internationalization stages: 1) new market conditions; 2) technological developments; and 3) founders' international-oriented capabilities. Another incentive to internationalize against the traditional "rings in the water" models is when subcontractors follow a customer or supplier that expands abroad to a not necessarily close geographical location. Finally, three main challenges for MNEs were presented. In order to adopt disruptive technologies, MNEs must adapt their strategies to approve new potential projects. It is advisable to have independent organizations adjusted to the new customers. Another challenge is the coordination of the innovation processes. MNEs are expected to link innovation on a global scale, in a joint effort between the central unit and subsidiaries. This way, innovations flow rapidly over the subsidiaries and can be adapted to different markets.

5. Innovation Strategy Formulation

This section will address the issues related with institutions and the establishment of dominant designs. Firms can introduce their products in the market with *robust designs*, open innovation approaches or knowledge-sharing strategies and gain fast acceptance from the institutional environment while assuring the business sustainability.

5.1 Innovation and Institutions

Hargadon and Douglas (2001) provide an important contribution to the study of innovation strategies. The authors introduce the notion of *robust design* to explain how innovation strategies are more effective when the new product or process is introduced within a familiar world to all the parties involved: users, suppliers, regulatory agencies and so forth. Their study is based on the early years of the introduction of Edison's system of electric lighting. According to the authors, Edison's ability to strike a balance between innovations and established institutional fields was key to its initial success. They suggest that "Edison triumphed over the gas industry not by clearly distinguishing his new system from but, rather, by initially cloaking it in the mantle of these established institutions."(*id*.: 479) In addition, they further examine other evidences where *robust design* plays a role in recent innovation such as online service providers and digital video recorders. One major conclusion of their study is that entrepreneurs "should choose their innovation designs carefully to present some details as new, others as old, and hide still others from view altogether." (*id*.: 499).

Recalling R&D strategies discussed in section 3.2, a firm that follows an R&D leadership strategy may enjoy institutional barriers against imitation and secure patents which might become standards in the industry (Porter, 1985: 188).

5.2 Open Innovation

A new kind of innovation strategy has been introduced by Chesbrough and Appleyard (2007) – the *open innovation strategy*. Taking into account the increasing importance of innovation communities, ecosystems, and networks "it embraces the benefits of openness as a means of expanding value creation for organizations" (Appleyard and Chesbrough, 2007: 58). The authors define openness "as the pooling of knowledge for innovative purposes where the contributors have access to the inputs of others and cannot exert exclusive rights over the resultant innovation" (*idem*: 60). In their study, the open and closed types of innovations are analyzed with examples of software companies such as Microsoft, Google, Linux and Wikipedia. Furthermore, they present existing business models that seek to:

> "capture and then sustain the created value without alienating the individuals, communities, or ecosystem members responsible for the continued development of the good, service, or standard." (Appleyard and Chesbrough, 2007: 64).

The companies already pursuing this kind of strategy and referred in their study are mostly in the software industry, although evidence is provided that in other industries this strategy is being adopted as well, such as extreme sports (*idem*). In a nutshell, this new approach of innovation strategy is important because its inputs (collective creativity contributions) not only save money to the company and create more value

but also innovations are more effectively accepted due to network effects. Comparing to the robust design strategy (Douglas and Hargadon, 2001), we could argue that the open innovation strategy also aims to introduce innovations within a familiar environment.

5.3 Knowledge-sharing Strategies

When firms share knowledge with their innovation systems – national or global – their performance increases (Spencer, 2003). Conventional innovation strategies tend to protect technological knowledge and hide it from external sources, namely competitors. However, research has shown that knowledge sharing strategies payoff in the pre commercial phase (*idem*.). R&D scientists can share knowledge for example by publishing articles or by attending technical conferences. Although companies incur in costs like time spent by researchers and opportunity costs, the benefits might be higher. Indeed the diffusion of information with regards to the new technology can influence the institutional environment in two ways (*idem*):

1) Shaping evaluation standards; and

2) Attracting new entrants.

By publicizing its internal research activities, a firm can influence other researchers' opinions about the most important attributes of the new technology (*idem*). A firm can also attract other well-respected firms to its own trajectory and increase the likelihood to set the dominant design of the industry. All firms pursuing the technological path which will determine the standard of the industry will achieve a higher innovative performance, than if they had followed the losing path (*idem*). In globally integrated

industries like the flat panel displays, it is not enough to share knowledge only with national institutions but firms have to share it with the global system as well so as to achieve higher innovative performance (Spencer, 2003).

5.4 Summary

With robust designs, companies introduce their products within the familiar world of all the parties involved, making clear what their applications are yet preserving some details for future introduction to avoid complexity. Open innovation strategies are important because the inputs (collective creativity contributions) not only save money to the company and create more value but also innovations are more effectively accepted due to network effects. Knowledge-sharing strategies can influence the institutional environment by shaping evaluation standards and by attracting new entrants.

6. Pros and Cons of Innovation in Multinationals

As we have seen throughout this thesis, MNEs seem to be more innovative than NEs. In the table below some advantages and disadvantages of MNEs over NEs, regarding the ability to innovate are summarized. The authors' support is listed below each advantage or disadvantage.

Table 4 – Pros and Cons of Innovation in Multinationals

Pros	Cons
Greater knowledge Flows (Gomes-Casseres *et al*., 2006) (Mowery *et al*., 1996) (Hart, 2007)	**Coordination costs** (Bartlett *et al*., 2008) (Cantwell and Santangelo, 2002) (Fallah and Lechler, 2008)
Geographical Diversity (Anand *et al*., 2005) (Barkema and Vermeulen, 1998) (Bartlett *et al*., 2008)	**Organizational complexity** (Christensen, 2006) (Hart, 2007) (Powell *et al*., 1996)
Global Reach (Bartlett *et al*., 2008) (Fallah and Lechler, 2008) (Hart, 2007)	

Three main advantages of MNEs, in their ability to innovate, are greater knowledge flows, geographical diversity and global reach.

An MNE must have a competitive advantage over NEs in order to overcome the disadvantage of being a foreign company, which often consists in advanced and proprietary knowledge (Gomes-Casseres *et al*., 2006). Broadly speaking, MNEs should prefer equity arrangements as external organizational modes rather than looser

agreements because they have financial capabilities. Empirical evidence showed that equity arrangements promote greater knowledge transfer (Mowery *et al*., 1996). The knowledge of MNEs and their capability to transfer it within their units sets them at an advantage over domestic firms. MNEs, with their unique knowledge base, are able to transfer it from one BoP market to another (Hart, 2007). The literature seems to support the idea that MNEs, which have greater knowledge flows, have higher innovation levels.

With respect to geographical diversity the literature seems to agree that this distinct characteristic of MNEs is an advantage which provides higher innovation levels. Cross-border acquisitions provide additional sources of value creation than domestic ones, for the knowledge transfer of rich organizational knowhow and coordination routines (Anand *et al*., 2005). "Operating in diverse circumstances increases the variety of events and ideas to which a firm is exposed, leading to a more extensive knowledge base and stronger technological capabilities." (Barkema and Vermeulen, 1998: 7). Most MNEs "build their innovation processes around multiple operating units and geographically disparate sources of knowledge." (Bartlett *et al*., 2008: 466).

Regarding global reach, the literature supports the advantage MNEs have in accessing knowledge, which may contribute to higher innovational levels. "As more and more sources of potentially relevant knowledge emerge across the globe, MNEs must establish a presence at an increasing number of locations" (Bartlett *et al*., 2008). "Firms have to expand their global innovation reach to maintain access to important market and technological knowledge." (Fallah and Lechler, 2008). MNEs have the

necessary commercial infrastructure, knowledge base and financial resources to reach the BoP (Hart, 2007: 163).

On the other hand, the literature also seems to support that MNEs have some disadvantages with regards to innovation.

The literature seems to support that geographical and cultural diversity of markets which MNEs operate may represent a disadvantage for the costs involved. A major issue tends to be "the high coordination cost required to link widely dispersed assets, resources, and capabilities into an effective, integrated network of free-flowing ideas and innovations."(Barlett *et al*., 2008: 457). One of the main disadvantages of cross-border acquisitions is the overestimation of the ability to deal with unfamiliar markets and technologies (Cantwell and Santangelo, 2002). The adaptation to different markets or technologies may result in loss of time and money which could be spent instead in real R&D projects for example. Increased globalization is accompanied with higher costs (Fallah and Lechler, 2008).

The complexity of rapidly developing fields, like biotechnology, in which knowledge is widely dispersed, requires MNEs to engage in collaboration networks because the necessary capabilities exceed those residing inside the MNE (Powell et al., 1996). MNEs usually introduce "one-size-fits-all" products in markets which have different needs, as those at the BoP (Hart, 2007). Unless, MNEs create independent subsidiaries free from the mainstream business systems, the management of innovations, especially the disruptive ones, in such different markets may be very complex (Christensen, 2006).

7. Conclusions

7.1 Propositions

Empirical evidence has already shown that knowledge flows between MNE's units are higher than in alliances partnerships and arm's length relationships because MNEs facilitate the knowledge flows intentionally to maximize the incentive and ability of each to share knowledge within the firm (Gomes-Casseres *et al*., 2006). Thus, transfers of knowledge between units within the same company like the case of MNEs should contribute to higher innovation levels since the information is organized in order to yield the maximum results for the overall company. On the other hand, NEs tend to engage in alliances or arm's length relationships in order to exchange knowledge. Their innovative capacity is therefore limited by asymmetric information levels between the involved companies. Note that knowledge flows were defined in page 26 and innovation levels in page 32. The proposition regarding knowledge flows and innovation levels may be formulated as follows:

P1. Larger knowledge flows provide higher innovation levels.

MNEs not only generally have assets and operations in several geographic regions, but they are also in a better position to scan and engage in diverse inter-firm partnerships around the globe (Hagedoorn and Schakenraad, 1994), than NEs which are more inclined to search for inter-firm partnerships in the vicinity of their national boundaries. Note that geographical diversity was defined in page 32. Because innovations require diverse inputs and from several sources, geographical diversity which exposes a firm to a rich array of environments, leads to higher innovation levels

(Ghoshal, 1987; Kim, Hwang, and Burgers, 1993 *apud* Barkema and Vermeulen, 1998). These observations lead to the second proposition:

P2. Geographical diversity contributes to higher innovation levels.

Based on quantitative case analysis, Fallah and Lechler (2008), proposed a concave relationship between *global innovation reach* and *global innovation performance*. Further and wider empirical evidence should confirm this analysis. Another interesting analysis could be to investigate what would be the ideal range of R&D units which a company should possess and where it should locate them considering the time zones. Large MNEs should have at least three R&D departments spread around the world in a way to cover three relevant time zones. Innovations are happening faster everywhere in the world and the information flows at an astounding pace. The time available in a work day is not enough to be updated with all the news in a given industry, especially in the high-tech ones[10].

Nowadays the innovation function of a MNE has to be "awake" twenty four hours per day. For example, an MNE that has R&D departments in the USA, Europe and China is able to transfer the relevant developments within its departments. Following the rotation of the planet, the R&D departments in China work, say, eight hours, and by the end of the day transfers the relevant information to the R&D unit in Europe, which starts working by updating on the latest developments acquired and continues

10 OECD (1997) sectoral R&D intensities (the share of total R&D expenses in total turnover): pharmaceuticals, information technology and aerospace and defense are high-tech sectors with R&D intensities between 10 and 15%.

developing and screening for relevant events in the market it covers for eight hours. Before closing doors, the R&D unit reports all the important information gathered by its department and the one provided by the one in China to its counterpart in the USA. This cycle repeats itself in a continuous quest to follow the pace of technology.

Since innovation does not gather inputs solely from R&D units, other operational units spread across different time zones should also contribute to higher innovation levels. An idea may come from customers, competitors or other sources. Considering that a firm wishes to implement innovations on a global scale, if the sourcing of ideas is done on a twenty four hour basis, there are more chances of finding those with commercial value than if that sourcing is done on an eight hour basis.

In conclusion, an MNE may be able to develop and coordinate technologies at an advantage over NEs if it has operations (e.g. R&D sites) spread across different time zones because the innovation function is working more than the traditional eight hours per day, characteristic of NEs. So, the proposition about time zones should be formulated as follows:

> P3. Enterprises with operations spread across different time zones have higher innovation levels than those which only operate in one time zone.

From the perspective of the innovation function of the company, it is essential for the company to be close to knowledge centers. NEs can access a few knowledge centers in their country but MNEs can reach knowledge centers anywhere in the world. Therefore, unless NEs operate in sectors with knowledge centers in their home country, their innovative capacity is limited.

In addition, knowledge sharing strategies of NEs tend to focus in their own country. That does little to influence the emergence of a global dominant design, or even identify the trends emerging in a global industry community (Spencer, 2003). In contrast, MNEs which may have easier access to additional knowledge in international knowledge centers, actively participate in their global innovation system, which allows them to both observe and influence the standards that emerge in the global industry community (*idem*).

Hence, access to more knowledge centers provides higher innovation levels:

> P4. Easier access to knowledge centers spread across the world, leads to higher innovation levels.

The previous prepositions seem to indicate that MNEs have higher innovation levels than NEs. The larger amount (and most probably, more accurate) of knowledge shared between units within MNEs than that of NEs and their allied partners, should provide higher innovation levels (P1). In addition, geographical diversity may provide rich inputs for innovation (P2). Because the innovation function of some MNEs is working more hours than that of NEs, innovation levels are expected to be higher in MNEs (P3). Furthermore, knowledge centers around the world are more accessible to MNEs than to NEs (P4). Consequently, MNEs may bring more knowledge into their innovation equation, contrasting with NEs which have fewer resources spread around the world and therefore limited management capabilities to access as many and as far knowledge centers from their home country. The global proposition which encompasses all previous propositions can be formulated as follows:

P5. Multinational enterprises have higher innovation levels than national enterprises.

However, multinational diversity also brings some drawbacks to the innovation function of MNEs. As more innovation activities are spread across different cultural and geographical regions, costs increase. In addition, as more inputs from across the world enter in the innovation function of MNEs, the costs of coordination increase proportionally (Fallah and Lechler, 2008). These coordination costs also represent opportunity costs. The time and money spent in coordination efforts could be invested instead in other important activities of innovation like R&D projects or acquisition of equity stakes in other innovative companies. In case coordination costs outweigh the additional innovation output (for having a *globally linked innovation*) MNEs are at a disadvantage over NEs which have less coordination costs in their innovation activities. Therefore, this restriction leads to the following proposition:

P6. Coordination costs incurred by multinational enterprises restrain their innovation levels.

All propositions are summarized in Table 5– Propositions:

Table 5– Propositions

Propositions which lead to global proposition:
P1. Larger knowledge flows provide higher innovation levels.
P2. Geographical diversity contributes to higher innovation levels.
P3. Firms with operations spread across different time zones have higher innovation levels than those which only operate in one time zone.
P4. Easier access to knowledge centers spread across the world, leads to higher innovation levels.
Global proposition:
P5. Multinational enterprises have higher innovation levels than national enterprises.
Proposition which restrains global proposition:
P6. Coordination costs incurred by multinational enterprises restrain their innovation levels.

7.2 Limitations

Although there was an attempt to present the main innovation strategies and challenges for MNEs, some may have been left out due to time and length restrains. Certainly, more propositions could be formulated in the process of improving our knowledge on innovation strategies of MNEs. However they do add some research questions which lack enough or any empirical support studies.

The definition of innovation levels adopted in this thesis uses patent intensity as a proxy. Indeed, some innovations have never been patented despite their credit attributed to highly innovative companies. For example, Brisa which is the largest Portuguese tolled motor way operator developed a pioneering automatic toll system but never patented it[11].

In addition, the definition of knowledge flows adopted is based in patent citation. Although this is an indicator which researchers might have easier access to, other methods could be identified for its measurement, through interviewing managers for

[11] In Expresso: Portugueses criam duas inovações por dia. URL: http://aeiou.expresso.pt/portugueses-criam-duas-invencoes-por-dia=f598575 (21/09/2010)

example. Perhaps, most of knowledge flows within firms or units happen by informal means (e.g. meetings).

The particularities of different industries were not dealt in depth, although some differences between high-tech and low-tech industries were mentioned throughout the text. Moreover, other variables could have been analyzed, such as cultural differences, country of origin, or age of industries.

Since Born globals are still a recent phenomenon, the literature has not agreed yet in a main definition. For example, neither the length of time "born" refers to, nor their global nature have standard definitions (Dunning and Lundan, 2008). Furthermore, the differences between born globals and MNEs are not clear, regarding their innovation capabilities.

7.3 Hints for Future Research

Future research could test the propositions developed in this thesis through empirical studies. By means of case studies and using triangulation techniques (e.g. surveying several stakeholders), or control groups, MNEs could be compared with NEs, with regards to innovation capabilities. Nevertheless, large scale future studies would provide stronger validity to the testing of the propositions.

Other control variables could be added in future studies, such as age, industry, cultural diversity, country of origin, labor costs, and national regulations (e.g. IPR protection). Future researchers could explore whether the existence of communities of practice within MNEs fosters knowledge flows, thus leading to higher innovation levels. A group of engineers working on similar projects around the world may have regular meetings,

either physically or via conference calls, to share individual knowledge and increase the overall knowledge. Moreover, exploring the differences between MNEs, regarding their information support systems could provide more clues for what contributes to higher innovation flows.

Furthermore, propositions 1, 2, 3 and 4 could be tested in large NEs from large countries, such as U.S.A., Russia or China. In fact, within these large countries, NEs could benefit from different time zones and have access to more than one knowledge center.

Finally, future researchers could relate proposition 3 ("time zones") and proposition 4 ("knowledge centers") in order to help managers deciding upon the location of the R&D centers. For example, if a company is considering establishing a new R&D center in a relevant time zone, which allows an extended workflow, there may be several options (cities/countries). However, if along the same time zone there is one knowledge center of the company's interest in a specific city or country, then options are reduced to one ideal location. Naturally, other control variables such as the ones previously suggested should be taken into account as well.

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Appendix

A1. Glossary of Terms

Aggressive actions - when the company is seeking to be proactive and to position itself strategically one step ahead of its competitors (Dunning and Lundan, 2008).

Augmenting laboratory sites – R&D sites established in order to tap knowledge from competitors and universities around the globe; the information flows from the foreign laboratory to the central lab at home (Bartlett *et al*., 2008).

Born global enterprises – firms that seek to derive significant advantages from the use of resources from or the sale of outputs to multiple countries/continents right from their legal birth (Madsen and Servais, 1997).

Creative destruction – when quiet periods in market are punctuated by fundamental "shocks" or "discontinuities" that destroy old sources of advantage and replace them with new ones (Besanko *et al*., 2007).

Corporate venturing capital (CVC) - investments that consist of minority equity stakes in relatively new, not publicly traded companies that are seeking capital to continue operation (Dushnitsky and Lenox, 2005).

Defensive actions - when the company behaviour is defined in reaction to actions taken or perceived likely to be taken by its competitors (Dunning and Lundan, 2008).

Disruptive technologies - innovations which offer a lower benefit to the customer but drastically lower costs of production or increase convenience (Christensen, 2006).

Economies of scale – indicates that average costs decrease as output increases (Besanko *et al*., 2007).

Economies of scope – cost savings that a company achieves as it increases the variety of activities it performs, such as the variety of goods it produces (Besanko *et al*., 2007).

Efficiency seekers – MNEs that rationalize the structure of established resource-based or market-seeking investment in such a way that the investing company can gain from the common governance of geographically dispersed activities (Dunning and Lundan, 2008).

Exploiting laboratory sites – R&D site established to support manufacturing facilities in foreign countries or to adapt standard products to the demand there (Bartlett *et al*., 2008).

Foreign direct investment (FDI) – expansion of a firm's production outside its national boundaries which involves transfer of assets or intermediate products (Dunning and Lundan, 2008).

Globally linked innovation – MNEs pool the resources and capabilities of many different units – typically at both the parent company and the subsidiary level – to create and manage an activity jointly (Bartlett *et al*., 2008).

Incremental innovation – improvements in the performance of products or services, within an existing technological approach (e.g. improvements on the areal recording density of hard disk drives within the ferrite-oxide heads technology) (Christensen, 2006).

Innovation - process of translating ideas into useful – and used – new products, processes and services (Bessant and Tidd, 2007).

Market seekers – MNEs that invest in a particular country or region to supply goods or services to markets in these or in adjacent countries (Dunning and Lundan, 2008).

Multinational enterprise (MNE) – enterprise that engages in *foreign direct investment* (FDI) and owns or, in some way, controls value-added activities in more than one country (Dunning and Lundan, 2008).

National enterprise (NE) – enterprise that owns and coordinates all or the majority of its activities of its *value chain* inside its country boundaries and does not engage in *foreign direct investment*.

Natural resource seekers – MNEs that invest abroad to acquire particular and specific resources of a higher quality at a lower cost than could be obtained in their home country (if they are obtainable at all) (Dunning and Lundan, 2008).

Open innovation strategy – pooling of knowledge for innovative purposes where the contributors have access to the inputs of others and cannot exert exclusive rights over the resultant innovation (Chesbrough and Appleyard, 2007).

Opportunity cost – a concept which states that the economic cost of deploying resources in a particular activity is the value of the best foregone alternative use of those resources (Besanko *et al*., 2007).

Paradigm innovation – changes in the underlying mental models which frame what the organization does (Bessant and Tidd, 2007).

Product innovation – changes in the products/services themselves (Bessant and Tidd, 2007).

Position innovation – when the context in which the products/services are introduced Change (Bessant and Tidd, 2007).

Process innovation – changes in the ways products/services are created and delivered (Bessant and Tidd, 2007).

Radical innovation – improvements in the performance of products or services by using a different technological approach (e.g. new thin-film heads technology for hard disk drives, which improved areal recording density) (Christensen, 2006).

Robust design – robust designs are immediately effective in locating the novel product within the familiar world, yet preserve the flexibility necessary for future evolution by not constraining the potential evolution of understanding and action that follows use (Hargadon and Douglas, 2001).

Strategic asset or capability seekers – MNEs that engage in FDI, usually by acquiring the assets of foreign corporations, to promote their long-term strategic objectives – especially that of sustaining or advancing their global competitiveness (Dunning and Lundan, 2008).

Transactions costs – concept developed by Ronald Coase, consists in costs of using the market, such as costs of organizing and transacting exchanges (e.g. costs of negotiating and writing contingent contracts), which can be eliminated by using the firm (Besanko *et al*., 2007).

Value chain – concept, developed by Michael Porter, which describes the activities within firms and across firms that add value along the way to the ultimate transacted good or service (Besanko *et al*., 2007).