THE UNIVERSITY OF QUEBEC IN MONTREAL

UNRAVELING THE PROCESS OF CREATIVE CONSTRUCTION AND ITS IMPACT ON CORPORATE STRATEGY AND THE INDUSTRY STRUCTURE IN TURBULENT ECOSYSTEMS

DISSERTATION

PRESENTED IN PARTIAL REQUIREMENT OF THE

DOCTORATE OF MANAGEMENT

BY

HANI SARKIS

FEBRUARY 2012

L'UNIVERSITÉ DU QUÉBEC À MONTRÉAL

LE PROCESSUS DE CONSTRUCTION CRÉATRICE ET SON IMPACT SUR LA STRATÉGIE D'ENTREPRISE ET LA STRUCTURE DE L'INDUSTRIE DANS LES ECOSYSTÈMES TURBULENTS

THÈSE

PRÉSENTÉE COMME EXIGENCE PARTIELLE

DU DOCTORAT EN ADMINISTRATION

PAR

HANI SARKIS

FÉVRIER 2012

PREFACE

The telecommunications industry has gone in the last twenty years, and still going, through a radical change and a paradigm shift, with its seeds starting at the sixties. Having worked in this industry for more than twenty years, as an engineer, a manager and a consultant, and having witnessed this technological revolution in many ways, the motivation for this dissertation research was to explore and understand the forces and dynamics of these changes. It was clear that the industry is facing tremendous challenges and therefore, I developed a passion for documenting these changes, researching for their root causes, and prescribing new theories and practical advice for scholars and managers.

This dissertation research went through different stages in its evolution. It started with a research interest on disruptive technologies and acquisitions, and ended by unraveling the process of creative construction. The core of the research was inspired by the work of the Austrian economist Joseph Schumpeter and Clayton M. Christensen at Harvard University. Lots of the ideas in this research were enhanced and better formulated through the participation and the feedback received at the doctoral consortia of the Academy of Management (BPS 2009, TIM 2009, TIM 2010) and the West Coast Research Symposium on Technology Entrepreneurship in 2010. Moreover, the active participation in the last five years at the conferences of the Administrative Sciences Association of Canada helped in improving the quality of this research, through peer review evaluations and valuable conversations. I am very grateful for all my friends and colleagues there for their advice.

I would like to enthusiastically thank Albert Cannella (Tulane University), Shaker Zahra (University of Minnesota), and Glenn Rowe (University of Western Ontario) for their continuous support and encouragement. Also, I would like to thank Taieb Hafsi (HEC Montreal), Roger Miller (University of Montreal), Liette Lapointe (McGill University), Brian Silverman (University of Toronto), Jay Barney (Ohio State University), Phil Bromiley (University of California Irvine), Alan MacCormack (Massachusetts Institute of Technology), Saikat Chaudhuri (University of Pennsylvania), Raghu Garud (Pennsylvania State University), Riitta Katila and Kathy Eisenhardt (Stanford University), Suresh Kotha (University of Washington), for their valuable advice.

I am very grateful to all the firms, entrepreneurs, consultants, experts and government agencies, for their support on this research.

Special thanks go to my doctoral committee and members of the jury: Prosper Bernard and Michel Plaisent (University of Quebec in Montreal), Sayed Abouzeid (Concordia University), Silvia Ponce (HEC Montreal) and Jean-Pierre Booto (University of Moncton).

Finally, I am grateful to my family for their unconditional support.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

RÉSUMÉ

Créée dans les années 50 par l'économiste autrichien Joseph Schumpeter, le terme "Destruction créatrice" suggère que la compétition émergente des nouvelles technologies ferait perdre aux compagnies déjà bien établies, leur position sur le marché ainsi que leur avantage compétitif. Depuis, ce terme et son concept ont évolué. Certains chercheurs avancèrent que les technologies disruptives remplaceraient celles existantes, représentant ainsi un inconvénient aux entreprises historiques et leurs fournisseurs. Cette recherche empirique explore le processus par lequel la construction créatrice (ou la destruction), telle que suggérée par Schumpeter, a eu un effet sur l'industrie des télécommunications et la façon dont cela a changé la stratégie corporative des entreprises et la structure de l'industrie dans le domaine des télécommunications. La relation à l'étude est celle entre les activités intensives de fusions et d'acquisitions, celles des entreprises guidées par les entrepreneurs et managers en matière de technologies. En outre, cette recherche explique tout en le soulignant, le lien entre les acquisitions et l'entrepreneuriat innovateur, la création de nouvelles technologies et le capital-risque, le tout dans un système national d'innovation servant d'écosystème. De plus, elle explore le processus d'intégration de ces technologies acquises afin de créer de nouveaux services, applications et modèles d'affaire convergents.

Dans le cadre de cette recherche qualitative, une méthodologie mixte a été employée. Celle-ci est composée principalement de la théorie ancrée (grounded theory) qui permettra de construire puis proposer un modèle théorique et ses propositions, en se basant sur les informations existantes de l'industrie de la télécommunication. Les résultats pourront être appliqués à d'autres industries de haute technologie telles que la biotechnologie, l'aérospatial et la nano technologie. Il s'agit d'une recherche multidisciplinaire suivant les traditions de la stratégie, l'entrepreneuriat et la gestion de la technologie et de l'innovation, qui aura des répercussions sur les chercheurs de même que les professionnels de l'industrie.

ABSTRACT

The term creative destruction was coined in the 1950s by the Austrian economist Joseph Schumpeter, to suggest that some established companies would lose their market position and competitive advantage due to competition emerging from new technologies. Since then, the term and its concept have evolved and some scholars have suggested that disruptive technologies would substitute existing technologies, causing a disadvantage to incumbent firms and providers. This empirical research explores the process by which creative construction (or destruction), as suggested by Schumpeter, had an impact on the telecommunications industry, and how it changed the corporate strategy of the firms and the industry structure, in this industry. It explores the relationship between the intensive activities of mergers and acquisitions and the entrepreneurial activities led by technology entrepreneurs and managers. Moreover, it explains and highlights the relationship of acquisitions and entrepreneurship with innovation, the creation of new technologies and venture capital, in the context of a national system of innovation as the ecosystem. Furthermore, it explores how these acquired technologies are then integrated, to create new converged services, applications and business models.

This qualitative research uses a mixed methodology using mainly grounded theory to construct and propose a theoretical model and its propositions, based on the insights from the telecommunications industry. The findings could be generalized into other high technology industries such as biotechnology, aerospace and nano technologies. This is a multidisciplinary research, in the traditions of business policy and strategy, entrepreneurship and technology and innovation management, with implications for both scholars and practitioners.

INTRODUCTION

Innovation is a highly complex process that integrates technological, economical, social and psychological aspects. In social sciences, research on innovation could be found mainly at the intersections of the areas of business policy and strategy, technology and innovation management and entrepreneurship. It draws upon a variety of variables and constructs from these areas and it explores different inputs, outcomes, critical success factors, performance measurements, and processes, all involved in the creation, management and measurement of innovation. The research on innovation covers different levels of analysis, such as the individual, the firm, the industry, the society, the country, the region, etc. Moreover, it covers all types of industries, from low to medium to high technology, and from nascent or well established industries to stable or rapidly changing industries. However, the research on innovation in rapidly changing industries or turbulent and high velocity environments, are much more insightful, because they reveal to us the forces and dynamics that are at play and the reasons why certain firms remain competitive, while others fail to compete, all this in a complex setting of interacting variables. The information and telecommunications industries are good examples of these turbulent and high velocity environments.

Innovations in the information and telecommunications industries are amongst the most important innovations in the last century. Their impacts extend beyond their boundaries, to affect our way of life, and to reengineer the processes of production, distribution, operation and management in companies across the globe. At the center of all this, is the electronic transistor and all the generations of innovative and disruptive technologies, which had an impact bigger than any technology in other high technology sectors such as biotechnology, aerospace, and defense . (A. D. Chandler, 1997).

A Long History of Innovations

The telecommunications industry has a long history of sustaining and disruptive innovations. The industry could be segmented into different sub-segments and historical periods, in which some faded in time, while others are still active and continue to show a steady growth across large periods of time. Some of these sub-segments are:

- The telegraph period;
- Telephony, networks and switching;
- Radio and wireless;
- Television and broadcasting;
- Microwave and satellite;
- The digital era;
- Digital switching and telephony;
- Mobile and marine communications;
- Computer networks.

These technologies gave us some interesting innovations that changed our lives such as mobility in communications, online messaging, the Internet, remote access to knowledge databases, telemedicine, remote education, video conferencing, online collaboration tools, dating services, social networks, etc., in addition to some negative aspects such as the lack of individual privacy, email spam, dangerous viruses, and the potential of system hacking.

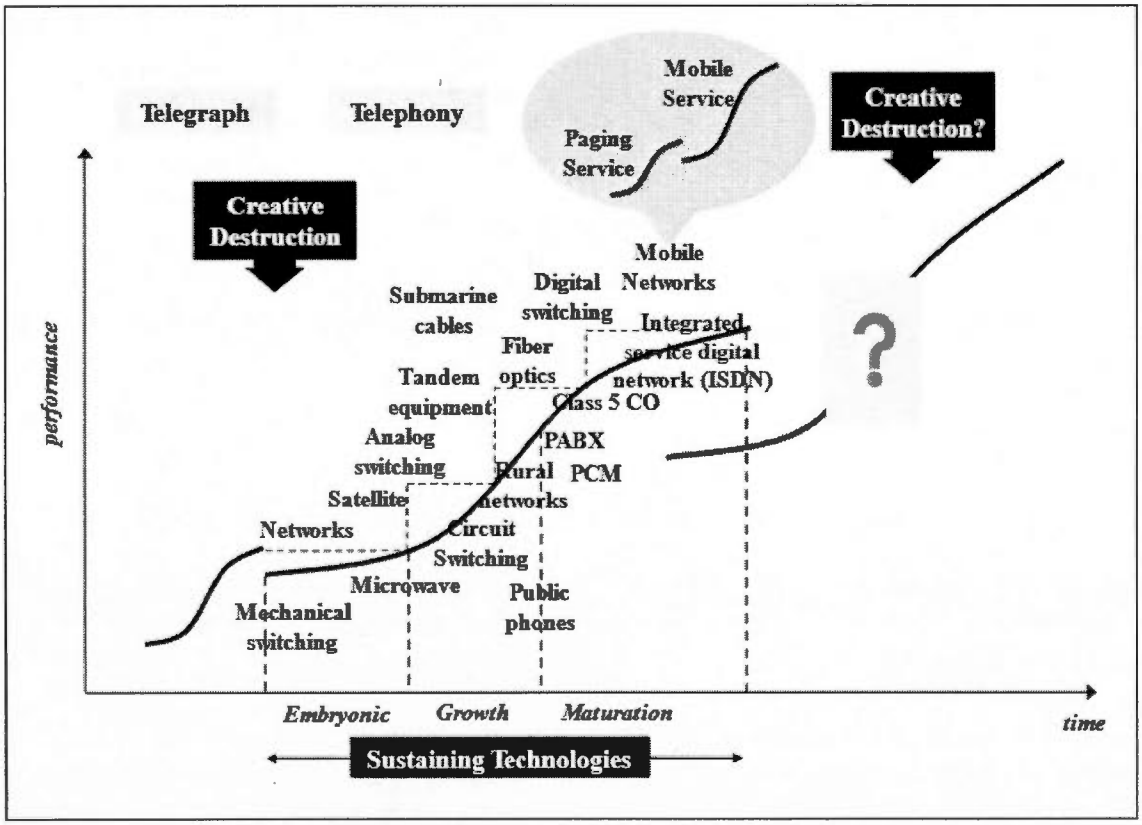
Throughout the history of the telecommunications industry, the industry has witnessed a major wave of creative destruction, with the replacement of the telegraph service by the telephony service. The telephony is considered a disruptive technology to an existing telegraph service. After this period, as illustrated in figure I.1, the industry witnessed a series of sustaining technologies that enhanced the telephony services, whether by enhancing the quality of the service, adding more capacity or upgrading to complementary services. These sustaining technologies went through embryonic, growth and maturation phases that last for more than 40 years. However, a second wave of creative destruction was witnessed through the replacement of traditional telephony technologies by the data technologies and more advanced networks. This led

to the fusion of the telecommunications and information technology industries, to the convergence of telephony voice, data and video and more importantly to the convergence of business models for the carrier service, the end-users application, the content and the entertainment.

Therefore, the telecommunication industry has witnessed a continuous and intense wave of innovation and disruptive technologies, which represents an illustration of the pattern that affected many high technology sectors from 1995 to 2005. Researching this pattern throughout this research, gives an explanation to the real reasons of why some companies survive, while others fail, in the face of such environmental challenges.

Figure I.1

The diffusion of technology and the second wave of creative destruction



A Major Shift in the Telecommunications Industry

The telecommunications industry has been going since the 1990s through a quiet major shift. New technologies, products, services and innovations are continuously emerging, with their impact changing every aspect of our lives and the way business is conducted. Some of them are well known to the end-user customers such as Wi-Fi, Wi-Max, Skype, Vonage and mobile video. Others are not transparent to the end-user customers due to their technical nature, such as voice over internet protocol (VoIP), MPLS, optical switching, IPTV, broadband, triple and quadruple play. Some of them represent improvements to existing technologies and services and are categorized as "sustaining innovations". Others represent a radical change with the potential of destroying value for existing technologies and services and creating value by introducing new technologies and services. Those "disruptive technologies and innovations" are substituting existing technologies and services, posing a great challenge to locked-in incumbent service providers by eroding competency, market share and boundaries, and facilitating the entry of new and smaller dependence-free service providers, by reducing barriers, and providing more competitive advantages based on new services and business models. This major shift is happening at different levels and causing a major change in the industry structure of the telecommunications industry. It is creating a new "digital ecosystem" in which data, voice, and video, wireline and wireless, traditional telephony and TV broadcasting, are all converging, in addition to the entry of new players such as the application, content and entertainment service providers.

The telecommunications industry major shift is in line with the work of the Austrian economist Joseph Schumpeter, who in 1950 coined the term "*perennial gale of creative destruction*" where he described how companies and monopolies are challenged by the competition, not based on price, but on *"competition from the new commodity, the new technology...competition that strikes not at the margin of the profit of the existing firms but at their foundations and their very lives"*(Schumpeter, 1950). This *creative destruction* and the emergence of the disruptive technologies do not start in the service provider segment of the telecommunications industry or by just being introduced to the end-user customer. It is transferred to the service provider segment, as new services and business models, through the buyer-supplier relationship that exists between the service providers and the equipment manufacturers in the telecommunication industry. Therefore, this convergence of services and

business models is the end product delivered to the service providers by the equipments manufacturers.

In the equipment manufacturing segment, firms established in this knowledge intense sector face a variety of turbulent environmental challenges. Their products are technically complex, in which the embedded knowledge is tacit in nature, non codified and non transferable as a public good. The complexity of the technology is coupled with a high level of uncertainty due to the lack of dominant standards or standard wars, the lack of credible forecast for the potential future new products and the lack of specific requirements to respond to the customers' needs. The rate of innovation of new technologies and products is higher than any other industry and the industry faces continuous waves of new technological generations and disruptive technologies, which render the products obsolete, possibly even before being launched to the market. The rate of obsolescence is such that products often become obsolete before their development costs can be recaptured. The new and disruptive technologies emerge either inside the firm or in the environmental ecological system, following a pattern of an epidemic technology diffusion, mutation and permutation of characteristics. However, in the literature we could not find any research linking these environmental challenges to the disruptive technologies, in a cause/effect relationship.

Since the 1990 there was a substantial increase in mergers and acquisitions activities in the high technology industry. This intensity of acquisition's activities is motivated by different reasons. Beside traditional motivations of economizing and empire building, high-tech firms used acquisitions mainly to acquire external strategic resources, gain access to valuable human talents, reduce the cost and risk of R&D, expand their portfolio of products, reduce product time to market and provide for an external source of continuous innovation. In most of the research on corporate mergers and acquisitions, they are viewed as strategies for corporate control and empire building, and they are dealt with using financial and economic perspectives, while neglecting their social, strategic and organizational dimensions. The motivations of acquisitions in the high tech industries, and specifically the telecommunications industry, are different than the motivations of acquisitions in other industries. Many of the high tech acquisitions in the 1990s appeared to be motivated by the firms' need to obtain critical technologies or capabilities, in contrast to acquisitions in other industries, which are motivated by economies of scale, gains in

market share, geographical expansion, empire building or CEO hubris. Despite the importance of the intensive acquisition trend within the context of the telecommunications industry, the research on acquisitions in the literature of strategic management could be categorized as contradictory, incoherent and incomplete. It is contradictory because the findings present contradictory performance outcome related to acquisitions, even in the same industry sector. It is incoherent, because most of the researches focus on the economic aspect of acquisitions including performance, economies of scope and scale, market penetration, growth, position, net gain, etc., while the others focus on the strategic aspect of acquisition including human talent, tacit knowledge, strategic resources, strategic fit, organizational culture and core competencies. Each approach neglects the other, which leads to an incoherent picture of the factors involved. Each approach gives a perspective to the study of acquisitions, however the whole picture remain fragmented and unclear. Third, it is incomplete because the literature has not shed enough light on the factors, criteria, conditions, motivations, causes and consequences related to the acquisition formation in high velocity and turbulent environments.

In the service providers segment of the telecommunications industry, the acquired and then integrated technologies provided by the manufacturers, give rise to new disruptive innovations and the convergence of services and business models. This is creating a new landscape for the telecommunications industry and changing the rules of the game that were established decades ego, leading to a change in the industry structure of the telecommunications industry. The change in the industry structure refers to the change in the competitive dynamics and market forces, the change of the incumbent firms' competitive advantage, the changing and blurring of market boundaries, the erosion of market share, the destruction of competency, the lack and need for a new regulatory environment, the cannibalization of services and the subsequent loss of revenues in traditional markets.

The Research Question

Consequently, we argue that there is an intrinsic relation between the intensive emergence of disruptive technologies and innovations in the telecommunications industry and the change in the industry structure of both the equipment manufacturing and service provider

segments of the telecommunication industry. Therefore, this research intends to explore and understand this relationship, by firstly linking the intensity of the disruptive technologies and innovations in this industry to the intensity of mergers and acquisitions in the equipment manufacturer segment, and then by linking the integration and convergence of technologies (due to the emergence of disruptive technologies in the equipment manufacturer segment) to the integration and convergence of services in the service provider segment of the telecommunications industry. Moreover, the research will identify the various disruptive technologies and their impacts on both segments of the industry; describe the environmental context of each segment and the challenges faced by companies operating in each segment; explain and highlight how did the impact of these technologies lead to the acquisition spree in one segment and to the convergence of business models in the other; and describe the impact they had on the telecommunications industry.

The research question is: **What** is the impact of the disruptive technologies and innovations on the telecommunications industry and **how** this impact is manifested in the manufacturers' segment and the service providers' segment and on the industry structure of the telecommunications industry. By answering the *what* and *how*, the research will unravel the process of creative construction (or destruction) in the telecommunications industry and more specifically, the process through which some firms create value and sustain competitive advantage, while the other firms destroy value and lose their long established competitive positioning.

Creative Destruction and Creative Construction

The term *creative destruction* was coined in 1950 by Schumpeter to refer to the destruction of value of the established firms by the emerging new technologies. However, it was reported that the term was borrowed by Schumpeter and that it was originally coined by Werner Sombart in his german language book Krieg und Kapitalismus in 1913 (Sombart, 1913). The term *disruptive technology* refers to this type of technology that would replace an existing technology and therefore destroy value for the established firm using the incumbent technology and create value for the new entrant. Moreover, Tushman and Anderson (1986) used the terms *technological discontinuities*, *competence destroying* and *competence enhancing* to refer to the creation and

destruction of value. And for example, Utterback (1994) used example cases form the lake ice and plate glass industries that were replaced by the mechanical refrigeration and float glass processes, respectively.

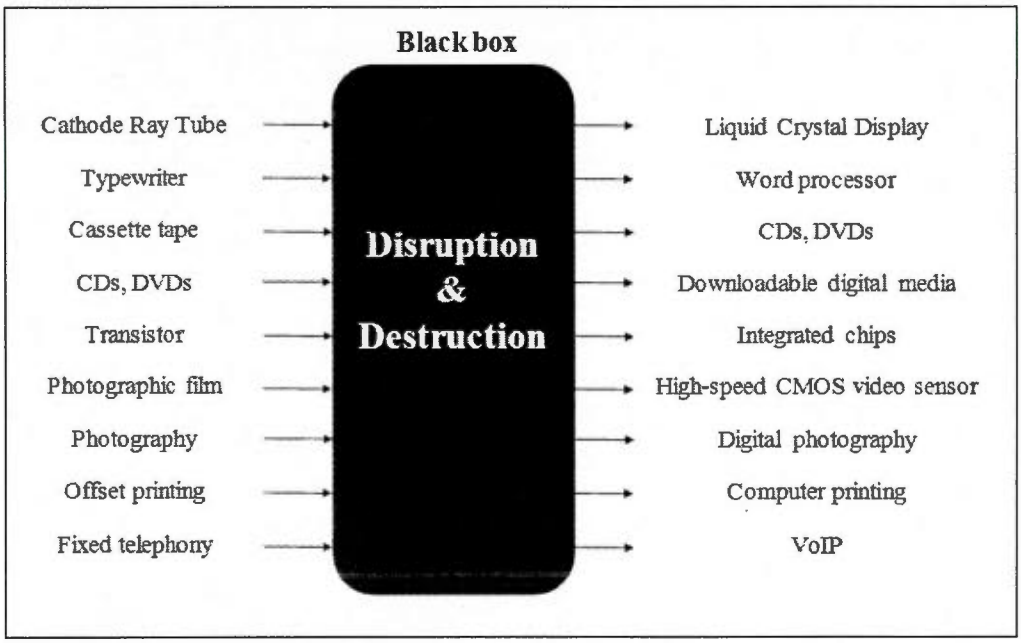
To give some examples of these types of disruptive technologies, here is a partial list of selected technologies in different industries:

1. Liquid Crystal Display replacing Cathode Ray Tube
2. Word processor replacing typewriter
3. CDs, DVDs replacing cassette tapes
4. Downloadable digital media replacing CDs, DVDs
5. Integrated chips replacing transistors
6. Semiconductors replacing vacuum tubes
7. High-speed CMOS (Complementary metal–oxide–semiconductor) video sensor replacing photographic film
8. Digital photography replacing film photography
9. Computer printing replacing offset printing
10. Refrigerators replacing ice boxes
11. Desktop publishing replacing traditional publishing
12. Computer printing replacing offset printing
13. Minicomputers replacing mainframes
14. Personal computers replacing minis and workstations
15. Telephony replacing telegraph
16. Packet switching networks (ATM: Asynchronous Transfer Mode, MPLS: Multiprotocol label switching, etc.) replacing circuit switching networks
17. Virtual private networks replacing leased lines
18. VoIP (Voice over Internet Protocol) using Skype application replacing incumbent international calls service providers
19. WiMax (Worldwide Interoperability for Microwave Access) Microwave technologies replacing incumbent service providers' infrastructure
20. Mobile telephony replacing paging services
21. Mobile telephony replacing terrestrial fixed line services
22. Routers replacing time and wave division multiplexing
23. High bandwidth fiber optics replacing copper wire
24. DSL (Digital subscriber line) high-speed Internet access replacing modems
25. Private jet replacing supersonic transport
26. Electronic organ replacing acoustic organ
27. Digital synthesizers replacing electronic organs
28. Calculators replacing slide rules
29. Open source operating system replacing proprietary operating systems
30. Open source applications software replacing proprietary applications software
31. Open source databases replacing commercial databases
32. Amazon web services replacing bookstores
33. Online social networks replacing online messaging services

This partial list suggests that these disruptive technologies replaced existing technologies in established industries and firms. It also suggests that this happens through a process in which disruptive technologies replace old technologies. This process of *creative destruction* is where the value and competence of existing firms or industries are destroyed by the incoming new disruptive technologies. However, this process in many of the cases is obscured and is considered as a black box of disruption and destruction, as illustrated in figure I.2.

Figure I.2

The black box of disruption and destruction



Therefore, the interesting question would be what is the *process of creative destruction* (the inside of the black box) through which the established firms and incumbent technologies lose their positioning to new entrants through disruptive technologies? Alternatively, and more interestingly, the question could be what is the *process of creative construction* by which new entrants and other firms create value and competencies and sustain competitive advantage in the

face of disruptive technologies? Clearly, creative destruction is one side of the coin, where the other side is creative construction, which is the main topic of this research.

The Choice of the Telecommunications Industry

As mentioned before, the telecommunications industry is an important industry with various impacts in our daily life, economy, education, medicine, defense, etc. The penetration rates, as shown in figure I.3, shows a steady growth rate across different telecommunications sub-segments and technologies and over large periods of times. In addition, figure I.4, illustrates the importance of telecommunications in our lives, by means of expenditures compared to other services and needs.

However, research on the telecommunications industries is scarce, compared to research on information technologies and software. Moreover, most of the research focuses on the tip of the iceberg, or in other words, on the end-user products such as the computer, the software, the television set, the iPhone, the mobile service, etc, that are seen on the application levels of the telecommunications service networks. The failure to look at and explore the underlying technologies and networks is mainly due to the complexities of these technologies and the required technical skills needed to navigate through the technical information and documentations.

Figure I.3

US household penetration rate by percentage (Veronis Suhler Stevenson 2004, Economist)

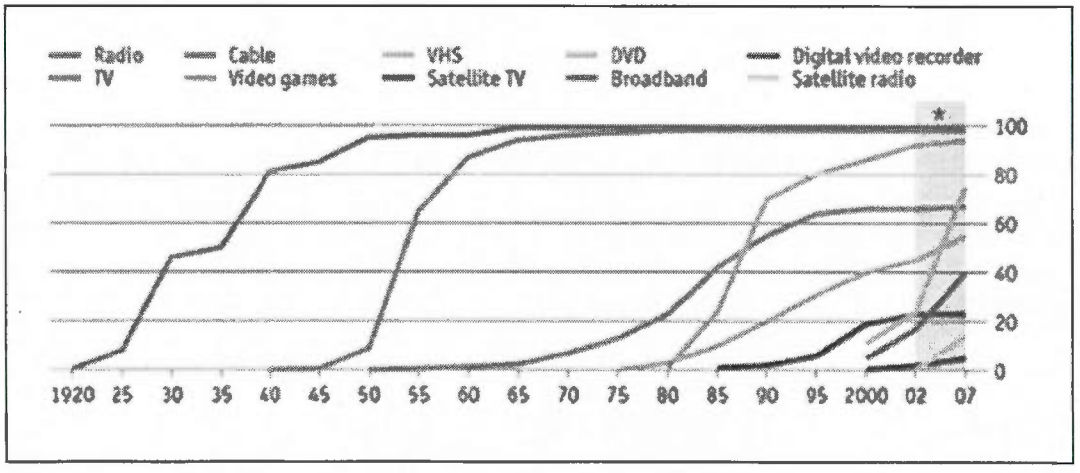
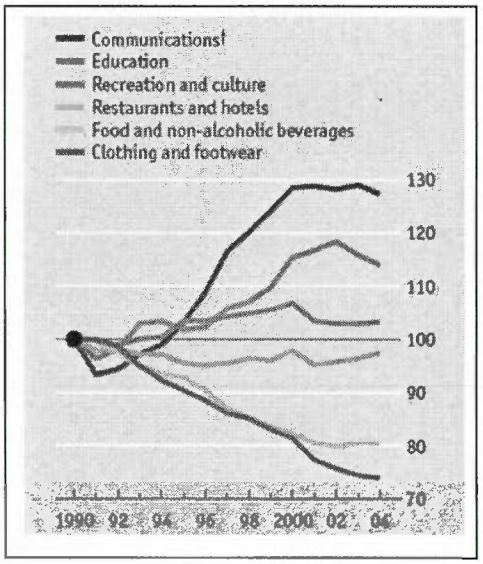


Figure I.4

Household spending in OECD countries, 1990=100 (source: OECD, Economist)



Therefore, this research attempts to explore, document, and analyze these underlying complex technologies and networks, without adding technical or engineering jargon to the reporting document. For that purpose, the dissertation text is stripped of all technical and complex engineering knowledge, for the purpose of focus, clarity and understanding.

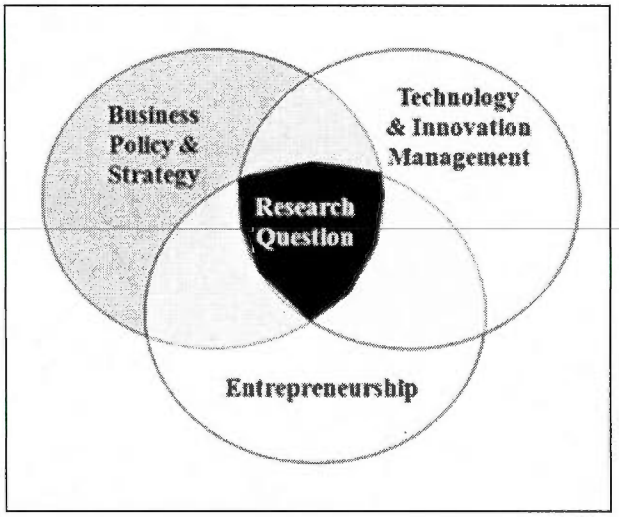
Basic Theoretical Research

The purpose of this inquiry and therefore the research question is to do basic theoretical research through an empirical study of the telecommunications industry. The questions emerging from the research question are derived from three traditions in the business administration and management disciplines, as illustrated in figure I.5: business policy and strategy, technology and innovation management and entrepreneurship. The objective of this theoretical research is to understand the phenomena under study and explain it. To understand it, the research will include a fieldwork in order to get closer to the 'real world', in which the individuals, events, groups, programs, organizations, and industries, all interact with each other in an ecological system,

which combined with the context, *represent* and *construct* the real world. Having gained this in-depth understanding of the phenomena under study, the research will strive to analyze it with the objective of fruitfully generating new theories that will contribute to the body of scientific knowledge in the respective disciplines, and from which emerge the research questions. As Taylor and Bogdan noted: *"Phenomenology has a long history in philosophy and sociology. The phenomenologist is committed to understanding social phenomena from the actor's own perspective. He or she examines how the world is experienced. The important reality is what people perceive it to be."* (Taylor & Bogdan, 1984 p. 1-2)

Figure I.5

The intersection of strategy, innovation management and entrepreneurship



Depth versus Breadth / Scope

Using a naturalistic qualitative method of inquiry will allow the research to be conducted with the objective of *in-depth understanding* the phenomena under study in a *holistic* fashion and without neglecting the details, the context, and the intricacies of the inter-relationships that exist between the various actors that constitute the ecosystem of this specific industry.

The research question covers both the manufacturing segment and the service provider segment of the telecommunications industry. To understand in-depth the impact of the disruptive technologies and innovations on the telecommunications industry, both sectors have to be studied. Sacrificing one segment would limit the ability to deeply understand the phenomenon and would render the findings incomplete.

Going deeply into the manufacturing segment will help understanding the impact of the disruptive technologies on the management of internal R&D, strategic assets, dynamic capabilities and the competitiveness of the firms in this sector. It will help understanding *how* these firms face and react to the environmental challenges of turbulence, high velocity, uncertainty and ambiguity. It will identify *how* some firms survive facing these challenges and *what* do they do to survive, in terms of reorganization, adaptation, adopting new business models, and innovation, etc., while others fail to adapt and despite being in incumbent positions, they become less competitive and sometime fade or end up being acquired by others.

These manufacturing firms who face the challenges posed by disruptive technologies and still manage to survive and stay competitive, are the ones producing, integrating and converging new technologies, innovations, systems, products, and services to the service providers segment. Therefore they act as a conduit between the environment that generate the disruptive technologies, and the service providers who receive these new disruptive technologies and innovation in the form of equipments, products and service delivery platforms and modules.

By going deeply into the service provider segment, this will help understanding *why* and *how* some incumbent service providers survive, adapt and become more competitive, while others lag and are challenged by new entrants. It will help understanding *why*, if true, these new disruptive technologies, innovations and services, facilitate the emergence of new entrants by reducing entry barriers and 'how' these new entrants are taking advantage of the disruption to challenge the incumbent, gain market power, and become more and more competitive in short periods of time.

Therefore, combining both the manufacturing segment and the service providers segment in the framework of this naturalistic qualitative research provides not only in-depth understanding, but also breadth by means of the scope covered by the research question.

Organization of the Document

This document is organized in a linear fashion, although it should have been organized according to the grounded theory prescription, starting by a brief review of the literature, going through the methodology and fieldwork, and then presenting the results of the findings and the proposed theoretical model that emerged and was constructed based on being grounded in the data.

In qualitative naturalistic inquiries, using inductive analysis and a methodological theoretical tradition such as *grounded theory*, the organization of the report and presentation of the findings and proposed theory, is different than the organization used in hypotheses-testing deductive / quantitative inquires. The theory is the finding and is the result of the emergence in the collected data and 'theoretical sensitivity'. Therefore, the data is presented as it is analyzed and the resulting theory is the final contribution of the inquiry: *"In my own studies, I refrained from advancing a theory at the beginning of my grounded theory research, generated the theory through data collection and analysis, posed the theory as a logic diagram, and introduced contending and contrasting theories with the model I generate at the end of my study."* (Creswell, 1998 p. 86)

However, for the purpose of this document intended as a doctoral dissertation, a conceptual framework *with variations* is presented at the start of the document (chapter 3) to facilitate the task of introducing the research strategy, research design and implementation plan for the fieldwork. The conceptual framework, therefore, serve as a guiding lantern in search of a grounded theory, to be hopefully, fruitfully achieved at the end of the inquiry.

Regarding the literature review and methodology sections, Creswell (1998 p. 179) notes that: *"The writer includes a literature review, but this review 'neither provides key concepts nor*

suggests hypotheses as it does in hypothetico-deductive research'. Instead, this literature review shows gap or bias in existing knowledge, thus providing a rationale for a grounded theory study. A researcher does not provide a theoretical framework in this review in as much as the intent of grounded theory is to generate or develop a theory."

After the research question was identified and clearly defined, in the search for a methodological approach, there wasn't any methodological bias, predetermined preference or paradigm of choice about the value of *knowledge* in relation to the representation and interpretation of *reality* when using a quantitative or qualitative design approach. However, it was known and advised before starting, that a quantitative inquiry would be less complicated in term of complexity, clarity of predetermined and standardized procedures to follow, and time consumption. Needless to say, the traditional bias that exists towards the hypothesis-testing / deductive approach, believed by many to be the scientific method of inquiry, had led to revisit the research question and to look for accommodating solution in the initial long quest for defining a research question and thinking about potential strategies for the research design, fieldwork, and final report. However, the interest and motivations for the chosen research question, helped in identifying potentials strategic framework for the research design and fieldwork, using one or a combination of the theoretical traditions in the inductive / naturalistic qualitative paradigm of scientific inquiry. In the quest to identify a clear and precise strategy, most of the theoretical traditions used for qualitative inquires were revisited. In his book *Qualitative inquiry and research design: Choosing among five traditions*, John Creswell (1998) provides a good description of five theoretical traditions used in qualitative inquiries: Biography; phenomenology; grounded theory; ethnography and case study. Moreover, Michael Quinn Patton (2002), in his book *Qualitative research and evaluation methods*, presented and described 16 theoretical traditions used in qualitative inquiries: Ethnography; autoethnography; reality testing (positivist and realist approaches); constructionism/constructivism; phenomenology; heuristic inquiry; ethnomethodology; symbolic interaction; semiotics; hermeneutics; narratology/narrative analysis; ecological psychology; system theory; chaos theory (nonlinear dynamics); grounded theory; and orientational (feminist inquiry, critical theory, queer theory, among others).

Finally, it was decided that the strategic framework for the research design, fieldwork and reporting, would be based mainly on the use of a combination of (a) inductive analysis composed

of a layered combination of (1) analytical induction, (2) case study, and (3) grounded theory; and (b) deductive analysis for validation composed of (1) theoretical hypotheses-testing, and (2) generalization, transferability and confirmation.

Presentation of the Chapters

Most of the chapters, except the first (for the methodology) and the last (for the discussion and conclusion), are presented using a manuscript format. The intention was to break up the holistic theoretical model presented in chapter X, as the main finding of the research, into small pieces or modules, in which each piece is researched and covered by a chapter targeting this particular piece. Furthermore, by using a manuscript format for the chapters, the objective is to provide more research focus on the modules of the theoretical model, to provide an adequate *theoretical sensitivity* for these modules, and hopefully an easier and structured reading and understanding. Each of these chapters could be treated as an independent manuscript, however, each chapter builds upon the previous one, and together they gradually lead to the construction of the theoretical model at the end of the research, in chapter X.

Moreover, the main motivation of using this hybrid form for the structure of the dissertation, by which the dissertation is structured in chapters and each chapter, is formatted using a manuscript style, was to avoid the disadvantages of the two traditional dissertations forms: the one based on four to five chapters in addition to the introduction and conclusion, and the dissertation based on three published papers or publishable manuscripts. The first does not recommend any structure or style for the body of the chapters, which means that the chapter could be too short or long, with no guidelines for the flows of ideas, and the lack of the presentation of a specific research question. The second, while providing a structure and a manuscript style format, it limits the research potential to three or four papers only.

Therefore, this dissertation used an innovative hybrid form, by which nine chapters (from chapter II to chapter X) were presented and structured based on a manuscript style format, in addition to the introduction, the methodological framework in chapter I and the discussion and conclusion in chapter XI. From these nine manuscripts structured chapters, one was published in an academic journal; six were published in peer review conference proceedings; and two were

presented in peer review conferences. Moreover, the three articles presented in chapters VIII, IX and X, received the recognition of 'one of top papers', honourable mention paper award, and the best student paper award, respectively. A footnote was added at the first page of each chapter to identify the name of the academic journal, the conference name and location and the award received, if any. It is worth noting that these papers presented in chapters II to X, were slightly modified to suite the global objectives of the dissertation and to provide continuity from one chapter to the other. For example, the methodology sections in some of these empirical papers were removed and integrated, without redundancy, to the methodological framework in chapter I, as the main section of the dissertation covering all methodological issues.

Furthermore, the dissertation was divided into five parts demarking different streams of research and the chapters were grouped according to these research streams. Part I, covers the exploratory study that was conducted at the beginning of the dissertation research, the disruptive technology and innovation modules in the theoretical model (chapter X) and it groups chapters II and III. Part II, covers the research on acquisitions, the two acquisitions modules in the theoretical model and it groups chapters IV and V. Part III, covers the research on the alliances and acquisitions, the acquisitions modules in the theoretical model, the proposition of generalization of the theoretical model into other industries in chapter XI and it groups chapters VI and VII. Part IV, covers the research on acquisitions, entrepreneurship and the system of innovation, the acquisitions and venture capital modules in the theoretical model and it groups chapters VIII and IX. Finally, Part V covers the research findings in a holistic integrative constructed theoretical model based on previous chapters, the closure with a discussion and conclusion section and it groups chapters X and XI. Here is a brief introduction to the dissertation chapters:

Chapter 1 covers the methodological framework, starting with the paradigm of choice and epistemological foundation, going through a review of the major qualitative methodologies which will be used in this inquiry. Then, it describes in more details, the research strategy formulation and implementation plan. It covers a description of the sources of data and the tools of analysis, as found in the literature on methodology and how this would apply to the specific design and strategic framework of the inquiry. It identifies the criteria for quality and evaluation. Finally, it states a list of ethical considerations for doing qualitative research.

Chapter 2 is part of the exploratory study and it introduces the multiple cases of Cisco Systems, Lucent Technologies and Nortel Networks. It explores the role of interfirm networks, strategic alliances and technology grafted acquisitions. Moreover, it highlights the role of leadership in high technology firms and it compares the difference between emergent and deliberate strategy formulation.

Chapter 3 is part of the exploratory study and it covers the definition of the disruptive technologies with some examples from the telecommunications industry. It explores the manufacturer segment and the service provider segment of the telecommunications industry. It highlights the current state of the telecommunications industry and moreover, it introduces the first steps towards the construction of a theoretical model, including a conceptual framework.

Chapter 4 explores the acquisitions in the telecommunications industry with the pre-acquisition and post-acquisition phases, in addition to the effect on the performance of the firms. Moreover, it takes us step by step through theory building with a proposition towards a theoretical model for understanding acquisitions in the telecommunications industry.

Chapter 5 introduces the concept of cognitive and conceptual mapping and the methodology used for doing research using this tool, with the objective of identifying the cause and effect of acquisitions in the telecommunications industry. A list of 73 variables and constructs are presented as either causes or consequences of acquisitions. Moreover, it presents the data findings and analysis, including the domain analysis, the centrality analysis and the cluster analysis.

Chapter 6 builds upon the previous chapter and it covers the factors related to R&D performance and technical collaboration in the telecommunications industry and the high technology industries in general. It explores the causes and motivation, the consequences and impact and the critical success factors of technical collaboration.

Chapter 7 builds upon the previous chapter and it explores the different modes of technical collaboration in the high technology industries. It presents a theoretical review of three established lenses used in research on acquisition and alliance: Network theory, resource based

view and transaction cost economics. Moreover, it links the three theories to strategic alliances and mergers and acquisitions. Furthermore, it presents a temporal model for integrating alliances and acquisitions as part of the strategy formulation process and it explores the criteria for deciding upon acquisition or alliance.

Chapter 8 builds upon the previous chapters and it explores the relationship between intensive acquisitions in the telecommunications industry and the role of entrepreneurship and venture capital, all within the context of a national system of innovation, as an ecosystem. It defines the difference between complementary, supplementary, sustaining and disruptive technologies. Moreover, it presents a list of the types of entrepreneurs and it introduces the entrepreneurship activities as a moderating variable between the intensive acquisition activities, the emergence of the acquisition and development model and the continuous emergence of new and disruptive technologies.

Chapter 9 builds upon the previous chapter and it explores the concept of the national system of innovation as an ecosystem for the research on the telecommunications industry. In the theoretical review section, it defines the terms system, innovation and knowledge, the innovation system and the national system of innovation. Moreover, it explores the structure and organization of the national system of innovation. Furthermore, it introduces the value chain model and the mesh topology, and characteristics and advantages of these models.

Chapter 10 builds upon all the previous chapter and concludes the research by presenting the theoretical model for the process of creative construction in the telecommunications industry.

Chapter 11 presents a discussion and conclusion of the research, including the contribution, the transferability or generalizability of the research, the limitations, and notes for further research.

CHAPTER I

METHODOLOGICAL FRAMEWORK

1.1 Introduction

A qualitative research, in contrast to experiment, is a "*naturalistic inquiry*" because it investigates the real world as it is without trying to manipulate the data, the environment surrounding the data or the findings. Patton defines naturalistic inquiry as *"a discovery-oriented approach that minimizes investigator manipulation of the study setting and places no prior constraints on what the outcomes of the research will be....Open ended, conversation-like interviews as a form of naturalistic inquiry contrast with questionnaires that have predetermined response categories. It's the difference between asking, 'Tell me about your experience in the program' and 'How satisfactory were you? Very, somewhat, little, not at all.'"* (Patton, 2002 p. 39).

Qualitative naturalistic research should allow for the emergence of the data and encourage flexibility in the research design strategy, which will not be complete before entering into the fieldwork: *"What these considerations add up to is that the design of a naturalistic inquiry (whether research evaluation, or policy analysis) cannot be given in advance; it must emerge, develop, unfold....The call for an emergent design by naturalists is not simply an effort on their part to get around the 'hard thinking' that is supposed to precede an inquiry; the desire to permits events to unfold is not merely a way of rationalizing what is at bottom 'sloppy inquiry'. The design specifications of the conventional paradigm form a procrustean bed of such a nature as to make it impossible for the naturalist to lie in it – not only uncomfortably, but at all."* (Lincoln & Guba, 1985b)

In qualitative inquiries "*purposeful sampling*" is translated in selecting "information-rich" cases, enabling to understand the phenomena investigated by the research question in much greater depth (Patton, 2002). Qualitative data collected during the fieldwork of a naturalistic inquiry are a combination of 1) quotations from open-ended and conversation-like interviews; 2) observations made during the fieldwork; 3) notes taken during and after the fieldwork has ended; and 4) excerpts from documents. Documents could possibly be, but not limited to, formal document of the companies involved in the case studies or beyond; reports such as plans, financial statements, sales forecast and outlook; market research studies, company internal or customer's presentations; minutes of meeting, brochures and publicity materials, existing product information and prototype; and brochures and sales materials. The documents could be of a public or confidential nature, and they could be found locally or internationally. Also, they could be collected not only from companies, but also from industrial and sectorial organizations, professional groups and associations, standard bodies, "open-sources" collaborative and participative networks, local and international workers' unions.

The primary focus of qualitative data is the interpretation, by the researcher, of the experiences of the subjects under investigation, which in turn, are the interpretations of their real world as they see it, live in it and experience it. In qualitative naturalistic inquiries the researcher commitment and engagement are very important during the field work in order to interact in physical proximity with the players in their own environment and comfort, and to observe their reactions, understand their realities as interpreted by them and to draw some important information that could lead to insightful analysis, valuable conclusion and theoretical contribution and practical implications. However, this engagement is contested by calls for objectivity and neutrality.

Therefore the choice of qualitative naturalistic inquiries and the important concept of 'objectivity' are in the center of a paradigm debate between critics who perceive qualitative research too 'subjective' as it is tinted by the interpretation of the inquirer and the defenders of the qualitative research, who believe that it is more in line with 'objectivity', which is the basis for the scientific method of inquiry, investigation and research.

1.1.1 Strategies for Qualitative Inquiries

Patton presents five analysis strategies for qualitative inquiries: Unique case orientation; inductive analysis and creative synthesis; holistic perspective; context sensitivity; and voice and perspective reflexivity (Patton, 2002). I will describe briefly four of them, which are concerned with my naturalistic inquiry and most pertinent to the research strategy formulation, research design and implementation.

Unique case orientation. From purposeful sampling described earlier, the objective in a qualitative naturalistic inquiry would be to purposefully select a limited number of "rich-information" cases that would be critical and crucial in understanding the phenomena under investigation in great depth, and by means of direct physical proximity, interactions with the people and their natural environment, and introspections, leading to insightful observations, and hopefully creative analysis and valuable contribution.

Inductive analysis. Qualitative inquires are largely based on inductive analysis. However, a phase of deductive analysis may follow to validate the emerging patterns, look for more patterns, categories and dimensions, and also to verify for the existence of "critical cases" which disconfirm the emerging pre-hypotheses propositions. This could go back and forth between inductive and deductive analysis, and between the emerging patterns from the data and the theoretical assumptions, reaching "theoretical sensitivity" (Glaser, 1992; Goulding, 2002; Strauss & Corbin, 1998), until no further patterns are observed, no further coding is possible, and no further categories are achievable; therefore concluding a certain degree of emergence and "theoretical saturation". Patton describes this process as follows: *"Over a period of inquiry, an investigation may flow from inductive approaches, to find out what the important questions and variables are (exploratory work), to deductive hypothesis-testing or outcome measurement aimed at confirming and / or generalizing exploratory findings, then back again to inductive analysis to look for rival hypotheses and unanticipated or unmeasured factors....Cross case analysis can begin in search of patterns and themes that cut across individual experiences. The initial focus is on full understanding of individual cases before those unique cases are combined or aggregated thematically. This helps ensure that emergent categories and discovered patterns are 'grounded'*

(Glaser, 1992; Goulding, 2002; Strauss & Corbin, 1998) in specific cases and their contexts." (Patton, 2002 p. 57)

Holistic perspective. From the theoretical perspective, the field of "strategy" is a complex one. It includes all the functions of the top executive, with the underlying divisional fields of marketing, finance, etc. It is also grounded in behavioral science, political science, anthropology, sociology, psychology, economics and finance. It combines different disciplines such as business policy and strategic management, industrial organization, organizational economics, economics sociology, human behavioral science, organizational theory and others. It use different theories borrowed from distinct areas of social science to interpret and explain the issues under investigation, such as transaction cost, resource-based view, network theory, knowledge-based view and market-based view.

However, the issues under investigation are much more complex than they seem when using one or another approach to explore them. As Hafsi and Thomas (2005 p. 509) noted, "*collective action cannot be understood if it is broken down into parts to be studied separately, As reality is complex, it is more appropriate to study it in its totality. This means not only studying all the parts together but also their inter-relationships, even if the result is an incomplete and imperfect understanding*". Furthermore, using the holistic approach alone for integrative purposes is considered to be outdated and not scientific and less credible because of the use of qualitative methods, while using the analytical approach alone tend to fragment the reality into unrelated (or less related and integrated) pieces, and tend to see strategy as an assemblage of theories and methodologies; *"...The question of what strategy is. It feels like a vast array of diverse and uncoordinated detailed observations that are scientifically respectable, yet incoherent in practice."* (Hafsi & Thomas, 2005).

Context sensitivity. Qualitative naturalistic inquires gives high importance to the context in which the phenomenon is under investigation, and consider it a part of the whole, and a integral part of an "ecological system" that is essential for the understanding of the actors involved, their relationships and interactions (Patton, 2002).

1.1.2 Objectives of the Methodological Framework

I have put a big emphasis on the epistemological, research inquiry design, design strategy and methodological framework. The reason, besides providing a base for the credibility and the rigor of the inquiry, is that as I started the careful process of research strategy, design and planning, I realized that the methodological approach and the methodologies of choice require, and to a great extent condition, an extensive amount of flexibility, uncertainty, ambiguity and creativity, to be reduced only after the start of the fieldwork and the full immersion in the data. In other words: emergence versus forcing.

Moreover, the definitions of my epistemology and ontology, the described research strategy and design, and the choice of the mixed qualitative inquiry strategies and techniques, are with the intention of 1) justifying my choice of paradigm and consequently the methodology; 2) asking for this prescribed flexibility granted by the naturalistic inquiry; and 3) the acceptance of a certain degree of ambiguity and uncertainty, to be reduced after starting the fieldwork.

Therefore, the emphasis on the methodological sections in this document and intensive use of excerpts and quotes, is with the objective of agreeing upon the framework of the inquiry (between the researcher and the evaluators), and providing solid references form the literature on methodologies to document (1) the thought process of the researcher during the course of the inquiry; (2) the basis for and the context in which the strategic framework and research design were developed; (3) the guidelines and considerations for data collection, analysis and interpretation layered phases; and finally (4) to serve as a roadmap from the beginning of the fieldwork to the final report on the inquiry's findings.

1.2 Early Stages of the Research – The Proposal

At the early stages of brainstorming and in preparation for my dissertation, I followed a check list provided by Patton (2002 p. 254) ,in the form of questions to be asked regarding the research strategy and design, with propositions for design issues and options:

1. *"What is the primary purpose of the study? Basic research, applied research, summative evaluation, formative evaluation, action research;*
2. *What is the focus of the study? Breadth versus depth trade-offs;*
3. *What are the units of analysis? Individuals, groups, program components, whole program, organizations, communities, critical incidents, time periods, etc.;*
4. *What will be the sampling strategies? Purposeful sampling, probability sampling. Variations in sample size from a single case study to a generalizable sample;*
5. *What types of data will be collected? Qualitative, quantitative, or both;*
6. *What type and degree of control will be exercised? Naturalistic inquiry (no control), experimental design, quasi-experimental;*
7. *What analytical approach or approaches will be used? Inductive, deductive. Content or thematic analysis, statistical analysis, combinations;*
8. *How will the validity of and confidence in findings be addressed? Triangulation options, multiple data sources, multiple methods, multiple perspectives,*
9. *Time issues: When will study occur? How will the study be sequenced or phased? Long term fieldwork, rapid reconnaissance, exploratory phase to confirmatory phase, fixed times versus open timelines;*
10. *How will the logistics and practicalities be handled? Gaining entry to the setting, access to people and records, contracts, training, endurance, etc.;*
11. *How ethical issues and matters of confidentiality be handled? Informed consent, protection of human subjects, reactivity, presentation of self, etc.;*
12. *What resources will be available? What will the study cost? Personnel, supplies, data collection, materials, analysis time and costs, reporting/publishing costs."*

I tried to answer all these questions, and the result is the product in this document. The organization of the document, though, does not follow the same sequence of the questions in this list. Rather, the order of the document takes the reader into the natural flow of my cumulative thinking, and progresses from start to end, with the objective of making this research clear, relevant, rigorous, interesting and convincing.

In preparing my dissertation proposal, I followed the thirteen guidelines and advices I found in the book *Proposals That Works* (Locke, Spirduso, & Silverman, 2000), which are: (1)

Why qualitative, (2) plan flexibility, (3) build a framework, (4) articulate parts, (5) plan for validity, (6) illustrate analyses, (7) plan for records, (8) demonstrate procedures, (9) don't anticipate findings, (10) quantify correctly, (11) plan entry and exit, (12) transfer cautiously, and (13) name your perspective. In addition, I adopted some of the advices given in the book *Practical Research* (Leedy, Newby, & Ertmer, 1996 p. 127-128), regarding the formatting of a research proposal – components and sequencing.

Furthermore, I adopted the flowchart in figure 1.1 and titled "twenty steps to a proposal" from the same book (Leedy, Newby, & Ertmer, 1996), with some modifications, to represent the 14 steps process I followed in organizing my thoughts, going through the tasks of collecting the pieces of puzzle and preparing the dissertation proposal. I thought it would be interesting to document it as part of the report, with the modifications I did to adapt it to my case.

1.3 Epistemological Foundation

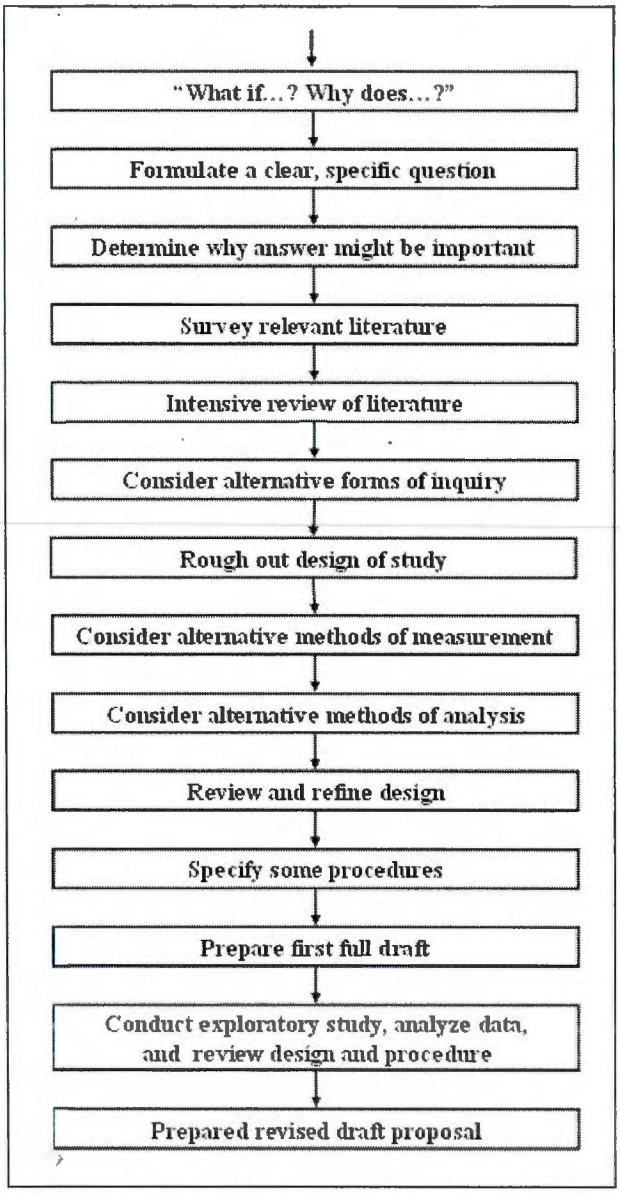
The debate between qualitative and quantitative methods of inquiry is in the middle of the debate between the methodologies paradigm. The debate concerns the positional difference and the distance between objectivity and subjectivity on a continuum of epistemological and ontological assumptions. Positivism is seen as the base for scientific research leading to knowledge generation, and theoretical contribution within the context of trustfulness, credibility, authenticity, generalization and transferability.

Therefore, there is an epistemological debate about the nature of scientific knowledge and its relationship to reality: *"Two major theoretical perspectives have dominated the social science scene. The first, 'positivism', traces its origins in the social sciences to the great theorists of the nineteenth and early twentieth centuries and especially to Auguste Comte and Emile Durkheim. The positivist seeks the 'facts' or 'causes' of social phenomena apart from the subjective states of individuals....The second theoretical perspective, which, following the lead of Deutscher, we will describe as 'phenomenological', has a long history in philosophy and sociology. The phenomenologist is committed to understanding social phenomena from the*

actor's own perspective. He or she examines how the world is experienced. The important reality is what people perceive it to be." (Taylor & Bogdan, 1984 p. 1-2)

Figure 1.1

Fourteen steps to the proposal



A paradigm, being a worldview of how we see and perceive reality, the researcher conducting a qualitative naturalistic and holistic inquiry would have to make five philosophical assumptions: *"(1) Ontological: What is the nature of reality? Reality is subjective and multiple, as seen by the participants in the study. (2) Epistemological: What is the relationship between the researcher and that being researched? Researcher attempts to lessen distance between himself or herself and that being researched. (3) Axiological: What is the role of values? Researcher acknowledges that research is value laden and that biases are present. (4) Rhetorical: What is the language of research? Researcher writes in a literary, informal style using the personal voice and uses qualitative terms and limited definitions. (5) Methodological: What is the process of research? Researcher uses inductive logic, studies the topic within its context, and uses an emerging design."* (Creswell, 1998 p. 75)

1.3.1 Positivism vs. Constructivism

Logical positivism. In the debate about "positivism" and referring to "logical positivism", Miles and Huberman (1984) noted that: *"We believe that social phenomena exist not only in the mind but also in the objective world – and that there are some lawful and reasonably stable relationships to be found among them...Given our beliefs in social regularities, there is corollary: Our task is to express them as precisely as possible, attending to their range and generality and to the local and historical contingencies under which they occur. So, unlike some schools within social phenomenology, we consider important to evolve a set of valid and verifiable 'methods' for capturing these social relationships and their causes. We want to interpret and explain these phenomena 'and' have confidence that others, using the same tools, would arrive at analogous conclusion."* (Miles & Huberman, 1984 p. 94)

Realism. In a revised study, the same authors, Miles and Huberman (1994), prescribed to a more "realist" view of the world: *"Our aim is to register and 'transcend' these processes by building theories to account for a real world that is both bounded and perceptually laden, and to test these theories in our various disciplines. Our tests do not use 'covering laws' or the deductive logic of classical positivism. Rather, our explanations flow from an account of how differing structures produced the events we observed. We aim to account for events, rather than simply to document their sequence. We look for an individual or a social process, a mechanism, a*

structure at the core of events that can be captured to provide 'causal description' of the forces at work. Transcendental realism calls both for causal explanation and for the evidence to show that each entity or event is an instance of that explanation. So we need not only an explanatory structure but also a grasp of the particular configuration at hand." (Miles & Huberman, 1994 p. 4)

Constructivism. Patton noted that 'constructivism' *"begins with the premise that the human world is different from the natural, physical world and therefore must be studied differently (Lincoln & Guba, 1985b). Because human beings have evolved the capacity to interpret and 'construct' reality – indeed, they cannot do otherwise – the world of human perception is not real in an absolute sense."* (Patton, 2002 p. 96)

In their primary assumptions of constructivism, Guba and Lincoln (1985b) noted that: *"'Truth' is a matter of consensus among informed and sophisticated constructors, not of correspondence with objective realities. 'Facts' have no meaning except within some value framework; hence there cannot be an 'objective' assessment of any proposition. 'Causes' and effects do not exist except by imputation. Phenomena can only be understood within the context in which they are studied; findings from one context cannot be generalized to another; neither problems nor solutions can be generalized from one setting to another. Data derived from constructivist inquiry have neither special status nor legitimation; they represent simply another construction to be taken into account in the move toward consensus."* (Lincoln & Guba, 1985b p. 44-45)

1.3.2 Objectivism vs. Subjectivism

However, having covered briefly "positivism" and "constructivism" as two extremes on a continuum of the epistemological debate, I looked at the theories of methods, to see how the authors relates specific theories to either the "objectivist" or "subjectivist" paradigm. For "grounded theory" Patton (2002) notes that *"Those social scientist and academics who find some value in the methods of qualitative inquiry, namely, in-depth interviewing and observation, but who eschew the philosophical underpinnings of constructivism and interpretivism can find comfort in the attention paid to objectivity in grounded theory."* (Patton, 2002 p. 128)

1.3.3 Grounded Theory within the Positivism and Constructivism Paradigm

Grounded theory could be related to the "positivist" and the "constructivism" paradigm, depending on how the researchers use it and how rigorously they follow the well defined systematic-like procedures found in grounded theory. The majority of grounded theorists follow the "objectivist" paradigm. Charmaz (2000) represents and compares two approaches to grounded theory; The objectivist grounded theory and the constructivist grounded theory: *"Objectivist grounded theory accepts the positivistic assumptions of an external world that can be described, analyzed, explained, and predicted: truth, but with a small 't'....It assumes that different observers will discover this world and describe it in similar ways. In contrast, in a 'constructivist grounded theory' causality is suggestive, incomplete, and intermediate....It looks at how 'variables' are grounded – given meaning and played out in subjects' lives"* (Charmaz, 2000 p. 524). Furthermore, *"a constructivist grounded theory may remain at a more intuitive, impressionistic level than an objectivist approach."* (Charmaz, 2000 p. 526)

Therefore, in comparing the two approaches in relation to grounded theory Patton states that *"as a matter of philosophical distinctness, grounded theory is best understood as fundamentally realist and objectivist in orientation, emphasizing disciplined and procedural ways of getting the researcher's biases out of the way but adding healthy doses of creativity to the analytical process."* (Patton, 2002 p. 128)

1.3.4 Methodological Appropriateness vs. Methodological Purity

In light of this complexity of having to choose between one of the several methods and approaches for conducting scientific research with the objective of reaching a better understanding of the "reality" and contributing to scientific "knowledge", Patton offers a more pragmatic approach that favors "methodological appropriateness" over "methodological purity" or "methodological orthodoxy": *"Such pragmatism means judging the quality of a study by its intended purposes, available resources, procedures followed, and results obtained, all within a particular context and for a specific audience....I reiterate: Being pragmatic allows one to*

eschew methodological orthodoxy in favor of 'methodological appropriateness' as the primary criterion for judging methodological quality." (Patton, 2002 p. 71-72)

1.3.5 Mixed Methodology

On mixing different strategies and methods, Patton (2002) notes that: *"Mixing parts of different approaches is a matter of philosophical and methodological controversy. Yet, the practical mandate in evaluation to gather the most relevant possible information for evaluation users outweighs concerns about methodological purity based on epistemological and philosophical arguments."* (Patton, 2002 p. 252)

I am taking this advice seriously and I consider it a statement of what I intend to do in formulating the research strategy, research design and implementation plan, and during the course of data collection, analysis and finally in reporting the research findings. In doing so, my epistemological paradigm is swinging in the middle of a continuum between "**realism**" and "**constructivism**" in the research strategy framework, research design and methodology; and is "**objectivist**" when dealing with data measurement, procedures, analysis, and the theorization of the findings. In using grounded theory as the main method of research, besides analytic induction at the exploratory stage of the research, I subscribe to the Strauss and Corbin's version of grounded theory called "**structured positivist grounded theory**" (Strauss & Corbin, 1998), as compared to the other constructivist-based grounded theory called "constructivist grounded theory" (Charmaz, 2000).

1.4 Review of the Theories of Methods Used in this Research

1.4.1 Analytical Induction

Analytic induction is a qualitative method of research using an inductive approach, however, starting with a deductive analysis by proposing hypotheses and verifying their validity by using one or several confirming cases and a negative case, if needed: *"Analytical induction offers a specific form of inductive analysis that begins deductively, by formulating propositions or*

hypotheses, and then examines a particular case in depth to determine if the facts of the case support the hypothesis. If it fits, another case is studied, and so forth, in search for generalizations. If a case does not support the hypothesis, that is, it is a 'negative case', the hypothesis is revised. The aim is to explain a phenomenon satisfactorily using qualitative, case based inquiry." (Patton, 2002 p. 94-95). Norman Denzin (1978) stated that analytic induction is amongst three approaches used in building theories, besides experiments and multivariate analysis.

On examining preconceived hypotheses, using multiple cases, Patton encouraged this process of formulation of hypotheses, despite the call in phenomenological research to start without preconceived ideas: *"It is as a strategy for engaging in qualitative inquiry and comparative case analysis that includes examining preconceived hypotheses, that is, without the pretense of the mental blank slate advocated in purer forms of phenomenological inquiry and grounded theory."* (Patton, 2002 p. 493)

These hypotheses, used at the start of the research in a deductive manner, are characterized by being general or rough and are based on assumptions, intuition or theory: *"These hypotheses can be based on hunches, assumptions, careful examination of research and theory, or combinations. ....Contemporary researchers have de-emphasized universality and causality and have emphasized instead the development of descriptive hypotheses that identify patterns of behavior, interactions and perceptions...called 'modified analytical induction'."* (Gilgun, 1999 p. 268-269)

1.4.2 Grounded Theory

On how to develop theory and how 'grounded theory' offers a set of procedure to develop theory from the emerging patterns in the collected data, Strauss and Corbin state that: *"Theory denotes a set of well-developed categories (e.g., themes, concepts) that are systematically interrelated through statements of relationship to form a theoretical framework that explains some relevant social, psychological, educational, nursing, or other phenomenon. The statements of relationship explain who, what, when, where, why, how, and with what consequences an event occurs. Once concepts are related through statements of relationship into*

an explanatory theoretical framework, the research findings move beyond conceptual ordering to theory....A theory usually is more than a set of findings; it offers an explanation about phenomena." (Strauss & Corbin, 1998 p. 22)

Patton introduces "grounded theory" as *"Grounded theory focuses on the process of generating theory rather than a particular theoretical content. It emphasizes steps and procedures for connecting induction and deduction through the constant comparative method, comparing research sites, doing theoretical sampling, and testing emergent concepts with additional fieldwork.... Grounded theory depends on methods that take the researcher into and close to the real world so that the results and findings are grounded in the empirical world."* (Patton, 2002 p. 125)

Strauss and Corbin present grounded theory as a rigorous process and coding techniques, which lead to building theory. Following the prescribed procedures in a systematic way, is essential when processing a large amount of collected data from fieldwork and to ensure rigor and validity: *"Analysis is the interplay between researchers and data, so what grounded theory offers as a framework is a set of 'coding procedures' to help provide some standardization and rigor to the analytical process. Grounded theory is meant to build theory rather than test theory. It strives to provide researchers with analytical tools for handling masses of raw data. It seeks to help qualitative analysts consider alternative meanings of phenomenon. It emphasizes being systematic and creative simultaneously. Finally, it elucidates the concepts that are the building blocks of theory."* (Glaser, 1992; Patton, 2002 p. 127; Strauss & Corbin, 1998)

Theory generation from the emerging patterns in collected data is constructed through a technique of constant comparison between fieldwork and data, and between emerging patterns and theoretical concepts found in the literature: *"Theoretical comparisons are tools (a list of properties) for looking at something somewhat objectively rather than naming or classifying without a thorough examination of the object at the property and dimensional levels. If the properties are evident within the data, then we do not need to rely on these tools."* (Strauss & Corbin, 1998 p. 80-81)

Patton explains what 'grounded theory' is and lists the characteristics of a 'grounded' theorist in the following: *"Grounded theory operates from a 'correspondence perspective' in that it aims to generate explanatory propositions that correspond to real-world phenomena. The characteristics of a grounded theorist, they posit, are these: (1) the ability to step back and critically analyze situations; (2) the ability to recognize the tendency toward bias; (3) the ability to think abstractly; (4) the ability to be flexible and open to helpful criticism; (5) sensitivity to the words and actions of respondents; (6) a sense of proportion and devotion to work process."* (Patton, 2002 p. 489-490; Strauss & Corbin, 1998 p. 7)

Grounded theory goes beyond a descriptive mode of analysis into building blocks for theory construction through the emergent categories, and their properties, and relationships. Here are some definitions and terms given by Strauss and Corbin (1998):

1.4.3 Useful Definitions in Grounded Theory

Microanalysis. *"The detailed line-by-line analysis necessary at the beginning of the study to generate initial categories (with their properties and dimensions) and to suggest relationships among categories; a combination of open and axial coding."* (Strauss & Corbin, 1998 p. 57)

Theoretical sampling. *"Sampling on the basis of the emerging concepts, with the aim being to explore the dimensional range or varied conditions along which the properties or concepts vary."* (Strauss & Corbin, 1998 p. 73)

Theoretical saturation. *"The point in category development at which no new properties, dimensions, or relationships emerge during analysis."* (Strauss & Corbin, 1998 p. 143)

Range of variability. *"The degree to which a concept varies dimensionally along its properties, with variation being built into the theory by sampling for diversity and range of properties."* (Strauss & Corbin, 1998 p. 143)

Open coding. *"The analytic process through which concepts are identified and their properties and dimensions are discovered in data."* (Strauss & Corbin, 1998 p. 101)

Axial coding. *"The process of relating categories to their subcategories, termed 'axial' because coding occurs around the axis of the category, linking categories of the level of properties and dimensions."* (Strauss & Corbin, 1998 p. 123)

Relational statements. *"We call these initial hunches about how concepts relate 'hypotheses' because they link two or more concepts, explaining the what, why, where, and how of phenomena."* (Strauss & Corbin, 1998 p. 135)

Furthermore, here are some other definitions given by Glaser (1992 p. 38):

Concept. *"The underlying, meaning, uniformity and/or pattern within a set of descriptive incidents."*

Category. *"A type of concept. Usually used for higher level of abstraction."*

Property. *"A type of concept that is a conceptual characteristic of a category, thus at a lesser level of abstraction than a category. A property is a concept of a concept."*

Coding. *"Conceptualizing data by constant comparison of incident with incident, and incident with concept to emerge more categories and their properties."*

Open coding. *"The initial stage of constant comparative analysis, before delimiting the coding to a core category and its properties – or selective coding. The analyst starts with no preconceived codes – he remains entirely open."*

Theoretical coding. *"A property of coding and constant comparative analysis that yields the conceptual relationship between categories and their properties as they emerge. Theoretical codes are conceptual connectors to be used implicitly and explicitly in the way and style in which the analyst writes."*

Constant comparative coding. *"Fundamental operation in the constant comparative method of analysis. The analyst codes incidents for categories and their properties and the theoretical codes that connect them."*

1.4.4 Grounded Theory and the Emergence and Forcing Split/Debate

It is worth noting that grounded theory was developed by Strauss and Glaser (1967). Their perspective was "the emergence" of patterns from the data. Later the two diverged into different paths. Glaser remained loyal to the concept of "emergence" (Glaser, 1992), while Strauss and Corbin (1998) combined the concept of "emergence" with the concept of "forcing": *"...there is the classic by Glaser and Strauss (1967), 'The Discovery of Grounded Theory', which lays down the reasons behind the development of the method and details the procedure for applying it. This was followed by Glaser's (1978) 'Theoretical Sensitivity', which elaborated on the nature of theory and in particular the issue of letting theory emerge from the data. In 1990, Strauss and Corbin published the often quoted 'Basics of Qualitative Research: Grounded Theory, Procedures and Techniques' This book marked a split between the two original authors with regards to the principles associated with the methodology and was vociferously criticized by Glaser in his (1992) publication 'Basics of Grounded Theory Analysis: Emergence v Forcing'"* (Goulding, 2002 p. 2)

Furthermore, the version of Strauss and Corbin (1998) is called "structured positivist grounded theory". (*a la* Strauss and Corbin). Grounded theory could also follow a constructivist approach, therefore called "constructivist grounded theory". (Charmaz, 2000; Patton, 2002). This was discussed in more detailed in the "epistemological foundation" section. In using grounded theory as the main method of research, besides analytic induction at the exploratory stage of the research, I subscribe to the Strauss and Corbin's version of grounded theory called "**structured positivist grounded theory**" (Strauss & Corbin, 1998), as compared to the other constructivist-based grounded theory called "constructivist grounded theory".

1.4.5 Case Study

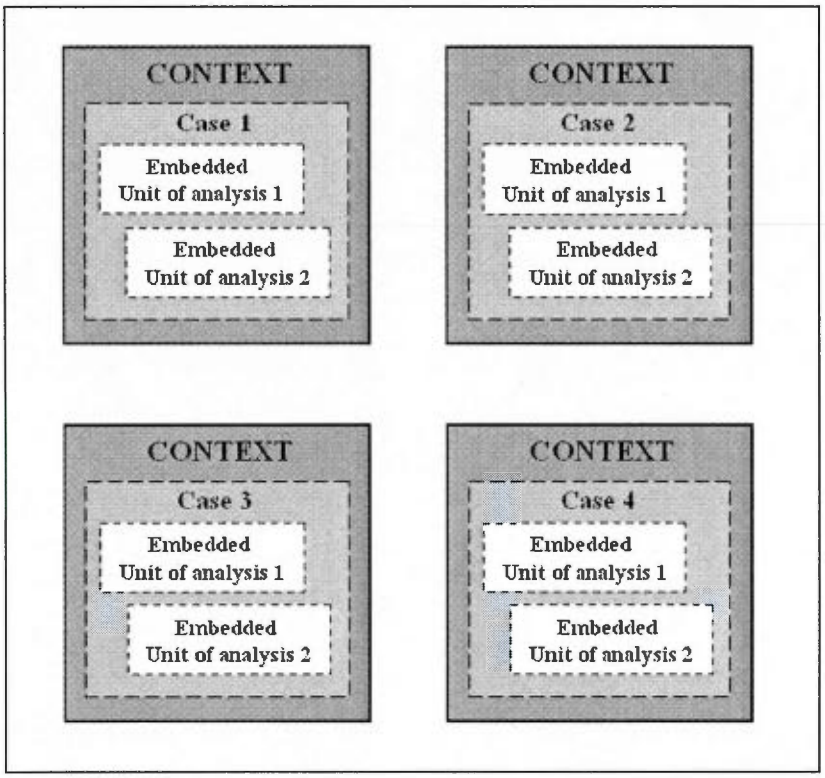
As for a definition of what case study is: *"Case study is not a methodological choice but a choice of what is to be studied. ...We could study it analytically or holistically, entirely by repeated measures or hermeneutically, organically or culturally, and by mixed methods – but we concentrate on the time being, on the case."* (Stake, 2000 p. 435)

Moreover, Patton (2002) describes what case study is, its components and the process involved by the following: *"Case analysis involves organizing the data by specific cases for in-depth study and comparison. Well constructed case studies are 'holistic' and 'context sensitive', two primary themes of qualitative inquiry....Cases can also be critical incidents, stages in the life of a person or program, or anything that can be defined as "specific, unique, bounded system" (Stake, 2000 p. 436). Cases are units of analysis. What constitutes a case, or unit of analysis, is usually determined during the design stage and becomes the basis for purposeful sampling in qualitative inquiry....The case study approach to qualitative analysis constitutes a specific way of collecting, organizing, and analyzing data; in that sense it represents an 'analysis process'. The purpose is to gather comprehensive, systematic, and in-depth information about each case of interest.....Thus, the term case study can refer to either the process of analysis or the product of analysis, or both....The analysis may consist of three layers of case studies: individual participant case studies at project sites combined to make up project site case studies, project site case studies combined to make up state program case studies, and state program combined to make up a national program case study....The analyst's first and foremost responsibility consists of doing justice to each individual case. All else depend on that....The full report may include several case studies that are then compared and contrasted, but the basic unit of analysis of such a comparative study remains the distinct cases and the credibility of the overall findings will depend on the quality of the individual case studies....Programs, organizations, and communities have parallel types of epiphanies, through they're usually called critical incidents, crises, transitions, or organizational lessons learned."* (Patton, 2002 p. 447-451).

Figure 1.2, which is adopted from (Yin, 2003 p. 40), describes the organization of cases with a particular context and with multiple embedded unit of analysis. The context in this research is the turbulent ecosystem of the telecommunications industry and the embedded units of

analysis are the disruptive technologies and acquisitions, as events during the period from 1994 till 2009.

Figure 1.2 adopted from (Yin, 2003 p. 40)
Multiple cases with multiple embedded units of analysis



1.5 Formulation of the Research Strategy and Implementation

Formulating a strategy for the research is an important and critical task at the beginning and before embarking on the fieldwork and analysis. Having a fair knowledge of the different research methods, their assumptions, epistemological foundations and procedures, is equally important. This would ensure first choosing the appropriate method for the specific research at hand and then for dealing with the detailed procedural steps required to complete the inquiry with

a high level of rigor and credibility: *"Being pragmatic allows one to eschew methodological orthodoxy in favor of 'methodological appropriateness' as the primary criterion for judging methodological quality, recognizing that different methods are appropriate for different situations."* (Patton, 2002 p. 71-72)

Moreover, Patton presented and defined 12 themes of qualitative inquiry as strategic ideals: *"(1) Real world observation through naturalistic inquiry; (2) openness, responsiveness, and flexibility through emergent designs; (3) focus through purposeful sampling; (4) richness and depth through qualitative data; (5) use of all of one's capacities through personal experience and engagement; (6) balancing the critical and creative through a stance of empathetic neutrality; (7) sensitivity to dynamic processes and systems; (8) appreciation of idiosyncrasies through unique case orientation; (9) insight and understanding through inductive analysis; (10) contextual sensitivity; (11) and a holistic perspective; and (12) authenticity and trustworthiness through ownership of voice and perspective. These are not absolute and universal characteristics of qualitative inquiry, but rather strategic ideals that provide a direction and framework for developing specific designs and concrete data collection tactics. Ideally, a pure qualitative inquiry strategy includes all the themes and dimensions identified above."* (Patton, 2002 p. 66)

Therefore the elements of the design before starting the fieldwork:

- Naturalistic: Studying the real word.
- Emergent design flexibility: Design provides initial focus, plans for observation, and initial guiding interview questions.
- Purposeful sampling: Selecting information rich cases to help understand the phenomena under study.

In quantitative research, data is collected using a limited number of questions and from a large number of subjects (databases, people surveys) then statistically compared and correlated, which makes generalization possible under certain rules and conditions. In qualitative research, data is collected from a limited number of subjects (cases, interviews) but the result is a much broader understanding and a more in-depth analysis of the researched subject.

1.5.1 Establishing the Definition of Validity

The evaluation of validity and rigor is different in quantitative and qualitative research. In quantitative research the instrument of measurement is constructed following specific rules and procedures, while in qualitative research the instrument of measurement is the researcher with his experience, understanding, careful analysis and creativity: *"Validity in quantitative research depends on careful instrument construction to ensure that the instrument measures what it is supposed to measure. The measure must then be administered in an appropriate standardized manner according to prescribed procedures. The focus is on the measurement instrument – the test items, survey questions, or other instruments tools. In qualitative inquiry, the researcher is the instrument. The credibility of qualitative methods, therefore hinges to a great extent on the skill, competence, and rigor of the person doing the fieldwork."* (Patton, 2002 p. 14)

1.5.2 The Iteration between Inductive and Deductive Towards Theoretical Sensitivity

As described earlier, qualitative inquires are largely based on inductive analysis. However, a phase of deductive analysis may follow to validate the emerging patterns, look for more patterns, categories and dimensions, and also to verify for the existence of "critical cases" which disconfirm the emerging pre-hypotheses propositions. This could go back and forth between inductive and deductive analysis, and between the emerging patterns from the data and the theoretical assumptions, reaching "theoretical sensitivity" (Glaser, 1992; Goulding, 2002; Strauss & Corbin, 1998), until no further patterns are observed, no further coding is possible, and no further categories are achievable; therefore concluding a certain degree of emergence and "theoretical saturation": *"In making this point, Guba (1978) has depicted the practice of naturalistic inquiry as a wave on which the investigator moves from varying degrees of a "discovery mode" to varying emphasis of a "verification mode" in attempting to understand the real world. As fieldwork begins, the inquirer is open to whatever emerges from the data, a discovery or inductive approach. Then, as the inquiry reveals patterns and major dimensions of interest, the investigator will begin to focus on verifying and elucidating what appears to be emerging – a more deductive approach to data collection and analysis."* (Patton, 2002 p. 67)

1.5.3 The Unit of Analysis

Patton defines the unit of analysis and notes that *"Decisions about samples, both sample size and sampling strategies, depend on prior decisions about the appropriate unit of analysis to study...Different units of analysis are not mutually exclusive. However, each unit of analysis implies a different kind of data collection, a different focus for the analysis of the data, and a different level at which statements about findings and conclusions would be made...One of the strength of qualitative analysis is looking at program units holistically....When a program, a group, organization, or community is the unit of analysis, qualitative methods involve observations and descriptions focused directly on that unit: The program, organization, or community, not just the individual people, becomes the case study focus in those settings. Particular events, occurrences, or incidents may also be the focus of study...Sampling can involve time period strategies, for example, continuous and ongoing observation versus fixed-interval sampling."* (Patton, 2002 p. 228-229)

Therefore, this qualitative inquiry will use multiple unit of analysis:

1. ~~Disruptive technology~~ → ~~Event / Individual~~
2. Acquisition → Event / Individual
3. The telecommunications industry → Organizations (Industry) / Holistic
4. Period from 1994-2009 → Time period / Holistic

1.5.4 Purposeful Sampling

Random and representative samplings are conditions for generalization in statistical and quantitative inquiries, by eliminating bias. However, in qualitative research, what could be considered as bias is in fact an objective and a strength. Therefore, purposeful sampling rather than random sampling lies in selecting information rich cases for an in-depth study that leads to uncovering the answers for questions such as What and How: *"A random and statistically representative sample permits confident generalization from a sample to a larger population...The purpose of probability random sampling is generalization from the sample to a population and control of selectivity errors...What would be 'bias' in statistical sampling, and*

therefore a weakness, becomes intended focus in qualitative sampling, and therefore a strength. The logic and power of purposeful sampling lie in selecting 'information rich-cases' for study in depth. Information-rich cases are those from which one can learn a great deal about issues of central importance to the purpose if the inquiry, thus the term 'purposeful' sampling. Studying information- rich cases yields insights and in-depth understanding rather than empirical generalization." (Patton, 2002 p. 230)

In achieving purposeful sampling, Patton (2002) presents 16 sampling strategies for purposefully selecting rich-information cases: (1) Extreme or deviant case sampling, (2) intensity sampling, (3) maximum variation sampling, (4) homogeneous sampling, (5) typical case sampling, (6) critical case sampling, (7) snowball or chain sampling, (8) criterion sampling, (9) theory-based sampling (operational construct, theoretical), (10) confirming and disconfirming cases, (11) stratified purposeful sampling, (12) opportunistic or emergent sampling, (13) purposeful random sampling, (14) sampling politically important cases, (15) convenience sampling, (16) combination or mixed purposeful sampling. He notes that *"these approaches are not mutually exclusive. Each approach serves a somewhat different purpose. Because research and evaluation often serve multiple purposes, more than one qualitative sampling strategy may be necessary. In long term fieldwork, all of these strategies may be used at some point."* (Patton, 2002 p. 245)

In the strategic framework of my research design, I selected several purposeful sampling strategies to be used in combination and in a layered filter-like approach, until information rich cases are identified, with respect to the research question and the unit of analysis. Here are my selections and their definitions:

1. Extreme or deviant case sampling (Patton, 2002 p. 230-234)
2. Intensity sampling (Patton, 2002 p. 234)
3. Maximum variation (Patton, 2002 p. 235)
4. Homogeneous sampling (Patton, 2002 p. 235)
5. Critical case sampling (Patton, 2002 p. 236)
6. Snowball or chain sampling (Patton, 2002 p. 237)
7. Criterion sampling (Patton, 2002 p. 238)

8. Theory-based sampling, operational construct sampling, theoretical sampling (Patton, 2002 p. 238)
9. Confirming and disconfirming cases (Patton, 2002 p. 239)
10. Stratified purposeful sampling (Patton, 2002 p. 240)
11. Opportunistic or emergent sampling (Patton, 2002 p. 240)

1.5.5 Sampling Size

On the issue of sampling size, Lincoln and Guba (1985b p. 202), prescribed that the selection of samples would be completed by reaching the level of redundancy. Furthermore, Patton (2002) notes that *"there are no rules for sample size in qualitative inquiry. Sample size depends on what you want to know, the purpose of the inquiry, what's at stake, what will be useful, what will be have credibility, and what can be done with available time and resources....In-depth information from small number of people can be very valuable, especially if the cases are information rich. ...The validity, meaningfulness, and insights generated from qualitative inquiry have more to do with the information richness of the cases selected and the observational/analytical capabilities of the researcher with sample size."* (Patton, 2002 p. 244-246).

1.5.6 Triangulation

Denzin (1989) identified four means of triangulation: *(1). data triangulation; (2) investigator triangulation; (3) theory triangulation and (4) methodological triangulation.* These methods of triangulation should be applied to ensure the credibility of the research.

1.6 The Research Design and Implementation

"In qualitative inquiry, the problem of design poses a paradox. The term 'design' suggests a very specific blueprint, but 'design in the naturalistic sense....means planning for certain broad contingencies without, however, indicating exactly what will be done in relation to each." (Lincoln & Guba, 1985b p. 226)

This empirical research is based on a qualitative method of inquiry which allowed the research to be conducted with the main objective of 'in-depth understanding' the phenomena (Patton, 2002) and to build theory rather than test theory (Glaser, 1992; Strauss & Corbin, 1998). This qualitative inquiry is based on the constructivist paradigm and the inductive approach (Burrell & Morgan, 1979; Kuhn, 1962). The findings are translated into 'rough and general approximation hypotheses' (Gilgun, 1999) or propositions that would be used as testable propositions for further quantitative analysis.

1.6.1 Theory Building

The theory building followed the building blocks prescriptions described by Whetten (1989) and avoided the pitfalls described by Sutton & Staw (1995) and Weick (1995b). It started by the thoughtful process of answering the following questions: '*What*' are the main factors (concepts, variables, constructs) related to the study of acquisitions in the high technology industries, which constituted the boxes in the proposed theoretical model. At the beginning, more concepts were used, but later the model was refined, keeping only the key and high level concepts, with the objective of completeness and generalizability and judged by two criteria comprehensiveness and parsimony. '*How*' provided for the links and relationships between the concepts and boxes. It explained how these selected factors are related in a logical setting and by connecting the concepts with arrows; the element of causality is introduced. 'Why' was used to define the theory's assumptions and logical interpretations by identifying the underlying psychological, economic or social dynamics that justify the selection of factors and the causal relationships between them. During the theory building phase, and in the absence of empirical evidence, the use of logic and intuition, based on the researcher experience, for explanation, justification and interpretation, is the only basis for evaluating the rational of the proposed theory. '*Who*', '*Where*' and '*When*' define the context of the proposed model (i.e. the intensive acquisitions in the high technology industries and more specifically the networking industry) and the boundaries for its generalization, although the limitations would be identified by further empirical research done by others.

The method of "analytic induction" was used in the exploratory phase of the research, to gather initial information and understanding, and to explore some rough propositions. The main qualitative method of inquiry used is "grounded theory" and is implemented at the start of the fieldwork for data collection, through the data analysis/interpretation phase, the theorizing and final reporting on the research major findings (Creswell, 1998, 2003; Denzin & Lincoln, 2003; Glaser, 1992; Strauss & Corbin, 1998). The use of grounded theory as a method of inquiry was preceded by a review of the literature to get an understanding of the phenomenon investigated and followed by another round of literature review for theoretical sensitivity and better understanding the identified patterns.

Following the structured positivist grounded theory process for collecting and organizing data (Charmaz, 2000; Lincoln & Guba, 1985b; Strauss & Corbin, 1998), the collected data was labeled and organized around patterns and themes. Open and axial coding were used to identify emerging categories and abducted concepts, through constant comparison, theoretical comparison and the identification of variations (Strauss & Corbin, 1998). The result was outcome processes, sensitized concepts and constructed hypothesis.

During the data collection, the process would be organized using a multiple case study approach with embedded units of analysis, to facilitate the collection, organization, categorization and analysis of the expected data. In qualitative inquiries, there are no rules on sampling size, rather purposeful sampling and reaching redundancy and saturation. Therefore, the sampling size is initially defined by three case studies, using the 'success case', 'failure case' in addition to a 'confirmatory case'. Multiple non-exclusive sampling strategies were used to identify and target "information-rich" cases for the case studies in the networking segment of the high technology industries, giving high importance to context sensitivity.

The research employed an embedded research design, that is, multiple levels of analysis, focusing on each case study at three levels: (1) the disruptive technologies, (2) the acquisitions and (3) the convergence of services. Although an embedded design is complex, it permits the induction of rich and reliable models (Yin, 1989).

The research followed the criteria for quality and triangulation (Lincoln & Guba, 1985a; Yin, 1989), to ensure the dependability, transferability and trustworthiness of the research and findings (Lincoln & Guba, 1985b; Miles & Huberman, 1984, 1994; Patton, 2002).

1.6.2 Data Sources

Both primary and secondary sources of data were used. Primary data consisted of interviews and interviews-like conversations. Both were designed to be conducted with top executives and middle management in the same sector of the study (the networking segment of the high technology industry), in addition to external consultants who were involved the acquisition process.

Some of the interviews were semi-structured, while the others were conversations-like interviews. Field notes and observations were also treated carefully. The interviews were composed of a non-directed phase and a directed phase. The non-directed phase was planned to last 15 minutes, starting by an introduction. The directed phase of the interviews was planned to last from 30 minutes to 45 minutes, depending on the extents of the answers. It also starts by an introduction and end by a conclusion. Cognitive and causal mapping was used as an interviewing tool and for the interview's analysis, in order to limit cognitive simplification, bounded rationality, uncertainty and ambiguity (Ackermann & Eden, 2005; Cossette, 2002; Cossette & Lapointe, 1997; Eden & Ackermann, 1998; Eden & Ackermann, 2004).

Secondary sources of data would be formal company documents and presentations, industry reports and market researches. Furthermore, data was gathered using two methodologies. First, we reviewed all the available written materials. These included articles from the trade publications, industry magazines, industry reports, investment firms' case studies and the selected companies' web sites.

Initially, a preliminary reading was conducted across the high-tech companies in the areas of telecommunications/networking, computer hardware and computer software industries, in order to identify potential companies that could be suitable for the study and serve as "information-rich cases" (Yin, 2003). The objective was to identify, based on this preliminary

reading two company cases with "successful" acquisitions and two company cases with acquisitions that could be considered "failures". Finally one company was selected, based on the extended reading, Cisco Systems, as the company with the most successful and extended acquisition record and as a leader in the networking segment. Another company was selected to confirm the hypotheses and later the model, as a company with successful acquisition record, Nortel Networks, however lagging in its position Cisco Systems. Furthermore, a third company was selected as a negative case (Lincoln & Guba, 1985a) to confirm the model, Alcatel-Lucent (Lucent Technologies), with a perceived acquisitions failure, based on the reading.

1.6.3 Data Analysis

As soon as the preliminary analysis was conducted, it was compared and combined with the propositions following the methods for building theory from cases studies (Eisenhardt, 1989b).

The propositions emerged by comparing the similarities and differences between the companies investigated and by categorizing the data around variables such as market positioning, product portfolio, product strategy and overall strategy, etc. The propositions were revisited by reviewing the data and looking for any confirming or disconfirming case. At the final stage, a new round of literature review was done to ensure theoretical sensitivity. The process of gathering data and analyzing patterns, categories and concepts, was ended by reaching theoretical saturation: No additional or new theoretical concept would emerge and the gathered data and analysis is sufficient to confidently construct the theoretical model. What emerged were propositions linking motivations, integration, complexity, synergy and autonomy with acquisition success and performance.

1.6.4 Sense Making

As for the process theorization or "sense-making" (Langley, 1999), strategies were considered based on accuracy, generality and simplicity. Different strategies would produce different models, thus the strategy used have an important impact on the nature of the emerging theory. In this study, several strategies were used in combination, such as *narrative strategy* for

storytelling, meanings and mechanisms; *grounded theory strategy* for finding meanings and identifying patterns; *visual mapping strategy* for identifying patterns and better understanding; *temporal bracketing strategy* for studying replications, repetitions over time and multiple cases with embedded design; and *synthetic strategy* for induction, hypothesizing and prediction.

Figure 1.3 illustrates the detailed research design using analytic induction, grounded theory, case study to reach the research findings. A final phase of validation was used before starting the theorizing process. Figure 1.4 illustrates the analytical layered process, with typologies of methodological approaches and outputs. It presents a step-by-step process including the method used and the expected outcome.

Figure 1.3

Detailed research design

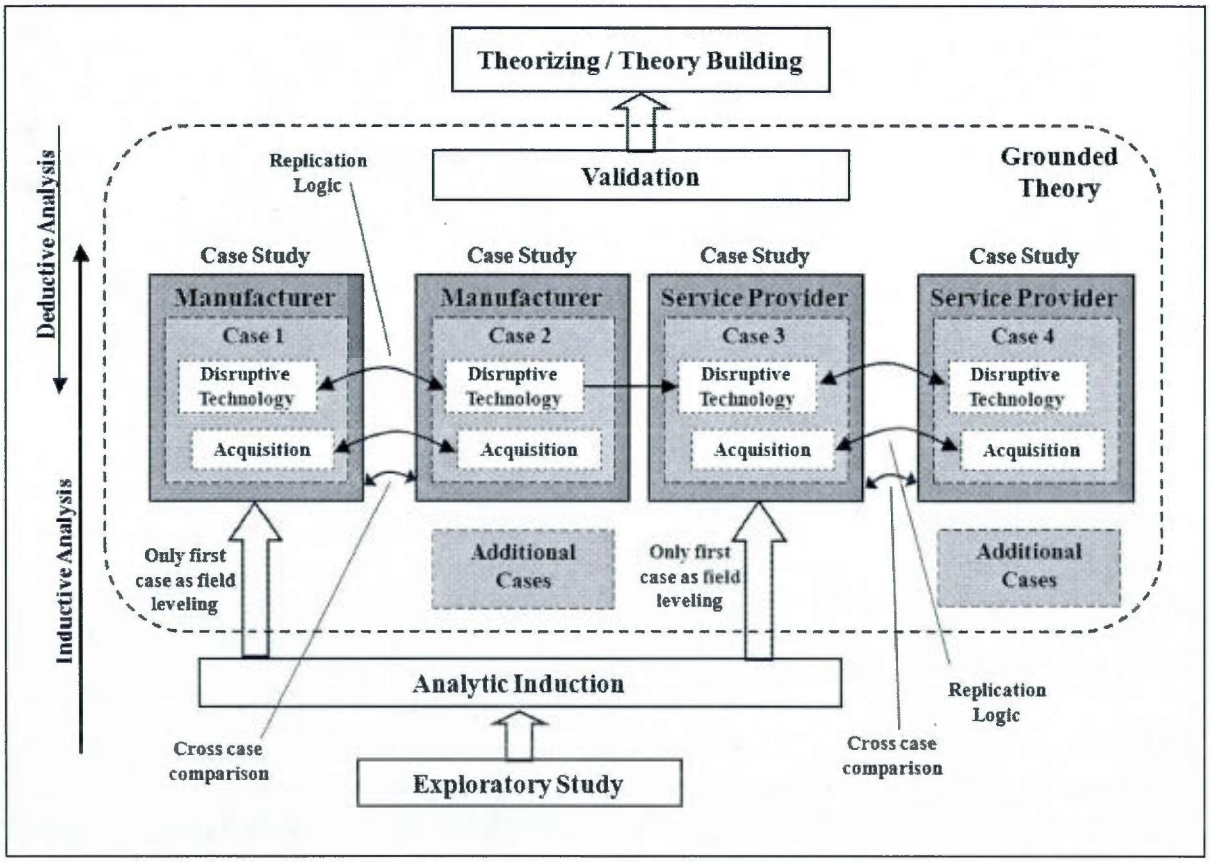
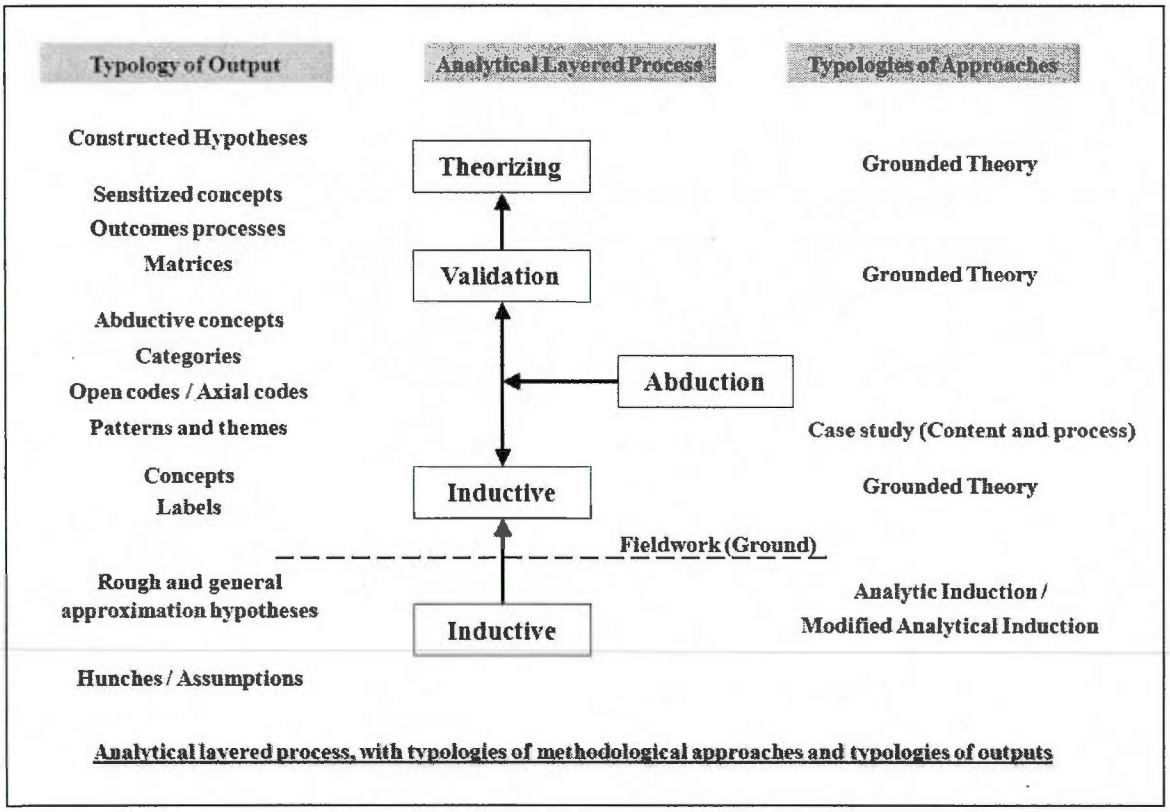


Figure 1.4

Analytical layered process, with typologies of methodological approaches and outputs



1.7 Data Sources

Qualitative data collected during the fieldwork of a naturalistic inquiry are a combination of 1) quotations from open-ended and interview-like conversations; 2) observations made during the fieldwork; 3) notes taken during and after the fieldwork has ended; and 4) excerpts from documents. Documents could possibly be, but not limited to, formal document of the companies involved in the case studies or beyond; reports such as plans, financial statements, sales forecast and outlook; market research studies, company internal or customer's presentations; minutes of meeting, brochures and publicity materials, existing product information and prototypes; and

brochures and sales materials. The documents could be of a public or confidential nature, and they could be found locally or internationally. Also, they could be collected not only from companies, but also from industrial and sectorial organizations, professional groups and associations, standard bodies, "open-sources" collaborative and participative networks, local and international workers' unions. Patton notes that: *"Case data consist of all information one has about each case: Interview data, observation, the documentary data (e.g., program records or files, newspaper clippings), impressions and statements of others about the case, and contextual information – in effect, all the information one has accumulated about each particular case goes into the case study."* (Patton, 2002 p. 449). Therefore, qualitative data collection can be drawn from many sources, combining various techniques and methodologies.

1.7.1 The Exploratory Study and the Resulting Preliminary Field Hypotheses

In an attempt to brainstorm on few potential hypotheses and before embarking on the fieldwork research, some potential hypotheses to be considered as a "walking stick" for pre-fieldwork were developed and presented in chapter 3.

As an outcome of the exploratory case study, identifying and understanding the emerging patterns and categories, led to the development of pre-fieldwork concepts and hypotheses. These hypotheses are not accurate construct, following the rules of construct validity, internal validity and external validity, as in traditional inductive methods of analysis; rather, they are based on the basic and preliminary understanding and analysis of the exploratory study content and on perception, hunches and intuition. They serve as a guiding tool in constructing a conceptual framework and as a starting point before entering the field and they will be disregarded as soon as the inductive analysis process begins. They will be revisited, later on, after some initial coding is done, to compare, cross-analyze, confirm and disconfirm: *"In analytical induction, researchers develop hypotheses, sometimes rough and general approximations, prior to entry in the field or, in cases where data already are collected, prior to data analysis. These hypotheses can be based on hunches, assumptions, careful examination of research and theory....Contemporary researchers have de-emphasized universality and causality and have emphasized instead the development of descriptive patterns of behaviors, interactions and perceptions."* (Gilgun, 1999 p. 268-269).

1.7.2 Fieldwork

The fieldwork consists of collecting data from fieldwork, with close proximity to the phenomena under study, and being sensitive to the context and the ecosystem. Collecting data will be from primary and secondary sources. The micro-case and mini-case approach will be used to collect primary and secondary data.

1.7.3 Mini-Case Approach for Collecting the Data

The case studies will be used to collect the data in a process-like systematic fashion. The primary case study analysis and the cross-case analysis will be the primary data for the grounded theory methodological process of open coding and axial coding, especially in the inductive portion of it. In the subsequent deductive portion, I will go back to the case studies or if necessary to fieldwork to confirm or disconfirm the emerging patterns and categories. In this way, case studies would be more of a process than a product of analysis, as Patton puts it *"The term case study refer to either the process of analysis or the product of analysis, or both"* (Patton, 2002 p. 447). Later, and after the conclusions of the inquiry are reached, part of the analysis will be reported as specific case studies on the selected units of analysis. Thus, case studies will constitute the product of the analysis or at least a part of it.

This qualitative inquiry has one "single-case" with embedded and layered "mini-cases" and "micro-cases". Each case will have multiple embedded units of analysis, concerning the phenomenon under study.

1.7.4 Sampling Size

The study will cover both, the manufacturers' segment and the service providers' segment of the telecommunications industry. Each segment will be studied using a minimum of two principal cases. Therefore, a minimum of four cases would be used to cover the industry. It is possible to add one or two more case in case the inquiry requires more data collection, comparison and analysis. It is possible to find an interesting case, after the case study phase was

done. Naturalistic qualitative inquiries require a certain amount of flexibility in the research design in case the study needs to go deeper into the data.

1.7.5 Primary Data

1. Semi-structured interviews / Open-ended interviews
2. Interview-like conversations
3. Field observations
4. Field notes
5. Survey

Selecting Stakeholders for the Interviews. The interviews and interview-like conversations are valuable sources of data collection in the qualitative analysis, as part of the study. Both should cover most of the stakeholders concerned with the research within the context the high-tech industries, mainly the telecommunications and networking industries. The stakeholders were identified as:

- Top and middle management in the companies forming part in the acquisitions:
  - Planning
  - Finance
  - Technology / Engineering
  - Marketing
- First level employees in the companies forming part in the acquisitions
- External consultants who assisted and participated in the pre-acquisitions formation
- Corporate customers who witnessed the acquisitions and its impact
- Government regulators who approved the acquisitions

An interview will be conducted with each of these groups in the selected company forming part of the survey. Each interview will be divided into two sessions; a non-directed and a directed session, starting with an introduction. A final word or conclusion is left to the interviewee. The interviews will be recorded and taped if this is accepted by the interviewee and

under his condition (Daunais, 1992). The overall duration of each interview (including both sessions) should not exceed more than one hour.

The selection of the interviewees will be based on the following general criteria (Huber & Power, 1985):

- Referrals from the director of research;
- Referrals from inside the company, as being the right person having all the right facts;
- Being emotionally detached from the acquisition formation;
- Being objective in representing retrospectively the facts.

Sample of Interview Guide. A sample of an interview guide is being presented as appendix A. Moreover, appendix B represents a sample of an interview, with questions and answers.

1.7.6 Sampling Strategies

As discussed previously, the sampling strategies selected for this research are the following:

1. Extreme or deviant case sampling
2. Intensity sampling
3. Maximum variation
4. Homogeneous sampling
5. Critical case sampling
6. Snowball or chain sampling
7. Criterion sampling
8. Theory-based sampling, operational construct sampling, theoretical sampling
9. Confirming and disconfirming cases
10. Stratified purposeful sampling
11. Opportunistic or emergent sampling

Figure 1.5 presents a graphical depiction of the positioning of each of these strategies. Table 1.1 presents the rational behind the selection of these sampling strategies and the potential stakeholders

Figure 1.5

An illustration of the sampling strategies

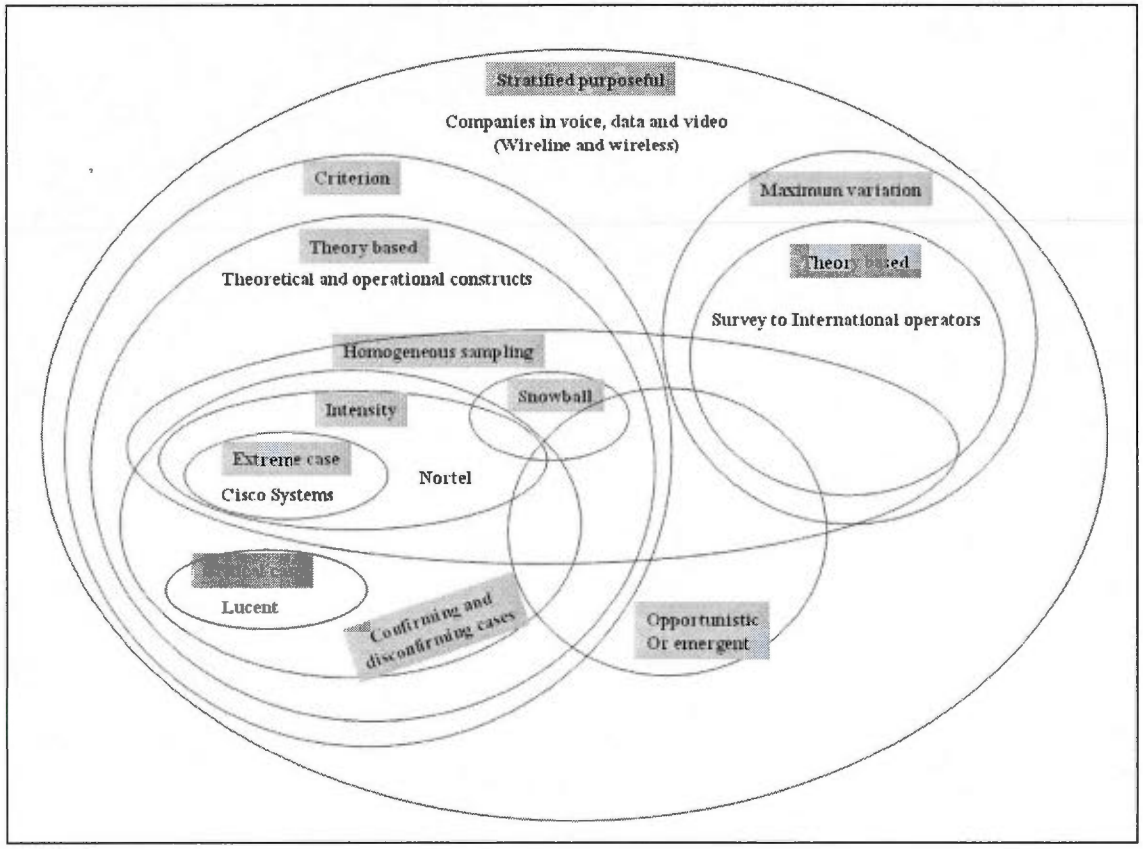


Table 1.1

Rational of sampling strategies

Strategies	**Potential stakeholders**
Extreme or deviant case sampling:	Cisco Systems (More than 114 acquisitions during 7 years, 23 acquisitions in one year)
Intensity sampling:	Cisco Systems Nortel Networks (Same acquisitions but with less intensity than Cisco)
Maximum variation:	Survey to international service providers using: - Geographical variations (North America, South America, Europe and Asia) - Industrial countries, emerging economies and developing markets; - Highly competitive markets and less competitive *(See preliminary list of potential service providers for the survey)*
Homogeneous sampling:	- All the manufacturers that benefited from the acquisition wave - Service providers in Canada (being in one ecosystem, facing the same context and environmental challenges)
Critical case sampling:	Manufacturers: Lucent Technologies (now Alcatel-Lucent)
Snowball or chain sampling:	Unknown for now
Criterion sampling:	- All manufacturers who adopted acquisition as a business model - New entrants (operators) in the service providers' market
Theory-based sampling, operational construct sampling, theoretical sampling:	- Manufacturers + theoretical constructs: + Diffusion of innovation + RBV and Dynamic capabilities + Strategic assets, substitution and complimentarily + Network theory and collaborative learning + Strategic alignment and R&D (only examples, see the list in section: Literature review / Conceptual Framework) - Service providers + theoretical constructs: + Market based view (barriers to entry, bargaining power, substitute products) + Markets, hierarchies and firm boundaries + Diversification + Absorptive capacity and internal R&D + Deregulation, regulation, protectionism and liberalization + Core competencies and strategic alignment + Resource dependency, lock-in and economies of scope + Economies of scale and network externalities + Strategic fit and synergy + Complexity, talent recruitment and retention + Cannibalization
Confirming and disconfirming cases:	For later stage deductive analysis, confirmation and theory building
Stratified purposeful sampling:	Only telecommunications companies (manufacturers and service providers) in the technology/market segment of voice, data, video, multimedia, triple and quadruple play, whether wireline, wireless, or satellite.
Opportunistic or emergent sampling:	On the spot, not know now.

1.7.7 The Survey

The survey could be conducted either in the manufacturers' segment or the service providers' segment of the telecommunications industry. However, it will be more useful and pertinent to use it in the service provider segment, to achieve generalizability, as the units of analysis in this segment is (1) the disruptive technology (2) the industry itself. The units of analysis for the manufacturers' segment will be (1) the acquisition (as a critical event) and (2) the disruptive technology (as a critical event).

The survey, in order to achieve generalizability, should cover different geographic areas, other than the one covered by the cases studies in the service providers' segment (two cases). Geographic areas could represent a variety of industrial nations, emerging economies, and developing markets. Also, it could cover a variety of competitive markets (highly competitive and less competitive markets), and the other extreme on the continuum; the monopolies. The variation could be represented also by purely geographic areas in an attempt to generalize the research findings, based on the fact that one of the final block studied, is the impact on the industry.

The representation of the survey findings will take the form of statistical analysis and graphical analysis, and will be considered as a quantitative data, as part of the qualitative data collected. This survey and its results, in addition to the qualitative findings of this inquiry, would serve as the basis for further research in a new quantitative inquiry, outside of the scope of this research proposal. Table 1.2 presents the list of companies selected for the international survey.

Table 1.2

List of companies (service providers) for the international survey:

Geographic variations	Country/ Company	Industrial Nation	Emerging Economy	Developing Market	Highly Competitive	Less
Canada						
	Tellus	✓			✓	
	Videotron	✓			✓	
United States	Verizon	✓			✓	
	Sprint	✓			✓	
	Vonage	✓			✓	
Europe						
	British Telecom	✓			✓	
	Telefonica Espana	✓			✓	
Latin America	Codetel			✓	✓	
	Wind Telecom			✓		✓
	Mexico Telemex		✓		✓	
Asia						
	Japan DoCoMo	✓			✓	
Africa & ME						
	Orascom Telecom			✓	✓	
	Etisalat			✓		✓

1.7.8 Secondary Data

Secondary data could make use of the following sources:

- Formal document of the companies involved in the case studies or beyond;
- Reports:
  - Plans
  - Financial statements
  - Sales forecast and outlook

  - Market research studies
- Company internal or customer's presentations
- Minutes of meeting
- Brochures and publicity materials
- Existing product information and prototypes
- Sales materials
- Blogs on the Internet
- Documents from:
  - Industrial and sectorial organizations
  - Professional groups and associations
  - Standard bodies
  - "Open-sources" collaborative and participative networks
  - Local and international workers' unions

Table 1.3 presents a summary of the data sources during the three phases of the research: Exploratory study, grounded theory process and the validation phase.

1.8 Data Analysis

> *"We have few agreed-on cannons for qualitative data analysis, in the sense of shared ground rules for drawing conclusions and verifying their sturdiness"* (Miles & Huberman, 1984 p. 16).

In a naturalistic qualitative inquiry, the analysis of the collected data does not start at the end of the data collection phase. Data collection and data analysis are both an integral part of one process which the outcome should be reaching a consensus (among the data) that all the patterns, typologies and categories that emerged have reached "saturation" in a confirming fashion and that there are no more disconfirming cases for further analysis. Therefore, the data collection task/process is overlapped with the data analysis task. This is especially essential in the case of a combination of inductive and deductive approaches, when using "grounded theory" to generate theories from the emerging data and patterns. The inquirer goes back and forth between the data

and the theories, whether derived from the literature or constructed based on the emerging categories embedded in the collected data. In any case, each qualitative research is special and it depends a great deal on the researcher preparation, knowledge, intellect and creativity: *"There are no formulas for determining significance. No straightforward tests can be applied for reliability and validity. Each qualitative study is unique, the analytical approach used will be unique....Qualitative analysis ultimately depends on the analytical intellect and style of the analyst."* (Patton, 2002 p. 432-434)

Table 1.3

Summary of data sources during the three phases of the research

Exploratory research	Surveys (1997-2009) -The Economist - New York Times - IEEE Spectrum magazine - Forbes magazine - Wired magazine - Wall Street Journal - Financial Times - Washington Post - Telecommunications magazine Interviews (6)
Grounded Theory	Interview-like conversations (32) International survey Industry companies' document (250+) Theoretical review/sensitivity (500+) Internet blogs (14+) Case studies (4+)
Validation	Academic conference presentations (11) Papers accepted in conference proceedings (9) Industry conference presentations (1) Doctoral consortia presentations (4) Interview-like conversations (3)

1.8.1 The Interplay Process of Inductive and Deductive Analysis

Qualitative inquiries are usually inductive as they do not start by a theoretical model and hypotheses testing, like in the case of the deductive process used quantitative inquiries. However, in the process of being emerged in the data; patterns, typologies, categories, and hopefully concepts and theories will be identified. To confirm and disconfirm those findings, the qualitative inquirer who started by an inductive approach, would move into a more deductive-like approach to do just that. This process is described by Patton (2002) as follows: *"Inductive analysis involves 'discovering' patterns, themes, and categories in one's data. Findings emerge out of the data, through the analysts' interactions with the data, in contrast to deductive analysis where the data are analyzed according to an existing framework. Qualitative analysis is typically inductive in the early stages, especially when developing a codebook for content analysis or figuring out possible categories, patterns, and themes. This is often called 'open coding' (Strauss & Corbin, 1998 p. 223) to emphasize the importance of being open to the data. 'Grounded theory' (Glaser, 1992; Glaser & Strauss, 1967) emphasizes becoming immersed in the data – being 'grounded' – so that embedded meanings and relationships can emerge.....Once patterns, themes, and /or categories have been established through inductive analysis, the final, confirmatory stage of qualitative analysis may be deductive in testing and affirming the authenticity and appropriateness of the inductive content analysis, including carefully examining deviate cases or data that don't fit the categories developed. Generating theoretical propositions or formal hypotheses after inductively identifying categories is considered deductive analysis by grounded theorists Strauss and Corbin. 'Analytical induction', in contrast to grounded theory, begins with an analyst' deduced propositions or theory-derived hypotheses and is a procedure for verifying theories or propositions based on qualitative data. Sometimes, as with analytic induction, qualitative analysis is first deductive or quasi-deductive and then inductive as when, for example, the analyst begins by examining the data in terms of theory-derived sensitizing concepts or applying a theoretical framework developed by someone else. After or alongside this deductive phase of analysis, the researcher strives to look at the data afresh for undiscovered patterns and emergent understandings (inductive analysis)."* (Patton, 2002 p. 453-454)

1.8.2 The Process of Analysis: An Objectivist-like Procedure and Techniques

Qualitative research is often criticized for being too 'subjective' and 'interpretative' as it relies on the interpretation of the researcher, based on his understanding, critical analysis and creativity. In fact, another layer of interpretation lies in the interpretation of the subjects under studied and how they see and 'interpret" their 'real world'. This could be true from an epistemological stance, as in the 'subjectivist', 'constructivist' and 'phenomenologist' paradigm, where the actors and the researcher are not describing the world as 'it is' out there, but they interpret it, as they see it with their own experience, emotions and intuition. However, subscribing to this paradigm does not, in my opinion, limit the scientific value of the process of analysis and consequently the resulted findings. Qualitative methods of inquiry, such as grounded theory, offer a detailed procedure-like approach to analyzing data, with confidence that the theorizing process is based on a comprehensive approach and rigorous steps, procedures and techniques. This process is composed of the following major steps:

1. After the data is collected, it starts by identifying general concepts and labels, whether they are found explicitly in the data (indigenous), or synthesized and labeled by the researcher, if they are not found in the data, but appear to be emerging concept of significant level of importance. (Patton, 2002 p. 454-458)
2. The following task is to identify major patterns, themes, and categories. (Patton, 2002 p. 458-460)
3. Identifying and constructing codes in a codebook. (Patton, 2002 p. 463-465)
4. After identifying and classifying codes, comes the next step is converting those codes into systematic categories. However, this task has to comply with two important rules; (a) convergence, which is examined based on 'internal homogeneity' and 'external heterogeneity'; and (b) divergence. (Patton, 2002 p. 465-466)
5. Logical analysis and abduction to create matrices. (Patton, 2002 p. 469-471)

Figure 1.4 presents the analytical layered process, typologies of approaches and the resulting outcomes, used in this research.

1.8.3 Causal / Cognitive Mapping for Analyzing and Interpreting Findings

The research on acquisitions in the context of the high technology industry is a complex issue and it is much more complex than it seems, when using one approach. As noted by Hafsi and Thomas (2005 p. 509) "*collective action cannot be understood if it is broken down into parts to be studied separately. As reality is complex, it is more appropriate to study it in its totality. This means not only studying all the parts together but also their inter-relationships, even if the result is an incomplete and imperfect understanding*". Strategy is classified into divisional functions such as marketing, finance, operations; it is grounded in behavioral science, political science, anthropology, sociology, psychology, economics and finance, it combines different disciplines such as business policy and strategic management, industrial organization, organizational economics, economics sociology, human behavioral science, organizational theory, it uses different theories borrowed from distinct areas of social science such as transaction cost, resource based view, network theory, knowledge-based view and market-based view. " *It feels like a vast array of diverse and uncoordinated detailed observations that are scientifically respectable, yet incoherent in practice*" (Hafsi & Thomas, 2005). Therefore the need for an integrative and holistic approach that encompasses as much variables as possible, constructing the reality as observed by the researcher, and painting a realistic picture of the reality using a constructivist approach.

The complexity of the research on acquisitions has led to the use of cognitive simplification by both academic researchers and practitioners. Decision makers use similarities and analogies to similar situation and they overestimate or underestimate the potential impact of their decisions due to the limited number of factors used in the analysis (Duhaime & Schwenk, 1985). Cognitive simplification is demonstrated to be widely used in the process of decision making and when dealing with complex and interrelated issues (Schwenk, 1984). Bounded rationality is the inability of the human to process more than a limited number of alternatives and to process them all, which limits his ability to solve complex problems (March & Simon, 1958; Simon, 1976). Under those limitations and facing complex issues, the process of decision making was researched in the context of structuring the unstructured (Mintzberg, Raisinghani, & Theoret, 1976), making judgment under uncertainty (Tversky & Kahneman, 1974), and the psychological

determinants of bounded rationality and its implications for decision making (Taylor, 1975). The cognitive complexity in the strategic decision process has been explored by Hitt and Tyler (1991). Also Tyler and Steensma (1995) explored the technological collaborative activities using a cognitive perspective: "The cognitive limitations affect the simplified mental models or schema top executives use to get a grasp of the situation at hand" (Schwenk, 1984; Walsh, 1995) as cited by Tyler and Steensma (1995). Finally Eisenhardt and Zbaracki (1992) provides a extensive comparison between bounded rationality, power and politics and the garbage can model.

Cognitive mapping is used to represent the mental schema of the researcher when studying an issue (Eden & Ackermann, 1998) or as a representation of the representation of the mental schema of a human subject related to a research issue (Cossette & Audet, 1994). They are constructed based on a subjectivist approach, by using concepts or variables related to the issue under investigation and links or relations between the concepts reflecting their interrelations, strength and directions. Cognitive maps helps to uncover the knowledge structure and the dominant logic within the firm related to the subject under investigation (Bettis & Prahalad, 1995). It assist in giving meaning and signification, or sense giving, to the issues related to a central concept, question, vision or strategy (Gioia & Chittipeddi, 1991).

Cognitive mapping techniques have been used in different areas of the administrative science and for different purposes. Some examples include: mapping conceptual models in macroeconomic theory (Cossette & Lapointe, 1997); analysing the thinking of F. W. Taylor (Cossette, 2002); supporting information system development (Ackermann & Eden, 2005); analysing policies in the public sector (Eden & Ackermann, 2004); analyzing retail location decision making (Clarke *et al.*, 2003); analyzing technology driven and model driven approaches to group decision (Morton, Ackermann, & Belton, 2003); analyzing delay and disruption (Williams, Ackermann, & Eden, 2003); analyzing the institutional influences on managers mental models of competition (Daniels, Johnson, & Chernatony, 2002).

1.8.4 Cognitive / Causal Mapping as a Research Tool

The research used the cognitive mapping technique as a qualitative research tool for analyzing qualitative data. The cognitive mapping technique was used with the aid of the

software package 'Decision Explorer', which allows for the introduction of the data collected, and the subsequent analysis based on the produced output in the form of quantitative data and graphic maps.

The data collection was based on the literature on strategic management related to acquisitions. Using the ProQuest and JSTOR databases, more than 80 articles from top management journal covering acquisitions were identified and carefully reviewed. Only 56 articles, where the main objective was to study acquisitions' motivations, impact and critical success factors, were chosen as pertinent to the research subject. Articles covered different theories and used different research methodologies: Qualitative and quantitative. They were studied thoroughly in search for concepts related to acquisitions. Some articles were eliminated because the constructs were poorly defined. The collected data was classified into (1) motivation or trigger (causes); (2) impact (consequence); and (3) critical success factor. A total of 85 concepts were found. After preparing a list of concepts, all the concepts were checked against each other to eliminate duplication and to ensure that each concept is unique and well defined on its own term and distinct from another, which ensures the construct validity (Lincoln & Guba, 1985a). A final number of 74 concepts were selected with their respective links to other concepts as described in the literature.

Each concept was analyzed using source and theory triangulation methods to ensure the validity of the construct and its agreement on the same definition of the concept, and its links. This ensures the credibility, internal validity and reliability if another researcher decides to embark on analyzing the same subject. After analyzing each concept, its relationships in term of causal link or consequential link with other concept were analyzed. Direct and indirect relationships were also analyzed. No overlap between direct and indirect relationships was allowed, unless specified in the literature explicitly. Triangulation of sources was also used in this regard. In the list of concepts (see chapter 5), and for reliability and auditing purposes, each concept was provided with a list of all citations from which it was drawn and applied in the model. In addition, only links described in the literature were listed, with their citation references. All citations are included in the bibliography.

1.9 Criteria for Quality and Triangulation

Analysis Approach and Collected Data Interpretation adopted from (Lincoln & Guba, 1985a; Yin, 1989)

Prior to the data collection phase and fieldwork, a definition of the research designs will be completed. This will serve as a guide or a research map prior to the data collection phase, a guide for the process of collecting, analyzing and interpreting observations. This is a logical model of proof that will allow me to draw inferences concerning casual relations among the acquisitions, the process steps and the critical success factors under investigation. This involved 5 elements:

Study question. Defining the what, where, how and why.

Study propositions. Each proposition will direct attention to something that should be examined within the scope of this study. The proposed propositions could be the condition under which the acquisitions is formed (what is the situation before the acquisitions, is there any alternative, how the decisions is formed and the step taken) and the effect it has (what is the expectations before and after the acquisitions, how is the company really performing after the acquisitions)

Unit of analysis. In this research four units of analysis are proposed.

Linking data to propositions and criteria for the interpretations of the findings. "Pattern matching" is whereby several pieces of information from the same case maybe related to some theoretical proposition, hoping that the different patterns are sufficiently contrasting that the findings can be interpreted in terms of comparing at least two rival propositions.

Theory development and generalization from case study to theory. My goal is to have a theoretical proposition before starting the data collection phase, as an essential step. According to Yin (1989), this provides strong guidance in determining what data to collect and the strategies

for analyzing the data. In addition, if appropriately developed, the theory will be the level at which the generalization of the case study will occur. The theory will be revisited in different phases and against all findings, until one will be found that fit the generalization criteria.

1.9.1 Case Study Design

The research will be based on a *multiple case*. However, although it is based on multiple cases, most of the emphasis will be on one company as a *critical case* (Cisco Systems), while the other two will serve to reinforce the model, in which one will serve as the *negative case* (Lucent Technologies). Furthermore, replications of acquisitions within the same case will be used to validate the theoretical model and to reach the desired generalization. The replication tactic will be used on the level of the acquisitions (a unit of analysis) by the same company, while attempting to measure its respective performance. Therefore, the research will have an embedded design with replication logic and different unit of analysis.

1.9.2 Criteria for Judging the Quality of the Research Design

Construct validity. Developing a sufficiently operational set of measures by: (1) respecting the nomological validity (constructs and measures have a theoretical base from the literature) and trait validity (each construct is well defined and measures only the specific construct); (2) respecting the convergent and discriminate validity of the constructs.

Internal validity. Through respecting the tactic of pattern matching for the propositions and replications, by establishing complete causality and effect and by using story telling for explanation building.

External validity. Making sure that the study's findings are generalizable beyond the immediate single and multiple case studies, by striving to generalize a particular set of results to some broader theory and by testing the theory through replications of the findings in a second or third unit of analysis (another acquisition and another company within the multiple case)

Reliability. By taking the necessary steps to document all the procedures during the whole process of collecting and analyzing, and therefore guarantying that if another researcher follows the same documented procedures, he would reach the same results.

1.9.3 Criteria for Evaluating the Trustworthiness of the Research

Validity and reliability. To achieve validity, one precondition is to achieve reliability. Furthermore, in the words of Kerlinger (1973, p.422, as cited by Lincoln, Y.S. and Guba, E.G., (1985a)), reliability is synonymous to (1) dependability (2) stability (3) consistency (4) predictability, and (5) accuracy, which will be respected in the induced hypothesis. One way to achieve reliability will be through repetitions or replications, as I intend to test my induced hypothesis and potential theoretical model against all the replications, represented by the various acquisitions the company conducted in the time specified by the research scope of work (1994-2009), in the single case study and later by replicating the research on the multiple cases for generalization.

Credibility. By engaging in activities that increase the probability that the findings produced will be credible, such as: Prolong engagement; persistent observation; using different triangulation methods (methods triangulation, triangulation of sources, theory triangulation); peer debriefing (through conferences and journals' peers evaluation and feedback), etc.

Transferability. By respecting that the findings and the theoretical model could be transferred and generalized, to other companies in the same sector, to other sectors in the same industry and to other industries, which is the main characteristic of a successful theory, one that could be applied to most of the cases, with no or few exceptions. The rigorous testing of the construct until they fit will do this.

Dependability. As Guba (1981, as cited by Lincoln and Guba (1985a)) claimed, there is no validity without reliability and there is no credibility without dependability. We will achieve dependability by using "overlap methods" (or triangulation) and stepwise replication or otherwise known as replication in all of the acquisitions studied within one company and for the three

companies. Moreover, all the documentation required explicitly to perform an auditing process, would be prepared and presented, as part of the process documentation.

1.9.4 Quality and Limits of the Chosen Methods

The evaluation of validity and rigor is different in quantitative and qualitative research. In quantitative research the instrument of measurement is constructed following specific rules and procedures, while in qualitative research the instrument of measurement is the researcher with his experience, understanding, careful analysis and creativity: *"Validity in quantitative research depends on careful instrument construction to ensure that the instrument measures what it is supposed to measure. The measure must then be administered in an appropriate standardized manner according to prescribed procedures. The focus is on the measurement instrument – the test items, survey questions, or other instruments tools. In qualitative inquiry, the researcher is the instrument. The credibility of qualitative methods, therefore hinges to a great extent on the skill, competence, and rigor of the person doing the fieldwork."* (Patton, 2002 p. 14)

However, the choice of qualitative naturalistic enquiries and the important concept of 'objectivity' are in the center of a paradigm debate between critics who perceive qualitative research too 'subjective' as it is tinted by the interpretation of the inquirer and the defenders of the qualitative research, who believe that it is more in line with 'objectivity', which is the basis for the scientific method of inquiry, investigation and research.

1.9.5 Criteria for the Evaluation

In qualitative research, findings are evaluated based on their 'substantive significance', in contrast to the quantitative research, which is based on 'statistical significance. In trying to differentiate between paradigms, Patton presented 'alternative sets of criteria for judging the quality and credibility of qualitative inquiry' (Patton, 2002 p. 544), according to a typology of two different perspectives: (1) Traditional scientific research criteria and (2) social construction and constructivist criteria and notes that 'grounded theory' lies in the first category:

"Traditional scientific research criteria:

- *Objectivity of the inquirer (attempts to minimize bias)*
- *Validity of the data*
- *Systematic rigor of fieldwork procedures*
- *Triangulation (consistency of findings across methods and data sources)*
- *Reliability of coding and pattern analyses*
- *Correspondence of findings to reality*
- *Generalizability (external validity)*
- *Strength of evidence supporting causal hypotheses*
- *Contributions to theory*

Social construction and constructivist criteria:

- *Subjectivity acknowledged (discusses and takes into account biases)*
- *Trustworthiness*
- *Authenticity*
- *Triangulation (capturing and respecting multiple perspectives)*
- *Reflexivity*
- *Particularity (doing justice to the integrity of unique cases)*
- *Enhanced and deepened understanding (Verstehen)*
- *Contribution to dialogue."* (Patton, 2002 p. 544)

The evaluation of validity and rigor is different in quantitative and qualitative research. In quantitative research the instrument of measurement is constructed following specific rules and procedures, while in qualitative research the instrument of measurement is the researcher with his experience, understanding, careful analysis and creativity: *"Validity in quantitative research depends on careful instrument construction to ensure that the instrument measures what it is supposed to measure. The measure must then be administered in an appropriate standardized manner according to prescribed procedures. The focus is on the measurement instrument - the*

test items, survey questions, or other instruments tools. In qualitative inquiry, the researcher is the instrument. The credibility of qualitative methods, therefore hinges to a great extent on the skill, competence, and rigor of the person doing the fieldwork." (Patton, 2002 p. 14)

1.10 Ethical considerations

There is a list of ethical considerations, to be an integral part of the research framework, scope and objectives. This list consist of giving the participants enough information about the study, the ability of the participant to withdraw without penalty, the elimination of all unnecessary risks, treating the participant with respect and dignity and within a safe environment, etc. (Glesne, 1992)

PART I

EXPLORATORY STUDY

CHAPTER II

STRATEGY FORMULATION: THE CASES OF CISCO SYSTEMS, NORTEL NETWORKS & LUCENT TECHNOLOGIES

The high technology industry is not like any other industry. It is characterized by being a high velocity, turbulent and uncertain environment. Companies in this important sector of the global economy face unprecedented challenges in keeping up with this unstable environment, which affect the technologies, the product and the organizations. In the context of the business policies and strategic management fields, this paper explores the important and critical issues involved in the process of the formulation of strategies within this industrial sector. It covers issues such as leadership, competitive advantage, inter-organizational relations, organizational culture, environmental influences, and management of change, leading to a better understanding of this complex environment and how strategies are formulated to sustain competitive advantage and superior performance.

2.1 Introduction

The function of strategy is to position the organization with its environment and industry structure, matching the internal resources to external opportunities, and considering the organization's strengths and weaknesses, with the objective of creating a competitive advantage and an efficient economic performance, whether via an intentional and deliberate strategy or an emerging and incremental strategy, and whether by the individual role of the leader and the leadership board alone or by the collective active participation of all the organization's actors. The strategic management function involves setting the objectives for the organization or the firm, developing the policies and plans to achieve those objectives and allocating the necessary resources for the implementation of this plan and the achievement of the objectives. It is

performed by the highest level of the managerial activity and it is usually performed by the chief executive officer or CEO, who provides the overall direction of the company is responsible before the stakeholders for achieving those objectives. A distinction must be made between the formulation of the strategy and the implementation of the strategy, and also between the process of formulation the strategy and the content of the formulated strategy.

The concept of strategy derives from the Greek word *Strategos* or the leader of the troops, as the ancient Greeks understood, it is the skills necessary to plan, manage and carry on with the task of conducting war. Since then, it has been used in the military organizations, in the teaching and practice of warfare. In the business administration academia, its foundation is due to Selznick (1957), Chandler (1962b), Ansoff (1965)and Andrews (1971), in the context of business policies, concerned with the study of strategy formulation for top executives. The field of strategy has moved from business policy to strategic management with two dominant paradigms the industrial organization or the market-based view (Porter, 1980b), which refer the firm's competitive advantage to the firm's position within the industry and the resource-based view (Prahalad & Hamel, 1994) which refer the competitive advantage of the firm to its internal strengths and weaknesses based on the efficient creation, management and utilization of the resources, whether internal or external.

In the strategic management field, the organization and its strategy are influenced by the individual role of its leader, by the organizational environment in which it operates and by the collectivity of the actors or participants of the organizational activities. The influence of each of these factors is different from one organization or firm to the other. In some firms, the role of the leader is dominant even tyrannical, not allowing for the participation of the management team in the decision-making process and strategy formulation (Vries & Miller, 1991; Westley & Mintzberg, 1989). While in others, the management team, with the collectivity of the base is active participants in the decision-making process and strategy formulation, with the leader setting the general objectives and providing the structure (Pascale, 1984; Quinn, 1978). Some organizations could play a passive role in reaction to the environmental influences (Vries & Miller, 1991), while others would play a proactive role in trying to shape and influence the environment or enacting the environment (Weick, 1984).

The environment plays an important role in shaping the strategy of the organization and influencing its actions. Since the prediction of Alvin Toffler (1970; 1980) in his books "Future Shock" and "The Third Wave", of an accelerating pace of change due to the technological revolution of the information and telecommunication technologies, several industries have been influenced by this rate of change, among them the telecommunication industry. The change was driven by the rise of the computer industry and the data networking industry. From this emerged some disruptive technologies, as defined by Clayton Christensen (1997) in his book "The Innovator Dilemma", such as the underlying technologies based on which the Internet is built and led to the creation of many other technologies, innovations, the convergence of existing technologies and the emergence of new products in an accelerated pace and a short period of time.

During the 1980s and the 1990s, the technology market was in continuous reshaping with the creation of thousands of small technology companies known as the high tech companies, conforming the dot com economy, and working in high technology industrial parks. The emergence of those new technologies, influenced the industry structure, but also created for those new emerging companies an environment that is characterized by high velocity, turbulent and with a degree of uncertainty. The rapid development of new technologies made the technology and product life cycle shorter than ever before. Technologies became obsolete in short period of time, and even in some cases before being applied into a product and launched into the market. Knowledge was dispersed over various technology sectors. The nature of this knowledge, based on which the technologies were created was embedded in socially complex and tacit knowledge. The innovation rate was intense and diversified over a variety of product categories. The direction of the market and the nature of the competition, however intense, were uncertain. However, companies starting-up or operating in this sector, and faced by those environmental and technological challenges, needed to provide rapid solution to market demands in a timely fashion and compete effectively, where sustaining a competitive advantage is an issue of survival, not only market share.

The question is how the companies in the high technology industry competed during this period, till the Nasdaq crash in 2001. How some firms sustained their competitive advantage, while others did not survive? Even large multinational companies, such as Lucent Technologies

and Nortel Networks (Northern Telecom) who had previously a dominant market position, were affected by this new environment and change in the rules of competition. Some adapted and others stagnated.

In the context of strategic management, this paper explores those questions by identifying the source of competitive advantage, the importance of inter firms relations and collaboration, the role of the leader, the importance of collaborative learning and organizational culture. The paper also discusses the decision making process and propose a conclusion on the process of strategy formulation.

To better explain the interrelation between those issues and their relationship with the process of strategy formulation, the paper uses the examples of strategic alliances, diversification and acquisitions, as explanatory devices, to relate theory to practice and to give some examples of documents cases of success and failure. As the objective of the paper is not to study alliances and acquisitions, they will be used only as a reference for further investigation. Three firms from the high technology sector will be used as examples: Lucent Technology, Nortel Networks and Cisco Systems.

2.2 Background

The high technology industry comprises the computer, the software, the biotech and the data networking firms. The focus of this paper is on the data networking firms. Those firms are manufacturers of data networking equipments for the telecommunications service providers and the corporate customers. Their products allow the access to communication networks and the transfer of information, voice as in telephony and video. The applications include services such as residential telephony, e-mail, long distance, Internet access, video conferencing, and cable television, among others.

Lucent Technologies was one of the largest telecommunications equipment manufacturers in North America. It was created from the spin-off of Bell labs and the creation of the operating bell companies. It had a large market share in the telecommunication service

provider market. However, with the emergence of the new data telecommunication technology, and the convergence of technologies (data, voice and video), innovated by smaller companies, it did not catch the wave and stay behind. Its large size, successful history, leadership style and internal organization culture, did not see the change coming and had a strategic myopia. Still, when it realized that the industry is changing, the competitive rules are different and that the customers are looking for the new innovative solutions, its routine, processes, shared beliefs codified in its organizational paradigm and culture prevented from changing, and it entered into inertia and a stagnation period. Lucent will be used as an example of the large stagnant company.

Nortel Networks, similar to Lucent in size and in the product and market it serves, did not have a strategic myopia. It realized that the change is essential to maintain its position in the market and adapted to the influences and challenges posed by the new competitive environment. One of their major strategies was to acquire a small successful firm Bay Networks, belonging to the cluster of the high tech firms who innovate in with the emerging technologies. Bay Networks it self was the product of the merger of two firms Synoptics and Wellfleet. Although Nortel was much larger than Bay at the time and had a different category of product for a different market, it realized and envisioned the future and knew that it did not have the required resources in term of skills and R&D capabilities to innovate in this new emerging technologies, within a short period of time, as those skills were rare, unique and inimitable and require a long time to be developed. In addition, it realized that it did not have the organizational culture in term of know-how, routine, processes and management experience to manage the business with respect to the new technology, which require a different set of skills. The acquisition of Bay allowed Nortel to move into the future, on the fast lane and to adapt its culture to the new environmental influences. In fact, one of the first decisions after the acquisition of Bay was to retain its CEO and ask him to visit all the divisions of Nortel, in order to champion the new culture, the one Bay had, and to lead the management for change. This was an example of adaptation to the new environmental influences, which included avoiding stretching in the past, avoiding stagnation and inertia due to the dominant logic and the organizational paradigm and old myth, and avoiding doing too much planning. To the contrary, the firm set a time pacing for a transition period and the emergence of a new myth, gained advantage from their past advantage and regenerated, started to move into the future with an accelerated pace by experimenting into the new technologies and the new businesses it generates, and it played the improvisational edge by improving into the new

territory. This leads Nortel to successfully manage the change and transition period in this chaotic environment and to capture on cross-business synergies that were creating by the joined capabilities of two successful companies. Nortel will be used as an example of the large size firm that adapted to the environment and lead a successful change management program.

Cisco Systems, now the largest firm in the equipment manufacturer category, started as a start-up company by a husband and a wife in Stanford University. Cisco grew to be the giant in this industry by changing and shaping the industry itself. At its earliest stages, its leaders and managers envisioned the future of their industry and shaped it to where it should go. Their had the clairvoyance of what the future will be like and "imageneered" their way to shaping this future and enacting their environment by setting the new rules of the business and developing the leading technology standards that dominated the industry and forced the lagers to adopt them. The success story of Cisco is one of creating a strategic intent and constructing a strategic architecture based on the core competencies needed for the future for a sustained competitive advantage and a leading position with the industry. This was done by creating, developing, recycling and maintaining the strategic assets, resources and capabilities that allowed the firm to develop a unique position and to create a unique strategy, leading to a strategic positioning. Those resources were unique, rare, difficult to imitate or duplicate and create value for the companies. This was done partially on internal development, referring to R&D research and management skills and on external resources available in their environment, through an extensive program of mergers and acquisitions of smaller start-up firms and few equally sized firms that were working on related technologies and had supplementary and complementary resources, identified as potential strategic assets. During a period of seven years (1990-1998), they had more than 94 cases of acquisitions; among them 18 acquisitions in only one year (1997). This is a clear case of constructivism and voluntarism. Cisco will be used as an example for enactment of the environment and controlling its destiny by shaping the future of the industry.

Start-ups will be as an example to small entrepreneurial firms founded by one or two entrepreneurs, and grew to be either a competitive threat to Cisco or a source of complementary strategic resources, and were acquired by the later. No specific names will be given, as the purpose is to explain the strategic context and the different strategies used by Cisco.

Figure 2.1 illustrates how the three companies (Nortel Networks, Lucent Technologies and Cisco Systems) engaged in an intensive acquisition spree. Due to the emergence of disruptive technologies in the telecommunication manufacturing segment, market segment boundaries collapsed. The demarcation line between markets segments became blurring, as the telephony, wide area networks, network access/edge and local area networks markets merged into one single data networking market within the manufacturing segment of the telecommunication/networking industry. Therefore, as a strategic response, each company tried to move into the other competitive market segments, than its own. As an example, Nortel Networks, while in the telephony and wide area networks market segments, decided to compete in the network access/edge and the local area networks market segments, by acquiring Bay Network, a competitive firm in this area. Another example, is when Lucent Technologies, while in the telephony market segment, decided to compete in the wide area networks and network access/edge market segments, by acquiring Ascend, who itself had previously acquired Newbridge. Lucent was acquired later on by Alcatel for the same rationality. A final example is when Cisco Systems, while in the network access/edge market segment, decided to compete in all other market segments, by acquiring established and startup firms in the three other segments, and beyond.

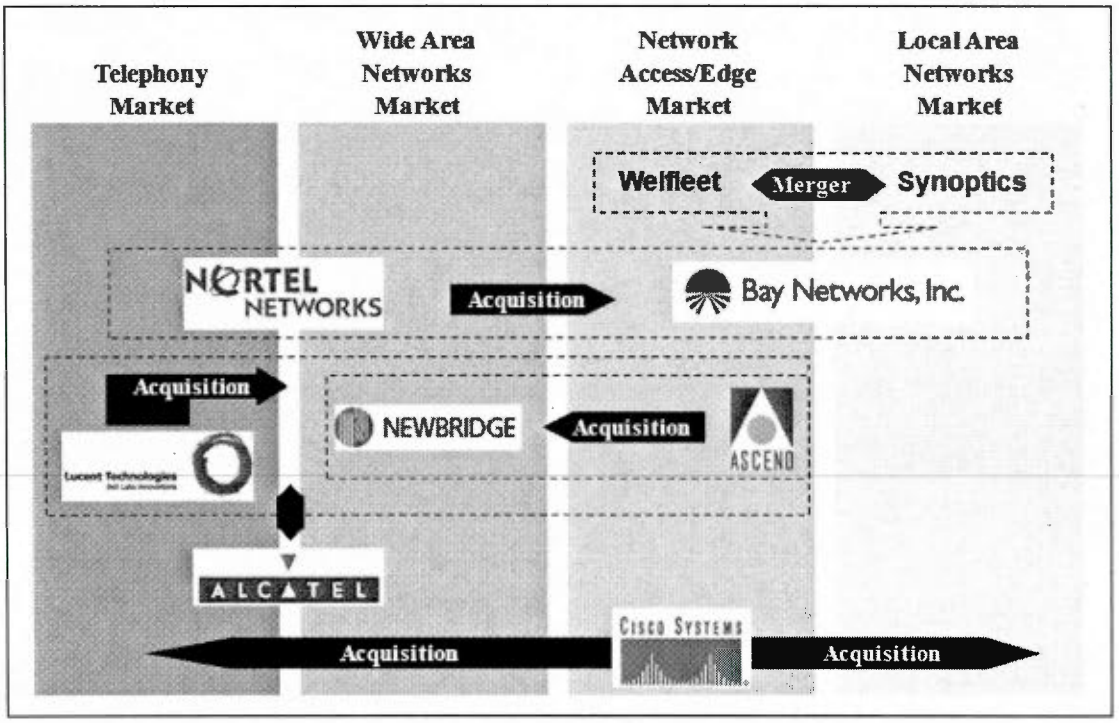
2.3 Core Competencies: A Source of Sustained Competitive Advantage

The concept of core competencies is based on the strategic assets, resources and capabilities possessed by the firm, and which are the source of sustained competitive advantage and unique positioning within its industry. Those strategic assets could tangible or intangible. Some examples are the superior technology created and developed by the firm, the research and development superior capabilities that are unmatched by the competition, the superior skills and talents of its researchers, managers and employees, the knowledge base and know-how embedded in the organization culture that is socially complex and tacit in nature, the experience and expertise of its managers in solving problem and decision making, the innovative capabilities embedded in its culture, the processes of its production, manufacturing and inventory systems, its sales force and pre and post sales services, its economic capital, liquidity and access to credit, its information systems that are integrated, credible, reliable and which reduce the asymmetry of

information between the management team and the rest of the employees for a better decision making, its business practices and quality management systems, and its organizational culture that is flexible, adaptable healthy.

Figure 2.1

Strategic acquisitions in the manufacturing segment



To constitute a core competency those assets need to be rare or not commonly available to others, unique or different than the one possessed by the competition by their superior value, knowledge content and complexity, durable or can be maintained, renovated and recycled over a long period without loosing value, non substitutable or not be replaced by others for the same advantage, inimitable, or cannot be imitated, replicated and copied by the competition, and idiosyncratic or based on high human or physical asset specificity. To be protected from the competition potential imitation and replication the firm could use casual ambiguity such as the

competition not being able to identify the strengths of the firm and where the source of competitive advantage does comes from. Those traits in the resources act as an isolating mechanism, such as to be invisible to competition like creating innovation, to be complex like in R&D research, to be tacit or implicit and embedded in the organizational culture and its memory, to be path dependent or based on strategic choice that lock the company into this path based on effort and dedication and to be time dependent as taking time to be created, maintained and productive.

2.3.1 SWOT Analysis

To identify those resources the firm conducts an assessment of the internal environment constituting an identification of the strengths and weaknesses of the firm, and an assessment of the external environment to identify the opportunities and threats in the present and in the future. The firm should not limit its assessment on the current situation, but to try to envision the future and imagine how it would be and how it should be. Following is an elaboration of a gap assessment defining the current resources and needs of the firm and its future needs in this imageneered future and the portfolio of resources need to construct this future. This is a participative and collective process, in which all employees are involved with a sense of belonging and not a rational one, in which they use their emotions, beliefs, perception and intuition. The employees are empowered to create this strategic architecture and the decision-making is top-down and bottom-up. Those resources could be developed internally based on the internal capabilities of the firm in areas such as research and development could be externalized based on strategic alliances with key partners in the same strategic group or vertically integrated through corporate mergers and acquisitions, as no one company is able to have all the resources it needs or develop them alone and internally, specially that most of these technological strategic assets are time and path dependent, require time and high investment, high risk and a tacit knowledge that is scarce and not transferable through human capital transfer. In addition, the steep learning curve for developing those skills and the shortened product life cycle makes it quite impossible to recover the high investment needed, and within this uncertain and turbulent environment.

2.3.2 Resource Dependency

The danger lies when the firm becomes resource dependent, whether on its internal current capabilities which prevent it from changing and acquiring the needed and better resources or when it becomes dependent on the external resources of a partner in a strategic alliance, which create an interdependence between them. Following the logic of population ecology, the diversity of the firm internal capabilities will enhance its probability for surviving by the possession of the resources needed to cope with an uncertain future.

2.4 Cisco's Success Story

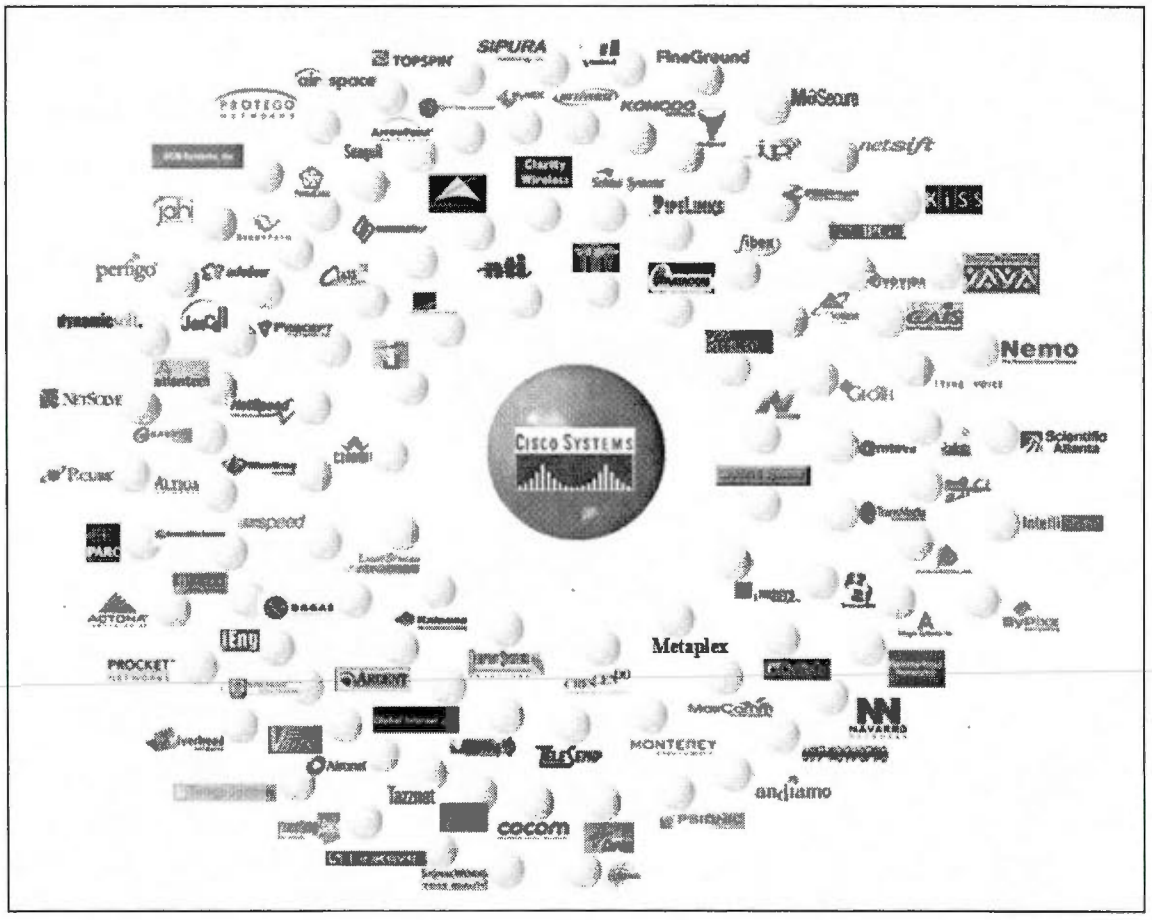
In fact, Cisco Systems, in its effort to enact the environment and shaping its future, had a very efficient analysis of internal needs and external opportunities done frequently on a formal base, once a month, and on an informal base done regularly through informal relations with other companies and the interaction with the individuals in its environment, knowledge networks, and formal relations through the strategic alliances and joint venture it had. The divisional responsibility of this SWOT analysis lied on two functional areas; the business units, each in its own product category, and the business development department under the leadership of M. Volpi, vice president for corporate development and corporate acquisitions. The business units focusing on the internal side of the firm, prepared on a regular basis an assessment of their internal needs based on an evaluation of their existing needs and the future goals and objectives set within the strategic architecture. Within this assessment of internal needs, the products to be developed to meet customer demands and projection, the technologies based on which those products would be developed and the required resources to develop those technologies and products. The assessment identifies the availability of those strategic resources, competencies, skills, tacit knowledge, R&D capabilities, tools, and if not existent, the possibility of developing them internally within acceptable R&D capabilities without dispersing the resources and by leveraging on the operating resources, within an acceptable budget that is financially feasible ensuring a high probability of return on the investment and within an acceptable time frame to meet market demands, projections and be the first to market with respect to the similar effort done by the competition.

This assessment was passed to the business development and corporate acquisitions department who worked closely and interact on a daily basis with the business units. The department role is to scan the environment continuously to identify two potential targets. First are potential external resources in term of technologies or human asset specificity, which match with the internal needs of the firm as identified by the business units, and second to identify potential opportunities in term of new technologies, new skills, new ideas, sources of innovation that are being developed by the competition and are not part of the existing strategic architecture of the firm, however could be an opportunity for diversification on related products, with complementary or supplementary resources.

As this external information was gathered, it was passed and communicated to the firm including the business units for further analysis with respect to their assessment of their needs and the match of the external resources, to the R&D labs to valuate the depth and intensity of the external innovation combined with their current capabilities to produce not similar but superior results within an acceptable time frame and budget, and finally, on a regular basis but not as frequent as the activities it selves, to the top executive and the board members to create an awareness of the competitive environment, its opportunities and threats, matched with an evaluation of the firm internal needs, its strength and weaknesses. As the environment is chaotic, turbulent, high velocity, changing constantly with a fast pace, with high degree of uncertainty about market demands, competitive positioning, state of current technologies and the probability of their obsolescence, the decisions were not taken from the top executive but left to the responsibility of the departmental head of corporate development and acquisitions, M. Volpi, who relied heavily on the managers of his department, and on the other hand on the assessment, interaction, and collaboration of the business units, which hierarchaly belongs to the product groups, each assigned a major product category, such as the "routing" group, the "switching" group and the "access" group just to name few examples. Figure 2.2 illustrates the intensive acquisition strategy lead by Cisco Systems. From the year 1994 to 2006, it successfully completed 107 acquisitions.

Figure 2.2

Cisco's intensive acquisition strategy



2.4.1 Learning by Doing

This in fact constituted a learning process for the whole company, as the industry was in a state of emergence, turbulence, and constant change. The information acquired was never available before. No one, or company intended or did this before. It was to everybody involved all new. However, they (the top executive, managers and other participants) were actively involved in shaping the future of their industry and positioning the firm in a unique highly

competitive position. They learn during the process of experimenting and improvisioning. They learn form their interaction within the firm and with the external environments through relations and links they had within the industry network. Decisions were taken by all participants on a daily basis, while keeping a sense of coherence and consensus. Those decisions were sometimes coming from the top executive downward, top-down, and most of the time, were initiated at the base ad the middle management level upward or bottom up. Those decisions were sometime taken and implemented as actions. Those decisions and actions constituted over time a pattern of actions, which if seen retrospectively constituted a strategy. This was not an intentional or deliberate strategy. It was an emergent strategy developed by sub-strategic systems over time (The firm underwent 94 acquisitions over seven years and in one year it completed 18 acquisitions). It was incremental as starting from an initial point, and then experimenting and testing as if muddling through. Those actions were structured to create an order to enable the organization to survive. We refer to the decisions and structured actions as the decisions to form strategic alliances and to use corporate acquisitions, in order to complement the existing resources and create cross sysnergies, or to fill the gap in the existing resources by relying on external source of innovation and talents. This created a myth, a perception of the world, in which the company can only survive and sustain a competitive advantage and positioning if it relies not only on internal sources of innovation, but on external ones, if available and matching their current and existing needs. This constituted the dominant logic at Cisco.

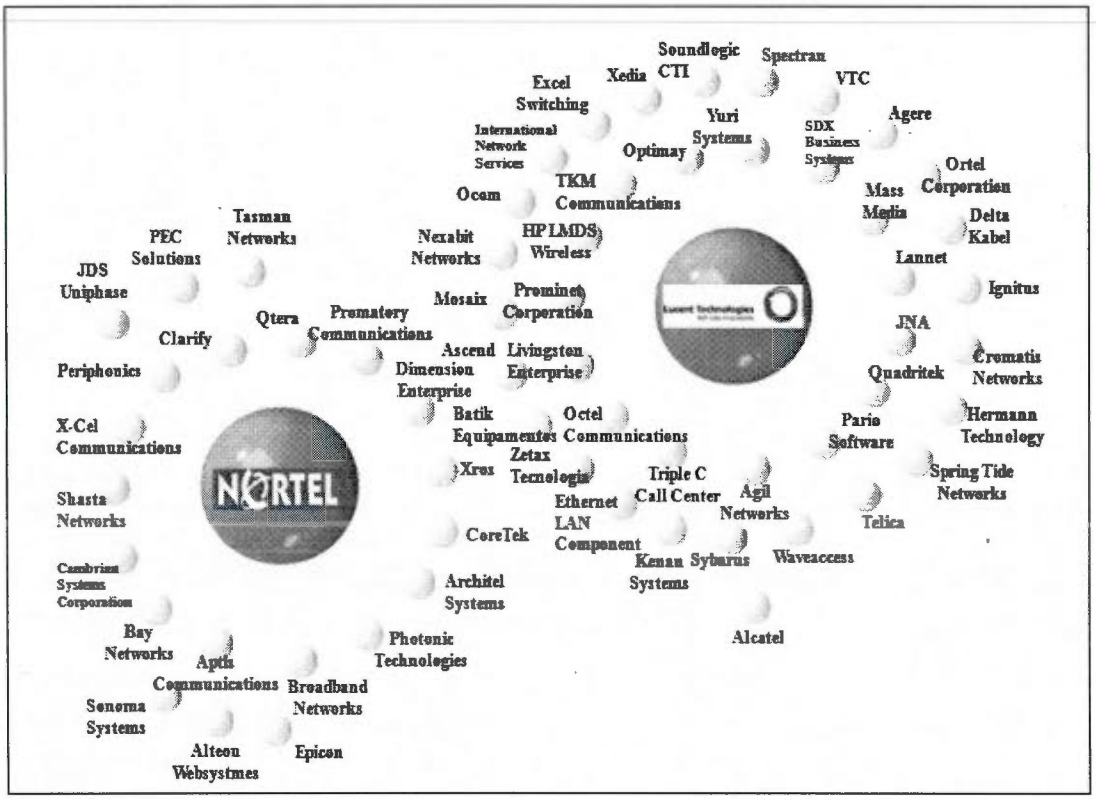
2.5 The Case of Nortel Networks and Lucent Technologies

In the case of Nortel, the strategy formulation process was deliberate, with the planning of acquiring Bay Networks. They took over a year to decide and plan for the acquisition and over two years to integrate it internally. However, it was not a great success, or at least it did not achieve the desired results, as the strategic fit was not there, the integration process was not very smooth, but most importantly. the internal organization culture of Nortel did not adapt very well and fast enough to the new culture of business that Bay brought. However, one of the reasons to acquire Bay, was to champion a radical change into Nortel's organizational culture by adopting the new business culture of the dot com economy. Nortel had an organizational paradigm different than the one of Bay. Their dominant logic with reference to the notion of risk, the short

term and long term and internal processes were different than the one of Bay. In case of Lucent, the firm stayed stagnant, and relied on its past success, which brought failure to their future. Their dominant logic was to innovate, develop, and manufacture everything internally, on their own pace, as in the past they were the innovator in telephony and the market was stable for a long time, which created an enormous bureaucracy and a dysfunctional organizational culture that could be labeled as the "depressive organization". It did not catch up with the new wave of external innovation, did not have a deliberate or emergent strategy on how to face the new environmental challenges, it did not assess well its real capabilities and the external opportunities and threats and did not intend to introduce a radical or gradual change within its organizational culture. In fact, Lucent acquired Ascend communications, an excellent innovator in the market, but did not have the strategic intent to use efficiently this acquisition. Rather, it was a move just to follow the strategies deployed by other leaders in the market. Figure 2.3 illustrates the acquisitions completed by Lucent Technologies and Nortel Network from the year 1993 to 2006.

Figure 2.3

Acquisitions completed by Nortel and Lucent from 1993 to 2006



2.6 The Important Role of Inter-Firm Networks

The high technology firms coexist within the perimeters of industrial high tech parks such as Silicon Valley in San Jose California, the Stanford Research Park in Palo Alto California and the Route 128 in Boston Massachusetts. Those high tech parks, beside grouping the high tech firms, they provided the cutting technology in term of infrastructure, communication technology, conference halls, exhibition centers and the most important, they are at close proximity to technology and business faculties in universities and technical institutes, such as the California institute of technology and MIT in Boston. This proximity of firms, in addition to the infrastructure, create a population of firms, borrowing the term from population ecology, and create a social networks consisting of firms as nodes and the interrelations between them as links. This creates an influence on the firms, expressed in the desire to learn from each other, share their findings and imitate the technologies, innovation and products produced by members of this network, as in isomorphism. The network grouping a variety of firms is also linked to other networks with either the same characteristics or distinct one, which increase heterogeneity and expand the knowledge base, from which members and participants of the networks can learn.

2.6.1 Nodes and Links

The firm location in the network known as node, represent the firm's position within the whole network, which is translated in its influence of others, it capacity to be influenced by others, its source of power, legitimacy, reputation and trust. The firm is related to other firms, by means of interrelated connections, called links. Those links are the medium through which resources could travel, be transferred, exchanged, and shared among the interconnected firms, known as relational embeddness, or through the structure of the network itself, as information travel through the structure in what is known as structural embeddness. Those resources that are transferred, exchanged or shared could be general and specialized information, skills and talents, human capital transfer, capital and investments as in angel investments and venture capitalist, ideas, innovations, power, trust, and status. The firm could have a central position or focal position, within the network it belongs, by which it is interconnected to several participants of the network and some time plays the intermediary role for information and other resources sharing.

Members of this social network of nodes and interrelated links enhance their position by influencing the flow of information, capital and power and the interaction of its members increase the level of trust among them. For a firm the sources of power are economic power in term of capital, assets, liquidity, financial position, stability and stock value; expertise and know-how in term of tacit and implicit knowledge that is socially complex and path and time dependent; technology that is superior in term of complexity, intensity, depth and innovation; skilled and talented workers in term of their learning, adaptive capabilities for continuous innovation; and organizational culture in term of internal trust, dominant logic, routine, processes, symbols, metaphors and myth.

2.6.2 Interdependence and Resource Sharing

The firm's relations could be on the individual level of its members, as in friendships with workers in other firms; participation in professional associations for learning, standardization or regulation; or participation in trade fairs, exhibitions, conferences and workshops. Also it could be through the firm's with component suppliers, subcontractor, consultants, others collaboration efforts with other network members in technology task forces and standardization bodies. Those relations could be formal and informal, as in collaboration on developing a new standard or technology or in negotiation for the formation of strategic alliances or joint ventures. Those inter-organizational relations create an interdependence and mutual dependence between the participants, which could be beneficial in term of sharing resources and creating cross-synergies, or it could be path dependent as it locks the participants into the existing pattern creating a resource dependency.

2.6.3 Cisco's Extensive Network of Relations

Referring to the process of assessing the internal needs of the firm and its external opportunities and threats described in the previous section, this process is based on the active participation of the firm in these social networks and its extensive links or interrelated relationships with other members of the network. Cisco systems, had an extensive network of relations, both informal and formal, with the objective of constantly scanning the environment in

order to identify its competitive positioning, the threats that could challenges its positioning and how to deal with them and the opportunities available in the environment, in term of collaboration, learning, sharing and exchanging information and expertise or simply acquiring those resources if identified as strategic assets, by means of strategic alliances and acquisitions.

This high number of relations increased its position in the network, and provided the firm with the legitimacy among the other firm and trust of the participants. This was enhanced by it sources of power, as economical, technological and skilled human resources, which provided the firm with a buying power and a negotiating leverage. This was efficiently utilized for identifying opportunities such as highly skilled human resource capabilities considered as strategic assets based on the internal assessment of the Cisco's internal business units and R&D labs, described in the previous section. For example the firm had an extensive and large database for identifying and tracking human capital with superior expertise in the technologies or the management areas. Those targets and potential high valuable resources were offered an attractive incentive and compensation to transfer to the firm. In other cases, the transfer of some human capital was not enough as the competitive advantage lied in the embedded culture of the small firm or start up, and constituted its dominant logic, its routine, processes and tacit knowledge which is unique, rare and not transferable. Then either strategic alliances or acquisitions were the right decisions.

2.7 Strategic Alliances

As the external strategic resources were identified, a process of exploration, learning and negotiation started. The managers of the business development and corporate acquisitions department, lead by vice president M. Volpi, usually initiated this process. The objective was to insure a strategic fit in order to create cross-synergies, to identify and assess the level of complexity of post acquisition integration and to valuate the internal information of the potential firm subject for acquisition, in term of its financial worth, technological edge and human asset specificity. This is a difficult task as this inside information is proprietary to the firm and protected against leakage and appropriation and also because of the uncertainty in evaluating this new technology and its potential worth in the future, if acquired by the company.

The decision of the alliance formation was left to the responsibilities of the managers of the business development department with the guidance of M. Volpi. The top executive did not interfere in the process, as the assessment of those decisions was purely based on complex and tacit knowledge and time history dependent expertise. The decision and action were taken in collaboration between the business development department and the respective business units based on the major product categories and where finally the alliances collaboration and learning will take place. Those alliances decisions and actions to form them, were not part of a deliberate strategy. In fact the deliberate strategy was to rely on internal innovation. However, the ever changing competitive field, the uncertainty related to the technology, market, and competition, and the turbulent environment, lead to the emergence of these actions or strategy as a pattern of actions over a period of time. This emergent strategy was incremental, and based on learning by doing, experimenting, and advancing and retrograding. The decisions were not top-down. They were the result of the collective interactionism of it's the firm members, internally with each other and externally with the environment.

2.8 Technology Based Acquisitions

As in alliances, acquisitions were used to acquire external resources that are considered strategic assets and complementary or supplementary to the firm existing resources, with the objective of sustained competitive advantage. The difference with alliances is that in the case of acquisitions, the external resources were identified with a sense of urgency to the internal needs of the acquiring firm, or as a threat to its future positioning as its technology represent a major technological paradigm shift from the existing one and possessed by the acquirer. Also a major factor in deciding on the acquisition if important to the firm, was the immediate identification of the importance of the target due to a lesser level of technological uncertainty regarding its technology and innovation and also an easier access to the internal information of the potential firm to be acquired, which was usually motivated by the mutual interest of the small firm (to be acquired) to identify sources of capital or management expertise. Those small firms were usually entrepreneurial in nature, and founded by one or two members, who probably had the technical expertise in a very specialized area in the technology segmentation map, but lacked either the necessary investments to proceed with innovation, sales and expansion, or simply lacked the

management expertise to develop a large business enabling a sustained growth and economic performance. For the small or start-up entrepreneurial firm, those were the strategic assets that constitute a sustained competitive advantage, and without which the firm and its technology would not survive. Because they were lacking those resources internally, and specially that they are time and history dependent, they looked for external sources to complement their core competencies. An acquisition then was the best fit. In their case, their strategic intent and deliberate strategy was to be acquired by a larger firm. A lot of those entrepreneurs were in fact highly skilled employees in a specialized technological area, working for one larger firm, and decided to quit and start their own business, with the intention of developing this new innovation on their own, getting the credit, attracting the attention of larger firms (some time by contacting them) and ultimately enhancing their economic power by means of equity shares and stock, when their firm is acquired by a larger one with a better financial position and a stable stock in the exchange market.

One important issue is the one of technology selection, based on the population ecology. In reality the technology, although identified and assessed by the acquirer, the basis of the selection is sometime irrational and founded on the bounded rationality that characterized decision-making. The ability to review all the alternative technologies, thoroughly assess them and choose the best among them is simply impractical and impossible to achieve in practice. Thus the decision is based on bounded rationality and the asymmetry of information that exists between the acquirer and the acquired, due to the safeguards for protecting proprietary information and against opportunism, leakage and appropriation. Then it could be said that the environmental and institutional forces select the technology of the small firm that is chosen by the acquiring firm, and will have the chance to survive this turbulent environment, as species are selected in the biological world for survival and future evolution. Therefore, lots of technologies do not survive, as the environment does not select them in a deterministic fashion.

2.9 Leadership Role and the Organizational Culture

The top executive plays an important role in the firm leadership. His could play this role alone or allow for the participation of other managers in the decision-making and strategy

formulation process in a collaborative learning fashion. His importance lies in the fact that he gives the general direction of the firm, establish the structure that embrace growth and allocate the necessary resources for the efficient achievement of the firm's objectives. His power is based on his legitimacy, as being selected or elected on ethical basis; his credibility based on his reputation, personal history, good example, ethical and moral value; charisma as his the attractiveness of his character and personality and its ability to influence other to achieve his objectives; his expertise as a well known expert in technology or a high caliber business manager. They rely on both intuition and rationality in dealing with the complex issues involved in this turbulent environment.

The leader is characterized by sagacity in dealing with people and influencing them, his ability to empower people and motivate them to achieve the firm's objectives, his talent in gathering consensus to build coherence, and his cognitive mental capacity to understand complex issues and meta-manage complex, interrelated and diversified businesses. His personality traits influence and shape the organization culture and strategy of the firm. If dysfunctional, his pathological traits will negatively influence the strategy formulation process and the resulting strategy if any. Some examples are paranoid, depressive or dramatic leaders who influence their firm strategy and the result is a sense ~~of continuous external threats, fight and flight, risk~~ aversion, or excessive joint venturing or simply creating a vague strategy.

In healthier conditions, the top executive could be a visionary leader, who create, manage and influence the organizational myth, or the perception of the world, as he see it and he transmits this world vision to the organization through the organizational culture and by means of using symbols, language, rhetoric, metaphor, and myth. In the high technology industry, he could be the creator and inventor of the technology as the case in most of the entrepreneurial firms, or he could be proselytizer who has the vision as foresight merged with imagination and the capacity for inspiration. Those leaders are regarded in some cases as industry leaders, gurus, with an evangelical zeal which elevate them to an even prophetic level and spiritual (technological) guide for his followers, who believe in him and cooperate with him to enact his vision. Those followers are characterized some time as living in a utopian society, where bad things do no exist, only good things from a future still to come, and lead by their leaders

In order to enact their vision, leaders success in the high tech industry depends on their age, educational experience, experience in business, the level of the executive within the corporation, their cognitive abilities and their risk orientation. Their relations with their environment, internal and external, play an important role in strategy formulation. In the case of the alliances and acquisitions, previously described, their friendships, family relationships and industry relationships enhance their firm's potential to interrelate with other firm, share knowledge, identify potential partners for alliances and acquisitions, and negotiate deals in friendly terms.

2.9.1 John Chambers, CEO of Cisco Systems

One example is John Chambers, the CEO of Cisco Systems, who had the vision and the foresight of where the company should go, and in which direction. He did not have a deliberate strategy, but an intentional one. However, during his journey with the company situations and circumstances emerged, and also emerged strategies, that were incremental and adopted as learning by doing, within this turbulent, chaotic and fast changing environment. He empowered his managers, to take decision and actions as necessary and within a short period of time. He relied on their good judgment and wisdom, as he was personally involved in selecting them. His role was to ensure that the firm was on the right direction, even with the high level of uncertainty, to allocate the resources needed to achieve the objectives and to build the structure to ensure the survival of the firm.

2.9.2 Mike Volpi, Vice President of Cisco

Another example is M. Volpi, the vice president of corporate development and acquisitions, who was the chief architect behind Cisco's extensive acquisitions, product portfolio and superior technological capability. At the age of 34, Volpi was running a multi billion dollars business. The strategy for achieving sustained competitive advantage through external sources of strategic assets, was developed as an emergent strategy. Cisco was dealing with a customer, trying to sell its networking products, when the customer mentioned that his preference would be Cisco's competitor Cresendo. At this early time, this was large and significant deal for Cisco and could not afford loosing it to the competition. In reality Cresendo had an alternative technology to

the one of Cisco, and by wining this deal over Cisco, it would replace the technology developed by Cisco and position it as the industry standard. Cisco did not the internal capability, nor the time to develop a superior technology, and decided to acquire those resources by acquiring Cresendo.

2.10 Emergent, Deliberate Strategies and Shifting Myths

This emerged based on a real time situation, as this was the case for all Cisco's acquisitions, which were based on emerging circumstances, moving targets and a high velocity environment that did not allow for the creation of a deliberate strategy over a period of time. However, this emergent strategy was adopted as a deliberate strategy, until another circumstances emerged and the old myth lost its attractiveness and convincing power to influence people. This happened, when the firm completed a lot of acquisitions in a short period of time, which created incoherence and conflicting synergies in the internal of the organization. Resistance to this acquisition myth start to develop and grown, fueled by the personal interests of the technological human resource experts and R&D labs, who saw their survivability affected, and predicted that the future of the company will be negatively affected, if following this path, relying only on external source of innovation. This resistance to change, motivated by the conflicted interests of different internal groups to dominate resources, which are the source of power, resulted in a shift from one myth to a new one. The following years Cisco had only one acquisition in one year and two in the following year.

2.11 Discussion

The environment plays an important role in shaping the strategy of the organization and influencing its actions. The high technology industry is characterized by high velocity and turbulent which influence the process of strategy making

Some organizations and industries relies more on emerging strategies as they are more suited to their needs. Emerging strategies are constituted by a pattern of action over a certain

period of time. Emerging strategies are formulated by sub-strategic systems; over time they become the organizational paradigm and represent the dominant logic and the myth. Over time they are adopted as a deliberate strategy. Over time, as circumstances change, resistance to this dominant myth influenced by the interest of the parties involved start to grow, and the myth is replaced by a new myth in a discontinuous patterns of successive myths.

The core competencies of the firm are based on their strategic assets and are the source of sustained competitive advantage. When those resources are not available internally, external resources, which are supplementary and complementary to the internal one, could be accessed through alliances or acquired through acquisitions. The network of relations constitutes a source of learning and sharing knowledge with the external environment. Strategy formulation is the high technology industry is characterized by the collectivity of the learning process and the interaction of its members, in learning by doing fashion.

The decision making process is cyclic, meaning top-down and bottom-up, which allows for the participation and empowerment of all participants, leading to the creation of coherence, legitimacy and synergy. The role of the top executive is an important one, is setting the general direction of the firm, allocating the resources to achieve the objectives and building the structure to ensure the survival of the firm. The organizational culture, with its embedded memory, routine, shared beliefs; tacit knowledge plays an important role in the enactment of the environment and the adaptation to the high velocity and turbulent industries.

CHAPTER III

DISRUPTIVE INNOVATIONS AND TECHNOLOGIES AND THEIR IMPACT ON THE TELECOMMUNICATIONS INDUSTRY [1]

This exploratory study explores the disruptive innovations and technologies in the telecommunication industry, first by defining the difference between sustaining innovations and disruptive innovations, using examples of past and current technologies from the telecommunication industry. Then, it describes the context of the manufacturing segment of the telecommunication industry and it explains how the disruptive technologies led to an intense wave of acquisitions in this segment and the development of the acquisition and development business model by some companies. Similarly, it describes the context of the service provider segment of the telecommunication industry and it explains how the disruptive technologies led to the integration and convergence of services and the development of new business models such as the triple and quadruple play.

3.1 Introduction

The information technology and telecommunication industries are different than any other industry. Firms established in this knowledge intense sector of the economy face turbulent environmental challenges. The information technology and telecommunications products are technically complex and the embedded knowledge is tacit in nature, non codified and non transferable as a public good. The rate of innovation of new technologies and products is high and the industry face continuous waves of new technological generations and disruptive technologies, which render the product obsolete, possibly even before being launch to the market and received

[1] This chapter was modified from an article published, with the same title, in the proceedings of the administrative sciences association of Canada (ASAC) annual conference 2009, technology and innovation management division. Niagara Falls, Canada, June 2009. Vol. 30, No 25.

by the end user customers. In fact the rate of obsolescence is higher the time required to recover the skyrocketing investment needed in research and development in order to produce new products and technologies that would built on the core competencies of the company and sustain competitive advantage. The complexity of the technology is coupled with a high level of uncertainty due to a lack of dominant standards, a lack of credible forecast for the potential new product and a lack of specific requirements from the customers' side.

Furthermore, the telecommunication industry has witnessed a continuous and intense wave of innovation and disruptive technologies (Christensen, Anthony, & Roth, 2004; Christensen & Raynor, 2003), which represents an illustration of the pattern that affected many high technology sectors from 1997 to 2003. Researching this pattern, give an explanation to the real reasons of why some companies survive, while others fail, in the face of such environmental challenges. In addition and as Clayton Christensen (2004) put it, the telecommunication industry is a very interesting case study because: "(1) it is a large and important industry: (2) it has a long and illustrious history of innovation and is credited with countless groundbreaking innovations such as the transistor, the laser, stereophonic and motion picture sound, cellular telephones, and high-definition television. With this long history of important innovations, telecommunications seems like a perfect environment to study the forces of innovation; and (3) the role of the government, where telecommunications represents an opportunity to apply the theories of innovation within an industry characterized by heavily regulated competition."

The telecommunications industry is composed of two major industry segments: (1) the equipment manufacturers segment, where companies conduct research and development (R&D), design, manufacture, commission telecommunications equipments and distribute them to consumers, corporate customers (banks, hospitals, education institutions, etc.), government (civil and defense), utilities and service providers (telephony, mobile, cable operators); and (2) the service providers segment, where companies (public and private) provide telecommunications services, such as residential telephony, mobile communications, satellite services, video conferencing, cable TV programming, Internet and email access, to consumers, corporate customers and government.

The telecommunications equipment manufacturers segment is subdivided into sub-categories such as transmission equipment, satellite, microwave, mobile, internet, cabling, submarine cabling, local area networks, wide area networks, wireless, etc. Until recent years, each of these sub-categories was a specific area of expertise and companies were limited to working in one or few areas of those sub-categories. However, due to the intensive and continuous emergence of disruptive technologies and innovations, we are witnessing the integration, merging, and convergence of those sub categories into fewer technical platforms and systems or into a single platform.

Moreover, the telecommunications service provider segment, until recently, was subdivided into sub-categories such as residential telephony, mobile or cellular communication, cable television, and Internet access. Recently, and due to the emergence of disruptive technologies and innovations and to the integration and convergence of those technologies taking place in the telecommunications manufacturer segment, many of those sub-categories of services are merging and converging into bundled and packaged services and offered to the end user customer in a variety of modules and prices. As an example, traditional incumbent residential telephony providers (Bell Canada) now offer mobile telephony and data (Bell mobility), variable speed (dialup and ADSL) internet and email access (sympatico) and cable television programming through the means of satellite service (ExpressView). On the other hand, traditional cable television service providers (Videotron) offer very high speed internet access (cable internet) and residential telephony.

Consequently, we see an intrinsic relation between the intensive emergence of disruptive technologies and innovations in the telecommunications industry and the change in the industry structure of both the equipment manufacturing and service provider segments of the telecommunication industry. Therefore, this exploratory research intends to explore this relationship, by firstly linking the intensity of the disruptive technologies and innovations in this industry to the intensity of mergers and acquisitions in the equipment manufacturer segment, and then secondly by linking the integration and convergence of technologies due to the emergence of disruptive technologies in the equipment manufacturer segment, to the integration and convergence of service in the service provider segment of the telecommunications industry.

As a result, this research will (1) explain the various disruptive technologies and their impacts on both segments of the industry; (2) describe the environmental context of each segment and the challenges faced by companies operating in each segment; (3) explain and highlight how did this lead to the acquisition spree in one segment and to the convergence of business models in the other; and (4) describe the impact it had on the telecommunications industry and forecast the future of the industry under the current and future potential circumstances.

To better understand how disruptive technologies and innovation affected the firms in the equipment manufacturing segment of the telecommunication industry, three firms from the high technology sector will be used as examples: Lucent Technology, Nortel Networks and Cisco Systems. For the service provider segment of the telecommunications industry, no particular example is given as a case study, based on secondary data and extensive field work is yet to be conducted in a later phase.

3.2 Background

The telecommunications industry has been going since the 1990s through a quiet major shift. New technologies, products, services and innovations are continuously emerging, with their impact changing every aspect of our lives and the way business is conducted. Some of them are well known to the end-user customers such as Wi-Fi, Wi-Max, Skype, Vonage and mobile video. Others are not transparent to the end-user customers and are less known due to their technical nature, such as voice over internet protocol (VoIP), MPLS, optical switching, IPTV, broadband, triple and quadruple play. Some of them represent improvements to existing technologies and services, not radical change, and are categorized as "sustaining innovations". Others represent a radical change with the potential of destroying value for existing technologies and services and creating value by introducing new technologies and services (Christensen, 1997). Those "disruptive technologies and innovations" are substituting existing technologies and services, posing a great challenge to locked-in incumbent service providers by eroding competency, market share and boundaries, and facilitating the entry of new and smaller dependence-free service providers, by reducing barriers, and providing more competitive advantages based on new services and business models (Christensen, Anthony, & Roth, 2004). This major shift is

happening at different levels and causing a major change in the industry structure of the telecommunications industry. It is creating a new "digital ecosystem" in which data, voice, and video, wireline and wireless, traditional telephony and TV broadcasting, are all converging, in addition to the entry of new players such as the application, content and entertainment service providers.

The telecommunications industry major shift is in line with the work of the Austrian economist Joseph Schumpeter, who in 1950 coined the term "*perennial gale of creative destruction*" where he described how companies and monopolies are challenged by the competition, not based on price, but on *"competition from the new commodity, the new technology...competition that strikes not at the margin of the profit of the existing firms but at their foundations and their very lives"* (Schumpeter, 1950 p. 84). This "creative destruction" and the emergence of the disruptive technologies do not start in the service provider segment of the telecommunications industry or by just being introduced to the end-user customer. It is transferred to the service provider segment, as new services and business models, through the buyer-supplier relationship that exists between the service providers and the equipment manufacturers in the telecommunication industry. Therefore, this convergence of services and business models, are the end products delivered to the service providers by the equipments manufacturers.

However, the products delivered by the equipment manufacturers are the result of the system integration, and assembly of a variety of technologies, which are then produced in modules or a single platform, then packaged and bundled to offer a variety of options and prices. Those technologies are either the product of internal innovation through internal R&D capabilities and strategic assets or external innovation through strategic alliances, joint ventures, or acquisitions. Some of the technologies are the combination of lower level technologies, or the permutation of various technologies. Due to the high velocity and intensive emergence of new and disruptive technologies in the manufacturers' ecosystem, it is difficult for the manufacturers to only rely on internal R&D capabilities and strategic assets that are built on the core competencies of the firm.

Furthermore, the equipment manufacturing firms established in this knowledge intense sector face a variety of turbulent environmental challenges (Bahrami & Evans, 1989; Romanelli, 1989). Their products are technically complex (Bettis & Hitt, 1995; Jemison & Sitkin, 1986b), in which the embedded knowledge is tacit in nature (Oliver, 1997), non codified and non transferable as a public good (Hagedoorn & Duysters, 2002; Peteraf, 1993). The complexity of the technology is coupled with a high level of uncertainty (Hoffman & Schaper-Rinkel, 2001; Quelin, 2000) due to the lack of dominant standards or standard wars (Besen & Farrell, 1994; Shapiro & Varian, 2003), the lack of credible forecast for the potential future new products and the lack of specific requirements to respond to the customers' needs (Quelin, 2000; Roberts et al., 2001; Robertson & Gatignon, 1998; Walker & Weber, 1984). The rate of innovation of new technologies and products is higher than any other industry (Hitt, Hoskisson, & Ireland, 1990; Hitt *et al.*, 1991a; Hitt *et al.*, 1996) and the industry faces continuous waves of new technological generations and disruptive technologies (Christensen, 1997; Christensen, Anthony, & Roth, 2004; Christensen & Raynor, 2003; Utterback & Acee, 2005b), which render the products obsolete, possibly even before being launched to the market (Mayer & Kenney, 2004b). The rate of obsolescence is such that products often become obsolete before their development costs can be recaptured (Roberts & Liu, 2001). The new and disruptive technologies emerge either inside the firm or in the environmental ecological system, following a pattern of an epidemic technology diffusion, mutation and permutation of characteristics. In the literature we could not find any research linking these environmental challenges to the disruptive technologies, in a cause/effect relationship.

Moreover, one technology does not necessarily constitute a product in itself. It could be a computer algorithm, a network protocol, an encryption code, a specific technique, a process, a class of fiber, a processing chip, etc. The product is created by assembling and integrating this mosaic of technological ecology. Each of these technologies emerges in the environmental ecology of the firm, in different temporal brackets, and not in a sequential pattern that would eventually lead to the creation of one stand alone product. In addition, these technologies are created and developed independently, although their innovation teams collaborate informally through personal networking and the participation in technical forums, presentations, and standards bodies.

Therefore, it is difficult for one company to rely on internal innovation through R&D capabilities and existing strategic assets alone. Besides, the integration of technologies and the convergence of services we are witnessing in the service providers segment are not the results of the system integration, conducted by the service providers, of separate and independent products that were transferred from the equipment manufacturers. It is achieved by the equipment manufacturers, through a deliberate strategy of an intensive wave of acquisitions with the objective of achieving platform leadership among competitors (Gawer & Cusumano, 2002). This imageneering of the future and the enactment of the industry structure and directions, leads to the strategically reengineering of the core competencies of some manufacturing firms to create a dominant logic and a sustained competitive advantage (Prahalad & Hamel, 1994). Thus, the link between the emergence of disruptive technologies in the ecosystem to the acquisitions intensity in the manufacturer segment, which is not documented in the literature.

Since the 1990 there was a substantial increase in mergers and acquisitions activities in the high technology industry. More than 11,000 acquisitions were completed in 1997 for a value estimated at over US$ 900 billion (Chaudhuri & Tabrizi, 1999a). This intensity of acquisition's activities Hitt et al., 1990; Hitt et al., 1991b) is motivated by different reasons. Beside traditional motivations of economizing and empire building, high-tech firms used acquisitions mainly to acquire external strategic resources, gain access to valuable human talents, reduce the cost and risk of R&D, expand their portfolio of products, reduce product time to market and provide for an external source of continuous innovation.

The networking segment of the telecommunications industry was created by the fusion of information technologies and traditional telephony technologies to connect computers to each other using computer networks and protocols through public telephone networks. In the networking segment, several firms have used acquisitions as their main growth strategy. For example, Cisco Systems, a Silicon Valley based company working in the manufacturing of networking and telecommunications equipment and software, acquired more than 107 companies during the period from 1993 to 2006. In the year 1999 alone it acquired 18 companies and in the year 2000 it acquired 23 companies, with an average of almost two acquisitions each month, or in other words, an acquisition every two weeks. It completed 12 acquisitions in 2004 and another 12 in 2005. Moreover, Nortel Networks completed 21 acquisitions in the period between 1996 and

2006 and Lucent Technologies completed 41 acquisitions during the same period. Lucent was later acquired by Alcatel in December 2006. Today, Cisco Systems stands as the leader in the telecommunications industry and as the company who created this trend of using a successful aggressive acquisition strategy as its main growth engine.

This strategy, termed "acquisition and development" or "A&D", combines acquisition activities for external sources of innovation, while maintaining the internal innovative capacities of the firm (Mayer & Kenney, 2004b). It starts by identifying the firm's internal needs (resources) and assessing the potential players for acquisitions in the strategic group within the industry, by means of continuous scanning of the competitive environment (Chaudhuri & Tabrizi, 1999a). During this scanning of the environment, informal relations (links) are established with the objective of identifying and evaluating potential emergent new technologies and innovation, assessing human assets (resources) involved in those activities and estimating the real economic value (cost) of these resources, in terms of technologies and human capital.

When deciding on an acquisition, the firm would evaluate the potential target's existing product line and portfolio of technologies. Those potential technologies could be sustaining or disruptive. They could be supplementary or complementary technologies and products. Supplementary technologies are similar in nature to the firm's existing products portfolio and complementary technologies are different products that strategically fit with the firm's existing products' map. In addition to supplementary and complementary products, a firm could choose to acquire a target firm because of the competitive threat of substitute products or disruptive technologies. By acquiring those substitute products, the firm would reduce the competitive threat and produce new entry barriers to other firms developing similar technologies and products, which would ensure a better market positioning and a sustained competitive advantage. In the post acquisition phase, the acquired technologies and products are system integrated into the existing product portfolio to create synergy. The integrated technologies are redesigned based on modularity or single platforms (Gawer & Cusumano, 2002; Mayer & Kenney, 2004b; Olleros, 2006), to provide bundles and solution packages with a variety of prices and options to meet the potential needs of future customers (Stremersch & Tellis, 2002). The integration process is very critical, as it provides the technical basis for the convergence of services, later used by the services providers, when the products are transferred to the service providers through the buyer-

seller relationship. For a successful post acquisition integration of the acquired company and its technologies, the integration complexity, strategic fit, and potential synergy, must all be anticipated and evaluated in the pre-acquisition phase and prior to the acquisition decision.

In most of the research on corporate mergers and acquisitions, they are viewed as strategies for corporate control and empire building, and they are dealt with using financial and economic perspectives, while neglecting their social, strategic and organizational dimensions. The motivations of acquisitions in the high tech industries, and specifically the telecommunications industry, are different than the motivations of acquisitions in other industries. Many of the high tech acquisitions in the 1990s appeared to be motivated by the firms' need to obtain critical technologies or capabilities, in contrast to acquisitions in other industries, which are motivated by economies of scale, gains in market share, geographical expansion, empire building or CEO hubris. Despite the importance of the intensive acquisition trend within the context of the telecommunications industry, the research on acquisitions in the literature of strategic management could be categorized as contradictory, incoherent and incomplete. It is contradictory because the findings present contradictory performance outcome related to acquisitions, even in the same industry sector. It is incoherent, because most of the researches focus on the economic aspect of acquisitions including performance, economies of scope and scale, market penetration, growth, position, net gain, etc., while the others focus on the strategic aspect of acquisition including human talent, tacit knowledge, strategic resources, strategic fit, organizational culture and core competencies. Each approach neglects the other, which leads to an incoherent picture of the factors involved. Each approach gives a perspective to the study of acquisitions, however the whole picture remain fragmented and unclear. Third, it is incomplete because the literature has not shed enough light on the factors, criteria, conditions, motivations, causes and consequences related to the acquisition formation in high velocity and turbulent environments. When companies such as Cisco Systems and others participate in intensive acquisition activities during a small period of time, the critical success factors and the process of decision making for the acquisition formation has not been fully researched, under those extreme and intense environmental conditions.

In the service providers segment of the telecommunications industry, the integrated technologies provided by the manufacturers, give rise to new disruptive innovations and the

convergence of services and business models. This is creating a new landscape for the telecommunications industry and changing the rules of the game that were established decades ego, leading to a change in the industry structure of the telecommunications industry. The change in the industry structure refers to the change in the competitive dynamics and market forces, the change of the firms' competitive advantage, the changing and blurring of market, the erosion of market share, the destruction of competency, the lack and need for a new regulatory environment, the cannibalization of services and the subsequent loss of revenues in traditional markets (Evans & Schmalensee, Forthcoming; Parker & Alstyne, 2005; Porter, 1980a).

For example, the ability to have an overseas voice conversation on the internet with a reasonable quality of service (QoS) using embedded software such as Microsoft Messenger or unbundled software such as Skype, is sharply reducing the traditional international calls' revenues for the telephony operators. New telecommunications alternative providers, such as Vonage and others, offering service providers-like's quality of service with a fraction of the cost, are challenging the traditional telephony operators locked-in with long term investment based on old technologies and infrastructure, in the local and international business segments. Enterprise voice over internet protocol equipments, or simply VoIP, sold by the equipment manufacturers directly to the end-user customers, are bypassing the telephone operators and sharply reducing their PABX (private automatic branch exchange) traditional business.

On a larger scale, the Wi-Max disruptive technology is decreasing the barriers for new investors to enter the service provider market and provide city-wide coverage of wireless-fixed broadband services, including data, voice, and video, with a fraction of the cost and lower technical expertise. Traditional cable TV operators are offering residential telephony and broadband Internet access, competing directly with traditional telephony operators in their core business. Telephony operators would be able to offer TV programming services using a technology called IPTV, competing directly with cable operators in their core business. The last two examples are based on the convergence new business model called "triple-play". The convergence of fixed and wireless broadband, adds another emerging business model, the quadruple play. Finally, the entrance of new nontraditional telecommunications players, such as content and entertainment providers such as YouTube, Google, AOL, Microsoft, NBC and Virgin, gives rise to a new business model. In this model, the industry change concerns the

market boundaries and the ownership of the network. It is already contemplated that the ownership of the network and services could be transferred to the media giants who would provide the content in addition to the traditional telecommunications services, while the network would become just a conduit. All this is happening while the regulatory environment is lagging behind, with large variations and differences between countries in industrial markets, emerging economies, highly and less competitive markets and geographic areas.

3.3 Disruptive Technologies and Innovations

The term disruptive technologies was first coined by Clayton Christensen in his book *The Innovator's Dilemma* (Christensen, 1997) and then used in the subsequent books *The Innovator's Solution* (Christensen & Raynor, 2003) and *Seeing What's Next* (Christensen, Anthony, & Roth, 2004). The concept behind the new term 'disruptive technology' and more generally "disruptive innovation" could be traced back to the Austrian scientist Joseph Schumpeter who developed the theory of creative destruction in his book *Capitalism, Socialism and Democracy*, published in 1950. In his chapter *The Process of Creative Destruction*, Schumpeter wrote *"The opening up of new markets and the organizational development from the craft shop and factory to such concerns as US Steel illustrate the process of industrial mutation that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one ... [The process] must be seen in its role in the perennial gale of creative destruction; it cannot be understood on the hypothesis that there is a perennial lull."*

Christensen et al. (2004) describe the disruptive innovation theory in such situations where "new organizations and market entrants can use relatively simple, convenient, low cost innovations to create growth and win over powerful incumbents and that the theory holds that existing companies have a high probability of beating entrant attackers when the contest is about sustaining innovations, but established companies almost always lose to attackers armed with disruptive innovations." (Introduction, XV)

Christensen et al. (2004) identify three types of innovations: "(1) Sustaining innovations, which move companies along established improvement characteristics, and are improvements to

existing products on dimensions historically valued by customers. Disruptive innovations, introduce a new value proposition, and are either creating new markets or reshaping existing markets. There are two types of disruptive innovations: (2) Low-end disruptive innovations can occur when existing products and services are too good and hence overpriced relative to the value existing customers can use; and (3) New market disruptive innovations, can occur when characteristics of existing products limit the number of potential consumers or force consumption to take place in inconvenient, centralized settings."

The theory is related to the Resource Based View, as it takes into consideration the resources, "*which are assets the company can build or destroy, the processes, which establish patterns of work to transform inputs into outputs, and values, which determine the criteria by which the companies allocate the resources.*" Christensen states that "*incumbent firms fail in the face of disruptive innovations because their values will not prioritize disruptive innovations, and the firm's existing processes do not help them get done what they need to get done.*" The disruptive innovation theory is also related to the value chain evolution theory as the companies have a choice: "*They can choose to integrate, executing most of the activities themselves, or they can choose to specialize and focus on a narrow range of activities, relying on suppliers and partners to provide other elements of value added.*"

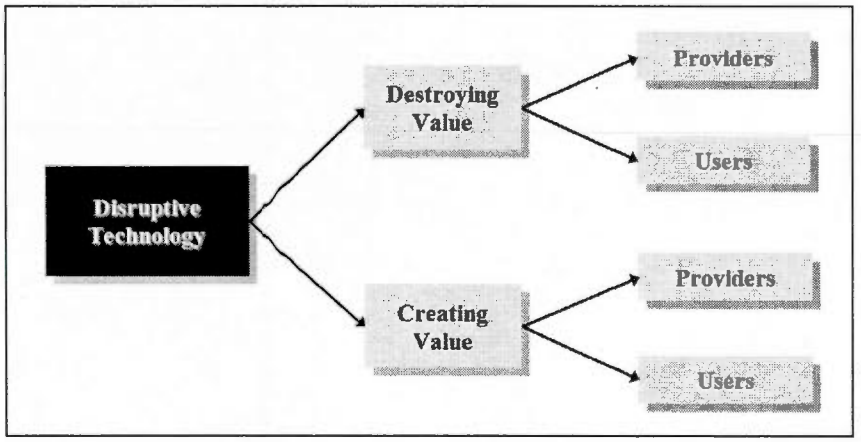
The book *Seeing What's Next* (Christensen, Anthony, & Roth, 2004) introduces a process model for analyzing and predicting industry change based on a three part process: "(1) identifying signals of change, where we can expect companies to emerge with products, services and business models that look very different from what we have seen in the past; (2) evaluating competitive battles, between companies classified as "attackers" and "incumbents"; (3) identifying strategic choices that can influence the outcome of the competitive battles, by showing what attackers can do to tilt the balance of power in their favor and what incumbents can do to withstand attacks."

In general, the process of disruptive technologies and innovations can be associated with the destruction of values and the creation of value (Utterback & Acee, 2005a), for both the providers and the end-user customers. For example, in figure 3.1, the destruction of value is represented in the loss of previously estimated revenues from the voice telephony in the

incumbent telephony service provider, for the new cable operator providing the same service to end-user customer. This new cable telephony service represent a creation of value for the cable operator, and for the end-user, who is offered alternative service breaking the monopoly of incumbent operator, and for a better price.

Figure 3.1

Disruptive technology characteristics



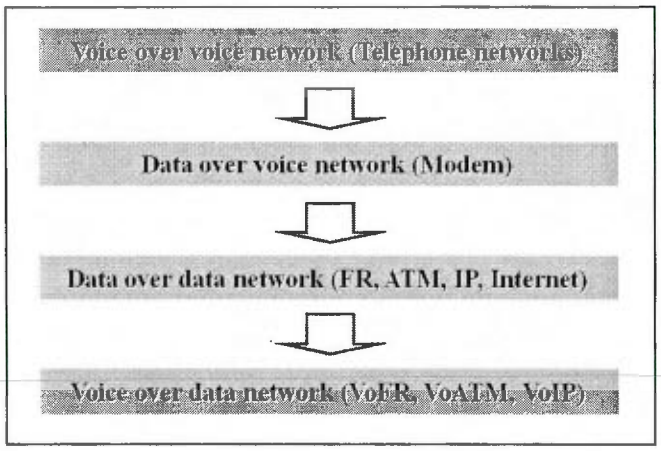
3.3.1 Examples of Disruptive Technologies

Packet switching technology vs. circuit switching. The telephony voice service was based since its inception on a technology called "circuit switching" where a circuit is reserved each time a call is established between point A and B on a telephone network, even if the call conversation included intervals of silence. With the emergence of computing and personal computer, the need was for connecting those computers through a network, to exchange information such as document, statistics, and database information. As the telephony network and its circuit switching technology where not economically suitable for the connection of large number of computers, data networks were developed in order to connect computers and transfer data between them. Several protocols were devised for this purpose such as X.25, TCP/IP (Transport control protocol/Internet protocol), frame relay, ATM (asynchronous transfer mode)

and MPLS (Multi protocol layer service). Over time those data networks, using data transfer protocols to transfer data mainly, begin to be used to transport voice, as in voice telephony, after the voice call is digitized from its analog form and transformed into binary numbers if 1s and Os and after being packetized, or in other words divided into small packets if data and switched over the different nodes of the packet switching network. Figure 3.2 illustrates this paradigm shift.

Figure 3.2

Paradigm shift: Moving from voice to data



Voice over ATM (Asynchronous transfer mode) and MPLS (Multi protocol layer service). Same as in Frame Relay, however, the issues of latency, delay, quality of service (QoS), and guaranteed service for the voice calls were greatly enhanced. As a result, voice calls could be transported between end-users, using an alternative data network service provider instead of the incumbent telephony provider network. In addition, it provided an efficient and economic mean of transporting backbone traffic between central offices of traditional telephony voice service provider.

Wi-Fi and Wi-Max. Wi-Fi provides a basis for a wireless local area network (LAN) connecting computer over a localized (limited) area. It's suitable for connection computers in an apartment, an office, a coffee shop, a university, a hotel, etc. Wi-Max, however, is an evolution of

the Wi-Fi, and it is capable of providing computer connections over a much larger area, such as a city, a village or a cosmopolitan area. The technology is suitable for the transfer of data, voice and video. Unlike mobile communication, it is license free and provide an alternative for new market entrant for providing alternative services.

Broadband access. Allow for the transmission of voice telephony and high speed internet access over the existing local loop or last mile, running from the central office equipments to the end-user establishment. High speed internet could be suitable for down-streaming video content such as Realmedia, and YouTube, etc.

Voice telephony and Internet over cable television. It provides the existing cable companies with the ability to transport and switch voice calls service and internet access and traffic over existing cable television infrastructure in the cosmopolitan area to end-user subscribers.

Internet protocol television (IPTV). It provides the existing telephony incumbent service providers with the ability to transport, switch, and broadcast television programming over the existing telephone infrastructure, using the Internet protocol television or IPTV.

3.3.2 Examples of Disruptive Innovations

Skype. A free downloadable application offering the possibility of making voice calls between computers connected to the internet. The transport technology uses the Internet for transporting data and voice messages and traffic, and therefore does not constitute any additional cost, other than the subscription to the internet service provider (ISP). However, the quality of service (QoS), latency, delay, noise and guaranteed service, are not resolved.

Enterprise voice over IP (VoIP). Offer an alternative for transporting voice traffic over a local area network in a localized area such as offices, universities, hospitals, etc. It replaces the traditional private branch exchange equipment, offered by the telephony incumbent provider.

Service provider like VoIP services (Vonage). This service offers the capability of transporting voice services over the internet, using either a computer connected to the internet or simply a phone equipment. Unlike skype and similar innovations, a service provider such as Vonage (and others) offer a guaranteed service, with a quality of service (QoS) equivalent to the voice-toll service offered by the incumbent or mobile service provider. However, the service is not for free, but is offered at a more competitive price than the incumbent provider.

3.4 The Telecommunication Industry: Manufacturing Segment

3.4.1 Intensive Acquisitions

In the high technology industries, including information technology, telecommunications, biotechnology and aerospace, firms face a challenging environment including a high level of uncertainty, a continuous fast pace of change, the emergence of disruptive technologies, the shortening cycle of product development, the high rate of obsolescence of technologies and products, the intensity of the research and development required, the volatility of the market and the extremely high cost of innovation. In this challenging environment the uncertainty (Bettis & Hitt, 1995; Hoffman & Schaper-Rinkel, 2001; Quelin, 2000; Roberts & Liu, 2001) is a result of technological uncertainty (Quelin, 2000; Roberts & Liu, 2001; Robertson & Gatignon, 1998; Walker & Weber, 1984) due to the lack of standards being still under development, competing technologies without a clear potential winner and the intensive emergence of disruptive technologies which render existing products obsolete; demand and market uncertainty (Quelin, 2000; Roberts & Liu, 2001; Robertson & Gatignon, 1998) due to the lack of credible demand forecast for competing and under developed technologies, the ignorance of the customers' perception of the potential new products; and product uncertainty (Quelin, 2000; Roberts & Liu, 2001) due to the lack of understanding of the potential customers' preferences for the future products' specifications and requirements.

This uncertainty is amplified because of the limitations facing the firm in this environment and in dealing with its challenges. One of those limitations is the embedded nature of the technical knowledge required to deal with uncertainty. This technical knowledge is not

codified, and has a tacit nature. It is in the mind and experience of the technical engineers and scientists and cannot be transferred as a public good without a price to pay and an effort to make. This tacit knowledge (Oliver, 1997) could be in the technical expertise and know-how of the technical teams, the research and development capabilities, the management practice, the entrepreneurial spirit or the innovation track record. This knowledge cannot be transferred to the firm simply by recruiting or by the free mobility of its agents. It is related to a technical idiosyncrasy and specific assets as part of the research, development, operations and maintenance phases. The asset specificity (Coff, 1997b; Hoffman & Schaper-Rinkel, 2001; Oliver, 1997; Robertson & Gatignon, 1998; Williamson, 1975; Williamson, 1999) owned by a firm determines the potential for it to join in an alliance or to be acquired by a larger firm.

Those highly specialized assets could be human, physical, or material and would represent for the potential partner or acquirer external assets needed to maintain a sustained competitive advantages. Those strategic assets (Hagedoorn & Duysters, 2002; Oliver, 1997; Peteraf, 1993) are characterized by being unique, inimitable, difficult to duplicate and part of the core competencies of the firm. If the firm finds those assets in its environment, it could either form an alliance to have access to them or form an acquisition to acquire them internally, as an external source of innovation. The objective for the acquirer or the allied firm is to build upon the core competencies (Hitt *et al.*, 1991b; Prahalad & Hamel, 1990, 1994; Quelin, 2000; Singh & Montgomery, 1987) of the firm by relying on external sources.

Facing those environmental challenges, firms established in the information technology and telecommunications industries tend to use alliances, acquisitions or both, to survive, enhance their performance, and guarantee their growth. Working together would reduce the level of uncertainty and risk imbedded in the required high investments in research and development. Moreover, it would give access to external resources of innovation, which are strategic assets that would complement or supplement the firm's existing assets. Sharing the cost of research and development would produce economies of scale and scope and achieve synergetic opportunities, producing efficiency and net gain. The formation of an alliance or acquisition would give access to new products, reduce the product life cycle and penetrate new markets and industry segments, which would increase the firm's market position and power.

When choosing alliances or acquisitions, the firm would evaluate and target the partner or the acquired firm's existing products line and portfolio of technologies. Those potential products for alliances and acquisitions could be supplementary or complementary products. Supplementary products (Shelton, 1988a; Wernerfelt, 1984) are similar in nature to the firm's existing products portfolio and complementary products (Mayer & Kenney, 2004a; Shelton, 1988a; Wernerfelt, 1984) are different products that combine well with the firm's existing products' lines. The firm would choose to have access to those resources through an alliance or acquire them through an acquisition, in order to increase its core competencies and improve its product portfolio competitiveness (Ferrary, 2003), which would ensure a sustained competitive advantage (Oliver, 1997; Porter, 1980a; Prahalad & Hamel, 1994). In addition to supplementary and complementary products, a firm could choose to acquire a target firm because of the competitive threat of substitute products or technologies (Gawer & Cusumano, 2002), which could result in barriers to entry (Wernerfelt, 1984; Yip, 1982) for the acquirer firm. By acquiring those substitute products, the firm would reduce the competitive threat and produce new entry barriers to other firms developing similar technologies and products, which would ensure a better market positioning (Gulati, 1999; Hopkins, 1987; Walter & Barney, 1990; Yip, 1982) and a sustained competitive advantage.

3.5 The Telecommunication Industry: Service Provider Segment

3.5.1 Integration of Services and Convergence

In the past, telephony networks were built using the "circuit switching" technology, as described earlier. With the emergence of a data communication network, as a result of the DARPA project (Defense advanced research projects agency) in the 1960s, telephony service providers and newly private companies begin to establish such networks (independent from the voice telephony networks) for the transport of digital data between interconnected computers. At first, those data networks using X.25 and TCP/IP protocols were used to transport data only and the telephony voice networks were used to transport voice toll traffic among the network subscribers. With the evolution of data networks protocols, such as Frame Relay, ATM and MPLS to name a few, it was made possible for the first time to carry voice toll traffic over such

networks originally designed to carry data. Therefore, private data network companies started to offer voice service by carrying voice traffic over their data networks and competing with telephony voice providers, and telephony service providers started to carry their voice toll traffic on larger capacity data networks, for more efficiency, cost reduction, redundancy, and better network monitoring and management. With the continuous evolution of data networking protocols, it was even possible to start carrying video (characterized by the need for larger transport capacity or bandwidth).

From the other hand the integration of the different technologies, systems and protocols, in the equipment manufacturer segment of the telecommunication industry and the creation of more modular and versatile products, allowed for the integration of services such as data, voice, and video and for the convergence of the voice, data and video network infrastructure into one consolidated network platform able to carry all type of signals and services.

As a simplified example to better illustrate to concept, consider the Microsoft application MSN or better known as messenger. In the past, the messenger was designed to connect internet users for exchanging online messages or chat messages. However, with the evolution of the service, it became possible, not only to write and exchange text messages, but also voice signals by exchanging a voice conversation and video signals by using a webcam and seeing the other end's online video. The explanation is that all type of online messages, whether text, pictures, voice or video, are transformed into a digital form or digitized using binary matrixes composed of streams of 1s and 0s, and then they are packetized, or divided into small portion of data called packets, and transported over the network.

3.5.2 Implications

The emergence of those disruptive technologies in the telecommunication industry paved the way for the integration of technologies and the convergence of services and networks. This created disruptive innovations that threatened the incumbent service providers and made it easier for new entrants to the ever changing market place. The boundaries between market segments became blurring as the services converges and the companies operating previously in one market segment were forced to rethink their strategy and develop new business models to sustain their

competitive advantage, or in some case, simply to survive. Incumbent service providers are seeing their revenue streams shrinking by the cannibalization of some of their services as an effect of disruptive technologies, or by the competitive threats of new business models and innovative services introduced by their existing competitors or new market players. In other words, disruptive technologies in the telecommunication industry reduced and in some cases eliminated the barriers to entry and decreased the switching cost. Figure 3.3 illustrates the various disruptive technologies and innovation in the service provider's segment of the telecommunication industry, the challenges faced by the incumbent (telephony) service providers and its strategic response to those challenges.

For example, until recent years the voice telephony service providers were limited in providing residential fixed voice telephony, mobile communications and international calls services and the cable television service providers were limited to offering cable television programming using their own cable network, whether terrestrial or through digital satellite links services. In recent years, this has changed dramatically. Voice telephony service providers were enabled, based on new disruptive technologies, to offer internet access in variable speed (dial up and high speed using ADSL technology) and most importantly video television programming through the use of their own cable network, or digital satellite services.

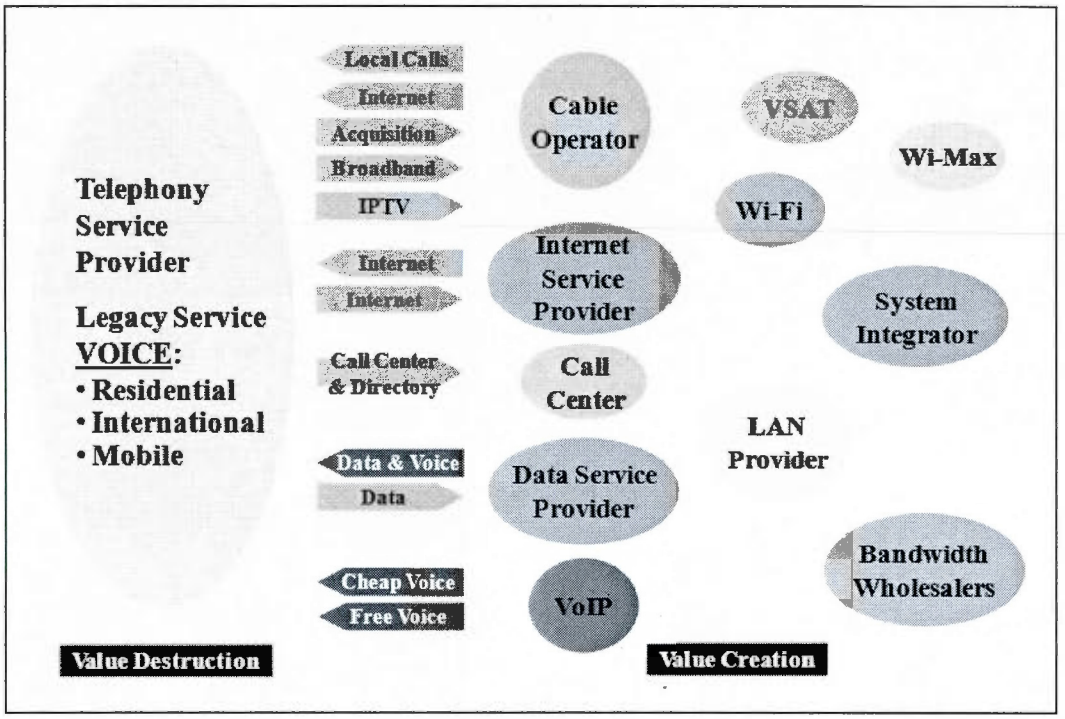
Moreover, cable television service providers were enabled, based on new disruptive technologies, to offer internet access in higher speed than the one offered by telephony service provider, and most importantly voice telephony fixed-residential services, which was previously a monopoly service to incumbent operators. The new disruptive technologies offered both, the voice telephony and the cable television service providers, the technical capability to compete in each other market segment, and to draw new sources of revenues.

A voice telephony residential customer, who chooses to switch from his preferred telephony service provider to the new service offered by his cable operators, will benefit from reduced cost because of bundling and packaging of services and a one stop shopping with a unified bill of service for all his communication needs. By doing this, the customer will increase the revenue streams of the cable operator, in a service area previously perceived as not in its core

business competency, and in the same time, decrease the revenue streams of the telephony service provider in an area of service considered for a very long time to be its core business competency.

Figure 3.3

Incumbent telephony provider dilemma and solution



Another example is the different applications and disruptive innovations emerging from the voice over IP, Frame Relay and ATM disruptive technologies. The first variation, such as the one offered by skype and other similar developers, provides the customer with the opportunity to place local or international calls using its own computer and pre-paid internet access, to other internet connected computers. It's true that the quality of the voice and the availability of the service is not guaranteed compared to the traditional voice telephony service, however, the service being free of charge and user friendly, the customer usually price prefers over quality. Another variation of the VoIP technology is the one offered by service provider-like such as

Vonage, where the customer is giving an alternative for placing local and international calls to either internet connected computers or just any telephone equipment, with a guaranteed service availability and a similar toll voice quality as in the traditional voice telephony services, for a reduced bill.

This shift in market segment, and the resulting disruptive innovations, create enormous challenges to all the players in the telecommunication service provider market segment, mainly the incumbent telephony service providers, to come up with new devised business strategies and new innovative business models, in face of fierce competition from unprecedented sources, in order to be able to sustain their competitive advantage or at least survive in this ever changing market place. In fact those radical changes caused by the continuous emergence of new disruptive technologies and innovations causing a restructuring of the telecommunication industry and are forcing the incumbents and new players to rethink their strategies. Most incumbent service providers, facing those challenges are trying to find answers, innovative solutions, and new business models.

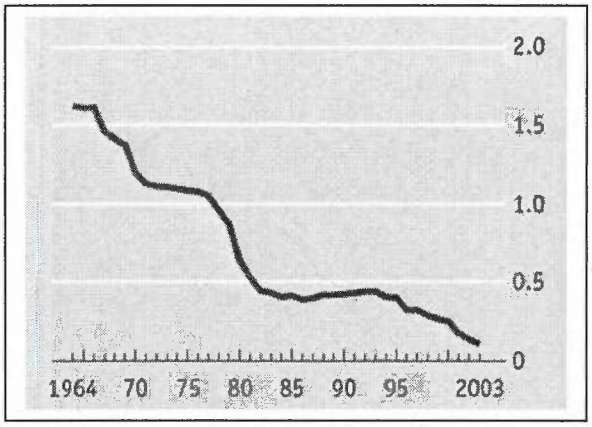
3.6 The Current State of the Telecommunications Industry

Here are some of the trends governing the thinking in the telecommunications industry. Those trends support the objectives of the research and shed some light on what was previously described in this exploratory paper.

The telecommunication industry has witnessed a sharp decrease in the net revenue per minute in the international call business. This is due to several reasons, among them internal price adjustment (high prices were fictitious), the effect of the calling cards wholesale and retail business, but also, the impact of the other technologies such as Internet email, online messaging and lately voice calls over the internet or simply voice over IP (VoIP) using applications such as Skype. Figure 3.4 illustrates the decline in net retained revenues per minutes for international call in US carriers.

Figure 3.4

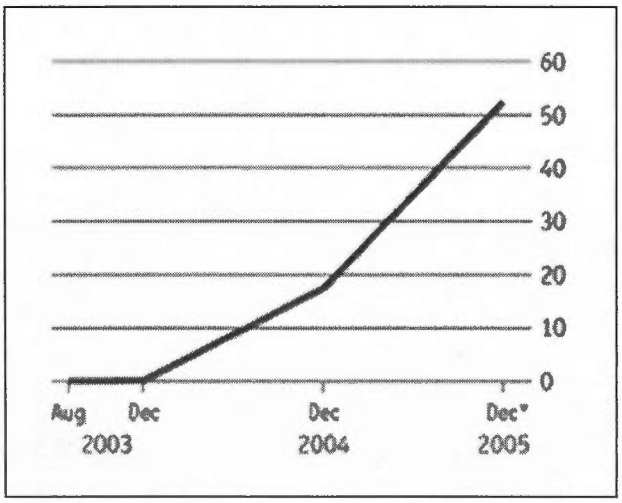
Net retained revenue per minute in dollar, International calls, US carriers (FCC, Economist)



Since its launch in December 2003, Skype have seen a rapid growth in the worldwide subscriber base. There are several attributes about the application among them the ease of use, and the no cost fees. It is expected that more people especially younger generations and computer savvy are using this application to place international calls, which has a negative implication on the international call business. Figure 3.5 illustrates the subscribers' base of Skype.

Figure 3.5

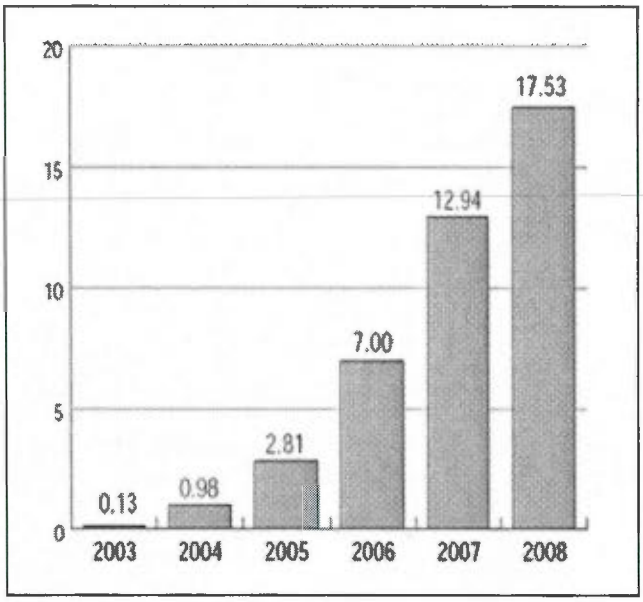
Skype's worldwide subscribers in million (source: Skype, Economist)



Another variation of the voice over IP technology is the service provider-like services offered by companies such as Vonage. In this case, customers switch to this service from the traditional voice telephony service provider, including cable television operators offering voice telephony services (such as Videotron). The subscriber base to this type of service has witnessed an important growth, which is expected to continue in the future due to reduced billing fees, a similar quality of service (QoS) to that offered by traditional service providers, the ease of use by non-computer savvy, and the possibility of placing calls to non-subscribers. Figure 3.6 iluustrates the growth of voice over IP subscribers.

Figure 3.6

Voice over IP subscribers in US, in millions (source: Yankee group, Economist)



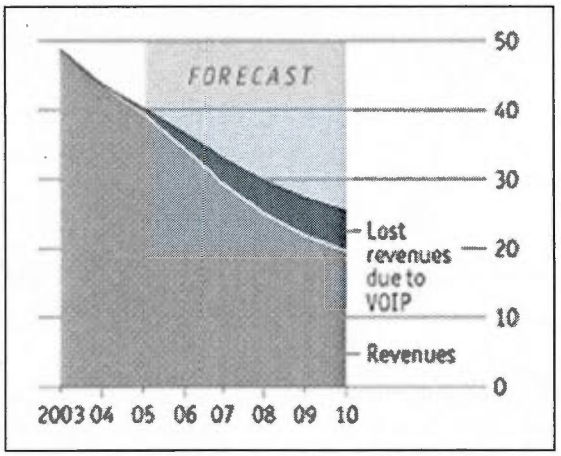
The revenues from long distance and local phone calls continue to drop in the near future. This is due to several reasons, chiefly among them the end-users switch to the use of various applications using voice over IP technologies, whether with the no-fees over the internet variation (Skype) or based on the service provider-like services offered by alternative providers such as

Vonage. Due to the drop in voice calls revenues (international and local), the traditional telephony service providers who will be most affected are the one relying on voice services in their core business and revenue streams. For example, Vodafone would be most affected as it relies in 80% of their revenues on voice services, while BT would be less affected as it relies in less than 20% of their revenues on voice services and more than 80% on data, video, business and other services. This shows the need for traditional voice telephony providers to move into new business models and more innovative solutions. Figure 3.7 Illustrates the loss in revenues in long distance and local phone, due to voice over IP in the US.

Figure 3.7

Long distance and local phone revenues in the US in billion of dollars

(source: TeleGeography Research, Economist)



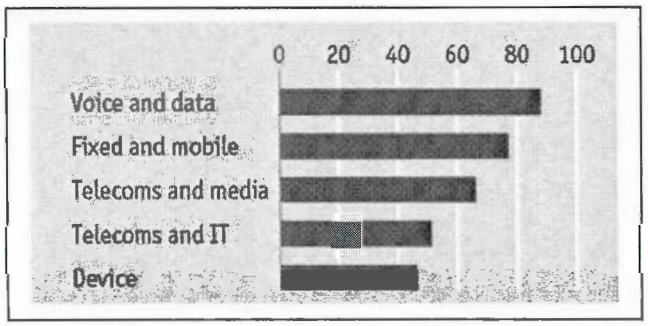
As a direct effect of disruptive technologies in the telecommunication industry, technologies are being integrated and services are converging. The effect of this convergence would be mostly noted in the voice and data telecom business, followed by the fixed and mobile communication services, then the media and entertainment and finally the IT and computing area in general. The convergence between the fixed and mobile services will continue to grow sharply in the future, especially in the consumer markets. More and more customer would prefer mobile

communication over fixed communication lines. In the enterprise market segment, the mobile trend will continue to grow; however, fixed lines communications would remain the preferred choice, because of the need to access fixed physical resources. Figure 3.8 illustrates the impact of types of convergence.

Figure 3.8

Impact of types of convergence, percent of telecom executives saying very strong

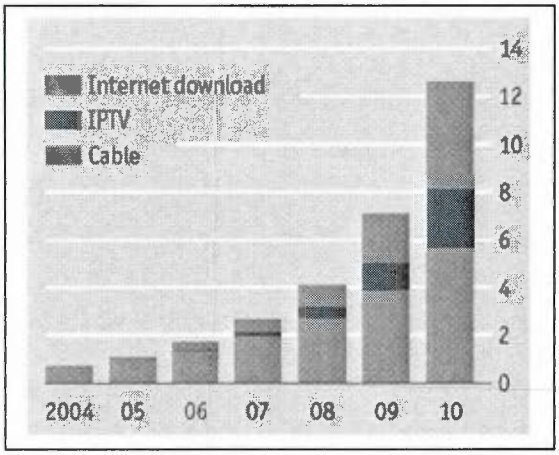
(source: Economist intelligence unit, Economist)



The convergence of media and telecommunications (known as Triple-Play as a short for voice, data and video) will continue to grow in the near future. In addition to the converged cable services (including voice telephony and Internet), the nascent Internet protocol television (IPTV) technology offered by telephony service and alternative providers will witness a steady growth, as well as the expected growth in online video-on-demand using Internet online streaming. The convergence of media and telecommunications will continue to grow, making the Triple-Play business model and services (voice, data and video) a main revenue growth area in the future and a shift of paradigm towards being the core business competency of traditional telecommunication service providers, cable operators, alternative providers, and content (and entertainment) providers. Figure 3.9 illustrates the revenues for video-on-demand.

Figure 3.9

Video-on-demand revenues by type of operator in billion of dollars (iSuppli, Economist)



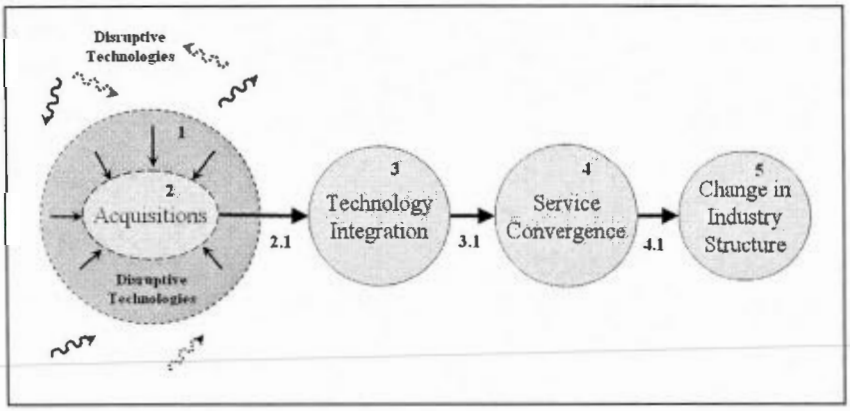
The convergence of the telecommunication industry and the media (and entertainment) industry would continue to grow in the future, giving rise to a new innovative business model called Quadruple-Play for voice, data, video and content (and mobile). This would encourage media and online content providers, such as NBC, Disney, Virgin, MTV, AOL, Time Warner, Microsoft, Google and YouTube, to enter the new realm of the telecommunications and media industries. One would expect giant content providers to try to play a major and dominant role in the provisioning of the other telecommunication services (data, voice and video), and that it is possible that the ownership of the telecommunication and media infrastructure would be acquired by those giant and emerging content providers. Should this be a potential future strategic scenario, the business models of both the telecommunications and the media industries would change radically and both industries would go through a major radical restructuring phase.

3.7 Construction of a Theoretical Model

Based on this exploratory findings and insights from the telecommunication industry, the conceptual model in figure 3.10 was developed. The same constructs of this conceptual model could be represented as illustrated in figure 3.11, to reflect the division of the telecommunication industry into two segments: the manufacturing and the service provider segments.

Figure 3.10

Conceptual model of creative construction



In an attempt to work on few *rough* general propositions and before embarking on the field research and investigation, here are some potential hypotheses to be considered for evaluation, discrimination and future research:

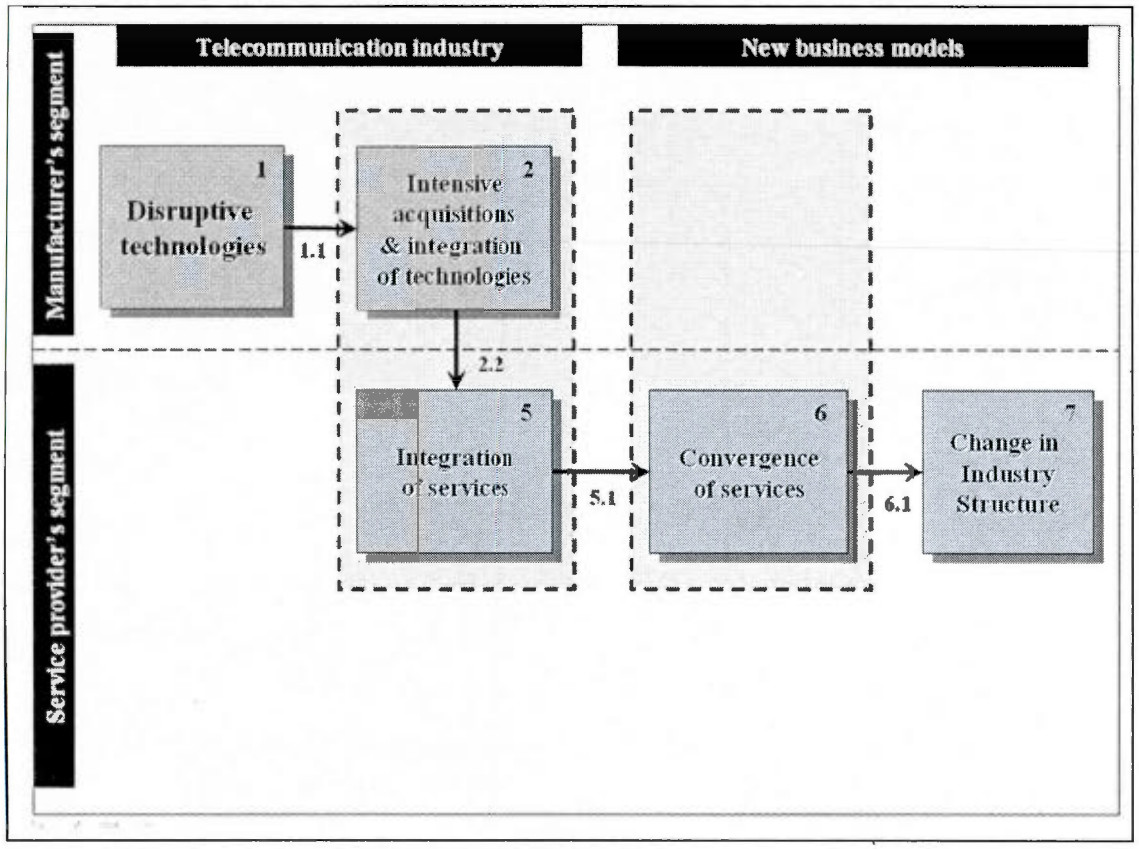
1. The intensive emergence of disruptive technologies in the telecommunications industry has led equipment manufacturers to resort to external sources of innovation through the mean of mergers and acquisitions of complementary, supplementary and substituting technologies and products.

1.A. New disruptive technologies are radically different than sustaining technologies in the telecommunications industry's equipment manufacturing segment, as they represent

substituting technologies or products for existing technologies, product and dominant logic.

Figure 3.11

The process of creative construction in the telecommunications industry



1.B. The lock-in effect coupled with the resource dependency on existing tacit knowledge, technical talent, strategic assets and incurred investments, in addition to the high risk of investment in new emerging technologies and product prototypes, prevent companies in the equipment manufacturer's segment of the telecommunications industry of effectively countering the continuous emergence of disruptive technologies by relying on internal innovation and internal R&D.

1.C. The intensity, continuous and frequent emergence of disruptive technologies in the telecommunication industry, could not be counter balanced by any single or group of companies, relying only on internal sources of innovation.

2. In intensive acquisition mode, equipment manufacturer use a process of acquisition for successfully completing, integrating and managing acquisitions and acquired companies.

2.A. In the pre-acquisition phase, it is crucial to rely on a continuous scanning of the environment, a real and deep assessment of internal needs, a network of formal and informal alliances and a thorough due diligence.

2.B. During the acquisition phase, criteria such as strategic fit, creating synergy, technology and product integration, management of complexity and proximity play a crucial role in completing a successful acquisition.

2.C. In the post acquisition phase, the integration of the acquired company while keeping certain autonomy for the innovation team, and the talent recruitment and retention, play an important role in successfully managing and benefiting from the strategic objectives of the acquisition and creating synergy.

3. Disruptive technologies in the telecommunications industry and the successful reliance on acquisitions as a source of external innovation could lead the company to adopt a new business model described as "acquisition and development" (A&D), instead of research and development (R&D).

3.A. In the post acquisition phase, the integration of the acquired company while keeping certain autonomy for the innovation team, and the talent recruitment and retention, play an important role in successfully managing and benefiting from the strategic objectives of the acquisition and creating synergy.

3.B. While the companies in the equipment manufacturing segment of the telecommunications industry relies on an "acquisition and development" (A&D) business model, they keep a high level of internal research and development (R&D), as a complementary and supplementary source of internal innovation.

3.C. While relying on intensive acquisition for external sources of innovation and adopting an "acquisition and development" (A&D) business model, internal R&D is crucial for the survivability and growth of the parent company. Strategic assets and internal talents are a determinant factor in the pre-acquisition phase to scan the environment, assess potential emerging technologies and identifying internal needs, and in the post acquisition phase to continue develop internally the acquired technologies and products and successfully integrate them into the parent company strategic plan and products' road maps.

4. The integration of disruptive technologies by companies in the equipment manufacturer segment of the telecommunications industry, coupled by the emergence of disruptive innovations, lead companies in the service provider segment to integrate their services, based on integrated and converged technologies

5. The integration of services by the service providers in the telecommunications industry, lead to the convergence of services, bundling and packaging of services, and the emergence of new business models.

5.A. The convergence of services poses a threat to incumbent service providers in the telecommunications industry. It reduces the effect of historic monopoly, reduce the barriers to entry and reduce the switching cost.

5.B. The emergence of new disruptive technologies and innovations in the service provider segment of the telecommunications industry, are negatively affecting the core business competencies of the incumbent service providers, by cannibalizing their core business products and reducing their revenue streams from those core products.

5.C. Facing those challenges, incumbent and new entrants service providers in the telecommunications industry are forced to rethink their strategy, develop innovative business models, adopt new business plans and enter into new product and market segment, even outside of their core business competency.

6. The convergence of disruptive technologies and services in the telecommunications industry and the consequently convergence of the telecommunications and the media industries, have a restructuring effect on the telecommunications industry and would change and reshape the market boundaries, give rise to new business models, and invite new entrants from outside those two industries.

6.A. Triple-Play will be the dominant logic and the new business model in the service providers segment of the telecommunications industry.

6.B. It is difficult to predict the effect of the convergence and Triple-Play on the incumbent service providers in the telecommunications industry.

6.C. New entrants such as content and media providers could start a new wave of restructuring of the telecommunications industry and lead to a new innovative business called the Quadruple-Play.

6.D. With the entrance of new players such as content and media providers in a Quadruple-Play business model mode, it is difficult to predict the ownership of the telecommunications infrastructure, historically monopolized by incumbent service providers.

References

Bahrami, H., & Evans, S. 1989. Strategy making in high-technology firms: The empiricist mode. ***California Management Review***, 31(2).

Besen, S. B., & Farrell, J. 1994. Choosing how to compete: Strategies and Tactics in Standardization. ***The Journal of Economic Perspective***, 8(2): 117-131.

Bettis, R. A., & Hitt, M. A. 1995. The new competitive landscape. ***Strategic Management Journal***, 16: 7-19.

Chaudhuri, S., & Tabrizi, B. 1999. Capturing the real value in high-tech acquisitions. ***Harvard Business Review***, 3(4).

Christensen, C. M. 1997. ***The innovator's dilemma - When new technologies cause great firms to fail***. Cambridge, Massachusetts: Harvard Business School Press.

Christensen, C. M., Anthony, S. D., & Roth, E. A. 2004. ***Seeing what's next - Using the theories of innovation to predict industry change***. Boston, Massachusetts: Harvard Business School Press.

Christensen, C. M., & Raynor, M. E. 2003. ***The innovator's solution - Creating and sustaining successful growth***. Boston, Massachusetts: Harvard Business School Press.

Coff, R. W. 1997. Human assets and management dilemmas: Coping with hazards on the road to resource based theory. ***Academy of Management Review***, 22(2): 374-402.

Evans, D. S., & Schmalensee, R. Forthcoming. The Industrial Organization of Markets with Two-Sided Platforms. In W. D. Collins (Ed.), ***Issues in Competition Laws and Policies***.

Ferrary, M. 2003. Managing the disruptive technologies life cycle by externalizing the research: social network and corporate venturing in the Silicon Valley. ***International Journal of Technology Management***, 25(1/2).

Gawer, A., & Cusumano, M. A. 2002. ***Platform Leadership: How Intel, Microsoft, and Cisco Drive Industry Innovation***: Harvard Business School Press.

Gulati, R. 1999. Network location and learning: The influence of network resources and firm capabilities on alliance formation. ***Strategic Management Journal***, 20: 397-420.

Hagedoorn, J., & Duysters, G. 2002. External sources of innovative capabilities: The preference for strategic alliances or mergers and acquisitions. ***Journal of Management Studies***, 39(2).

Hitt, M. A., Hoskisson, R. E., & Ireland, R. D. 1990. Mergers and acquisitions and managerial commitment to innovation in m-form firms. ***Strategic Management Journal***, 11: 29-47.

Hitt, M. A., Hoskisson, R. E., Ireland, R. D., & Harrison, J. S. 1991a. Are acquisitions a poison pill for innovation. ***Academy of Management Executive***, 5(4).

Hitt, M. A., Hoskisson, R. E., Ireland, R. D., & Harrison, J. S. 1991b. Effects of acquisitions on R&D inputs and outputs. ***Academy of Management Journal***, 34(3): 693-706.

Hitt, M. A., Hoskisson, R. E., Johnson, R. A., & Moesel, D. D. 1996. The market for corporate control and firm innovation. ***Academy of Management Journal***, 39(5): 1084-1119.

Hoffman, W. H., & Schaper-Rinkel, W. 2001. Acquire or ally? - A strategy framework for deciding between acquisition and cooperation. ***Management International Review***, 41(2): 131-159.

Hopkins, H. D. 1987. Acquisition strategy and the market position of acquiring firms. ***Strategic Management Journal***, 8: 535-547.

Jemison, D. B., & Sitkin, S. B. 1986. Corporate acquisitions: A process perspective. ***Academy of Management Review***, 11(1): 145-163.

Mayer, D., & Kenney, M. 2004a. Economic action does not take place in a Vacuum: Understanding Cisco's acquisition and development strategy. ***Industry and Innovation***, 11(4): 299.

Mayer, D., & Kenney, M. 2004b. Economic action does not take place in a vacuum: Understanding Cisco's acquisition and development strategy. ***Industry and Innovation***, 11(4): 299-325.

Oliver, C. 1997. Sustainable competitive advantage: Combining institutional and resource based views. ***Strategic Management Journal***, 18(9): 697-713.

Olleros, X. 2006. The Lean Core in Digital Platforms, ***DRUID Summer Conference***. Copenhagen, Denmark.

Parker, G. G., & Alstyne, M. W. V. 2005. Two-Sided Network Effects: A Theory of Information Product Design. ***Management Science***, 51(10): 1494–1504.

Peteraf, M. A. 1993. The cornerstones of competitive advantage: A resource-based view. ***Strategic Management Journal***, 14: 179-191.

Porter, M. 1980. ***Competitive Strategy***: Free Press.

Prahalad, C. K., & Hamel, G. 1990. The core competence of the corporation. ***Harvard business review***: 79-91.

Prahalad, C. K., & Hamel, G. 1994. ***Competitng for the future***. Boston: Harvard Business School Press.

Quelin, B. 2000. Core competencies, R&D management and partnerships. ***European Management Journal***, 18(5): 476-487.

Roberts, E. B., & Liu, W. K. 2001. Ally or acquire? ***MIT Sloan Management Review***.

Robertson, T. S., & Gatignon, H. 1998. Technology development mode: A transaction cost conceptualization. ***Strategic Management Journal***, 19: 515-531.

Romanelli, E. 1989. Environments and strategies of organization start-up: effects on early survival. ***Administrative Science Quarterly***, 34(3): 369-387.

Schumpeter, J. A. 1950. ***Capitalism, Socialism and Democracy*** (3rd. ed.). New York: Harper.

Shapiro, C., & Varian, H. R. 2003. The Art of Standards Wars, ***Managing in the Modular Age: Architectures, Networks and Organizations***: 424: Blackwell Publishing.

Shelton, L. M. 1988. Strategic business fits and corporate acquisition: Empirical evidence. ***Strategic Management Journal***, 9: 279-287.

Singh, H., & Montgomery, C. 1987. Corporate acquisition strategies and economic performance. ***Strategic Management Journal***, 8: 377-386.

Stremersch, S., & Tellis, G. J. 2002. Strategic bundling of products and prices: A new synthesis for marketing. ***Journal of Marketing***, 66(1): 55.

Utterback, J. M., & Acee, H. J. 2005. Disruptive Technologies: An Expanded View. ***International Journal of Innovation Management***, 9(1): 1-17.

Walker, G., & Weber, D. 1984. A transaction cost approach to make-or-buy decisions. ***Administrative Science Quarterly***, 29(3): 373-391.

Walter, G. A., & Barney, J. B. 1990. Management objectives in mergers and acquisitions. ***Strategic Management Journal***, 11: 79-86.

Wernerfelt, B. 1984. A resource-based view of the firm. ***Strategic Management Journal***, 5: 171-180.

Williamson, O. E. 1975. ***Markets and Hierarcies, analysis and antitrust applications: A study in the economics of internal organizations***. New York: Free Press.

Williamson, O. E. 1999. Strategy research: Governance and competence perspectives. ***Strategic Management Journal***, 20: 1087-1108.

Yip, G. S. 1982. Diversification entry: Internal development versus acquisition. ***Strategic Management Journal***, 3: 331-345.

PART II

ACQUISITIONS

CHAPTER IV

TOWARD A NEW THEORY OF ACQUISITION: INSIGHTS FROM THE HIGH-TECHNOLOGY INDUSTRIES [2]

The high tech industries (telecommunications, computers hardware and software) are in an important sector of the global economy. Companies in this sector, for different reasons, frequently and increasingly use merger & acquisitions. What are the motivations behind mergers & acquisitions, the process requirements, the critical success factors and the impact on the firm performance? This theoretical research, explores the acquisition experiences of three telecommunications and networking firms. Acquisition strategies and decisions are critical for growth in a high velocity environment. A clear vision and objectives are important pre-acquisition requisites. Factors such as complexity management, integration, synergy, change management and maintaining autonomy are critical success factors. It is difficult to link an acquisition to corporate performance, not only because of measurement and access problems, but also because the goals may vary.

4.1 Introduction

Since the 1990s, there was a substantial increase in alliances mergers and acquisitions activities in the high technology industry. More than 11,000 acquisitions were completed in 1997 for a value estimated at over US$ 900 billion (Chaudhuri & Tabrizi, 1999a; Sarkis, 2009).

In the high technology industries, several firms have used acquisitions as their main growth strategy. In the networking industry, for example, Cisco Systems, a high technology

[2] This chapter was presented as an article, with the same title, at the administrative sciences association of Canada (ASAC) annual conference 2009, strategy division. Niagara Falls, Canada, June 2009.

Silicon Valley based company working in the manufacturing of networking, telecommunications equipment and software, completed more than 107 companies during the period from 1993 to 2006. In the year 1999 alone, it acquired 18 companies, in the year 2000 it acquired 23 companies, with an average of almost two acquisitions each month, and in 2004 and 2005 it completed the acquisitions of 24 companies. Similarly, Nortel Networks completed 21 acquisitions during the period between 1996 and 2006 and Lucent Technologies completed 41 acquisitions during the same period. (Sarkis, 2009)

The equipment manufacturing firms established in this knowledge intense sector, face a variety of turbulent environmental challenges (Bahrami & Evans, 1989; Romanelli, 1989). Their products are technically complex (Bettis & Hitt, 1995; Jemison & Sitkin, 1986b), in which the embedded knowledge is tacit in nature (Oliver, 1997), non codified and non transferable as a public good (Hagedoorn & Duysters, 2002; Peteraf, 1993). The complexity of the technology is coupled with a high level of uncertainty (Hoffman & Schaper-Rinkel, 2001; Quelin, 2000) due to the lack of dominant standards or standard wars (Besen & Farrell, 1994; Shapiro & Varian, 2003), the lack of credible forecast for the potential future new products and the lack of specific requirements to respond to the customers' needs (Quelin, 2000; Roberts et al., 2001; Robertson & Gatignon, 1998; Walker & Weber, 1984). The rate of innovation of new technologies and products is higher than any other industry (Hitt, Hoskisson, & Ireland, 1990; Hitt *et al.*, 1991a; Hitt *et al.*, 1996) and the industry faces continuous waves of new technological generations and disruptive technologies (Christensen, 1997; Christensen, Anthony, & Roth, 2004; Christensen & Raynor, 2003; Utterback & Acee, 2005b), which render the products obsolete, possibly even before being launched to the market (Mayer & Kenney, 2004b). The rate of obsolescence is such that products often become obsolete before their development costs can be recaptured (Roberts & Liu, 2001). The new and disruptive technologies emerge either inside the firm or in the environmental ecological system, following a pattern of an epidemic technology diffusion, mutation and permutation of characteristics. (Sarkis, 2009)

In the context of the high technology industries characterized by turbulence, high velocity and high degree of uncertainty, no one company could possess all the required resources needed to compete and to sustain competitive advantage. The cost of R&D is very high, the learning curve very steep and the technology and product life cycle are very short (Duysters & Man,

2003b). This makes it difficult to rely only on internal R&D and innovative capabilities for sustained competitive advantage.

Mergers and acquisitions have been used intensively by information technology, networking and telecommunications firms for different reasons. Beside traditional motivations of economizing and empire building, firms in these sectors used acquisitions mainly to acquire external strategic resources, gain access to valuable human talents, reduce the cost of R&D, expand its portfolio of products, reduce product time to market and provide for an external source of continuous innovation.

Cisco Systems developed a strategy called "Acquisition and Development" or A&D, which is a combination of acquisition activities for external sources of innovation, while maintaining the internal innovative capacity of the firm through research and development or R&D (Mayer & Kenney, 2004b). Therefore, we assume that the motivations for acquisitions in these sectors of the high technology industries are different than the motivations in the other industries and the more stable ones. (Sarkis, 2009)

Furthermore, most of the acquisitions, whether in the entertainment, financial or retail sectors, except of the high-tech industries, take place in the form of a "large" firm acquiring a "smaller" firm. The acquisition is usually a one to one deal, between the acquirer and the acquired and it usually takes place by the acquirer no more than few times during a reasonably extended period of time, sometime extending for several years. However, in the high-tech industries and specifically in the networking equipment manufacturers sector, we have witnessed an explosion of acquisitions occurring over a very small period of time and with higher frequency during the same year. Therefore we assume that the nature of acquisitions in the high technology industries is different than in the other industries and the more stable ones. The characteristics of these acquisitions taking place intensively and over short periods of time must be different than the characteristics of less frequent acquisitions extending over long periods.

However, in most of the research on corporate mergers and acquisitions, they are viewed as strategies for corporate control and empire building, and they are dealt with using a financial and economic perspectives, while neglecting their social, strategic and organizational dimensions

(Mayer & Kenney, 2004b). The failure to identify the real motivations of acquisitions in the high technology industries or the cognitive simplification used by assuming only their economic dimensions, do not help us in understanding their dynamics, process, components, characteristics and critical success factors. Rather they are treated as a black box where the only intent is to measure their performance. (Sarkis, 2009)

Moreover, as the rate and speed of the acquisitions, the nature of the industry, the environmental challenges and the acquisitions motivations, are different in the high technology industries than any other industry, we assume that the process of starting and completing an acquisition and the critical success factors under those conditions, must also be different in the high tech industries compared to the other industries.

Therefore, this theoretical research intends to fill the gap, by exploring the black box of acquisitions in the high technology industries: Understanding their motivations, their different phases and the activities embedded in each phase, their critical success factors and their performance measurement. The research is organized around three main areas: (1) *Pre-acquisition period*: What are the motivation behind mergers and acquisitions, the rational in the identification of the target company to be acquired and the due diligence. (2) *Acquisition decision and integration periods*: What are the critical success factors in this period? Issues such as complexity, integration, retention, change and autonomy, are explored, and finally (3) *Post-acquisition period*: How to determine the success or failure of an acquisition in this challenging context? In other words, how to link intensive acquisitions to corporate performance and what are the measurement components?

The research begins with a short review of the extended literature on mergers and acquisitions. This is followed by a description of the methodology and the sources of data. Data analysis starts by propositions' building, followed by the construction of a proposed theoretical conceptual model.

4.2 Literature Review

The high tech industries are fundamentally different from other industries. Although product life cycles for all industries have shortened, high tech products can become obsolete in a matter of months. A successful new product may boost market share and profits, but the relentless pace of innovation means that any one gain is likely to be brief. Long-term success depends on the sustained ability to build on excellent products-to develop or recognize rising technologies and incorporate them into new versions that satisfy rapidly changing markets (Chaudhuri & Tabrizi, 1999a). Over the last decade, firms have constantly struggled to deal effectively with their rapidly changing environment. The cost of R&D have rocketed, whereas steep learning curves and ever shortening product and technology life cycles have reduced the time to recoup these costs (Duysters & Man, 2003b; Sarkis, 2009)

High technology firms embark on major strategic moves in the face of a unique set of challenges. Their products are technically complex (Bettis & Hitt, 1995; Jemison & Sitkin, 1986b), in which the embedded knowledge is tacit in nature (Oliver, 1997), non codified and non transferable as a public good (Hagedoorn & Duysters, 2002; Peteraf, 1993). The complexity of the technology is coupled with a high level of uncertainty (Hoffman & Schaper-Rinkel, 2001; Quelin, 2000) due to the lack of dominant standards or standard wars (Besen & Farrell, 1994; Shapiro & Varian, 2003), the lack of credible forecast for the potential future new products and the lack of specific requirements to respond to the customers' needs (Quelin, 2000; Roberts et al., 2001; Robertson & Gatignon, 1998; Walker & Weber, 1984). The rate of innovation of new technologies and products is higher than any other industry (Hitt, Hoskisson, & Ireland, 1990; Hitt *et al.*, 1991a; Hitt *et al.*, 1996) and the industry faces continuous waves of new technological generations and disruptive technologies (Christensen, 1997; Christensen, Anthony, & Roth, 2004; Christensen & Raynor, 2003; Utterback & Acee, 2005b), which render the products obsolete, possibly even before being launched to the market (Mayer & Kenney, 2004b). The rate of obsolescence is such that products often become obsolete before their development costs can be recaptured (Roberts & Liu, 2001). (Sarkis, 2009)

Effective strategies incorporate offensive moves, flexible postures, and a capacity for continuous learning (Bahrami & Evans, 1989). Consequently, many firms have adopted

acquisitions as a strategy for growth. In fast changing markets and turbulent industries, firms are using acquisitions to gain and sustain competitive advantage (Chaudhuri & Tabrizi, 1999a).

The research focusing on the high tech industries show that acquisitions are motivated by the need to obtain critical resources for the survivability of the firm or for sustaining competitive advantage, instead of the conventional explanation of gaining market share, expansion and economies of scale (Ranft & Lord, 2000). Those resources include R&D capabilities, innovative products, new technologies, skilled human assets, top management and entrepreneurial expertise, tacit and specialized knowledge and know-how.

One definition of acquisition in this context is "when a larger firm combines its capabilities in commercialization, manufacturing, distribution and innovation, with the product innovation capabilities of smaller entrepreneurial firms" (Puranam, Singh, & Zollo, 2003). Thus acquisitions enhance the technological capabilities of the acquirer, as those capabilities are embedded in the tacit and socially complex knowledge of the acquired firm (Ranft & Lord, 2000).

Some acquisitions succeed while others fail. As Meyer, A. D. (1999) pointed out: "*this is not a random event, or idiosyncratic to one particular company, but there seems to be a pattern. Some acquisitions fail because they are a strategic misfit, others probably because they are badly implemented*". He then asked about the conditions under which acquisitions are needed?; the phases and the process it follows?; and the conditions or critical success factors for successfully managing acquisitions towards fruitful results.

4.2.1 Pre-Acquisition

Mayer & Kenney (2004b) noted that the research on acquisitions could be divided into two perspectives. The first perspective deals with the *attributes* within the two firms engaged in the acquisition activity, the acquirer and the acquired. Those attributes could be related to the organizational structure such as economies of scale or scope (Bain, 1959), the synergies derived from a "broader product line" or from "vertical economies" (Williamson, 1975). Scherer, F. (1980) explained how acquisitions have a positive impact on market power due to reduced

competition and greater management involvement in larger acquisitions has a better chance of success, than in smaller acquisitions (Shelton, 1988b).

Network theory and social networks have been used to highlight the importance of social networks, and formal and informal relationships, to the process on target identification within the firm's ecosystem and the facilitation of gaining inside information, evaluating the potential for acquisition (or alliance), and valuating important attributes such as strategic fit, common culture, tacit knowledge, technology and product alignment (Haunschild, Henderson, & Davis-Blake, 1998; Palmer *et al.*, 1995). Cultural similarity between firms engaged in pre-acquisition activities was found to be positively related to the acquisition potential success rate (Datta, 1991; Larsson & Finkelstein, 1999).

4.2.2 Post-Acquisition

The second perspective in acquisition research deal with the *"post-transaction"* period after the acquisition decision is taken and the acquisition is completed as a transaction. The research in this post-acquisition phase is divided into two categories: The cultural features within the two organization with respect to strategic fit; and the process of the integration of the acquired firm with its embedded variables (Mayer & Kenney, 2004b). As in the pre-acquisition phase in which target selection is a key element of acquisition success, in the post-acquisition phase, *integration* is a Key element in achieving the desired benefits and in having a positive impact on the overall firm's performance.

Cultural misfit and culture clashes have contributed to poor acquisition outcome and acquisition failure (Nahavandi & Malekzadeh, 1988). Poor internal communication, the lack of a common strategic direction and employee resistance, of both the acquirer and the acquired firms, have negative contributions to strategic fit and acquisition outcome and performance (Larsson & Finkelstein, 1999). These human relations issues have a larger impact on team building and dynamics, organizational culture, recruitment and retention. In the same line, Hambrick & Cannella (1993) demonstrated that senior management turnover was negatively related to acquisition performance.

Another line of research in the post-acquisition phase highlighted the importance of the methodology used in completing the acquisition and the process used in the integration of the acquired firm (Haspelagh & Jemison, 1991; Jemison & Sitkin, 1986b). Moreover, Zollo & Singh (2002) have explained that the process codification of acquisitions have a larger influence on acquisition performance, than the accumulation of acquisition knowledge and experience.

Another stream of research deals with the relationship between knowledge management and human resource recruitment and retention. Knowledge management is an important component of the integration process in the post-acquisition phase. The objective would be how to integrate the knowledge base of the acquired firm and how to transfer the knowledge path, history and dependence, of the acquirer to the acquired firm. The nature of knowledge in the high technologies industries is tacit (Oliver, 1997) and embedded in the complex social and human capital. It could be in the technical expertise and know-how of the technical teams, the research and development capabilities, the management practice, the entrepreneurial spirit or the innovation track record. Ranft & Lord (2000) found that the retention of such tacit knowledge and talents is highly important during the integration process.

However, the literature presents contradictory results on the relationship between knowledge transfer and the process of post-acquisition integration. Huysman, Leonard & Nicolle (2002) found that some researchers propose a curvilinear relationship between knowledge transfer in the post-acquisition phase and some preconditions such as strategic fit, integration and retention of talent, while the other researchers propose a monotonic relationship. They assumed that acquisitions are idiosyncratic in nature and very specific to their context, and therefore concluding that it is difficult to find general causal explanation.

4.2.3 Effect on Performance

Although performance measurement is a critical issue in evaluating the acquisition performance and outcome, Tehrani (2003) found contradictory results linking acquisitions and superior performance: Some researches reflect on the positive relationship between acquisitions and performance, while others propose a negative relationship or no relationship between

acquisition activities and firm performance. A third group of researchers identified some mediating and moderating factors in the relationship between acquisitions and firm performance.

For example, Hayward & Hambrick (1997) and Ravenscraft & Scherer (1989) reported insignificant or negative returns as acquisition outcome on performance. To the contrary, Jensen (1984) reported positive returns. In balance, Larsson and Finkelstein (1999) concluded that there was no consensus on the relationship between acquisition and its effect on firm performance.

One way to measure the effect of acquisition on firm performance, is to calculate market returns before, during and after an acquisition has been announced and the announced acquisition completed (Porrini, 2004). However, it is difficult to measure the performance of successive acquisitions and especially the acquisitions occurring over short periods of time, such as one year. This is due to the difficulty in isolating the effect of one acquisition from the series of acquisitions occurring over the same short period of time (Weston, 1999).

Furthermore, while the main stream research on performance measurement of acquisitions has shifted from a general evaluation of the economic performance, to the evaluation of horizontal, vertical and unrelated acquisitions, performance measurement based on technical and technological dimensions has been ignored or neglected (Hagedoorn & Duysters, 2000). We assume that technological or technical performance is an important performance measurement, especially in the technology based industries such as the high technology industries, where some acquisitions, if not all, could be motivated by the need to acquire, integrate and build on complementary, supplementary or substitutive technologies. The outcome could be a better technology based product or service, a superior technical performance or a new line of products.

4.3 Theory Building and General Propositions (Hypotheses)

In the high technology industries, several firms have used acquisitions as their main growth strategy. In the networking industry, for example, Cisco Systems, a high technology Silicon Valley based company working in the manufacturing of networking, telecommunications equipment and software, completed more than 107 companies during the period from 1993 to

2006. In the year 1999 alone, it acquired 18 companies, in the year 2000 it acquired 23 companies, with an average of almost two acquisitions each month, and in 2004 and 2005 it completed the acquisitions of 24 companies. Similarly, Nortel Networks completed 21 acquisitions during the period between 1996 and 2006 and Lucent Technologies completed 41 acquisitions during the same period.

> *"Lucent wants the smartest group of people in Bell Labs. But if we're not good at something, we've got Silicon Valley. It's our lab"* -- Don Listwin, Cisco's No. 2 executive. (Goldblatt, 1999)

Mergers and acquisitions have been used intensively by information technology, networking and telecommunications firms for different reasons. Beside traditional motivations of economizing and empire building, firms in these sectors used acquisitions mainly to acquire external strategic resources, gain access to valuable human talents, reduce the cost of R&D, expand its portfolio of products, reduce product time to market and provide for an external source of continuous innovation, in a very short period of time.

> *"Our acquisition strategy was aimed at acquiring brainpower more than products"*
> -- John Chambers, CEO of Cisco Systems (Byrne & Elgin, 2002).

Cisco Systems developed a strategy called "Acquisition and Development" or A&D, which is a combination of acquisition activities for external sources of innovation, while maintaining the internal innovative capacity of the firm through research and development or R&D (Mayer & Kenney, 2004b). Therefore, we assume that the motivations for acquisitions in these sectors of the high technology industries are different than the motivations in the other industries and the more stable ones.

"In general, our philosophy is to have about 70 percent of our products come from internal development and 30 percent through acquired companies. About 80 percent of the company's technology is developed internally. Despite Cisco's vast resources it is unreasonable to expect the company to stay on top of every emerging technology. Acquisitions fill the void. We view it as a very efficient process to deliver a product to the customer."

-- Michelangelo Volpi, Chief acquisition officer, Cisco Systems (Heskett, 1997)

Acquisitions are a strategic tool to expand the firm capabilities, including physical assets and tacit knowledge. Acquisitions are engines for growth and sustained competitive advantage.

"The more integrated Cisco's router and switching hardware is with the company's new business offerings, the more entrenched Cisco will become in customers' networks. The more entrenched Cisco becomes, the less danger there is of customers' switching to other suppliers. Cisco is building walls around its territory or, as Chambers euphemistically puts it, keeping customers from having to make a vendor decision."

-- Michelangelo Volpi, Chief acquisition officer, Cisco Systems (Vogelstein, 2002)

However, acquisition should not be for the sake of acquisition. It should be based on the identification of real internal needs and potential external resources.

"Sycamore and Juniper are strong competitors. They are good for us. They make us work harder. But I would not make a defensive acquisition, like buying a Juniper just to throttle its technology." -- John Chambers, CEO of Cisco Systems (Serwer, 2000)

Furthermore, acquisitions if not well managed and especially in the case of acquisitions for the sake of acquisitions, are not a guarantee to success and could lead to failure.

"They're basically buying everything they don't have. M&A works to some extent, but at Cisco, it got out of hand" -- Craig Johnson, principal analyst for market watcher (Heskett, 1997)

Proposition 1. Acquisitions are sometime a critical factor for growth in a high velocity environment. However, successful acquisitions depend on a successful identification of needs, capabilities and a target to be acquired.

On key element in the pre-acquisition phase in the continuous scanning of the firm's ecosystem, coupled with the internal assessment of resources and needs.

> "*Once that decision is made, my team consults with business units and customers to find out about their technological needs. Customers have a profound influence on Cisco's strategy.*"
> -- Michelangelo Volpi, Chief acquisition officer, Cisco Systems (Goldblatt, 1999)

The continuous scanning of the environment and the assessment of internal needs, allow the acquiring company to move fast ahead of the competition.

> "*We had interest from other companies, but they didn't move as fast as Cisco. They were still considering us when the announcement came out that Cisco had bought us.*"
> -- Joe Bass, CEO of Monterey (Goldblatt, 1999)

The assessment of the external environment allows the firm to identify new emerging technologies that complement or supplement its product line and new disruptive technologies that could substitute their product advantage. In this ever changing, turbulent, high velocity environment with high degree of certainty, it is important to identify these new and disruptive technologies in their embryonic stage.

> "*If a market area appears to be promising, Cisco may eventually move to acquire the firm.*"
> John Chambers, CEO of Cisco Systems -- (Wuebker *et al.*, 1998).

However, the successful selection of targets is a precondition for successful integration in the post-acquisition transaction.

> *"I don't believe mergers of equals work."*
> John Chambers, CEO of Cisco Systems -- (Goldblatt, 1999).

> *"When Cisco has mistimed its bid...In the 1996 (the) acquisition of Granite Systems, a maker of gigabit ethernet switches, didn't work because Granite's product wasn't as far along as Cisco had believed. On the other hand, people close to one of Cisco's largest acquisitions, that of StrataCom in 1996, say it was difficult because StrataCom was too large and its product too developed. Cisco had trouble integrating elements of its operating system into StrataCom's switches".* (Goldblatt, 1999)

Proposition 2. Identification of the target to be acquired is a critical step in the pre-acquisition period and is the building block for the acquisition process and post-acquisition success. In addition, due diligence is critical in confirming a strategic fit combined with long-term objectives and leads to the acquisition approval and go-ahead.

Managing complexity is a key success factor in the post-acquisition transaction and implementation phase. It covers resource capabilities, assessment of needs, competitive analysis, existing and future technologies under development, engineering and innovation talents, corporate culture, strategic fit, information technologies infrastructure, products road map and human capital.

> *"Cisco's strategy can be boiled down to five things. We look at a company's vision; its short-term success with customers; its long-term strategy; the chemistry of the people with ours; and its geographic proximity."*
> -- Michelangelo Volpi, Chief acquisition officer, Cisco Systems (Goldblatt, 1999)

Complexity should be evaluated prior to the acquisition transaction and should be planned prior to the implementation and integration phase.

> *"Acquire a business that's too mature, and risk soars. If you buy a company with customers, product flows, and entrenched enterprise resource systems, you have to move very gingerly. Otherwise, you risk customer dissatisfaction. Figuring out how to integrate this type of company could take nine months or more."*
> -- Michelangelo Volpi, Chief acquisition officer, Cisco Systems (Goldblatt, 1999)

Reducing complexity could be achieved by selecting the right target based on several criteria, among them proximity.

> *"Our fifth rule of thumb was geographic proximity when doing large acquisitions. We combined StrataCom and Cisco in 90 days."*
> -- Michelangelo Volpi, Chief acquisition officer, Cisco Systems (Wuebker et al., 1998)

Culture fit and compatibility are important issues when assessing and planning for complexity.

> *"Go over the decisions that management made, and see if you'd come to the same conclusion. If so, the company's execs probably think the way you do and are likely to fit in fine."*
> -- Dan Scheinman, Vice President for legal affairs, Cisco Systems (Goldblatt, 1999)

Proposition 3. Complexity is a critical success factor in the pre-acquisition and implementation periods. Complexity has to be investigated linking the acquirer and the acquired, mapped and planed for prior to any acquisition.

Integration is a critical success factor in the acquisition implementation period. Integration involves issues such as employees' retention, management of change, integration of processes and information technology systems, technology infrastructure, R&D capabilities, product road map, and sales force capabilities. Successful integration relies on the methodology used for completing the acquisition and the process used for the integration of the acquired firm in the post-acquisition transaction phase.

> *"We're spending $10 billion a year in acquisitions; this is a process that works."*
> John Chambers, CEO of Cisco Systems -- (Goldblatt, 1999).

The most important element in the integration process is the human capital and the embedded tacit knowledge of the acquired firm.

"Cisco has an overall goal of getting the top 10% to 15% of people in our industry. Our philosophy is very simple--if you get the best people in the industry to fit into your culture and you motivate them properly, then you're going to be an industry leader."
-- John Chambers, CEO of Cisco Systems (Nakache, 1997)

"And then there's Cisco's acquisition strategy. If you can't hire talent, just buy it. One of Cisco's core strategies for growth is acquisition, and one of the primary purposes for acquisitions is for the engineering and R&D talent. In addition to hiring close to 1,000 new employees per year, Cisco absorbed the employees of the acquired companies, including 1,300 from StrataCom, a supplier of switches used to speed information delivery across the Internet. Cisco seeks to keep virtually all the employees of the companies it buys, sometimes by letting them telecommute."
-- Barbara Beck, Vice President human resources Cisco Systems (Nakache, 1997)

The integration process is a step by step, carefully designed and meticulously implemented process. Accumulating knowledge based on acquisition experience lead to the refinement and fine tuning of the process.

"I'm there from the point of inception till you can't identify the company as an acquisition anymore. I joke that I'm going to get companies to the point of do-it-yourself integration, where I just send a videotape of me talking"
-- Mimi Gigoux, Vice President for Integration Cisco Systems (Goldblatt, 1999)

"We closed the deal at 11 p.m. on a Wednesday. When I walked in Thursday morning, we all had Cisco tags on our doors and a banner on the front of our building. And they had this huge Cisco art thing on the wall in the lobby. I saw someone in here putting bottled water in the fridge to replace our coolers. They really don't mess around." -- Lori Smith, Human Resources director at Monterey (Goldblatt, 1999)

Proposition 4. Integration is a critical success factor in the acquisition implementation period. Based on the complexity map, the integration plan has to be prepared prior to the acquisition and implemented immediately after the acquisition transaction.

Maintaining autonomy is a critical success factor in the integration phase. As the integration of the acquired firm is critical, the autonomy of some business units within the

acquired firm such as the R&D and product management groups is important in the post-acquisition transaction phase. Autonomy positively enhances the retention of the acquired employees; the integrity of the R&D teams, protect the core creative teams from the larger firm bureaucracy, continue to bond the teams and to stimulate their creative activities.

> *"In general, business units are pretty autonomous here. It's not stifling at all. "People like to work for a leader."*
> -- Bill Rossi, Executive at Cisco Systems (Goldblatt, 1999)

Proposition 5. Maintaining the uniqueness, individuality, and autonomy of some areas or groups of the acquired company is a critical success factor in the acquisition implementation and post-acquisition periods.

Synergy is critical success factor in the post acquisition transaction and integration phase. Synergy is essential in avoiding duplication and it covers talent, products, capabilities, resources, objectives and operational plans. Synergy deals with economies of scope and scale and it has a direct effect on the overall success of the acquisition and the global corporate performance.

> *"Cisco's ability to integrate acquired companies is legendary. This creates lots of synergy. Thanks to acquisitions, Cisco's offerings run up and down the entire product hierarchy, giving customers one-stop shopping for their networking needs. End to end."* -- John Chambers, CEO of Cisco Systems (Serwer, 2000)

Synergy is an important element in maintaining the firm growth and in sustaining competitive advantage

> *"The more integrated Cisco's router and switching hardware is with the company's new business offerings, the more entrenched Cisco will become in customers' networks. The more entrenched Cisco becomes, the less danger there is of customers' switching to other suppliers. Cisco is building walls around its territory or, as Chambers euphemistically puts it, keeping customers from having to make a vendor decision."*
> -- Michelangelo Volpi, Chief Acquisition Officer Cisco Systems (Vogelstein, 2002)

Proposition 6. Creating synergy is a critical success factor during the acquisition implementation and post acquisition periods.

Proposition 7. It is difficult to link a specific acquisition to corporate performance, because of measurement and access problems. Acquisitions may have a direct or indirect effect on performance and the results may vary depending on the specific acquisition situation. Performance evaluation should not be limited to economic value only, but should take into account several other dimensions such as strategic objectives, technological and social performance. In addition it should be evaluated not only in the short-term, but also in the long-term.

4.4 Proposed Theoretical Model

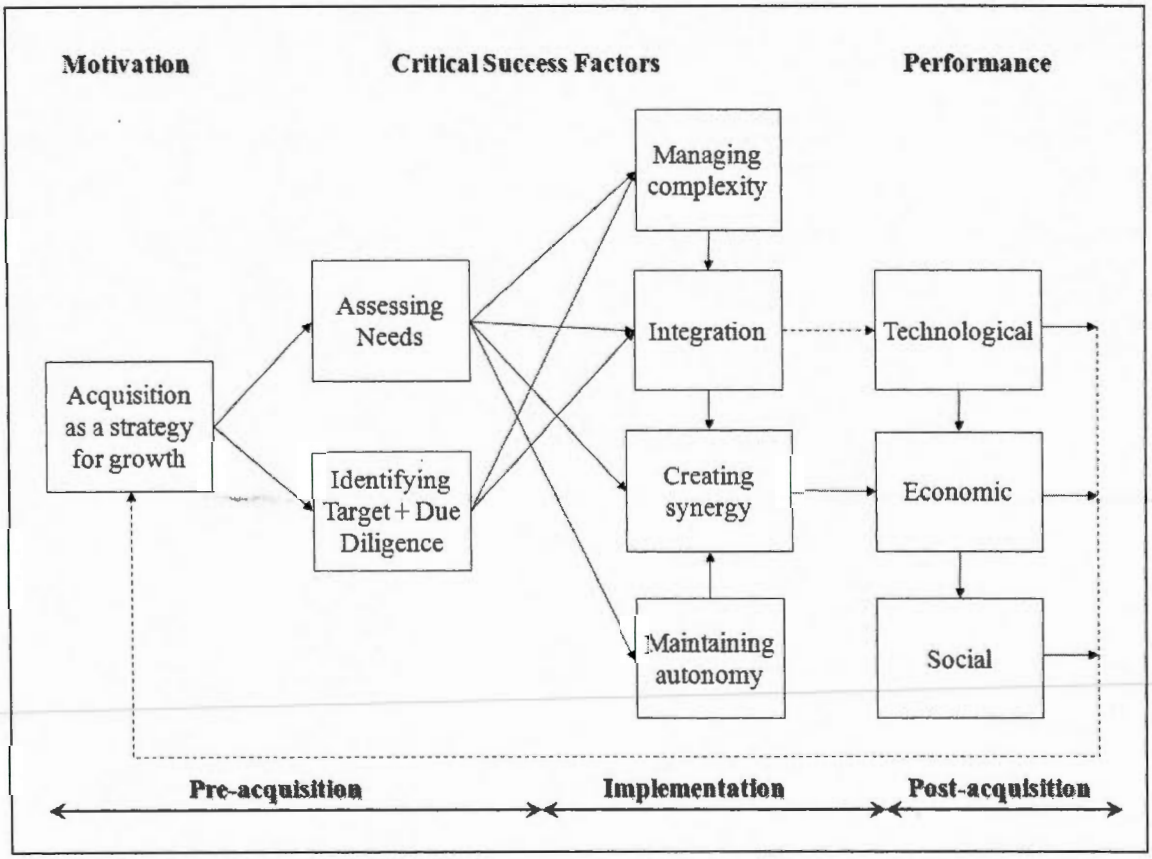
Figure 4.1 illustrates the proposed theoretical model, constructed based on the induced theoretical propositions.

Acquisitions are sometime a critical factor for growth in a high velocity environment. However, successful acquisitions depend on a successful identification of needs, capabilities and a target to be acquired. Furthermore, acquisitions if not well managed and especially in the case of acquisitions for the sake of acquisitions, are not a guarantee to success and could lead to failure

Identification of the target to be acquired is a critical step in the pre-acquisition period and is the building block for the acquisition process and post-acquisition success. In addition, due diligence is critical in confirming a strategic fit combined with long-term objectives and leads to the acquisition approval and go-ahead.

Figure 4.1

Acquisitions' model in high technology industries



Complexity is a critical success factor in the pre-acquisition and implementation periods. Complexity has to be investigated linking the acquirer and the acquired, mapped and planed for prior to any acquisition. It covers resource capabilities, assessment of needs, competitive analysis, existing and future technologies under development, engineering and innovation talents, corporate culture, information technologies infrastructure, products road map and human capital.

Integration is a critical success factor in the acquisition implementation period. Based on the complexity map, the integration plan has to be prepared prior to the acquisition and implemented immediately after the acquisition agreement has been reached. Integration involves

issues such as employees' retention, management of change, integration of processes and information technology systems, product road map, and sales force capabilities.

Maintaining the uniqueness, individuality, and autonomy of some areas or groups of the acquired company is a critical success factor in the acquisition implementation and post-acquisition periods.

Synergy is a critical success factor during the acquisition implementation and post acquisition periods. Synergy is essential in avoiding duplication and it covers talent, products, capabilities, resources, objectives and operational plans. It has a direct effect on the overall success of the acquisition and the global corporate performance.

It is difficult to link a specific acquisition to corporate performance, because of measurement and access problems. Acquisitions may have a direct or indirect effect on performance and the results may vary depending on the specific acquisition situation. Performance evaluation should not be limited to economic value only, but should take into account several other dimensions such as strategic objectives, technological and social performance. In addition it should be evaluated not only in the short-term, but also in the long-term.

References

Ackermann, F., & Eden, C. 2005. *"Using Causal Mapping to Support Information Systems Development: Some Considerations" in Narayanan, V. K. and Armstrong, D. J., Eds, "Causal Mapping for Research in Information Technology*. Hershey, PA: Idea Group Publishing.

Bahrami, H., & Evans, S. 1989. Strategy making in high-technology firms: The empiricist mode. *California Management Review*, 31(2).

Bain, J. S. 1959. *Industrial Organization*. New York: John Wiley & Company.

Besen, S. B., & Farrell, J. 1994. Choosing how to compete: Strategies and Tactics in Standardization. *The Journal of Economic Perspective*, 8(2): 117-131.

Bettis, R. A., & Hitt, M. A. 1995. The new competitive landscape. *Strategic Management Journal*, 16: 7-19.

Burrell, G., & Morgan, G. 1979. *Sociological Paradigms and Organizational Analysis*. Exeter: Heinemann.

Byrne, J. A., & Elgin, B. 2002. Cisco Shopped till It Nearly Dropped, *Business Week*.

Charmaz, K. 2000. Grounded Theory: Objectivist and Constructivist Methods. In N. K. Denzin, & Y. S. Lincoln (Eds.), *Handbook of Qualitative Research*, 2nd. ed.: 509-535. Thousands Oaks, CA.: Sage.

Chaudhuri, S., & Tabrizi, B. 1999. Capturing the real value in high-tech acquisitions. *Harvard Business Review*, 3(4).

Christensen, C. M. 1997. *The innovator's dilemma - When new technologies cause great firms to fail*. Cambridge, Massachusetts: Harvard Business School Press.

Christensen, C. M., Anthony, S. D., & Roth, E. A. 2004. *Seeing what's next - Using the theories of innovation to predict industry change*. Boston, Massachusetts: Harvard Business School Press.

Christensen, C. M., & Raynor, M. E. 2003. *The innovator's solution - Creating and sustaining successful growth*. Boston, Massachusetts: Harvard Business School Press.

Cossette, P. 2002. Analysing the thinking of F. W. Taylor using cognitive mapping. *Management Decision*, 40(2): 168-182.

Cossette, P., & Lapointe, A. 1997. A mapping approach to conceptual models : The case of macroeconomic theory. *Canadian Journal of Administrative Sciences*, 14 (1): 41-51.

Creswell, J. W. 1998. *Qualitative inquiry and research design : choosing among five traditions* Thousand Oaks, Calif.: Sage.

Creswell, J. W. 2003. *Research design : qualitative, quantitative and mixed approaches* (2nd ed ed.). Thousand Oaks, Calif.: Sage Publications.

Datta, D. K. 1991. Organizational Fit and Acquisition Performance: Effects of Post-Acquisition Integration. *Strategic Management Journal*, 12: 281-297.

Denzin, N. K., & Lincoln, Y. S. 2003. *Strategies of qualitative inquiry* (2nd ed ed.). Thousand Oaks Sage.

Duysters, G., & Man, A.-P. d. 2003. Transitory alliances: an instrument for surviving turbulent industries? *R&D Management*, 33(1): 49-58 (10 pp.).

Eden, C., & Ackermann, F. 1998. *Making strategy: The journey of strategic management*: Sage Publications.

Eden, C., & Ackermann, F. 2004. Cognitive mapping expert views for policy analysis in the public sector. *European Journal of Operational Research*, 152(3).

Eisenhardt, K. M. 1989. Building theories from case study research. *Academy of Management Review*, 14(4): 532-550.

Gilgun, J. 1999. We Shared Something Special: The Moral Discourse of Incest Perpetrators. *Journal of Marriage and the Family*, 57: 265-281.

Glaser, B. G. 1992. *Basics of grounded theory analysis: Emergence Vs. Forcing* Mill Valley, Calif.: Sociology Press.

Goldblatt, H. 1999. Cisco's Secrets, *Fortune*.

Hagedoorn, J., & Duysters, G. 2000. The effect of mergers and acquisitions on the technological performance of companies in a high-tech environment. The Netherlands: Eindhoven Center for Innovative Studies.

Hagedoorn, J., & Duysters, G. 2002. External sources of innovative capabilities: The preference for strategic alliances or mergers and acquisitions. *Journal of Management Studies*, 39(2).

Hambrick, D. C., & Cannella, A. A. 1993. Relative Standing: A Framework for Understanding Departures of Acquired Executives. *Academy of Management Journal*, 36(4): 733-762.

Haspelagh, P., & Jemison, D. 1991. *Managing Acquisitions*. New York: Free Press.

Haunschild, P. R., Henderson, A., & Davis-Blake, A. 1998. *CEO Demographics and Acquisitions: Network and Cognitive Effects of Educational and Functional Background.* New York: Addison Wesley.

Hayward, M., & Hambrick, D. 1997. Explaining the premiums paid for large acquisitions: Evidence of CEO hubris. *Administrative Science Quarterly*(42): 103-127.

Heskett, B. 1997. Cisco shops to fill technology holes, *CNET News*.

Hitt, M. A., Hoskisson, R. E., & Ireland, R. D. 1990. Mergers and acquisitions and managerial commitment to innovation in m-form firms. *Strategic Management Journal*, 11: 29-47.

Hitt, M. A., Hoskisson, R. E., Ireland, R. D., & Harrison, J. S. 1991. Are acquisitions a poison pill for innovation. *Academy of Management Executive*, 5(4).

Hitt, M. A., Hoskisson, R. E., Johnson, R. A., & Moesel, D. D. 1996. The market for corporate control and firm innovation. *Academy of Management Journal*, 39(5): 1084-1119.

Hoffman, W. H., & Schaper-Rinkel, W. 2001. Acquire or ally? - A strategy framework for deciding between acquisition and cooperation. *Management International Review*, 41(2): 131-159.

Huysman, M., Leonard, D., & Nicolle, A. 2002. *Towards a learning perspective on knowledge/technology transfer through corporate acquisitions.* Paper presented at the 35th Hawaii International Conference on System Sciences, Hawaii.

Jemison, D. B., & Sitkin, S. B. 1986. Corporate acquisitions: A process perspective. *Academy of Management Review*, 11(1): 145-163.

Jensen, M. C. 1984. Takeovers: Folklore and Science. *Harvard Business Review*, 62(6): 109-122.

Kuhn, T. 1962. *The Structure of Scientific Revolutions*. Chicago: University of Chicago Press.

Langley, A. 1999. Strategies for Theorizing from Process Data. *Academy of Management Review*, 24(4): 691-710.

Larsson, R., & Finkelstein, S. 1999. Integrating, Strategic, Organizational, and Human Resource Perspectives on Mergers and Acquisitions: A Case Study of Synergy Realization. *Organization Science*, 10(1): 1-26.

Lincoln, Y. S., & Guba, E. G. 1985a. Establishing Trustworthiness, *Naturalistic Inquiry*, Vol. 11: 289-331: Sage Publication.

Lincoln, Y. S., & Guba, E. G. 1985b. *Naturalistic Inquiry*. Beverly Hills, CA: Sage Publication.

Managing_Technology. 2001. Thinking of Buying a High-Tech Start-up? Read This First, *Knowledge @ Wharton*.

Mayer, D., & Kenney, M. 2004. Economic action does not take place in a vacuum: Understanding Cisco's acquisition and development strategy. *Industry and Innovation*, 11(4): 299-325.

Mehta, S. N. 2000. Lucent's New Spin, *Fortune*.

Meyer, A. D. 1999. Using strategic partnerships to create a sustainable competitive position for high-tech start-up firms. *R&D Management*, 29(4): 323-328 (326 pp.).

Miles, M. B., & Huberman, A. M. 1984. *Qualitative data analysis : a sourcebook of new methods*. Beverly Hills Sage.

Miles, M. B., & Huberman, A. M. 1994. *Qualitative data analysis : an expanded sourcebook* (2nd ed ed.). Thousand Oaks Sage Publications.

Nahavandi, A., & Malekzadeh, A. R. 1988. Acculturation in Mergers and Acquisitions. *Academy of Management Review*, 13(1): 79-90.

Nakache, P. 1997. Cisco recruiting edge, *Fortune*.

Oliver, C. 1997. Sustainable competitive advantage: Combining institutional and resource based views. *Strategic Management Journal*, 18(9): 697-713.

Palmer, D., Barber, B., Zhou, X., & Soysal, Y. 1995. The Other Contested Terrain: Friendly and Predatory Acquisition of Large U.S. Corporations in the 1960s. *American Sociological Review*, 60: 469-499.

Patton, M. Q. 2002. *Qualitative research & evaluation methods* (3rd ed ed.). Thousand Oaks Sage Publications.

Peteraf, M. A. 1993. The cornerstones of competitive advantage: A resource-based view. *Strategic Management Journal*, 14: 179-191.

Porrini, P. 2004. Alliance experience and value creation in high-tech and low-tech acquisitions. *Journal of High Technology Management Research*(15): 267-292.

Puranam, P., Singh, H., & Zollo, M. 2003. A bird in the hand or two in the bush? Integration trade-offs in technology-grafting acquisitions. *European Management Journal*, 21(2): 79-84.

Quelin, B. 2000. Core competencies, R&D management and partnerships. *European Management Journal*, 18(5): 476-487.

Ranft, A. L., & Lord, M. D. 2000. Acquiring new knowledge: The role of retaining human capital in acquisitions of high-tech firms. *The Journal of High Technology Management Research*, 11(2): 295-319.

Ravenscraft, D. J., & Scherer, F. M. 1989. The Profitability of Mergers. *International Journal of Industrial Organization*(7): 101-116.

Roberts, E. B., & Liu, W. K. 2001. Ally or acquire? *MIT Sloan Management Review*.

Romanelli, E. 1989. Environments and strategies of organization start-up: effects on early survival. *Administrative Science Quarterly*, 34(3): 369-387.

Scherer, F. M. 1980. *Industrial Market Structure and Economic Performance*. Chicago: Rand-McNally.

Serwer, A. 2000. There is something about Cisco, *Fortune*.

Shapiro, C., & Varian, H. R. 2003. The Art of Standards Wars, *Managing in the Modular Age: Architectures, Networks and Organizations*: 424: Blackwell Publishing.

Shelton, L. M. 1988. Strategic Business Fits and Corporate Acquisitions: Empirical Evidence. *Strategic Management Journal*, 11: 99-115.

Strauss, A., & Corbin, J. 1998. *Basics of qualitative research: techniques and procedures for developing grounded theory* (2nd ed.). Thousand Oaks, Calif.: Sage.

Sutton, R. I., & Staw, B. M. 1995. What theory is not. *Administrative Science Quarterly*, 40: 371-384.

Tehrani, M. 2003. Competitive strategies, strategic alliances and performance in international high-tech industries: A cross cultural study. *Journal of American Academy of Business*, 2(2): 610-617 (618 pp.).

Utterback, J. M., & Acee, H. J. 2005. Disruptive Technologies: An Expanded View. *International Journal of Innovation Management*, 9(1): 1-17.

Vogelstein, F. 2002. Can Cisco Dig Out Of Its Hole?, *Fortune*.

Weick, K. E. 1995. What theory is not, theorizing is. *Administrative Science Quarterly*, 40: 385-390.

Weston, J. F. 1999. Mergers and performance. California: Anderson School of Management, University of California.

Whetten, D. A. 1989. What constitutes a theoretical contribution? *Academy of Management Review*, 14: 490-495.

Williamson, O. E. 1975. *Markets and Hierarcies, analysis and antitrust applications: A study in the economics of internal organizations.* New York: Free Press.

Wuebker, R., Navoth, Z., Rao, B., Horwitch, M., & Ziv, N. 1998. Cisco Systems: The Internetworking Company of the Future. New York: Institute for Technology and Enterprise.

Yin, R. K. 1989. Designing single - and multiple-case studies, *Case study research: Design and methods*, Revisited edition ed.: (170 p.), chap. 172, p. 127-160 (134p.): Sage Publications.

Yin, R. K. 2003. *Case study research : design and methods* (3rd ed ed.). Thousand Oaks, Calif.: Sage Publications.

Zollo, M., & Singh, H. 2002. Post-acquisition Strategies, Integration Capability, and the Economic Performance of Corporate Acquisition. *Strategic Management Review*.

CHAPTER V

A COGNITIVE PERSPECTIVE OF DECISION MAKING IN THE HIGH TECHNOLOGY INDUSTRY USING CAUSAL MAPPING [3]

This paper explores the strategy formulation and the concepts related to the decision making regarding acquisition formation in the information technology industry. Acquisitions, as part of the technical collaboration between firms in the information technology industry, have been intensive since 1990. The complexity of the related issues, critical success factors, conditions, triggers, motivations, causes, effects and their interlinked relationships, have not been fully covered in the literature of strategic management. In this paper, they are explored with a holistic approach to the study of strategic management, using a cause and effect mapping technique, known as cognitive mapping. The application of this research tool and the results help us to understand the importance of each concept (causes and consequences) used, the interrelationships between them, and the complexity of the decision making process. The paper is a contribution to the field of strategic management and to the cognitive approach in the management science.

5.1 Introduction

The information technology industry is different than any other technology based industry. It is characterized by turbulence, high velocity, uncertainty and complexity. This is due partially to the high rate of innovation, obsolescence, intensity of R&D activities and the continuous emergence of disruptive technologies. The IT industry is based on knowledge intensive content, which is not codified in routines and procedures, tacit in nature, and embedded

[3] This chapter was published as an article, with the same title, at the proceedings of the administrative sciences association of Canada (ASAC) annual conference 2009, strategy division. Niagara Falls, Canada, June 2009. Vol. 30, No 6.

in the social complexity of the interrelation between the agents' interactions. Firms in the IT sector, possess highly technical skills, intensive R&D capabilities, entrepreneurial management experience, and healthy organizational structure and culture that encourage innovation and creativity, all of which are considered as strategic assets which are difficult to imitate, unique, copy, duplicate or simply transfer by employees mobility, recruitment or retention. Those strategic assets are built over time, based on choice and path dependency, and constitute the core competencies of the firm providing a sustained competitive advantage. (Sarkis, 2009)

The information technology industry has witnessed intensive collaborative activities between the firms in the sector, aimed at coping with the environmental challenges, need for continuous innovation and scarcity of strategic resources and talents. Those collaborative activities included informal collaboration, strategic alliances, R&D agreement, joint-ventures, venture capital, angel investment, mergers and acquisitions. Since 1990, mergers and acquisitions for example have been used intensively by information technology firms for different reasons. Beside traditional motivations of economizing and empire building, IT firms used acquisitions mainly to acquire external strategic resources, gain access to valuable human talents, reduce the cost of R&D, expand its portfolio of products, reduce product time to market and provide for an external source of continuous innovation. Several firms have used acquisitions as their main growth strategy. Cisco systems for example, a high technology Silicon Valley based company working in the manufacturing of networking and telecommunications equipment and software, acquired more than 107 companies during the period from 1993 to 2006. In the year 1999 alone it acquired 18 companies and in the year 2000 it acquired 23 companies, with an average of almost two acquisitions each month. Today, Cisco systems stands as a leader in the high technology industry and as the company who created this trend of using a successful aggressive acquisition strategy as its main growth engine; a strategy later called A&D. (Sarkis, 2009)

However, the importance of this trend within the context of the high technology industry, the research on acquisitions in the literature of strategic management could be categorized as contradictory, incoherent and incomplete. First, it is contradictory because the findings present contradictory performance outcome related to acquisitions, even in the same industry sector. Second, it is incoherent, because some researches focus on the economic aspect of acquisitions including performance, economies of scope and scale, market penetration, growth, position, net

gain, etc., while the others focus on the strategic aspect of acquisition including human talent, tacit knowledge, strategic resources, strategic fit, organizational culture and core competencies. Each approach neglects the other, which leads to an incoherent picture of the factors involved. The theories used are numerous: transaction cost economics, resource based view, market based view, knowledge based view, institutional theory, network theory, population ecology, among others. Each theory gives a perspective to the study of acquisitions, however the whole picture remain fragmented and unclear. Third, it is incomplete because the literature has not shed enough light on all the factors, criteria, conditions, motivations, causes and consequences related to the acquisition formation. When a company such as Cisco undergo intensive acquisition activities during a small period of time (two per month), the critical success factors and the process of decision making for the acquisition formation has not been fully researched, under those extreme and intense environmental conditions. In fact due to its complexity, most of the factors and the whole process is researched using cognitive simplification (Duhaime & Schwenk, 1985), implying also that practitioners use simplification in their decision making. Furthermore, practical considerations limit the research on complex issues. In quantitative research studying acquisitions, the practical limitation on the number of variables to be used, limit the research to those variables, and does not explain the "why" and "how" related questions. Using industrial and commercial databases and conducting statistical analysis using multiple techniques, does not clarify, nor explain the factors and their interrelations related to acquisitions. In qualitative acquisitions research, the textual form provides more clarification and explanation, but is constrained by the limited number of pages required for publishing a paper. Moreover, as the field of strategy and strategic management borrows from different disciplines such as sociology, anthropology, politics, industrial economics, etc., acquisitions research using one or another perspective, remain fragmented, does not integrate all of the factors involved and does not portray the complexity of the issue (Hasfi & Thomas, 2005).

Therefore, there is a gap in the strategic management literature with respect to the research on acquisitions in the context of the high technology industry. This paper provides a valuable contribution in filling this gap. The paper uses a holistic and integrative approach in researching acquisitions in the context of the high technology industry, by integrating and combining different and distinct perspectives into a larger model, while maintaining the depth of analysis that could be used in an analytical approach, without neglecting the details, coherence

and the relation to practice. The objective of this research is to highlight the concepts related to acquisitions in the context of the high technology industry and their relative importance in the process of decision making leading to the acquisition formation. The concepts have been gathered from the strategic management literature, classified according to their respective theoretical approach and their interrelated links examined using triangulation to ensure internal validity. A causal mapping technique know as cognitive mapping, was used to draw the causal and effect relationships between the different concepts and to analyze their interrelated effects on each other and their relative importance with a constructivist, holistic and integrative model. The constructed map eliminates the limitations of the traditional statistical methods used in quantitative research and the textual methods used in qualitative research, by providing a visual tool for combining a large number of concepts in one space, including their interrelated links describing a causal or effect relationship. It is a representation of cognitive schema based on my understanding of the literature on acquisitions in the strategic management tradition. The research is a contribution to the field of strategic management, to the research on acquisitions in the context of the high technology industry and to the application of the cognitive approach in studying management issues using the cognitive mapping as a research tool. The research is intended to both the academia and to the practitioners.

5.2 Theoretical Background

The research on acquisitions in the context of the high technology industry is a complex issue and it is much more complex than it seems, when using one approach. As noted by Hafsi and Thomas (2005, p 509) "*collective action cannot be understood if it is broken down into parts to be studied separately. As reality is complex, it is more appropriate to study it in its totality. This means not only studying all the parts together but also their inter-relationships, even if the result is an incomplete and imperfect understanding*". Strategy is classified into divisional functions such as marketing, finance, operations; it is grounded in behavioral science, political science, anthropology, sociology, psychology, economics and finance, it combines different disciplines such as business policy and strategic management, industrial organization, organizational economics, economics sociology, human behavioral science, organizational theory, it uses different theories borrowed from distinct areas of social science such as transaction

cost, resource based view, network theory, knowledge-based view and market-based view. " *It feels like a vast array of diverse and uncoordinated detailed observations that are scientifically respectable, yet incoherent in practice*" (Hasfi & Thomas, 2005, p 511). Therefore the need for an integrative and holistic approach that encompasses as much variables as possible, constructing the reality as observed by the researcher, and painting a realistic picture of the reality using a constructivist approach.

The complexity of the research on acquisitions has led to the use of cognitive simplification by both academic researchers and practitioners. Decision makers use similarities and analogies to similar situation and they overestimate or underestimate the potential impact of their decisions due to the limited number of factors used in the analysis (Duhaime & Schwenk, 1985). Cognitive simplification is demonstrated to be widely used in the process of decision making and when dealing with complex and interrelated issues (Schwenk, 1984). Bounded rationality is the inability of the human to process more than a limited number of alternatives and to process them all, which limits his ability to solve complex problems (March & Simon, 1958; Simon, 1976). Under those limitations and facing complex issues, the process of decision making was researched in the context of structuring the unstructured (Mintzberg, Raisinghani, & Theoret, 1976), making judgment under uncertainty (Tversky & Kahneman, 1974), and the psychological determinants of bounded rationality and its implications for decision making (Taylor, 1975). The cognitive complexity in the strategic decision process has been explored by Hitt and Tyler (1991). Also Tyler and Steensma (1995) explored the technological collaborative activities using a cognitive perspective: "The cognitive limitations affect the simplified mental models or schema top executives use to get a grasp of the situation at hand" (Schwenk, 1984; Walsh, 1995) as cited by Tyler and Steensma (1995). Finally Eisenhardt and Zbaracki (1992) provides a extensive comparison between bounded rationality, power and politics and the garbage can model.

Cognitive mapping is used to represent the mental schema of the researcher when studying an issue (Eden & Ackermann, 1998) or as a representation of the representation of the mental schema of a human subject related to a research issue (Cossette & Audet, 1994). They are constructed based on a subjectivist approach, by using concepts or variables related to the issue under investigation and links or relations between the concepts reflecting their interrelations, strength and directions. Cognitive maps helps to uncover the knowledge structure and the

dominant logic within the firm related to the subject under investigation (Bettis & Prahalad, 1995). It assist in giving meaning and signification, or sense giving, to the issues related to a central concept, question, vision or strategy (Gioia & Chittipeddi, 1991).

Cognitive mapping techniques have been used in different areas of the administrative science and for different purposes. Some examples include: mapping conceptual models in macroeconomic theory (Cossette & Lapointe, 1997); analysing the thinking of F. W. Taylor (Cossette, 2002); supporting information system development (Ackermann & Eden, 2005); analysing policies in the public sector (Eden & Ackermann, 2004); analyzing retail location decision making (Clarke *et al.*, 2003); analyzing technology driven and model driven approaches to group decision (Morton, Ackermann, & Belton, 2003); analyzing delay and disruption (Williams, Ackermann, & Eden, 2003); analyzing the institutional influences on managers mental models of competition (Daniels, Johnson, & Chernatony, 2002).

5.3 Methodological Framework

The research used the cognitive mapping technique as a qualitative research tool for analyzing qualitative data. The cognitive mapping technique was used with the aid of the software package 'Decision Explorer', which allows for the introduction of the data collected, and the subsequent analysis based on the produced output in the form of quantitative data and graphic maps.

The data collection was based on the literature on strategic management related to acquisitions. Using the ProQuest and JSTOR databases, more than 80 articles from top management journal covering acquisitions were identified and carefully reviewed. Only 56 articles, where the main objective was to study acquisitions' motivations, impact and critical success factors, were chosen as pertinent to the research subject. Articles covered different theories and used different research methodologies: Qualitative and quantitative. They were studied thoroughly in search for concepts related to acquisitions. Some articles were eliminated because the constructs were poorly defined. The collected data was classified into (1) motivation or trigger (causes); (2) impact (consequence); and (3) critical success factor. A total of 85

concepts were found. After preparing a list of concepts, all the concepts were checked against each other to eliminate duplication and to ensure that each concept is unique and well defined on its own term and distinct from another, which ensures the construct validity (Lincoln & Guba, 1985a). A final number of 74 concepts were selected with their respective links to other concepts as described in the literature.

Each concept was analyzed using source and theory triangulation methods to ensure the validity of the construct and its agreement on the same definition of the concept, and its links. This ensures the credibility, internal validity and reliability if another researcher decides to embark on analyzing the same subject. After analyzing each concept, its relationships in term of causal link or consequential link with other concept were analyzed. Direct and indirect relationships were also analyzed. No overlap between direct and indirect relationships was allowed, unless specified in the literature explicitly. Triangulation of sources was also used in this regard. In the list of concepts (table 5.1), and for reliability and auditing purposes, each concept was provided with a list of all citations from which it was drawn and applied in the model. In addition, only links described in the literature were listed, with their citation references. All citations are included in the bibliography.

The map of concept and links (figure 5.1), or cognitive map, was drawn using the software tool "Decision Explorer" from Banxia Software Company (ww.banxia.com). After drawing the map, several revisions were made on the relationships between the concepts. Few links were added, within the spirit of my understanding of the literature regarding acquisitions, although not found explicitly in the literature. The added links were verified against common sense and did not contradict the literature in any way. Table 5.1 describes the list of the 74 selected concepts, with their references and related links that were only found in the literature. Table 5.2 describes the list of positive and negative links for each concept as drawn in the cognitive map, which includes the links found in the literature and the links that were not explicitly found but added for common sense.

Table 5.1

Concept description, references and related links

	Concept / Construct / Variable	Concept cited by	Related concepts	Link cited by
1	Competitive advantage	(Porter, 1980a) (Prahalad & Hamel, 1994) (Oliver, 1997)		
2	Synergy	(Brush, 1996) (James, Georghiou, & Metcalfe, 1998) (Walter & Barney, 1990) (Chatterjee, 1986) (Lubatkin, 1983) (Wernerfelt, 1984)	49, 17, 50, 51, 52, 37	(Brush, 1996) (James, Georghiou, & Metcalfe, 1998)
3	Market power	(Galbraith & Stiles, 1984)	17, 54	(Galbraith & Stiles, 1984) (Trautwein, 1990)
4	Complexity	(Jemison & Sitkin, 1986b)		
5	Barriers to entry	(Yip, 1982) (Wernerfelt, 1984)	58	(Yip, 1982)
6	Cost	(Walter & Barney, 1990)		
7	Firm's size			
8	Incentives	(Paine & Power, 1984)		
9	Talent retention	(Mayer & Kenney, 2004a) (Cannella & Hambrick, 1993) (Coff, 1997b)		
10	Absorptive capacity	(Hoffman & Schaper-Rinkel, 2001)		
11	R&D cost	(Roberts & Liu, 2001)		
12	Degree of integration	(James, Georghiou, & Metcalfe, 1998) (Paine & Power, 1984) (Mayer & Kenney, 2004a) (Jemison & Sitkin, 1986b) (Nahavandi & Malekzadeh, 1988)	51, 17,	(James, Georghiou, & Metcalfe, 1998)
13	Management control	(Eisenhardt, 1989a)	63	(Hitt et al., 1991b)
14	Increase economies of scale	(Duysters & Man, 2003b) (Walter & Barney, 1990) (Hoffman & Schaper-Rinkel, 2001) (Singh & Montgomery, 1987)	17	
15	Increase economies of scope	(Hoffman & Schaper-Rinkel, 2001) (Lubatkin, 1983) (Singh & Montgomery, 1987)		
16	Increase core competencies	(Hitt et al., 1991b) (Prahalad & Hamel, 1990) (Prahalad & Hamel, 1994) (Quelin, 2000) (Singh & Montgomery, 1987)	17	(Hitt et al., 1991b)
17	Acquisition formation	(Feeser & Willard, 1990) (Shelton, 1988a) (Brush, 1996) (Galbraith & Stiles, 1984) (Hopkins, 1987)	48, 45, 2, 3, 46, 62, 60	(Shelton, 1988a) (Brush, 1996) (Galbraith & Stiles, 1984) (Haleblian & Finkelstein, 1999) (Hitt et al., 1991b)
18	Trust	(Eisenhardt, 1989a) (Williamson, 1975) (Jemison & Sitkin, 1986b) (Williamson, 1999)		

	Concept / Construct / Variable	Concept cited by	Related concepts	Link cited by
19	Danger of appropriation	(Hoffman & Schaper-Rinkel, 2001)	17	
20	Moral hazard	(Eisenhardt, 1989a) (Hoffman & Schaper-Rinkel, 2001) (Coff, 1997b)		
21	Degree of opportunism	(Eisenhardt, 1989a) (Williamson, 1975) (Hoffman & Schaper-Rinkel, 2001; Williamson, 1999)	28	(Eisenhardt, 1989a)
22	Bounded rationality	(Eisenhardt, 1989a) (Williamson, 1975) (Williamson, 1999) (Coff, 1997b)		
23	Resource dependency	(Pfeffer, 1972)	17	(Pfeffer, 1972)
24	Asset specificity	(Hoffman & Schaper-Rinkel, 2001) (Williamson, 1975) (Williamson, 1999) (Oliver, 1997) (Coff, 1997b) (Robertson & Gatignon, 1998)		
25	Path dependency	(Oliver, 1997) (Singh & Montgomery, 1987)		
26	Tacit knowledge	(Oliver, 1997)		
27	Technical complexity	(Bettis & Hitt, 1995)		
28	Information asymmetry	(Eisenhardt, 1989a) (Hoffman & Schaper-Rinkel, 2001) (Coff, 1997b)	21	(Eisenhardt, 1989a)
29	Uncertainty	(Quelin, 2000) (Roberts & Liu, 2001) (Hoffman & Schaper-Rinkel, 2001) (Bettis & Hitt, 1995)		
30	Technological uncertainty	(Quelin, 2000) (Roberts & Liu, 2001) (Robertson & Gatignon, 1998; Walker & Weber, 1984)		
31	Market uncertainty	(Quelin, 2000) (Roberts & Liu, 2001) (Robertson & Gatignon, 1998)		
32	Product uncertainty	(Quelin, 2000) (Roberts & Liu, 2001)		
33	Proximity	(Ferrary, 2003) (Mayer & Kenney, 2004a)		
34	Degree of modularity	(Gawer & Cusumano, 2002)		
35	Platform leadership	(Gawer & Cusumano, 2002)		
36	Economic performance	(Lubatkin, 1983) (Singh & Montgomery, 1987)		
37	Technological performance	(James, Georghiou, & Metcalfe, 1998)		
38	Complementary product / technology	(Shelton, 1988a) (Mayer & Kenney, 2004a) (Wernerfelt, 1984)	45	(Shelton, 1988a)
39	Supplementary product / technology	(Shelton, 1988a) (Wernerfelt, 1984)	45	(Shelton, 1988a)
40	Substitute product / technology	(Gawer & Cusumano, 2002)	58,	
41	Degree of product relatedness	(Feeser & Willard, 1990) (Hopkins, 1987) (James, Georghiou, & Metcalfe, 1998) (Roberts & Liu, 2001) (Wernerfelt, 1984)	48, 17, 58	(Feeser & Willard, 1990)
42	Compatible organizational culture	(Jemison & Sitkin, 1986b) (Mayer & Kenney, 2004a) (Datta, 1991) (Nahavandi & Malekzadeh, 1988)		

	Concept / Construct / Variable	Concept cited by	Related concepts	Link cited by
43	Compatible organizational objectives / strategy	(Mayer & Kenney, 2004a)		
44	Level of strategic asset	(Hagedoorn & Duysters, 2002) (Oliver, 1997) (Peteraf, 1993)	17	
45	Strategic fit	(Shelton, 1988a) (Paine & Power, 1984) (Mayer & Kenney, 2004a) (Jemison & Sitkin, 1986b) (Wernerfelt, 1984)	38, 39, 17	(Shelton, 1988a)
46	Experience in Alliances / Acquisitions	(Haleblian & Finkelstein, 1999) (Jemison & Sitkin, 1986b) (Pennings, Barkema, & Douma, 1994b)	17	(Haleblian & Finkelstein, 1999)
47	Product time to market			
48	Growth	(Feeser & Willard, 1990) (Walter & Barney, 1990)	17, 41, 55	(Feeser & Willard, 1990) (Trautwein, 1990)
49	Market share	(Brush, 1996; Walter & Barney, 1990) (Mayer & Kenney, 2004a)	2	(Brush, 1996)
50	Financial synergies	(Trautwein, 1990) (Chatterjee, 1986) (Hoffman & Schaper-Rinkel, 2001)	2	(Trautwein, 1990)
51	Operational synergies	(Trautwein, 1990) (Chatterjee, 1986; James, Georghiou, & Metcalfe, 1998)	2	(Trautwein, 1990)
52	Managerial synergies	(Trautwein, 1990)	2	(Trautwein, 1990)
53	Net gain	(Trautwein, 1990)	56	(Trautwein, 1990)
54	Increase monopoly	(Trautwein, 1990)	3	(Trautwein, 1990)
55	Empire building	(Trautwein, 1990)	3, 48	(Trautwein, 1990)
56	Efficiency	(Trautwein, 1990) (Walter & Barney, 1990) (Williamson, 1999)	53	(Trautwein, 1990)
57	CEO's Hubris	(Hayward & Hambrick, 1997)		
58	Increase positioning	(Hopkins, 1987) (Walter & Barney, 1990) (Yip, 1982) (Gulati, 1999)	17, 41, 40, 3	
59	R&D intensity	(Hitt et al., 1991b) (Hitt et al., 1996)	62, 61	(Hitt et al., 1991b)
60	Increase acquisition & development	(Mayer & Kenney, 2004a)	17, 61	
61	Rate of internal innovation	(Hitt et al., 1991b) (Hitt et al., 1996) (Hitt, Hoskisson, & Ireland, 1990)	59, 60, 63, 65	(Hitt et al., 1991b) (Hitt et al., 1996)
62	R&D investment	(Hitt et al., 1991b)	17, 59,	(Hitt et al., 1991b)
63	Acquisition intensity	(Hitt et al., 1996) (Hitt, Hoskisson, & Ireland, 1990)	64, 65, 61, 13	(Hitt et al., 1991b)
64	Strategic control	(Hitt et al., 1996) (Hitt, Hoskisson, & Ireland, 1990)	63	(Hitt et al., 1996)
65	Financial control	(Hitt et al., 1996)	63, 61	(Hitt et al., 1996)
66	Transaction cost	(Teece, 1982) (Williamson, 1986) (Williamson, 1975) (Borys & Jemison, 1989) (Eisenhardt, 1989a) (Williamson, 1999) (Walker & Weber, 1984)	17	

	Concept / Construct / Variable	Concept cited by	Related concepts	Link cited by
67	Risk sharing	(Walter & Barney, 1990) (Roberts & Liu, 2001) (Lubatkin, 1983)		
68	Learning by doing	(Hoffman & Schaper-Rinkel, 2001) (Pennings, Barkema, & Douma, 1994b)		
69	Resource endowment	(Hoffman & Schaper-Rinkel, 2001) (Gulati, 1999)		
70	Target firm relative size	(Kusewitt, 1985) (Jemison & Sitkin, 1986b) (Datta, 1991)	36	
71	Degree of portfolio competitiveness	(Ferrary, 2003)		
72	Risk	(Walter & Barney, 1990) (Roberts & Liu, 2001)		
73	Penetrate new markets	(Walter & Barney, 1990)		
74	Social capital	(Hoffman & Schaper-Rinkel, 2001) (Geletkanycz & Hambrick, 1997) (Gulati, 1999)		

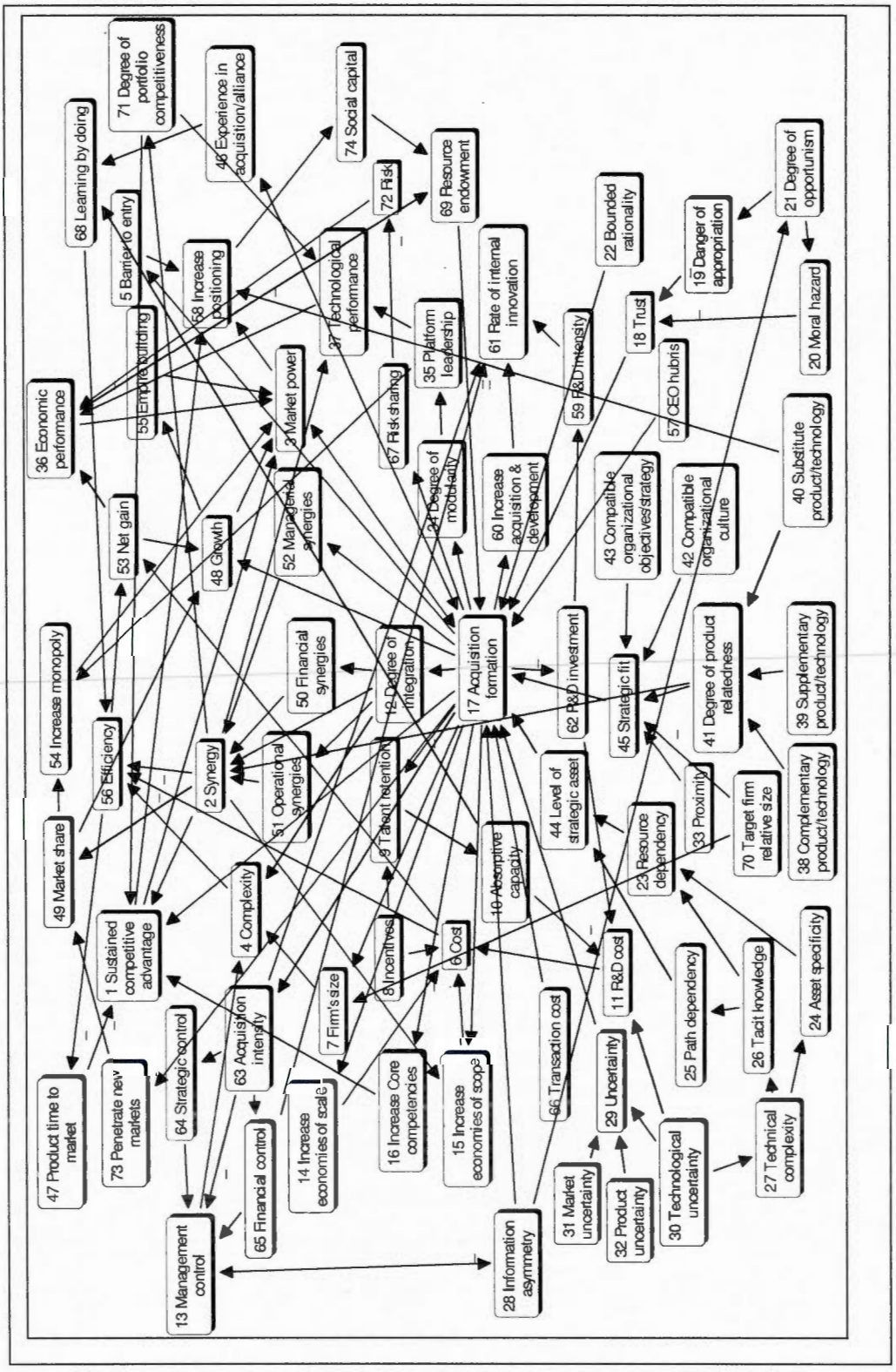
Table 5.2

Concepts and their links as drawn in the cognitive mapping

Concepts and their links (positive or negative) to other concepts				
1 > +58 +3	16 > +1	31 > +29	46 > +68 +17	62 > +11 +59
2 > +15 +71 +37 +56 +49 +1	17 > +73 +67 +34 +63 +60 -62 +5 +46 +52 +3 +48 -9 +14 +16 +15 +7 +1 +12	32 > +29	47 > -1	63 > -13 -61 +65 -64
3 > +58 +17	18 > +17	33 > +45	48 > +55 +3	64 > +13
4 > -56	19 > -18	34 > +35	49 > +54 +48	65 > -61 +13
5 > +58	20 > -18	35 > +54 +37	50 > +2	66 > +17
6 > -56 +53	21 > +19 +20	36 > +69 +3	51 > +2	67 > -72
7 > +4	22 > +17	37 > +36	52 > +2	68 > +56
8 > +9 +6	23 > +44	38 > +41	53 > +36 +48	69 > +17
9 > +10	24 > +23	39 > +41	54 > +3	70 > +7 -45
10 > +68 -11	25 > +44	40 > -58 +41	55 > +3	71 > +37 +1
11 > +6	26 > +23 +25	41 > +2 +45	56 > -47 +53	72 > -36
12 > +51 +50 +4 +2	27 > +24 +26	42 > +45	57 > +17	73 > +49
13 > +4 -28	28 > +21 +13 +17	43 > +45	58 > +74	74 > +69
14 > -6	29 > +17	44 > +17	59 > +61	
15 > -6	30 > +27 +11 +29	45 > +17	60 > +61	

Figure 5.1

Cognitive mapping: Strategy formulation for acquisitions In the IT industry



5.4 Data Finding and Analysis

Using the software program "Decision Explorer" (Banxia_Software_Ltd., 2005) several analyses were conducted mainly the "domain analysis" (table 5.3), the "centrality analysis" (table 5.4), the "cluster analysis" (figures 5.2 and 5.3) and the "loop analysis".

The "domain analysis" is described in the software manual as follows: "The "domain" command gives an indication of the complexity of linking around concepts. The rationale behind domain analysis is that people tend to talk a lot about what they see as important or key issues, and so certain concepts characterizing these "key issues" will be highly elaborated (a lot of concepts linking into and out of them). Highly elaborated concepts will have a high domain score."

The "centrality analysis" is described in the software manual as follows: "The "central" command gives an indication of the influence of a concept in the wider context of the model. This analysis gives an initial indication of the importance of the different concepts in the model. Central analysis is complementary to domain analysis. Central analysis looks beyond the immediate environment (links) around a concept and examines the complexity of links at a number of levels away from the centre. The combined weighting leads to an overall centrality score. The higher the score the more influence the concept has within the model as a whole. A high scoring concept has a complex network of concepts supporting it, and/or a complex network of concepts stemming from it. The topmost central concept may not in itself be top of the domain analysis results, likewise for lower scoring concepts."

The "cluster analysis" is described in the software manual as follows: "The result of the cluster analysis suggests that, based on the picture of the situation as it stands, an effective solution to the problem would entail addressing all aspects that have been acknowledged in the map, and that there are no areas which can be worked out in isolation. Clustering is very useful because it provides a breakdown of the model and becomes important in helping to manipulate information in large models". The "loop analysis" is described in the software manual as follows: "Loops are caused when a circle of links is formed, often in a complex chain of argumentation in

large models. A Loop is generally a bad thing (certainly for automated analysis, but it is a matter of debate whether they are generally bad), as it causes chains of argument to become over-complicated. The LOOP command, in identifying these Loops, allows the user to decide where/whether to break them."

5.4.1 Domain Analysis

Table 5.3 provides a list of the most important consequences of acquisition formation. The concepts listed were selected based on the high number of inputs converging into one concept making it an important consequence. The concept 'acquisition formation' is in itself an important consequence resulting from 11 motivations as represented by the 11 inputs converging into it. All those consequences are coherent with the literature on strategic management, and they are a combination of both strategizing and economizing: Market power, cost, and efficiency are for economizing and the rest for strategizing. They are borrowed from the transaction cost economics and the resource based view of the firm. They are in line with legitimate corporate objectives: Increase positioning, sustaining competitive advantage, reduce cost and increase efficiency. Strategic fit is a critical success factor to the formation of acquisition and depends on a series of factors such as proximity of the target firm, its relative size, the degree of product relatedness between the acquirer and the acquired in term of supplementary, complementary or substitute products, the compatibility of both firms' organizational objectives and cultures. The rate of internal innovation is the product of the R&D intensity, the acquisition intensity, the increase in acquisition and development (A&D) and the financial control. The increase in financial control has a negative effect on the rate of innovation as the creative teams feel less autonomous and projects are more controlled. Sustaining competitive advantage is the result of building on and increasing the core competencies of the firm, reducing the product time to market, produced synergies, and the increased level of the products portfolio competitiveness. Synergy is a result of operational, financial and managerial synergies, the degree of product relatedness between the acquirer and the acquired firm and the degree of integration. The reduction in cost is a product of the decrease in internal R&D cost, the economies of scale and scope and is negatively affected by the increase in incentives given to the management team and skilled human resources of the acquired firm. Market power is the combined product of improving economic performance, growth resulting from an increased market share, sustaining

competitive advantage based on the core competencies of the firm, increasing monopoly and empire building. Increasing market power, sustaining competitive advantage and creating barriers to entry for new products, will increase the overall firm position in the market.

Table 5.3

Domain analysis

Important consequences	**Inputs**	Outputs	Total
Acquisition formation	11	18	29
Market power	6	2	8
Sustained competitive advantage	5	2	7
Synergy	5	6	11
Cost	4	2	6
Management control	4	2	6
Strategic fit	5	1	6
Efficiency	4	2	6
Increase positioning	4	1	5
Rate of internal innovation	4	0	4
Important causes/explanations	Inputs	**Outputs**	Total
Acquisition formation	11	18	29
Synergy	5	6	11
Degree of integration	1	4	5
Technological uncertainty	0	3	3
Acquisition intensity	1	4	5

Table 5.3 also provides a list of the important causes/explanations, which were selected based on the high number of concepts diverging from them, as represented by the number of outputs. Synergy is a consequence and a cause. A consequence from the acquisition formation or at least a desired consequence and a cause or explanation for a diversity of concept affect by it. It's the engine behind achieving efficiencies, sustaining competitive advantage, increasing economies of scope, and market share, and increasing the degree of portfolio competitiveness. The degree of integration defined by the scope, depth and quality is determinant in producing operational and financial synergies, and reducing the complexity of integrating the two firms. Technological uncertainty adds to the overall uncertainty faced by the firm in this high velocity

and turbulent environment, and affects the R&D cost and the degree of technical complexity. Acquisition intensity affects the firm's strategic, financial and management control, and the internal rate of innovation.

5.4.2 Centrality Analysis

Table 5.4 provides a ranking list of the important concepts based on their centrality to the acquisition formation concept. The acquisition formation is clearly the most important concept as it is in the center of the cognitive map with the highest number of inputs and outputs. From the first 10 most important concepts, market power, sustained competitive advantage, strategic fit, degree of integration and acquisition intensity are present in the centrality analysis list, as they were present in the domain analysis list, which confirm their highly relative importance to the concept of the acquisition formation. Three other concepts present in this list are strongly related to respective concepts present in the domain analysis list: Increasing the economies of scope is related to creating synergy; growth is related to market power; and uncertainty is related to technological uncertainty. The two sets of mirrored concepts reflect the high importance of those concepts to the concept of strategy formation. Finally, the only concept present in this list and not in the domain list is resource endowment, which is necessary to an acquisition formation decision.

Table 5.4

Centrality analysis

Rank	Important concepts	
1	Acquisition formation	48 from 73 concepts.
2	Market power	33 from 68 concepts.
3	Sustained competitive advantage	33 from 70 concepts.
4	Strategic fit	32 from 70 concepts.
5	Degree of integration	32 from 70 concepts.
6	Increase economies of scope	31 from 70 concepts.
7	Acquisition intensity	30 from 66 concepts.
8	Growth	30 from 68 concepts.
9	Uncertainty	30 from 68 concepts.
10	Resource endowment	29 from 68 concepts.

11	R&D investment	29 from 67 concepts.
12	Managerial synergies	29 from 70 concepts.
13	Level of strategic asset	29 from 68 concepts.
14	Synergy	29 from 58 concepts.
15	Penetrate new markets	28 from 67 concepts.
16	Experience in acquisition/alliance	28 from 66 concepts.
17	Degree of modularity	28 from 66 concepts.
18	Information asymmetry	28 from 66 concepts.
19	Increase Core competencies	28 from 68 concepts.
20	Increase economies of scale	28 from 66 concepts.
21	Talent retention	28 from 66 concepts.
22	Firm's size	28 from 66 concepts.
23	Barrier to entry	28 from 66 concepts.
24	Risk sharing	27 from 66 concepts.
25	Increase acquisition & development	27 from 65 concepts.
26	Trust	27 from 65 concepts.
27	Transaction cost	26 from 65 concepts.
28	CEO hubris	26 from 65 concepts.
29	Bounded rationality	26 from 65 concepts.
30	Degree of product relatedness	23 from 52 concepts.
31	Efficiency	22 from 47 concepts.
32	Net gain	22 from 52 concepts.
33	Cost	22 from 50 concepts.
34	Economic performance	21 from 50 concepts.
35	Complexity	21 from 50 concepts.
36	Degree of portfolio competitiveness	20 from 50 concepts.
37	Increase positioning	20 from 47 concepts.
38	Market share	20 from 48 concepts.
39	Product time to market	19 from 50 concepts.
40	Management control	19 from 45 concepts.
41	R&D cost	19 from 46 concepts.
42	Learning by doing	18 from 46 concepts.
43	Increase monopoly	18 from 45 concepts.
44	Operational synergies	18 from 48 concepts.
45	Financial synergies	18 from 48 concepts.
46	Platform leadership	17 from 42 concepts.
47	Technological uncertainty	17 from 43 concepts.
48	Empire building	16 from 43 concepts.
49	Technological performance	16 from 35 concepts.
50	Absorptive capacity	16 from 40 concepts.
51	Social capital	15 from 40 concepts.
52	Risk	15 from 40 concepts.
53	Target firm relative size	15 from 39 concepts.
54	Incentives	15 from 39 concepts.
55	Financial control	14 from 35 concepts.
56	Rate of internal innovation	14 from 34 concepts.

57	Strategic control	13 from 35 concepts.
58	R&D intensity	13 from 36 concepts.
59	Compatible organizational objectives/strategy	13 from 36 concepts.
60	Compatible organizational culture	13 from 36 concepts.
61	Substitute product/technology	13 from 31 concepts.
62	Proximity	13 from 36 concepts.
63	Resource dependency	13 from 33 concepts.
64	Degree of opportunism	13 from 34 concepts.
65	Path dependency	12 from 33 concepts.
66	Product uncertainty	11 from 32 concepts.
67	Market uncertainty	11 from 32 concepts.
68	Moral hazard	11 from 31 concepts.
69	Danger of appropriation	11 from 31 concepts.
70	Supplementary product/technology	8 from 21 concepts.
71	Complementary product/technology	8 from 21 concepts.
72	Technical complexity	7 from 14 concepts.
73	Tacit knowledge	5 from 9 concepts.
74	Asset specificity	4 from 9 concepts.

5.4.3 Cluster Analysis

The cluster analysis provided two cluster sets as shown in figures 5.2 and 5.3. In the first cluster set the concept of synergy is in the center with its related direct and indirect links. Important concepts present in this cluster set and in the domain analysis are: cost, efficiency, degree of integration, acquisition intensity, the rate of internal innovation, management control, and sustained competitive advantage. The second cluster set has in its center the concept of acquisition formation with its direct and indirect links. It represents a smaller version of the original cognitive map with the most affecting links, as in a check list before taking the final decision on the formation of an acquisition.

Figure 5.2

Cluster analysis

Cluster set # 1

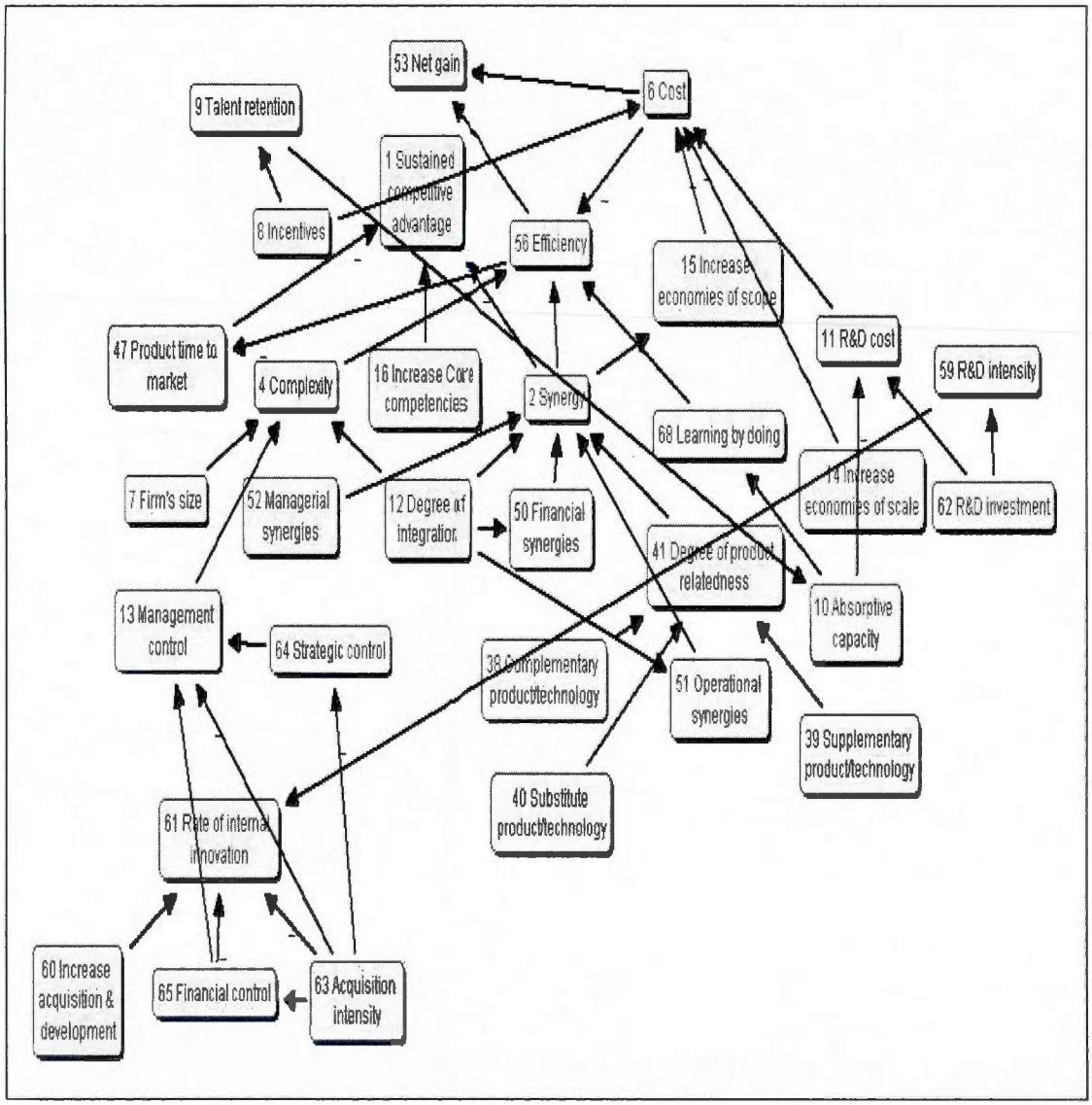
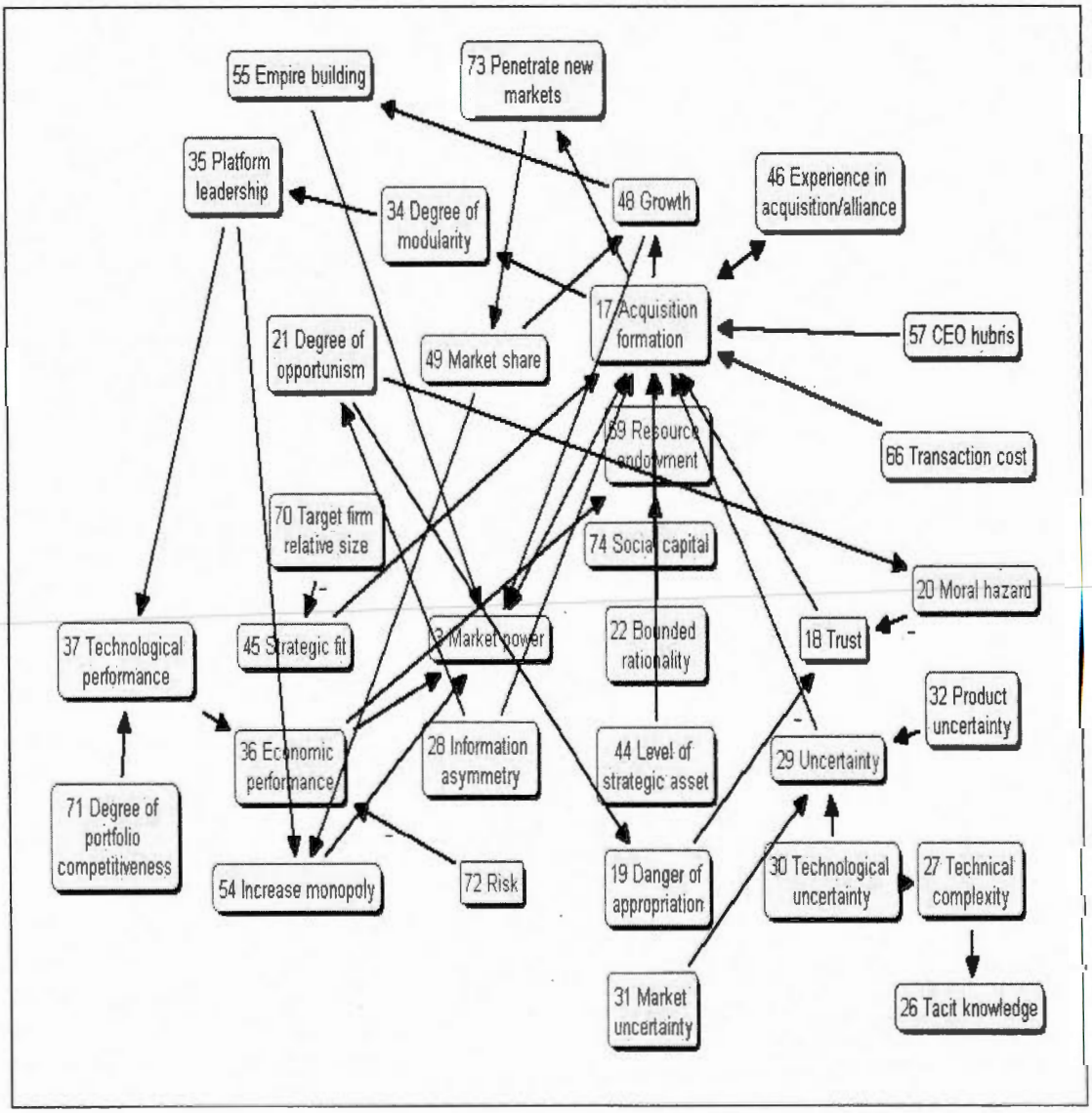


Figure 5.3

Cluster analysis

Cluster set # 2



5.5 Discussion

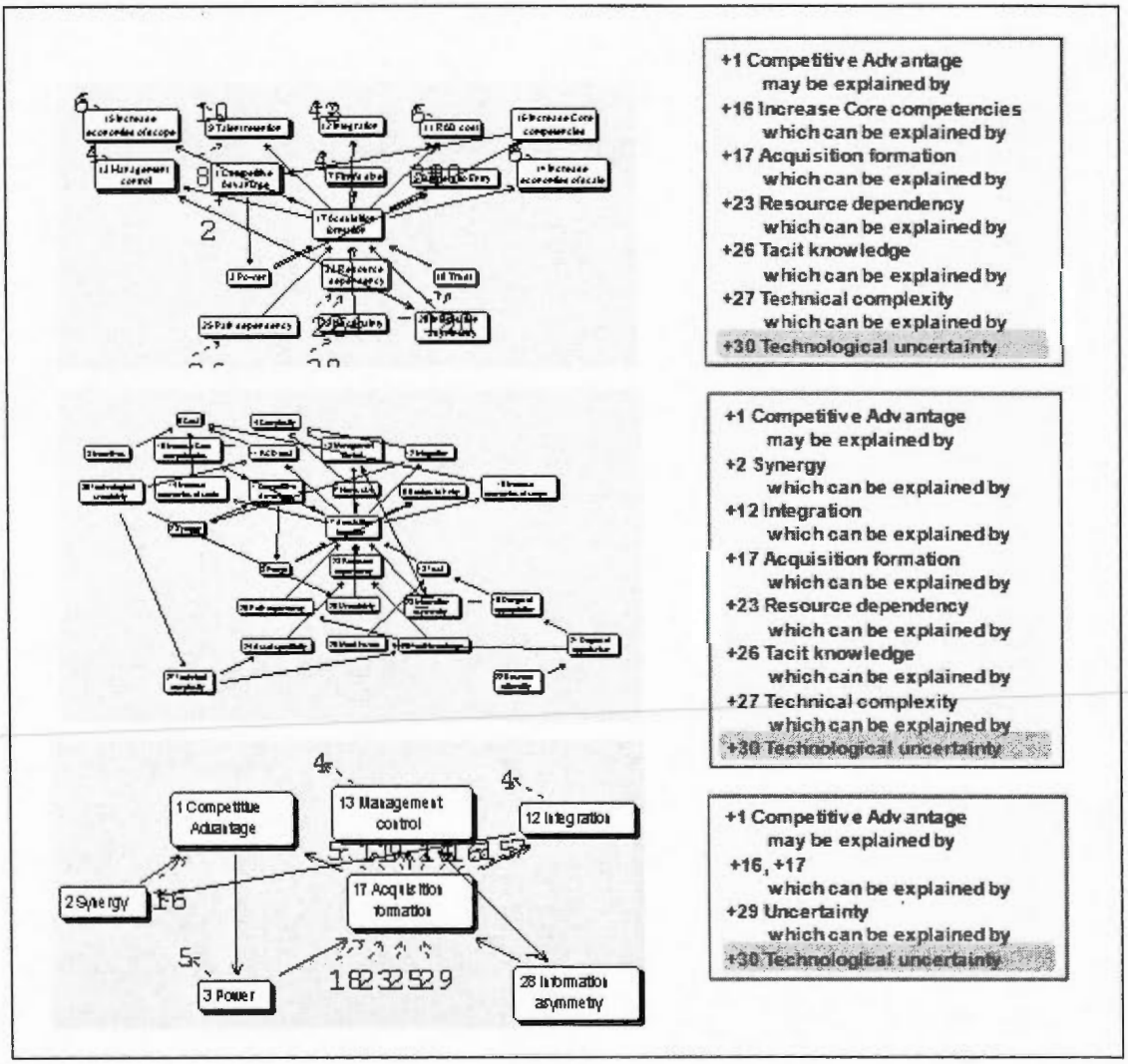
Acquisition formation is the central concept as it has 11 causal and 18 consequential relationships. Synergy is a balanced concept as it has as many inputs as outputs: 5 causal and 6 consequential relationships. The following concepts are especially important as they have more inputs and few if any outputs: sustained competitive advantage, market power, strategic fit, and rate of internal innovation. From the literature of strategic management, those concepts are key strategic objectives related to the research on acquisitions. Their importance should highlight their critical inputs.

The first ten most central (important) concepts are: acquisition formation, market power, sustained competitive advantage, strategic fit, and the degree of integration, increase economies of scope, acquisition intensity, growth, uncertainty, and resource endowment.

Loop analysis run for more than two hours and provided more than 3000 loop sets. The analysis was stopped manually. The test was run four times and it gave the same results. Maybe the large number of loops in the model explains the complexity of the researched subject, as its central concept is related to interrelated links with a large number of feedback loops that either stabilize the model or destabilize it. However, a large number of loops indicate that *uncertainty* and more specifically *technological uncertainty* is at the root cause of acquisition formation, as illustrated in figure 5.4. This suggests that the large number of acquisitions in the telecommunications industry and the intensity of acquisitions, emergence of new and disruptive technologies and entrepreneurial activities, are all motivated by a high level of technical uncertainty.

Figure 5.4

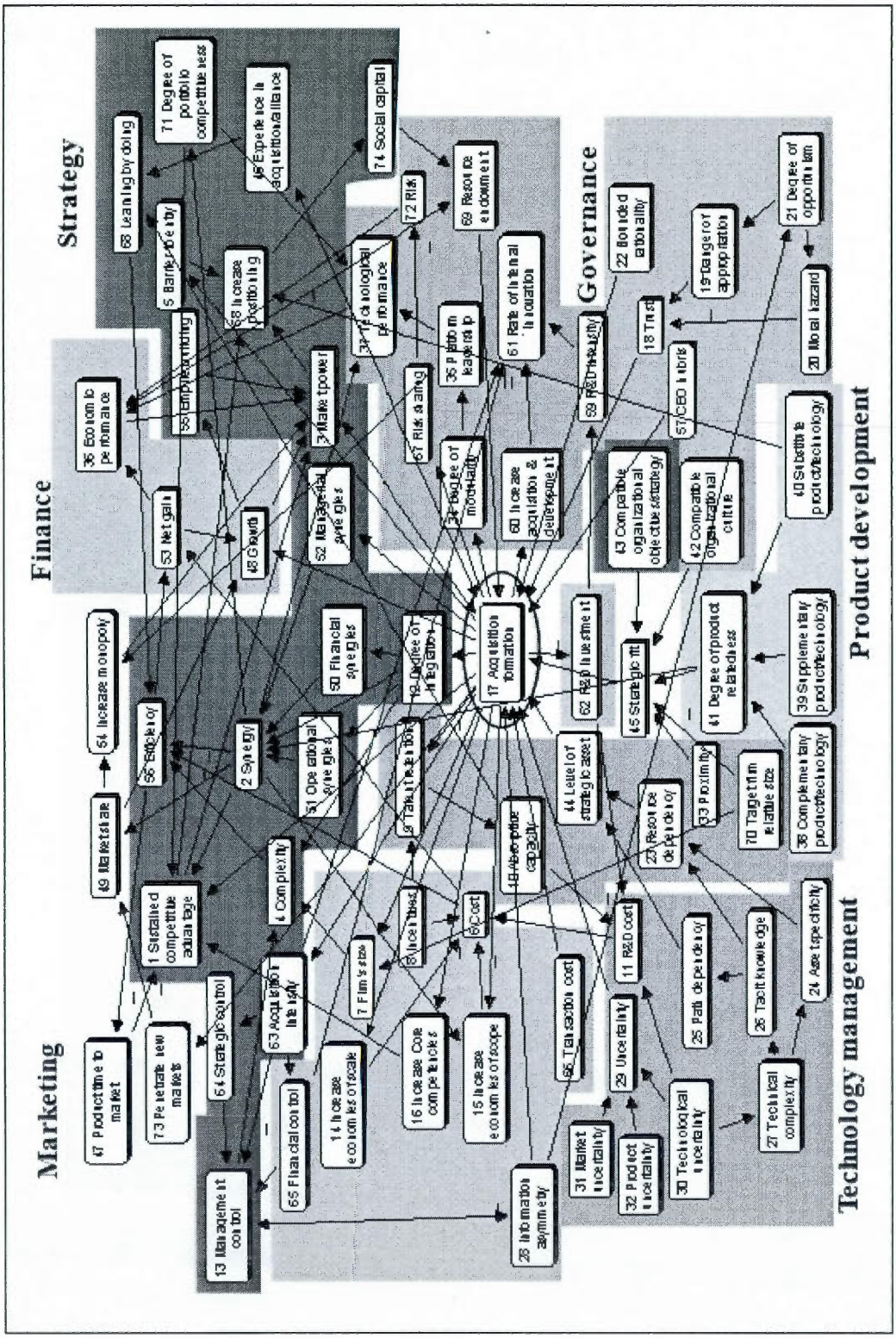
Technological uncertainty as a root cause for acquisition formation



Furthermore, the cognitive mapping could be presented with the illustration of the different decision groups involved in the complex decision making of an acquisition formation. For example, figure 5.5 illustrates the different decision groups such as marketing, finance, strategy, governance, product development and technology management, all of which are part of the decision of acquisition formation.

Figure 5.5

Cognitive mapping based on different decision groups for the decision of acquisition formation



The cognitive mapping technique provided the scope to understand a complex and integrated issue, with roots in different disciplines and consequences combining economizing and strategizing. It provided a holistic and integrated approach to the study of a complex research topic such as decision making.

The limitation of this research is in its inability to come up with a theoretical model as different effects vary based the case studied. The replication of some links and effects on their respective concepts could produce contrasting results based on different case studies. Also the research was based in the context of the information technology industry in North America and it is not clear to what point the results could be generalized on other industries, sectors, or countries.

References

Ackermann F, Eden C. (2005). *"Using Causal Mapping to Support Information Systems Development: Some Considerations" in Narayanan, V. K. and Armstrong, D. J., Eds, "Causal Mapping for Research in Information Technology*. Idea Group Publishing: Hershey, PA

Banxia_Software_Ltd. 2005. Decison Explorer, 3.3 ed.: www.banxia.com

Bettis RA, Hitt MA. (1995a). The new competitive landscape. *Strategic Management Journal* 16: 7-19

Bettis RA, Prahalad CK. (1995b). The dominant logic: Retrospective and extension. *Strategic Management Journal* 16: 5-14

Borys B, Jemison DB. (1989). Hybrid arrangements as strategic alliances: Theoretical issues in organizational combinations. *Academy of Management Review* 14(2): 234-249

Brush TH. (1996). Predicted change in operational synergy and post acquisition performance of acquired businesses. *Strategic Management Journal* 17: 1-24

Cannella AA, Hambrick DC. (1993). Effects of executive departures on the performance of acquired firms. *Strategic Management Journal* 14: 137-152

Chatterjee S. (1986). Types of synergy and economic value: The impact of acquisitions on merging and rival firms. *Strategic Management Journal* 7: 119-139

Clarke I, Mackaness W, Ball B, Horita M. (2003). The devil is in the detail: visualising analogical thought in retail location decision making. *Environment and Planning* 30(1): 15-36

Coff RW. (1997). Human assets and management dilemmas: Coping with hazards on the road to resource based theory. *Academy of Management Review* 22(2): 374-402

Cossette P. (2002). Analysing the thinking of F. W. Taylor using cognitive mapping. *Management Decision* 40(2): 168-182

Cossette P, Audet M. (1994). Qu'est-ce qu'une carte cognitive. In P Cossette (Ed.), *Cartes cognitives et organizations*, ESKA ed.: 13-33. Les presses de l'universite laval: Quebec/Paris

Cossette P, Lapointe A. (1997). A mapping approach to conceptual models : The case of macroeconomic theory. *Canadian Journal of Administrative Sciences* 14 (1): 41-51

Daniels K, Johnson G, Chernatony Ld. (2002). Task and institutional influences on managers' mental models of competition. *Organization Studies* 23(1): 31-62

Datta DK. (1991). Organizational Fit and Acquisition Performance: Effects of Post-Acquisition Integration. *Strategic Management Journal* 12: 281-297

Duhaime IM, Schwenk CR. (1985). Conjectures on cognitive simplification in acquisition and divestment decision making. *Academy of Management Review* 10(2): 287-295

Duysters G, Man A-Pd. (2003). Transitory alliances: an instrument for surviving turbulent industries? *R&D Management* 33(1): 49-58 (10 pp.)

Eden C, Ackermann F. (1998). *Making strategy: The journey of strategic management.* Sage Publications

Eden C, Ackermann F. (2004). Cognitive mapping expert views for policy analysis in the public sector. *European Journal of Operational Research* 152(3)

Eisenhardt K, Zbaracki MJ. (1992). Strategic decision making. *Strategic Management Journal* 13: 17-37

Eisenhardt KM. (1989). Agency theory: An assessment and review. *Academy of Management Review* 14(1): 57-74

Feeser HR, Willard GE. (1990). Founding strategy and performance: A comparison of high and low growth high tech firms. *Strategic Management Journal* 11: 87-98

Ferrary M. (2003). Managing the disruptive technologies life cycle by externalizing the research: social network and corporate venturing in the Silicon Valley. *International Journal of Technology Management* 25(1/2)

Galbraith CS, Stiles CH. (1984). Merger strategies as a response to bilateral market power. *Academy of Management Journal* 27(3): 511-524

Gawer A, Cusumano MA. (2002). *Platform Leadership: How Intel, Microsoft, and Cisco Drive Industry Innovation.* Harvard Business School Press

Geletkanycz MA, Hambrick DC. (1997). The external ties of top executives: Implications for strategic choice and performance. *Administrative Science Quarterly* 42(4): 654-681

Gioia DA, Chittipeddi K. (1991). Sensemaking and sensegiving in strategic change initiation. *Strategic Management Journal* 12: 433-448

Gulati R. (1999). Network location and learning: The influence of network resources and firm capabilities on alliance formation. *Strategic Management Journal* 20: 397-420

Hagedoorn J, Duysters G. (2002). External sources of innovative capabilities: The preference for strategic alliances or mergers and acquisitions. *Journal of Management Studies* 39(2)

Haleblian J, Finkelstein S. (1999). The influence of organizational acquisition experience on acquisition performance: A behavioral learning perspective. *Administrative Science Quarterly* 44(1): 29-56

Hasfi T, Thomas H. (2005). The field of strategy: In search of a walking stick. *European Management Journal* 23(5): 507-519

Hayward M, Hambrick D. (1997). Explaining the premiums paid for large acquisitions: Evidence of CEO hubris. *Administrative Science Quarterly*(42): 103-127

Hitt MA, Hoskisson RE, Ireland RD. (1990). Mergers and acquisitions and managerial commitment to innovation in m-form firms. *Strategic Management Journal* 11: 29-47

Hitt MA, Hoskisson RE, Ireland RD, Harrison JS. (1991a). Effects of acquisitions on R&D inputs and outputs. *Academy of Management Journal* 34(3): 693-706

Hitt MA, Hoskisson RE, Johnson RA, Moesel DD. (1996). The market for corporate control and firm innovation. *Academy of Management Journal* 39(5): 1084-1119

Hitt MA, Tyler BB. (1991b). Strategic decision models: Integrating different perspectives. *Strategic Management Journal* 12: 327-351

Hoffman WH, Schaper-Rinkel W. (2001). Acquire or ally? - A strategy framework for deciding between acquisition and cooperation. *Management International Review* 41(2): 131-159

Hopkins HD. (1987). Acquisition strategy and the market position of acquiring firms. *Strategic Management Journal* 8: 535-547

James AD, Georghiou L, Metcalfe JS. (1998). Integrating technology into merger and acquisition decision making. *Technovation* 18(8/9)

Jemison DB, Sitkin SB. (1986). Corporate acquisitions: A process perspective. *Academy of Management Review* 11(1): 145-163

Kusewitt JB. (1985). An exploratory study of strategic acquisition factors relating to performance. *Strategic Management Journal* 6: 151-169

Lincoln YS, Guba EG. (1985). Establishing Trustworthiness, *Naturalistic Inquiry*, Vol. 11: 289-331. Sage Publication

Lubatkin M. (1983). Mergers and the performance of the acquiring firm. *Academy of Management Review* 8(2): 218-225

March J, Simon H. (1958). *Organizations*. Wiley: New York

Mayer D, Kenney M. (2004). Economic action does not take place in a Vacuum: Understanding Cisco's acquisition and development strategy. *Industry and Innovation* 11(4): 299

Mintzberg H, Raisinghani P, Theoret A. (1976). The structure of the unstructured decision processes. *Administrative Science Quarterly* 2: 246-275

Morton A, Ackermann F, Belton V. (2003). Technology-driven and model-driven approaches to group decision, support: focus, research philosophy, and key concepts. *European Journal of Information Systems* 12(2): 110-126

Nahavandi A, Malekzadeh AR. (1988). Acculturation in Mergers and Acquisitions. *Academy of Management Review* 13(1): 79-90

Oliver C. (1997). Sustainable competitive advantage: Combining institutional and resource based views. *Strategic Management Journal* 18(9): 697-713

Paine FT, Power DJ. (1984). Merger strategy: An examination of Druker's five rules for successful acquisitions. *Strategic Management Journal* 5: 99-110

Pennings JM, Barkema H, Douma S. (1994). Organizational learning and diversification. *Academy of Management Journal* 37(3): 608-640

Peteraf MA. (1993). The cornerstones of competitive advantage: A resource-based view. *Strategic Management Journal* 14: 179-191

Pfeffer J. (1972). Merger as a response to organizational interdependence. *Administrative Science Quarterly* 17: 382-394

Porter M. (1980). *Competitive Strategy*. Free Press

Prahalad CK, Hamel G. (1990). The core competence of the corporation. *Harvard business review*: 79-91

Prahalad CK, Hamel G. (1994). *Competitng for the future*. Harvard Business School Press: Boston

Quelin B. (2000). Core competencies, R&D management and partnerships. *European Management Journal* 18(5): 476-487

Roberts EB, Liu WK. (2001). Ally or acquire? *MIT Sloan Management Review*

Robertson TS, Gatignon H. (1998). Technology development mode: A transaction cost conceptualization. *Strategic Management Journal* 19: 515-531

Schwenk CR. (1984). Cognitive simplification processes in strategic decison making. *Strategic Management Journal* 5: 111-128

Shelton LM. (1988). Strategic business fits and corporate acquisition: Empirical evidence. *Strategic Management Journal* 9: 279-287

Simon H. (1976). *Administrative behavior*. Free Press: New York

Singh H, Montgomery C. (1987). Corporate acquisition strategies and economic performance. *Strategic Management Journal* 8: 377-386

Taylor RN. (1975). Psychological determinants of bounded rationality: Implications for decision making. *Decision Sciences* 6: 409-429

Teece DJ. (1982). Towards an economic theory of the multiproduct firm. *Journal of Economic Behavior and Organization* 3: 39-63

Trautwein F. (1990). Merger motives and merger prescriptions. *Strategic Management Journal* 11: 283-295

Tversky A, Kahneman D. (1974). Judgment under uncertainty: Heuristics and biases. *Science* 185: 1124-1131

Tyler BB, Steensma HK. (1995). Evaluating technological collaborative opportunities: A cognitive modeling perspective. *Strategic Management Journal* 16: 43-70

Walker G, Weber D. (1984). A transaction cost approach to make-or-buy decisions. *Administrative Science Quarterly* 29(3): 373-391

Walsh J. (1995). Managerial and organizational cognition: Notes from a trip down memory lane. *Organization Science* 6

Walter GA, Barney JB. (1990). Management objectives in mergers and acquisitions. *Strategic Management Journal* 11: 79-86

Wernerfelt B. (1984). A resource-based view of the firm. *Strategic Management Journal* 5: 171-180

Williams T, Ackermann F, Eden C. (2003). Structuring a delay and disruption claim: An application of cause-mapping and system dynamics. *European Journal of Operational Research* 148(1): 192-204

Williamson OE. (1975). *Markets and Hierarcies, analysis and antitrust applications: A study in the economics of internal organizations*. Free Press: New York

Williamson OE. (1986). Transaction-cost economics: The governance of contractual relations. In JB Barney, WG Ouchi (Eds.), *Organizational Economics*: 98-129. Jossey Bass

Williamson OE. (1999). Strategy research: Governance and competence perspectives. *Strategic Management Journal* 20: 1087-1108

Yip GS. (1982). Diversification entry: Internal development versus acquisition. *Strategic Management Journal* 3: 331-345

PART III

ALLIANCES AND ACQUISITIONS

CHAPTER VI

FACTORS RELATED TO R&D PERFORMANCE AND TECHNICAL COLLABORATION IN THE TELECOMMUNICATIONS INDUSTRY [4]

This paper explores the factors related to technical collaboration in research and development (R&D) among firms in the telecommunications industry. Technical collaboration includes informal collaboration, strategic alliances and acquisitions. The factors are divided into three main categories: Causes or motivations for establishing such technical collaboration; consequences or impact of the technical collaboration on the innovation rate, R&D intensity and the firm performance; and finally critical success factors for achieving a positive outcome from establishing such technical collaboration among firms within the telecommunications industry. The overview from the literature results in a total of 74 factors, classified into the three categories. Furthermore, the paper shows that in the literature of strategic management, the impact of the technical collaboration on the performance is contradictory and incomplete. A more holistic approach is proposed.

6.1 Introduction

The telecommunications industry is different than any other industry. Firms established in this knowledge intense sector of the economy face turbulent environmental challenges. The telecommunications products are technically complex and the embedded knowledge is tacit in nature, non codified and non transferable as a public good. The rate of innovation of new technologies and products is high and the industry face continuous waves of new technological generations and disruptive technologies, which render the product obsolete, possibly even before

[4] This chapter was presented as an article, with the same title, at the administrative sciences association of Canada (ASAC) annual conference 2009, strategy division. Niagara Falls, Canada, June 2009.

being launch to the market and received by the end user customers. In fact the rate of obsolescence is higher the time required to recover the skyrocketing investment needed in research and development in order to produce new products and technologies that would built on the core competencies of the company and sustain competitive advantage. The complexity of the technology is coupled with a high level of uncertainty due to a lack of dominant standards, a lack of credible forecast for the potential new product and a lack of specific requirements from the customers' side. (Sarkis, 2009)

Facing those environmental challenges, firms established in the telecommunications industry tend to use alliances, acquisitions or both, to survive, enhance their performance, and guarantee their growth. Working together would reduce the level of uncertainty and risk imbedded in the required high investments in research and development. Moreover, it would give access to external resources of innovation, which are strategic assets that would complement or supplement the firm's existing assets. Sharing the cost of research and development would produce economies of scale and scope and achieve synergetic opportunities, producing efficiency and net gain. The formation of an alliance or acquisition would give access to new products, reduce the product life cycle and penetrate new markets and industry segments, which would increase the firm's market position and power. (Sarkis, 2009)

Research and development is categorized historically as a first, second, third and fourth generations of the evolution of the management of R&D activities. In the third generation R&D, the strategic objectives of the firm are aligned to the R&D projects, which produce a coordinated portfolio of products. The whole company collaborates in the development of a joint plan, including the research and development teams, the marketing and finance departments and the top management team, including the CEO. Therefore the strategic management dimension in the full integration of R&D projects, budget and objectives in the overall strategic plan of the firm. In the fourth generation R&D, the boundaries of the firm allow for the cooperation with other firms and the collaboration between it different operational teams, including the research and development human assets. Innovation is not based only on the internal resources of the organization, but rather on the combination of internal and external source of innovation, including partnerships between the government labs and the universities' research centers, the government and the privately owned firms and among the private firms. In the later category, firms form alliances and

acquisitions to collaborate on research level and the development of new products, while sharing risk and cost, and reducing uncertainty. (Sarkis, 2009)

To fully understand the factors related to the R&D collaboration among the firms in the technology industry, a holistic approach to the study of strategic management would be not only useful but essential. The issue of alliance and acquisition formation is a complex issue, and fragmenting all of its components would give some explanations, but stay short of describing the whole picture and prescribing valuable and pertinent recommendations.

Therefore, this paper intends to explore the factors related to the formation of alliances and acquisitions, within the context of research and development in the telecommunications industry. The holistic approached is used and the factors are classified and divided into three main categories. First are the motivations of the formation of alliances and acquisitions. Second, the consequences or impact of the formation of the alliance or acquisition on the firm. Finally, the critical success factors related to the successful implementation of joint R&D projects within the formation of a new alliance or acquisition.

The paper is divided into an introduction, followed by three parts each describing the motivations, impact and critical success factors. In the comments section, a table is provided listing the factors covered and researched in this paper and their classification between alliance and acquisition. The paper ends with a bibliographic list.

This paper fills a gap in the literature of the management of research and development and it provides a valuable contribution to the literature of strategic management and technology management.

6.2 Causes and Motivations of Technical Collaboration

Technical collaboration including alliances and acquisitions are motivated and triggered by different sources. The context in which the alliances and acquisitions take place is an important factor. The specific industry, the industrial sector and the market segment may all

influence whether firms in this sector rely more on alliances and acquisitions for developing their strategy, penetrating new markets or acquiring new technologies. Environmental challenges faced by firms in a specific sector or industry, such as the high technology industries, may force firms to choose alliances or acquisitions or a combination of both, as the strategy for achieving sustained competitive advantage.

In a general term alliances and acquisitions may be motivated by the desire to maintain growth (Feeser & Willard, 1990; Walter & Barney, 1990) over a certain period of time. If growth cannot be achieved internally based on an increase in sales, penetrating new markets, developing new products or innovating new technologies, external sources of growth could be the alternative, by using either alliances with other strategic partner or acquisitions of target firms. Technological firms could choose alliances or acquisitions for the purpose of empire building (Trautwein, 1990), by acquiring large firms in either related or unrelated diversification, which would have a positive impact on their market share, global coverage and operations, stock performance and market value. In some instances, the desire for acquisitions is motivated by the external ties of the firm's leadership and the CEO's hubris (Hayward & Hambrick, 1997), which is defined as the desire for more power, control based on an exaggerated self-pride or self confidence.

Market failure and the firm's need to transition towards a hybrid form or hierarchy (vertical integration) is another motivation for using alliances and acquisitions. In order to reduce the transaction costs (Borys & Jemison, 1989; Eisenhardt, 1989a; Teece, 1982; Walker & Weber, 1984; Williamson, 1975; Williamson, 1986, 1999) in dealing with the market, the firm may opt for forming a strategic alliances with a partner based on a preferential term, long term contract and shared risk and commitment. Also the firm could decide to vertically integrate its supplier, which could produce other costs in term of complexity and sunk costs. In both cases this would require more management control, and a specific governance regime. For both cases, resource endowment (Gulati, 1999; Hoffman & Schaper-Rinkel, 2001) is essential in forming either alliances or acquisitions, as without enough resources the firm would not be in a market power position to negotiate an alliance nor would not the economic power to acquire the target firm. The existence of those resources could be the motivation behind alliance or acquisition moves. The external ties of the firm's executives, informal technical collaboration of the engineers, the reputation of the R&D scientists and their collaboration with their peers in standard bodies and

professional association, their personal friendships with other firms' employees, all form the social capital (Geletkanycz & Hambrick, 1997; Gulati, 1999; Hoffman & Schaper-Rinkel, 2001) of the firm, which facilitate and may trigger the desire to form alliances or acquisitions, whether decided from top-down or bottom-up. This social capital exists and is facilitated specially among firms located in an agglomeration of firms such as industrial parks, technological incubators or technology free zones, where links and personal relationships are closer due to the closer proximity (Ferrary, 2003; Mayer & Kenney, 2004a) of the firms with each others.

In the high technology industries, including information technology, biotechnology and aerospace, firms face a challenging environment including a high level of uncertainty, a continuous fast pace of change, the emergence of disruptive technologies, the shortening cycle of product development, the high rate of obsolescence of technologies and products, the intensity of the research and development required, the volatility of the market and the extremely high cost of innovation. In this challenging environment the uncertainty (Bettis & Hitt, 1995; Hoffman & Schaper-Rinkel, 2001; Quelin, 2000; Roberts & Liu, 2001) is a result of technological uncertainty (Quelin, 2000; Roberts & Liu, 2001; Robertson & Gatignon, 1998; Walker & Weber, 1984) due to the lack of standards being still under development, competing technologies without a clear potential winner and the intensive emergence of disruptive technologies which render existing products obsolete; demand and market uncertainty (Quelin, 2000; Roberts & Liu, 2001; Robertson & Gatignon, 1998) due to the lack of credible demand forecast for competing and under developed technologies, the ignorance of the customers' perception of the potential new products; and product uncertainty (Quelin, 2000; Roberts & Liu, 2001) due to the lack of understanding of the potential customers' preferences for the future products' specifications and requirements. (Sarkis, 2009)

This uncertainty is amplified because of the limitations facing the firm in this environment and in dealing with its challenges. One of those limitations is the embedded nature of the technical knowledge required to deal with uncertainty. This technical knowledge is not codified, and has a tacit nature. It is in the mind and experience of the technical engineers and scientists and cannot be transferred as a public good without a price to pay and an effort to make. This tacit knowledge (Oliver, 1997) could be in the technical expertise and know-how of the technical teams, the research and development capabilities, the management practice, the

entrepreneurial spirit or the innovation track record. This knowledge cannot be transferred to the firm simply by recruiting or by the free mobility of its agents. It is related to a technical idiosyncrasy and specific assets as part of the research, development, operations and maintenance phases. The asset specificity (Coff, 1997b; Hoffman & Schaper-Rinkel, 2001; Oliver, 1997; Robertson & Gatignon, 1998; Williamson, 1975; Williamson, 1999) owned by a firm determines the potential for it to join in an alliance or to be acquired by a larger firm. Those highly specialized assets could be human, physical, or material and would represent for the potential partner or acquirer external assets needed to maintain a sustained competitive advantages. Those strategic assets (Hagedoorn & Duysters, 2002; Oliver, 1997; Peteraf, 1993) are characterized by being unique, inimitable, difficult to duplicate and part of the core competencies of the firm. If the firm finds those assets in its environment, it could either form an alliance to have access to them or form an acquisition to acquire them internally, as an external source of innovation. The objective for the acquirer or the allied firm is to build upon the core competencies (Hitt *et al.*, 1991b; Prahalad & Hamel, 1990, 1994; Quelin, 2000; Singh & Montgomery, 1987) of the firm by relying on external sources.

When choosing alliances or acquisitions, the firm would evaluate and target the partner or the acquired firm's existing products line and portfolio of technologies. Those potential products for alliances and acquisitions could be supplementary or complementary products. Supplementary products (Shelton, 1988a; Wernerfelt, 1984) are similar in nature to the firm's existing products portfolio and complementary products (Mayer & Kenney, 2004a; Shelton, 1988a; Wernerfelt, 1984) are different products that combine well with the firm's existing products' lines. The firm would choose to have access to those resources through an alliance or acquire them through an acquisition, in order to increase its core competencies and improve its product portfolio competitiveness (Ferrary, 2003), which would ensure a sustained competitive advantage (Oliver, 1997; Porter, 1980a; Prahalad & Hamel, 1994). In addition to supplementary and complementary products, a firm could choose to acquire a target firm because of the competitive threat of substitute products or technologies (Gawer & Cusumano, 2002), which could result in barriers to entry (Wernerfelt, 1984; Yip, 1982) for the acquirer firm. By acquiring those substitute products, the firm would reduce the competitive threat and produce new entry barriers to other firms developing similar technologies and products, which would ensure a better market positioning

(Gulati, 1999; Hopkins, 1987; Walter & Barney, 1990; Yip, 1982) and a sustained competitive advantage.

Firms also enter into alliances or acquisitions with other firms in their related or unrelated technology sectors, to reduce the risk by sharing it with their partners or acquired firms. Risk (Roberts & Liu, 2001; Walter & Barney, 1990) is inherent in this challenging and turbulent environment which is characterized by uncertainty and fast pace of change, among others. The operation risk could include the skyrocketing research and development cost, while the R&D intensity by competitors, the high rate of obsolescence, the ever shorter product cycle and the continuous threat of the emergence of disruptive technologies, could prevent the firm from recovering the R&D cost (Roberts & Liu, 2001), before the product is replaced or cannibalized by another from the same company or a competitor. Sharing the research and development cost would be a high priority for firms in innovation and knowledge intense industries such as the information technology.

Furthermore, when forming alliances and acquisitions, information asymmetry (Coff, 1997b; Eisenhardt, 1989a; Hoffman & Schaper-Rinkel, 2001) is an important factor in dealing with management control, technology and knowledge transfer, non-codified tacit knowledge and technical expertise. In alliances, information asymmetry could prevent the allied firms from aligning their strategy, objectives and product portfolios due to a gap in the information exchange among them. However, information asymmetry especially technical know-how between firms regarding strategic assets and external sources of innovation could be a motivation for forming an alliance or acquiring a firm. Bounded rationality (Coff, 1997b; Eisenhardt, 1989a; Williamson, 1975; Williamson, 1999) would mean that the firm could not develop its internal needed resources to sustain competitive advantage. Also, it means that in evaluating potential and target firms for alliances or acquisitions, the firm would be rationally bounded as it would not be able to process all the available information and would select from a limited number of choices. In this phase of evaluation and selection, there is always the danger of moral hazard (Coff, 1997b; Eisenhardt, 1989a; Hoffman & Schaper-Rinkel, 2001), as the parties could misrepresent their respective information, based on their personal or corporate self interest and opportunistic behavior. The degree of opportunism (Eisenhardt, 1989a; Hoffman & Schaper-Rinkel, 2001; Williamson, 1975; Williamson, 1999) could be qualified as higher in alliances' pre and post

formation phases when compared to acquisitions respective phases. In the pre-alliance phase, the lack of access to the potential partner internal information for evaluation could prevent a solid evaluation of their market value, potential technologies, internal capabilities, and financial strength. In the post alliance phase, the governance structure within this hybrid form, may not guarantee the flow of the information between the hierarchy and among the partners, which could create a greater potential for opportunism and agency problems. Furthermore, in alliances when dealing with the evaluation of an alliance or in the post alliance phase, there is the danger of appropriation (Hoffman & Schaper-Rinkel, 2001) of proprietary technology, know-how and expertise. If the danger of appropriation is significant and persistent, and if the related products or technologies are part of the core competencies of the firm, the later could have a preference for forming acquisitions rather than alliances. In fact, alliances could pave the way for acquisition formation, as in the alliance phase the future acquirer and acquired would gather the need internal and critical information necessary for a solid evaluation with respect to an alliance formation.

Two issues remain critical for the success of either the alliance or acquisition formation: Complexity (Bettis & Hitt, 1995) in its broad meaning and strategic fit (Jemison & Sitkin, 1986b; Mayer & Kenney, 2004a; Paine & Power, 1984; Shelton, 1988a; Wernerfelt, 1984) as defined by the strategic management literature. There is a certain amount of complexity during the formation and post alliance or acquisition phases. In either contractual or non-contractual forms, alliances represent a challenge in aligning the strategies of the allied firms and in producing synergetic operational objectives in achieving the desired alliance's goals. After the decision to acquire a firm takes place, the following complex task would be to integrate the two companies including their physical locations, assets and capabilities, finances, information systems, sales forces and product portfolio. Complexity is also inherited in the nature of the knowledge intensive and tacit nature of the technologies and products involved. This complexity makes it difficult to evaluate the products and the technologies in the pre alliance and acquisition phase and in challenging in the implementation phase when taking the task of integrating the different technological components in a modular fashion. Therefore, strategic fit between the potential partners for an alliance or acquisition, must include the complexity of integrating the technologies and the product to create a unified portfolio. Moreover, the two companies must evaluate the fit with respect to organizational culture (Datta, 1991; Jemison & Sitkin, 1986b; Mayer & Kenney, 2004a; Nahavandi & Malekzadeh, 1988), management style, training and education, etc...

Clashing or dissimilar cultures would not integrate or work well, thus hindering the alliance or acquisition objectives. Finally, the two or more firms should have compatible, or better complementary, organizational and corporate objectives (Mayer & Kenney, 2004a).

6.3 Consequences and Impact of Technical Collaboration

One of the main objectives of alliances and acquisitions is to increase the core competencies (Hitt *et al.*, 1991b; Prahalad & Hamel, 1990, 1994; Quelin, 2000; Singh & Montgomery, 1987) of the allied firms in the case of an alliance or of the acquired firm in case of an acquisition. This is done by accessing or acquiring key resources categorized as strategic assets (Hagedoorn & Duysters, 2002; Oliver, 1997; Peteraf, 1993) required for sustaining the competitive advantage of the firm. Those resources are unique, inimitable and difficult to duplicate. The other main objective in the formation of alliances and acquisitions is the improvement of economic performance (Lubatkin, 1983; Singh & Montgomery, 1987) of the firm, otherwise, the alliance or acquisition would not serve the interest of the firm and its "raison d'être". This is due and as a consequence of the alliance or acquisition formation, to the increase of the economy of scale and scope. The increase in the economies of scale (Duysters & Man, 2003b; Hoffman & Schaper-Rinkel, 2001; Singh & Montgomery, 1987; Walter & Barney, 1990) is due to the access to new geographic market and industry segment, the use of complementary manufacturing facilities, and the aggregation of supplementary and complementary research, development, and production capabilities. The increase in the economies of scope (Hoffman & Schaper-Rinkel, 2001; Lubatkin, 1983; Singh & Montgomery, 1987) is due to the efficient use of combined resources such as R&D labs, marketing and publicity costs, sales forces, administrative structure, integrated information system, and transportation, warehousing and production facilities.

Those economies of scope and scale would significantly reduce the operational expenses and cost (Walter & Barney, 1990), which would result in a net gain (Trautwein, 1990) for the combined allied partners or the acquired firm in case of an acquisition. Alliances and acquisitions should, as one of its objectives and a consequence to its formation, penetrate new market (Walter & Barney, 1990) segments or geographic territory. This will be facilitated by the access to the

new assets or the acquirement of the new strategic resources. Those new resources would improve the development cycle of new products, which could result in reducing the product time to market or the temporal gap between the initial idea and the product launch. Reducing the product life cycle and penetrating new markets would increase the alliance's joint venture or the acquirer's market share (Brush, 1996; Mayer & Kenney, 2004a; Walter & Barney, 1990) due to the attractiveness of the new combined portfolio or due to the acquisition of acquires market share. Furthermore, the combined resources whether supplementary or complementary products and technologies would create entry barriers (Wernerfelt, 1984; Yip, 1982) to competitive firms, resulting in an increase in monopoly status (Trautwein, 1990). All those efforts and positive effects of alliances and acquisitions formation would improve the firm's position within its network. The firm position (Gulati, 1999; Hopkins, 1987; Walter & Barney, 1990; Yip, 1982) could be based on its economic power, bargaining power, influence, reputation, technical capabilities, market share, and product competitiveness and organization culture in a knowledge intense industry. The firm central position within its immediate network would positively influence its acquisition capabilities and influence in forming more alliances with strategic partners. Intensive alliances and acquisitions could lead the firm to reach a platform leadership (Gawer & Cusumano, 2002), due to the aggregation of the combined dominant or promising technologies and the modularity (Gawer & Cusumano, 2002) of the portfolio of products.

On the less positive side, alliances and acquisitions could represent a threat to the firm's key resource; the tacit knowledge (Oliver, 1997) that the firm holds and protects as part of its core competencies. This tacit knowledge could be embedded in the technical know-how, research techniques, business practices, operation processes and procedures, marketing skills and innovative talents. When forming an alliance the danger is from the appropriation of proprietary non-codified and non-patented technology and know-how, by one or the two firms. In acquisitions, the danger of appropriation (Hoffman & Schaper-Rinkel, 2001) could result from the departure of key agents such as top executives or technical scientists and engineers.

Furthermore, increasing the alliances and acquisitions intensity (Hitt, Hoskisson, & Ireland, 1990; Hitt *et al.*, 1996) whereby the firm would rely strategically on alliances or acquisitions for achieving its objectives could result in reducing the research and development intensity (Hitt et al., 1991b; Hitt et al., 1996) and thus affecting negatively the internal innovative

capabilities of the firm. Such firms would opt for using a more adaptable and flexible "acquisition and development" (A&D) (Mayer & Kenney, 2004a) strategy instead of a research and development (R&D) one. This could be due to the lack of internal resources for continuous innovation, but could hinder those same resources if available. Internal research and development activities is performed as in 'learning-by-doing' (Hoffman & Schaper-Rinkel, 2001; Pennings, Barkema, & Douma, 1994b) and relying more on access to products through alliances or off the shelf acquisitions would not permit for the continuation of the process of learning which involves trial and errors and constitutes the path upon which technical expertise, know-how practices, skills and talents are created. This path is time and resource dependent in a cumulative fashion. Not utilizing those resources would create an irreversible path dependent situation and would negatively impact the internal rate of innovation (Hitt, Hoskisson, & Ireland, 1990; Hitt *et al.*, 1991b; Hitt *et al.*, 1996).

It is important to highlight some of the critical success factors related to the consequences of alliances and acquisitions. First, the formation of alliances and acquisitions, would endow the firm with the experience gained during the different phases including the scanning of the environment, the evaluation of potential firms, the decision making process, the integration, and the post alliance or acquisition's phases. This alliance and acquisition's experience (Haleblian & Finkelstein, 1999; Jemison & Sitkin, 1986b; Pennings, Barkema, & Douma, 1994b) is critical for the success of an intensive alliance or acquisition strategy. The best of class criteria for the selection of target firms, the speed of the integration, the expertise in combining valuable assets, and the transparency of the process to the end-user customers, are all some of the valuable skills gained by alliances and acquisitions experience. Second, in the post alliance and acquisition phase, creating overall efficiency is critical to the success of the integration process and the overall performance of the firm. Efficiency (Trautwein, 1990; Walter & Barney, 1990; Williamson, 1999) would result from the better use of the combined resources, avoiding duplications and redundancies and the better utilization of synergetic opportunities created by the new alliance or acquisition. Third, achieving a superior technical or technological performance is critical to the success of any alliance and acquisition. Technical or technological performance (James, Georghiou, & Metcalfe, 1998) could result from a better and more advanced technology, setting new standards, achieving a greater level of modularity, versatility and utilization,

improving technical support, reducing time to market, increasing the product portfolio competitiveness (Ferrary, 2003) compared to rival firms.

6.4 Critical Success Factors in Technical Collaboration

Forming alliances or acquisitions is mainly with the objective of sustaining competitive advantage (Oliver, 1997; Porter, 1980a; Prahalad & Hamel, 1994) with all its underlying conditions such the efficient management of strategic assets and building on core competencies, which remain one of the critical success factors. In a pre alliance and acquisition phase, one critical success factor remains crucial to the strength of the formation of a partnership between compatible partners: Trust (Eisenhardt, 1989a; Jemison & Sitkin, 1986b; Williamson, 1975; Williamson, 1999). Without trust, conflict of interest, opportunistic behavior and moral hazard could weaken the potential for a mutually beneficial relationship. During the scanning phase to evaluate potential partners, the reputation of the target firm and the personal relationships between its agent and the acquirer would speed up the process of access internal information and would reduce the lengthy negotiations. In alliances, trust between the partners would create synergetic opportunities (Brush, 1996; Chatterjee, 1986; James, Georghiou, & Metcalfe, 1998; Lubatkin, 1983; Walter & Barney, 1990; Wernerfelt, 1984) and a healthy organizational culture.

Compatible organizational cultures (Datta, 1991; Jemison & Sitkin, 1986b; Mayer & Kenney, 2004a; Nahavandi & Malekzadeh, 1988) between the partners, either in an alliance or an acquisition are another critical success factor to guarantee an alignment between the two organizations and produce a high level of synergy. Culture is sometime termed the informal structure of the organization and a healthy structure produces a winning strategy. In fact, a high level of compatibility between the two organizations, in which the strategic objectives and missions of the two are aligned, would create a strategic fit. Compatible organizational objectives (Mayer & Kenney, 2004a) are a key success factor. The success of an alliance and acquisition rely on the strategic choice made in the evaluation and selection process, in which one company among many is believed to be the best in complementing the resources of the principal firm and aggregating to it external strategic assets. In the post formation phase and during the integration phase of an acquisition or the implementation phase of an alliance, the partners should work

together to combine the resources and devise a plan for financial synergy (Chatterjee, 1986; Hoffman & Schaper-Rinkel, 2001; Trautwein, 1990). Among the expectations of alliances and acquisitions are the production of significant economies leading to a net gain, while increasing the rate of growth and maintain the strategic objectives. This would not be achieved without the integration of the firms' value chains and physical assets, producing significant improvement in the operation level and a high level of operational synergy (Chatterjee, 1986; James, Georghiou, & Metcalfe, 1998; Trautwein, 1990). A healthy organization culture that is based on trust, the full integration of the two firms' information systems infrastructure resulting in reducing the asymmetry of information, the integration of the acquired firm into the acquirer by establishing clear channel of communication and command, would eventually create managerial synergies (Trautwein, 1990).

Moreover, the different components of synergy, such as the financial, operational and managerial synergies, depend on the success of the integration process and the degree of integration (James, Georghiou, & Metcalfe, 1998; Jemison & Sitkin, 1986b; Mayer & Kenney, 2004a; Nahavandi & Malekzadeh, 1988; Paine & Power, 1984); In other words, its scope, depth and quality. An enormous and serious effort should start immediately after the alliance or acquisition's decision is completed, to integrate the two firms. During the scanning and evaluation process, the integration plan should be thought of and the complexity of the integration should be compared among the different choices of potential and target firms. Therefore, plans should be devised in an early stage, which would guarantee a full speed progress and project implementation after the decision. As the degree of integration is a critical success factor, the complexity of the integration and the length of the process would depend on related factors. The target firm relative size (Datta, 1991; Jemison & Sitkin, 1986b; Kusewitt, 1985) would affect the scope of the integration, the length of the integration process and the amount of resources dedicated to complete the integration. Those resources and all the resources owned by the firm should be utilized in the production of goods and services, and borrowing from those resources would limit the firm from reaching its full potential.

The proximity (Ferrary, 2003; Mayer & Kenney, 2004a) of the two firms would facilitate the movement of the personnel between the two entities and the exchange of information in a more personal way through meeting and personal contacts. This would increase the quality of

communication and collaboration, fomenting trust. The idea behind an alliance or acquisition is to access or acquire strategic resources from an external source, which is in the high technology industry highly technical expertise and know how that is tacit in nature. When those resources are transferred to the other firm or absorbed by the partner firm in an alliance, a new process of learning and knowledge transfer begins. Teams from the two firms would work together, reaching a consensus on the way ahead and forging plans for the development of objectives, products and results. The level of synergy resulting from the combined effort is based on the absorptive capacity (Hoffman & Schaper-Rinkel, 2001) of the teams working together and the degree of product relatedness (Feeser & Willard, 1990; Hopkins, 1987; James, Georghiou, & Metcalfe, 1998; Roberts & Liu, 2001; Wernerfelt, 1984), in a related diversification move. The more the products are related, the easiest the integration between them and the creation of levels of modularity and versatility. The degree of modularity (Gawer & Cusumano, 2002) is influenced mainly by the compatibility of the parts and their full interoperability. The technical complexity (Hitt et al., 1996) embedded in high technology products would make the integration process of modular parts a more difficult task. Dealing with this complexity would require lengthy planning, dedicating the best resources available from the two firms.

In the post alliance and acquisition formation, management control (Eisenhardt, 1989a) and the governance structure is a key to success. The structure would follow the strategy and ensure the achievement of both strategic control (Hitt, Hoskisson, & Ireland, 1990; Hitt *et al.*, 1996) in term of allocating the valuable resources owned by the firm and the alignment of the strategic objectives with those resources; and financial control (Hitt, Hoskisson, & Ireland, 1990; Hitt *et al.*, 1996) to produce economies, efficiencies and gain. Guarding and protecting the resources is critical to maintaining a sustained competitive advantage. In some cases, after the formation of an alliance or an acquisition, some valuable human resources such as experience managers, talented engineers or skilled scientists could depart the firm, because of a conflict of loyalty because they do not fully agree with the new formation or because their position or power is affected by the new arrangements. The departure of those human assets could negatively impact the success of the alliance and the acquisition and prevent the firm from achieving its desired and planned objectives. Talent retention (Cannella & Hambrick, 1993; Coff, 1997b; Mayer & Kenney, 2004a) is a success factor in ensuring a smooth integration and could be achieved by both economic and non economic incentives (Paine & Power, 1984), such as equity

share for the acquired management team, relative power for the team leader and project managers of the acquired firmed, and the maintenance of a certain degree of autonomy for the creative teams acquired, to ensure the non disruption of the creative environment, procedures and routines.

6.5 Conclusion

Firms establish alliances or acquisitions for different motivations. There are critical success factors for the success of alliances or acquisitions. The paper explored those motivations and described the consequences or impact of the alliances and acquisitions on the firm performance. It also listed key critical success factors.

The following table 6.1 is a list of the motivations, consequences and critical success factors of the formation of alliances and acquisitions. Each variable or concept is given its reference from the bibliographical list. In addition, each concept is categorized as belong more to alliance formation, the acquisition formation or to both.

Table 6.1

Motivations, consequences and critical success factors of alliance and acquisition formation

Causes			Consequences			Critical Success Factors		
	Collaboration	*Cited by*		Collaboration	*Cited by*		Collaboration	*Cited by*
11 R&D cost	Alliances	(Roberts & Liu, 2001)	**5 Barriers to Entry**	Alliances and acquisitions	(Yip, 1982) (Wernerfelt, 1984)	**1 Competitive Advantage**	Alliances	(Porter, 1980a) (Prahalad & Hamel, 1994) (Oliver, 1997)
20 Moral hazard	Acquisitions	(Eisenhardt, 1989a) (Hoffman & Schaper-Rinkel, 2001) (Coff, 1997b)	**6 Cost**	Alliances and acquisitions	(Walter & Barney, 1990)	**2 Synergy**	Alliances	(Brush, 1996) (James, Georghiou, & Metcalfe, 1998) (Walter & Barney, 1990) (Chatterjee, 1986) (Lubatkin, 1983) (Wernerfelt, 1984)
21 Degree of opportunism	Acquisitions	(Eisenhardt, 1989a) (Williamson, 1975) (Hoffman & Schaper-Rinkel, 2001; Williamson, 1999)	**14 Increase economies of scale**	Alliances	(Duysters & Man, 2003b) (Walter & Barney, 1990) (Hoffman & Schaper-Rinkel, 2001) (Singh & Montgomery, 1987)	**3 Market power**	Alliances	(Galbraith & Stiles, 1984)

Causes			Consequences			Critical Success Factors		
	Collaboration	*Cited by*		Collaboration	*Cited by*		Collaboration	*Cited by*
22 Bounded rationality	Alliances and acquisitions	(Eisenhardt, 1989a) (Williamson, 1975) (Williamson, 1999) (Coff, 1997b)	**15 Increase economies of scope**	Alliances	(Hoffman & Schaper-Rinkel, 2001) (Lubatkin, 1983) (Singh & Montgomery, 1987)	**7 Firm's size**	Alliances	
24 Asset specificity	Alliances	(Hoffman & Schaper-Rinkel, 2001) (Williamson, 1975) (Williamson, 1999) (Oliver, 1997) (Coff, 1997b) (Robertson & Gatignon, 1998)	**16 Increase Core competencies**	Alliances and acquisitions	(Hitt et al., 1991b) (Prahalad & Hamel, 1990) (Prahalad & Hamel, 1994) (Quelin, 2000) (Singh & Montgomery, 1987)	**8 Incentives**	Alliances and acquisitions	(Paine & Power, 1984)
26 Tacit knowledge	Alliances	(Oliver, 1997)	**19 Danger of appropriation**	Alliances	(Hoffman & Schaper-Rinkel, 2001)	**9 Talent retention**	Alliances	(Mayer & Kenney, 2004a) (Cannella & Hambrick, 1993) (Coff, 1997b)
28 Information asymmetry	Alliances	(Eisenhardt, 1989a) (Hoffman & Schaper-Rinkel, 2001) (Coff, 1997b)	**35 Platform leadership**	Alliances	(Gawer & Cusumano, 2002)	**10 Absorptive capacity**	Alliances	(Hoffman & Schaper-Rinkel, 2001)

Causes			Consequences			Critical Success Factors		
	Collaboration	*Cited by*		Collaboration	*Cited by*		Collaboration	*Cited by*
29 Uncertainty	Alliances	(Quelin, 2000) (Roberts & Liu, 2001) (Hoffman & Schaper-Rinkel, 2001) (Bettis & Hitt, 1995)	**36 Economic performance**	Alliances	(Lubatkin, 1983) (Singh & Montgomery, 1987)	**12 Degree of integration**	Alliances and acquisitions	(James, Georghiou, & Metcalfe, 1998) (Paine & Power, 1984) (Mayer & Kenney, 2004a) (Jemison & Sitkin, 1986b) (Nahavandi & Malekzadeh, 1988)
30 Technological uncertainty	Alliances	(Quelin, 2000) (Roberts & Liu, 2001) (Robertson & Gatignon, 1998; Walker & Weber, 1984)	**47 Product time to market**	Alliances and acquisitions		**13 Management control**	Alliances	(Eisenhardt, 1989a)
31 Market uncertainty	Alliances	(Quelin, 2000) (Roberts & Liu, 2001) (Robertson & Gatignon, 1998)	**49 Market share**	Alliances	(Brush, 1996; Walter & Barney, 1990) (Mayer & Kenney, 2004a)	**18 Trust**	Acquisitions	(Eisenhardt, 1989a) (Williamson, 1975) (Jemison & Sitkin, 1986b) (Williamson, 1999)
32 Product uncertainty	Alliances	(Quelin, 2000) (Roberts & Liu, 2001)	**53 Net gain**	Alliances	(Trautwein, 1990)	**33 Proximity**	Alliances and acquisitions	(Ferrary, 2003) (Mayer & Kenney, 2004a)

Causes			Consequences			Critical Success Factors		
	Collaboration	*Cited by*		Collaboration	*Cited by*		Collaboration	*Cited by*
38 Complementary product / technology	Alliances	(Shelton, 1988a) (Mayer & Kenney, 2004a) (Wernerfelt, 1984)	**54 Increase monopoly**	Alliances	(Trautwein, 1990)	**34 Degree of modularity**	Alliances and acquisitions	(Gawer & Cusumano, 2002)
39 Suplementary product / technology	Alliances	(Shelton, 1988a) (Wernerfelt, 1984)	**58 Increase positioning**	Alliances and acquisitions	(Hopkins, 1987) (Walter & Barney, 1990) (Yip, 1982) (Gulati, 1999)	**41 Degree of product relatedness**	Alliances	(Feeser & Willard, 1990) (Hopkins, 1987) (James, Georghiou, & Metcalfe, 1998) (Roberts & Liu, 2001) (Wernerfelt, 1984)
40 Substitute product / technology	Alliances and acquisitions	(Gawer & Cusumano, 2002)	**59 R&D intensity**	Alliances	(Hitt et al., 1991b) (Hitt et al., 1996)	**42 Compatible organizational culture**	Alliances	(Jemison & Sitkin, 1986b) (Mayer & Kenney, 2004a) (Datta, 1991) (Nahavandi & Malekzadeh, 1988)
44 Level of strategic asset	Acquisitions	(Hagedoorn & Duysters, 2002) (Oliver, 1997) (Peteraf, 1993)	**60 Increase acquisition & development**	Alliances and acquisitions	(Mayer & Kenney, 2004a)	**43 Compatible organizational objectives / strategy**	Alliances	(Mayer & Kenney, 2004a)

Causes			Consequences			Critical Success Factors		
	Collaboration	*Cited by*		Collaboration	*Cited by*		Collaboration	*Cited by*
48 Growth	Alliances and acquisitions	(Feeser & Willard, 1990) (Walter & Barney, 1990)	**63 Acquisition intensity**	Alliances and acquisitions	(Hitt et al., 1996) (Hitt, Hoskisson, & Ireland, 1990)	**50 Financial synergies**	Alliances and acquisitions	(Trautwein, 1990) (Chatterjee, 1986) (Hoffman & Schaper-Rinkel, 2001)
55 Empire building	Alliances and acquisitions	(Trautwein, 1990)	**68 Learning by doing**	Alliances	(Hoffman & Schaper-Rinkel, 2001) (Pennings, Barkema, & Douma, 1994b)	**51 Operational synergies**	Alliances	(Trautwein, 1990) (Chatterjee, 1986; James, Georghiou, & Metcalfe, 1998)
57 CEO's hubris	Alliances and acquisitions	(Hayward & Hambrick, 1997)	**73 Penetrate new markets**	Alliances	(Walter & Barney, 1990)	**52 Managerial synergies**	Alliances	(Trautwein, 1990)
66 Transaction cost	Alliances and acquisitions	(Teece, 1982) (Williamson, 1986) (Williamson, 1975) (Borys & Jemison, 1989) (Eisenhardt, 1989a) (Williamson, 1999) (Walker & Weber, 1984)				**64 Strategic control**	Alliances	(Hitt et al., 1996) (Hitt, Hoskisson, & Ireland, 1990)
69 Resource endowment	Alliances	(Hoffman & Schaper-Rinkel, 2001) (Gulati, 1999)				**65 Financial control**	Alliances	(Hitt et al., 1996) (Hitt, Hoskisson, & Ireland, 1990)

Causes		
	Collaboration	*Cited by*
72 Risk	Alliances	(Walter & Barney, 1990) (Roberts & Liu, 2001)
74 Social capital	Alliances	(Hoffman & Schaper-Rinkel, 2001) (Geletkanycz & Hambrick, 1997) (Gulati, 1999)

Critical Success Factors		
	Collaboration	*Cited by*
70 Target firm relative size	Alliances and acquisitions	(Kusewitt, 1985) (Jemison & Sitkin, 1986b) (Datta, 1991)

Causes / Critical Success Factors		
	Collaboration	*Cited by*
4 Complexity	Alliances and acquisitions	(Jemison & Sitkin, 1986b)
45 Strategic fit	Alliances and acquisitions	(Shelton, 1988a) (Paine & Power, 1984) (Mayer & Kenney, 2004a) (Jemison & Sitkin, 1986b) (Wernerfelt, 1984)

Consequences / Critical Success Factors		
	Collaboration	*Cited by*
37 Technological performance	Alliances	(James, Georghiou, & Metcalfe, 1998)
46 Experience in Alliances / Acquisitions	Alliances	(Haleblian & Finkelstein, 1999) (Jemison & Sitkin, 1986b) (Pennings, Barkema, & Douma, 1994b)

Causes / Consequences		
	Collaboration	*Cited by*
23 Resource dependency	Alliances	(Pfeffer, 1972)
25 Path dependency	Alliances and acquisitions	(Oliver, 1997) (Singh & Montgomery, 1987)

Consequences / Critical Success Factors			Causes / Consequences		
	Collaboration	*Cited by*		Collaboration	*Cited by*
56 Efficiency	Alliances	(Trautwein, 1990) (Walter & Barney, 1990) (Williamson, 1999)	**27 Technical complexity**	Alliances	(Bettis & Hitt, 1995)
61 Rate of internal innovation	Alliances	(Hitt et al., 1991b) (Hitt et al., 1996) (Hitt, Hoskisson, & Ireland, 1990)	**62 R&D investment**	Alliances	(Hitt et al., 1991b)
71 Degree of portfolio competitiveness	Alliances	(Ferrary, 2003)	**67 Risk sharing**	Alliances	(Walter & Barney, 1990) (Roberts & Liu, 2001) (Lubatkin, 1983)

References

Bettis, R. A., & Hitt, M. A. 1995. The new competitive landscape. *Strategic Management Journal*, 16: 7-19.

Borys, B., & Jemison, D. B. 1989. Hybrid arrangements as strategic alliances: Theoretical issues in organizational combinations. *Academy of Management Review*, 14(2): 234-249.

Brush, T. H. 1996. Predicted change in operational synergy and post acquisition performance of acquired businesses. *Strategic Management Journal*, 17: 1-24.

Cannella, A. A., & Hambrick, D. C. 1993. Effects of executive departures on the performance of acquired firms. *Strategic Management Journal*, 14: 137-152.

Chatterjee, S. 1986. Types of synergy and economic value: The impact of acquisitions on merging and rival firms. *Strategic Management Journal*, 7: 119-139.

Coff, R. W. 1997. Human assets and management dilemmas: Coping with hazards on the road to resource based theory. *Academy of Management Review*, 22(2): 374-402.

Datta, D. K. 1991. Organizational Fit and Acquisition Performance: Effects of Post-Acquisition Integration. *Strategic Management Journal*, 12: 281-297.

Duysters, G., & Man, A.-P. d. 2003. Transitory alliances: an instrument for surviving turbulent industries? *R&D Management*, 33(1): 49-58 (10 pp.).

Eisenhardt, K. M. 1989. Agency theory: An assessment and review. *Academy of Management Review*, 14(1): 57-74.

Feeser, H. R., & Willard, G. E. 1990. Founding strategy and performance: A comparison of high and low growth high tech firms. *Strategic Management Journal*, 11: 87-98.

Ferrary, M. 2003. Managing the disruptive technologies life cycle by externalizing the research: social network and corporate venturing in the Silicon Valley. *International Journal of Technology Management*, 25(1/2).

Galbraith, C. S., & Stiles, C. H. 1984. Merger strategies as a response to bilateral market power. *Academy of Management Journal*, 27(3): 511-524.

Gawer, A., & Cusumano, M. A. 2002. *Platform Leadership: How Intel, Microsoft, and Cisco Drive Industry Innovation*: Harvard Business School Press.

Geletkanycz, M. A., & Hambrick, D. C. 1997. The external ties of top executives: Implications for strategic choice and performance. *Administrative Science Quarterly*, 42(4): 654-681.

Gulati, R. 1999. Network location and learning: The influence of network resources and firm capabilities on alliance formation. *Strategic Management Journal*, 20: 397-420.

Hagedoorn, J., & Duysters, G. 2002. External sources of innovative capabilities: The preference for strategic alliances or mergers and acquisitions. *Journal of Management Studies*, 39(2).

Haleblian, J., & Finkelstein, S. 1999. The influence of organizational acquisition experience on acquisition performance: A behavioral learning perspective. *Administrative Science Quarterly*, 44(1): 29-56.

Hayward, M., & Hambrick, D. 1997. Explaining the premiums paid for large acquisitions: Evidence of CEO hubris. *Administrative Science Quarterly*(42): 103-127.

Hitt, M. A., Hoskisson, R. E., & Ireland, R. D. 1990. Mergers and acquisitions and managerial commitment to innovation in m-form firms. *Strategic Management Journal*, 11: 29-47.

Hitt, M. A., Hoskisson, R. E., Ireland, R. D., & Harrison, J. S. 1991. Effects of acquisitions on R&D inputs and outputs. *Academy of Management Journal*, 34(3): 693-706.

Hitt, M. A., Hoskisson, R. E., Johnson, R. A., & Moesel, D. D. 1996. The market for corporate control and firm innovation. *Academy of Management Journal*, 39(5): 1084-1119.

Hoffman, W. H., & Schaper-Rinkel, W. 2001. Acquire or ally? - A strategy framework for deciding between acquisition and cooperation. *Management International Review*, 41(2): 131-159.

Hopkins, H. D. 1987. Acquisition strategy and the market position of acquiring firms. *Strategic Management Journal*, 8: 535-547.

James, A. D., Georghiou, L., & Metcalfe, J. S. 1998. Integrating technology into merger and acquisition decision making. *Technovation*, 18(8/9).

Jemison, D. B., & Sitkin, S. B. 1986. Corporate acquisitions: A process perspective. *Academy of Management Review*, 11(1): 145-163.

Kusewitt, J. B. 1985. An exploratory study of strategic acquisition factors relating to performance. *Strategic Management Journal*, 6: 151-169.

Lubatkin, M. 1983. Mergers and the performance of the acquiring firm. *Academy of Management Review*, 8(2): 218-225.

Mayer, D., & Kenney, M. 2004. Economic action does not take place in a Vacuum: Understanding Cisco's acquisition and development strategy. *Industry and Innovation*, 11(4): 299.

Nahavandi, A., & Malekzadeh, A. R. 1988. Acculturation in Mergers and Acquisitions. *Academy of Management Review*, 13(1): 79-90.

Oliver, C. 1997. Sustainable competitive advantage: Combining institutional and resource based views. *Strategic Management Journal*, 18(9): 697-713.

Paine, F. T., & Power, D. J. 1984. Merger strategy: An examination of Druker's five rules for successful acquisitions. *Strategic Management Journal*, 5: 99-110.

Pennings, J. M., Barkema, H., & Douma, S. 1994. Organizational learning and diversification. *Academy of Management Journal*, 37(3): 608-640.

Peteraf, M. A. 1993. The cornerstones of competitive advantage: A resource-based view. *Strategic Management Journal*, 14: 179-191.

Pfeffer, J. 1972. Merger as a response to organizational interdependence. *Administrative Science Quarterly*, 17: 382-394.

Porter, M. 1980. *Competitive Strategy*: Free Press.

Prahalad, C. K., & Hamel, G. 1990. The core competence of the corporation. *Harvard business review*: 79-91.

Prahalad, C. K., & Hamel, G. 1994. *Competitng for the future*. Boston: Harvard Business School Press.

Quelin, B. 2000. Core competencies, R&D management and partnerships. *European Management Journal*, 18(5): 476-487.

Roberts, E. B., & Liu, W. K. 2001. Ally or acquire? *MIT Sloan Management Review*.

Robertson, T. S., & Gatignon, H. 1998. Technology development mode: A transaction cost conceptualization. *Strategic Management Journal*, 19: 515-531.

Shelton, L. M. 1988. Strategic business fits and corporate acquisition: Empirical evidence. *Strategic Management Journal*, 9: 279-287.

Singh, H., & Montgomery, C. 1987. Corporate acquisition strategies and economic performance. *Strategic Management Journal*, 8: 377-386.

Teece, D. J. 1982. Towards an economic theory of the multiproduct firm. *Journal of Economic Behavior and Organization*, 3: 39-63.

Trautwein, F. 1990. Merger motives and merger prescriptions. *Strategic Management Journal*, 11: 283-295.

Walker, G., & Weber, D. 1984. A transaction cost approach to make-or-buy decisions. *Administrative Science Quarterly*, 29(3): 373-391.

Walter, G. A., & Barney, J. B. 1990. Management objectives in mergers and acquisitions. *Strategic Management Journal*, 11: 79-86.

Wernerfelt, B. 1984. A resource-based view of the firm. *Strategic Management Journal*, 5: 171-180.

Williamson, O. E. 1975. *Markets and Hierarcies, analysis and antitrust applications: A study in the economics of internal organizations*. New York: Free Press.

Williamson, O. E. 1986. Transaction-cost economics: The governance of contractual relations. In J. B. Barney, & W. G. Ouchi (Eds.), *Organizational Economics*: 98-129: Jossey Bass.

Williamson, O. E. 1999. Strategy research: Governance and competence perspectives. *Strategic Management Journal*, 20: 1087-1108.

Yip, G. S. 1982. Diversification entry: Internal development versus acquisition. *Strategic Management Journal*, 3: 331-345.

CHAPTER VII

COMMONALITIES AND DIFFERENCES IN ALLIANCES AND ACQUISITIONS RESEARCH [5]

Research and practice have documented that alliances and acquisitions are frequent in high velocity environments such as the high-tech, biotech and aerospace industries. There are causes that lead the firms in these sectors to use alliances or acquisitions and effects that influence the firms' performance. Alliance and acquisition are well researched and documented. However, most researchers specialize on either alliances or acquisitions. This research explores the commonalities and the differences between alliance and acquisition research, with the objective of reducing the gag between the two research streams and proposing for a cross fertilized research agenda. An overview of the literature on TCE, RBV, network theory, alliance, and acquisition explores a total of 74 factors.

7.1 Introduction

Alliance and acquisition research streams are an integral part of research in the field of business policy and strategy. Most of the research on alliance and acquisition is mainly focused on the motivations and drivers for alliance and acquisition, the consequences of alliance and acquisitions to the firm and the critical success factors for alliances and acquisitions. Another type of research deals with performance measurement and competitive advantage, with the objective of measuring the effect of alliance and acquisition on the performance of the firm and sustained competitive advantage. Alliance and acquisition research are also common in other

[5] This chapter was published as an article, with the same title, in the proceedings of the administrative sciences association of Canada (ASAC) annual conference 2011, technology and innovation management division. Montreal, Canada, July 2011. Vol. 32, No 25.

disciplines such as technology and innovation management, in dealing with knowledge transfer, innovation management, and contracting; international business, in dealing with international markets and the behavior and strategies of multi national corporations, etc. Some of the published alliance and acquisition research have a theoretical orientation, in most part it is empirical research, using both qualitative and quantitative methods of inquiry.

Alliance and acquisition have been well researched and documented over the years in the literature of business policy and strategy. However, the research is mainly focused on either alliances or acquisitions. Consequently researchers in the field of business policy and strategy specialize either in alliance or acquisition research, and publish their findings accordingly. Scientific publications and academic journals often make this distinction between the two streams of research, alliance and acquisitions. Moreover, there are specialized publication venues for both alliance and acquisition. Furthermore, industry oriented research and publication is often motivated by one stream of research or the other, by alliance or acquisition. For example, the research on the high technology industry is motivated by acquisitions, while the research on biotechnology industry is motivated by alliance.

Consequently, researchers are divided between these two main streams. They either focus on alliance or on acquisition. Rarely, one researcher would conduct his research on both streams. This means that the resources the researchers use are divided between the two camps. We mean by resources, the theoretical lenses, literature, methodological framework, methods of inquiry and analysis, which are divided between the two streams of research and are not shared by the researchers working on these streams.

We believe that alliance and acquisition research are two sub streams of one stream of research, be it market organization or simply organizational research, whether it is for business policy and strategy, technology and innovation management or international business. We believe that the two sub streams are very close and that the commonalities between them are much more than the differences. We believe that the experience acquired by the researcher in doing research on alliance for example would help him if he decides to do research on acquisition, and vice versa. Cumulative experience in one field, if shared with the other stream of research, would help advancing both streams of research on alliance and acquisition, and would have a positive effect

on our understanding of the field of business policy and strategy in one of its critical component; using external resources for competitive advantage.

Therefore, this research intends to fill this gap between the two streams of research on alliance and acquisition and in the literature of business policy and strategy. The objective is to bring both alliance and acquisition researchers closer, by exploring the commonalities and differences between what we believe are two sub-streams of research, under what could be called *market organization* or simply *organizational research.* In doing so, this paper proposes the first steps towards a cross fertilized research agenda for the combined sub-streams of alliance and acquisition research.

This research was motivated by a scholarly conversation that took place during a professional development workshop at the Academy of Management annual meeting in 2009 in Chicago, which was titled *"Alliances and acquisitions: identifying commonalities and setting a new, cross-fertilized agenda"*. The panel was chaired by leading scholars on alliance and acquisition research. Therefore, this paper is a follow up on this scholarly conversation and a step further towards creating a cross-fertilized agenda for alliance and acquisition research.

This paper offers a quick overview of the main aspects of alliance and acquisitions research, using three different theoretical lenses from a literature review of top publications in the field of business policy and strategy: Network theory, Resource Based View, and Transaction Cost Economics. This is followed by a review of these concepts and their applications on both, alliance and acquisition. Finally, we conducted an overview of the literature and explored a total of 74 factors, which we classified into three categories: Some factors are found to be used mainly with either research stream only, while the others are used for both alliance and acquisition.

7.2 Theoretical Background

7.2.1 Network Theory

Embeddedness. The issue of embeddedness is an important one in the network theory as it increases trust and understanding, reduce opportunism as a barrier to resource exchange and mitigate search cost in obtaining resource information (Granovetter, 1985b). One definition of embeddedness is "*the fact that exchanges and discussions within a group typically have a history, and that this history results in the routinization and stabilization of linkages among members. As elements of ongoing social structures, actors do not respond solely to individualistically determined interests, a structure of relations affects the action taken by the individual actors composing it. It does so by constraining the set of actions available to the individual actors and by changing the dispositions of those actors towards the actions they may take*" (Marsden, 1981). Underlying embeddedness is the quest for information, to reduce uncertainty and how economic actions influence the social structure of ties within which they are embedded (Granovetter, 1985b). The social context in which the firm is embedded include structural, cognitive, institutional and cultural elements(Zukin & Dimaggio, 1990). The distinct social structure within markets influence the flow of information (Baker, 1984; White, 1981), which in addition to understanding the nature and purpose of the network, reflects the importance of social networks (Stinchcombe, 1990). By influencing the access to information about potential partners, social networks could facilitate or restrain the firm's opportunity to identify potential and viable alliances.

Trust. An implication of the embeddedness of firms in social networks is the increase in trust, where partners will have the confidence that exploitation will not take place. This could take the form of knowledge based trust, which a strong cognitive and emotional bases (Gulati, 1998). Trust is built on reputation, by personal friendships and social bonds and is manifested by interdependence (Thorelli, 1986). Trust has a positive influence on resource sharing, which reduce opportunism. It helps to reduce technological uncertainty and to increase commitment (Perry, Sengupta, & Krapfel, 2004). Trust is enhanced by the cooperation and negotiation between partners in managing alliances and networks (Geringer & Herbert, 1989). Trust relationships constitute the firm's social capital, beside its reputation in the industry and the

community (Hoffman & Schaper-Rinkel, 2001), which is an important basis for competitive advantage (Gulati, 1999). On the other hand opportunism and self-interest as being defined the motivators for economic activities (Williamson, 1986), could be reduced by increased trust and commitment, the history of cooperation and through the administrative form of alliances using government structure (Eisenhardt, 1989b).

Power. Power (and politics, to the other extreme of trust), is an important issue in embeddedness. It is usually seen as possessed unilaterally, but could also be of interdependence. The inter-organizational network could be conceived as a political economy based on the flow of power and the distribution of information. The sources of power for a network participant include economic power, technology base, expertise, trust and legitimacy. Some indicators of economic power are market share, size, and centrality of the seller product to the buyer core activity. The source of the buyer's power are the number of alternatives of supply sources, the less transaction costs for switching, relative liquidity, ability to extend credit and to integrate vertically. Other sources of power could be superior technology, product and process innovation, quality, flexibility, expertise, capabilities in R&D and engineering and pre and post sales services. (Thorelli, 1986).

Governance. The network theory covers the areas of strategic alliances and joint ventures. Joint ventures are temporary forms of organizations categorized as hybrids, which provide quick response in real time. They facilitate timely entry as timing is critical in a high velocity environment and when learning by doing is important (Williamson, 1991a). As in alliances, they are motivated by learning, technology development, market penetration, access to capital (Kogut, 1988), and they are prevailing in some industries (Osborn & Hagerdoorn, 1997). Regarding the governance structure, joint ventures involved partners creating a new entity in which they share equity and hierarchical control, while alliances are formed with no equity sharing and few hierarchical controls (Gulati, 1998). In joint ventures, the ability to share knowledge and implement may vary based on the administrative form and governance structure. The equity form stresses issues of control, governance, setting targets and measuring progress. The hierarchical form provides a structure to absorb tacit knowledge that is not easily codifiable or transferable, to reduce moral hazard and adverse selection (Eisenhardt, 1989b), and the reduce and control the danger of appropriation. The greater the appropriation concerns, the more

hierarchical the governance structures (Gulati, 1998). In alliances, non-equity forms provide a better way to discover knowledge and day-to-day cooperation. This is important early in the alliance, when it is difficult to evaluate the partner's information and the potential future value of the knowledge gained by the alliance (Osborn & Hagerdoorn, 1997). Alliances between a large firm and a start-up, with little information known about it, allow the firm to evaluate the information about its partner technology, human and financial assets, in order to determine if there is a strategic fit.

7.2.2 The Resource-Based View

Resources and heterogeneity. Beside the isolating mechanisms, the resource characteristics are whether the resources are scarce, unique, inimitable, durable, idiosyncratic, non-tradeable, intangible, non substitutable (Amit & Schoemaker, 1993; Barney, 1991; Peteraf, 1993), valuable and rare (Lippman & Rumelt, 1982). Resources that are rare, imitable and create value are categorized as strategic resources (Chi, 1994). Also strategic resources could be an experience top management team (Castanias & Helfat, 1991; Combs & David J. Ketchen, 1999) or a group of R&D researchers, as valuable idiosyncratic human assets, who possess specialized knowledge, which can help in reducing cost, improve quality, and innovate, all sources of competitive advantage (Collis, 1994). Those non-tradable assets are difficult to imitate because they have a tacit dimension, are socially complex (Dierickx & Cool, 1989), time dependent and path dependent, which give the firm who possess them an informational advantage (Peteraf, 1993) and should be identified and sustained (Barney, 1986).

The resource-based view focuses, as stated by Oliver (1997) on "the characteristics of the resources and the strategic factor markets from which they are obtained to explain firm heterogeneity and sustainable advantage". The idiosyncratic human, physical and intangible assets create heterogeneity (Mahoney & Pandian, 1992), which is one of the conditions for competitive advantage, and if preserved, create a sustained competitive advantage (Peteraf, 1993). The resource-based view assumes that the resources and capabilities across firms are heterogeneous, and some that are superior to others achieves economic efficiency and rent streams (Barney, 1991). Homogeneity, on the other hand, could result from strategic alliances, regulatory pressures, human capital transfer, social and professional relations and competency

blueprints (Oliver, 1997). So alliances could be a source of homogeneity, as it could be a source of heterogeneity, if used to access superior resources not available internally. Acquisitions are a source of heterogeneity as they allow the firm to acquire resources leading to competitive advantage.

Resources and capabilities. Some authors make a distinction between resources and capabilities: Capabilities are skills based on human competencies and "capacities to coordinate and deploy resources to perform tasks", while resources are all other assets (Markides & Williamson, 1996) and "input factors used by the firm to develop and implement their strategies" (Amit & Schoemaker, 1993; Oliver, 1997). Capabilities could be dynamic, referring to the firm capacity to renew competences to adapt to a changing environment. They require timely response, rapid and flexible innovation, which is essential when time to market and timing are important, especially in the context of a high rate of technological change and when the uncertainty about markets and competition is high (Teece, Pisano, & Shuen, 1997).

As the firm is portrayed as a bundle of resources (Penrose, 1959), they comprise all the firm assets and capabilities and constitute the company's strength and advantage (Prahalad & Hamel, 1994), or its weakness (Wernerfelt, 1984). The firm's resources could be tangible and intangible (Caves, 1980) and are semi-permanently tied to the firm. To give some examples; brand names, in-house knowledge and technology, employed and skilled personnel, trade contract, machinery, efficient procedures, R&D expertise, capital, etc. (Wernerfelt, 1984). Those resources influence the firm's growth and its rate, if they are used to expand into activities related to those resources (Combs & David J. Ketchen, 1999). Resource differences among firms could explain the performance differences and resource scarcity could lead the firm to engage in inter-firm cooperation such as alliances or to acquire those needed resources in the market (Mahoney & Pandian, 1992). The sustainability of these differences depends on the difficulty faced by competitors in accessing similar resources (Barney, 1991; Dierickx & Cool, 1989). Whether home grown or acquired, those resources that lead to high profits could be called "resource position barriers" as in analogy to entry barriers, since one competitor will have an advantage (Wernerfelt, 1984). Those entry barriers are isolation mechanisms.

Because the history of the firm engender its routines based on which strategies are formulated and actions are taken, the organization's resources and capabilities could be a source of competitive advantage or a constraint (Madhok, 1997). The valued resources and capabilities that contribute to competitive advantage, are defined as strategic assets, and they could be built up through cumulative experience and learning-by-doing or acquired from factor markets (Amit & Schoemaker, 1993), with the probability to be motivated by collaboration more than by transaction cost economizing (Madhok, 1997), and as in the case of alliances and acquisitions, for resources that cannot be built internally with acceptable cost, risk and within acceptable time (Eisenhardt & Schoonhoven, 1996). In addition, built in resources are subject to difficulty in measurement as a determinant of governance performance, based on the principal-agent theory, due to moral hazard and adverse selection (Eisenhardt, 1989b).

Competitive advantage. The strategic assets create a competitive advantage based on four conditions: heterogeneity, ex-post limits, imperfect mobility and ex-ante limits (Peteraf, 1993). Ex-post limit could be limited by imperfect imitability and imperfect substitutability (Peteraf & Barney, 2003). Imperfect imitability could not be achieved if the innovation is an assembly of available technologies, and which patent protection would not be a sufficient barrier. Imperfect mobility depends on the value of the innovation or resource which cannot be revealed because it is proprietary and for fear of appropriation (Peteraf, 1993). With all those conditions met, the strategic assets are the core competencies of the firm and the source of sustained competitive advantage (Prahalad & Hamel, 1990).

When the firm needs additional assets, whether to complement existing ones or for reason of scarcity, alliances and acquisitions occur. Alliances are seen as a quick inexpensive external growth method, as studies show that financially weak firms tend to use alliances, while financially strong firms tend to acquire (Hoffman & Schaper-Rinkel, 2001) and as "learning races" favoring the partner that learn more quickly (Hamel, 1991; Khanna, Gulati, & Nohria, 1998). The issue of resource endowment has an influence on all inter-organizational relationships, which are used by the firm to access, control and share resources external resources needed to overcome growth constraints (Hamel, 1991), which in the same time require internal resources such as capital, management, experience (Hoffman & Schaper-Rinkel, 2001), and the ability to learn and adapt known as absorptive capacity (Cohen & Levinthal, 1990b).

7.2.3 Transaction Cost Economics and Agency Theory

Asset specificity, frequency and uncertainty. The transaction cost approach to the study of organizations covers issues ranging from varieties of organizational structure to franchise contracting (Armour & Teece, 1978; Williamson, 1986). The definition of a transaction is "the transfer of goods or a service between technologically separate units and the analysis of transactions focuses on achieving efficiencies in their administration" (Williamson, 1991a). The critical dimensions or criteria of a transaction are the frequency with which it occurs, the degree of uncertainty it involves and the degree of asset specificity it involves (Williamson, 1986). Depending on the frequency of the transaction, the efficient governing structure for the efficient use of resources will depend on the degree of uncertainty (which is high in high velocity environments) and the specificity of the assets involved in the transaction (Walker & Weber, 1984; Williamson, 1986). Asset specificity has reference to "the degree to which an asset can be redeployed to alternative uses and by alternative users without sacrifice of productive value". It could be site specificity, stations located nearby to economize on transportation and inventory; physical assets, specialized tools to produce a component; human asset specificity, learning by doing and know-how; dedicated assets, investments; brand name capital; and temporal specificity, technological non separability in which time response is critical. Assets specificity increases the cost of governance, which could be offset by cost savings and increased revenues. The ownership of assets is related to the property rights: the right to use the assets, appropriate the returns and to change the form of the asset (Williamson, 1991a). Transaction costs are assessed indirectly by measuring the degree of asset specificity and uncertainty associated with the buyer supplier contract (Walker & Weber, 1984).

Vertical integration and acquisitions is a demonstration of market failure (Williamson, 1986, 1991a). When faced with market failure, the two parties searching for complementary or supplementary resources would internalize their transaction by adopting alliance, joint venture or merger and acquisition. In case of an acquisition, this contribute to the transfer of specialized tacit knowledge to the acquirer and of access to capital to the acquired (Robertson & Gatignon, 1998). The decision to use alliances or acquisitions depends on several factors among them, opportunism, governance, and safeguards against appropriation. If the danger of opportunism and

the safeguards to protect individual interests are high with high asset specificity, then internalization is favored to reduce costs. If the cost of integrating the economic activities of the combined entities is higher than the expected synergy potentially resulting from the integration, then alliances are favored over acquisitions (Hoffman & Schaper-Rinkel, 2001). As the sustained competitive advantage of the firm is based on the procession of strategic assets and core competencies (Prahalad & Hamel, 1990; Wernerfelt, 1984), the boundaries of the firm determines the composition and possession of those resources (Poppo & Zenger, 1998).

Governance. The choice of governance structure has an implication on the nature of the contract and the mechanism to resolve conflicts and disputes, which influence costs. Neo-classic contract form is used when parties maintain certain autonomy and they remain bilaterally dependent and engaged, such as in alliances and joint ventures. Bilateral monopoly uses relational contracting, and it is when the two parties engaged with a commitment for long-term due to the nature of their respective large investments occurring over a large period of time, with no fast returns. This engagement limits their agreement or collaboration with others.

Whether the transaction is based on make or buy, internal procurement or market procurement, will have an implication on the means of dispute resolutions, whether arbitration or litigation. In neoclassic contracting the mean for dispute resolution is through arbitration and not litigation, which in case of alliances and joint ventures, as bilateral monopolies, reduces the cost of litigation, the time of conflict resolution and increase the contracting flexibility in managing uncertainty (Williamson, 1986, 1991a). In the case of acquisitions, the implicit law of resolving conflict is that of forbearance and business judgment rule. This allows managing internal dispute without going to court, which reduce costs, time of conflict resolution and increase trust (Williamson, 1991a). The internal organization of economic activities or acquisitions reduces the internal incentives compared to market incentives and reduces the difficulty in measuring behavior. However, the incentive deficiency and measurement difficulty could be reduced by outcome based contract and equity sharing, which curb the opportunism, deal with moral hazard and adverse selection, and transfer an amount of risk to the internal agent which help align its goals with that of the principal (Eisenhardt, 1989b).

7.3 Strategic Alliances

Strategic alliances are defined as "a voluntary arrangement between firms involving the exchange, sharing or co-development of products, technologies and services". Some of the decisions taken by the firm are the choice of the appropriate partner, the choice to enter into an alliance, the choice of the alliance's structure and the dynamic evolution of the alliance. The unit of analysis is the firm or the alliance (Gulati, 1999). From an economic perspective strategic alliances capitalize on specific advantages in firms, markets and industries. Industries with high R&D rates have a higher proportion of alliances, which result in higher savings. In international business, they are temporary form or hybrids, for expansion, penetration, cost and risk sharing. From a corporate strategy perspective, alliances are used for learning, technology development, and market penetration. Alliances are viewed as a learning conduit and process. They support the firm to improve its know-how, capabilities and tacit knowledge. The process of learning within alliances is more complex than in hierarchies, however, alliances provide a faster response to R&D challenges when timing is critical specially in a high velocity environment, with a degree of uncertainty (Osborn & Hagerdoorn, 1997).

From a transaction cost perspective, alliances are placed on a continuum between hierarchies and markets (Robertson & Gatignon, 1998; Thorelli, 1986; Williamson, 1991b) with a hybrid form of governance (Eisenhardt, 1989b; Williamson, 1986). They help to reduce the net cost of conducting business, however one of the shortcomings of the transaction cost approach to alliance analysis is the focus on the cost minimization by one party, while alliances are for exchanges between two or more partners. In fact alliances are not only about cost minimization, but also joint value maximization (Zajac & Olsen, 1993).

From inter-organizational and institutional approaches, alliances characterized collective patterns of survival, growth and sustainability (Osborn & Hagerdoorn, 1997). Environmental pressures on the firm could lead to resource dependency (Pfeffer & Salancik, 1978). The argument is that at intermediate level of industry concentration, firms could experience high levels of competitive uncertainty and could moderate this competitive interdependence by entering into alliances (Pfeffer & Nowak, 1976). The resource consideration is important as some firm use alliances to buffer and explore uncertainty (Kogut, 1991). Firms enter into alliances

when they perceive a critical strategic interdependence with other organizations in the environment, where one firm possess capabilities not possessed by others (Aiken & Hage, 1968; Levine & White, 1961). Because rapid changes in the environment could alter the needs of the firm, the later should identify their real needs and potential partners, otherwise it could be locked in a path dependency (Gulati, 1998). Alliances also are viewed as experiments in institution building to solve strategic problems and they allow the emergence of trust (Osborn & Hagerdoorn, 1997). One driving force behind alliances could be isomorphism (Haveman, 1993).

Alliances are used when the firms are faced with daunting technological and environmental challenges, such as the convergence of technologies and the emergence of new government regulations (Osborn & Hagerdoorn, 1997). They provide an external source of innovation and R&D, and buffer from uncertainty, by sharing risks and adapt to change (Robertson & Gatignon, 1998), reduce time to market by shortening the cycle of innovation (Williamson, 1991a), and leverage resources by means of horizontal and vertical alliances, which help to expand strategic capabilities and reduce competition (Robertson & Gatignon, 1998). The Japanese model of inter-organizational collaboration, alliances and joint venture is a good example. The issue of technological uncertainty is critical as the emergence of new technologies could represent a technological paradigm shift, where in the area of high-tech industries, the rate of technology obsolescence is higher than other industries (Robertson & Gatignon, 1998). In their study, Hoffman and Schaper-Rinkel (2001) found that strategic and technological uncertainty, disperse knowledge and converging technologies, and high level of inter-organizational trust, favor the formation of alliances in high velocity environment, which allows for the sharing of history dependent competencies (Oliver, 1997).

Alliance formation depends on three motivation as transaction costs resulting from small number bargaining, enhancing market power and competitive positioning, and the quest for organizational knowledge (Kogut, 1988). The quest for market power may be an important motive (Berg & Friedman, 1978). The factors influencing alliance formation are the extent of competition, the stage of development of the market and demand and competitive uncertainty (Gulati, 1998). Attributes such as size, age, competitive position, product diversity and financial resources are predictors of the firm propensity to enter an alliance (Barley, Freeman, & Hybels, 1992; Powell & Brantley, 1992; Shan, 1990). The condition of mutual economic advantage is

necessary but not sufficient to enter into an alliance (Gulati, 1998). The extent of market overlap between the partner, or relative scope, could influence the likelihood of competitive dynamics between the partners (Khanna, Gulati, & Nohria, 1998). The research on the relationship between the size of the firm and the decision to enter into an alliance are contradictory (Robertson & Gatignon, 1998).

During the network phase, strategic alliance or joint venture, a market adaptation and coordination is used to coordinate investments and alignments. This could create through time, a bilateral dependency that paves the way for internalization. This bilateral dependency is a path dependency that leads to vertical integration through acquisitions (Williamson, 1991a). Safeguards against opportunism and contracting hazards create a mutual dependency between the parties (Robertson & Gatignon, 1998). The danger of opportunism and the safeguard costs against appropriation, influence the decision to use alliances or acquisitions (Hoffman & Schaper-Rinkel, 2001). The danger of appropriation comes from the risk of one partner imitating the technology or the core competencies of the other and start competing (Pisano, Russo, & Teece, 1988). The argument of the transaction cost approach in the case of alliances is the cost reduction, while dealing with market uncertainty and the risk of opportunism, which tend to increase costs (Osborn & Hagerdoorn, 1997; Walker & Weber, 1984).

7.4 Mergers and Acquisitions

Alliances could be seen as a first step before or towards acquisitions. As proposed by Hoffman and Schaper-Rinkel (2001), weak appropriability regimes, high expected synergies and high resource endowment (specially financially) favors acquisitions over alliances. High synergy require a strategic fit between the acquired and acquirer's strategy, resources and organizational culture (Wernerfelt, 1984). To achieve this fit, the acquisition strategy could be based on resources that are related supplementary (more of what the firm has) or related complementary (resources which combine effectively with what the firm has) (Salter & Weinhold, 1980). The combination of supplementary and complementary resources produces synergy and lead to superior economic performance (Singh & Montgomery, 1987).

Therefore, acquisitions could be defined as a purchase of a bundle of resources in an imperfect market and to trade otherwise non-marketable resources (Wernerfelt, 1984), which are imperfectly imitable because of tacit knowledge and social complexity (Dierickx & Cool, 1989). Social complexity is considered a general asset for the firm (Coff, 1997a). The resources which support diversification could be defined as quasi-fixed, yet inherently fungible (Peteraf, 1993), and resulting from excess capacity, multiple use and market failure (Chatterjee & Wernerfelt, 1991). This bidding of firms based on strategically related acquisitions could produce abnormal returns (Peteraf & Barney, 2003), depending on the degree of relatedness among products and coherence in business activities and the scope of the firm including the speed of learning, the breadth of path dependencies, the degree of asset specificity and the nature of the selection environment (Peteraf, 1993). Acquisitions achieve economies of scope such as sharing overhead costs, administrative and advertising costs, skills and resources such as inputs and technologies, relations such as customers and suppliers, generic resources and physical assets such as office building and equipments, risk, investments, knowledge and know-how and it reduce the learning curve (D'Aveni & Ravenscraft, 1994). This economies of scope and scale, achieve high gains through acquisitions in high velocity and high uncertainty environment such as the high tech industry.

Acquisitions and vertical integration are a demonstration of market failure (Williamson, 1986, 1991a). The problem of evaluating the supplier or the partner's (in case of alliances) performance, combined with the risk of opportunism, uncertainty and high asset specificity, favors the internalization of the transaction through acquisition. The coordination required in the case of alliances, between the in-house engineering or management team and the supplier or partner, becomes more complex under volume uncertainty, as fluctuation in demand and non-predictability and technological uncertainty, which favors acquisitions (Walker & Weber, 1984). When the knowledge cannot be protected by law against leakage, then acquisition is favored (Teece, 1986). Hoffman and Schaper-Rinkel (2001) found that high behavioral uncertainty, risk of opportunism, moral hazards and adverse selection favors acquisitions over alliances.

The incentives to vertically integrate depends on the type of production involved, the extent of the transaction costs, the amount of specialized assets, the degree of market power, the separability of activities and the amount of uncertainty concerning price and cost. However,

vertical integration could raise costs due to the complexity of managing the integration, which could lead to managerial inefficiencies. Mobility and exit barriers may increase strategic inflexibility, which leads to path dependency. Cost may be reduced by reducing transaction costs, decreasing uncertainty or asymmetry of information and by protecting proprietary technologies. Vertical integration could increase profits through higher prices by creating entry barriers, reducing service and advertising externalities. Acquisitions result in economies of scale and scope, such as sharing R&D expenses, resources, knowledge and relations. Economies are achieved by coordinating and reducing production and inventory costs, transportation costs by using the same location, and by the opportunities to exploit technological interdependency (D'Aveni & Ravenscraft, 1994).

7.5 Discussion

In the analysis of alliances, acquisition and make-or-buy decisions, the transaction cost approach focuses on the cost of the transaction, the resource based view focuses on the value of the resources and the network theory focuses on the informational flow, and the risk of appropriation. The strength of the firm in transaction cost is based on economic efficiencies, in the resource-based view on core competencies and strategic assets and in the network theory on position within the network, trust, and power. The unit of analysis is the cost in transaction cost; the firm or resource in the resource based view and the link or position in the network theory. Opportunism and uncertainty are reduced by trust in network theory, by governance structure in transaction cost and by collaboration, fit and synergy in the resource based view. The distinction between cost and value is critical since it causes a fundamental shift in the approach towards governance and the analysis of decisions related to the firm's boundaries. Transaction cost focuses on market failure, network theory on network failure and the resource based view on limits of the firm capabilities and hierarchical failure. Transaction cost focuses on the exploitation of the firm's advantages, network theory on the exploitation and development of the firm's relations, and the resource based view looks at the development of such advantages. Transaction cost and network theory are driven by the assumption of opportunism and bounded rationality and resource based view by bounded rationality only. The choice of the firm boundaries has an impact on the transaction cost, the transfer and flow of knowledge and the firm's internal and external

capabilities. The distinction between value and cost has an influence on the internalization and the collaboration decisions. The governance structure is distinct and has different implications in transaction cost, network theory and the resource-based view. The mechanism used in dealing with opportunism is distinct in each case. Transaction cost, the resource based view and the network theory, explain the rational behind the alliances formation and the acquisitions of external resources for sustained competitive advantage. However, when applied to an environment characterized by a high degree of uncertainty and high velocity such as the high tech industry, it seems that the network theory is more suitable to explain the process of scanning the environment, forming alliances and joint ventures, while the resource based view is more suitable for explaining the use of acquisitions, as it conceptualizes the decision making based on the lack of critical resources and the need to access or acquire in a timely fashion tacit knowledge which is difficult to buy. The choice of the governance structure has an important effect on the firm performance. The choice between transaction cost, network theory and the resource-based view is a choice on the firm boundaries, as the choice between cost and value would determine the boundaries of the firm. The role that technological uncertainty has on governance performance and optimal boundaries is not clear. Increases in technological uncertainty have no effect on performance, making it unclear how the comparative performance of such activities affects the boundaries decisions.

The field of strategy is a complex one. It includes all the functions of the top executive, with the underlying divisional fields of marketing, finance, etc. It is also grounded in behavioral science, political science, anthropology, sociology, psychology, economics and finance. It combines different disciplines such as business policy and strategic management, industrial organization, organizational economics, economics sociology, human behavioral science, organizational theory and others. It use different theories borrowed from distinct areas of social science to interpret and explain the issues under investigation, such as transaction cost, resource-based view, network theory, knowledge-based view and market-based view.

However, the issues under investigation are much more complex than they seem when using one or another approach to explore them. As Hafsi and Thomas (2005) noted, "*collective action cannot be understood if it is broken down into parts to be studied separately, As reality is complex, it is more appropriate to study it in its totality. This means not only studying all the*

parts together but also their inter-relationships, even if the result is an incomplete and imperfect understanding". Furthermore, using the holistic approach alone for integrative purposes is considered to be outdated and not scientific and less credible because of the use of qualitative methods, while using the analytical approach alone tend to fragment the reality into unrelated (or less related and integrated) pieces, and tend to see strategy as an assemblage of theories and methodologies; *"...The question of what strategy is. It feels like a vast array of diverse and uncoordinated detailed observations that are scientifically respectable, yet incoherent in practice.*" (Hafsi & Thomas, 2005)

Even before reading Hafsi and Thomas, and in the planning stage of this paper, I was guided by my intuition to use a holistic approach to explore the issue of my interest, alliances and acquisitions in the high-tech industries, with the intention of integrating, if pertinent, the different theories into a theoretical model that could be used to explain the object of my investigation, acquisitions and alliances in high velocity environments, and most importantly without neglecting the details and their implications to practice in real life and corporate decisions making.

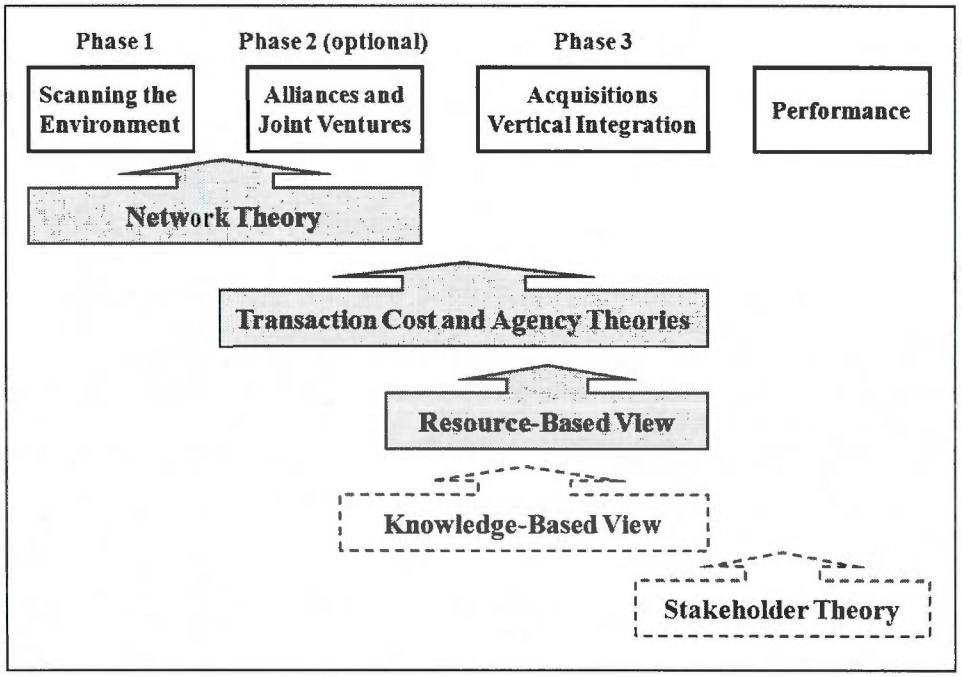
My understanding is that, in studying alliances and acquisitions, more than one theory should be used in an integrated approach with a clear definition of its theoretical foundations, assumptions and boundaries, within the scope of the investigated object. After exploring the different theories included in this paper, the theoretical model represented in figure 7.1 emerged. It combined the network theory, the transaction cost and agency theory and finally the resource-based view, with a temporal assumption reflecting the different phases of alliances and acquisitions: Pre-acquisition, acquisition decision making, post-acquisition and performance measurement.

In the context of the high-tech industry, the network theory is more pertinent to the pre-acquisition phase, where the firms are scanning the environment based on their relations and searching for potential partners for informal collaboration, strategic alliances or joint venture. This is usually done in an exploratory and test mode, for future acquisitions. The boundaries for the use of the network theory are clear; before taking the decision for internalizing the activity through acquisition. The transaction cost and agency theory deal with organization forms (alliances, joint ventures, or acquisitions/vertical integration), the cost involved in each mode

(market, hybrid or alliances/joint venture and vertical integration/acquisition), and the governing mechanism for each structure. Thus, those combined theories are pertinent at the boundaries of the scanning phase, during the alliance/joint venture phase and the acquisition phase. The theoretical boundaries of their application cover the three areas. Finally the resource-based view concerned with the acquisition and accumulation of strategic assets and core competencies for sustained competitive advantage, is more pertinent to the acquisition and integration phase. However, in evaluating external complementary and supplementary resources, it also covers part of the alliance/joint venture phase. Therefore, its coverage area is the acquisition phase and part of the optional alliance phase, and its boundaries are fixed on the acquisition phase and flexible in the optional alliance/joint venture phase. In the context of acquisitions, alliances with their different contractual and non contractual forms are optional. Some cases would encourage the use of transitory alliances (Duysters & Man, 2003a) before taking the acquisition decision, to evaluate closely the potential acquisition target and overcome information asymmetry. In other cases, the decision to acquire is made without the need for any pre-acquisition formal or informal cooperation, such as alliances and joint-ventures.

Figure 7.1

Integrative theoretical grounding model for alliances and acquisitions



Finally, the knowledge-based view, the market-based view and the stakeholder theory could be integrated into the theoretical model; however they were not part of the scope of this research. Their tentative position is planned for further exploration as shown in figure 7.1.

7.6 Implications

This work in progress has several implications for scholars and practitioners. For practitioners, it describes the environment and the context of acquisition decision making in a high velocity environment, and the phases prior to making the decision (scanning and due diligence) and the subsequent phase of integration. It explains the complexity of the factors involved in each of these phases and categorizes them using three distinct lenses: Transaction cost economics (and agency theory), resource based view, and network theory. Those various factors with their underlying theoretical lenses are closely linked and, by using cognitive simplification, are reduced to three key decision areas: Resources, links, and cost. Before contemplating an acquisition, the key decision maker or the acquisition team, would have to evaluate their internal and external resources, by identifying their needs, their existing capabilities and the potential resources in their firm's ecosystem (Adner & Kapoor, 2010a, 2010b; Kapoor & Lee, 2010). They would have to use their existing relationships within their ecosystem or establish new relationships, to link their needs with the external resources (Grigoriou & Rothaermel, 2010). Their needs could vary from assessing the external environment and evaluating potential targets, to informal or formal collaboration with competitors, through participating in standard bodies to enact the future direction of technologies and markets, or through venture capital, joint venturing or strategic alliances. In assessing the resources and establishing the links, the factor cost should be calculated. The cost and resource endowment could be influential in deciding between the decision for acquisition or alliance. The cost of internal R&D and of acquiring an external source of innovation could be decisive in a make or buy decision. The complexity of the integration in a post-acquisition phase could have serious implications on the overall cost, the efficient use of capabilities and the efficiency of the governance structure. The three factors together, resources, links and cost, would have a large impact on the organizational structure and strategy, which would have serious implications on performance and the firm's ability to sustain competitive advantage.

The complexity of the tasks involved in acquisitions' activities within the context of high velocity environment, such as the high technology industries, lead us to believe that undertaking the decision to go for acquisition is a multi-level, multi-function and involving a temporal dimension as well. Those tasks cannot be undertaken by one key decision maker alone like the chief executive or by the executive team only. Cognitive simplification, bounded rationality, and asymmetry of information, would not yield to successful acquisition outcome. In addition, it would be highly impossible to manage such intensive acquisition activities, as in the case of the high technology industries, with this limited number of involvement. Instead, it would be highly probable, that different teams, from different department with different skills, are involved in managing the different phases and lifecycles of such intensive acquisitions' activities. The involvement of multi departmental teams would have an impact on the organizational structure and strategy formation within the organization dealing with intensive acquisitions activities. Dynamic capabilities would be a key success factor in managing an organization structure of this nature. This structure would reinforce the tendency to believe that the process of strategy formulation in such an organization is not an emergent one, but rather deliberate with long range planning. The involvement in intensive acquisitions' activities, such as in the case of the high technology industries, would lead us to believe that the firm has adopted deliberately acquisitions as a key strategy, if not the main strategy for growth and sustaining competitive advantage.

7.7 Common Concepts, Constructs, and Variables

A review of the literature was based on journals such as the *strategic management journal*, *academy of management review*, *academy of management journal*, *administrative science quarterly*, *organization science*, *R&D management*, and others, explored factors related to alliance and acquisitions and resulted in a total of 74 factors, for both alliance and acquisition. They were then classified into the three categories: Some factors are found to be used mainly with either research stream only, while the others are used for both alliance and acquisition research. Table 7.1 is a list of factors used mainly in alliance research. Table 7.2 is a list of factors used mainly in acquisitions research. Table 7.3 is a list of common factors used in both alliance and acquisition research.

Table 7.1

Selected list of constructs and variables used mainly for alliance research

	Constructs used mainly in Alliances	**Research type**	**Cited by**
1	Market uncertainty	Motivates alliance	(Eisenhardt, 1989a) (Williamson, 1975) (Jemison & Sitkin, 1986b) (Williamson, 1999)
2	Product uncertainty	Motivates alliance	(Quelin, 2000) (Roberts & Liu, 2001)
3	Danger of appropriation	To control for and affect	(Hoffman & Schaper-Rinkel, 2001)
4	Economic performance	To measure as a result of	(Lubatkin, 1983) (Singh & Montgomery, 1987)
5	Absorptive capacity	A critical success factor (CSF)	(Hoffman & Schaper-Rinkel, 2001)
6	Management control	A CSF, to control for	(Eisenhardt, 1989a)
7	Trust	Precondition, CSF	(Eisenhardt, 1989a) (Williamson, 1975) (Jemison & Sitkin, 1986b) (Williamson, 1999)
8	R&D intensity	Shared by and distributed	(Hitt et al., 1991b) (Hitt et al., 1996)
9	Learning by doing	A motivation for	(Hoffman & Schaper-Rinkel, 2001) (Pennings, Barkema, & Douma, 1994b)
10	Penetrate new markets	An objectif for	(Walter & Barney, 1990)
11	Compatible organizational objectives / strategy	A CSF	(Mayer & Kenney, 2004a)
12	Strategic control	To control for	(Hitt et al., 1996) (Hitt, Hoskisson, & Ireland, 1990)
13	Risk	Motivation for	(Walter & Barney, 1990) (Roberts & Liu, 2001)
14	Social capital	A CSF, increase success	(Hoffman & Schaper-Rinkel, 2001) (Geletkanycz & Hambrick, 1997) (Gulati, 1999)
15	Technological performance	To be measured	(James, Georghiou, & Metcalfe, 1998)
16	Efficiency	To be measured	(Trautwein, 1990) (Walter & Barney, 1990) (Williamson, 1999)
17	Degree of portfolio competitiveness	Planned for, to be measured	(Ferrary, 2003)
18	Resource dependency	Created by	(Pfeffer, 1972)
19	Degree of opportunism	To control for and affect	(Eisenhardt, 1989a) (Williamson, 1975) (Hoffman & Schaper-Rinkel, 2001; Williamson, 1999)
20	Moral hazard	To control for and affect	(Eisenhardt, 1989a) (Hoffman & Schaper-Rinkel, 2001) (Coff, 1997b)
21	Risk sharing	A motivation for	(Walter & Barney, 1990) (Roberts & Liu, 2001) (Lubatkin, 1983)

Table 7.2

Selected list of constructs and variables used mainly for acquisition research

	Constructs used mainly in Acquisitions	**Research type**	**Cited by**
22	Firm's size	A CSF	
23	Synergy	A desired outcome	(Brush, 1996) (James, Georghiou, & Metcalfe, 1998) (Walter & Barney, 1990) (Chatterjee, 1986) (Lubatkin, 1983) (Wernerfelt, 1984)
24	Market power	A desired outcome	(Galbraith & Stiles, 1984)
25	Increase monopoly	A desired outcome	(Trautwein, 1990)
26	Platform leadership	A motivation for	(Gawer & Cusumano, 2002)
27	Technological uncertainty	A driver for	
28	Talent retention	To control for and measure	(Mayer & Kenney, 2004a) (Cannella & Hambrick, 1993) (Coff, 1997b)
29	Degree of integration	To control for and measure	(James, Georghiou, & Metcalfe, 1998) (Paine & Power, 1984) (Mayer & Kenney, 2004a) (Jemison & Sitkin, 1986b) (Nahavandi & Malekzadeh, 1988)
30	Level of strategic asset	To analyze before, CSF	(Hagedoorn & Duysters, 2002) (Oliver, 1997) (Peteraf, 1993)
31	Empire building	A desired outcome	(Trautwein, 1990)
32	Suplementary product / technology	A motivation for	(Shelton, 1988a) (Wernerfelt, 1984)
33	Substitute product / technology	A motivation for	(Gawer & Cusumano, 2002)
34	Rate of internal innovation	Increased by	(Hitt et al., 1991b) (Hitt et al., 1996) (Hitt, Hoskisson, & Ireland, 1990)
35	Increase acquisition & development	A strategy based on	(Mayer & Kenney, 2004a)
36	Operational synergies	A desired outcome	(Trautwein, 1990) (Chatterjee, 1986; James, Georghiou, & Metcalfe, 1998)
37	Financial control	To control for	(Hitt et al., 1996) (Hitt, Hoskisson, & Ireland, 1990)
38	Managerial synergies	To control for, a desired outcome	(Trautwein, 1990)
39	Acquisition intensity	To be increased by	(Hitt et al., 1996) (Hitt, Hoskisson, & Ireland, 1990)

Table 7.3

Selected list of constructs and variables used for alliance and acquisition research

	Common constructs used in Alliance and Acquisition	**Cited by**
40	Tacit knowledge	(Oliver, 1997)
41	Information asymmetry	(Eisenhardt, 1989a) (Hoffman & Schaper-Rinkel, 2001) (Coff, 1997b)
42	Uncertainty	
43	R&D cost	(Roberts & Liu, 2001)
44	Complementary product / technology	(Shelton, 1988a) (Mayer & Kenney, 2004a) (Wernerfelt, 1984)
45	Asset specificity	(Hoffman & Schaper-Rinkel, 2001) (Williamson, 1975) (Williamson, 1999) (Oliver, 1997) (Coff, 1997b) (Robertson & Gatignon, 1998)
46	Increase economies of scale	(Duysters & Man, 2003b) (Walter & Barney, 1990) (Hoffman & Schaper-Rinkel, 2001) (Singh & Montgomery, 1987)
47	Increase economies of scope	(Hoffman & Schaper-Rinkel, 2001) (Lubatkin, 1983) (Singh & Montgomery, 1987)
48	Competitive Advantage	(Porter, 1980a) (Prahalad & Hamel, 1994) (Oliver, 1997)
49	Bounded rationality	(Eisenhardt, 1989a) (Williamson, 1975) (Williamson, 1999) (Coff, 1997b)
50	Barriers to Entry	(Yip, 1982) (Wernerfelt, 1984)
51	Cost	(Walter & Barney, 1990)
52	Increase Core competencies	(Hitt et al., 1991b) (Prahalad & Hamel, 1990) (Prahalad & Hamel, 1994) (Quelin, 2000) (Singh & Montgomery, 1987)
53	Incentives	(Paine & Power, 1984)
54	Product time to market	
55	Proximity	(Ferrary, 2003) (Mayer & Kenney, 2004a)
56	Degree of modularity	(Gawer & Cusumano, 2002)
57	Growth	(Feeser & Willard, 1990) (Walter & Barney, 1990)
58	CEO's hubris	(Hayward & Hambrick, 1997)
59	Market share	(Brush, 1996; Walter & Barney, 1990) (Mayer & Kenney, 2004a)
60	Net gain	(Trautwein, 1990)
61	Transaction cost	(Teece, 1982) (Williamson, 1986) (Williamson, 1975) (Borys & Jemison, 1989) (Eisenhardt, 1989a) (Williamson, 1999) (Walker & Weber, 1984)

62	Increase positioning	(Hopkins, 1987) (Walter & Barney, 1990) (Yip, 1982) (Gulati, 1999)
63	Degree of product relatedness	(Feeser & Willard, 1990) (Hopkins, 1987) (James, Georghiou, & Metcalfe, 1998) (Roberts & Liu, 2001) (Wernerfelt, 1984)
64	Compatible organizational culture	(Jemison & Sitkin, 1986b) (Mayer & Kenney, 2004a) (Datta, 1991) (Nahavandi & Malekzadeh, 1988)
65	Financial synergies	(Trautwein, 1990) (Chatterjee, 1986) (Hoffman & Schaper-Rinkel, 2001)
66	Resource endowment	(Hoffman & Schaper-Rinkel, 2001) (Gulati, 1999)
67	Target firm relative size	(Kusewitt, 1985) (Jemison & Sitkin, 1986b) (Datta, 1991)
68	Complexity	(Jemison & Sitkin, 1986b)
69	Strategic fit	(Shelton, 1988a) (Paine & Power, 1984) (Mayer & Kenney, 2004a) (Jemison & Sitkin, 1986b) (Wernerfelt, 1984)
70	Experience in Alliances / Acquisitions	(Haleblian & Finkelstein, 1999) (Jemison & Sitkin, 1986b) (Pennings, Barkema, & Douma, 1994b)
71	Path dependency	(Oliver, 1997) (Singh & Montgomery, 1987)
72	Technical complexity	(Bettis & Hitt, 1995)
73	R&D investment	(Hitt et al., 1991b)

7.8 Conclusion

This paper has mainly one objective that is of bridging the gap between alliance and acquisition research, towards a cross-fertilized agenda, which would be beneficial to both sub-streams of research, alliance and acquisition, and to the field of business policy and strategy at large. Following the literature review and exploration through the three main theoretical lenses widely used in business policy and strategy research, we hope that our proposal is clear now, and that we demonstrated that there are more commonalities in alliance and acquisition research, than differences. It is obvious that the list for common factors of alliance and acquisition research is larger than the two other lists of factors that are more focused on either alliance or acquisition.

We suggest that the next step in bridging the gap between alliance and acquisition research is to focus a good deal of effort on two questions linking the two sub-streams of research. The first is the critical success factors in alliance and acquisition. The second is to rely on past and current research to answer the following important questions: To ally or to acquire?; under what conditions?, what are the prerequisites in each case?. And knowing that firms do both alliance and acquisition, how to measure them efficiently, in order to use cumulative performance measurement as feedback to answer the first question, to ally or acquire? This question obviously has not only theoretical implications, but critical practical implications as well, as it will provide a guideline and a check list for firms and managers facing this dilemma, to ally or to acquire?

7.8.1 Critical Success Factors in Alliance and Acquisition

Forming alliances or acquisitions is mainly with the objective of sustaining competitive advantage (Oliver, 1997; Porter, 1980a; Prahalad & Hamel, 1994) with all its underlying conditions such the efficient management of strategic assets and building on core competencies, which remain one of the critical success factors. In a pre alliance and acquisition phase, one critical success factor remains crucial to the strength of the formation of a partnership between compatible partners: Trust (Eisenhardt, 1989a; Jemison & Sitkin, 1986b; Williamson, 1975; Williamson, 1999). Without trust, conflict of interest, opportunistic behavior and moral hazard could weaken the potential for a mutually beneficial relationship. During the scanning phase to evaluate potential partners, the reputation of the target firm and the personal relationships between its agent and the acquirer would speed up the process of access internal information and would reduce the lengthy negotiations. In alliances, trust between the partners would create synergetic opportunities (Brush, 1996; Chatterjee, 1986; James, Georghiou, & Metcalfe, 1998; Lubatkin, 1983; Walter & Barney, 1990; Wernerfelt, 1984) and a healthy organizational culture.

Compatible organizational cultures (Datta, 1991; Jemison & Sitkin, 1986b; Mayer & Kenney, 2004a; Nahavandi & Malekzadeh, 1988) between the partners, either in an alliance or an acquisition are another critical success factor to guarantee an alignment between the two organizations and produce a high level of synergy. Culture is sometime termed the informal structure of the organization and a healthy structure produces a winning strategy. In fact, a high level of compatibility between the two organizations, in which the strategic objectives and

missions of the two are aligned, would create a strategic fit. Compatible organizational objectives (Mayer & Kenney, 2004a) are a key success factor. The success of an alliance and acquisition rely on the strategic choice made in the evaluation and selection process, in which one company among many is believed to be the best in complementing the resources of the principal firm and aggregating to it external strategic assets. In the post formation phase and during the integration phase of an acquisition or the implementation phase of an alliance, the partners should work together to combine the resources and devise a plan for financial synergy (Chatterjee, 1986; Hoffman & Schaper-Rinkel, 2001; Trautwein, 1990). Among the expectations of alliances and acquisitions are the production of significant economies leading to a net gain, while increasing the rate of growth and maintain the strategic objectives. This would not be achieved without the integration of the firms' value chains and physical assets, producing significant improvement in the operation level and a high level of operational synergy (Chatterjee, 1986; James, Georghiou, & Metcalfe, 1998; Trautwein, 1990). A healthy organization culture that is based on trust, the full integration of the two firms' information systems infrastructure resulting in reducing the asymmetry of information, the integration of the acquired firm into the acquirer by establishing clear channel of communication and command, would eventually create managerial synergies (Trautwein, 1990).

Moreover, the different components of synergy, such as the financial, operational and managerial synergies, depend on the success of the integration process and the degree of integration (James, Georghiou, & Metcalfe, 1998; Jemison & Sitkin, 1986b; Mayer & Kenney, 2004a; Nahavandi & Malekzadeh, 1988; Paine & Power, 1984); In other words, its scope, depth and quality. An enormous and serious effort should start immediately after the alliance or acquisition's decision is completed, to integrate the two firms. During the scanning and evaluation process, the integration plan should be thought of and the complexity of the integration should be compared among the different choices of potential and target firms. Therefore, plans should be devised in an early stage, which would guarantee a full speed progress and project implementation after the decision. As the degree of integration is a critical success factor, the complexity of the integration and the length of the process would depend on related factors. The target firm relative size (Datta, 1991; Jemison & Sitkin, 1986b; Kusewitt, 1985) would affect the scope of the integration, the length of the integration process and the amount of resources dedicated to complete the integration. Those resources and all the resources owned by the firm

should be utilized in the production of goods and services, and borrowing from those resources would limit the firm from reaching its full potential.

The proximity (Ferrary, 2003; Mayer & Kenney, 2004a) of the two firms would facilitate the movement of the personnel between the two entities and the exchange of information in a more personal way through meeting and personal contacts. This would increase the quality of communication and collaboration, fomenting trust. The idea behind an alliance or acquisition is to access or acquire strategic resources from an external source, which is in the high technology industry highly technical expertise and know how that is tacit in nature. When those resources are transferred to the other firm or absorbed by the partner firm in an alliance, a new process of learning and knowledge transfer begins. Teams from the two firms would work together, reaching a consensus on the way ahead and forging plans for the development of objectives, products and results. The level of synergy resulting from the combined effort is based on the absorptive capacity (Hoffman & Schaper-Rinkel, 2001) of the teams working together and the degree of product relatedness (Feeser & Willard, 1990; Hopkins, 1987; James, Georghiou, & Metcalfe, 1998; Roberts & Liu, 2001; Wernerfelt, 1984), in a related diversification move. The more the products are related, the easiest the integration between them and the creation of levels of modularity and versatility. The degree of modularity (Gawer & Cusumano, 2002) is influenced mainly by the compatibility of the parts and their full interoperability. The technical complexity (Hitt et al., 1996) embedded in high technology products would make the integration process of modular parts a more difficult task. Dealing with this complexity would require lengthy planning, dedicating the best resources available from the two firms.

In the post alliance and acquisition formation, management control (Eisenhardt, 1989a) and the governance structure is a key to success. The structure would follow the strategy and ensure the achievement of both strategic control (Hitt, Hoskisson, & Ireland, 1990; Hitt *et al.*, 1996) in term of allocating the valuable resources owned by the firm and the alignment of the strategic objectives with those resources; and financial control (Hitt, Hoskisson, & Ireland, 1990; Hitt *et al.*, 1996) to produce economies, efficiencies and gain. Guarding and protecting the resources is critical to maintaining a sustained competitive advantage. In some cases, after the formation of an alliance or an acquisition, some valuable human resources such as experience managers, talented engineers or skilled scientists could depart the firm, because of a conflict of

loyalty because they do not fully agree with the new formation or because their position or power is affected by the new arrangements. The departure of those human assets could negatively impact the success of the alliance and the acquisition and prevent the firm from achieving its desired and planned objectives. Talent retention (Cannella & Hambrick, 1993; Coff, 1997b; Mayer & Kenney, 2004a) is a success factor in ensuring a smooth integration and could be achieved by both economic and non economic incentives (Paine & Power, 1984), such as equity share for the acquired management team, relative power for the team leader and project managers of the acquired firmed, and the maintenance of a certain degree of autonomy for the creative teams acquired, to ensure the non disruption of the creative environment, procedures and routines.

7.8.2 To Ally or to Acquire?

Although few researches were published to answer this question, we believe that it is still vastly and open question. The contention between alliance and acquisition decision has not been resolved, or at least not to a satisfactory level. Research findings and prescriptions are contradictory, incoherent or incomplete. More research is needed to answer what we believe should be the central question in alliance or acquisition research, and this would only happen if the gap between the two research sub-streams is bridged, specially if the commonalities between the two sub-streams are much more than the differences.

References

Aiken M, Hage J. (1968). Organizational interdependence and intraorganizational structure. *American Sociological Review* 33: 912-930

Amit R, Schoemaker PJH. (1993). Strategic assets and organizational rents. *Strategic Management Journal* 14(1): 33-46

Armour HO, Teece DJ. (1978). Organization structure and economic performance: A test of the multidivisional hypothesis. *Bell Journal of Economics* 9: 106-122

Baker WE. (1984). The social structure of a national securities market. *American Journal of Sociology* 89: 775-811

Barley SR, Freeman J, Hybels RC. (1992). Strategic alliances in commercial biotechnology. In N Nohria, R Eccles (Eds.), *Networks and Organizations: Structure, Form and Action*: 311-347. Harvard Business Press: Boston, MA.

Barney J. (1986). Strategic factor markets: Expectations, luck and business strategy. *Management Science* 42: 1231-1241

Barney J. (1991). Firm resources and sustained competitive advantage. *Journal of Management* 17: 99-120

Berg S, Friedman P. (1978). Joint ventures in American industry: An overview. *Mergers and Acquisitions* 13: 28-41

Bettis RA, Hitt MA. (1995). The new competitive landscape. *Strategic Management Journal* 16: 7-19

Borys B, Jemison DB. (1989). Hybrid arrangements as strategic alliances: Theoretical issues in organizational combinations. *Academy of Management Review* 14(2): 234-249

Brush TH. (1996). Predicted change in operational synergy and post acquisition performance of acquired businesses. *Strategic Management Journal* 17: 1-24

Cannella AA, Hambrick DC. (1993). Effects of executive departures on the performance of acquired firms. *Strategic Management Journal* 14: 137-152

Castanias RP, Helfat CE. (1991). Managerial resources and rents. *Journal of Management* 17: 155-172

Caves RE. (1980). Industrial organization, corporate strategy and structure. *Journal of Economic Literature* 58: 64-92

Chatterjee S. (1986). Types of synergy and economic value: The impact of acquisitions on merging and rival firms. *Strategic Management Journal* 7: 119-139

Chatterjee S, Wernerfelt B. (1991). The link between resources and type of diversification: Theory and evidence. *Strategic Management Journal* 12: 33-48

Chi T. (1994). Trading in strategic resources: Necesary conditions, transaction cost problems, and choice of exchange structure. *Strategic Management Journal* 15(4): 271-290

Coff RW. (1997a). Human assets and management dilemmas: Coping with hazards on the road to resource-based theory. *Academy of Management Review* 22(2): 374-402

Coff RW. (1997b). Human assets and management dilemmas: Coping with hazards on the road to resource based theory. *Academy of Management Review* 22(2): 374-402

Cohen WM, Levinthal DA. (1990). Absorptive capacity: A new perspective on leaning and innovation. *Administrative Science Quarterly* 35: 128-152

Collis DJ. (1994). How valuable are organizational capabilities? *Strategic Management Journal* 15: 143-152

Combs JG, David J. Ketchen J. (1999). Explaining interfirm cooperation and performance: Toward a reconciliation of predictions from the resource-based view and organizational economics. *Strategic Management Journal* 20: 867-888

D'Aveni RA, Ravenscraft DJ. (1994). Economies of integration versus bureacracy of costs: Does vertical integration improve performance. *Academy of Management Journal* 37: 1167-1206

Datta DK. (1991). Organizational Fit and Acquisition Performance: Effects of Post-Acquisition Integration. *Strategic Management Journal* 12: 281-297

Dierickx I, Cool K. (1989). Asset stock accumulation and sustainability of competitive advantage. *Management Science* 35: 1504-1511

Duysters G, Man A-Pd. (2003). Transitory alliances: an instrument for surviving turbulent industries? *R&D Management* 33(1): 49-58 (10 pp.)

Eisenhardt KM. (1989). Agency theory: An assessment and review. *Academy of Management Review* 14(1): 57-74

Eisenhardt KM, Schoonhoven CB. (1996). Resource based view of strategic alliance formation: Strategic and social effects in entrepreneurial firms. *Organisation Science* 7(2): 136-150

Feeser HR, Willard GE. (1990). Founding strategy and performance: A comparison of high and low growth high tech firms. *Strategic Management Journal* 11: 87-98

Ferrary M. (2003). Managing the disruptive technologies life cycle by externalizing the research: social network and corporate venturing in the Silicon Valley. *International Journal of Technology Management* 25(1/2)

Galbraith CS, Stiles CH. (1984). Merger strategies as a response to bilateral market power. *Academy of Management Journal* 27(3): 511-524

Gawer A, Cusumano MA. (2002). *Platform Leadership: How Intel, Microsoft, and Cisco Drive Industry Innovation*. Harvard Business School Press

Geletkanycz MA, Hambrick DC. (1997). The external ties of top executives: Implications for strategic choice and performance. *Administrative Science Quarterly* 42(4): 654-681

Geringer JM, Herbert L. (1989). Control and performance of international joint ventures. *Journal of International Business Studies* 20: 235-254

Granovetter M. (1985). Economic action and social structure: The problem of embeddedness. *American Journal of Sociology* 91: 481-510

Gulati R. (1998). Alliances and networks. *Strategic Management Journal* 19: 293-317

Gulati R. (1999). Network location and learning: The influence of network resources and firm capabilities on alliance formation. *Strategic Management Journal* 20: 397-420

Hagedoorn J, Duysters G. (2002). External sources of innovative capabilities: The preference for strategic alliances or mergers and acquisitions. *Journal of Management Studies* 39(2)

Haleblian J, Finkelstein S. (1999). The influence of organizational acquisition experience on acquisition performance: A behavioral learning perspective. *Administrative Science Quarterly* 44(1): 29-56

Hamel G. (1991). Competition for competence and inter-partner learning within international strategic alliances. *Strategic Management Journal* 12: 83-103

Haveman HA. (1993). Follow the leader: Mimemic isomorphism and entry into new markets. *Administrative Science Quarterly* 38: 593-627

Hayward M, Hambrick D. (1997). Explaining the premiums paid for large acquisitions: Evidence of CEO hubris. *Administrative Science Quarterly*(42): 103-127

Hitt MA, Hoskisson RE, Ireland RD. (1990). Mergers and acquisitions and managerial commitment to innovation in m-form firms. *Strategic Management Journal* 11: 29-47

Hitt MA, Hoskisson RE, Ireland RD, Harrison JS. (1991). Effects of acquisitions on R&D inputs and outputs. *Academy of Management Journal* 34(3): 693-706

Hitt MA, Hoskisson RE, Johnson RA, Moesel DD. (1996). The market for corporate control and firm innovation. *Academy of Management Journal* 39(5): 1084-1119

Hoffman WH, Schaper-Rinkel W. (2001). Acquire or ally? - A strategy framework for deciding between acquisition and cooperation. *Management International Review* 41(2): 131-159

Hopkins HD. (1987). Acquisition strategy and the market position of acquiring firms. *Strategic Management Journal* 8: 535-547

James AD, Georghiou L, Metcalfe JS. (1998). Integrating technology into merger and acquisition decision making. *Technovation* 18(8/9)

Jemison DB, Sitkin SB. (1986). Corporate acquisitions: A process perspective. *Academy of Management Review* 11(1): 145-163

Khanna T, Gulati R, Nohria N. (1998). The dynamics of learning alliances: Competition, cooperation, and relative scope. *Strategic Management Journal* 19(3): pg. 193

Kogut B. (1988). Joint ventures: Theoretical and empirical perspectives. *Strategic Management Journal* 9: 319-332

Kogut B. (1991). Joint ventures and the option to expand and acquire. *Management Science* 37(1): 19-33

Kusewitt JB. (1985). An exploratory study of strategic acquisition factors relating to performance. *Strategic Management Journal* 6: 151-169

Levine S, White PE. (1961). Exchange as a conceptual framework for the study of interorganizational relationships. *Administrative Science Quarterly* 5: 583-601

Lippman S, Rumelt RP. (1982). Uncertain imitability: An analysis of interfirm differences in effiency under competition. *Bell Journal of Economics* 13(418-438)

Lubatkin M. (1983). Mergers and the performance of the acquiring firm. *Academy of Management Review* 8(2): 218-225

Madhok A. (1997). Cost, value and foreign market entry mode: The transaction and the firm. *Strategic Management Journal* 18: 39-61

Mahoney JT, Pandian JR. (1992). The resource-based view within the conversation of strategic management. *Strategic Management Journal* 13: 363-380

Markides CC, Williamson PJ. (1996). Corporate diversification and organization structure: A resource based view. *Academy of Management Journal* 39: 340-367

Marsden PV. (1981). Introducing influence processes into a system of collective decisions. *American Journal of Sociology* 86(6): 1203-1235

Mayer D, Kenney M. (2004). Economic action does not take place in a Vacuum: Understanding Cisco's acquisition and development strategy. *Industry and Innovation* 11(4): 299

Nahavandi A, Malekzadeh AR. (1988). Acculturation in Mergers and Acquisitions. *Academy of Management Review* 13(1): 79-90

Oliver C. (1997). Sustainable competitive advantage: Combining institutional and resource based views. *Strategic Management Journal* 18(9): 697-713

Osborn RN, Hagerdoorn J. (1997). The institutionalization and evolutionary dynamics of interorganizational alliances and networks. *Academy of Management Journal* 40(2): 261-278

Paine FT, Power DJ. (1984). Merger strategy: An examination of Druker's five rules for successful acquisitions. *Strategic Management Journal* 5: 99-110

Pennings JM, Barkema H, Douma S. (1994). Organizational learning and diversification. *Academy of Management Journal* 37(3): 608-640

Penrose EG. (1959). *The theory of the growth of the firm.* Wiley: New York

Perry ML, Sengupta S, Krapfel R. (2004). Effectivess of horizontal strategic alliances in technologically uncertain environments: Are trust and commitment enough? *Journal of Business Research* 57: 951-956

Peteraf MA. (1993). The cornerstones of competitive advantage: A resource-based view. *Strategic Management Journal* 14: 179-191

Peteraf MA, Barney J. (2003). Unraveling the resource-based tangle. *Managerial and Decision Economics* 24(4): 309-323

Pfeffer J. (1972). Merger as a response to organizational interdependence. *Administrative Science Quarterly* 17: 382-394

Pfeffer J, Nowak P. (1976). Joint venture and interorganizational interdependence. *Administrative Science Quarterly* 21(3): 398-418

Pfeffer J, Salancik GR. (1978). *The external control of organizations.* Harper & Row: New York

Pisano GP, Russo MV, Teece DJ. (1988). Joint venture and collaborative arrangements in the telecommunications equipment industry. In D Mowery (Ed.), *International Collaborative Ventures in U.S. Manufacturing.* Ballinger: Cambridge, MA.

Poppo L, Zenger T. (1998). Testing alternative theories of the firm: Transaction cost, knowledge-based, and measurement explanation for make-or-buy decisions in information services. *Strategic Management Journal* 19(9): 853-877

Porter M. (1980). *Competitive Strategy.* Free Press

Powell WW, Brantley P. (1992). Competitive cooperation in biotechnology: Learning through networks. In N Nohria, R Eccles (Eds.), *Networks and Organizations: Structure, Form and Action*: 366-394. Harvard Business School: Boston, MA

Prahalad CK, Hamel G. (1990). The core competence of the corporation. *Harvard business review*: 79-91

Prahalad CK, Hamel G. (1994). *Competitng for the future.* Harvard Business School Press: Boston

Quelin B. (2000). Core competencies, R&D management and partnerships. *European Management Journal* 18(5): 476-487

Roberts EB, Liu WK. (2001). Ally or acquire? *MIT Sloan Management Review*

Robertson TS, Gatignon H. (1998). Technology development mode: A transaction cost conceptualization. *Strategic Management Journal* 19: 515-531

Salter M, Weinhold W. (1980). *Diversification by acquisition*. Free Press: New York

Shan W. (1990). An empirical analysis of organizational strategies by entrepreneurial high-technology firms. *Strategic Management Journal* 11(2): 129-139

Shelton LM. (1988). Strategic business fits and corporate acquisition: Empirical evidence. *Strategic Management Journal* 9: 279-287

Singh H, Montgomery C. (1987). Corporate acquisition strategies and economic performance. *Strategic Management Journal* 8: 377-386

Stinchcombe AL. (1990). *Information and Organization*. University of California Press: Berkeley, CA.

Teece DJ. (1982). Towards an economic theory of the multiproduct firm. *Journal of Economic Behavior and Organization* 3: 39-63

Teece DJ. (1986). Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy. *Research Policy* 15: 285-305

Teece DJ, Pisano G, Shuen A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal* 18(7): 509-533

Thorelli HB. (1986). Networks: Between markets and hierarchies. *Strategic Management Journal* 7: 37-51

Trautwein F. (1990). Merger motives and merger prescriptions. *Strategic Management Journal* 11: 283-295

Walker G, Weber D. (1984). A transaction cost approach to make-or-buy decisions. *Administrative Science Quarterly* 29(3): 373-391

Walter GA, Barney JB. (1990). Management objectives in mergers and acquisitions. *Strategic Management Journal* 11: 79-86

Wernerfelt B. (1984). A resource-based view of the firm. *Strategic Management Journal* 5: 171-180

White HC. (1981). Where do markets come from? *American Journal of Sociology* 87: 517-547

Williamson OE. (1975). *Markets and Hierarcies, analysis and antitrust applications: A study in the economics of internal organizations*. Free Press: New York

Williamson OE. (1986). Transaction-cost economics: The governance of contractual relations. In JB Barney, WG Ouchi (Eds.), *Organizational Economics*: 98-129. Jossey Bass

Williamson OE. (1991a). Comparative economic organization: The analysis of discrete structural alternatives. *Administrative Science Quarterly* 36(2): 269-296

Williamson OE. (1991b). Strategizing, economizing, and economic organization. *Strategic Management Journal* 12(Special Issue): 75-94

Williamson OE. (1999). Strategy research: Governance and competence perspectives. *Strategic Management Journal* 20: 1087-1108

Yip GS. (1982). Diversification entry: Internal development versus acquisition. *Strategic Management Journal* 3: 331-345

Zajac EJ, Olsen CP. (1993). From transaction cost to transactional value analysis: Implications for the study of interorganizational strategies. *Journal of Management Studies* 30(1): 131-145

Zukin S, Dimaggio P. (1990). *Structures of capital: the social organization of the economy*. Cambridge University Press: Cambridge

PART IV

ENTREPRENEURSHIP AND INNOVATION

CHAPTER VIII

ACQUISITIONS, ENTREPRENEURSHIP AND SYSTEMS OF INNOVATION [6]

The high technology industry had witnessed intensive activities of mergers and acquisitions throughout the last two decades. Mergers and acquisitions' motivations, consequences, and performance had been well researched and documented in the literature of business policy and strategy. However, the relationship with entrepreneurship and entrepreneurial activities has not been clearly established. This theoretical research explores the relationship between the intensive activities of mergers and acquisitions in the high technology industry and the entrepreneurial activities led by technology entrepreneurs and managers. Furthermore, the research explains and highlights the relationship of acquisitions and entrepreneurship with innovation, the creation of new technologies and venture capital, in the context of a national system of innovation, using insights from the high technology industry and Silicon Valley.

8.1 Introduction

Mergers and acquisitions have been used during the 1960s, 1970s and 1980s for vertical integration or diversification. Since the 1990s there has been a substantial increase in merger and acquisition activities in the different sectors of the economy, with a significant portion of those activities occurring in technology based companies. For example, Chaudhuri & Tabrizi (1999a) stated that in the United States, more than 11,000 merger and acquisition deals were completed in 1997, valued at over $900 billion and there were 5,000 such acquisition, totaling half a trillion

[6] This chapter was published as an article, with the same title, in the International Journal of Small Business and Entrepreneurship in 2011, and in the proceedings of the administrative sciences association of Canada (ASAC) annual conference 2010, entrepreneurship and family business division. Regina, Canada, May 2010. Vol. 31, No 21. The article was recognized by the entrepreneurship and family business division as *one of the best papers* in 2010.

dollars, in 1998. Some of the well-known acquisitions during this period are the AOL and Time Warner; MCI and WorldCom; Bell Atlantic and GTE; Kmart and Sears; Cingular and AT&T Wireless; and SBC and AT&T. (Sarkis, 2009)

Most of these acquisitions, whether in the entertainment, financial or retail sectors, with the exception of the high-tech industries, took place in the form of a larger company acquiring a smaller company. The acquisition is usually a one-to-one deal, between the acquirer and the acquired. In most cases, the acquisitions take place, by the acquirer, no more than few times during a reasonable period of time extending for several years. However, in the high-tech industries and specifically in the networking equipment manufacturers industry, we have witnessed an explosion of acquisitions occurring over very short periods of time and with high frequency during the same year. For example, Cisco Systems completed 107 acquisitions from the period between 1993 and April 2006, Nortel Networks completed 21 acquisitions from the period between 1996 and 2006 and Lucent Technologies completed 41 acquisitions during the same period. In addition, Cisco Systems completed 18 acquisitions in 1999 with an average of one and half acquisitions per month, 23 acquisitions in 2000 with an average of almost two acquisitions per month (an acquisition every two weeks), 12 acquisitions in 2004 and 12 acquisitions in 2005 alone. (Sarkis, 2009)

The equipment manufacturing firms established in this knowledge intense sector face a variety of turbulent environmental challenges (Bahrami & Evans, 1989; Romanelli, 1989). Their products are technically complex (Bettis & Hitt, 1995; Jemison & Sitkin, 1986b), in which the embedded knowledge is tacit in nature (Oliver, 1997), non codified and non transferable as a public good (Hagedoorn & Duysters, 2002; Peteraf, 1993). The complexity of the technology is coupled with a high level of uncertainty (Hoffman & Schaper-Rinkel, 2001; Quelin, 2000) due to the lack of dominant standards or standard wars (Besen & Farrell, 1994; Shapiro & Varian, 2003), the lack of credible forecast for the potential future new products and the lack of specific requirements to respond to the customers' needs (Quelin, 2000; Roberts et al., 2001; Robertson & Gatignon, 1998; Walker & Weber, 1984). The rate of innovation of new technologies and products is higher than any other industry (Hitt, Hoskisson, & Ireland, 1990; Hitt *et al.*, 1991a; Hitt *et al.*, 1996) and the industry faces continuous waves of new technological generations and disruptive technologies (Christensen, 1997; Christensen, Anthony, & Roth, 2004; Christensen &

Raynor, 2003; Utterback & Acee, 2005b), which render the products obsolete, possibly even before being launched to the market (Mayer & Kenney, 2004b). The rate of obsolescence is such that products often become obsolete before their development costs can be recaptured (Roberts & Liu, 2001). The new and disruptive technologies emerge either inside the firm or in the environmental ecological system, following a pattern of an epidemic technology diffusion, mutation and permutation of characteristics. (Sarkis, 2009)

Consequently, many companies looking for potentially interesting new products have engaged in intensive acquisitions. Smart buyers keep their eyes on building the right long term capabilities. The acquisition boom in much of the economy has also reached high technology industries (Telecommunications, computer hardware, computer software, biotechnology, aerospace and defense industries). Eager to stay ahead of fast changing markets, more and more high tech companies are going outside for external sources of innovation and sustained competitive advantage.

Moreover, the motivations of acquisitions in the high tech industries are different than the motivations of acquisitions in other industries. Many of the high technology acquisitions in the 1990s appeared to be motivated by the firms' need to obtain critical technologies or capabilities, in contrast to acquisitions in other industries, which are in most parts, motivated by economies of scale, potential gains in market share, geographic expansion, empire building (Mayer & Kenney, 2004b) or CEO hubris (Hayward & Hambrick, 1997). Many acquisitions are attempting to obtain highly developed technical expertise and skills of employees, high-functioning teams for product development or other functions, or specific new technologies in fast-paced industries. Acquiring firms may not have the ability to develop these valuable knowledge- based resources internally or, alternately; internal development may take too long (Ranft & Lord, 2000). (Sarkis, 2009)

The intensive activities of mergers and acquisitions in the high technology industries have been well researched and documented over the years in the literature of business policy and strategy. However, past and current research on entrepreneurship, or more specifically techno-entrepreneurship, have not dealt satisfactorily with this phenomenon and the relationship between the acquisitions activities in the high technology industries and the entrepreneurial activities has not been fully explored. Most of the research on entrepreneurship in the high technology industry

deals with the personality traits of entrepreneurs, the motivations for establishing new ventures and startups, the different phases of establishing a new venture and its business cycles, and family business in the high tech industries, etc. Despite the fact that behind all these acquisitions, are high technology startups built by entrepreneurial activities and entrepreneurs, the relationship with acquisitions, new technologies and venture capital remain unclear and under researched.

Therefore, this theoretical research intends to fill this gap, by exploring the relationship between the intensity of acquisitions in the high technology industry and the entrepreneurial activities in the same industry. In doing so, the research will explain and highlight the relationship of acquisitions and entrepreneurship, with innovation, the creation of new technologies and venture capital, in the context of a national system of innovation, using insights from the high technology industry and Silicon Valley.

The objectives of this theoretical research are to (1) explore and understand the relationship between acquisitions and entrepreneurship in the context of high technology; (2) explore and understand the relationship of entrepreneurship and acquisitions, within the context of innovation, venture capital, and the national system of innovation; (3) construct a theoretical model that explains the relationship between entrepreneurship and acquisition in the context of a national system of innovation, using testable propositions and based on the guidelines for building theory. In the process, the research will introduce and explain the building blocks of the proposed model, and will explain the causal relationships between these building blocks and the underlying logic that explain these causal relationships.

Following the introduction, the next sections will provide a theoretical background on the intensive acquisitions in the high technology industry, the nature of the new technologies as supplementary, complementary, sustaining and disruptive, the national system of innovation as the ecosystem for acquisitions and entrepreneurship and the entrepreneurial activities in the high technology industry. Following the theoretical background, the next section will introduce the proposed theoretical model for entrepreneurship and acquisitions in the high technology, followed by an explanation of the rational behind its building blocks and their relationships, using a list of testable propositions for further empirical research. Finally, the discussion section will provide a final reflection on the contribution of this research and a reorganization of the proposed

theoretical model, to reflect the important and central role played by entrepreneurship and entrepreneurs in the high technology industry.

8.2 Intensive Acquisitions in the High Technology Industry

The equipment manufacturing firms established in the high technology industry, a knowledge intense sector of the economy, face a variety of turbulent environmental challenges (Bahrami & Evans, 1989; Romanelli, 1989). Their products are technically complex (Bettis & Hitt, 1995; Jemison & Sitkin, 1986b), in which the embedded knowledge is tacit in nature (Oliver, 1997), non codified and non transferable as a public good (Hagedoorn & Duysters, 2002; Peteraf, 1993). The complexity of the technology is coupled with a high level of uncertainty (Hoffman & Schaper-Rinkel, 2001; Quelin, 2000) due to the lack of dominant standards or standard wars (Besen & Farrell, 1994; Shapiro & Varian, 2003), the lack of credible forecast for the potential future new products and the lack of specific requirements to respond to the customers' needs (Quelin, 2000; Roberts et al., 2001; Robertson & Gatignon, 1998; Walker & Weber, 1984). The rate of innovation of new technologies and products is higher than any other industry (Hitt, Hoskisson, & Ireland, 1990; Hitt *et al.*, 1991a; Hitt *et al.*, 1996) and the industry faces continuous waves of new technological generations and disruptive technologies (Christensen, 1997; Christensen, Anthony, & Roth, 2004; Christensen & Raynor, 2003; Utterback & Acee, 2005b), which render the products obsolete, possibly even before being launched to the market (Mayer & Kenney, 2004b). The rate of obsolescence is such that products often become obsolete before their development costs can be recaptured (Roberts & Liu, 2001). The new and disruptive technologies emerge either inside the firm or in the environmental ecological system, following a pattern of an epidemic technology diffusion, mutation and permutation of characteristics. (Sarkis, 2009)

In the context of the high technology industries characterized by turbulence, high velocity and high degree of uncertainty, no one company could possess all the required resources needed to compete and sustain competitive advantage. The cost of R&D is very high, the learning curve very steep and the technology and product life cycle are very short (Duysters & Man, 2003b).

This makes it difficult to rely only on internal R&D and innovative capabilities for sustained competitive advantage.

Therefore, mergers and acquisitions have been used intensively by information technology, networking and telecommunications firms for different reasons. Beside traditional motivations of economizing and empire building, firms in these industries used acquisitions mainly to acquire external strategic resources, gain access to valuable human talents, reduce the cost of R&D, expand their portfolio of products, reduce product time to market and provide for an external source of continuous innovation.

In the high technology industries, several firms have used acquisitions as their main growth strategy. In the networking industry, for example, Cisco Systems, a high technology Silicon Valley based company working in the manufacturing of networking, telecommunications equipment and software, completed more than 107 companies during the period from 1993 to 2006. In the year 1999 alone, it acquired 18 companies, in the year 2000 it acquired 23 companies, with an average of almost two acquisitions each month, and in 2004 and 2005 it completed the acquisitions of 24 companies. Similarly, Nortel Networks completed 21 acquisitions during the period between 1996 and 2006 and Lucent Technologies completed 41 acquisitions during the same period. Figure 8.1 shows the timeline of Cisco Systems' completed acquisitions from the year 1993 till 2009. (Sarkis, 2009)

Moreover, Cisco Systems developed a strategy called "Acquisition and Development" or A&D, which is a combination of acquisition activities for external sources of innovation, while maintaining the internal innovative capacity of the firm through research and development or R&D (Mayer & Kenney, 2004b). Therefore, we assume that the motivations for acquisitions in these sectors of the high technology industry are different than the motivations in the other industries and specially the more stable ones. (Sarkis, 2009)

It is important to note that while figure 8.1 shows the list of companies and startups acquired by Cisco Systems from the year 1993 to 2009, it represents as well an illustration of entrepreneurship activities and a map of the companies and startups that were available for

acquisitions and eventually subject to completed acquisitions by a single acquirer, in this case, Cisco Systems.

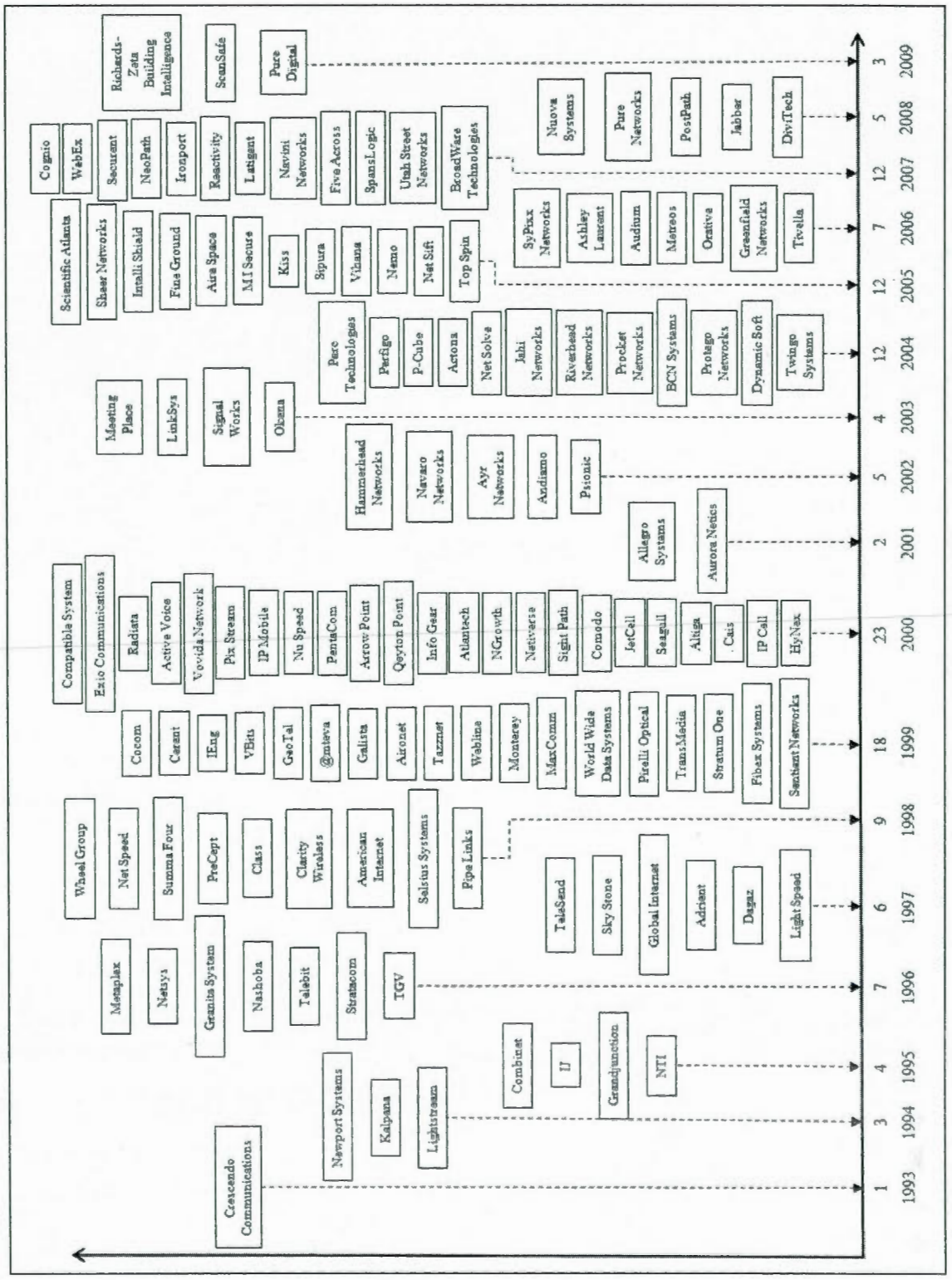
8.3 Complementary, Supplementary, Sustaining and Disruptive Technologies

The high technology products and their embedded technologies could be characterized as technically complex (Bettis & Hitt, 1995; Jemison & Sitkin, 1986b), in which the embedded knowledge is tacit in nature (Oliver, 1997), non codified and non transferable as a public good (Hagedoorn & Duysters, 2002). The complexity of the technology is coupled with a high level of uncertainty (Hoffman & Schaper-Rinkel, 2001; Quelin, 2000) due to the lack of dominant standards (Besen & Farrell, 1994; Shapiro & Varian, 2003).

When choosing or shopping for an acquisition, the acquirer firm would evaluate and target the potential partner or the acquired firm's existing products line and portfolio of technologies. Those potential products for acquisitions could be *supplementary* or *complementary* products. Supplementary products (Shelton, 1988a; Wernerfelt, 1984) are similar in nature to the firm's existing products portfolio and complementary products (Mayer & Kenney, 2004a; Shelton, 1988a; Wernerfelt, 1984) are different products that combine well with the firm's existing product lines. The firm would choose to have access to those resources through an alliance or acquire them through an acquisition, in order to increase its core competencies and improve its product portfolio competitiveness (Ferrary, 2003), which would ensure a sustained competitive advantage (Oliver, 1997; Porter, 1980a; Prahalad & Hamel, 1994). In addition to supplementary and complementary products, a firm could choose to acquire a target firm because of the competitive threat of *substitute* products or technologies (Gawer & Cusumano, 2002), which could result in barriers to entry (Wernerfelt, 1984; Yip, 1982) for the acquirer firm. By acquiring those substitute products, the firm would reduce the competitive threat and produce new entry barriers to other firms developing similar technologies and products, which would ensure a better market positioning (Gulati, 1999; Hopkins, 1987; Walter & Barney, 1990; Yip, 1982) and a sustained competitive advantage.

Figure 8.1

The timeline of Cisco System's acquisitions from the year 1993 till 2009



The supplementary and complementary technologies and product could be categorized as *sustaining* technologies as they represent improvement to existing technologies and do not represent a radical change in technology or a threat of substitution. The improvement they present could be a better quality, a larger size, specific technical improvements, or a more economical variation of the same technology, etc. Alternatively, substitutive technologies and products could be categorized as *disruptive* technologies and innovations. These represent a radical change over existing technologies and products and not just an improvement in quality, specifications, or price. They represent a competitive threat to existing manufacturers and incumbent service providers. They could catalyze a radical shift in technology production or utilization and could provoke a revolutionary change in a specific industry.

This revolutionary change in an industry is in line with the work of the Austrian economist Joseph Schumpeter, who in 1950 coined the term "*perennial gale of creative destruction*" where he described how companies and monopolies are challenged by the competition, not based on price, but on *"competition from the new commodity, the new technology...competition that strikes not at the margin of the profit of the existing firms but at their foundations and their very lives"* (Schumpeter, 1950: p. 84).

Moreover, the term 'disruptive technology' was first coined by Clayton Christensen in his book *The Innovator's Dilemma* (Christensen, 1997) and then used in the subsequent books *The Innovator's Solution* (Christensen & Raynor, 2003) and *Seeing What's Next* (Christensen, Anthony, & Roth, 2004). The concept behind the new term 'disruptive technology' and more generally 'disruptive innovation' could be traced back to the Austrian scientist Joseph Schumpeter who developed the theory of creative destruction in his book "Capitalism, Socialism and Democracy", published in 1950. In his book "The Process of Creative Destruction", Schumpeter wrote *"The opening up of new markets and the organizational development from the craft shop and factory to such concerns as US Steel illustrate the process of industrial mutation that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one ... [The process] must be seen in its role in the perennial gale of creative destruction; it cannot be understood on the hypothesis that there is a perennial lull."*

Christensen et al. (2004) describe the disruptive innovation theory in such situations where "*new organizations and market entrants can use relatively simple, convenient, low cost innovations to create growth and win over powerful incumbents and that the theory holds that existing companies have a high probability of beating entrant attackers when the contest is about sustaining innovations, but established companies almost always lose to attackers armed with disruptive innovations.*" (Introduction, XV)

Christensen et al. (2004) identify three types of innovations: *"(1) Sustaining innovations, which move companies along established improvement characteristics, and are improvements to existing products on dimensions historically valued by customers. Disruptive innovations, introduce a new value proposition, and are either creating new markets or reshaping existing markets. There are two types of disruptive innovations: (2) Low-end disruptive innovations can occur when existing products and services are too good and hence overpriced relative to the value existing customers can use; and (3) New market disruptive innovations, can occur when characteristics of existing products limit the number of potential consumers or force consumption to take place in inconvenient, centralized settings."*

It is important to note that Schumpeter (1934) defined the development of new product or technology as *new combination* or innovation. He suggested that *"new combinations do not arise out of existing firms but in new firms that rise up along the existing ones"* (Schumpeter, 1934: p. 66). In explaining how these new combinations lead to the change of the competitive landscape or creative destruction, he added: *"...especially in the competitive economy, in which new combinations mean the competitive elimination of the old, it explains on the one hand the process by which individuals rise and fall economically and socially and which is peculiar to this form of organization."* (Schumpeter, 1934: p. 67).

Furthermore, Schumpeter suggested that the entrepreneurs are the ones who are creating these new products, this innovation and these 'new combinations': *"...the individuals whose function is to carry them out (new combination) we call 'entrepreneurs.'"* (Schumpeter, 1934: p. 74) He added that carrying out new combinations requires the entrepreneurs to take existing products and redeploy them and that the entrepreneurs are a force in the economic system that explains qualitative change.

8.4 National System of Innovation as the Ecosystem

The 'national system of innovation' concept is not new. Its origin could be traced back to the forefather of the German historical school of economics Friedrich List (1885), who published in 1841 his seminal work "The national system of political economy", which was later translated into the English language by Sampson S. Lloyd, in 1885. Following Adam Smith's concept of the division of labor, but with no mention of innovation, List (1885) coined the term "national system of production (and learning)" taking into account a variety of national institutions including educational and training institutions, among others (Lundvall *et al.*, 2002). (Sarkis, 2012)

Since then, the concept of national system of innovation (Lundvall, 1992) has evolved into its current definition(s), with multiple variations such as technological systems (Carlsson & Jacobsson, 1994), innovation systems (Edquist, 1997, 2005; Lundvall, 2006a), technological infrastructure (Freeman, 2004; Lundvall, 2004), regional systems of innovation (Cooke, Gomez, & Etxebarria, 1997), sectoral system of innovation (Breschi & Malerba, 1997) and triple helix (Etzkowitz & Leydesdorff, 2000). Much of the literature highlights the importance of the national system of innovation as the driving force for the national economies of the industrialized nations, OECD nation members, as well as for the emerging economies. Multiple empirical researches were conducted on various North American, European, Asian, and Latin American countries (Carlsson & Jacobsson, 1994; Freeman, 1987; Saxenian, 1994). (Sarkis, 2012)

One of the earliest definitions of 'innovation' was presented by the Austrian economist Joseph Schumpeter in 1939, who proposed that innovation is "*...the setting up of a new production function. This covers the case of a new commodity, as well as those of a new form of organization such as merger, of the opening up of new markets and so on...Recalling that production in the economic sense is nothing but combining productive services, we may express the same thing by saying that innovation combines factors in a new way, or that it consists in carrying out* ***new combination***" (Schumpeter, 1939: p. 87-88). Since then, this generic definition of 'innovation' as 'new combination' was adopted widely in the literature of strategic management, technology and innovation management, and entrepreneurship (Kline & Rosenberg, 1986; Lundvall & Johnson, 1994; Nelson & Winter, 1977; Pavitt, 2005; Stein, 1997; Von-Hippel,

1988). It combines two contradictory dimensions: existing elements and new combinations (Lundvall et al., 2002). (Sarkis, 2012)

Moreover, one definition of the concept of 'innovation system' is based on the interactions between the different institutions or 'knowledge providers', participating in this system (Edquist, 2005). These interactions and knowledge creation and sharing could take place within the firm, between the firms, between the firm and other organizations, within a sector, an industry, an economy, a nation or even a region. These organizations could be other firms such as the suppliers, the producers, the customers, the competitors, etc. Therefore, the systems of innovation could be defined in institutional terms. For example, Carlsson & Jacobsson (1994) define the innovation system in term of the sum and synergy of institutions like the entrepreneurs, the universities, the academic infrastructure, the research and development (R&D) labs, the schools, the patent system, the labor organizations, the standard bodies, the banking system, the government agencies, and the state policies, etc. They specifically divide the 'institutional infrastructure' related to the innovation or technological system into four parts: the industrial research and development, the academic infrastructure, other institutions, state policy. The interactions between these interdependent and interlinked institutions constitute the dynamic of the innovation system. This innovation system could be on the national level, covering a whole geographic region, or it could be supranational or international as well. (Sarkis, 2012)

Furthermore, national systems of innovation could be defined in terms of technological systems combined with an institutional infrastructure as "*...a network of agents interacting in a specific economic/industrial area under a particular institutional infrastructure or set of infrastructures and involved in the generation, diffusion and utilization of technology.*" (Carlsson & Stankiewicz, 1995: p. 49; Stankiewicz & Carlsson, 1991). This means that the participating institutions with their interconnections and interlinks are part of this national system of innovation, which represents a national infrastructure composed of institutions that are engaged in a well defined dynamic and a process of interactive learning, coordination, cooperation, with the main and core objective of using, diffusing, sharing, producing knowledge, and aiming at the transformation of this existing knowledge into new combinations or simply innovation, in term of innovative ideas, products, services, processes, and business models, etc. (Sarkis, 2012)

It is important to note that the entrepreneurial activities and the entrepreneurs are a critical part of this national system of innovation and play an important role in using, sharing, and diffusing existing knowledge, and in transforming it through collaboration and interactive learning with the other institutions, into 'new combination' or innovation, in terms of new ideas, new technologies, new products, new business models, new venture, and new markets. While figure 8.2 illustrates the critical and important role the entrepreneurs play as part of the value chain of the national system of innovation, figure 8.3 represents the different configurational topologies for the type of collaboration, interaction and interactive learning that exist between the participating members of the national system of innovation, in which the entrepreneur is an important element and plays a critical role. (Sarkis, 2012)

Figure 8.2

The value chain of the national system of innovation (Sarkis, 2012)

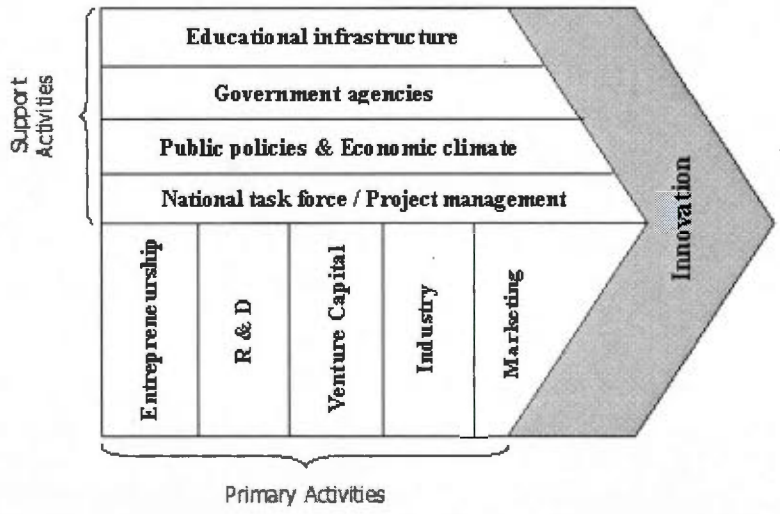
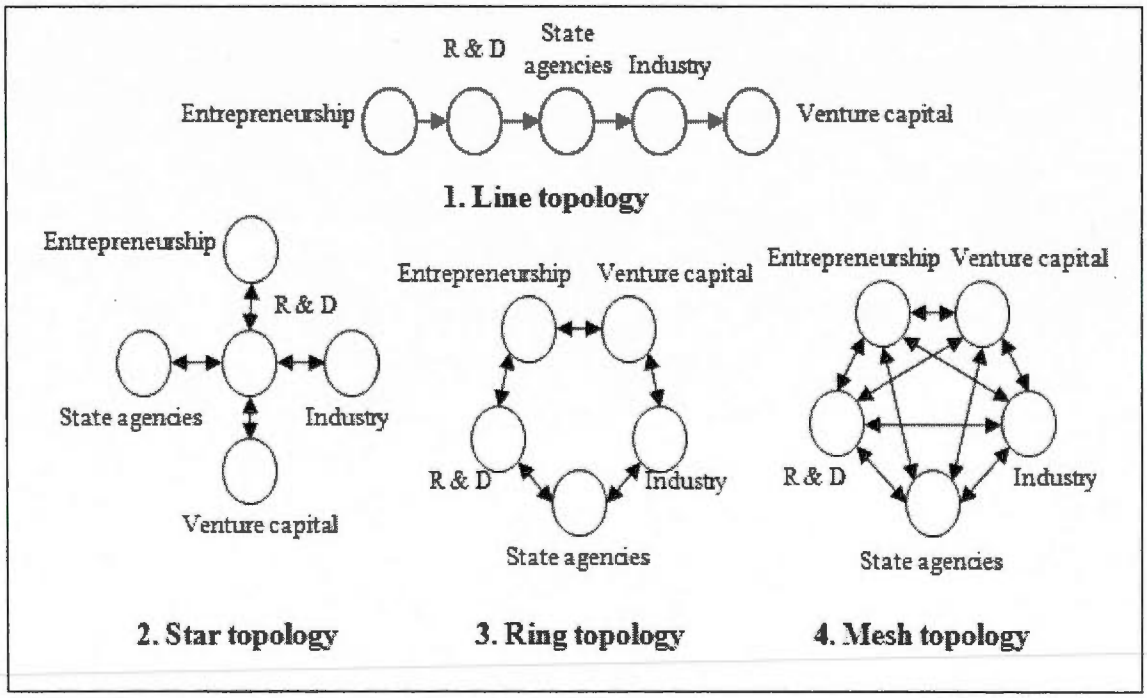


Figure 8.3

The different configurational topologies of interaction
in the national system of innovation (Sarkis, 2012)



8.5 Entrepreneurship Activities in the High Technology Industry

Entrepreneurs are the one carrying out new combination by starting up new ventures and creating new technologies, new products, new services, and new business models. Most of the entrepreneurs in the high technology industry possess many exceptional traits. Besides initiating, maintaining and developing profit oriented new ventures; they have the ability to work hard and smart. They are driven by the perception of opportunity, based on their expertise, alertness and cognition, and they have the ability to anticipate market imperfections, and turn them into potential new ideas, products, services, etc. Most importantly, they have a tolerance for ambiguity and can successfully work under uncertainty and within the context of a turbulent environment or industry. In fact, they thrive on uncertainty and see it as an opportunity to establish new standards (i.e. technical standard) and consider the turbulent environment as a temporary phase through

which they can propose, induce and motivate change. For entrepreneurs, high velocity and turbulent environments, such as the high technology industry, motivate technological and demographic changes, involving incremental change and technology breakthrough, which they can influence the outcome through heuristics based logic and effectuation. Finally, they are opportunistic, highly adaptable and possess an evangelistic-type of message, with high energy and strong convictions in technology, technical culture, and the need for discovery and leading-edge innovation.

The key success factors for entrepreneurs in the high technology industry are the ability to identify opportunity and transform it into a significant economic value; to possess the right combination of knowledge and know-how necessary to carry out new combination and innovation; to have the necessary initial financial resources to start a new venture and seek more financial support and backing through formal financial institutions or through venture capital and angel investors; to have the necessary social capital and be part of a social network within the industry, sector or region and be connected to key individuals who have the technical expertise, for seeking support if necessary, and acquiring tacit knowledge which is embedded in the complex social network; and to have the skills and charisma of leadership, with the ability to inspire, motivate, build and manage working teams.

According to Schumpeter, there are five types of entrepreneurs (or strategies): the pioneers, the adoptionists, the imitators, the complementors, and mixed strategy (Lundvall et al., 2002). We believe that in the context of the high technology industry, this list could be revised and we suggest the following additions and extensions to the Schumpeter list of entrepreneur's types:

The pioneer entrepreneur. The pioneer entrepreneur is the one who not only starts up, maintains and develops a new business venture, but also leads the way in an unprecedented venue while instigating a revolutionary change, whether it is in technology, demographic, product, service, or market. A good example would be Henry Ford, Thomas Edison and Graham Bell, as the later had used and applied a new invention into a pioneering and revolutionary new service, the telephony.

The inventor entrepreneur. The inventor entrepreneur is the one who has the brilliance of inventing new technologies, devices, machines, etc. and later turns them into a profitable business idea, business plan, and a new venture, creating a significant economic value. A good example would be Graham Bell, and Thomas Edison. In the high tech industry and Silicon Valley, there are some good examples of young entrepreneurs, who started their own start-up based on their invention and creation, and later inspiring other like minded people to join them.

The bricoleur entrepreneur. The 'bricolage' is a French word, referring to the act of using existing materials and tools to create new things. The bricoleur entrepreneur is a sort of handy-man, who creates a technology or product idea out of a perceived opportunity and using available ingredients. A good example is Steve Job of Apple.

The imitator entrepreneur. The imitator entrepreneur is the one who starts his new business by copying or modifying someone else's idea. According to Bhide (2000), most of the entrepreneurs are in this category, as isomorphism being the explanation for this behavior. This category applies also to the high technology industry, as lots of technologists and entrepreneurs embark on creating new venture, when they see an opportunity, in term of technology or market, concretizes with others. While the widely held perception is that all startups in Silicon Valley and Route 128 are based mostly on new technology and product ideas, we believe that a fair amount of ideas are isomorphic.

The complementor entrepreneur. The complementor entrepeneur is the one who builds on an existing idea, product or service, and sees an opportunity in providing a complementary product or service to the existing one. The opportunity is defined by the potential to draw on the success of the existing product or service, to capitalize on the market adopted trajectory and to adapt to the natural selection performed by the ecology. This type of product or service is especially important to established firms, who are looking for external sources of innovation to complement their already existing and successful products. Therefore, these complementary products and services are a high potential for acquisitions by larger and endowed firms.

The supplementor entrepreneur. The supplementor entrepreneur is similar to the complementor entrepreneur in adopting existing idea, product and service and building on it,

except that he provides a supplementary attribute to the already existing product or service, such as a bigger or smaller size, a larger coverage, etc. The opportunity is defined by the potential to draw on the success of the existing product and service, and to capitalize on the market adopted trajectory. This type of product or service is especially important to established firms, who are looking for external sources of innovation to supplement their already existing and successful products. Therefore, these supplementary products and services are a high potential for acquisitions by larger and endowed firms.

The accidental entrepreneur. The entrepreneur by accident is the one who falls into a good idea for a technology or product, just by being in the right place and time, later to discover that it was a brilliant idea and an excellent opportunity to establish a successful new venture. It could be when someone develops something by habit, by necessity or for his immediate environment and it turns later to be useful for other people, situations and environments. A good example is the discovery and development of the microwave oven out of the characteristics of microwave transmitting signals for microwave telecommunications applications. This accidentally discovered technology could have the potential to catalyze a radical change or be disruptive in nature to existing technologies and products.

The serial entrepreneur. This type of entrepreneur is the one who sees an opportunity and establishes, maintains and develops a new business venture to a certain point of stability and success in the organization life cycle and development stage, then moves on to establish a new venture based on a new opportunity or an extended variation of the first opportunity. In doing so, this serial entrepreneur is going from one venture to another, by hopping from one business stage of venture development in a newly created venture, be it post startup, transitional or corporate phase, to another business stage of a new or another venture, such as a new startup creation, or at the managerial and leadership stages of an existing new venture. This serial entrepreneur could be motivated by either his passion for venture creation with its embedded excitement, risk taking, opportunity development and gratifying experience; or by financial motivation, as he sees no interest in staying with his own created venture till later stages of its life cycle and development stages, and prefers to recover his initial investments multiplied by the establish market value of his created venture, based on its product and market potential. In doing so, he might be lacking the necessary managerial skills to continue developing his own created venture, as he might

perceive himself not fitting with a new stage of development of his created venture and its required hiring of external managerial experience. In the high technology industry and Silicon Valley Mory Ejabat is a good example of the serial entrepreneur.

The incremental entrepreneur. To the contrary of the serial entrepreneur, the incremental entrepreneur seeks to move into new venture opportunities, while staying with his own created first venture. His motivation might be empire building or entrepreneur hubris.

The plateau entrepreneur. The plateau entrepreneur is the one who stays with his own created venture till later stages in the firm life and development cycles.

The corporate entrepreneur. The entrepreneur does not have to be always self-employed. The corporate entrepreneur, is the one who, while working and acting as a high ranking corporate officer with his current employer, he acts and performs tasks that the traditional self-employed entrepreneur do, and in addition possesses all the characteristics and skills of a 'ideal' entrepreneur, such as tolerance for ambiguity, alertness to and the ability to perceive and identify opportunity, risk taking, passion for venture creation, high energy, leadership, and building teams skills, etc. His executive functions could require him to be highly visible for networking, to invest in trials of new technologies, to support new ideas and prototypes as angel investors, to scan the environmental ecosystem of his firm for new opportunities and to acquire or ally with potentially successful new trends, and new technology providers, etc. One good example is Michelangelo Volpi, the chief strategy and acquisition officer at Cisco Systems.

The entrepreneur leader. The leader entrepreneur is the one who leads the company after its startup and managerial stages, into a new corporate stage.

The entrepreneur technologist. The technologist entrepreneur is the one who acts like an evangelist, and who inspire others in his immediate team, venture, or community, of new venues and trajectories in technologies, applications, and products.

The entrepreneur-manager. The entrepreneur-manager is the one who is hired for managing the newly created venture, in its stage of opportunity consolidation and early corporate development.

The acquisition-driven entrepreneur. This is the entrepreneur, be it corporate, incremental, serial, complementor or supplementor, who uses acquisitions as a strategy for developing new businesses and for existing businesses. Moreover, the acquisition-driven entrepreneur could acquire new and established businesses, created by the pioneer, the bricoleur, the inventor, the imitator, the accidental and the plateau entrepreneurs. Acquisition-driven entrepreneurship will be discussed in more details in the next section and part of theory building.

8.5.1 Venture Capital

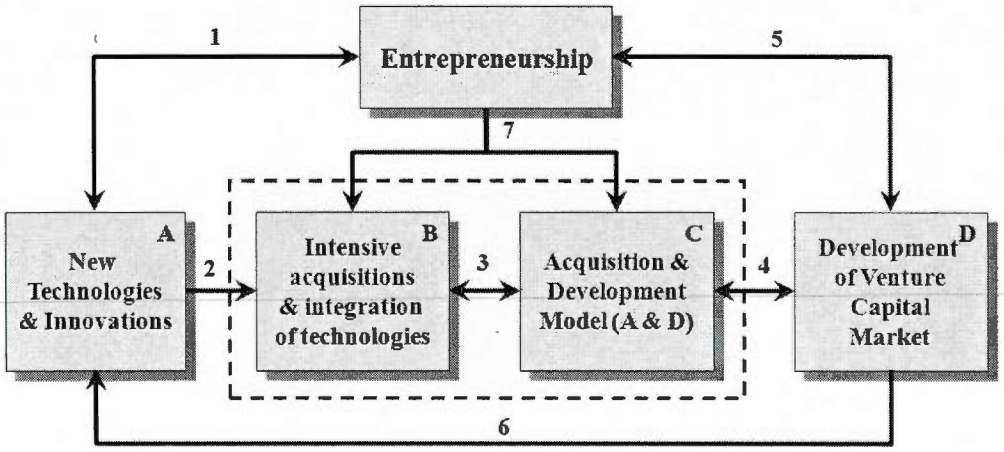
Venture capital is the other important aspect of the entrepreneurial activities in the high technology industry. Beside identifying the opportunity and having the motivation to take risk, in a highly uncertain and turbulent environment, the non endowed entrepreneur has to secure the financial resources necessary to pursue his opportunity, with a reasonable amount of risk and interest. Venture capital and angels investors are an essential and critical part of the high technology industry. They not only provide financial support, but most of the time, they additionally provide technical backing, managerial experience, access to social capital and even moral encouragement. The model of a startup that is backed by venture capital is widespread and dominates the high technology industry, such as the information technology and biotechnologies. The startups that are backed by venture capital are widely perceived as more likely to adopt planning rather than an opportunistic adaptation behavior. However, in the high technology industry, specifically the information technology, networking and telecommunications segments, we believe to the contrary, that venture capital adapts well to entrepreneurs and new ventures using either modes: opportunistic adaptation or strategic planning. Their interactions with the entrepreneurial activities and entrepreneurs and their relationships with intensive acquisitions and the development of the acquisition and development model will be discussed in the next section of theory building and propositions.

8.6 Theory Building and General Propositions (Rough Hypotheses)

Based on the analysis presented in the previous sections, this section deals with the construction of a theoretical model and suggests some propositions or rough hypotheses to explain the underlying logic. Figure 8.4, illustrates the proposed theoretical model with its relationship and embedded ecosystem.

Figure 8.4

The proposed theoretical model of entrepreneurship and acquisitions



During periods of incremental and revolutionary change in the high technology industry, the emergence of new technologies and new innovation is facilitated by the entrepreneurs who carry out new combinations. Entrepreneurs, transform existing knowledge into innovation. They acquire this knowledge through their interactions, collaborations, interactive learning, and participation as members of a national system of innovation, which encompasses universities, R&D labs, standard bodies, patent offices, and government agencies, etc. Based on this knowledge, their cognition is enhanced and their abilities to identify opportunity are improved. These technologies could be complementary, supplementary or substitutive technologies to

existing ones. Equally, these technologies could be considered sustaining technologies, as to provide an improvement to existing technologies and product in term of quality and price, or they could be potentially disruptive technologies, offering a radical change from established products and services. These disruptive technologies could potentially pose a threat to incumbent firms, as they propose a change in the competitive landscape and a menace to their sustained competitive advantage.

Proposition 1: New technologies and innovations, including sustaining and disruptive technologies are facilitated by entrepreneurs who seek to challenge the existing competitive landscape and to find an opportunity through a technology breakthrough;

From the other hand, existing firms and incumbent service providers in the high technology industry operate in an environment which is characterized by high uncertainty, turbulence and high velocity. The rising cost and risk of internal R&D and the threat of the environmental and industrial shifts, coupled with the internal scarcity of strategic assets, the tacit and embedded nature of knowledge, and the threat of substitutive technologies, increment the difficulty for the established firms to rely solely on internal sources of innovation to sustain competitive advantage.

Proposition 2: The emergence of new technologies, either sustaining or disruptive, motivates the established firms to acquire these new technologies, through acquisitions and the integration of these technologies, as external sources of innovation;

In some industries, such as the high technology industry, the rate of innovation is much higher and the frequency of emergence of new technology is short-paced. This is coupled with higher investment risks in internal R&D, higher rates of technology and product obsolescence, and shorter time to market required for end-user products. Moreover, the emergence of the new technologies has an epidemic pattern of technology diffusion and the nature of the technologies is as such that they are part of a mosaic of technologies, which means that only one technology does not constitute a product-transferable opportunity. Consequently, and facing these challenges,

some firms adopt a new model of strategic choice, based on intensive acquisitions, as the main strategy for growth and sustaining competitive advantage. This model and the cumulative experience gained in implementation reinforce this strategy of acquisition for growth based on the Acquisition & Development model, and it becomes a dominant logic.

Proposition 3: Facing environmental challenges, establish firms embark on programs of intensive acquisitions, and they develop and adopt a new business model called Acquisition & Development (A&D), instead of R&D, as the main strategy for growth and to sustain competitive advantage. Experience gained in acquisitions helps in reinforcing the model, therefore creating a bidirectional relationship;

The adoption of this model of acquisition called Acquisition & Development (A&D) by the established firms, and consequently the rise of corporate acquisition programs, foment and foster the development of the venture capital market, based on the demand and supply logic. More acquisitions require more venture capital firms, more experience, and more financial resources. The intensity of the acquisition program in one firm creates the cumulative expertise in the venture capital industry and more importantly, it creates a dominant logic that is equally profitable to venture capital firms, by which acquisitions become the main strategy for growth and encourages the replication and adoption by others. This dominant logic and its dynamic, encourages other hesitant firms to adopt this new strategy of acquisition for growth, based on the Acquisition and Development model, and the positive returns.

Proposition 4: The relationship between the intensive acquisition programs and the development of the Acquisition & Development model from one side, and the development of the venture capital market, is a bidirectional relationship. More acquisitions foster the development of the venture capital market. More cumulative expertise in the venture capital market creates a dominant logic that encourages more acquisitions;

Furthermore, the development of the venture capital market and the cumulative experience it creates, coupled with the availability of more venture capital financial resources for

entrepreneurial ventures, encourage more entrepreneurs and would-be-entrepreneurs, to stay alert to opportunity and to help in using, sharing, producing and diffusing interactive learning, that is essential to new combination and innovation, within the context of a national system of innovation, in which venture capital and entrepreneurs are participating members. Equally, as venture capital development encourages more entrepreneurial activities, the increased number of entrepreneurs encourages the creation and development of more venture capital firms and put them in high demand.

Proposition 5: The relationship between the development of the venture capital market or industry and the increase in the entrepreneurial activities and the number of entrepreneurs is bidirectional. The more venture capital is developed, the more entrepreneurial activities are encouraged. The more the number of entrepreneurs is increased, the more the venture capital firms and their activities are in high demand;

Moreover, the development of the venture capital industry, as it encourages the entrepreneurial activities; it induces, instigates and fosters the development of new technologies. While the venture capital firms represent the incubating environment, the new technologies are the final products and the entrepreneurs are the messengers. It is important to observe in the proposed theoretical model, that new technologies are encouraged, motivated and fostered by both, the entrepreneurs and the venture capital firms.

Proposition 6: The relationship between venture capital and the development of new technologies is unidirectional, as venture capital encourages and fosters the emergence and development of new technologies. The more venture capital is developed, the more is the emergence of new technologies. This relationship is moderated by the entrepreneurial activity and the efficiency of the national system of innovation;

Finally, and most importantly, the entrepreneurs and their entrepreneurial activities play a critical role in the increased number of acquisitions, the intensity of acquisitions' activities and the development and adoption of the Acquisition & Development model (A&D). For example,

the *incremental entrepreneur* and the *acquisition-driven entrepreneur*, use acquisition for empire building, economies of scope and scale, and as a strategy for shorter time to market, reduced R&D activities with the incorporated risk and mainly for rapid growth versus internal development based on learning-by-doing. On the other hand, the *corporate entrepreneur* encourages the acquisitions of new startups and small ventures, by continuously scanning the firm's environmental ecosystem and national system of innovation; by looking and identifying opportunities; by investing in venture capital firms or acting as an angel investor; by backing up new technology initiatives, technology and product trials and prototypes; and by adopting the model of Acquisition & Development as the main strategy of growth for his established firm and as the mean to overcome and compensate for the lack of internal sources of innovation that are impossible to have them all in one company. He also could be interested in complementary, supplementary and substitutive technologies, the later being a mean to increase the entry barrier for competition and for avoiding disruption and consequently the destruction of value for his own firm. Finally, and contrary to the widely held belief, new startups in the high technology industry are not motivated only by the desire of the entrepreneur to create new combinations, innovation, and new products and services. They are also motivated basically and instinctively by the opportunistic behavior of the entrepreneur and his desire for profit and rent. This legitimate desire includes the potential that his newly created firm, if successful and competitive, would be potentially acquired by a larger firm. This potential of being acquired by a larger firm could be deterministic in nature and intentional at the planning or developing phase of the new venture creation. If this is the case, the rational of the *acquisition-driven entrepreneur* would be to provide for complementary, supplementary or substitutive technologies or products. In other words, this acquisition-driven entrepreneur would start a new venture creation with the objective of, or at least to hope for, being potentially acquired by a larger firm, with all the financial and reputational consequences that this position would entail, which matches the legitimate opportunistic behavior of the entrepreneur.

Proposition 7: Entrepreneurs and their entrepreneurial activities encourage and motivate the intensity of acquisitions activities in the high technology industry and the adoption of the Acquisition & Development model, whether it is through the incremental entrepreneur, the corporate entrepreneur, the complementor and supplementor entrepreneurs and the acquisition-driven entrepreneur.

8.7 Discussion

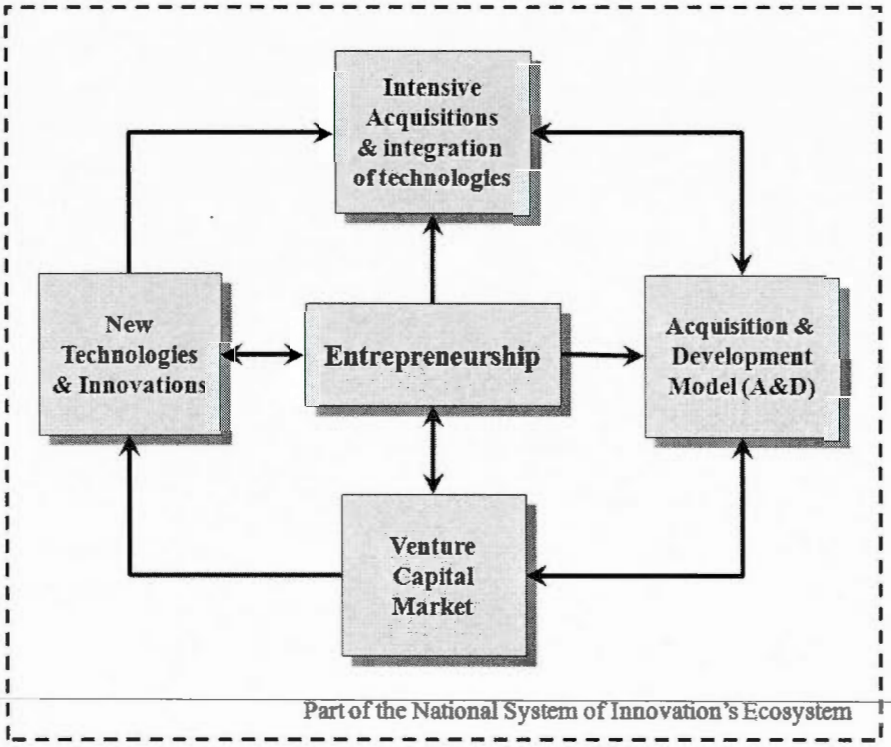
This theoretical research paper was motivated partially by the proposition of linking entrepreneurship research with the research on the national system of innovation, suggested by leading scholars on the concept of innovation system, Lundvall et al. (2007: p. 110): *"...An interesting challenge is to link entrepreneurship, seen as the classic driver of innovation, to the concept of innovation system"*. The other main motivation was to explore and understand the relationship, if any, between the intensive activities of acquisitions and entrepreneurial activities in the high technology industry, an area of research that remain unclear, blurry and under researched.

The research paper proposes a theoretical model and few propositions (rough hypotheses) that could be converted into testable hypotheses, using the case study approach for building theory. Although the findings of the case study do not constitute a part in the framework of this theoretical research, mainly for functional and practical reason, such as the limited page number assigned for conference papers, further research is planned and potentially more manuscripts are envisaged in order to cover all the aspects of this proposed model.

The proposed theoretical model and its rational that explains the underlying logic of the relationship between the different composing blocks, suggest that entrepreneurship and the entrepreneurs play an important, critical and central role in the development of new technologies, products and services, through their interactions with existing firms, venture capital, R&D research, government agencies, standard bodies, and research universities, etc., within the boundaries of the ecosystem of a national system of innovation. An attempt to reorganize the proposed theoretical model around the same relationships between its different building blocks, without affecting the underlying logic and theoretical interpretation, would suggest that entrepreneurship and the entrepreneurs play a central role, as illustrated by figure 8.5

Figure 8.5

The key and central role played by entrepreneurship



References

Bahrami H, Evans S. (1989). Strategy making in high-technology firms: The empiricist mode. *California Management Review* 31(2)

Besen SB, Farrell J. (1994). Choosing how to compete: Strategies and Tactics in Standardization. *The Journal of Economic Perspective* 8(2): 117-131

Bettis RA, Hitt MA. (1995). The new competitive landscape. *Strategic Management Journal* 16: 7-19

Bhide A. (2000). *The origin and evolution of new business*. Oxford University Press

Breschi S, Malerba F. (1997). Sectoral Innovation Systems: technological regimes, schumpeterian dynamics, and spatial boundaries. In C Edquist (Ed.), *Systems of innovation : technologies, institutions, and organizations*, Vol. xiv: 432 p.

Carlsson B, Jacobsson S. (1994). Technological Systems and Economic-Policy - the Diffusion of Factory Automation in Sweden. *Research Policy* 23(3): 235-248

Carlsson B, Stankiewicz R. (1995). On the nature, function and composition of technological systems. In B Carlsson (Ed.), *Technological Systems and Economic Performance: The Case of Factory Automation*. Kluwer Academic Publishers

Chaudhuri S, Tabrizi B. (1999). Capturing the real value in high-tech acquisitions. *Harvard Business Review* 3(4)

Christensen CM. (1997). *The innovator's dilemma - When new technologies cause great firms to fail*. Harvard Business School Press: Cambridge, Massachusetts

Christensen CM, Anthony SD, Roth EA. (2004). *Seeing what's next - Using the theories of innovation to predict industry change*. Harvard Business School Press: Boston, Massachusetts

Christensen CM, Raynor ME. (2003). *The innovator's solution - Creating and sustaining successful growth*. Harvard Business School Press: Boston, Massachusetts

Cooke P, Gomez M, Etxebarria G. (1997). Regional innovation systems: Institutional and organisational dimensions. *Research Policy* 26(4-5): 475-491

Duysters G, Man A-Pd. (2003). Transitory alliances: an instrument for surviving turbulent industries? *R&D Management* 33(1): 49-58 (10 pp.)

Edquist C. (1997). *Systems of innovation : technologies, institutions, and organizations*. Pinter: London; Washington

Edquist C. (2005). Systems of Innovation: Perspectives and Challenges. In J Fagerberg, DC Mowery, RR Nelson (Eds.), *The Oxford handbook of innovation*, Vol. xviii: 656 p. Oxford University Press: New York

Etzkowitz H, Leydesdorff L. (2000). The dynamics of innovation: from National Systems and "Mode 2" to a Triple Helix of university-industry-government relations. *Research Policy* 29(2): 109-123

Ferrary M. (2003). Managing the disruptive technologies life cycle by externalizing the research: social network and corporate venturing in the Silicon Valley. *International Journal of Technology Management* 25(1/2)

Freeman C. (1987). *Technology, policy, and economic performance: lessons from Japan.* Pinter Publishers: London ; New York

Freeman C. (2004). Technological infrastructure and international competitiveness. *Ind Corp Change* 13(3): 541-569

Gawer A, Cusumano MA. (2002). *Platform Leadership: How Intel, Microsoft, and Cisco Drive Industry Innovation.* Harvard Business School Press

Gulati R. (1999). Network location and learning: The influence of network resources and firm capabilities on alliance formation. *Strategic Management Journal* 20: 397-420

Hagedoorn J, Duysters G. (2002). External sources of innovative capabilities: The preference for strategic alliances or mergers and acquisitions. *Journal of Management Studies* 39(2)

Hayward M, Hambrick D. (1997). Explaining the premiums paid for large acquisitions: Evidence of CEO hubris. *Administrative Science Quarterly*(42): 103-127

Hitt MA, Hoskisson RE, Ireland RD. (1990). Mergers and acquisitions and managerial commitment to innovation in m-form firms. *Strategic Management Journal* 11: 29-47

Hitt MA, Hoskisson RE, Ireland RD, Harrison JS. (1991). Are acquisitions a poison pill for innovation. *Academy of Management Executive* 5(4)

Hitt MA, Hoskisson RE, Johnson RA, Moesel DD. (1996). The market for corporate control and firm innovation. *Academy of Management Journal* 39(5): 1084-1119

Hoffman WH, Schaper-Rinkel W. (2001). Acquire or ally? - A strategy framework for deciding between acquisition and cooperation. *Management International Review* 41(2): 131-159

Hopkins HD. (1987). Acquisition strategy and the market position of acquiring firms. *Strategic Management Journal* 8: 535-547

Jemison DB, Sitkin SB. (1986). Corporate acquisitions: A process perspective. *Academy of Management Review* 11(1): 145-163

Kline SJ, Rosenberg N. (1986). An Overview of Innovation. In R Landau, N Rosenberg (Eds.), *The Positive sum strategy : harnessing technology for economic growth*, Vol. xiv: 640 p. National Academy Press: Washington, D.C.

List F. (1885). *The National system of political economy* (MP Sampson Lloyd, Trans.). Longmans, Green and Co.: London

Lundvall BA. (2004). Introduction to 'Technological infrastructure and international competitiveness' by Christopher Freeman. *Ind Corp Change* 13(3): 531-539

Lundvall BA. 2006. Innovation Systems between Policy and Research, *Innovation Pressure Conference*: Tampere, Finland

Lundvall BÅ. (1992). *National systems of innovation : towards a theory of innovation and interactive learning*. Pinter Publishers; Distributed exclusively in the USA and Canada by St. Martin's Press: London, New York

Lundvall BA, Johnson B. (1994). The learning economy. *Journal of Industry Studies* 1(2): 23-42

Lundvall BÅ, Johnson B, Andersen ES, Dalum B. (2002). National systems of production, innovation and competence building. *Research Policy* 31(2): 213-231

Lundvall BA, Nielsen P. (2007). Knowledge management and innovation performance. *International Journal of Manpower* 28(3-4): 207-223

Mayer D, Kenney M. (2004a). Economic action does not take place in a Vacuum: Understanding Cisco's acquisition and development strategy. *Industry and Innovation* 11(4): 299

Mayer D, Kenney M. (2004b). Economic action does not take place in a vacuum: Understanding Cisco's acquisition and development strategy. *Industry and Innovation* 11(4): 299-325

Nelson RR, Winter SG. (1977). In search of useful theory of innovation. *Research Policy* 6(1): 36-76

Oliver C. (1997). Sustainable competitive advantage: Combining institutional and resource based views. *Strategic Management Journal* 18(9): 697-713

Pavitt K. (2005). Innovation Processes. In J Fagerberg, DC Mowery, RR Nelson (Eds.), *The Oxford handbook of innovation*, Vol. xviii: 656 p. Oxford University Press: Oxford ; New York

Peteraf MA. (1993). The cornerstones of competitive advantage: A resource-based view. *Strategic Management Journal* 14: 179-191

Porter M. (1980). *Competitive Strategy*. Free Press

Prahalad CK, Hamel G. (1994). *Competitng for the future*. Harvard Business School Press: Boston

Quelin B. (2000). Core competencies, R&D management and partnerships. *European Management Journal* 18(5): 476-487

Ranft AL, Lord MD. (2000). Acquiring new knowledge: The role of retaining human capital in acquisitions of high-tech firms. *The Journal of high technology management research* 11(2): 295-319

Roberts EB, Liu WK. (2001). Ally or acquire? *MIT Sloan Management Review*

Romanelli E. (1989). Environments and strategies of organization start-up: effects on early survival. *Administrative Science Quarterly* 34(3): 369-387

Saxenian A. (1994). *Regional advantage: culture and competition in Silicon Valley and Route 128*. Harvard University Press: Cambridge, Mass.

Schumpeter J. (1934). *The theory of economic development*. Translation Publishers: New Brunswick

Schumpeter JA. (1939). *Business cycles; a theoretical, historical, and statistical analysis of the capitalist process.* (1st ed.). McGraw-Hill Book Company, Inc.: New York, London

Schumpeter JA. (1950). *Capitalism, Socialism and Democracy* (3rd. ed.). Harper: New York

Shapiro C, Varian HR. (2003). The Art of Standards Wars, *Managing in the Modular Age: Architectures, Networks and Organizations*: 424. Blackwell Publishing

Shelton LM. (1988). Strategic business fits and corporate acquisition: Empirical evidence. *Strategic Management Journal* 9: 279-287

Stankiewicz R, Carlsson B. (1991). On the nature, function and composition of technological systems. *Journal of Evolutionary Economics* 1(2): 93

Stein J. (1997). Waves of creative destruction- Firm specific learning by doing and dynamics of innovation. *The Review of Economic Studies* 64(219): 265 p.

Sutton RI, Staw BM. (1995). What theory is not. *Administrative Science Quarterly* 40: 371-384

Utterback JM, Acee HJ. (2005). Disruptive Technologies: An Expanded View. *International Journal of Innovation Management* 9(1): 1-17

Von-Hippel E. (1988). *The sources of innovation.* Oxford University Press

Walter GA, Barney JB. (1990). Management objectives in mergers and acquisitions. *Strategic Management Journal* 11: 79-86

Weick KE. (1995). What theory is not, theorizing is. *Administrative Science Quarterly* 40: 385-390

Wernerfelt B. (1984). A resource-based view of the firm. *Strategic Management Journal* 5: 171-180

Whetten DA. (1989). What constitutes a theoretical contribution? *Academy of Management Review* 14: 490-495

Yip GS. (1982). Diversification entry: Internal development versus acquisition. *Strategic Management Journal* 3: 331-345

CHAPTER IX

NATIONAL SYSTEM OF INNOVATION: INTEGRATING THE INNOVATION VALUE CHAIN AND THE MESH TOPOLOGY [7]

The national systems of innovation are well researched and empirically documented in the literature of technology and innovation management. However, the issues of the organization and the structure of the national system of innovation are under researched, despite the importance of structure in strategy development and the alignment of strategic objectives. The lack of such research and a consensus on the organization of national system of innovation, leads to contradictory, incoherent and incomplete results. This theoretical paper reopens the conversation on the evolution of the national system of innovation concept, by introducing two modes of organization: The value chain and the mesh topology. Furthermore, it explores, with respect to these two modes, a large list of variables/factors that could be used to further enhance the qualitative and quantitative research on national system of innovation. This is a multidisciplinary research, in the traditions of business policy and strategy, and technology and innovation management, and is intended to both scholars and practitioners.

9.1 Introduction

The national system of innovation concept is not new. Its origin could be traced back to the forefather of the German historical school of economics Friedrich List (1885), who in 1841 published his seminal work "The national system of political economy", which was later translated into the English language by Sampson S. Lloyd, in 1885. Following Adam Smith's concept of the division of labor, but with no mention of innovation, List (1885) coined the term

[7] This chapter was published as an article, with the same title, in the proceedings of the administrative sciences association of Canada (ASAC) annual conference 2012, technology and innovation management division. St. John's, Canada, June 2012. Vol. 33, No 25. The article received the *honourable mention paper award* from the strategy division at ASAC 2012.

"national system of production" taking into account a variety of national institutions including educational and training institutions, among others (Lundvall et al., 2002).

Since then, the concept of national system of innovation (Lundvall, 1992) has evolved into its current definition(s), with multiple variations such as technological systems (Carlsson & Jacobsson, 1994), innovation systems (Edquist, 1997, 2005; Lundvall, 2006a), technological infrastructure (Freeman, 2004; Lundvall, 2004), regional systems of innovation (Cooke, Gomez, & Etxebarria, 1997), sectoral system of innovation (Breschi & Malerba, 1997) and triple helix (Etzkowitz & Leydesdorff, 2000). Much of the literature highlights the importance of the national system of innovation as the driving force for the national economies of the industrialized nations, OECD nation members, as well as for the emerging economies. Multiple empirical researches were conducted on various North American, European, Asian, and Latin American countries (Carlsson & Jacobsson, 1994; Freeman, 1987; Saxenian, 1994).

However, most of the research does not explore the central issue of the organization and the structure of these national systems of innovation. Whether using a quantitative or qualitative analysis, the research tend to measure the performance of these national systems of innovation or provide a descriptive analysis of the components of these systems and their roles (research centers, educational institutions, financial institutions and venture capital, government agencies, public policies, private firms and entrepreneurs, etc.), strengths and weaknesses, inputs and outputs and comparative studies. Moreover, most the research evolves around important and key concepts directly linked to the efficiency of these national systems of innovation, such as the knowledge management, the nature of knowledge and knowledge spillover from, to and within these systems; the learning and interacting between the different components or agents; the dynamic capabilities of the single participant or the combined synergies; the boundaries of the systems and whether flexible, fixed, predetermined, or subject to restructuring; the historical trajectories, path dependencies and locked-in effects, and cumulativeness, etc.

Although these dimensions are important in understanding and exploring the national systems of innovation, we believe that the structure and the organization of these systems are equally important and in fact they are at the core of these systems and represent a central issue based on which our understanding of the other dimensions would be greatly enhanced. Therefore

further in-depth research is needed on the structure and organization at the core center of research on national system of innovation (Mintzberg, 1979).

Moreover, the research on national systems of innovation in the literature of technology and innovation management could be categorized as contradictory, incoherent and incomplete. First, it is *contradictory* because the findings present contradictory performance outcome related to these systems, even in the same cluster of industrial nations or the same geographical region. Second, it is *incoherent* because some research focus on measuring the performance of the these systems based on economic and financial indicators, in an evaluation mode, while the others focus on exploring and understanding the composition and components of these systems, their roles and characteristics, their interactions, their processes of learning, sharing knowledge, and decision making, in a prescriptive mode. Each approach neglects the other, which leads to an incoherent picture of the factors involved. Third it is *incomplete* because while the central issues of structure and organization of these national systems of innovation are neglected and under researched, the factors, concepts, construct and variables used are limited and insufficient in providing a comprehensive, thorough and parsimonious understanding of a holistic picture of the phenomenon.

Structure is intrinsically related to strategy content and process, and the industry structure. While strategy is defined as the "*pattern of decisions in a company* (or institution) *that determines and reveals its objectives, purposes and goals, produces the principle policies and plans for achieving those goals, and define the range of business the company* (or institution) *is to pursue, the kind of economic and human organization it is or intends to be, and the nature of the economic and non-economic contribution it intends to make to shareholders, employees, customers and communities*" (Andrews, 1971), Chandler (1962a) proposed that structure follows strategy and other scholars proposed that strategy follows structure (Burgelman, 1983; Hall & Saias, 1980). Therefore is the importance of structure at the central core of national systems of innovation research. Equally, the research on research and development (R&D), as in the third generation R&D (Roussel, Saad, & Erickson, 1991), highlights the importance of linking R&D and the innovation process with the other components of the institution through an institutional (or corporate) strategy leading to strategy alignment and synergetic objectives, in which structure plays a central role.

The motivation for this theoretical research was inspired by one of the leading scholars on innovation system, B. A. Lundvall (2007), who posed the following question and offered this proposal: "*How to organize empirical studies of innovation systems? When it comes to empirical work, two parallel efforts to analyze innovation systems seem to dominate the picture currently. One is focused on the performance of national innovation systems, while the other is focused on comparing systems in more qualitative terms. Sometimes the first tends to neglect the systems aspect and degenerates to looking for "general best practices", while the other emphasizes the unique systemic features of each single system. Research that bridges the gap between the two approaches may be empirically important.*" (Lundvall, 2007: p. 111)

Therefore, this theoretical research provides a contribution by filling this gap. Although national system of innovation is not a theory, but rather a focusing tool or a combination of concept relying on established theories, this paper will use a conceptual approach to introduce two models of national systems of innovation: the value chain model and the mesh topology, emphasizing on the importance of structure (and the implied strategy) as a core and central issue in national system of innovation research. Moreover, the paper will explore factors and constructs borrowed from the literature of business policy and strategy and technology and innovation management, to further examine the two proposed models and to provide for a comprehensive list of constructs that could be used to qualitatively or quantitatively examine and measure the efficiency and performance of national systems of innovation.

This multidisciplinary research is a contribution to the research on national system of innovation, based on the tradition of business policy and strategy and technology management and innovation, and is intended to both scholars and practitioners. The research has three objectives: (1) to introduce two models for the national systems of innovation: the value chain and the mesh topology; (2) to examine these two models or structure of national systems of innovation, using a list of constructs, factors and variables, borrowed from the literature of business policy and strategy and technology and innovation management; (3) to propose some of these constructs, factors and variables, as formal tools for enhancing the research on national systems of innovation and for further research.

Following the introduction, the next sections will provide for a theoretical background on the literature of the national systems of innovation. Following the literature review, the next two sections will introduce the two proposed models for the national systems of innovation, followed by an exploration of these two models, using a list of variables and constructs, for further examination and understanding. Finally, the discussion section will provide for final reflections, comments on limitations, and further research.

9.2 Theoretical Background

9.2.1 Systems, Innovation and Knowledge

The national system of innovation concept is not new. Its origin could be traced back to the forefather of the German historical school of economics Friedrich List (1885), who published in 1841 his seminal work "The national system of political economy". Following Adam Smith's concept of the division of labor, but with no mention of innovation, List (1885) coined the term "national system of production" taking into account a variety of national institutions including educational and training institutions, among others (Lundvall et al., 2002). Therefore the educational and training institutions were part of a system, in which they were involved in a process of learning, sharing knowledge and contributing to the advancement of the overall system of production and the technology involved. This would have enormous implications on the competitiveness of this industry, this sector, or of the nation as a whole (Porter, 1990).

Systems. National systems of innovation are obviously systems engaged in the process, content and product of innovation, on the national level, within a technology or industrial sector or a specific geographic region. Here the term 'system' refers to more than one component or a group of separate or independent components that are interlinked among each other, forming interdependence within this group and interacting with each other, to form one whole with specific boundaries. This "system" could be described by the composition of its independent components or elements, the structure that bind them together, the links that connect them, the flow of their interconnections, the process embedded within these interconnections, the resources specified as inputs to the system and outputs of the whole group of components, its boundaries,

and its connections with the external environment of the group. Moreover, systems could be characterized as simple or complex, open or closed, independent or integrated, unidirectional, bidirectional or with feedback loops. They usually reflect a systemic approach or the notion of flowing from one direction to the other, processing from start to finish and through the interactions of their interdependent components, which explains the dynamics of the system and how the input, including knowledge, with its original nature or form is transformed into the output product, in this case innovation.

Thus, the use of the term 'system' in national system of innovation refers to the integration of all the important economic, social, political, organizational, institutional elements or entities, and all the factors that positively contribute and enhance the development, production, diffusion and the use of innovation (Edquist, 1997; Fagerberg, Mowery, & Nelson, 2005; Lundvall, 1992). While, the word 'system' refers to the dynamic and the process, the term "innovation" refers to the content, or the material input that will be transformed into a new product, or a "*new combination*" (Schumpeter, 1939), as a product of its course through the process' dynamics of the interlinked components of the system.

Innovation. Innovation is the creation of 'new' with a measurable amount of economic value. This transformation from the original input going through the system, to the 'new creation' is not linear. The transformation of the basic research or science to the applied research or technology is not the product of going through a simple linear path. Instead, the transformation is done, through a complex system of feedback mechanisms and a combinations of interactions (Edquist, 1997). Moreover, through this complex process of interactions and feedbacks, innovation is the product of a cumulative process based on "*innovation avenues*" (Sahal, 1985) and "*technological trajectories*" (Dosi, 1982). This constitutes the cumulativeness of the interactive learning process (Brown & Duguid, 1991; Dodgson, 1993; Fiol & Lyles, 1985; Jensen *et al.*, 2007; Lundvall, 1985).

In fact, one of the earliest definitions of 'innovation' was presented by the Austrian economist Joseph Schumpeter in 1939, who proposed that innovation is "*...the setting up of a new production function. This covers the case of a new commodity, as well as those of a new form of organization such as merger, of the opening up of new markets and so on...Recalling that*

production in the economic sense is nothing but combining productive services, we may express the same thing by saying that innovation combines factors in a new way, or that it consists in carrying out ***new combination****"* (Schumpeter, 1939: p. 87-88). Since then, this generic definition of innovation as 'new combination' was adopted widely in the literature of strategic management, technology and innovation management, and entrepreneurship (Kline & Rosenberg, 1986; Lundvall & Johnson, 1994; Nelson & Winter, 1977; Pavitt, 2005; Stein, 1997; Von-Hippel, 1988). It combines two contradictory dimensions: existing elements and new combinations (Lundvall et al., 2002).

Knowledge. The innovation or new combination, is the product of the transformation of existing elements, such as materials, tools, financial resources, human capital and talent, managerial experience, entrepreneurial skills, social capital, research and development capabilities, production facilities, business and industrial processes, basic scientific research, including the know-how and knowledge. This component of 'knowledge' and the embedded learning, is one of the most important dimensions in the process of innovation, and is intrinsically related to the innovation process and content. As innovation is ubiquitous, we are witnessing the diffusion of knowledge in the modern economy; '*the learning economy*' (Lundvall & Johnson, 1994), through the continuous process of exploration, discovery, learning, sharing, using and producing the new knowledge, which gives birth to new ideas, new designs, new models, new products, new systems, new applications, new techniques, new forms of organizations and new markets (Lundvall, 1992).

This knowledge is produced, acquired, shared, used and diffused in a process of interactive learning which takes place between the different components, entities or institutions of the national system of innovation (Johnson, 1992; Lundvall, 2006b; Murmann, 2003). This process of learning could face some environmental challenges, in which the process of learning and the content of the knowledge itself is not always a simple one. The knowledge could be complex (Bettis & Hitt, 1995; Jemison & Sitkin, 1986b), tacit in nature (Oliver, 1997; Polanyi, 1966) and embedded in the social network of interactive entities (Granovetter, 1985a). The tacit knowledge is not codified and is non transferable as a public good (Hagedoorn & Duysters, 2002; Peteraf, 1993). Moreover, the nature of knowledge could be generic or specific, with a certain degree of tacitness, complexity and independence (Jensen et al., 2007). This complex and specific

or specialized knowledge could be coupled with uncertainty conditions, such as technology uncertainty, product uncertainty, and market uncertainty (Shapiro & Varian, 2003). The knowledge could have a changeable nature, as the technological environment surrounding it is also changes, is being revolutionized (Tushman & O'Reilly, 1996), or is being reshaped, due to disruptive new knowledge (Christensen, 1997; Christensen & Raynor, 2003; Utterback & Acee, 2005b).

The sharing, using and diffusing of 'knowledge', is moderated by the cognition of humans in the interacting institutions (Weick, 1995a) and in the same time, is limited by bounded rationality (Simon, 1991; Taylor, 1975; Tversky & Kahneman, 1974), hence the importance of structure which facilitates collaboration and sharing. In addition, the sharing of knowledge is affected by issues of power, position, influence, and trust, all affected by structure and organization. For example, an established structure, could favor the density and strength of ties between the different interdependent institutions. Dense and strong ties would enhance trust and reduce power, which in turn would favor the exchange and sharing of knowledge. But the advantage of having a structure over not having one or having an informal one, could be lost when knowledge is be subject to appropriability, due to moral hazard and opportunism.

Therefore, a formal structure, a defined organization, a clear process, well designed functions, in addition to factors such as trust, coordination, collaboration and strong ties, would favor the positive effects of knowledge spillover (Breschi & Lissoni, 2001) instead of the negative effect of knowledge appropriability conditions (Audretsch & Lehmann, 2004). A formal structure would also prepare all the participating entities by increasing their absorptive capacity (Cohen & Levinthal, 1990a). In the context of trust, collaboration, sharing and interacting, the participating institutions would lead a trajectory towards new combinations and through learning by doing (Arrow, 1962; Shrivastava, 1983). These institutions, in their knowledge sharing and learning mode, become 'knowledge providers'.

9.2.2 Innovation System

One definition of the concept of 'innovation system' is based on the interactions between the different institutions or 'knowledge providers', participating in this system (Edquist, 2005).

These interactions, knowledge creation and sharing could take place within the firm, between the firms, between the firm and other organizations, with a sector, an industry, an economy, a nation or even a region. These organizations could be other firms such as the suppliers, the producers, the customers, the competitors, etc. Therefore, the systems of innovation could be defined in institutional terms. For example, Carlsson & Jacobsson (1994) define the innovation system in term of the sum and synergy of institutions like the universities, the academic infrastructure, the research and development (R&D) labs, the schools, the patent system, the labor organizations, the standard bodies, the banking system, the government agencies, the state policies, etc. More specifically, they divide the 'institutional infrastructure' related to the innovation or technological system into four parts: the industrial research and development, the academic infrastructure, other institutions, and state policy. The interactions between these interdependent and interlinked institutions constitute the dynamic of the innovation system. This innovation system could be on the national level, covering a whole geographic region, or it could be supranational or international.

According to Freeman (2004), the basic characteristics of technical innovation between the different institutions and within the system of innovation are: coupling, creating, clustering, comprehending and coping. Furthermore, some of the common characteristics of the system of innovation approach are: (1) at the core of the system is learning and innovation; (2) it is usual to use a historical perspective; (3) there are some varieties among the systems and differences between the systems and non-optimality; (4) they include product technologies and organizational innovations; and (5) they are based on a conceptual framework, rather than formal theories. (Edquist, 2005)

Most scholars widely agree that the origins of the system of innovation concept is largely based on interactive learning between the various institutions constituting the system, or more formally the theory of interactive learning; and technological transformation or more formally the evolutionary theory of technical change (Carlsson & Stankiewicz, 1995; Lundvall, 2006a; Nelson & Nelson, 2002).

Institutions. Institutions were part of the original definition of 'national system' in Friedrich List's (1885) seminal work "national system of production". Accordingly, it took into

account a variety of national institutions including those engaged in educational and training institutions. By definition, institutions are "*sets of common habits, routines, established practices, rules, or law that regulate the relations and interactions between individuals and groups.*" (Edquist, 1997; Hodgson, 2006)

In the context of an innovation system, institutions could play an important role in managing the potential conflict that could arise between the different interacting and interdependent participants of the system; in reducing uncertainty by collaborating and sharing available asymmetrical knowledge; in reducing risk; in exchanging knowledge and participating in interactive learning; and in providing a governance structure and incentives for the successful management of the process of innovation and hopefully the product of innovation, as well.

Therefore, institutions, as they were earlier defined as 'norms', 'habits', and 'rules', are embedded in the society and their role is of great importance in defining how people relate, coordinate, cooperate, share, interact, and learn. The role institutions play is very important for the process of innovation and dynamics of interactive learning (Johnson, 1992). Hence, their impact in shaping the future and the economic performance of a nation (Nelson & Nelson, 2002; Nelson & Sampat, 2001). Combining the process of interactive learning and the national boundaries of a country, would suggest the important role of institutions on the national level, or 'national systems of innovation'.

9.2.3 National System of Innovation

For example, Freeman conducted an important study on Japan, in which he described the important role of the ministry of international trade and industry, the role of the firm R&D capabilities, the role of training and education, and finally the conglomerate '*structure*' of the industry (Freeman, 1987: p 4). Therefore the 'national system of innovation' is defined as being "*...all parts and aspects of the economic structure and the institutional set-up affecting learning as well as searching and exploring the production system, the marketing system, and the system of finance, present themselves as subsystems in which learning takes place. Determining in detail which subsystems and social institutions should be included, or excluded in the analysis of the system is a task involving historical analysis , as well as theoretical consideration...a definition*

of the subsystem of innovation must be kept open and flexible regarding which subsystems and which processes should be included." (Lundvall, 1992:.p 11-12)

Moreover, national systems of innovation could be defined in terms of technological systems combined with an institutional infrastructure as *"a network of agents interacting in a specific economic/industrial area, under a particular institutional infrastructure or set of infrastructures and involved in the generation, diffusion and utilization of technology."* (Carlsson & Stankiewicz, 1995: p. 49; Stankiewicz & Carlsson, 1991). This means that the participating institutions, with their interconnections, interlinks and interdependencies, are part of this national system of innovation, which represents a national infrastructure composed of institutions that are engaged in a well defined dynamic and a process of interactive learning, coordination, cooperation, in which the main and core objective is of using, diffusing, sharing, and producing knowledge, and aiming at the transformation of this existing knowledge into new combinations or simply innovation, in term of innovative idea, products, services, processes, business models, etc.

Some of the most common characteristics of the national systems of innovation are that: (1) they vary in their specializations in production, trade, services, and knowledge; (2) they rely on components of knowledge that are fundamental for their economic performance and which could be found in one place and difficult to move to another location; (3) they mainly focus on knowledge sharing and diffusion through a process of interactive learning; and (4) they speed up the diffusion of knowledge among the participants and enhance the quality and content of the diffused knowledge, through synergy and scope (Johnson, Edquist, & Lundvall, 2003).

Variations of innovation systems and examples of empirical research. The concept of national system of innovation, as described above, could be applied in a vast array of context, locations, economic sectors and industries. In addition, its boundaries could encompass interlinked institutions on the national level within one country, or could extend to include several countries in the same geographic region, or on the international level. For the latter, some good examples are in the aerospace industry, such as the case of the European EADS conglomerate and its Airbus subsidiary, which employs around 57,000 people at sixteen sites in four European Union countries: Germany, France, the United Kingdom, and Spain, with assembly production facilities in Toulouse (France), Hamburg (Germany), Seville (Spain), and Tianjin (China), in

addition to subsidiaries in the United States, Japan and China (Niosi & Zhegu, 2005; Wikipedia, 2010).

Therefore, the term 'national system of innovation' could vary depending on the context and the application, while le main concept remains the same. For example, and as a variation of the national system of innovation concept, we can find (1) technological systems (Carlsson & Jacobsson, 1994); (2) technological infrastructure (Freeman, 2004; Lundvall, 2004); (3) sectoral innovation systems (Breschi & Malerba, 1997; Malerba, 2002); (4) industrial cluster (Niosi, 2002, 2011a, 2011b; Niosi & Zhegu, 2005); (5) regional systems of innovation (Cooke, Gomez, & Etxebarria, 1997); and (6) the triple helix model (Etzkowitz & Leydesdorff, 2000).

One good example of empirical research conducted using (or based on) the concept of the national system of innovation and its variations, is the major research conducted by Nelson (1993) on a comparative study of national systems of innovation, in which he studied larger high-income countries such as the United States, Japan, Germany, the United Kingdom, France and Italy; smaller high-income countries, such as Denmark, Sweden, Canada, and Australia; and lower income countries, such as Korea, Taiwan, Brazil, Argentina, and Israel. Another example is the regional study done by Saxenian (1994) on the culture and competition in Silicon Valley and Route 128. On the national level, for example, Niosi et al. (2000) studied the national system of innovation in Canada.

9.2.4 Innovation System's Organization and Structure

The origins. The concept of national system of innovation could be traced back to Adam Smith's division of labor. However, he did not specify whether it is for a tradition task (i.e. production or assembly line), or an innovation task, such as the creation of new knowledge through interactive learning. As mentioned before, Friedrich List (1885) was the first to coin the term 'national system of production', with its *national*, *system* and *production* dimensions, with its implied institutions that are engaged in education and training. Moreover, it was not until the 1970s, when Freeman pursued several studies and concluded that the success in the innovation process lies on strong formal ties and long-term interactions between the firm and some other external institutions, such as education centers, universities, government agencies, etc. (Freeman,

1974). However, there was no mention of how these entities or institutions, external to the firm, would be organized and structured within the system and around the firm.

The chain-linked model. It was widely held that the innovation is the product of a linear model, in which it is created and produced based solely on the scientific research (and development), as it is shown in figure 9.1. It was Kline & Rosenberg (1986) who introduced and proposed an alternative model to the widely adopted linear model: The *chain-linked model*. This model introduced a more elaborate structure, which could be adopted and adapted to suit and encompass external institutions, as mentioned above in Freeman's early research. The chain-linked model, as shown in the original illustration in figure 9.2, integrated the function of marketing with the before research and after research phases, and the market distribution function, in term of pricing, publicity and sales supervision.

Figure 9.1

The linear model (Kline & Rosenberg, 1986)

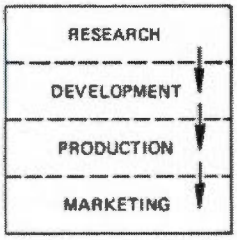
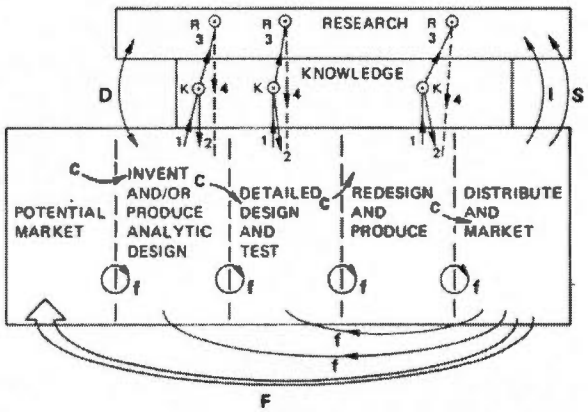


Figure 9.2

The chain-linked model (Kline & Rosenberg, 1986)



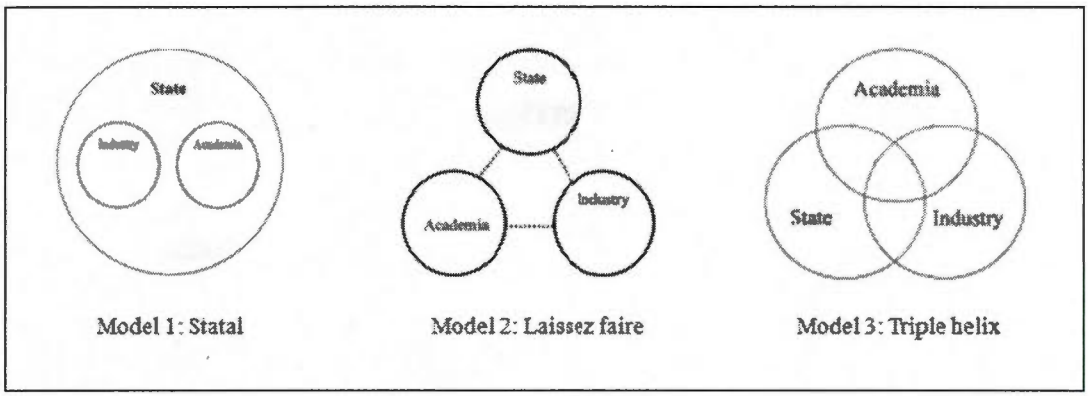
The chain-linked model had two major contributions. First, the integration of a knowledge function and a research activity, with what it seems to be a supervisory role, with an interactive dynamic over a large span covering the marketing, the design and the production

functions. It is clear that the functions of knowledge and research in the model are not limited to the within-the-firm activities, but rather the model suggests that these functions, and others, could be interlinked with external institutions to the firm, thus the potential of creating a system of interconnected but still independent entities or institutions. Lundvall (2002) suggested that the idea of interaction (or transaction) based only on quality and price was not enough and that a 'non-price-relationship' is more realistic and needed, to govern the interactions between the functions and their entities (divisions), therefore reinforcing the concept of institutions interacting from the external of the firm. Moreover, the suggestion that markets would be transformed into hierarchies, as proposed by Williamson (1986) in the transaction cost economics theory, did not materialized, hence highlighting the important of interactive collaboration with external institutions, in market or hybrid conditions. The other major contribution introduced by the Kline and Rosenberg (1986) model, is the proposed feedback flows between the different functions and entities. This suggests the notion of process, more detailed functional descriptions, directions for the process, order and priority, and most importantly, deliverables and indicators. Although, these were not specified in the Kline's model, they could be inspired from it.

The triple helix model. Etzkowitz H, Leydesdorff (2000) presented a model called triple helix with three different evolutionary stages that suggest three *modes* of interaction density, three types of interdependence ties and two (or three) governance mechanisms, as shown in figure 9.3. In mode one, the "*statal*" model, the industry and academia exist within the ecosystem of the state. The relationships, if any, between neither the industry and the academia, or both and the state, are clear. In mode two, "*laissez-faire*" model, which represents a progress in the direction of the strength of ties, the three entities (the industry, the academia and the state) are on equal footing, and they are all linked by doted lines in a triangular shape, suggesting that the ties are not strong enough, weak, or blurry, due to the lack of a formal structure. In mode three, the "*triple helix*" model, the three entities are much closer in distance, in such a way that creates an intersection suggesting more formal interaction, more collaboration, sharing and learning, stronger level of trust, scope and synergy and a unified set of objectives.

Figure 9.3

The triple helix model (Etzkowitz & Leydesdorff, 2000)



However, no process, fluidity or dynamics could be inspired from the proposed models. The weakness or non existence of the ties in the second model, *laissez faire*, suggests the difficulty of establishing any formal model, institutions in terms of routines, habits, and procedures, and the problem of the lack of trust could not be overcome due to the distance between the independent entities. In the third model, *triple helix*, although the distance between the entities is reduced, the existence of a formal process is not clear and far from evident. In addition, the closeness of the entities and the shortening of the distances between them in this manner, suggest that the intersection area could create overlaps in terms of the resources and slack, the underutilization of dynamic capabilities (Teece & Pisano, 1998), the lack of strategic fit and alignment, the duplication and replication. Eventually, these factors would potentially reduce the critical element of trust, increase the danger of moral hazard and appropriability, increment power and influence, and consequently discourage collaboration and interaction. This could be amplified by the lack of incentives, information asymmetry and the weakness of the hybrid governance structure, if any. Therefore, the need for a better model that would enhance knowledge collaboration and trust-based interactive learning, with the aim of using, sharing, producing, transforming and diffusing knowledge, and finally creating 'new combinations' or innovation.

9.3 Introducing the Innovation Value Chain Model and the Mesh Topology

In his early definition of 'innovation', Joseph Schumpeter (1939) pointed out to system of innovation, through the process of innovation, the dynamic of transformation and the importance of the form or 'structure' in creating 'new combination' or in another word, simply 'innovation': "*...define innovation more rigorously by means of the production function...this function describes the way in which quality of products varies if quantities of factors vary. If instead of quantities of factors, we vary the form of the function, we have innovation.*" (Schumpeter, 1939: p. 87)

Structure is intrinsically related to strategy content and process, and the industry structure. In the definition of Mintzberg's ten schools of thoughts, the prescriptive or normative group consists of the design school or conceptual process (Andrews, 1971), the planning school or formal process (Ansoff, 1965), and the positioning school or analytical process (Porter, 1980a). These three schools support an analytical and logical approach to strategy formulation. For Andrews (1971) strategy is "*a pattern of decisions in a company* (or institution) *that determines and reveals its objectives, purposes and goals, produces the principle policies and plans for achieving those goals, and define the range of business the company* (or institution) *is to pursue, the kind of economic and human organization it is or intends to be, and the nature of the economic and non-economic contribution it intends to make to shareholders, employees, customers and communities*". For Porter (1980a), strategy is "*how the company* (or institution) *will distinguish itself in its competitive environment to earn superior profitability*" *and "the essence of strategy is to identify a different position from those rivals*". Ansoff (1965), considers that strategy is linked to the institution's environment: "*strategic decisions are not related to internal problems rather to external problems of the firm* (or institution) *and specifically the product mix which a firm will produce and markets in which it will sell them*". While Porter drew on Chandler's work on strategy and structure (1962a), where he suggested that structure follows strategy, other scholars suggested that strategy follows structure (Burgelman, 1983; Hall & Saias, 1980). Hence is the importance of structure for strategy alignment, for defining a set of objectives for the national systems of innovation, and for sustaining competitive advantage.

Competitive advantage is achieved through competing in 'distinctive' and 'unique' ways and could be sustained by continuous innovation. The competitive advantage is achieved by doing the company's activities efficiently. According to Porter (1980a), "*the activities are the ultimate source of competitive advantage, and the way to achieve cost leadership or non-price buyer value; differentiation*". Therefore is the importance of activities, which constitute the 'value chain', or a configuration of internal activities in a way different than the rivals. As Porter puts it: "*...the value chain provides a systematic framework for identifying activities and their role in cost positioning and differentiation*" (Porter, 1980a). On the national level, the 'diamond of national advantage' which defines the competitiveness of nations consists of factor conditions, such as talents and skills in the local market, the demand condition, or the local demand for the industry products, the related and supporting industry, or the existence of local competitive suppliers in other related industries and finally the firm strategy, structure and rivalry, or in other words, the way companies are created, organized and managed and the nature of domestic rivalry (Porter, 1990). It is obvious that combining these factors with other institutions would provide for an efficient and competitive national system of innovation.

Therefore, the concept of the value chain is not new. It emerged within the boundaries of the firm and for the purpose of transforming the initial resources into the new combination of end-user products, increasing the efficiency of the firm's internal activities, and sustaining competitive advantage. It is worth to note that the concept of value chain in the case of one firm applies when these activities are contained in one localized area or when they are spanning over different locations. Equally, the same concept applies when all the activities are handled internally by the firm, or alternatively, when some of them are carefully passed to external entities or institutions, whether through a market mode (transactions based on quality and price relationships) or a hybrid mode (quality and price, in addition to non-price-relationship), in which outsourcing and subcontracting are few good examples.

Under these assumptions, if the concept of the value chain could apply to firms that have interactions with external institutions, therefore, it is only natural that the same concept, using the same analogy could be adopted to propose an enhanced structural framework for the concept of the national system of innovation. In fact, adopting the same concept and applying it to the national systems of innovation, be it "the value chain of the nation system of innovation", would

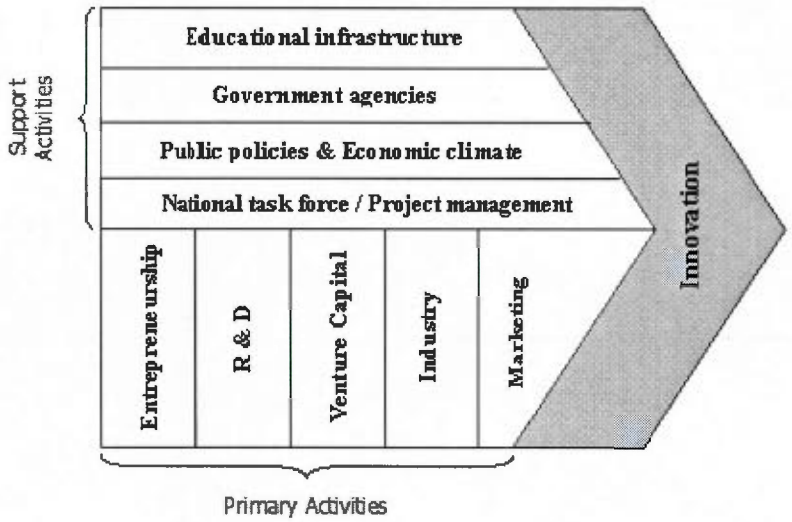
create the conditions for further structuring, better measuring, and creating and sustaining the competitive advantage of nations, as proposed in the diamond of national advantage by Porter (1990).

It is important to remember that the composition of the national system of innovation should not be restricted or limited. As suggested by Lundvall (1992) earlier in the article, the inclusion or exclusion of institutions in the national system of innovation should be based on a historical perspective and on theoretical, as well as practical considerations. Consequently, the proposed value chain of the national system of innovation is not concerned with the inclusion or exclusion of participating institutions. This is done based on historical analysis, theoretical and practical considerations. Rather, the adoption of the value chain concept to the national system of innovation, gives it a better structure, a more formal process and a defined dynamic, regardless of the selected participating members. Moreover, the order, sequence, and composition of the participating members are not part of the model and are rendered insignificant. As defined above by Porter (1980a), the value chain provides *'a systemic approach for identifying activities and their role'*, in other words a structural framework for the national system of innovation. Figure 9.4, introduces the proposed model of the innovation value chain of the national system of innovation.

Furthermore, the proposed mesh topology for the national system of innovation is the ideal and perfect configuration for the network of interlinked and interdependent institutions forming the national system of innovation, in which each institution is linked to almost, if not to all the others, with strong and dense ties. Therefore, it could be a partially connected mesh topology or a potentially fully connected mesh topology. In terms of network configuration of the interlinked institutions participating in the national system of innovation, the mesh topology has a superior formation over the other topologies, such as the line, the star, and the ring, as shown in figure 9.5. The mesh topology encourages, facilitates and enforces the interactive collaboration and learning in the dynamic of the national system of innovation, by using, sharing, and diffusing existing knowledge, and by producing new combinations and innovation.

Figure 9.4

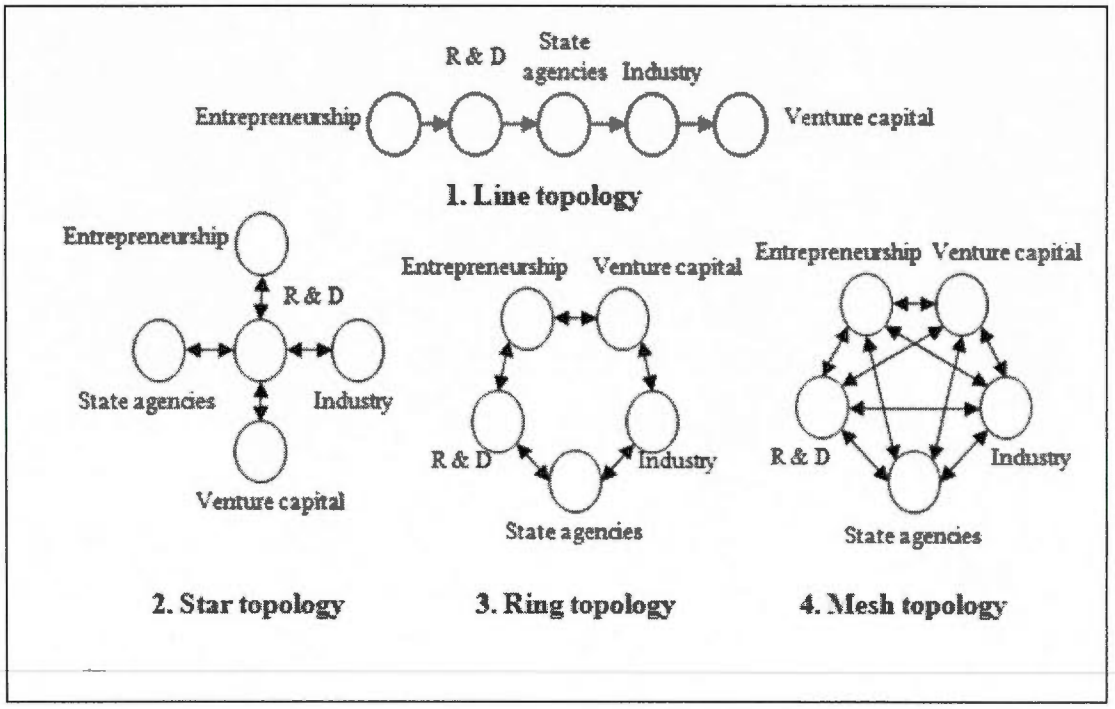
The proposed innovation value chain model of the national system of innovation



It is important to reflect on the differences between the proposed value chain and mesh topology for the national system of innovation, and how they represent complementary, and not contradictory roles. The proposed value chain suggests a systemic approach for organizing and structuring the activities encompassed in the dynamic collaboration and interaction between the participating members of the national system of innovation. It suggests a process perspective for the organization of these activities. It helps to define for each member institution in the national system of innovation, its respective functions, responsibilities, receivables (inputs) and their specifications, deliverables (outputs) and their specifications, the task ownership and time frame, the planned benchmark quality, etc. Moreover, while the proposed value chain is a 'virtual' structure for organizing and processing the activities and tasks, the proposed mesh topology is more of a physical depiction of the organizational structure of the participating members in the national system of innovation. It suggests and reflects the type of interconnection between the member institutions, whether existent or non-existent, and the nature and characteristics of these interconnections, in term of strong and week ties, and dense and loose ties.

Figure 9.5

The different configurational topologies and the proposed mesh topology for innovation



Furthermore, the integration of both proposed organizational structures, the value chain and the mesh topology for the national system of innovation concept, enhances the core issue of structure for the national system of innovation, increases its efficiency and sustain competitive advantage and facilitates further qualitative and quantitative research on the national system of innovation concept, by providing more measurement tools, as described later. It is suggested that the adoption of the proposed integrated value chain and mesh topology organizational and configurational structures would have the following characteristics and advantages:

- *Integrating*: The participating institutions are better integrated in the national system of innovation;
- *Structuring*: It enhances the structure of the national system of innovation;

- *Optimizing*: It optimizes the process of sharing, interactive learning and the use of resources;
- *Transforming*: It facilitates the transformation of basic and existing knowledge into innovation;
- *Planning*: It provides a better framework for the planning of activities, deliverables, and indicators;
- *Managing*: It fosters the ability to manage the whole process of the national innovation system;
- *Interacting*: It facilitates the interaction between the institutions engaged in knowledge sharing;
- *Learning*: It motivates for a better learning and knowledge sharing environment;
- *Processing*: It enforces a process perspective to the national system of innovation;
- *Dividing*: It improves the division of labor and tasks;
- *Defining*: It increases the ability to better define the institutional' tasks, time frames and ownership;
- *Measuring*: It provides for a new set of measurement tools for evaluating the innovation system;
- *Delivering*: It improves the delivery mechanism of inputs and outputs of the institutions;
- *Aligning*: It encourages the alignment of a unified set of strategic objectives;
- *Transferring*: It foments the transferring of knowledge from one institution to the other;
- *Diffusing*: It stimulates the diffusion of knowledge across the national system of innovation;
- *Institutionalizing*: It provokes the institutionalization of the activities in the system of innovation;
- *Rationalizing*: It helps the rationalization of the dynamics of the national system of innovation;
- *Economizing*: It enforces the economy of scope, the rational use of resources, and avoids duplication;
- *Strategizing*: It catalyzes the ability to analyze, plan, strategize and measure.

9.4 Exploring potential constructs and variables for measuring the proposed models

As suggested before, the adoption and integration of the proposed two models for the national systems of innovation, the value chain model and the mesh topology, would facilitate further qualitative and quantitative research on the national system of innovation concept, by

providing more measurement tools. Here, is a comprehensive list of concepts, constructs and variables, borrowed mostly from the literature of business policy and strategy, and technology and innovation management. Table 9.1 provides a description of these factors with respect to the proposed value chain and mesh topology respectively, and the expected characteristics of the two proposed models when using these measurement tools.

Table 9.1

Potential constructs and variables for the proposed models: Value chain and mesh topology

	Concept/Construct / Variable	NSI Value Chain Structure	NSI Mesh Topology	Concept cited by
1	Strategy alignment	Improve planning, vision, objectives		
2	Strategy process	Enhanced due to interaction dynamic		
3	Innovation diffusion		Enhanced across industry structure	
4	Knowledge diffusion	Encouraged due to better process	Increased due to strong ties	
5	Learning process	More efficient due to structure		
6	Interactive learning	Facilitated due to systematic approach	Increased due to dense ties	
7	Absorptive capacity	Increased due to planning and process	Improved to closeness of ties	(Cohen & Levinthal, 1990a)
8	Learning by doing	Enhanced due to absorptive capacity		
9	Knowledge spillover	Increased due to structure and process	Increased to network effects	
10	Ties	Integration favors strong ties	Favors strong and dense ties	
11	Centralization	Not favored due to division of tasks	Entities are on equal footing	
12	Governance	Improved	Enhanced due to closeness	
13	Reorganization	Open to it due to flexibility		
14	Development	Progressive and evolutionary	Chaotic?	
15	Innovation. management	Facilitated	Improved through ties	
16	Systemic approach	Enforced		

	Concept/Construct / Variable	NSI Value Chain Structure	NSI Mesh Topology	Concept cited by
17	Social capital		Impact on network configuration	(Geletkanycz & Hambrick, 1997) (Gulati, 1999)
18	Facilitating communication	Improved to systemic approach	Facilitated due to strong ties	
19	Embeddedness	In the process and dynamic	In the network configuration	
20	Compatibility	Important for process integration	Configuration formation	(Jemison & Sitkin, 1986b)
21	Strategic fit	Critical in culture and strategy	Critical in culture	(Shelton, 1988a)
22	Coordination	Facilitated and enforced	Encouraged	
23	Proximity	Important/not essential		(Mayer & Kenney, 2004a)
24	Boundaries	Structured but flexible		
25	Dynamic capability	Fostered		
26	Trajectories	Create historical perspective		
27	Path dependency	Creates positive lock-in effects		(Oliver, 1997) (Singh & Montgomery, 1987)
28	Cognition	Creates organizational memory		
29	Ambiguity	Reduced	Managed	
30	Uncertainty	Reduced through cooperation	Reduced through collaboration	(Quelin, 2000)
31	Techno uncertainty			(Robertson & Gatignon, 1998; Walker & Weber, 1984)
32	Market uncertainty			(Robertson & Gatignon, 1998)
33	Product uncertainty			(Roberts & Liu, 2001)
34	Appropriability	Managed and reduced buy structure	Reduced by trust	(Hoffman & Schaper-Rinkel, 2001)
35	Opportunism	Reduced by incentives and governance		(Williamson, 1975)
36	Moral hazard	Reduced due common objectives		(Hoffman & Schaper-Rinkel, 2001))
37	Trust	Increased due to interaction, sharing	Increased due to strong ties	(Eisenhardt, 1989a) (Williamson, 1975) (Jemison & Sitkin, 1986b)
38	Power	Reduced due to trust and interaction	Increased by network position	
39	Complexity	Reduced and managed		(Jemison & Sitkin, 1986b)

	Concept/Construct / Variable	NSI Value Chain Structure	NSI Mesh Topology	Concept cited by
40	Technical complexity			(Bettis & Hitt, 1995)
41	Degree of integration	Increased		(James, Georghiou, & Metcalfe, 1998) (Paine & Power, 1984) (Mayer & Kenney, 2004a)
42	Degree of modularity	Implication on division of labor		(Gawer & Cusumano, 2002)
43	Economy of scope	Adopted and increased due to sharing		(Duysters & Man, 2003b) (Walter & Barney, 1990) (Hoffman & Schaper-Rinkel, 2001)
44	Core competencies	Increased due to specialization		(Hitt et al., 1991b) (Prahalad & Hamel, 1990) (Prahalad & Hamel, 1994)
45	Bounded rationality	Improved by tasks division & process		(Williamson, 1999) (Coff, 1997b)
46	Resource dependency	Create positive lock-in effects		(Pfeffer, 1972)
47	Tacit knowledge	Transferred through collaboration	Transferred through relations	(Oliver, 1997)
48	Degree of tacitness	Reduced due to interactive learning		
49	Leadership	Created through consensus	Emerges due to position, influence	
50	Synergy	Increased		(Brush, 1996), (Lubatkin, 1983)
51	Financial synergies	Increased		(Trautwein, 1990)
52	Cost	Reduced and shared		(Walter & Barney, 1990)
53	R&D cost	Shared, Economy of scope		(Roberts & Liu, 2001)
54	Firm's size	Relative		
55	Talent retention	Highlighted and managed		(Mayer & Kenney, 2004a) (Coff, 1997b)
56	Management control	Facilitated		(Eisenhardt, 1989a)
57	Information asymmetry	Reduced by sharing and enforced		(Eisenhardt, 1989a) (Hoffman & Schaper-Rinkel, 2001) (Coff, 1997b)
58	Techno performance			(James, Georghiou, & Metcalfe, 1998)
59	Complementary product / technology			(Shelton, 1988a) (Mayer & Kenney, 2004a) (Wernerfelt, 1984)

	Concept/Construct / Variable	NSI Value Chain Structure	NSI Mesh Topology	Concept cited by
60	Supplementary product / technology			(Shelton, 1988a) (Wernerfelt, 1984)
61	Degree of product relatedness			(Feeser & Willard, 1990) (Hopkins, 1987) (James, Georghiou, & Metcalfe, 1998)
62	Product time to market	Reduced		
63	Efficiency	Improved		(Trautwein, 1990) (Walter & Barney, 1990) (Williamson, 1999)
64	R&D intensity	Increased		(Hitt et al., 1991b)
65	R&D investment	Increased	Increased	(Hitt et al., 1991b)
66	Financial control	Improved		(Hitt et al., 1996)
67	Transaction cost	Reduced		(Teece, 1982) (Williamson, 1986)
68	Risk sharing	Increased		(Walter & Barney, 1990) (Roberts & Liu, 2001) (Lubatkin, 1983)
69	Risk	Reduced		(Roberts & Liu, 2001)
70	Learning by doing	Encouraged		(Hoffman & Schaper-Rinkel, 2001) (Pennings, Barkema, & Douma, 1994b)

9.5 Discussion

In this theoretical research on the concept of national system of innovation, we proposed two conceptual framework and organizational structure for increasing the efficiency through interactive learning and knowledge transfer: The value chain model and the mesh topology configuration. The motivation of the research was the need for more structure and organization in national system of innovation research and the need for more and better measuring tools. These two proposed structures improve the issue of structure at the core of the national system of innovation research. Moreover, we explored an extensive and comprehensive list of constructs, variables and factors to better measure quantitatively the performance of national system of

innovation. Furthermore, these measures provide qualitative tools for a better and in-depth understanding of 'how' national systems of innovation work and 'what' dimensions are the most important. Using these tools could provide the basis for a better referenced and equally weighted comparative analysis between systems of innovation, on the national, regional or international levels.

Further research is needed in order to adjust these measurements on the national system of innovation research, followed by empirical research to test the internal and construct validity of these measures. Although, the national system of innovation is not a formal theory, but rather a focusing tool for studying different things, such as innovation management, policies, knowledge management, etc., these proposed constructs would enhance the research on the national systems of innovation, as they cross the boundaries of many disciplines and provide for a more integrative and holistic approach to the study of the national systems of innovation. Although the picture could still be blurry, having a perspective of the whole is better than the fragmented picture we usually get from the literature.

References

Andrews KR. (1971). *The concept of corporate strategy*. Dow Jones-Irwin: Homewood

Ansoff I. (1965). *Corporate strategy: An analytic approach to business policy for growth and expansion*. McGraw-Hill: New York

Arrow KJ. (1962). The Economic-Implications of Learning by Doing. *Review of Economic Studies* 29(80): 155-173

Audretsch DB, Lehmann EE. (2004). University spillovers: Does the kind of science matter? *Industry and Innovation* 11(3): p. 193

Bettis RA, Hitt MA. (1995). The new competitive landscape. *Strategic Management Journal* 16: 7-19

Breschi S, Lissoni F. (2001). Knowledge spillovers and local innovation systems- A critical survey. *Industrial and Corporate change* 10(4): p. 975

Breschi S, Malerba F. (1997). Sectoral Innovation Systems: technological regimes, schumpeterian dynamics, and spatial boundaries. In C Edquist (Ed.), *Systems of innovation : technologies, institutions, and organizations*, Vol. xiv: 432 p.

Brown JS, Duguid P. (1991). Organizational Learning and Communities-of-Practice: Toward a Unified View of Working, Learning, and Innovation. *Organization Science* 2(1): 40-57

Brush TH. (1996). Predicted change in operational synergy and post acquisition performance of acquired businesses. *Strategic Management Journal* 17: 1-24

Burgelman R. (1983). A model of the interaction of the strategic behavior, corporate context, and the concept of strategy. *Academy of Management Review* 8(000001): pg. 61

Carlsson B, Jacobsson S. (1994). Technological Systems and Economic-Policy - the Diffusion of Factory Automation in Sweden. *Research Policy* 23(3): 235-248

Carlsson B, Stankiewicz R. (1995). On the nature, function and composition of technological systems. In B Carlsson (Ed.), *Technological Systems and Economic Performance: The Case of Factory Automation*. Kluwer Academic Publishers

Chandler AD. (1962). *Strategy and structure: chapters in the history of the industrial enterprise*. M.I.T. Press: Cambridge

Christensen CM. (1997). *The innovator's dilemma - When new technologies cause great firms to fail*. Harvard Business School Press: Cambridge, Massachusetts

Christensen CM, Raynor ME. (2003). *The innovator's solution - Creating and sustaining successful growth*. Harvard Business School Press: Boston, Massachusetts

Coff RW. (1997). Human assets and management dilemmas: Coping with hazards on the road to resource based theory. *Academy of Management Review* 22(2): 374-402

Cohen WM, Levinthal DA. (1990). Absorptive-Capacity - a New Perspective on Learning and Innovation. *Administrative Science Quarterly* 35(1): 128-152

Cooke P, Gomez M, Etxebarria G. (1997). Regional innovation systems: Institutional and organisational dimensions. *Research Policy* 26(4-5): 475-491

Dodgson M. (1993). Organizational Learning: A Review of Some Literatures. *Organization Studies* 14(3): 375-394

Dosi G. (1982). Technological Paradigms and Technological Trajectories - a Suggested Interpretation of the Determinants and Directions of Technical Change. *Research Policy* 11(3): 147-162

Duysters G, Man A-Pd. (2003). Transitory alliances: an instrument for surviving turbulent industries? *R&D Management* 33(1): 49-58 (10 pp.)

Edquist C. (1997). *Systems of innovation : technologies, institutions, and organizations*. Pinter: London; Washington

Edquist C. (2005). Systems of Innovation: Perspectives and Challenges. In J Fagerberg, DC Mowery, RR Nelson (Eds.), *The Oxford handbook of innovation*, Vol. xviii: 656 p. Oxford University Press: New York

Eisenhardt KM. (1989). Agency theory: An assessment and review. *Academy of Management Review* 14(1): 57-74

Etzkowitz H, Leydesdorff L. (2000). The dynamics of innovation: from National Systems and "Mode 2" to a Triple Helix of university-industry-government relations. *Research Policy* 29(2): 109-123

Fagerberg J, Mowery DC, Nelson RR. (2005). *The Oxford handbook of innovation*. Oxford University Press: Oxford ; New York

Feeser HR, Willard GE. (1990). Founding strategy and performance: A comparison of high and low growth high tech firms. *Strategic Management Journal* 11: 87-98

Fiol CM, Lyles MA. (1985). Organizational Learning. *Academy of Management Review* 10(4): 803-813

Freeman C. (1974). *The economics of industrial innovation*. Penguin: Harmondsworth ; Baltimore

Freeman C. (1987). *Technology, policy, and economic performance: lessons from Japan.* Pinter Publishers: London ; New York

Freeman C. (2004). Technological infrastructure and international competitiveness. *Ind Corp Change* 13(3): 541-569

Gawer A, Cusumano MA. (2002). *Platform Leadership: How Intel, Microsoft, and Cisco Drive Industry Innovation.* Harvard Business School Press

Geletkanycz MA, Hambrick DC. (1997). The external ties of top executives: Implications for strategic choice and performance. *Administrative Science Quarterly* 42(4): 654-681

Granovetter M. (1985). Economic Action and Social Structure: The Problem of Embeddedness. *American Journal of Sociology* 91(3): 481-510

Gulati R. (1999). Network location and learning: The influence of network resources and firm capabilities on alliance formation. *Strategic Management Journal* 20: 397-420

Hagedoorn J, Duysters G. (2002). External sources of innovative capabilities: The preference for strategic alliances or mergers and acquisitions. *Journal of Management Studies* 39(2)

Hall DJ, Saias M. (1980). Strategy Follows Structure! *Strategic Management Journal* 1(2): pg. 149

Hitt MA, Hoskisson RE, Ireland RD, Harrison JS. (1991). Effects of acquisitions on R&D inputs and outputs. *Academy of Management Journal* 34(3): 693-706

Hitt MA, Hoskisson RE, Johnson RA, Moesel DD. (1996). The market for corporate control and firm innovation. *Academy of Management Journal* 39(5): 1084-1119

Hodgson GM. (2006). What Are Institutions? *Journal of Economic Issues* 40(1): 1-25

Hoffman WH, Schaper-Rinkel W. (2001). Acquire or ally? - A strategy framework for deciding between acquisition and cooperation. *Management International Review* 41(2): 131-159

Hopkins HD. (1987). Acquisition strategy and the market position of acquiring firms. *Strategic Management Journal* 8: 535-547

James AD, Georghiou L, Metcalfe JS. (1998). Integrating technology into merger and acquisition decision making. *Technovation* 18(8/9)

Jemison DB, Sitkin SB. (1986). Corporate acquisitions: A process perspective. *Academy of Management Review* 11(1): 145-163

Jensen MB, Johnson B, Lorenz E, Lundvall BA. (2007). Forms of knowledge and modes of innovation. *Research Policy* 36(5): 680-693

Johnson B. (1992). Institutional Learning. In BÅ Lundvall (Ed.), *National systems of innovation: towards a theory of innovation and interactive learning*, Vol. xiii: 342 p. Pinter Publishers: London

Johnson B, Edquist C, Lundvall BA. 2003. Economic Development and the National System of Innovation Approach, *Globelics Academy 2004*: Lisbon, Portugal

Kline SJ, Rosenberg N. (1986). An Overview of Innovation. In R Landau, N Rosenberg (Eds.), *The Positive sum strategy : harnessing technology for economic growth*, Vol. xiv: 640 p. National Academy Press: Washington, D.C.

List F. (1885). *The National system of political economy* (MP Sampson Lloyd, Trans.). Longmans, Green and Co.: London

Lubatkin M. (1983). Mergers and the performance of the acquiring firm. *Academy of Management Review* 8(2): 218-225

Lundvall BA. (1985). Product innovation and user-producer interaction. *Industrial Development Research Series* 31

Lundvall BA. (2004). Introduction to 'Technological infrastructure and international competitiveness' by Christopher Freeman. *Ind Corp Change* 13(3): 531-539

Lundvall BA. 2006a. Innovation Systems between Policy and Research, *Innovation Pressure Conference*: Tampere, Finland

Lundvall BA. (2006b). Interactive Learning, Social Capital and Economic Performance. In B Kahin, D Foray (Eds.), *Advancing knowledge and the knowledge economy*, Vol. x: 503 p. MIT Press: Cambridge, Mass.

Lundvall BÅ. (1992). *National systems of innovation : towards a theory of innovation and interactive learning*. Pinter Publishers; Distributed exclusively in the USA and Canada by St. Martin's Press: London, New York

Lundvall BÅ. (2007). National Innovation Systems - Analytical Concept and Development Tool. *Industry & Innovation* 14(1): 95-119

Lundvall BA, Johnson B. (1994). The learning economy. *Journal of Industry Studies* 1(2): 23-42

Lundvall BÅ, Johnson B, Andersen ES, Dalum B. (2002). National systems of production, innovation and competence building. *Research Policy* 31(2): 213-231

Malerba F. (2002). Sectoral systems of innovation and production. *Research Policy* 31(2): 247-264

Mayer D, Kenney M. (2004). Economic action does not take place in a Vacuum: Understanding Cisco's acquisition and development strategy. *Industry and Innovation* 11(4): 299

Mintzberg H. (1979). *The structuring of organizations : a synthesis of the research.* Prentice-Hall: Englewood Cliffs, N.J.

Murmann JP. (2003). *Knowledge and competitive advantage the coevolution of firms, technology, and national institutions.* Cambridge University Press: Cambridge, UK ; New York

Nelson RR. (1993). *National innovation systems : a comparative analysis.* Oxford University Press: New York

Nelson RR, Nelson K. (2002). Technology, institutions, and innovation systems. *Research Policy* 31(2): 265-272

Nelson RR, Sampat BN. (2001). Making sense of institutions as a factor shaping economic performance. *Journal of Economic Behavior & Organization* 44(1): 31-54

Nelson RR, Winter SG. (1977). In search of useful theory of innovation. *Research Policy* 6(1): 36-76

Niosi J, Godin B, Manseau A. (2000). *Canada's national system of innovation.* McGill-Queen's University Press: Montreal ; Ithaca

Niosi J, Zhegu M. (2005). Aerospace Clusters: Local or Global Knowledge Spillovers? *Industry and Innovation* 12(1): p. 5

Oliver C. (1997). Sustainable competitive advantage: Combining institutional and resource based views. *Strategic Management Journal* 18(9): 697-713

Paine FT, Power DJ. (1984). Merger strategy: An examination of Druker's five rules for successful acquisitions. *Strategic Management Journal* 5: 99-110

Pavitt K. (2005). Innovation Processes. In J Fagerberg, DC Mowery, RR Nelson (Eds.), *The Oxford handbook of innovation*, Vol. xviii: 656 p. Oxford University Press: Oxford ; New York

Pennings JM, Barkema H, Douma S. (1994). Organizational learning and diversification. *Academy of Management Journal* 37(3): 608-640

Peteraf MA. (1993). The cornerstones of competitive advantage: A resource-based view. *Strategic Management Journal* 14: 179-191

Pfeffer J. (1972). Merger as a response to organizational interdependence. *Administrative Science Quarterly* 17: 382-394

Polanyi M. (1966). *The tacit dimension* (1st ed.). Doubleday: Garden City, N.Y.

Porter M. (1980). *Competitive Strategy.* Free Press

Porter ME. (1990). *The competitive advantage of nations.* Free Press: New York

Prahalad CK, Hamel G. (1990). The core competence of the corporation. *Harvard business review*: 79-91

Prahalad CK, Hamel G. (1994). *Competitng for the future*. Harvard Business School Press: Boston

Quelin B. (2000). Core competencies, R&D management and partnerships. *European Management Journal* 18(5): 476-487

Roberts EB, Liu WK. (2001). Ally or acquire? *MIT Sloan Management Review*

Robertson TS, Gatignon H. (1998). Technology development mode: A transaction cost conceptualization. *Strategic Management Journal* 19: 515-531

Roussel PA, Saad KN, Erickson TJ. (1991). *Third Generation Research and Development: Managing the link to corporate strategy*. Harvard Business School Press: Boston

Sahal D. (1985). Technological guideposts and innovation avenues. *Research Policy* 14(1985): 61-82

Saxenian A. (1994). *Regional advantage: culture and competition in Silicon Valley and Route 128*. Harvard University Press: Cambridge, Mass.

Schumpeter JA. (1939). *Business cycles; a theoretical, historical, and statistical analysis of the capitalist process*. (1st ed.). McGraw-Hill Book Company, Inc.: New York, London

Shapiro C, Varian HR. (2003). The Art of Standards Wars, *Managing in the Modular Age: Architectures, Networks and Organizations*: 424. Blackwell Publishing

Shelton LM. (1988). Strategic business fits and corporate acquisition: Empirical evidence. *Strategic Management Journal* 9: 279-287

Shrivastava P. (1983). A Typology of Organizational Learning-Systems. *Journal of Management Studies* 20(1): 8-28

Simon HA. (1991). Bounded rationality and organizational learning. *Organization Science* 2(1): 125-134

Singh H, Montgomery C. (1987). Corporate acquisition strategies and economic performance. *Strategic Management Journal* 8: 377-386

Stankiewicz R, Carlsson B. (1991). On the nature, function and composition of technological systems. *Journal of Evolutionary Economics* 1(2): 93

Stein J. (1997). Waves of creative destruction- Firm specific learning by doing and dynamics of innovation. *The Review of Economic Studies* 64(219): 265 p.

Taylor RN. (1975). Psychological determinants of bounded rationality: Implications for decision making. *Decision Sciences* 6: 409-429

Teece DJ. (1982). Towards an economic theory of the multiproduct firm. *Journal of Economic Behavior and Organization* 3: 39-63

Teece DJ, Pisano G. (1998). The Dynamic Capabilities of Firms. In G Dosi, DJ Teece, J Chytry (Eds.), *Technology, organization and competitiveness: perspectives on industrial and corporate change*, Vol. ix: 345p. Oxford University: Oxford

Trautwein F. (1990). Merger motives and merger prescriptions. *Strategic Management Journal* 11: 283-295

Tushman ML, O'Reilly CA. (1996). Ambidextrous organizations: Managing evolutionary and revolutionary change. *California Management Review* 38(4)

Tversky A, Kahneman D. (1974). Judgment under uncertainty: Heuristics and biases. *Science* 185: 1124-1131

Utterback JM, Acee HJ. (2005). Disruptive Technologies: An Expanded View. *International Journal of Innovation Management* 9(1): 1-17

Von-Hippel E. (1988). *The sources of innovation*. Oxford University Press

Walker G, Weber D. (1984). A transaction cost approach to make-or-buy decisions. *Administrative Science Quarterly* 29(3): 373-391

Walter GA, Barney JB. (1990). Management objectives in mergers and acquisitions. *Strategic Management Journal* 11: 79-86

Weick KE. (1995). *Sensemaking in organizations.* . Sage Publications: Thousand Oaks

Wernerfelt B. (1984). A resource-based view of the firm. *Strategic Management Journal* 5: 171-180

Wikipedia. 2010. Airbus, *Wikipedia*: http://en.wikipedia.org/wiki/Airbus

Williamson OE. (1975). *Markets and Hierarcies, analysis and antitrust applications: A study in the economics of internal organizations*. Free Press: New York

Williamson OE. (1986). Transaction-cost economics: The governance of contractual relations. In JB Barney, WG Ouchi (Eds.), *Organizational Economics*: 98-129. Jossey Bass

Williamson OE. (1999). Strategy research: Governance and competence perspectives. *Strategic Management Journal* 20: 1087-1108

PART V

THEORY BUILDING

CHAPTER X

UNRAVELING THE PROCESS OF CREATIVE CONSTRUCTION: THE SYNTHESIS AND CONSTRUCTION OF A THEORETICAL MODEL [8]

The term creative destruction was coined in the 1950s by the Austrian economist Joseph Schumpeter, to suggest that some established companies would lose their market position (and competitive advantage) due to competition emerging from new technologies. Since then, the term and its concept have evolved and some scholars have suggested that disruptive technologies would substitute existing technologies, causing a disadvantage to incumbent firms and providers. However, no one has suggested how this happens? This theoretical research paper explores the process by which creative construction, as suggested by Schumpeter, would have an impact on an industry, and how it would change the corporate strategy of the firms and the industry structure, in this industry. The paper uses grounded theory to construct and propose a theoretical model and its propositions, using insights from the high technology industry.

10.1 Introduction

The information technology and telecommunication industries are different than any other industry. Firms established in this knowledge intense sector of the economy face turbulent environmental challenges. The information technology and telecommunications products are technically complex and the embedded knowledge is tacit in nature, non codified and non transferable as a public good. The rates of innovation of new technologies and products are high and the industry face continuous waves of new technological generations and disruptive

[8] This chapter was published as an article, with the title "Unraveling the process of creative destruction and its impact on corporate strategy and industry structure", in the proceedings of the administrative sciences association of Canada (ASAC) annual conference 2010, strategy division. Regina, Canada, May 2010. Vol. 31, No 6. The article received the *best student paper award* from the strategy division at ASAC 2010.

technologies, which render the products obsolete, possibly even before being launch to the market and received by the end user customers. In fact the rate of obsolescence is higher the time required to recover the skyrocketing investment needed in research and development in order to produce new products and technologies that would be built on the core competencies of the firm and sustain competitive advantage. The complexity of the technology is coupled with a high level of uncertainty due to the lack of dominant standards, the lack of credible forecast for the potential new product and the lack of specific requirements from the customers. Moreover, the telecommunication industry has witnessed a continuous and intense wave of innovation and disruptive technologies (Christensen, Anthony, & Roth, 2004; Christensen & Raynor, 2003), which represents an illustration of the pattern that affected many high technology sectors from 1997 to 2003. Researching this pattern, gives an explanation to the real reasons of why some companies survive, while others fail, in the face of such environmental challenges. (Sarkis, 2009)

The telecommunications industry has been going since the 1990s through a quiet major shift. New technologies, products, services and innovations are continuously emerging, with their impact changing every aspect of our lives and the way business is conducted. Some of them are well known to the end-user customers such as Wi-Fi, Wi-Max, Skype, Vonage and mobile video. Others are not transparent to the end-user customers and are less known due to their complex technical nature, such as voice over internet protocol (VoIP), MPLS (Multiprotocol label switching), optical switching, IPTV (Internet protocol television), broadband, triple and quadruple play. Some of them represent improvements to existing technologies and services, not radical change, and are categorized as *sustaining innovations*. Others represent a radical change with the potential of destroying value for existing technologies and services and creating value by introducing new technologies and services (Christensen, 1997). These *disruptive technologies and innovations* are substituting existing technologies and services, posing a great challenge to locked-in incumbent service providers by eroding competency, market share and boundaries, and facilitating the entry of new and smaller dependence-free service providers, by reducing barriers, and providing more competitive advantage based on new services and business models (Christensen, Anthony, & Roth, 2004). This major shift is happening at different levels and is causing a major change in the industry structure of the telecommunications industry. It is creating a new 'digital ecosystem' in which data, voice, and video, wireline and wireless, traditional telephony and TV broadcasting, are all converging, in addition to the entry of new players such as

the application (i.e. Google, MSN, Facebook, Skype), content (i.e. YouTube) and entertainment service providers (i.e. Fox, NBC, Turner). (Sarkis, 2009)

The telecommunications industry major shift is in line with the work of the Austrian economist Joseph Schumpeter, who in 1950 coined the term "*perennial gale of creative destruction*" where he described how companies and monopolies are challenged by the competition, not based on price, but on *"competition from the new commodity, the new technology...competition that strikes not at the margin of the profit of the existing firms but at their foundations and their very lives"* (Schumpeter, 1950 p. 84). This *creative destruction* and the emergence of the disruptive technologies do not start in the service provider segment of the telecommunications industry or by just being introduced to the end-user customer. It is transferred to the service provider segment, as new services and business models, through the buyer-supplier relationship that exists between the service providers and the equipment manufacturers in the telecommunication industry. Therefore, this convergence of services and business models, are the end products delivered to the service providers by the equipments manufacturers. (Sarkis, 2009)

The term *disruptive technology* was first coined by Clayton Christensen in his book *The Innovator's Dilemma* (Christensen, 1997) and then used in the subsequent books *The Innovator's Solution* (Christensen & Raynor, 2003) and *Seeing What's Next* (Christensen, Anthony, & Roth, 2004). The concept behind the new term 'disruptive technology' and more generally 'disruptive innovation' could be traced back to the Austrian economist Joseph Schumpeter who developed the theory of creative destruction in his book *Capitalism, Socialism and Democracy*, published in 1950. In his book, Schumpeter wrote *"The opening up of new markets and the organizational development from the craft shop and factory to such concerns as US Steel illustrate the process of industrial mutation that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one ... [The process] must be seen in its role in the perennial gale of creative destruction; it cannot be understood on the hypothesis that there is a perennial lull."* (Sarkis, 2009)

It is important to note that Schumpeter (1934) defined the development of new product or technology as *new combination* or innovation. He suggested that *"new combinations do not arise*

out of existing firms but in new firms that rise up along the existing ones" (Schumpeter, 1934: p. 66). In explaining how these new combinations lead to the change of the competitive landscape or creative destruction, he added: *"...especially in the competitive economy, in which new combinations mean the competitive elimination of the old, it explains on the one hand the process by which individuals rise and fall economically and socially and which is peculiar to this form of organization."* (Schumpeter, 1934: p. 67).

However, only few studies explained to us how this 'new combination' or innovation, when it takes place, would eventually replace the old technology and consequently provoke a creative destruction as suggested by Schumpeter. In fact, the later did suggest that such a creative destruction would take place, but he did not elaborate on the process, by which the new technologies are created, and through which stages, they would replace the old ones. In fact, the term *process* was not part of Schumpeter's definition of creative destruction. As for Christensen's disruptive technologies, his research could be categorized mainly into three contributions: the description of the dilemma of existing companies facing the disruptive technologies; how to predict disruptive technologies; and how some disruptive technologies would threaten some industries, the telecommunication industry included (by giving some examples of final products such as Voice over IP). But Christensen did not explain how these disruptive technologies would impact the telecommunication industry, and to what extent, to what effect and through which process, stages or phases? In fact, our understanding of the concept of creative destruction and its relationship with the disruptive technologies remain unclear, vague, and ambiguous. At its best, it is a simplified construction of a more complex reality. This is partly due to the lack of a process perspective to the study of the concept of creative destruction and for the lack of a qualitative study (or a quantitative for that matter) that explores in depth the effect of creative destruction on an industry. So we believe that this area is under researched and there is a gap in the literature of business policy and strategy and technology and innovation management.

Therefore, this theoretical research intends to fill this gap, by unraveling and exploring the creative destruction and its process in the high technology industry. In doing so, the research will explain and highlight the relationship of the disruptive technologies and innovations, the intensive acquisitions activities and the integration of technologies and the convergence of services, with the process of creative destruction, in the context of the high technology industry,

using insights from the telecommunications industry in North America, and specifically the equipment manufacturers in Silicon Valley and the service providers in North America. Furthermore, the impact of the process of creative destruction on the corporate strategy and on the industry structure of the telecommunications industry will be examined.

The objectives of this theoretical research are to (1) explore and understand the creative destruction and its process in the high technology industry; (2) explore and understand the relationship of the disruptive technologies and innovations, the intensive acquisitions activities and the integration of technologies and the convergence of services, with the process of creative destruction; (3) to explore the impact of the process of creative destruction on corporate strategy and the industry structure of the telecommunications industry, as an example; and (4) to use testable propositions and the guidelines for building theory, in introducing and explaining the building blocks of the proposed model, the relationships between these building blocks and the underlying logic that explains the causal relationships.

Following the introduction, the next section will provide for a theoretical background on the telecommunications industry; the disruptive technologies and innovations; the intensive acquisition activities and the development of the Acquisition & Development business model; the entrepreneurial activities in the high technology industry; and the convergence of services. Following the theoretical background, the next two sections will discuss the methodology used for data collection and analysis, and will introduce the proposed theoretical model for the process of creative destruction, followed by an explanation of the rational behind its building blocks and their relationships, using a list of testable propositions for further empirical research. Finally, the discussion section will provide a final reflection on the impact of the process of creative destruction on the corporate strategy and industry structure, and the contribution of this research.

10.2 Theoretical Background

The telecommunications industry is composed of two major industry segments: (1) the equipment manufacturers segment, where companies conduct research and development (R&D), design, manufacture, commission telecommunications equipments and distribute them to

consumers, corporate customers (banks, hospitals, education institutions, etc.), government (civil and defense), utilities and service providers (telephony, mobile, cable operators); and (2) the service providers segment, where companies (public and private) provide telecommunications services, such as residential telephony, mobile communications, satellite services, video conferencing, cable TV programming, Internet and email access, to consumers, corporate customers and government.

The telecommunications equipment manufacturers segment is subdivided into sub-categories such as transmission equipment, satellite, microwave, mobile, internet, cabling, submarine cabling, local area networks, wide area networks, wireless, etc. Until recent years, each of these sub-categories was a specific area of expertise and companies were limited to working in one or few areas of those sub-categories. However, due to the intensive and continuous emergence of disruptive technologies and innovations, we are witnessing the integration, merging, and convergence of these sub categories into fewer technical platforms and systems or into a single platform. (Sarkis, 2009)

Moreover, the telecommunications service providers segment, until recently, was subdivided into sub-categories such as residential telephony, mobile or cellular communication, cable television, and Internet access. Recently, and due to the emergence of disruptive technologies and innovations and to the integration and convergence of these technologies taking place in the telecommunications manufacturer segment, many of these sub-categories of services are merging and converging into bundled and packaged services and are being offered to the end user customer in a variety of modules, bundles and prices. As an example, traditional incumbent residential telephony providers (i.e. Bell Canada) now offer mobile telephony and data (i.e. Bell Mobility), variable speed dialup and ADSL internet and email access (i.e. Sympatico) and cable television programming through satellite transmission services (i.e. ExpressView). On the other hand, traditional cable television service providers (i.e. Videotron) offer very high speed internet access through cable internet, residential and mobile telephony, besides television programming. (Sarkis, 2009)

10.2.1 Disruptive Technologies and Innovations

Christensen et al. (2004) describe the disruptive innovation theory in such situations where "*new organizations and market entrants can use relatively simple, low cost innovations to create growth and win over powerful incumbents and that the theory holds that existing companies have a high probability of beating entrant attackers when the contest is about sustaining innovations, but established companies almost always lose to attackers armed with disruptive innovations.*" (Introduction, XV). Christensen et al. (2004) identify three types of innovations: "(1) Sustaining innovations, which move companies along established improvement characteristics, and are improvements to existing products on dimensions historically valued by customers. Disruptive innovations, introduce a new value proposition, and are either creating new markets or reshaping existing markets. There are two types of disruptive innovations: (2) Low-end disruptive innovations can occur when existing products are too good and hence overpriced relative to the value existing customers can use; and (3) New market disruptive innovations, can occur when characteristics of existing products limit the number of potential consumers or force consumption to take place in inconvenient, centralized settings." (Sarkis, 2009)

The theory is related to the Resource Based View, as it takes into consideration the resources, *"which are assets the company can build or destroy, the processes, which establish patterns of work to transform inputs into outputs, and values, which determine the criteria by which the companies allocate the resources."* Christensen states that *"incumbent firms fail in the face of disruptive innovations because their values will not prioritize disruptive innovations, and the firm's existing processes do not help them get done what they need to get done."* The disruptive innovation theory is also related to the value chain evolution theory as the companies have a choice: *"They can choose to integrate, executing most of the activities themselves, or they can choose to specialize and focus on a narrow range of activities, relying on suppliers and partners to provide other elements of value added."* Christensen et al. (2004) (Sarkis, 2009)

In general, the process of disruptive technologies and innovations can be associated with the destruction of value and the creation of value, for both the providers and the end-user customers. For example, the destruction of value could be in the loss of previously estimated

revenues from the voice telephony by the incumbent telephony service provider, for the new cable operator providing the same service to end-user customer. This new cable telephony service offering represents a creation of value for the cable operator in term of revenue streams, and for the end-user, who is offered an alternative service for a better price, and diminishing the monopoly of incumbent operators. Here is a partial list of disrupted technologies in the telecommunications industry:

1. Telephony replacing telegraph
2. Packet switching networks replacing circuit switching networks
3. Virtual private networks replacing leased lines
4. VoIP using Skype application replacing incumbent international calls service providers
5. WiMax Microwave technologies replacing incumbent service providers' infrastructure
6. Mobile telephony replacing paging services
7. Mobile telephony replacing terrestrial fixed line services
8. Routers replacing time and wave division multiplexing transmission
9. High bandwidth fiber optics replacing copper wire
10. DSL (Digital subscriber line) high-speed Internet access replacing dialup modems

10.2.2 The Ecology of Disruption

One technology does not necessarily constitute a product in itself. It could be a computer algorithm, a network protocol, an encryption code, a specific technique, a process, a class of fiber, a processing chip, etc. The product is created by assembling and integrating this mosaic of technological ecology. Each of these technologies emerges in the environmental ecology of the firm, in different temporal brackets, and not in a sequential pattern that would eventually lead to the creation of one stand alone product. In addition, these technologies are created and developed independently, although their innovation teams collaborate informally through personal networking and the participation in technical forums, presentations, and standards bodies. The technologies are then selected through the natural selection process by the ecology of the ecosystem.

10.2.3 Intensive Acquisition Activities

The equipment manufacturing firms established in this knowledge intense sector face a variety of turbulent environmental challenges (Bahrami & Evans, 1989; Romanelli, 1989). Their products are technically complex (Bettis & Hitt, 1995; Jemison & Sitkin, 1986b), in which the embedded knowledge is tacit in nature (Oliver, 1997), non codified and non transferable as a public good (Hagedoorn & Duysters, 2002; Peteraf, 1993). The complexity of the technology is coupled with a high level of uncertainty (Hoffman & Schaper-Rinkel, 2001; Quelin, 2000) due to the lack of dominant standards or standard wars (Besen & Farrell, 1994; Shapiro & Varian, 2003), the lack of credible forecast for the potential future new products and the lack of specific requirements to respond to the customers' needs (Quelin, 2000; Roberts et al., 2001; Robertson & Gatignon, 1998; Walker & Weber, 1984). The rate of innovation of new technologies and products is higher than any other industry (Hitt, Hoskisson, & Ireland, 1990; Hitt *et al.*, 1991a; Hitt *et al.*, 1996) and the industry faces continuous waves of new technological generations and disruptive technologies (Christensen, 1997; Christensen, Anthony, & Roth, 2004; Christensen & Raynor, 2003; Utterback & Acee, 2005b), which render the products obsolete, possibly even before being launched to the market (Mayer & Kenney, 2004b). The rate of obsolescence is such that products often become obsolete before their development costs can be recaptured (Roberts & Liu, 2001). The new and disruptive technologies emerge either inside the firm or in the environmental ecological system, following a pattern of an epidemic technology diffusion, mutation and permutation of characteristics. (Sarkis, 2009)

Therefore, it is difficult for one company to rely on internal innovation through R&D capabilities and existing strategic assets alone. Besides, the integration of technologies and the convergence of services that we are witnessing in the service providers segment are not the results of the system integration, conducted by the service providers, of separate and independent products that were transferred from the equipment manufacturers. It is achieved by the equipment manufacturers, through a deliberate strategy of an intensive wave of acquisitions with the objective of achieving platform leadership among competitors (Gawer & Cusumano, 2002). This imageneering of the future and the enactment of the industry structure and directions, leads to the strategically reengineering of the core competencies of some manufacturing firms, to create a dominant logic and a sustained competitive advantage (Prahalad & Hamel, 1994). Thus is the link

between the emergence of the disruptive technologies in the ecosystem, to the acquisitions intensity in the manufacturers segment. (Sarkis, 2009)

Consequently, since the 1990, there was a substantial increase in mergers and acquisitions activities in the high technology industry. More than 11,000 acquisitions were completed in 1997 for a value estimated at over US$ 900 billion (Chaudhuri & Tabrizi, 1999a). This intensity of acquisition's activities Hitt et al., 1990; Hitt et al., 1991b) is motivated by different reasons. Beside traditional motivations of economizing and empire building, high-tech firms used acquisitions mainly to acquire external strategic resources, gain access to valuable human talents, reduce the cost and risk of R&D, expand their portfolio of products, reduce product time to market and provide for an external source of innovation. (Sarkis, 2009)

The development of the Acquisition and Development Model (A&D). The strategy, termed "acquisition and development" or "A&D", combines acquisition activities for external sources of innovation, while maintaining the internal innovative capacities of the firm (Mayer & Kenney, 2004b). It starts by identifying the firm's internal needs (resources) and assessing the potential players for acquisitions in the strategic group within the industry, by means of continuous scanning of the competitive environment (Chaudhuri & Tabrizi, 1999a). During this scanning of the environment, informal relations (i.e. links) are established with the objective of identifying and evaluating potential emergent new technologies and innovation, assessing human assets (i.e. resources) involved in those activities and estimating the real economic value (i.e. cost) of these resources, in terms of technologies and human capital. (Sarkis, 2009)

The evolution of acquisitions in Cisco Systems. The networking segment of the telecommunications industry was created by the fusion of information technologies and traditional telephony technologies, to connect computers to each other using computer networks and protocols through public telephone networks. In the networking segment, several firms have used acquisitions as their main strategy for growth. For example, Cisco Systems, a Silicon Valley based company working in the manufacturing of networking and telecommunications equipment and software, acquired more than 107 companies during the period from 1993 to 2006. In the year 1999 alone it acquired 18 companies and in the year 2000 it acquired 23 companies, with an average of almost two acquisitions a month, or in other words, an acquisition every two weeks. It

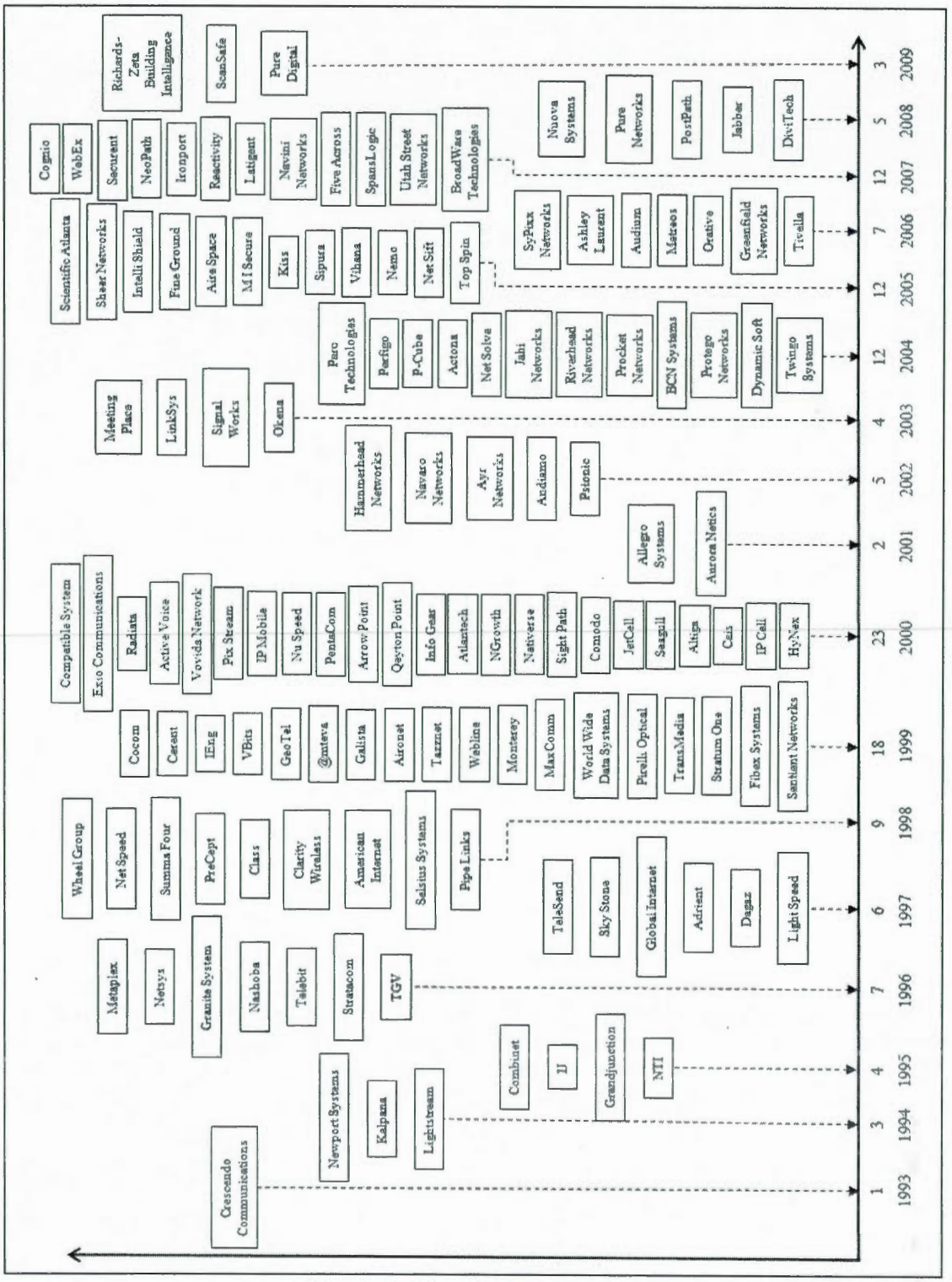
completed 12 acquisitions in 2004 and another 12 in 2005. Moreover, Nortel Networks completed 21 acquisitions in the period between 1996 and 2006 and Lucent Technologies completed 41 acquisitions during the same period. Lucent was later acquired by Alcatel in December 2006. Today, Cisco Systems stands as the leader in the telecommunications industry and as the firm who created this trend of using a successful aggressive acquisition strategy as its main growth engine (Sarkis, 2009). Figure 10.1 shows the evolution of Cisco's intensive acquisition strategy from 1993 to 2009 (Sarkis, 2011).

10.2.4 Entrepreneurship and Venture Capital

Venture capital is an important aspect of the entrepreneurial activities in the high technology industry. Beside identifying the opportunity and having the motivation to take risk, in a highly uncertain and turbulent environment, the non endowed entrepreneur has to secure the financial resources necessary to pursue his opportunity, with a reasonable amount of risk and interest. Venture capital and angels investors are an essential and critical part of the high technology industry. They not only provide financial support, but most of the time, they additionally provide technical backing, managerial experience, access to social capital and even moral encouragement. The model of startups that are backed by venture capital is widespread and dominates the high technology industry, such as the information technology and biotechnologies. The startups that are backed by venture capital are widely perceived as more likely to adopt strategic planning rather than an opportunistic adaptation behavior. However, in the high technology industry, specifically the information technology, networking and telecommunications segments, we believe to the contrary, that venture capital adapts well to entrepreneurs and new ventures using either mode: opportunistic adaptation or strategic planning. Their interaction with entrepreneurial activities and entrepreneurs and their relationship with intensive acquisitions and the development of the acquisition and development model will be discussed in the next section on theory building and propositions. Here are some of the roles played by different types of entrepreneurs: (Sarkis, 2011)

Figure 10.1

The timeline of Cisco System's acquisitions from the year 1993 till 2009 (Sarkis, 2011)



The inventor entrepreneur. The inventor entrepreneur is the one who has the brilliance of inventing new technologies, devices, machines, etc. and later turns them into a profitable business idea, business plan, and a new venture, creating a significant economic value. A good example would be Graham Bell, and Thomas Edison. In the high tech industry, there are some good examples of young entrepreneurs, who started their own startup based on their invention and creation, and later inspiring other like-minded people to join them. (Sarkis, 2011)

The bricoleur entrepreneur. The 'bricolage' is a French word, referring to the act of using existing materials and tools to create new things. The bricoleur entrepreneur is a sort of handy-man, who creates a technology or product idea out of a perceived opportunity and using available ingredients. A good example is Steve Job of Apple. (Sarkis, 2011)

The imitator entrepreneur. The imitator entrepreneur is the one who starts his new business by copying or modifying someone else's idea. According to Bhide (2000), most of the entrepreneurs are in this category, as isomorphism being the explanation for this behavior. This category applies also to the high technology industry, as lots of technologists and entrepreneurs embark on creating new ventures, when they see an opportunity, in terms of technology or market, concretizes with others. While the widely held perception is that all startups in Silicon Valley and Route 128 are based mostly on new technologies and product ideas, we believe that a fair amount of ideas are isomorphic. (Sarkis, 2011)

The serial entrepreneur. This type of entrepreneur is the one who sees an opportunity and establishes, maintains and develops a new business venture to a certain point of stability and success in the organization life cycle and development stage, then moves on to establish a new venture based on a new opportunity or an extended variation of the first opportunity. In doing so, this serial entrepreneur is going from one venture to the other, by hopping from one business stage of venture development in a newly created venture, be it post start up, transitional or corporate phase, to another business stage of a new or another venture, such as a new startup creation, or at the managerial and leadership stages of an existing new venture. This serial entrepreneur could be motivated by either his passion for venture creation with its embedded excitement, risk taking, opportunity development and gratifying experience; or by financial

motivation, as he sees no interest in staying with his own created venture till later stages of its life cycle and development stages, and prefers to recover his initial investments multiplied by the establish market value of his created venture, based on its product and market potential. In doing so, he might be lacking the necessary managerial skills to continue developing his own created venture, as he might perceive himself as not fitting with a new stage of development of his created venture and its required hiring of external managerial experience. In Silicon Valley Mory Ejabat is a good example of the serial entrepreneur. (Sarkis, 2011)

The corporate entrepreneur. The entrepreneur does not have to be always self employed. The corporate entrepreneur, is the one who, while working and acting as a high ranking corporate officer with his current employer, he acts and performs tasks that traditional self employed entrepreneurs do, and in addition possesses all the characteristics and skills of a regular entrepreneur, such as tolerance for ambiguity, alertness to and the ability to perceive and identify opportunity, risk taking, passion for venture creation, high energy, leadership, and teams building, etc. Their executive functions could require them to be highly visible for networking, to invest in trials of new technologies, to support new ideas and prototypes as angel investors, to scan the environmental ecosystem of their firm for new opportunities and to acquire or ally with potentially successful new trends, and new technology providers, etc. One good example is Michelangelo Volpi, the chief strategy and acquisition officer at Cisco Systems. (Sarkis, 2011)

The acquisition-driven entrepreneur. This is the entrepreneur, be it corporate, incremental, serial, complementor or supplementor, who uses acquisitions as a strategy for developing new businesses and for existing businesses. Moreover, the acquisition driven entrepreneur could acquire new and established businesses created by the pioneer, the bricoleur, the inventor, the imitator, the accidental and the plateau entrepreneurs. Acquisition-driven entrepreneurship will be discussed in more details in the next section and as part of theory building. (Sarkis, 2011)

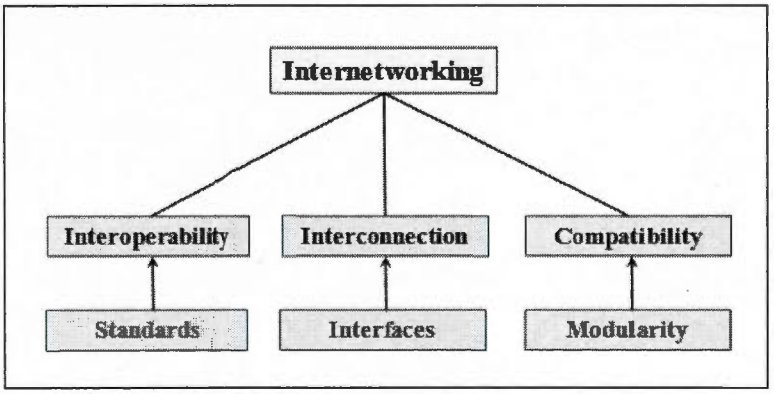
10.2.5 Integration of technologies and services

The acquired technologies are then integrated to be part of the product platform. The main objective of the integration of technologies is to guarantee *internetworking*, which means

that all the technologies, modules, devices and products are capable of working properly together and are capable when connected to transport the communication content smoothly from its source to destination, whether its voice, data or video, and over whatever acceptable length as prescribed by the appropriate standards. The objective of internetworking, as illustrated in figure 10.2, is achieved through *interoperability* by means of compatible standards, *interconnection* by means of compatible interfaces, and *compatibility* by means of modularity.

Figure 10.2

Internetworking as a key objective for system design and integration

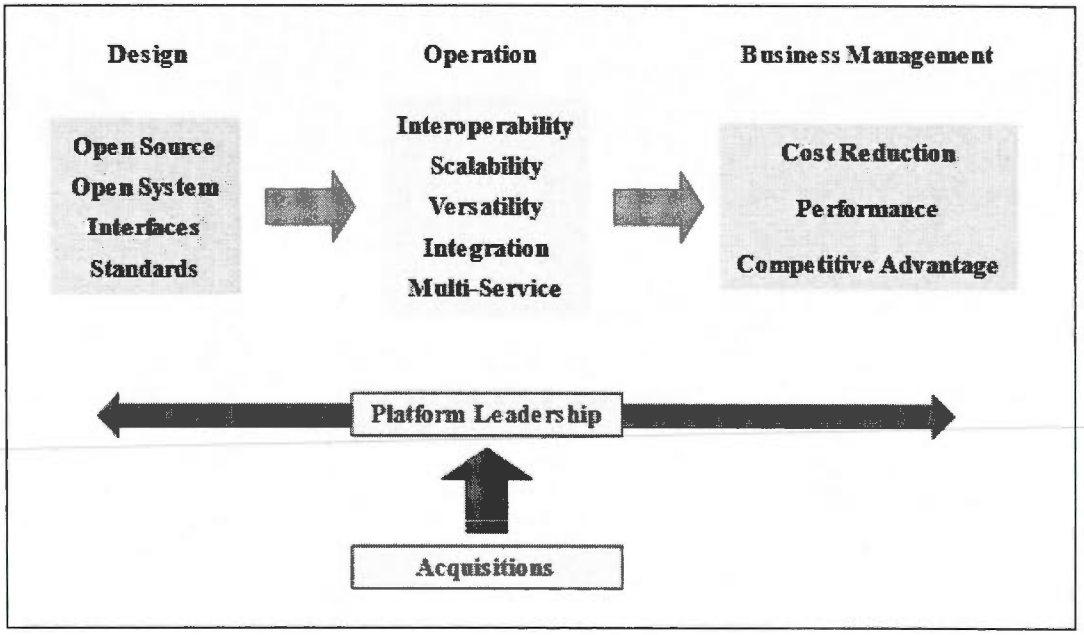


The objectives and advantages of modularity span from the system design to the system operation and finally to the business management, as illustrated in figure 10.3. In the design phase of the system, the design is in most cases, based on open sources, open system and with the respect to current interfaces and standards. In the operation phase, the system design should guarantee interoperability, scalability, versatility, integration and multi-services. In the business management phase, the system design should provide for cost reduction, better performance, and therefore competitive advantage, both technical and economical. The firm's adherence to these criteria, coupled with the intensive acquisition activites, aims at achieving the strategic goal of platform leadership. This translates into creating and sustaining a competitive advantage and a superior market positioning, through the capability of offering to the service providers a wide

variety of technologies, services, applications and across different market segments, while guaranteeing internetworking, cost reduction, better performance and user friendly management. This leads to a dominant market position and the ability to influence and enact future standards and interfaces, and therefore reducing uncertainty.

Figure 10.3

Objectives and advantages of modularity



10.2.6 Convergence of Services

In the service providers segment of the telecommunications industry, the integrated technologies provided by the manufacturers, give rise to new disruptive innovations and the convergence of services and business models. This is creating a new landscape for the telecommunications industry and changing the rules of the game that were established decades ego, leading to a change in the industry structure of the telecommunications industry. The change in the industry structure refers to the change in the competitive dynamics and market forces, the

change of the firms' competitive advantage, the changing and blurring of market boundaries, the erosion of market shares, the destruction of competencies, the lack and need for a new regulatory environment, the cannibalization of services and the subsequent loss of revenues in traditional markets (Evans & Schmalensee, Forthcoming; Parker & Alstyne, 2005; Porter, 1980a).

For example, the ability to have an overseas voice conversation on the internet with a reasonable quality of service (QoS) using embedded software such as Microsoft Messenger (MSN) or unbundled software such as Skype, is sharply reducing the traditional international calls' revenues for the telephony operators. New telecommunications alternative providers, such as Vonage and others, offering service providers-like's quality of service with a fraction of the cost, are challenging the traditional telephony operators locked-in with long term investments based on old technologies and infrastructure, in the local and international business segments. Enterprise voice over internet protocol equipments, or simply VoIP, sold by the equipment manufacturers directly to the end-user customers, are bypassing the telephony operators and sharply reducing their private automatic branch exchange traditional business. (Sarkis, 2009)

On a larger scale, the Wi-Max Microwave disruptive technology is decreasing the barriers for new investors to enter the service providers market and provides city-wide coverage of wireless-fixed broadband services, including data, voice, and video, with a fraction of the costs and a lower technical expertise. Traditional cable TV operators are offering residential telephony and broadband Internet access, competing directly with traditional telephony operators in their core business. Telephony operators would be able to offer TV programming services using a technology called IPTV (Internet Protocol Television), competing directly with cable operators in their core business. The last two examples are based on the convergence new business model called "triple-play". Moreover, the convergence of fixed and wireless broadband, adds another emerging business model, the quadruple play. Finally, the entrance of new nontraditional telecommunications players, such as content and entertainment providers (i.e. YouTube, Google, AOL, Microsoft, NBC, FOX, Turner and Virgin), gives rise to new business models. In these innovative business models, the industry change refers to the market boundaries and the ownership of the network. It is already contemplated that the ownership of the network and services could be transferred to the media giants who would provide the content in addition to the traditional telecommunications services, while the network infrastructure and service would

become just a conduit. All this is happening while the regulatory environment is lagging behind, with large variations and differences between countries in industrial markets, OECD countries, emerging economies, highly and less competitive markets and geographic areas. (Sarkis, 2009)

10.3 Theory Building and General Propositions (Hypotheses)

Based on the theoretical background presented in the previous sections, this section deals with the construction of a theoretical model and suggests some propositions or rough hypotheses to explain the underlying logic. First, attempting to link the different blocks, previously described, in a process perspective, figure 10.4 shows an initial *conceptual model* of the process of creative destruction linking disruptive technologies, with acquisitions, technology integration, service convergence and the change in industry structure, in the context of the telecommunications industry. (Sarkis, 2009)

During periods of incremental and revolutionary change in the high technology industry, the emergence of new technologies and new innovations is facilitated by the entrepreneurs who carry out new combinations. Entrepreneurs, transform existing knowledge into innovation. They acquire this knowledge through their interactions, collaboration, interactive learning, and participation as members of a national system of innovation, which encompasses universities, R&D labs, standard bodies, patent offices, and government agencies, etc. Based on this knowledge, their cognition is enhanced and their ability to identify opportunity is improved. These technologies could be *complementary*, *supplementary* or *substitutive* technologies to existing ones. Equally, these technologies could be considered sustaining technologies, as to provide an improvement to existing technologies and product in term of quality and price, or they could be potentially disruptive technologies, offering a radical change from established products and services. These disruptive technologies could potentially pose a threat to incumbent firms, as they propose a change in the competitive landscape and a menace to their sustained competitive advantage. Figure 10.5, illustrates a section of the proposed theoretical model with its relationship, while taking into consideration that the final proposed theoretical model does not include the entrepreneurship and venture capital aspects of the process of creative construction for a simplification purpose. This is the reason they appear in dotted lines. (Sarkis, 2011)

Figure 10.4

Conceptual model: A process perspective of the relationship between disruptive technologies, acquisitions, convergence and the industry structure (Sarkis, 2009)

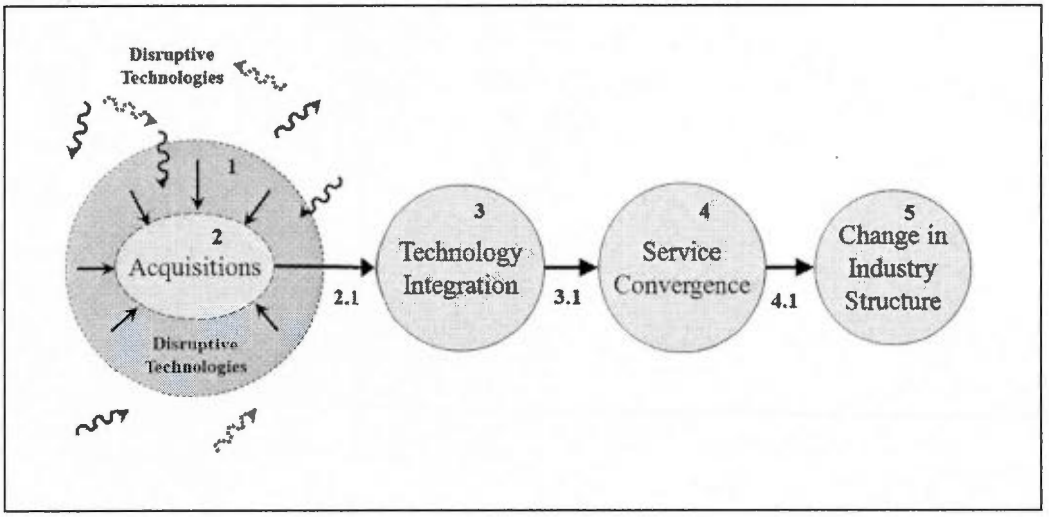
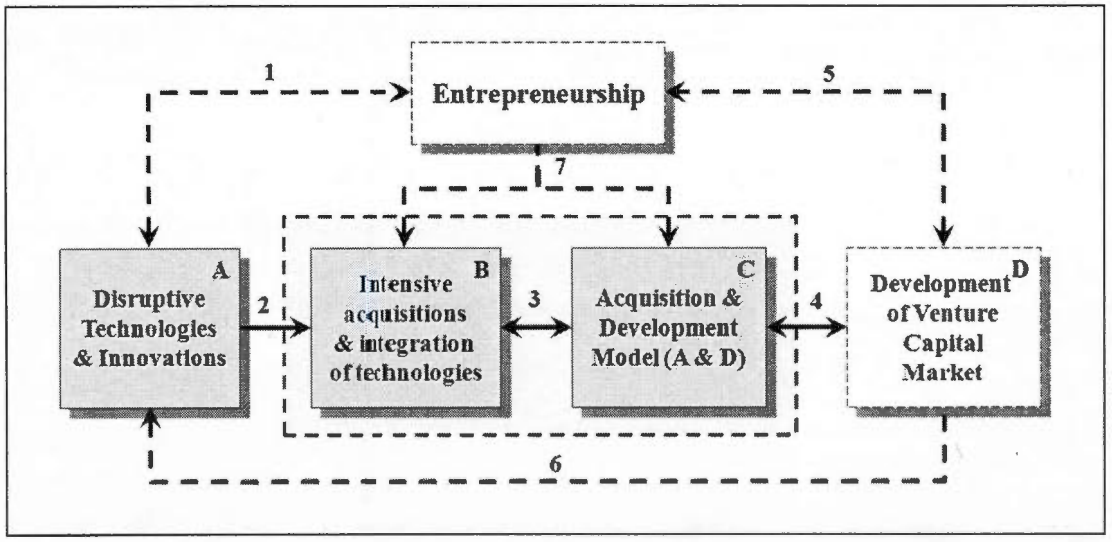


Figure 10.5

The relationship between disruptive technologies, acquisitions and entrepreneurship (Sarkis, 2011)



Proposition 1: New technologies and innovations, including sustaining and disruptive technologies are facilitated by entrepreneurs who seek to challenge the existing competitive landscape and find an opportunity through a technology breakthrough;

From the other hand, existing firms and incumbent service providers in the high technology industry operate in an environment which is characterized by high uncertainty, turbulence and high velocity. The rising cost and risk of internal R&D and the threat of the environmental and industrial shifts, coupled with the internal scarcity of strategic assets, the tacit and embedded nature of knowledge, and the threat of substitutive technologies, increment the difficulty for the established firms to rely solely on internal sources of innovation to sustain competitive advantage.

Proposition 2: The emergence of new technologies, either sustaining or disruptive, motivates the established firms to acquire these new technologies, through acquisitions and the integration of these technologies, as external sources of innovation;

In some industries, such as the high technology industry, the rate of innovation is much higher and the frequency of emergence of new technology is short-paced. This is coupled with higher investment risks in internal R&D, higher rates of technology and product obsolescence, and shorter time to market required for end-user products. Moreover, the emergence of the new technologies has an epidemic pattern of technology diffusion and the nature of the technologies is as such that they are part of a mosaic of technologies, which means that only one technology does not constitute a product-transferable opportunity. Consequently, and facing these challenges, some firms adopt a new model of strategic choice, based on intensive acquisitions, as the main strategy for growth and sustaining competitive advantage. This model and the cumulative experience gained in implementation reinforce this strategy of acquisition for growth based on the Acquisition & Development model, and it becomes a dominant logic.

Proposition 3: Facing environmental challenges, establish firms embark on programs of intensive acquisitions, and they develop and adopt a new business model called Acquisition & Development (A&D), instead of R&D, as the main strategy for growth and to sustain competitive

advantage. Experience gained in acquisitions helps in reinforcing the model, therefore creating a bidirectional relationship;

The adoption of this model of acquisition called Acquisition & Development (A&D) by the established firms, and consequently the rise of corporate acquisition programs, foment and foster the development of the venture capital market, based on the demand and supply logic. More acquisitions require more venture capital firms, more experience, and more financial resources. The intensity of the acquisition program in one firm creates the cumulative expertise in the venture capital industry and more importantly, it creates a dominant logic that is equally profitable to venture capital firms, by which acquisitions become the main strategy for growth and encourages the replication and adoption by others. This dominant logic and its dynamic, encourages other hesitant firms to adopt this new strategy of acquisition for growth, based on the Acquisition and Development model, and the positive returns.

Proposition 4: The relationship between the intensive acquisition programs and the development of the Acquisition & Development model from one side, and the development of the venture capital market, is a bidirectional relationship. More acquisitions foster the development of the venture capital market. More cumulative expertise in the venture capital market creates a dominant logic that encourages more acquisitions;

Furthermore, the development of the venture capital market and the cumulative experience it creates, coupled with the availability of more venture capital financial resources for entrepreneurial ventures, encourage more entrepreneurs and would-be-entrepreneurs, to stay alert to opportunity and to help in using, sharing, producing and diffusing interactive learning, that is essential to new combination and innovation, within the context of a national system of innovation, in which venture capital and entrepreneurs are participating members. Equally, as venture capital development encourages more entrepreneurial activities, the increased number of entrepreneurs encourages the creation and development of more venture capital firms and put them in high demand.

Proposition 5: The relationship between the development of the venture capital market or industry and the increase in the entrepreneurial activities and the number of entrepreneurs is

bidirectional. The more venture capital is developed, the more entrepreneurial activities are encouraged. The more the number of entrepreneurs is increased, the more the venture capital firms and their activities are in high demand;

Moreover, the development of the venture capital industry, as it encourages the entrepreneurial activities; it induces, instigates and fosters the development of new technologies. While the venture capital firms represent the incubating environment, the new technologies are the final products and the entrepreneurs are the messengers. It is important to observe in the proposed theoretical model, that new technologies are encouraged, motivated and fostered by both, the entrepreneurs and the venture capital firms.

Proposition 6: The relationship between venture capital and the development of new technologies is unidirectional, as venture capital encourages and fosters the emergence and development of new technologies. The more venture capital is developed, the more is the emergence of new technologies. This relationship is moderated by the entrepreneurial activity and the efficiency of the national system of innovation;

The entrepreneurs and their entrepreneurial activities play a critical role in the increased number of acquisitions, the intensity of acquisitions' activities and the development and adoption of the Acquisition & Development model (A&D). For example, the *incremental entrepreneur* and the *acquisition-driven entrepreneur*, use acquisition for empire building, economies of scope and scale, and as a strategy for shorter time to market, reduced R&D activities with the incorporated risk and mainly for rapid growth versus internal development based on learning-by-doing. On the other hand, the *corporate entrepreneur* encourages the acquisitions of new startups and small ventures, by continuously scanning the firm's environmental ecosystem and national system of innovation; by looking and identifying opportunities; by investing in venture capital firms or acting as an angel investor; by backing up new technology initiatives, technology and product trials and prototypes; and by adopting the model of Acquisition & Development as the main strategy of growth for his established firm and as the mean to overcome and compensate for the lack of internal sources of innovation that are impossible to have them all in one company. He also could be interested in complementary, supplementary and substitutive technologies, the later being a mean to increase the entry barrier for competition and for avoiding disruption and

consequently the destruction of value for his own firm. Finally, and contrary to the widely held belief, new startups in the high technology industry are not motivated only by the desire of the entrepreneur to create new combinations, innovation, and new products and services. They are also motivated basically and instinctively by the opportunistic behavior of the entrepreneur and his desire for profit and rent. This legitimate desire includes the potential that his newly created firm, if successful and competitive, would be potentially acquired by a larger firm. This potential of being acquired by a larger firm could be deterministic in nature and intentional at the planning or developing phase of the new venture creation. If this is the case, the rational of the *acquisition-driven entrepreneur* would be to provide for complementary, supplementary or substitutive technologies or products. In other words, this acquisition-driven entrepreneur would start a new venture creation with the objective of, or at least to hope for, being potentially acquired by a larger firm, with all the financial and reputational consequences that this position would entail, which matches the legitimate opportunistic behavior of the entrepreneur.

Proposition 7: Entrepreneurs and their entrepreneurial activities encourage and motivate the intensity of acquisitions activities in the high technology industry and the adoption of the Acquisition & Development model, whether it is through the incremental entrepreneur, the corporate entrepreneur, the complementor and supplementor entrepreneurs and the acquisition-driven entrepreneur.

Following the acquisition decision and successful completion of the acquisition process, the acquired firms are integrated into the equipment manufacturing firms. The acquired disruptive technologies by the equipment manufacturers in the manufacturing segment are then integrated into the existing products portfolio, which leads to the creation of new products, based on technology type, application category, service protocol, modularity, platform, sizing, service coverage, market segment, packaging and pricing. These new products, with their acquired and integrated technologies, are then transferred to the service providers in the service providers segment through the buyer and seller relationship. These new products encourage and force the service providers to rethink their service plans and to restructure their services towards the integration of services.

Proposition 8: The integration of disruptive technologies by companies in the equipment manufacturers segment of the telecommunications industry, coupled by the emergence of disruptive innovations, lead companies in the service providers segment to integrate their services, based on integrated and converged technologies;

Proposition 9: The integration of services by the service providers in the telecommunication industry, lead to the convergence of services, bundling and packaging of services, and the emergence of new business models;

Proposition 10: The convergence of services poses a threat to incumbent service providers in the telecommunications industry. It has the potential to reduce the effect of historic monopoly, to reduce the barriers to new entry, to reduce the switching cost, to change and reshape the market boundaries, to give rise to new business models and to invite new entrants from outside the industry.

Figure 10.6 illustrates the constructed proposed theoretical model of the process of creative destruction in the high technology industry and its impact on corporate strategy and the industry structure, specifically in the telecommunication sector. The model was modified from its initial state presented in chapter 3 (Sarkis, 2009).

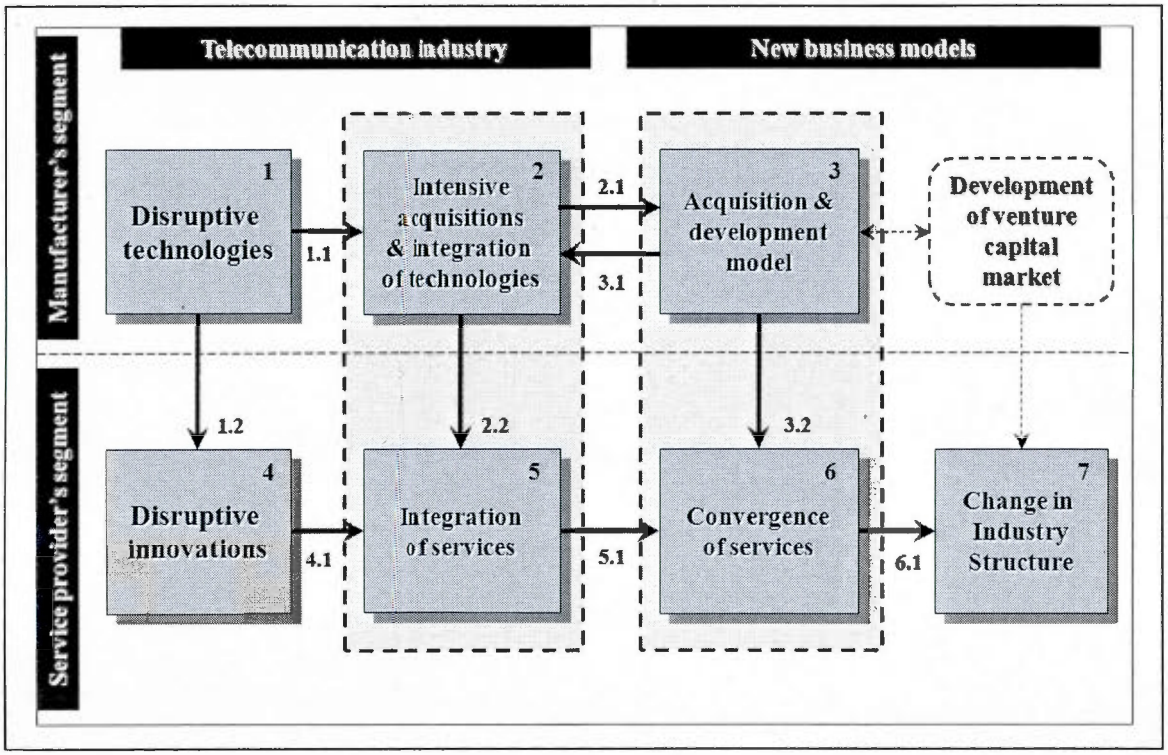
10.4 Discussion

This theoretical paper suggests a process perspective for understanding the concept of *creative destruction* (and construction) coined in the 1950s by Joseph Schumpeter. In doing so, it explains how new wave of technologies, sustaining and disruptive, would change the structure of both segments of the telecommunication industry, as an example of a high technology industry. The manufacturers segment would be forced to adopt a corporate strategy of intensive acquisitions, as the main strategy for growth and for sustaining competitive advantage. This will eventually lead to the emergence of a new business model in this segment based on acquisitions: the Acquisition & Development model (A&D). In the service providers segment, the newly acquired and integrated technologies, transferred through the buyer seller relationship, would

encourage and force the service providers to adopt a strategy of integration of services, which would eventually lead to the convergence of services, based on bundled and packaged services. For example, the convergence of basic services such as voice, data and video, would enable the traditional cable operators to offer voice telephony (residential or mobile) and internet access, in addition to cable services and TV programming, all bundled in one package with one bill. Moreover, the traditional incumbent telephony service providers would be able to offer television programming through high speed DSL Internet service, in addition to the traditional telephony and Internet access.

Figure 10.6

The proposed theoretical model for the process of creative construction in the high-tech industry



This wave of creative destruction would have a major impact on the industry structure of the telecommunication industry. It would change the competitive landscape for both existing

providers and new entrants. It would reduce the barriers for new entrants and invite new players from outside the industry, such as media providers (i.e. Warner, Paramount, etc.) and content providers (i.e. Google, Yahoo, and MSN, etc.). This would have an impact on the market boundaries of both the firms and the industry. While some competencies are destroyed, new competencies are created and new economic value is identified. This would give rise to new business models and the reshaping of an industry, such as the telecommunication industry, which witnessed a large period of stable growth and incremental development. All this highlights and explains the process of creative destruction, its components, stages, implications and consequences. The model could be generalized to other industries, specifically in the high technology industries.

References

Bahrami H, Evans S. (1989). Strategy making in high-technology firms: The empiricist mode. *California Management Review* 31(2)

Besen SB, Farrell J. (1994). Choosing how to compete: Strategies and Tactics in Standardization. *The Journal of Economic Perspective* 8(2): 117-131

Bettis RA, Hitt MA. (1995). The new competitive landscape. *Strategic Management Journal* 16: 7-19

Bhide A. (2000). *The origin and evolution of new business*. Oxford University Press

Burrell G, Morgan G. (1979). *Sociological Paradigms and Organizational Analysis*. Heinemann: Exeter

Charmaz K. (2000). Grounded Theory: Objectivist and Constructivist Methods. In NK Denzin, YS Lincoln (Eds.), *Handbook of Qualitative Research*, 2nd. ed.: 509-535. Sage: Thousands Oaks, CA.

Chaudhuri S, Tabrizi B. (1999). Capturing the real value in high-tech acquisitions. *Harvard Business Review* 3(4)

Christensen CM. (1997). *The innovator's dilemma - When new technologies cause great firms to fail*. Harvard Business School Press: Cambridge, Massachusetts

Christensen CM, Anthony SD, Roth EA. (2004). *Seeing what's next - Using the theories of innovation to predict industry change*. Harvard Business School Press: Boston, Massachusetts

Christensen CM, Raynor ME. (2003). *The innovator's solution - Creating and sustaining successful growth*. Harvard Business School Press: Boston, Massachusetts

Creswell JW. (1998). *Qualitative inquiry and research design : choosing among five traditions* Sage: Thousand Oaks, Calif.

Creswell JW. (2003). *Research design : qualitative, quantitative and mixed approaches* (2nd ed ed.). Sage Publications: Thousand Oaks, Calif.

Denzin NK, Lincoln YS. (2003). *Strategies of qualitative inquiry* (2nd ed ed.). Sage: Thousand Oaks

Eisenhardt KM. (1989). Building theories from case study research. *Academy of Management Review* 14(4): 532-550

Evans DS, Schmalensee R. (Forthcoming). The Industrial Organization of Markets with Two-Sided Platforms. In WD Collins (Ed.), *Issues in Competition Laws and Policies*:

Gawer A, Cusumano MA. (2002). *Platform Leadership: How Intel, Microsoft, and Cisco Drive Industry Innovation*. Harvard Business School Press

Gilgun J. (1999). We Shared Something Special: The Moral Discourse of Incest Perpetrators. *Journal of Marriage and the Family* 57: 265-281

Glaser BG. (1992). *Basics of grounded theory analysis: Emergence Vs. Forcing* Sociology Press: Mill Valley, Calif.

Hagedoorn J, Duysters G. (2002). External sources of innovative capabilities: The preference for strategic alliances or mergers and acquisitions. *Journal of Management Studies* 39(2)

Hitt MA, Hoskisson RE, Ireland RD. (1990). Mergers and acquisitions and managerial commitment to innovation in m-form firms. *Strategic Management Journal* 11: 29-47

Hitt MA, Hoskisson RE, Ireland RD, Harrison JS. (1991). Are acquisitions a poison pill for innovation. *Academy of Management Executive* 5(4)

Hitt MA, Hoskisson RE, Johnson RA, Moesel DD. (1996). The market for corporate control and firm innovation. *Academy of Management Journal* 39(5): 1084-1119

Hoffman WH, Schaper-Rinkel W. (2001). Acquire or ally? - A strategy framework for deciding between acquisition and cooperation. *Management International Review* 41(2): 131-159

Jemison DB, Sitkin SB. (1986). Corporate acquisitions: A process perspective. *Academy of Management Review* 11(1): 145-163

Kuhn T. (1962). *The Structure of Scientific Revolutions*. University of Chicago Press: Chicago

Langley A. (1999). Strategies for Theorizing from Process Data. *Academy of Management Review* 24(4): 691-710

Lincoln YS, Guba EG. (1985a). Establishing Trustworthiness, *Naturalistic Inquiry*, Vol. 11: 289-331. Sage Publication

Lincoln YS, Guba EG. (1985b). *Naturalistic Inquiry*. Sage Publication: Beverly Hills, CA

Mayer D, Kenney M. (2004). Economic action does not take place in a vacuum: Understanding Cisco's acquisition and development strategy. *Industry and Innovation* 11(4): 299-325

Miles MB, Huberman AM. (1984). *Qualitative data analysis : a sourcebook of new methods*. Sage: Beverly Hills

Miles MB, Huberman AM. (1994). *Qualitative data analysis : an expanded sourcebook* (2nd ed ed.). Sage Publications: Thousand Oaks

Oliver C. (1997). Sustainable competitive advantage: Combining institutional and resource based views. *Strategic Management Journal* 18(9): 697-713

Parker GG, Alstyne MWV. (2005). Two-Sided Network Effects: A Theory of Information Product Design. *Management Science* 51(10): 1494–1504

Patton MQ. (2002). *Qualitative research & evaluation methods* (3rd ed ed.). Sage Publications: Thousand Oaks

Peteraf MA. (1993). The cornerstones of competitive advantage: A resource-based view. *Strategic Management Journal* 14: 179-191

Porter M. (1980). *Competitive Strategy*. Free Press

Prahalad CK, Hamel G. (1994). *Competitng for the future*. Harvard Business School Press: Boston

Quelin B. (2000). Core competencies, R&D management and partnerships. *European Management Journal* 18(5): 476-487

Roberts EB, Liu WK. (2001). Ally or acquire? *MIT Sloan Management Review*

Romanelli E. (1989). Environments and strategies of organization start-up: effects on early survival. *Administrative Science Quarterly* 34(3): 369-387

Schumpeter J. (1934). *The theory of economic development.* Translation Publishers: New Brunswick

Schumpeter JA. (1950). *Capitalism, Socialism and Democracy* (3rd. ed.). Harper: New York

Shapiro C, Varian HR. (2003). The Art of Standards Wars, *Managing in the Modular Age: Architectures, Networks and Organizations*: 424. Blackwell Publishing

Strauss A, Corbin J. (1998). *Basics of qualitative research: techniques and procedures for developing grounded theory* (2nd ed.). Sage: Thousand Oaks, Calif.

Sutton RI, Staw BM. (1995). What theory is not. *Administrative Science Quarterly* 40: 371-384

Utterback JM, Acee HJ. (2005). Disruptive Technologies: An Expanded View. *International Journal of Innovation Management* 9(1): 1-17

Weick KE. (1995). What theory is not, theorizing is. *Administrative Science Quarterly* 40: 385-390

Whetten DA. (1989). What constitutes a theoretical contribution? *Academy of Management Review* 14: 490-495

Yin RK. (1989). Designing single - and multiple-case studies, *Case study research: Design and methods*, Revisited edition ed.: (170 p.), chap. 172, p. 127-160 (134p.). Sage Publications

Yin RK. (2003). *Case study research : design and methods* (3rd ed ed.). Sage Publications: Thousand Oaks, Calif.

CHAPTER XI

DISCUSSION AND CONCLUSION

The telecommunications industry has been going since the 1990s through a quiet major shift. New technologies, products, services and innovations are continuously emerging, with their impact changing every aspect of our lives and the way business is conducted. Some of them are well known to the end-user customers such as Wi-Fi, Wi-Max, Skype, Vonage and mobile video. Others are not transparent to the end-user customers and are less known due to their technical nature, such as voice over internet protocol (VoIP), MPLS, optical switching, IPTV, broadband, triple and quadruple play. Some of them represent improvements to existing technologies and services, not radical change, and are categorized as "sustaining innovations". Others represent a radical change with the potential of destroying value for existing technologies and services and creating value by introducing new technologies and services (Christensen, 1997). Those "disruptive technologies and innovations" are substituting existing technologies and services, posing a great challenge to locked-in incumbent service providers by eroding competency, market share and boundaries, and facilitating the entry of new and smaller dependence-free service providers, by reducing barriers, and providing more competitive advantages based on new services and business models (Christensen, Anthony, & Roth, 2004). This major shift is happening at different levels and causing a major change in the industry structure of the telecommunications industry. It is creating a new "digital ecosystem" in which data, voice, and video, wireline and wireless, traditional telephony and TV broadcasting, are all converging, in addition to the entry of new players such as the application, content and entertainment service providers.

The telecommunications industry major shift is in line with the work of the Austrian economist Joseph Schumpeter, who in 1950 coined the term "*perennial gale of creative destruction*" where he described how companies and monopolies are challenged by the competition, not based on price, but on *"competition from the new commodity, the new*

technology...competition that strikes not at the margin of the profit of the existing firms but at their foundations and their very lives" (Schumpeter, 1950 p. 84). This "creative destruction" and the emergence of the disruptive technologies do not start in the service provider segment of the telecommunications industry or by just being introduced to the end-user customer. It is transferred to the service provider segment, as new services and business models, through the buyer-supplier relationship that exists between the service providers and the equipment manufacturers in the telecommunication industry. Therefore, this convergence of services and business models, are the end products delivered to the service providers by the equipments manufacturers.

However, the products delivered by the equipment manufacturers are the result of the system integration, and assembly of a variety of technologies, which are then produced in modules or a single platform, then packaged and bundled to offer a variety of options and prices. Those technologies are either the product of internal innovation through internal R&D capabilities and strategic assets or external innovation through strategic alliances, joint ventures, or acquisitions. Some of the technologies are the combination of lower level technologies, or the permutation of various technologies. Due to the high velocity and intensive emergence of new and disruptive technologies in the manufacturers' ecosystem, it is difficult for the manufacturers to only rely on internal R&D capabilities and strategic assets that are built on the core competencies of the firm.

Furthermore, the equipment manufacturing firms established in this knowledge intense sector face a variety of turbulent environmental challenges (Bahrami & Evans, 1989; Romanelli, 1989). Their products are technically complex (Bettis & Hitt, 1995; Jemison & Sitkin, 1986b), in which the embedded knowledge is tacit in nature (Oliver, 1997), non codified and non transferable as a public good (Hagedoorn & Duysters, 2002; Peteraf, 1993). The complexity of the technology is coupled with a high level of uncertainty (Hoffman & Schaper-Rinkel, 2001; Quelin, 2000) due to the lack of dominant standards or standard wars (Besen & Farrell, 1994; Shapiro & Varian, 2003), the lack of credible forecast for the potential future new products and the lack of specific requirements to respond to the customers' needs (Quelin, 2000; Roberts et al., 2001; Robertson & Gatignon, 1998; Walker & Weber, 1984). The rate of innovation of new technologies and products is higher than any other industry (Hitt, Hoskisson, & Ireland, 1990;

Hitt *et al.*, 1991a; Hitt *et al.*, 1996) and the industry faces continuous waves of new technological generations and disruptive technologies (Christensen, 1997; Christensen, Anthony, & Roth, 2004; Christensen & Raynor, 2003; Utterback & Acee, 2005b), which render the products obsolete, possibly even before being launched to the market (Mayer & Kenney, 2004b). The rate of obsolescence is such that products often become obsolete before their development costs can be recaptured (Roberts & Liu, 2001). The new and disruptive technologies emerge either inside the firm or in the environmental ecological system, following a pattern of an epidemic technology diffusion, mutation and permutation of characteristics. In the literature we could not find any research linking these environmental challenges to the disruptive technologies, in a cause/effect relationship.

Moreover, one technology does not necessarily constitute a product in itself. It could be a computer algorithm, a network protocol, an encryption code, a specific technique, a process, a class of fiber, a processing chip, etc. The product is created by assembling and integrating this mosaic of technological ecology. Each of these technologies emerges in the environmental ecology of the firm, in different temporal brackets, and not in a sequential pattern that would eventually lead to the creation of one stand alone product. In addition, these technologies are created and developed independently, although their innovation teams collaborate informally through personal networking and the participation in technical forums, presentations, and standards bodies.

Therefore, it is difficult for one company to rely on internal innovation through R&D capabilities and existing strategic assets alone. Besides, the integration of technologies and the convergence of services we are witnessing in the service providers segment are not the results of the system integration, conducted by the service providers, of separate and independent products that were transferred from the equipment manufacturers. It is achieved by the equipment manufacturers, through a deliberate strategy of an intensive wave of acquisitions with the objective of achieving platform leadership among competitors (Gawer & Cusumano, 2002). This imageneering of the future and the enactment of the industry structure and directions, leads to the strategically reengineering of the core competencies of some manufacturing firms to create a dominant logic and a sustained competitive advantage (Prahalad & Hamel, 1994). Thus, the link

between the emergence of disruptive technologies in the ecosystem to the acquisitions intensity in the manufacturer segment, which is not documented in the literature.

Since the 1990 there was a substantial increase in mergers and acquisitions activities in the high technology industry. More than 11,000 acquisitions were completed in 1997 for a value estimated at over US$ 900 billion (Chaudhuri & Tabrizi, 1999a). This intensity of acquisition's activities Hitt et al., 1990; Hitt et al., 1991b) is motivated by different reasons. Beside traditional motivations of economizing and empire building, high-tech firms used acquisitions mainly to acquire external strategic resources, gain access to valuable human talents, reduce the cost and risk of R&D, expand their portfolio of products, reduce product time to market and provide for an external source of continuous innovation.

The networking segment of the telecommunications industry was created by the fusion of information technologies and traditional telephony technologies to connect computers to each others using computer networks and protocols through public telephone networks. In the networking segment, several firms have used acquisitions as their main growth strategy. For example, Cisco Systems, a Silicon Valley based company working in the manufacturing of networking and telecommunications equipment and software, acquired more than 107 companies during the period from 1993 to 2006. In the year 1999 alone it acquired 18 companies and in the year 2000 it acquired 23 companies, with an average of almost two acquisitions each month, or in other words, an acquisition every two weeks. It completed 12 acquisitions in 2004 and another 12 in 2005. Moreover, Nortel Networks completed 21 acquisitions in the period between 1996 and 2006 and Lucent Technologies completed 41 acquisitions during the same period. Lucent was later acquired by Alcatel in December 2006. Today, Cisco Systems stands as the leader in the telecommunications industry and as the company who created this trend of using a successful aggressive acquisition strategy as its main growth engine.

This strategy, termed "acquisition and development" or "A&D", combines acquisition activities for external sources of innovation, while maintaining the internal innovative capacities of the firm (Mayer & Kenney, 2004b). It starts by identifying the firm's internal needs (resources) and assessing the potential players for acquisitions in the strategic group within the industry, by means of continuous scanning of the competitive environment (Chaudhuri & Tabrizi, 1999a).

During this scanning of the environment, informal relations (links) are established with the objective of identifying and evaluating potential emergent new technologies and innovation, assessing human assets (resources) involved in those activities and estimating the real economic value (cost) of these resources, in terms of technologies and human capital.

When deciding on an acquisition, the firm would evaluate the potential target's existing portfolio of technologies. Those potential technologies could be sustaining or disruptive. They could be supplementary or complementary technologies and products. Supplementary technologies are similar in nature to the firm's existing products portfolio and complementary technologies are different products that strategically fit with the firm's existing products' map. In addition to supplementary and complementary products, a firm could choose to acquire a target firm because of the competitive threat of substitute products or disruptive technologies. By acquiring those substitute products, the firm would reduce the competitive threat and produce new entry barriers to other firms developing similar technologies and products, which would ensure a better market positioning and a sustained competitive advantage. In the post acquisition phase, the acquired technologies and products are system integrated into the existing product portfolio to create synergy. The integrated technologies are redesigned based on modularity or single platforms (Gawer & Cusumano, 2002; Mayer & Kenney, 2004b; Olleros, 2006), to provide bundles and solution packages with a variety of prices and options to meet the potential needs of future customers (Stremersch & Tellis, 2002). The integration process is critical, as it provides the technical basis for the convergence of services, later used by the services providers, when the products are transferred to the service providers through the buyer-seller relationship. For a successful post acquisition integration of the acquired company and its technologies, the integration complexity, strategic fit, and potential synergy, must all be anticipated and evaluated in the pre-acquisition phase and prior to the acquisition decision.

In most of the research on corporate mergers and acquisitions, they are viewed as strategies for corporate control and empire building, and they are dealt with using financial and economic perspectives, while neglecting their social, strategic and organizational dimensions. The motivations of acquisitions in the high tech industries, and specifically the telecommunications industry, are different than the motivations of acquisitions in other industries. Many of the high tech acquisitions in the 1990s appeared to be motivated by the firms' need to

obtain critical technologies or capabilities, in contrast to acquisitions in other industries, which are motivated by economies of scale, gains in market share, geographical expansion, empire building or CEO hubris. Despite the importance of the intensive acquisition trend within the context of the telecommunications industry, the research on acquisitions in the literature of strategic management could be categorized as contradictory, incoherent and incomplete. It is contradictory because the findings present contradictory performance outcome related to acquisitions, even in the same industry sector. It is incoherent, because most of the researches focus on the economic aspect of acquisitions including performance, economies of scope and scale, market penetration, growth, position, net gain, etc., while the others focus on the strategic aspect of acquisition including human talent, tacit knowledge, strategic resources, strategic fit, organizational culture and core competencies. Each approach neglects the other, which leads to an incoherent picture of the factors involved. Each approach gives a perspective to the study of acquisitions, however the whole picture remain fragmented and unclear. Third, it is incomplete because the literature has not shed enough light on the factors, criteria, conditions, motivations, causes and consequences related to the acquisition formation in high velocity and turbulent environments. When companies such as Cisco Systems and others participate in intensive acquisition activities during a small period of time, the critical success factors and the process of decision making for the acquisition formation has not been fully researched, under those extreme and intense environmental conditions.

In the service providers segment of the telecommunications industry, the integrated technologies provided by the manufacturers, give rise to new disruptive innovations and the convergence of services and business models. This is creating a new landscape for the telecommunications industry and changing the rules of the game that were established decades ego, leading to a change in the industry structure of the telecommunications industry. The change in the industry structure refers to the change in the competitive dynamics and market forces, the change of the firms' competitive advantage, the changing and blurring of market, the erosion of market share, the destruction of competency, the lack and need for a new regulatory environment, the cannibalization of services and the subsequent loss of revenues in traditional markets (Evans & Schmalensee, Forthcoming; Parker & Alstyne, 2005; Porter, 1980a).

For example, the ability to have an overseas voice conversation on the internet with a reasonable quality of service (QoS) using embedded software such as Microsoft Messenger or unbundled software such as Skype, is sharply reducing the traditional international calls' revenues for the telephony operators. New telecommunications alternative providers, such as Vonage and others, offering service providers-like's quality of service with a fraction of the cost, are challenging the traditional telephony operators locked-in with long term investment based on old technologies and infrastructure, in the local and international business segments. Enterprise voice over internet protocol equipments, or simply VoIP, sold by the equipment manufacturers directly to the end-user customers, are bypassing the telephone operators and sharply reducing their PABX (private automatic branch exchange) traditional business.

On a larger scale, the Wi-Max disruptive technology is decreasing the barriers for new investors to enter the service provider market and provide city-wide coverage of wireless-fixed broadband services, including data, voice, and video, with a fraction of the cost and lower technical expertise. Traditional cable TV operators are offering residential telephony and broadband Internet access, competing directly with traditional telephony operators in their core business. Telephony operators would be able to offer TV programming services using a technology called IPTV, competing directly with cable operators in their core business. The last two examples are based on the convergence new business model called "triple-play". The convergence of fixed and wireless broadband, adds another emerging business model, the quadruple play. Finally, the entrance of new nontraditional telecommunications players, such as content and entertainment providers such as YouTube, Google, AOL, Microsoft, NBC and Virgin, gives rise to a new business model. In this model, the industry change concerns the market boundaries and the ownership of the network. It is already contemplated that the ownership of the network and services could be transferred to the media giants who would provide the content in addition to the traditional telecommunications services, while the network would become just a conduit. All this is happening while the regulatory environment is lagging behind, with large variations and differences between countries in industrial markets, emerging economies, highly and less competitive markets and geographic areas.

11.1 Methodological Overview

Using a naturalistic qualitative method of inquiry allowed the research to be conducted with the main objective of *in-depth understanding* the phenomena under study, in a holistic fashion and without neglecting the details, the context, and the intricacies of the interrelationships that exist between the various actors that constitute the ecosystem. Regarding the scope and breadth of the inquiry, the research covered both the manufacturing segment and the service provider segment of the telecommunications industry, in order to understand in-depth the impact of the disruptive technologies and innovations on the telecommunications industry. Sacrificing one segment would have limited the ability to deeply understand the phenomenon and would have rendered the findings incomplete.

This naturalistic qualitative inquiry is based on the constructivist paradigm and the inductive approach. It started by an exploratory study of the telecommunications industry, using the *analytic induction* method of research. The findings were translated into 'rough and general approximation hypotheses' that were used as a walking stick in the start of the fieldwork, and were revised after the fieldwork was completed. The exploratory study helped in identifying four non-exclusive levels and units of analysis (Creswell, 1998; Eisenhardt, 1989b; Golden-Biddle, K., & Locke, 1997; Langley, 1999; Yin, 1989): (1) the telecommunications industry with a special focus on the networking segment for the equipment manufacturers (*industry/holistic*); (2) the time period between 1993 and 2009 (*time period/holistic*); (3) disruptive technologies (*event/individual*); (4) acquisitions (*event/individual*). Moreover, the exploratory study ended by the construction and the proposition of an initial conceptual model, with a variation, allowing for flexibility, variation, emergence, open mindedness, ambiguity and creativity, and it was revised after the fieldwork was completed. A review of the academic literature and a comprehensive strategic framework for the research design and implementation were completed before the start of the fieldwork. However, the review of the literature continued in iteration with the next phase of field work and the final phase of the validation of the results and theorization.

The main qualitative method of inquiry *grounded theory* was used at the start of the fieldwork for data collection, through the data analysis/interpretation phase, the theorizing and final reporting on the research major findings. During the fieldwork, primary sources of data were

open-ended and interviews-like conversations, in addition to field notes and observations. Cognitive and causal mapping were used as an interviewing tool in order to limit cognitive simplification, bounded rationality, uncertainty and ambiguity. Secondary sources of data were formal company documents and presentations, reports (plans, financial statements, sales forecasts, and market research), brochures, product prototypes, sales materials, and documents from industrial organizations, professional groups, standard bodies, workers' unions and collaborative networks in the telecommunications industry.

During the fieldwork, the data collection process was organized using a *multiple case study* approach with embedded units of analysis, to facilitate the collection, organization, categorization and analysis of the massive data. In qualitative inquiries, there are no rules on sampling size, rather *purposeful sampling* and reaching redundancy and saturation. Therefore, the sampling size was initially defined by three case studies in each segment of the telecommunications industry; however more cases were added for triangulation. While giving high importance to context sensitivity, multiple non-exclusive sampling strategies were used to identify and target information-rich cases for the case studies in both segments. In the reporting phase, the mini-case approache was used to document the specific case studies' findings.

11.2 Contribution of the Research

The disruptive technologies and innovations and their impact on the change of the industry structure of the telecommunication industry, were not fully researched in the literature of strategic management and technology and innovation management. Therefore, this research suggests an association between the emergence of disruptive technologies and a subsequent change in the industry structure of both segments of the industry. The research fills the gaps in the literature by:

- Exploring and understanding the impact of the disruptive technologies on the telecommunications industry, and tracking them from their origins in the equipment manufacturers' ecosystem;

- Exploring and understanding the forces and dynamics of the intensive acquisition activities in the manufacturer segement of the telecommunications industry;
- Exploring and understanding the role of entrepreneurship as a moderating factor in the intensive acquisition activities, in the emergence of the acquisition and development model and in the rise of venture capital;
- Exploring the ecosystem of the telecommunications industry as a national system of innovation, where all the entities and institutions are interlinked for collaboration and knowledge transfer;
- Understanding how the acquired technologies, are integrated and bundled on modular or single platforms by the equipment manufacturers and then transferred to the service providers through the buyer-seller relationship;
- Exploring and understanding the essence of platform leadership in the equipment manufacturer segment which leads to the convergence of services in the service providers segment;
- Understanding the challenges facing incumbent service providers due to the emergence of new players, disruptive innovations and new business models;
- Understanding the change in the industry structure of the telecommunications industry.

The research question is: *What* is the impact of the disruptive technologies and innovations on the telecommunications industry and *how* this impact is manifested in the manufacturers' segment and the service providers' segment and on the industry structure of the telecommunications industry. The research explored this relationship, by firstly linking the intensity of the disruptive technologies and innovations in this industry to the intensity of the mergers and acquisitions in the equipment manufacturer segment, and then by linking the integration of technologies, to convergence of service in the service provider segment of the telecommunications industry. The research identified and explained various disruptive technologies in the telecommunications industry and their impacts on both segments of the telecommunications industry by clearly defining the difference between sustaining and disruptive technologies and innovations using examples of past and current technologies. It described the environmental context and the challenges facing the firms operating in each segment of the telecommunications industry. It explained how the disruptive technologies led to the intensive acquisition activities in the manufacturer segment and to the development of the acquisition and

development business model by some firms. Moreover, it explained how the disruptive technologies led to the integration and convergence of services and the development of new business models in the service provider segment. Furthermore, it highlighted the impact the disruptive technologies and innovations have on the structure of the telecommunications industry.

By answering the *what* and *how*, the research unraveled the process of creative construction (or destruction) in the telecommunications industry and more specifically, the process through which some firms create value and sustain competitive advantage, while the other firms destroy value and lose their long established competitive positioning. This is an important contribution in understanding the notion or concept of creative destruction. The research suggests that the process is temporally long and it consists of various phases as illustrated in the theoretical model. The process is the result of the interaction of different entities and institutions, and therefore this interaction consistitutes the links of these entities which form the national system of innovation in this industry. Moreover, the process of creative construction happens on different levels: the individuals (entrepreneurs), the firms, the industry, and on the national level as well. Understanding the forces and dynamics of the process of creative construction and destruction, helps in understanding how to create and sustain competitive advantage in the face of turbulence, uncertainty and in a high velocity environment such as the telecommunications industry.

In determining how solid, coherent and consistent is the evidence in support of the findings, triangulation of methods, sources, and theories were used, and suggested very positive results. Moreover, the findings increase and deepen our understanding of key areas of research in the three disciplines of business policy and strategy, technology and innovation management and entrepreneurship. These key areas of reseach are mergers and acquisitions, strategic alliances, disruptive technology, strategy formulation, technology entrepreneurship, platform leadership, convergence, new business models, competitive advantage, national system of innovation, industry structure, high technology industries and the process of creative destruction. While the findings in these research areas are of a contribution to the body of knowledge, they are consistent and complementory with the existing knowledge. Furthemore, the research and its findings provide to some extent a *holistic* and *integrative approach* to some of the existing knowledge, and increase our sense-making of the phenomena in a specific industry under extreme

environmental challenges, such as the telecommunications industry. In addition, the research and the findings provide useful insight on the telecommunications industry, with implactions for both scholars and practitioners.

11.2.1 Methodological Contributions

This research presents a novel application of the grounded theory method of inquiry, in the spirit of methodological appropriateness rather than methodological purity. While respecting the strict guidelines of the grounded theory prescriptions, it combined and integrated the grounded theory as the main research tool, with the methods of analytical induction and case study research, all towards the process of building and construction a theoretical model. In my opinion, this did not affect the integrity of any of the three methods, but rather, it added a more powerful and extended research tool. For example, while the traditional prescription for the application of the grounded theory method calls for the start of the field work without preconceived ideas or knowledge about the research in the field, whether practical or theoretical, the analytical induction method was used at the exploratory stage of the research prior to the field work, to provide a *walking stick* and initial insights before starting the field work using the grounded theory method. This insight was paramount in structuring the researcher thoughts, and provided a level of comfort in going into the unknown terrain of the fieldwork with its expected massive amount of information to be collected.

Furthermore, the use of the case study method and its integration into the grounded theory method provided a more structured process in collecting and analyzing the data from the field work. While the case study method was used as a process to collect data, it was not used to report the collected data into the traditional form of case studies.

Moreover, in the final validation stage of the grounded theory method, the validation was based on the theoretical sensitivity in one hand and in a larger part on the publication of the different chapters of the dissertation, as presented in the form of articles. The effort in publishing these papers or dissertation chapters yielded a lot of valuable feedback from peer reviewers at various academic journals, consortia, seminars, academic and professional conference proceedings and presentations. Undoubtedly, all this feedback from various sources and at

different stages of the dissertation research, helped to provide additional insight and to enhance to a great extent the quality of the research and its product, the dissertation.

Finally, the application of the process methodology in the field of strategy is not widely used. In this dissertation, the use of the process methodology in the attempt to explore and understand the research question, provided a temporal dimension to the findings and in the construction of the theoretical model as the research findings. It provided a better understanding of the *how* question in the context of this research.

11.2.2 Theoretical Contributions

As Schumpeter described it, the creative destruction is when established firms fail to sustain competitive advantage and their market positioning due to the arrival of new technologies, or in other words disruptive technologies. Clearly, in his definition of creative destruction, he predicted that established firms lose their advantage to new entrants due to the emergence of the new technologies; however, he did not define the process through which this creative destruction takes place. From this definition, obviously, the loss of sustained competitive advantage by established firms is simultaneous to the gaining of market power by newly established firms, based on new technology.

Therefore, this dissertation contributes to the literature by enhancing our understanding of how these newly established firms succeed in starting, growing, gaining market power and sustaining competitive advantage. Alternatively, using the term *Creative Construction* gives us an insight into the process by which these new firms overcome entrant barriers and establish a strong and competitive market positioning, while stripping the incumbent firms from their long established positions. By understanding the *Process of Creative Construction* and the corporate strategies used by these new firms, we provide a prescription to incumbent firms on how to avoid strategic myopia and how to enact the future to their advantage.

Finally, this dissertation contributes to the literature on acquisitions, alliances and collaboration in the high technology industries. Also, a minor contribution was made on the concept of the convergence of technologies, applications, products and services.

11.2.3 Managerial Contributions

By presenting a prescription of the *Process of Creative Construction*, this dissertation provides lots of insight into the revolutionary change that took place in the telecommunications and information technology industries over the last twenty years. It explains the nature, dangers and potentials of the disruptive technologies and innovations. It invites managers at the marketing, planning and research and development, to look for these technologies and innovations in their immediate environment, by continuously scanning their adjacent environment and beyond. Having the ability to adapt to new emerging technologies, would reduce the risk of stagnation and losing competitive advantage to newly established firms and emerging startups. Avoiding strategic myopia and preparing new executive plans to enact the future of their industry would help guarantying potential growth.

For merger and acquisition managers, this dissertation presents an internal look into the complex process of intensive acquisitions in a high velocity, uncertainty and a turbulent environment, such as the high technology industries. It provides insight into the causes, consequences and critical success factors of the acquisition and alliance formations. It provides a prescription for the collaboration and integration of multi task teams in the pre-acquisition, acquisition decision and post-acquisition stages. As seen in this research, complex acquisitions would require the collaboration of teams integrating the marketing, product development, strategic planning, finance, and research and development departments. Complex acquisitions involve different factors and dimensions that were described in the dissertation.

For entrepreneurs, this dissertation enhances our understanding of their potential role in starting, growing and sustaining technology firms in the face of incumbent firms. It explains how entrepreneurs are instrumental in the ecology of new technology and how they could maximize their return on investments by allying with established firms and inviting acquisitions through complementary, supplementary, or substitutive technologies, products, and services.

For technology and research and development managers, this dissertation gives an insight into the complexity of integrating newly acquired acquisitions, and the creation of new products

and services into the firm product roadmap and portfolio. It enhances our understanding of the interplay between two different business models that yield to sustaining competitive advantage: The traditional research and development model and the innovative acquisition and development model. Combining both business models requires due diligence and managing the complexity in the post integration phase, while continuously recruiting and retaining talent and technical expertise, to support this challenging venture. It also explains how the integration of technologies and services, and the convergence of technologies, applications, products, and services could have a great potential in changing the industry structure and the competitive landscape.

For policy makers and government agencies, this dissertation gives an insight into the efficiency of the national or clustural systems of innovation. It explains how the technology innovation took place in the telecommunications and information industries through the strengthening of the links between the university, the entrepreneur, the venture capitalist, the private firms, the regulatory bodies, and specific project task forces. It prescribes a structure for comparing national systems of innovation and a topology as an objective to be reached for strengthening the links between the institutions on the national or the regional levels.

11.3 Generalization and Transferability of the Research

As this research provides a useful insight on the telecommunications industry, this insight could be transferred and generalized to other high technology industries such as bio technologies, aeronautic technologies and nano technologies, for example. The key elements of this research's theoretical model could be found, with variations, in these industries. For example, disruptive technology, creative destruction, acquisition, alliance, integration and convergence, are present in all of these industries with different degrees. Moreover, while the context and the process of creative destruction is these industries are different than the process in the telecommunications industries, it is still present. For example, as illustrated in figure 11.1, the convergence of different industries, technologies and sciences, give rise to the emergence of new industries and technologies. The convergence of biotechnologies and information technologies give rise to the genomics, bioinformatics, and proteomics. The convergence of nano technologies and information technologies, give rise to the nano devices, nano sensors and nano electronics. The

convergence of biotechnologies and nano technologies, give rise to the bioelectronics, microfluidics, and nano biotechnologies (Zahra, Bhawe, & Gupta, 2009).

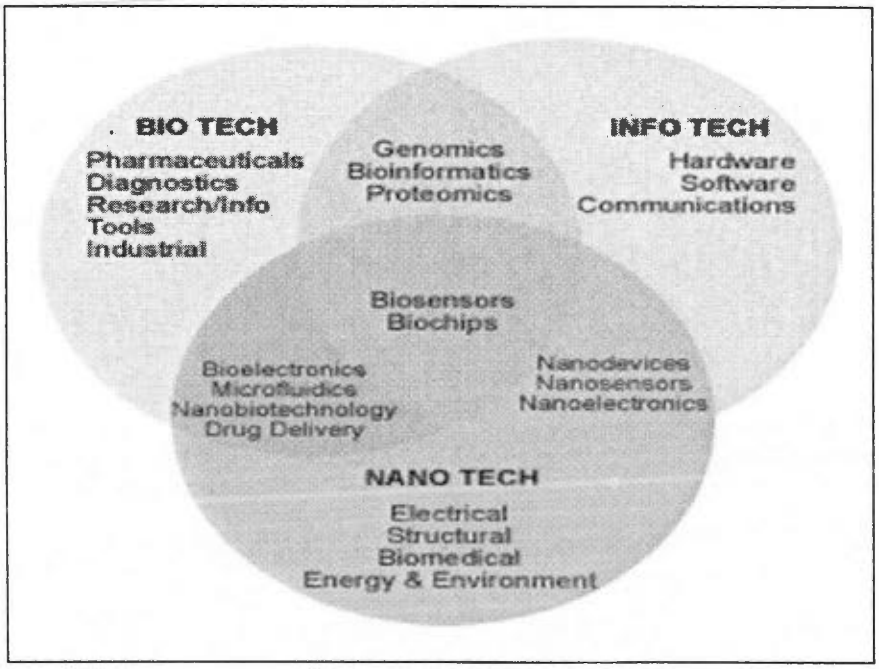
Biotechnology: In the biotechnology industries, we witness creative destruction and disruption in the pharmatheutical industry, in addition to a series of strategic alliances. Therefore, instead of acquisition programs as in the telecommunications industry, we find alliance portfolios in the biotechnology industries.

Aeronautics: In the aeronautic industry, we witness creative destruction and disruption as well. This is present in the different segments of the industry from avionics, and fuselage, to instrumentation and composite materials. In this industry, we witness a hybrid of alliances, acquisitions and joint ventures as well.

Figure 11.1

The convergence of industries and the emergence of new industries

(Zahra, Bhawe, & Gupta, 2009)

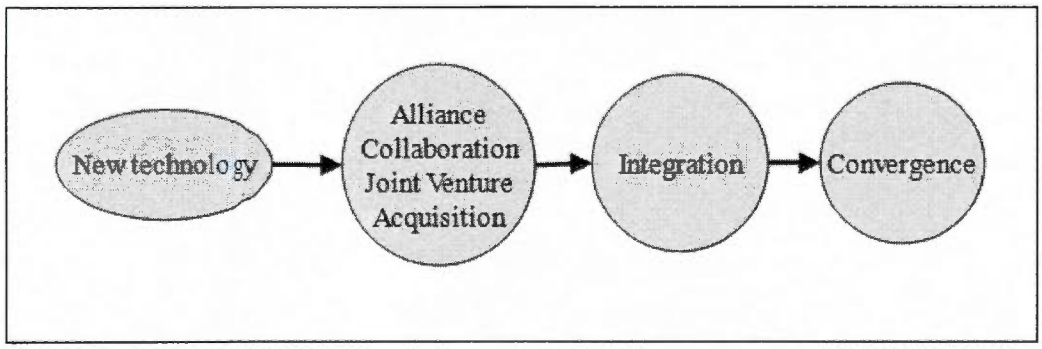


Nanotechnology: In the nano technology field, we a combination and convergence of different sciences, technologies, tools, techniques, and processes and the result is the emergence of new nano applications and sciences. This is done through multiple modes of cooperation including alliance, acquisition, technical collaboration, joint venture, joint field and lab research, etc.

Therefore, a conceptual model could be generalized for other high technology industries such as the biotechnology, aeronautics and nano technologies, as illustrated in figure 11.2.

Figure 11.2

Generalized model of creative destruction or construction



11.4 Limitations of the Research

As any research, this dissertation has several limitations. The first limitation is the methodological complexity in dealing with the announced research question. The scope and the depth of the research question required the use of mixed methodology by the integration of three methods: Grounded theory, analytic induction and case study research. This was designed and applied in the spirit of the methodological appropriateness rather than the methodological purity. While this novelty is considered a methodological contribution, it required a good level of

knowledge of the three, more time for applying the different stages of the research, the openness and flexibility in applying the methods while respecting the strict guidelines of each.

The second limitation is the potential researcher bias, also known as *reactivity*. Although I have a professional experience in the context and the specific industry covered in the research, I tried to limit the personal bias by staying objective, using different triangulation methods for the data sources, methodology, and validation and by seeking external validation through the process of publishing my research findings through the different stages of the research and analyzing carefully and objectively the feedback received from peer reviewer evaluations. However, on a positive note, my experience with the research question provided me with a walking stick into the field work, a comfort level in conducting the research and in addition, it provided me with the initial hunches and assumptions during the exploratory stage of the research, prior to the field work. As Maxwell (1996 p. 92) stated, it is impossible to eliminate reactivity in qualitative research, but rather it is expected to identify its potential influence and interaction and try to control it: *"The influence of the researcher on the setting or individuals studied, a problem generally know as reactivity, is a ... problem that is often raised about qualitative studies. The approach to reactivity of most quantitative research, of trying to control for the effect of the researcher, is appropriate to a variance theory perspective, in which the goal is to prevent researcher variability from being an unwanted cause of variability in the outcome variables. However, eliminating the actual influence of the researcher is impossible ... , and the goal in a qualitative study is not to eliminate this influence but to understand it and to use it productively."*

The third limitation is the generalization of the research or the external validity and the transferability. The research in this dissertation with its context, variables and findings are potentially not applicable to all other industries. It is clear that the research is not transferable to non technology industries and also possibly not transferable to low technology industries. Moreover, within the high technology industries, it is possible that this research is not transferable into more stable industries, where the level of uncertainty and change are less prominent, or where the change takes place over a longer temporal bracket. Furthermore, while this longitudinal research is over the period from 1993 to 2009, it is possible that this research is not transferable in the same high technology industry, the telecommunications and information technology industries, over a different longitudinal time period. However, as stated by Maxwell (1996 p. 97),

the generalization of this qualitative research is an analytical and conceptual generalization that leads to the development of a theory that could potentially be extend to other cases: *"... , external generalizability is often not a crucial issue for qualitative studies. Indeed, the value of a qualitative study may depend on its lack of external generalizability, in the sense of being representative of a larger population; it may provide an account of a setting or population that is illuminating as an extreme case or ideal type.... , the generalizability of qualitative studies usually is based, not on explicit sampling of some defined population to which the results can be extended, but on the development of a theory that can be extended to other cases."*

11.5 Further Research

This research provides a first step towards a research program. The elements of this research could be further investigated using deductive analysis and statistical inference. Furthermore, more interesting questions could be asked. It would be interesting to explore the impact of the epidemic emergence and diffusion of disruptive technologies on the erosion of market shares, boundaries and competencies; the forces and dynamics of creative destruction: Implications on the firm, industry, and national levels; the disruptive business models in the telecommunication, biotechnology and aerospace industries; and the innovation models in turbulent ecosystems. Therefore, the research in this dissertation could be extended by following multiple research streams, to increase our understanding of the process of creative construction and technological disruption.

By researching the categories, typologies and nature of disruptive technologies and innovation, we could identify the ecology of disruption and the forces and dynamics that take place during the waves of radical change. By studying this ecology, using case studies from high technology firms over longitudinal periods, we could identify and explain why specific new and disruptive technologies succeed in making a long term presence while other fail to survive. Researching technological disruption spanning different industries could identify not only disruptive technologies, but also disruptive products, services and business models. This could explain why disruptive business models could have a greater impact on the industry structure, beyond the effect of a single or few disruptive technologies.

As the research in this dissertation was focused mainly on the telecommunications and information technology industries, further research is suggested into other high technology industries, such as the bio technology, aeronautics, nano and green technologies. How disruptive technologies, innovations and business models, are compared in these different industries and if there is any pattern that exists across these industries. For example, while seeking external sources of innovation, why the acquisition model is dominant in the telecommunications and information technology industries (acquisition programs), while in the biotechnology, the alliance model is more prominent (alliance portfolios). Moreover, the effect of creative destruction and technology disruption could be researched on the firm level, as well as on the cluster, national and regional levels. For example, on the international context, how the governmental regulations and deregulations could have either a catalyst or damper effects on the emergence and diffusion of disruptive technologies and services. How the incumbent firms are resisting these waves of technology disruption and if this resistance is structured and justified or is it a strategic choice.

On the acquisition and alliance research stream, further research is needed to understand the complex work of acquisitions in the high technology industries. For example how the potential acquisitions are evaluated and what are the factors that are having more weight in the decision making process of acquisition formulation. It would be interesting to explore how the process of acquisition formulation is collaborated between the multi task teams involved in the decision, and how the decision is reached. For example how the multi task team, with its divergent objectives, would decide on whether to ally, acquire or internally develop this needed technology. On the performance level, how the performance of an acquisition is really measured in high technology firms, and whether it is measured by the increase in market value, market share, technological efficiency, or a combination of the three. On performance, how the performance of multiple acquisitions could be measured over a fiscal year and how to identify the individual performance contribution of each acquisition over the same fiscal year period. In the post acquisition decision, how the acquired firm is integrated and the nature of this integration: Is it a full integration, full autonomy within the acquiring firm or a hybrid form of integration and autonomy, and on which areas of the business and on what levels.

On the technological integration and convergence research stream, more research is needed in this emerging area. What is the nature and definition of convergence and if it is different from consolidation and integration. Using case studies, it would be interesting to see how convergence took place in different industries and how it affected the competitive landscape and the industry structure. How new entrants are taking advantage of the convergence and how incumbent firms could survive the challenge of convergence in their industries. Does convergence lead to new business models or it is new business models that lead to the convergence of products and services. How the convergence of products and services lead to the establishment of new firms and new industries.

On the systems of innovation, furthering the research on the structure of the national systems of innovation would enhance our understanding on how to compare these national systems across clusters, industries and nations. Using a structured model and a typology for the national system of innovation would help us to measure the efficiency of these national systems and prescribe ways to increase their performance. For example, continuing to explore the telecommunications industry as an ecosystem for the system of innovation, would helps us understand how the collaboration is maximized across the interlinks between the various institutions being part of the national system of innovation. In this ecosystem, is collaboration deterministic or voluntaristic, and if the governance of these systems centralized or distributed, with respect to national projects or project management task forces.

APPENDIX A

A SAMPLE OF A DIRECTED INTERVIEWING GUIDE

- What was the competitive situation before reaching a decision to go for an acquisition
- How do you rate the technological and financial performance of the company at that time
- Were there any available strategic alternatives
- What was the strategic importance of the acquisition for the company at that time
- At this time do you still agree that it was the right strategic decision
- How the decision was taken and who took it
- How did you evaluate the companies for potential acquisitions
- Was there a previous expertise in forming acquisitions
- What were the goals of the acquisition formation
- What were the expectations after the acquisition formation
- Did the company outsourced external consultants with expertise on acquisition formation, and what was their role.
- What was the time frame set for the acquisition formation and implementation
- What were the challenges anticipated in this phase before the implementation
- What were the challenges faced during the implementation
- What was the structural control mechanism that was put in place to manage the process
- Was there any contractual goals and were they met
- How did you anticipated the effect the acquisition would have on
  - Technology integration,
  - Complexity,
  - Retention of talent,
  - Financial management,
  - Customer satisfaction,
  - Corporate culture
  - Product development
  - Stock value
  - Competitive positioning
  - Overall performance
- How do you rate the acquisition effect after the implementation phase and on the short medium and long term, on the following:
  - Technology integration,
  - Complexity,
  - Retention of talent,
  - Financial management,
  - Customer satisfaction,
  - Corporate culture
  - Product development
  - Stock value
  - Competitive positioning
  - Overall performance

APPENDIX B

SAMPLE OF A DIRECTED INTERVIEWING QUESTIONAIRE

M. A., the following is the directed interview. I'll be asking you kindly some questions for you to elaborate on your experience either in implementing an acquisition or in the role of a consultant in an acquisition.

Q 1: what was the competitive situation before reaching the decision to go ahead with an acquisition?

A: We have to specify the type of acquisition we are talking about. Perhaps the largest and most recent one I was involved in, negotiating directly, was B.'s acquisition of Adtranz, the German holding-stock manufacturers, purchased in 2000 and being integrated from 2000 onward. The reason this acquisition is important is that it helped to consolidate the industry; there are now three major players, Alstom, B.-Adtranz and Siemens. At the time B. was weak in certain areas of technology, specifically B. did not manufacture propulsion. Therefore, on any of the transit cars, be they for a subway or others, B. had to buy the propulsion from others, and because the propulsion sector had been consolidated, we had to buy from Adtranz, Alstom or Siemens, who are actually our competitors. This made B. vulnerable and our choices were to go out of the business, sell, or become competent in propulsion. The only way to achieve that was to make a major acquisition. Adtranz is a small part of Daimler Chrysler Co. (DC); they wanted to sell so we got together and eventually made a deal to acquire it. Adtranz was a large company, it more than doubled B's transportation sector, and brought locomotives, signalling for some important technology, and propulsion for all kinds of rolling stock from subway cars to tramways to high-speed...

Q: and they are manufactured by Alstom...

A: No, by Adtranz, Alstom, and Siemens, they all had propulsion, we bought Adtranz. That was the driver, a very important driver for this acquisition.

Q: why go with this decision with this specific company?

A: Basically, we had discussions with Siemens. Alstom was not for sale, to buy it it has to be for sale. We looked at an alliance with Siemens, we looked at an alliance with a (sca.... position,) we went quite a ways with them, eventually it didn't work. Adtranz was available, at least Adtranz was on the selling block by D C who clearly indicated that they wanted to sell as that part of their business only amounted to five % of their revenues, (they didn't even know they were doing that business.) So, they were interested in selling. We had an interested seller and an interested buyer. This did not require a long consideration among the three. (that would be B+DC+A) What was more delicate was whether we could build the technology internally or make an other smaller acquisition to build the capability in the propulsion sector without buying out Adtranz or any of the others. We looked at this very thoroughly but came to the conclusion that it would take too long to acquire the full range in propulsion, from high-speed trains to tramways, this is a very wide range. Before we could develop the capacity to do this it would take

several years and the game would be over. We could not wait several years, so the way to go was with the acquisition.

Q: was this a strategy?

A: it was a strategy, an opportunity we pursued because it met a very clear strategic challenge and issue identified by the transportation group.

Q 2: how do you read the technological and financial performance of the company at that time? We are referring to B. before this acquisition.

A: the performance was great but there was a technological weakness due to a change in the dynamics of the market and the industry. It used to be that you had several holding stock manufacturers and you had several propulsion makers and they were not integrated. So before 1994 Siemens, Alstom and Adtranz, which didn't exist then but was a subsidiary of that(didn't say who), they were a propulsion maker but they did not manufacture the bodies of the cars. So, the car makers could ask for bids from these three companies and decide which offered the best bid before submitting theirs to an authority, a buyer, In time they started buying companies. Eventually they integrated themselves vertically. At that point was not integrated vertically and was facing three vertically integrated companies who were essentially the suppliers of propulsion. So, technologically something had to be done at that point.

Q: can we say this created a certain strategic vulnerability for B. in the transportation sector?

A: Yes, there were only two choices, either to sell transportation to one of them, or acquire propulsion.

Q: were there any available strategic alternatives?

A: Yes, I mentioned the possibility of a joint-venture with Siemens which was exploration land, and secondly the possibility of doing it through a smaller acquisition and internal development which would have been too slow. The first one, the Siemens alliance eventually did not work out and the small acquisition and internal development route was too slow.

Q: why didn't you decide to sell those assets?

A: No, because we felt that it was an interesting market and was very important to B. as a diversified company. Transportation has always been a substantial cash producer, which was very helpful as aerospace was investing heavily in new products, new aircraft programs. It was a very compelling case the fact that transportation provided a lot of cash. The transportation business is a negative asset business, advances are greater than your assets. We have client-advances which bring cash up front and that was an important part in developing the aerospace and in having a balance of diversified companies. If we had sold, B. would have basically become an aerospace company and we didn't want that.

Q: so this was the strategic importance for the acquisition. At this time do you still agree that it was the right decision?

A: I think it was the right decision. Now there were many problems between B. and Daimler Chrysler around the actual financial and accounting adjustments which had to be made.

The transaction was made on the basis that B. could do very little due diligence, for 2 reasons: 1. for two direct competitors, the European Competition Commission would not let you probe into a competitor's costs, as you would go away after having acquired all this information on their costs, they won't let you do that. Secondly, DC was very worried, the people were doing a good job turning around the company, and if we came in, did the due diligence then decided not to buy, then it would totally demotivate them. So what they did was guarantee a certain amount of equity. After all the accounting would be completed, all adjustments for contracts and adequate provisions made, they guaranteed that a certain amount of equity would be there. If it wasn't there, then they would adjust the equity, reduce the price to adjust the equity. Obviously when the time came to do this, D C didn't want to. The investment was quite large and they started contesting. All this took a long time, it went all the way to the International Chamber of Commerce and Arbitration. B. won, though less than it wanted, 175 million Euro as compensation from DC. (The reason D C didn't want it, it was plausible but turned into a very messy situation afterwards.)

Q 6: how was the decision taken and by whom, how did you come about making the decision.

A: at some point this goes before the Board. You make a presentation on why the decision makes sense, and it comes back with a recommendation from the Chairman and CEO, Jean Beaudoin (Bob Brown at the time), and whether the Board agrees or it doesn't. Eventually there was a whole series of negotiations and at many points we almost walked away from the transaction. It is a very sinuous process and until the very end, close to the end, we thought we had reached the end, we were in Berlin and we on the point of leaving our rooms and returning. Then D C gave in on key elements so we came back to the board and said: here's the deal we have agreed upon, do you agree on it.

Q: how many persons were involved in this process, and how was the rest of the Board and the Company involved in shaping the decision, was it taken by consensus, how?

A: well you have to understand B. At the time, J Beaudoin and the rest of the Family had control of the votes, some 60% of the votes then, they have a lot of weight, they control the votes. The Chairman, CEO & I were the three most involved. Then once certain terms were set and agreed upon between the Chairman, CEO & DC, I took over because Mergers & Acquisitions was one of my many responsibilities, strategies etc., there was a VP Mergers Acquisitions, VP Legal and under my direction; they started negotiating all the details of a purchase agreement. This took several months of negotiation, in which I participated. At some point there was a meeting at the top with two senior men from DC to come to terms on various issues which were pending, not only the price, but many other issues. At various times during this process there were presentations made to the Board as to where we were, and an agreement from the Board. They never count the vote as such, you present the project and the Board agrees on the terms, where things are at. Of course as things change we go back to the Board for approval, until the final approval for the deal about to be signed.

Q: you had formal scheduled meetings, weekly, monthly, formal, informal ? or the whole was a process of interventions?

A: this was fulltime, on-going. In a corporate office everything is formal, not necessarily in the way of someone taking minutes, but this is a corporate office, it is very formal in the sense that you know you are about to make big decisions. The players are there and

whoever has authority is there and all the elements are on the table and we decide to go ahead, which means going to the Board with the proposal.

Q: you mentioned the VP Legal and VP Mergers and Acquisitions who reported to you. I was wondering about the VP Technology, VP Finance, were they involved in any part of the process even for consultation, evaluation?

A: They were very much involved when we were presenting the financials of Adtranz but they were not involved in the negotiations as at that point, there was no commitment. They became very involved. Once we were involved in the process, so were the people from B. Transportation as they know the technology, know the contracts; a whole team of them, some 15 came to Berlin to look at the contract. Once that was completed, a mammoth operation via the transportation people took place as they are the experts, in the sense of looking at the technology from the information we have, and looking at the contracts. It was a consultation process by the operations people who will actually be managing it.

Q: and marketing people were involved?

A: all the transportation people were involved; contract people, finance, legal, marketing in some sense, technology people of transportation, all of them.

Q 7: how were the companies evaluated as for potential alliances?

A: Alstom, we didn't discuss this with. With Siemens there was a long process of discussions, negotiations, how would the company be organized, a lot of organizational structure, how we should structure an alliance, what would be the corporate structure, how we would share, who would own what, who would have control of what, this is why eventually it tripped on these issues of conflict.

Q 8: was there former experience within B. regarding acquisitions and forming alliances?

A; huge, here are two things you have to read for tomorrow, chapter 6, 6.6.1: Diversification and governance at B, all of what we believe and how; B. comme acquéreur des principes, l'importance du prix, l'importance des vérifications, le style, la valeur de gestion, l'acquisition de Canadair en details. The first acquisition from which we drew a lot of lessons for the future was in 1986 with the Canadair acquisition. It was a huge acquisition then, and it was to become the model applied for all acquisitions. The team in place at B. at that time stayed in place for almost 15 years.

Q: what were B's expectations after the acquisition, what did you expect?

A: We expected what we were looking for, to be the largest transportation company in the world, which B. is. It is part of a small group of three large players, Europeans, capable now of a full range of technologies, full range of products and a presence essentially worldwide, such as our doing a joint-venture in China.

Q: what exactly was your role before, during and after the acquisition.

A: I was Executive VP of B, and had reporting to me the VP Acquisitions, Treasurer, VP Finance, VP Human Resources, the structured finance people, legal, etc.

Q 11: your role stayed the same before, during and afterward?

A: yes.

Q 12: what was the time frame set for the acquisition?

A: no timeframe was set as such. Basically we had decided during the Board's strategic review held for 3 days every year, I think it was the Board of February 1998 when transportation was a big issue, because of the consolidation of the propulsion makers, and we decided we had to resolve this issue. From that point on we started investigating, started negotiating with Siemens, evaluating whether we could do it internally with a task force, what that would mean, what small acquisition could be made, how could we develop that, etc. In 1999 we met in Washington for a first time with Karl... (cldn't get the name...), who just left Mercedes-Benz, he was the one in charge of all these strategies at xxx?. I met him in Washington in the fall of 1999 and we started the process of discussions. From that time on there were hard discussions which concluded in July 2000 in Berlin.

Q: but you didn't have a timeframe for the implementation?

A: Implementation is another thing. The problem is you have a deal in July, but you can't do anything until the Commission approves it, that's the difficult part. They can decide that it is such an important merger that they will go through a lengthy process of evaluation which can take from 1 to 2 years, and you can't do anything. I was in charge and managed to get the approval in April.2nd, 2001. Until then all you can do is prepare on paper, we could not get into the company. It was finally signed on April 30th in Berlin on the 1st of May there was a whole operation of integration put into motion on that day.

Q 13: can we say that those are the challenges that you anticipated in the phase preceding the implementation? The acceptance of the EU?

A: we always knew we had to go before the EU, and that they had blocked a GE purchase...

Implementation is always a challenge because you are taking over a group, a lot of Germans, Swedes, operations people, full of companies, major.

Q: during the actual implementation, what real challenges were present?

A: I don't think there were any surprises. The only problem resulted from the tension and animosity between DC & ourselves based on the price adjustment that led to arbitration. This contaminated the relationship at the operating level so it was very difficult to deal with the DC people. That was different than anticipated. There were some people that counted, who worked for us, but who were still loyal to some extent to DC.

Q: did you face any challenges on the level of complexity of integration, on the level of cultures of the companies?

A: not that we did not anticipate. We had made an acquisition in Germany before, we knew it was tricky, What is always tricky and you can never do as fast as you want is plant closures. Part of the rationalization was to close some plants, that took more time than anticipated.

Q: what was the structure of the control mechanism that was put in place to manage the process.

A: Very detailed, it's called integration governance, a whole architecture was put into place, reporting, reviewing, etc.

Q: what was the key element.

A: it was to have a clear demarcation of past force, a focus on the right thing, with a well established calendar to achieve the goal and very close monitoring of the progress according to the calendar.

Q 16: were there any contractual goals in the acquisition agreements?
A: what do you mean?

Q: any goals in the contract as such?
A: the fundamental contractual element which was the source of restriction was the fact that there was a liquidity guarantee on the part of the seller, and when the adjustments came in they were such that they didn't want to live with this agreement. That was a huge problem.

Q: those were contractual (boards), were they met?
A: that went to arbitration so it was not met.

Q 17: How did you anticipate the effect of the acquisition on the technology integration of the two companies? Complexity, challenge?
A: basically we were acquiring technology B. Transportation did not have, so in that sense we were adding technology so there was not much integration. Complexity, yes, huge amount of complexity. Challenge, yes because during the period when it was public that we had acquired, we could not make any commitment to anyone because we had this approval from the EU to obtain and therefore there was a period of uncertainty. With all these B. people coming and going, thinking they would lose their jobs, it was easy for competitors to come and pick the best people and make them offers. We tried to cope with that issue. Financial management was certainly a lot more complicated, a larger company but we're used to that, I don't think it was a big issue here. Customer satisfaction... Corporate culture well I would have to explain that Adtranz itself was a new entity created by merging several companies back in the late 1990's. It's not like it was a 100-year old company. So I wouldn't say it had one corporate culture and B. another one. I think it had the diverse culture which tended to reflect the particular company the people were coming from and also the particular region. The Swedes are different from the Germans and we had Poles Czechs, facilities in France and England. That's the complexity of a real multinational operation so it wasn't unanticipated, certainly. Product development?

Q: was it fast enough, slow enough?
A: I don't know, I left in 2001 while it was still in the process. I left without the approval and the secondary approval, I left on June 30th 2001 but I worked with Lortie who was there afterwards, and I don't see any influence one way or the other. Stock value? Well the stock responded well at the time but of course on Sept 11th everything went down.

Q: so the stock's losing value wasn't because of the acquisition.
A: not really, although indirectly, because first you pay one billion dollars for the acquisition. At the time B. was generating enough cash flow that the finance people thought we didn't need to issue shares because we had enough cash flow to do it, so they didn't go and finance the deal. And because of this disagreement with Adtranz there was a lot of cash to pay on these contracts which we can sue them for, but still you have to do it. So that was all right, except that Sept 11th happened at the same time, so obviously when the stock goes down it's not time to issue anymore, and you have this one billion that you pay in cash, and the stock went down tremendously. So, in that sense...

Q: can we say that the acquisition had a positive impact?
A: Yes, B. is in a much better position now, yes.

Q: and on the overall performance?
A: well, the overall performance of Transportation, I think they are still struggling because they are finding it very difficult to rationalize the facilities. There are facilities in different countries, some where B. was already established so B. Transportation has to close some and it's a very difficult process. We knew that but it's turning out to be very difficult so the margin is not improved enough at this point to satisfy the shareholders.

Q: how do you measure the combined theoretical and practical interests, how do you measure the performance, do you measure it only economically or technologically or socially, in a few words.
A: clearly the first responsibility of a private listed company when carrying out an acquisition is to demonstrate and prove eventually that it has turned out to be beneficial to the long term interests of the company. And the long tern interests of the company obviously means the shareholders' long term interests, but not in the strict sense of maximizing every cent of the shareholders' but you also increase the imperviousness of the company, the ability to resist unfavourable conditions, you've increased the durability of the company, its longevity, these are elements which are in the long term interests of the shareholders but also of the company as a whole.

Q: so you don't take into consideration the short term?
A: you don't take into consideration the short term but you don't say these are social benefits either, that would be a false statement to make.

Mr. A., thank you very much for the interview. Would you like to add anything?
A: no, that's it.

Ok Sir, thank you very much
A: Thank you. Good.

References

A. D. Chandler J. (1997). The Computer Industry: The first Half-Century. In DB Yoffie (Ed.), *Competing in the Age of Digital Convergence, Chapter 2*: 37-122. Harvard Business School Press: Boston, Massachusetts

Abrahams P. 2001. Online gaming, *Financial Times*: p. 24 London (UK)

Ackermann F, Eden C. (2005). *"Using Causal Mapping to Support Information Systems Development: Some Considerations" in Narayanan, V. K. and Armstrong, D. J., Eds, "Causal Mapping for Research in Information Technology*. Idea Group Publishing: Hershey, PA

Adner R. (2002). When are technologies disruptive - A demand-based view of the emergence of competition. *Strategic Management Journal* 23(8): 667

Adner R, Kapoor R. 2010a. Innovation Ecosystems and the Pace of Substitution: Re-examining Technology S-curves. Wharton School: Philadelphia, USA

Adner R, Kapoor R. (2010b). Value Creation in Innovation Ecosystems: How the Structure of Technological Interdependence Affects Firm Performance in New Technology Generations. *Strategic Management Journal* 31: 306–333

Adner R, Zemsky P. (2005). Disruptive technologies and the emergence of competition. *The Rand Journal of Economics* 36(2): p. 229 (226 pages)

Ahn MJ, Adamson JSA, Dornbusch D. (2004). From Leaders to Leadership: Managing Change. *Journal of Leadership & Organizational Studies* 10(4): p. 112 (112 pages)

Aiken M, Hage J. (1968). Organizational interdependence and intraorganizational structure. *American Sociological Review* 33: 912-930

Amit R, Schoemaker PJH. (1993). Strategic assets and organizational rents. *Strategic Management Journal* 14(1): 33-46

Anderson B, Gale C, Gower AP, France EF, Jones MLR, Lacohee HV, McWilliam A, Tracey K, Trimby M. (2002). Digital Living -- People-Centred Innovation and Strategy. *BT Technology Journal* 20(2): 11

Anderson H. 2003. The ultimate disruptive technology, *Network World*, Vol. 20: p. 37

Andrews KR. (1971). *The concept of corporate strategy*. Dow Jones-Irwin: Homewood

Anonymous. 1999. Fear of the unknown, *The Economist*, Vol. 353: p. 61 (62 pages)

Anonymous. 2001. Surviving the downturn - Step back before you fall, *The Futurist*, Vol. 35: p. 17 (11 page)

Anonymous. 2002. Six next-gen disruptive technologies, *Communications News*, Vol. 39: p. 10 (11 page)

Ansoff I. (1965). *Corporate strategy: An analytic approach to business policy for growth and expansion*. McGraw-Hill: New York

Appleyard MM. (1996). How does knowledge flow? Interfirm patterns in the semiconductor industry. *Strategic Management Journal* 17(Winter Special Issue): 137-154

Armour HO, Teece DJ. (1978). Organization structure and economic performance: A test of the multidivisional hypothesis. *Bell Journal of Economics* 9: 106-122

Arnason AB. 2002. The 'latest greatest' technology trends, *Rural Telecommunications*, Vol. 21: p. 14 (14 pages)

Arrow KJ. (1962). The Economic-Implications of Learning by Doing. *Review of Economic Studies* 29(80): 155-173

Audretsch DB, Lehmann EE. (2004). University spillovers: Does the kind of science matter? *Industry and Innovation* 11(3): p. 193

Bahrami H, Evans S. (1989). Strategy making in high-technology firms: The empiricist mode. *California Management Review* 31(2)

Bain JS. (1959). *Industrial Organization*. John Wiley & Company: New York

Baker WE. (1984). The social structure of a national securities market. *American Journal of Sociology* 89: 775-811

Banham R. (2005). High-Tech's Spree. *Chief Executive*: p. 30 (34 pages)

Banxia_Software_Ltd. 2005. Decison Explorer, 3.3 ed.: www.banxia.com

Barley SR, Freeman J, Hybels RC. (1992). Strategic alliances in commercial biotechnology. In N Nohria, R Eccles (Eds.), *Networks and Organizations: Structure, Form and Action*: 311-347. Harvard Business Press: Boston, MA.

Barney J. (1986). Strategic factor markets: Expectations, luck and business strategy. *Management Science* 42: 1231-1241

Barney J. (1991). Firm resources and sustained competitive advantage. *Journal of Management* 17: 99-120

Barthold J. 2004. Digital can of worms, *The American City & County*, Vol. 119: p. 40 (44 pages)

Berg S, Friedman P. (1978). Joint ventures in American industry: An overview. *Mergers and Acquisitions* 13: 28-41

Besen SB, Farrell J. (1994). Choosing how to compete: Strategies and Tactics in Standardization. *The Journal of Economic Perspective* 8(2): 117-131

Bettis RA, Hitt MA. (1995). The new competitive landscape. *Strategic Management Journal* 16: 7-19

Bettis RA, Prahalad CK. (1995). The dominant logic: Retrospective and extension. *Strategic Management Journal* 16: 5-14

Bhide A. (2000). *The origin and evolution of new business*. Oxford University Press

Borck JR. (2002). How to snare an 800-pound gorilla. *InfoWorld* 24(1): p. 33 (31 page)

Borys B, Jemison DB. (1989). Hybrid arrangements as strategic alliances: Theoretical issues in organizational combinations. *Academy of Management Review* 14(2): 234-249

Bradner S. 2002. Prediction: Fast is not everything, *Network World*, Vol. 19: pg. 28

Breschi S, Lissoni F. (2001). Knowledge spillovers and local innovation systems- A critical survey. *Industrial and Corporate change* 10(4): p. 975

Breschi S, Malerba F. (1997). Sectoral Innovation Systems: technological regimes, schumpeterian dynamics, and spatial boundaries. In C Edquist (Ed.), *Systems of innovation : technologies, institutions, and organizations*, Vol. xiv: 432 p.

Brown JS, Duguid P. (1991). Organizational Learning and Communities-of-Practice: Toward a Unified View of Working, Learning, and Innovation. *Organization Science* 2(1): 40-57

Brown M. 2000. Embracing disruptive technology: Storage of data over IP, *Computer Technology Review*: pg. 60 (66 pages)

Brown S, Eisenhardt K. (1997). The art of continuous change: Linkning complexity theory and time-paced evolution in relentlessly shifting organizatons. *Administrative Science Quarterly* 42(1): 1-34

Brush TH. (1996). Predicted change in operational synergy and post acquisition performance of acquired businesses. *Strategic Management Journal* 17: 1-24

Burgelman R. (1983). A model of the interaction of the strategic behavior, corporate context, and the concept of strategy. *Academy of Management Review* 8(000001): pg. 61

Burrell G, Morgan G. (1979). *Sociological Paradigms and Organizational Analysis*. Heinemann: Exeter

Byrne JA, Elgin B. 2002. Cisco Shopped till It Nearly Dropped, *Business Week*:

Cannella AA, Hambrick DC. (1993). Effects of executive departures on the performance of acquired firms. *Strategic Management Journal* 14: 137-152

Carlsson B, Jacobsson S. (1994). Technological Systems and Economic-Policy - the Diffusion of Factory Automation in Sweden. *Research Policy* 23(3): 235-248

Carlsson B, Stankiewicz R. (1995). On the nature, function and composition of technological systems. In B Carlsson (Ed.), *Technological Systems and Economic Performance: The Case of Factory Automation*. Kluwer Academic Publishers

Cass S. 2004. Disruption to order, *IEEE Spectrum*: p. 83 (82page)

Castanias RP, Helfat CE. (1991). Managerial resources and rents. *Journal of Management* 17: 155-172

Caves RE. (1980). Industrial organization, corporate strategy and structure. *Journal of Economic Literature* 58: 64-92

Champy J. 2001. Net disruption, *Computerworld*, Vol. 35: p. 41 (41 page)

Chandler AD. (1962a). *Strategy and structure: chapters in the history of the industrial enterprise*. M.I.T. Press: Cambridge

Chandler AD. (1962b). *Strategy and structure: chapters in the history of the industrial enterprise*. M.I.T. Press: Cambridge

Charmaz K. (2000). Grounded Theory: Objectivist and Constructivist Methods. In NK Denzin, YS Lincoln (Eds.), *Handbook of Qualitative Research*, 2nd. ed.: 509-535. Sage: Thousands Oaks, CA.

Chatterjee S. (1986). Types of synergy and economic value: The impact of acquisitions on merging and rival firms. *Strategic Management Journal* 7: 119-139

Chatterjee S, Wernerfelt B. (1991). The link between resources and type of diversification: Theory and evidence. *Strategic Management Journal* 12: 33-48

Chaudhuri S, Tabrizi B. (1999a). Capturing the real value in high-tech acquisitions. *Harvard Business Review* 3(4)

Chaudhuri S, Tabrizi B. (1999b). Capturing the real value in high-tech acquisitions. *Harvard Business Review*

Chi T. (1994). Trading in strategic resources: Necesary conditions, transaction cost problems, and choice of exchange structure. *Strategic Management Journal* 15(4): 271-290

Christensen CM. (1997). *The innovator's dilemma - When new technologies cause great firms to fail*. Harvard Business School Press: Cambridge, Massachusetts

Christensen CM. 2001. Making friends with disruptive technology: - an interview with Clayton M. Christensen, *Strategy & Leadership*, Vol. 29: p. 10

Christensen CM, Anthony SD, Roth EA. (2004). *Seeing what's next - Using the theories of innovation to predict industry change*. Harvard Business School Press: Boston, Massachusetts

Christensen CM, Craig T, Hart S. (2001). The great disruption. *Foreign Affairs* 80(2): p. 80 (16 pages)

Christensen CM, Raynor ME. (2003). *The innovator's solution - Creating and sustaining successful growth*. Harvard Business School Press: Boston, Massachusetts

Cisco.com. (2005).

Clarke I, Mackaness W, Ball B, Horita M. (2003). The devil is in the detail: visualising analogical thought in retail location decision making. *Environment and Planning* 30(1): 15-36

Clarke P, Privat J, Patus ES, Tsirtsis G. (2000). FreeUnet -- Disruptive Technology IP Network Research Platform. *BT Technology Journal* 18(1): p. 48

Coff RW. (1997a). Human assets and management dilemmas: Coping with hazards on the road to resource-based theory. *Academy of Management Review* 22(2): 374-402

Coff RW. (1997b). Human assets and management dilemmas: Coping with hazards on the road to resource based theory. *Academy of Management Review* 22(2): 374-402

Cohen WM, Levinthal DA. (1990a). Absorptive-Capacity - a New Perspective on Learning and Innovation. *Administrative Science Quarterly* 35(1): 128-152

Cohen WM, Levinthal DA. (1990b). Absorptive capacity: A new perspective on leaning and innovation. *Administrative Science Quarterly* 35: 128-152

Collis DJ. (1994). How valuable are organizational capabilities? *Strategic Management Journal* 15: 143-152

Combs JG, David J. Ketchen J. (1999). Explaining interfirm cooperation and performance: Toward a reconciliation of predictions from the resource-based view and organizational economics. *Strategic Management Journal* 20: 867-888

Connolly PJ, Rash W. 2003. Network effects, *InfoWorld*, Vol. 25: p. 25 (22 pages)

Connolly PJ, Yager T. 2003. Not enough disruption?, *InfoWorld*, Vol. 25: p. 38 (33 pages)

Cooke P, Gomez M, Etxebarria G. (1997). Regional innovation systems: Institutional and organisational dimensions. *Research Policy* 26(4-5): 475-491

Cosier G, Hughes PM. (2001). The Problem with Disruption. *BT Technology Journal* 19(4): p. 9

Cossette P. (2002). Analysing the thinking of F. W. Taylor using cognitive mapping. *Management Decision* 40(2): 168-182

Cossette P, Audet M. (1994). Qu'est-ce qu'une carte cognitive. In P Cossette (Ed.), *Cartes cognitives et organizations*, ESKA ed.: 13-33. Les presses de l'universite laval: Quebec/Paris

Cossette P, Lapointe A. (1997). A mapping approach to conceptual models : The case of macroeconomic theory. *Canadian Journal of Administrative Sciences* 14 (1): 41-51

Cravens DW, Piercy NF, Low GS. (2002). The innovation challenges of proactive cannibalisation and discontinuous technology. *European Business Review* 14(4): p. 257 (211 pages)

Creswell JW. (1998). *Qualitative inquiry and research design : choosing among five traditions* Sage: Thousand Oaks, Calif.

Creswell JW. (2003). *Research design : qualitative, quantitative and mixed approaches* (2nd ed ed.). Sage Publications: Thousand Oaks, Calif.

Curwen P. 2006. Will Skype fever abate before it's too late, *Info : the Journal of Policy, Regulation and Strategy for Telecommunications, Information and Media*, Vol. 8: p. 91 (92 pages)

D'Aveni RA, Ravenscraft DJ. (1994). Economies of integration versus bureacracy of costs: Does vertical integration improve performance. *Academy of Management Journal* 37: 1167-1206

Daniels K, Johnson G, Chernatony Ld. (2002). Task and institutional influences on managers' mental models of competition. *Organization Studies* 23(1): 31-62

Danneels E. (2004). Disruptive Technology Reconsidered - A Critique and Research Agenda. *The journal of product innovation management* 21(246): 258

Datta DK. (1991). Organizational Fit and Acquisition Performance: Effects of Post-Acquisition Integration. *Strategic Management Journal* 12: 281-297

Daunais JP. (1992). *L'entretien non-directif.* Presses de l'Universite du Quebec: Quebec

Denzin NK. (1978). *The Research Act: A Theoretical Introduction to Sociological Methods* (2nd ed.). McGraw-Hill: New York

Denzin NK. (1989). *The Research Act: A Theoretical Introduction to Sociological Methods* (3rd ed.). McGraw-Hill: New York

Denzin NK, Lincoln YS. (2003). *Strategies of qualitative inquiry* (2nd ed ed.). Sage: Thousand Oaks

Dierickx I, Cool K. (1989). Asset stock accumulation and sustainability of competitive advantage. *Management Science* 35: 1504-1511

Dodgson M. (1993). Organizational Learning: A Review of Some Literatures. *Organization Studies* 14(3): 375-394

Donlan TG. 2005. Creative Disruption, *Barron's*, Vol. 85: p. 39 (31 page)

Dosi G. (1982). Technological Paradigms and Technological Trajectories - a Suggested Interpretation of the Determinants and Directions of Technical Change. *Research Policy* 11(3): 147-162

Draughon RS. (2000). NAPSTER - Sustaining vs. disruptive technologies. *Information Executive* 4(10): p. 3 (1 page)

Duhaime IM, Schwenk CR. (1985). Conjectures on cognitive simplification in acquisition and divestment decision making. *Academy of Management Review* 10(2): 287-295

Duysters G, Man A-Pd. (2003a). Transitory alliances: An instrument for surviving turbulent industries? *R&D Management* 33(1)

Duysters G, Man A-Pd. (2003b). Transitory alliances: an instrument for surviving turbulent industries? *R&D Management* 33(1): 49-58 (10 pp.)

Eden C, Ackermann F. (1998). *Making strategy: The journey of strategic management.* Sage Publications

Eden C, Ackermann F. (2004). Cognitive mapping expert views for policy analysis in the public sector. *European Journal of Operational Research* 152(3)

Edquist C. (1997). *Systems of innovation : technologies, institutions, and organizations*. Pinter: London; Washington

Edquist C. (2005). Systems of Innovation: Perspectives and Challenges. In J Fagerberg, DC Mowery, RR Nelson (Eds.), *The Oxford handbook of innovation*, Vol. xviii: 656 p. Oxford University Press: New York

Eisenhardt K, III LJB. (1988). Politics of strategic decision making in high velocity environments: Toward a midrange theory. *Academy of Management Journal* 31(4): 737-770

Eisenhardt K, Schoonhoven CB. (1990). Organizational growth: Linkning founding team, strategy, environment, and growth among U.S. semiconductor ventures, 1978-1988. *Administrative Science Quarterly* 35(3): 504-529

Eisenhardt K, Tabrizi BN. (1995). Accelerating adaptive process: Product innovation in the global computer industry. *Administrative Science Quarterly* 40(1): 84-110

Eisenhardt K, Zbaracki MJ. (1992). Strategic decision making. *Strategic Management Journal* 13: 17-37

Eisenhardt KM. (1989a). Agency theory: An assessment and review. *Academy of Management Review* 14(1): 57-74

Eisenhardt KM. (1989b). Building theories from case study research. *Academy of Management Review* 14(4): 532-550

Eisenhardt KM, Schoonhoven CB. (1996). Resource based view of strategic alliance formation: Strategic and social effects in entrepreneurial firms. *Organisation Science* 7(2): 136-150

Etzkowitz H, Leydesdorff L. (2000). The dynamics of innovation: from National Systems and "Mode 2" to a Triple Helix of university-industry-government relations. *Research Policy* 29(2): 109-123

Evans DS, Schmalensee R. (Forthcoming). The Industrial Organization of Markets with Two-Sided Platforms. In WD Collins (Ed.), *Issues in Competition Laws and Policies*:

Fagerberg J, Mowery DC, Nelson RR. (2005). *The Oxford handbook of innovation*. Oxford University Press: Oxford ; New York

Faletra R. 2005. Yet Another Company With An Inability To Deal With Disruptive Technology, *CRN*: p. 76 (71 page)

Feeser HR, Willard GE. (1990). Founding strategy and performance: A comparison of high and low growth high tech firms. *Strategic Management Journal* 11: 87-98

Ferelli M. 2000. Fibre Channel technology: Disruptive, yes; diminishing, no, *Computer Technology Review*, Vol. 20: p. 6 (1 page)

Ferrary M. (2003). Managing the disruptive technologies life cycle by externalizing the research: social network and corporate venturing in the Silicon Valley. *International Journal of Technology Management* 25(1/2)

Fiol CM, Lyles MA. (1985). Organizational Learning. *Academy of Management Review* 10(4): 803-813

Fortune.com. (2005).

Freeman C. (1974). *The economics of industrial innovation*. Penguin: Harmondsworth ; Baltimore

Freeman C. (1987). *Technology, policy, and economic performance: lessons from Japan*. Pinter Publishers: London ; New York

Freeman C. (2004). Technological infrastructure and international competitiveness. *Ind Corp Change* 13(3): 541-569

Gage SJ. 2000. A recipe for disruption, *Management Review*, Vol. 89: p 46 (41 page)

Galbraith CS, Stiles CH. (1984). Merger strategies as a response to bilateral market power. *Academy of Management Journal* 27(3): 511-524

Gawer A, Cusumano MA. (2002). *Platform Leadership: How Intel, Microsoft, and Cisco Drive Industry Innovation*. Harvard Business School Press

Geletkanycz MA, Hambrick DC. (1997). The external ties of top executives: Implications for strategic choice and performance. *Administrative Science Quarterly* 42(4): 654-681

Geringer JM, Herbert L. (1989). Control and performance of international joint ventures. *Journal of International Business Studies* 20: 235-254

Gilgun J. (1999). We Shared Something Special: The Moral Discourse of Incest Perpetrators. *Journal of Marriage and the Family* 57: 265-281

Gillmor D. 2002a. Eight ways to get ready for mobile usage, *Computerworld*, Vol. 36: p. 27 (21 page)

Gillmor S. 2002b. Man in the white suit, *InfoWorld*, Vol. 24: p. 46 (41 page)

Gillmor S. (2003). And the winner is ... - A satirical look at disruptive technologies. *InfoWorld* 25(1)

Gioia DA, Chittipeddi K. (1991). Sensemaking and sensegiving in strategic change initiation. *Strategic Management Journal* 12: 433-448

Glaser BG. (1992). *Basics of grounded theory analysis: Emergence Vs. Forcing* Sociology Press: Mill Valley, Calif.

Glaser BG, Strauss AL. (1967). *Discovery of Grounded Theory: Strategies for Qualitative research.* Aldine: Chicago

Glesne C. (1992). But Is It Ethical? Learning to Do Right, *Becoming Qualitative Researchers*, Vol. chap. 6: 113-129. Addison Wesley Longman

Goldblatt H. 1999. Cisco's Secrets, *Fortune*:

Golden-Biddle K, K. KD, Locke. (1997). Crafting the Storyline, *Composing Qualitative Research*, Vol. chap. 2: 21-49. Sage Publications

Goulding C. (2002). *Grounded theory: a practical guide for management, business and market researchers.* SAGE: London ; Thousand Oaks, Calif

Graham T, Ure J. (2005). IP telephony and voice over broadband. *Info : the Journal of Policy, Regulation and Strategy for Telecommunications, Information and Media* 7(4): p. 8 (13 pages)

Granovetter M. (1985a). Economic Action and Social Structure: The Problem of Embeddedness. *American Journal of Sociology* 91(3): 481-510

Granovetter M. (1985b). Economic action and social structure: The problem of embeddedness. *American Journal of Sociology* 91: 481-510

Grigoriou K, Rothaermel FT. 2010. Organizing For Adaptation: Innovative Capabilities, Relational Stars, Coordination Costs, and Boundary Choices, *DRUID Summer conference*: Imperial College London Business School

Gu X, Taylor L. (2003). Ultra-Wideband and Its Capabilities. *BT Technology Journal* 21(3): p. 56

Guba EG. (1978). Toward a Methodology of Naturalistic Inquiry in Educational Evaluation. In CSE (Ed.), *Monograph Series in Evaluation No. 8*. Center for the Study of Evaluation, University of California, Los Angeles.: Los Angeles

Gulati R. (1998). Alliances and networks. *Strategic Management Journal* 19: 293-317

Gulati R. (1999). Network location and learning: The influence of network resources and firm capabilities on alliance formation. *Strategic Management Journal* 20: 397-420

Guo A. 2003. A framework for forecasting and designing failure of incumbents: 142. Stanford University

Hafsi T, Thomas H. (2005). The field of strategy: In search of a walking stick. *European Management Journal* 23(5): 507-519

Hagedoorn J, Duysters G. 2000. The effect of mergers and acquisitions on the technological performance of companies in a high-tech environment. Eindhoven Center for Innovative Studies: The Netherlands

Hagedoorn J, Duysters G. (2002). External sources of innovative capabilities: The preference for strategic alliances or mergers and acquisitions. *Journal of Management Studies* 39(2)

Haleblian J, Finkelstein S. (1999). The influence of organizational acquisition experience on acquisition performance: A behavioral learning perspective. *Administrative Science Quarterly* 44(1): 29-56

Hall DJ, Saias M. (1980). Strategy Follows Structure! *Strategic Management Journal* 1(2): pg. 149

Hambrick DC, Cannella AA. (1993). Relative Standing: A Framework for Understanding Departures of Acquired Executives. *Academy of Management Journal* 36(4): 733-762

Hamel G. (1991). Competition for competence and inter-partner learning within international strategic alliances. *Strategic Management Journal* 12: 83-103

Hapgood F. 2001. Call of the Internet, *CIO*, Vol. 14: p. 144

Hasfi T, Thomas H. (2005). The field of strategy: In search of a walking stick. *European Management Journal* 23(5): 507-519

Haspelagh P, Jemison D. (1991). *Managing Acquisitions*. Free Press: New York

Haunschild PR, Henderson A, Davis-Blake A. (1998). *CEO Demographics and Acquisitions: Network and Cognitive Effects of Educational and Functional Background.* Addison Wesley: New York

Haveman HA. (1993). Follow the leader: Mimemic isomorphism and entry into new markets. *Administrative Science Quarterly* 38: 593-627

Hayward M, Hambrick D. (1997). Explaining the premiums paid for large acquisitions: Evidence of CEO hubris. *Administrative Science Quarterly*(42): 103-127

Heller R. 1999. The new meaning of a free market, *Management Today*: p. 30 (31 page)

Hennessy M. 2004. CCTA - more than television New name reflects growth of digital convergence, *Playback : Canada's Broadcast and Production Journal*: p. 26

Heskett B. 1997. Cisco shops to fill technology holes, *CNET News*:

Hitt MA, Hoskisson RE, Ireland RD. (1990). Mergers and acquisitions and managerial commitment to innovation in m-form firms. *Strategic Management Journal* 11: 29-47

Hitt MA, Hoskisson RE, Ireland RD, Harrison JS. (1991a). Are acquisitions a poison pill for innovation. *Academy of Management Executive* 5(4)

Hitt MA, Hoskisson RE, Ireland RD, Harrison JS. (1991b). Effects of acquisitions on R&D inputs and outputs. *Academy of Management Journal* 34(3): 693-706

Hitt MA, Hoskisson RE, Johnson RA, Moesel DD. (1996). The market for corporate control and firm innovation. *Academy of Management Journal* 39(5): 1084-1119

Hitt MA, Tyler BB. (1991). Strategic decision models: Integrating different perspectives. *Strategic Management Journal* 12: 327-351

Hodgson GM. (2006). What Are Institutions? *Journal of Economic Issues* 40(1): 1-25

Hoffman WH, Schaper-Rinkel W. (2001). Acquire or ally? - A strategy framework for deciding between acquisition and cooperation. *Management International Review* 41(2): 131-159

Holmes JS, Glass JT. 2004. INTERNAL R&D - VITAL BUT ONLY ONE PIECE OF THE INNOVATION PUZZLE, *Research Technology Management*, Vol. 47: p. 7 (4 pages)

Holmes PE, Dufour IG, Muschamp P. (2004). Future Technologies. *BT Technology Journal* 22(2): p. 116

Hopkins HD. (1987). Acquisition strategy and the market position of acquiring firms. *Strategic Management Journal* 8: 535-547

Huber GP, Power DJ. (1985). Research Notes and Communications: Retrospective Reports of Strategic-level Managers: Guidelines for Increasing Accuracy. *Strategic Management Journal* 6(2): 171-180

Hughes PM, Cosier G. (2001a). What Makes a Revolution - Disruptive Technology and Social Change. *BT Technology Journal* 19(4): p. 24

Hughes PM, Cosier G. (2001b). Whose Power is it Anyway? *BT Technology Journal* 19(4): p. 35

Husig S, Hipp C, Dowling M. (2005). Analysing disruptive potential: the case of wireless local area network and mobile communications network companies. *R&D Management* 35(1)

Huysman M, Leonard D, Nicolle A. 2002. Towards a learning perspective on knowledge/technology transfer through corporate acquisitions, *35th Hawaii International Conference on System Sciences*. IEEE: Hawaii

James AD, Georghiou L, Metcalfe JS. (1998). Integrating technology into merger and acquisition decision making. *Technovation* 18(8/9)

Jemison D, Sitkin S. (1986a). Corporate acquisitions: A process perspective. *Academy of Management Review* 11(1): 145-163

Jemison DB, Sitkin SB. (1986b). Corporate acquisitions: A process perspective. *Academy of Management Review* 11(1): 145-163

Jensen MB, Johnson B, Lorenz E, Lundvall BA. (2007). Forms of knowledge and modes of innovation. *Research Policy* 36(5): 680-693

Jensen MC. (1984). Takeovers: Folklore and Science. *Harvard Business Review* 62(6): 109-122

Johnson B. (1992). Institutional Learning. In BÅ Lundvall (Ed.), *National systems of innovation: towards a theory of innovation and interactive learning*, Vol. xiii: 342 p. Pinter Publishers: London

Johnson B, Edquist C, Lundvall BA. 2003. Economic Development and the National System of Innovation Approach, *Globelics Academy 2004*: Lisbon, Portugal

Johnson JT. 2004. AT&T's bellwether move, *Network World*, Vol. 21: p. 24 (21 page)

Johnson JT. 2005. Telecom taxes - Time for a tea party, *Network World*, Vol. 22:

Johnson JT. 2006. VoIP regulations test nations around the globe, *Network World*, Vol. 23: p. 35 (31 page)

Kaplan SM. 1999. Discontinuous innovation and the growth paradox, *Strategy & Leadership*, Vol. 27: p. 16 (16 pages)

Kapoor R, Lee JM. 2010. Coordinating and Competing in Ecosystems: How Organizational Forms Shape New Technology Investments, *ACAC 2010*:

Kassicieh SK, Kirchhoff BA, Walsh ST, McWhorter PJ. (2002a). The role of small firms in the transfer of disruptive technologies. *Technovation* 22: 667–674

Kassicieh SK, Walsh ST, Cummings JC, McWhorter PJ, Romig AD, Williams WD. (2002b). Factors differentiating the commercialization of disruptive and sustaining technologies. *IEEE TRANSACTIONS ON ENGINEERING MANAGEMENT* 49(4): 375

Kenny L. 1999. Take the leap, *Telephony*, Vol. 236: p. 40 (41 page)

Khanna T, Gulati R, Nohria N. (1998). The dynamics of learning alliances: Competition, cooperation, and relative scope. *Strategic Management Journal* 19(3): pg. 193

Kline SJ, Rosenberg N. (1986). An Overview of Innovation. In R Landau, N Rosenberg (Eds.), *The Positive sum strategy : harnessing technology for economic growth*, Vol. xiv: 640 p. National Academy Press: Washington, D.C.

Kogut B. (1988). Joint ventures: Theoretical and empirical perspectives. *Strategic Management Journal* 9: 319-332

Kogut B. (1991). Joint ventures and the option to expand and acquire. *Management Science* 37(1): 19-33

Krauss M. 1999. Author searches for dilemma's solution, *Marketing News*, Vol. 33: p. 8 (2 pages)

Kuhn T. (1962). *The Structure of Scientific Revolutions*. University of Chicago Press: Chicago

Kusewitt JB. (1985). An exploratory study of strategic acquisition factors relating to performance. *Strategic Management Journal* 6: 151-169

Langley A. (1999). Strategies for Theorizing from Process Data. *Academy of Management Review* 24(4): 691-710

Larsson R, Finkelstein S. (1999). Integrating, Strategic, Organizational, and Human Resource Perspectives on Mergers and Acquisitions: A Case Study of Synergy Realization. *Organization Science* 10(1): 1-26

Lasry E. 2000. User involvement in new product development - An empirical investigation: 102 Carleton University: Canada

Lebowitz J. (2002). How new technology elbows out the incumbents. *Mortgage Banking* 62(6): p. 42 (47 pages)

Leedy PD, Newby TJ, Ertmer PA. (1996). *Practical research : planning and design* (6th ed ed.). Merrill: Upper Saddle River, NJ

Levine S, White PE. (1961). Exchange as a conceptual framework for the study of interorganizational relationships. *Administrative Science Quarterly* 5: 583-601

Lewis B. 1998. To identify the next big wave in the industry, let your users innovate with small projects, *InfoWorld*, Vol. 20: p. 90 (91 page)

Lewis B. 2003. Redefining the market, *InfoWorld*, Vol. 25: p. 43 (41 page)

Lilja H. 2005. Seven steps to VoIP heaven, *Telecommunications International*, Vol. 39: p. 39 (32 pages)

Lincoln YS, Guba EG. (1985a). Establishing Trustworthiness, *Naturalistic Inquiry*, Vol. 11: 289-331. Sage Publication

Lincoln YS, Guba EG. (1985b). *Naturalistic Inquiry*. Sage Publication: Beverly Hills, CA

Lippman S, Rumelt RP. (1982). Uncertain imitability: An analysis of interfirm differences in effiency under competition. *Bell Journal of Economics* 13(418-438)

List F. (1885). *The National system of political economy* (MP Sampson Lloyd, Trans.). Longmans, Green and Co.: London

Locke LF, Spirduso WW, Silverman SJ. (2000). *Proposals that work : A guide for planning dissertations and grant proposals* (4th ed ed.). Sage: Thousand Oaks, Calif.

London S. 2002. Simon London talks to Nicholas Negroponte about wireless internet access and what it means for the telecommunications industry, *Financial*: p. 15

Lubatkin M. (1983). Mergers and the performance of the acquiring firm. *Academy of Management Review* 8(2): 218-225

Lundvall BA. (1985). Product innovation and user-producer interaction. *Industrial Development Research Series* 31

Lundvall BA. (2004). Introduction to 'Technological infrastructure and international competitiveness' by Christopher Freeman. *Ind Corp Change* 13(3): 531-539

Lundvall BA. 2006a. Innovation Systems between Policy and Research, *Innovation Pressure Conference*: Tampere, Finland

Lundvall BA. (2006b). Interactive Learning, Social Capital and Economic Performance. In B Kahin, D Foray (Eds.), *Advancing knowledge and the knowledge economy*, Vol. x: 503 p. MIT Press: Cambridge, Mass.

Lundvall BÅ. (1992). *National systems of innovation : towards a theory of innovation and interactive learning*. Pinter Publishers; Distributed exclusively in the USA and Canada by St. Martin's Press: London, New York

Lundvall BÅ. (2007). National Innovation Systems - Analytical Concept and Development Tool. *Industry & Innovation* 14(1): 95-119

Lundvall BA, Johnson B. (1994). The learning economy. *Journal of Industry Studies* 1(2): 23-42

Lundvall BÅ, Johnson B, Andersen ES, Dalum B. (2002). National systems of production, innovation and competence building. *Research Policy* 31(2): 213-231

Lundvall BA, Nielsen P. (2007). Knowledge management and innovation performance. *International Journal of Manpower* 28(3-4): 207-223

Madhok A. (1997). Cost, value and foreign market entry mode: The transaction and the firm. *Strategic Management Journal* 18: 39-61

Mahoney JT, Pandian JR. (1992). The resource-based view within the conversation of strategic management. *Strategic Management Journal* 13: 363-380

Malerba F. (2002). Sectoral systems of innovation and production. *Research Policy* 31(2): 247-264

March J, Simon H. (1958). *Organizations*. Wiley: New York

Markides C. (2006). Disruptive Innovation: In Need of Better Theory. *The journal of product innovation management* 23(19): 25

Markides CC, Williamson PJ. (1996). Corporate diversification and organization structure: A resource based view. *Academy of Management Journal* 39: 340-367

Marsden PV. (1981). Introducing influence processes into a system of collective decisions. *American Journal of Sociology* 86(6): 1203-1235

Maxwell J. (1996). *Qualitative Research Design. An Interactive Approach*. Sage Publications: Thousand Oaks, CA

Mayer D, Kenney M. (2004a). Economic action does not take place in a Vacuum: Understanding Cisco's acquisition and development strategy. *Industry and Innovation* 11(4): 299

Mayer D, Kenney M. (2004b). Economic action does not take place in a Vacuum: Understanding Cisco's acquisition and development strategy. *Industry and Innovation* 11(4): 299-325

Mayer D, Kenney M. (2004c). Economic action does not take place in vacuum: Understanding Cisco's acquisition and development strategy. *Industry and Innovation* 11(4): 299-325

Meyer AD. (1999). Using strategic partnerships to create a sustainable competitive position for high-tech start-up firms. *R&D Management* 29(4): 323-328 (326 pp.)

Miles G, Preece S, Baetz M. (1999). Dangers of Dependence: The impact of strategic alliance use by small technology-based firms. *Journal of small business management* 37(2): 20

Miles MB, Huberman AM. (1984). *Qualitative data analysis : a sourcebook of new methods*. Sage: Beverly Hills

Miles MB, Huberman AM. (1994). *Qualitative data analysis : an expanded sourcebook* (2nd ed ed.). Sage Publications: Thousand Oaks

Mintzberg H. (1979). *The structuring of organizations : a synthesis of the research*. Prentice-Hall: Englewood Cliffs, N.J.

Mintzberg H, Raisinghani P, Theoret A. (1976). The structure of the unstructured decision processes. *Administrative Science Quarterly* 2: 246-275

Moffat D. (1999). Weighing in with Wall Street. *Telephony* 236(23): p. 88 (84 pages)

MORRISON S. 2003. US regulators cautious on internet telephony rules, *Financial Times*: p. 6 London (UK)

Morton A, Ackermann F, Belton V. (2003). Technology-driven and model-driven approaches to group decision, support: focus, research philosophy, and key concepts. *European Journal of Information Systems* 12(2): 110-126

Moysey SP. 2001. A cross-functional examination of technological discontinuities and the associated risk of firm disruptions: 366 Tufts University

Murmann JP. (2003). *Knowledge and competitive advantage the coevolution of firms, technology, and national institutions*. Cambridge University Press: Cambridge, UK ; New York

Nahavandi A, Malekzadeh AR. (1988). Acculturation in Mergers and Acquisitions. *Academy of Management Review* 13(1): 79-90

Naish R. 2006. Disruptive technologies, *E.learning Age*: p. 12 (12 pages)

Nakache P. 1997. Cisco recruiting edge, *Fortune*:

Nault BR, Vandenbosch MB. (2000). Disruptive technologies - Explaining entry in next generation information technology markets. *Information Systems Research* 11(3): p. 304

Nelson RR. (1993). *National innovation systems : a comparative analysis*. Oxford University Press: New York

Nelson RR, Nelson K. (2002). Technology, institutions, and innovation systems. *Research Policy* 31(2): 265-272

Nelson RR, Sampat BN. (2001). Making sense of institutions as a factor shaping economic performance. *Journal of Economic Behavior & Organization* 44(1): 31-54

Nelson RR, Winter SG. (1977). In search of useful theory of innovation. *Research Policy* 6(1): 36-76

Niosi J. (2002). National systems of innovations are "x-efficient" (and x-effective) Why some are slow learners. *Research Policy* 31(2): 291-302

Niosi J. (2011a). Building innovation systems: an introduction to the special section. *Industrial and Corporate Change* 20(6): 1637–1643

Niosi J. (2011b). Complexity and path dependence in biotechnology innovation systems. *Industrial and Corporate Change* 20(6): 1795–1826

Niosi J, Godin B, Manseau A. (2000). *Canada's national system of innovation*. McGill-Queen's University Press: Montreal ; Ithaca

Niosi J, Zhegu M. (2005). Aerospace Clusters: Local or Global Knowledge Spillovers? *Industry and Innovation* 12(1): p. 5

Nortelnetworks.com. (2005).

O'Shea D. 2004. Watching for WiMAX, *Telephony*, Vol. 245: p. 46 (42 pages)

Oliver C. (1997). Sustainable competitive advantage: Combining institutional and resource based views. *Strategic Management Journal* 18(9): 697-713

Olleros X. 2006. The Lean Core in Digital Platforms, *DRUID Summer Conference*: Copenhagen, Denmark

Osborn RN, Hagerdoorn J. (1997). The institutionalization and evolutionary dynamics of interorganizational alliances and networks. *Academy of Management Journal* 40(2): 261-278

Paine FT, Power DJ. (1984). Merger strategy: An examination of Druker's five rules for successful acquisitions. *Strategic Management Journal* 5: 99-110

Palmer D, Barber B, Zhou X, Soysal Y. (1995). The Other Contested Terrain: Friendly and Predatory Acquisition of Large U.S. Corporations in the 1960s. *American Sociological Review* 60: 469-499

Pappalardo D. 2001. AT&T dives into metro Ethernet, *Network World*, Vol. 18: p. 1 (2 pages)

Parker GG, Alstyne MWV. (2005). Two-Sided Network Effects: A Theory of Information Product Design. *Management Science* 51(10): 1494–1504

Pascale R. (1984). Perspectives on strategy: the real story behind Honda's success. *California Management Review* 26(3): 47-72

Passmore D. 2004. VOIP Regulation For Dummies, *Business Communications Review*, Vol. 34: p. 14 (12 pages)

Patton MQ. (2002). *Qualitative research & evaluation methods* (3rd ed ed.). Sage Publications: Thousand Oaks

Pavitt K. (2005). Innovation Processes. In J Fagerberg, DC Mowery, RR Nelson (Eds.), *The Oxford handbook of innovation*, Vol. xviii: 656 p. Oxford University Press: Oxford ; New York

Pennings J, Barkema H, Douma S. (1994a). Organizational learning and diversification. *Academy of Management Journal*(37)

Pennings JM, Barkema H, Douma S. (1994b). Organizational learning and diversification. *Academy of Management Journal* 37(3): 608-640

Penrose EG. (1959). *The theory of the growth of the firm.* Wiley: New York

Perry ML, Sengupta S, Krapfel R. (2004). Effectivess of horizontal strategic alliances in technologically uncertain environments: Are trust and commitment enough? *Journal of Business Research* 57: 951-956

Peteraf MA. (1993). The cornerstones of competitive advantage: A resource-based view. *Strategic Management Journal* 14: 179-191

Peteraf MA, Barney J. (2003). Unraveling the resource-based tangle. *Managerial and Decision Economics* 24(4): 309-323

Peters L. 2002. What role will disruptive technologies play in the future?, *Semiconductor International*, Vol. 25: p. 15 (11 page)

Pfeffer J. (1972). Merger as a response to organizational interdependence. *Administrative Science Quarterly* 17: 382-394

Pfeffer J, Nowak P. (1976). Joint venture and interorganizational interdependence. *Administrative Science Quarterly* 21(3): 398-418

Pfeffer J, Salancik GR. (1978). *The external control of organizations*. Harper & Row: New York

Pfeiffer EW. 1999. Controlling disruptive data, *Forbes*: p. 15 (13 pages)

PFITZNER J. 2006. Jonathan Pfitzner says VoIP will not wipe out big companies, *Financial Times*: p. 4 London

Pisano GP, Russo MV, Teece DJ. (1988). Joint venture and collaborative arrangements in the telecommunications equipment industry. In D Mowery (Ed.), *International Collaborative Ventures in U.S. Manufacturing*. Ballinger: Cambridge, MA.

Polanyi M. (1966). *The tacit dimension* (1st ed.). Doubleday: Garden City, N.Y.

Poppo L, Zenger T. (1998). Testing alternative theories of the firm: Transaction cost, knowledge-based, and measurement explanation for make-or-buy decisions in information services. *Strategic Management Journal* 19(9): 853-877

Porrini P. (2004). Alliance experience and value creation in high-tech and low-tech acquisitions. *Journal of High Technology Management Research*(15): 267-292

Porter M. (1980a). *Competitive Strategy*. Free Press

Porter M. (1980b). *Competitive Strategy: Techniques for analyzing industries and competitors*. Free Press: New York

Porter ME. (1990). *The competitive advantage of nations*. Free Press: New York

Porter ME. 2001. How to Profit From a Downturn, *Wall Street Journal (Eastern edition)*: p. A.22 New York

Powell WW, Brantley P. (1992). Competitive cooperation in biotechnology: Learning through networks. In N Nohria, R Eccles (Eds.), *Networks and Organizations: Structure, Form and Action*: 366-394. Harvard Business School: Boston, MA

Prahalad CK, Hamel G. (1990). The core competence of the corporation. *Harvard business review*: 79-91

Prahalad CK, Hamel G. (1994). *Competing for the future*. Harvard Business School Press: Boston

Prewitt E. 2001. Disruption is good, *CIO*, Vol. 14: p. 77

Puranam P, Singh H, Zollo M. (2003). A bird in the hand or two in the bush? Integration trade-offs in technology-grafting acquisitions. *European Management Journal* 21(2): 79-84

Quelin B. (2000). Core competencies, R&D management and partnerships. *European Management Journal* 18(5): 476-487

Quinn JB. (1978). Strategic Change: 'Logical Incrementalism'. *Sloan Management Review* 20(1): 7-19

Raciti R. (2006). Reducing Uncertainty in Converging Markets: Media and Communications. *Commercial Lending Review* 21(2): p. 40 (43 pages)

Radosevich L. 1998. Bringing home tomorrow's bright ideas, *InfoWorld*, Vol. 20: p. 71 (72 pages)

Ranft AL, Lord MD. (2000). Acquiring new knowledge: The role of retaining human capital in acquisitions of high-tech firms. *The Journal of high technology management research* 11(2): 295-319

Raoa B, Angelova B, Nova O. (2006). Fusion of Disruptive Technologies: Lessons from the Skype Case. *European Management Journal* 24(2-3): 174-188

Ravenscraft DJ, Scherer FM. (1989). The Profitability of Mergers. *International Journal of Industrial Organization*(7): 101-116

Reid A. 2005. Will Video on Demand hit ads?, *Campaign*, Vol. 254: p. 19 (11 page)

Reinhardt A. 2005. DISRUPTIVE TELECOM, *Business Week*: p. 60

Ritson M. 2005. Skype's call is worth the disruption, *Marketing*: p. 19 (11 page)

Roberts EB, Liu WK. (2001). Ally or acquire? *MIT Sloan Management Review*

Robertson TS, Gatignon H. (1998). Technology development mode: A transaction cost conceptualization. *Strategic Management Journal* 19: 515-531

Romanelli E. (1989). Environments and strategies of organization start-up: effects on early survival. *Administrative Science Quarterly* 34(3): 369-387

Roussel PA, Saad KN, Erickson TJ. (1991). *Third Generation Research and Development: Managing the link to corporate strategy*. Harvard Business School Press: Boston

Sahal D. (1985). Technological guideposts and innovation avenues. *Research Policy* 14(1985): 61-82

Salter M, Weinhold W. (1980). *Diversification by acquisition*. Free Press: New York

Sarkis H. 2009. Disruptive innovations and technologies and their impact on the telecommunication industry, *Administrative Sciences Association of Canada*, Vol. 30. Technology and innovation management division: Niagara Falls, Canada

Sarkis H. (2011). Acquisitions, Entrepreneurship and Systems of Innovation. *International Journal of Small Business and Entrepreneurship* 16(3): 314-335

Sarkis H. 2012. National systems of innovation: Integrating the innovation value chain and the mesh topology, *Administrative Sciences Association of Canada*, Vol. 33. Strategy division: St. John's.,New Foundland and Labarador

Saxenian A. (1994). *Regional advantage: culture and competition in Silicon Valley and Route 128*. Harvard University Press: Cambridge, Mass.

Scherer FM. (1980). *Industrial Market Structure and Economic Performance*. Rand-McNally: Chicago

Schumpeter J. (1934). *The theory of economic development*. Translation Publishers: New Brunswick

Schumpeter JA. (1939). *Business cycles; a theoretical, historical, and statistical analysis of the capitalist process*. (1st ed.). McGraw-Hill Book Company, Inc.: New York, London

Schumpeter JA. (1950). *Capitalism, Socialism and Democracy* (3rd. ed.). Harper: New York

Schwartz E. 2003. Defining disruption, *InfoWorld*, Vol. 25: p. 1 (2 pages)

Schwenk CR. (1984). Cognitive simplification processes in strategic decison making. *Strategic Management Journal* 5: 111-128

Seidenberg I. 2001. Convergence & competition in communications: Dreaming bigger dreams, *Executive Speeches*, Vol. 16: p. 1 (3 pages)

Seidenberg I. 2004. The Information Revolution - It's Just Getting Started, *Executive Speeches*, Vol. 18: p. 12 (14 pages)

Selznick P. (1957). *Leadership in administration - A Sociological Interpretation*. University of California Press

Serwer A. 2000. There is something about Cisco, *Fortune*:

SEVASTOPULO D, TAYLOR P. (2004). How the rise of internet telephony is shaking up Americas communications giants Net technology has galvanised the US telecoms industry. *Financial*: p. 15

Shan W. (1990). An empirical analysis of organizational strategies by entrepreneurial high-technology firms. *Strategic Management Journal* 11(2): 129-139

Shapiro C, Varian HR. (2003). The Art of Standards Wars, *Managing in the Modular Age: Architectures, Networks and Organizations*: 424. Blackwell Publishing

Shelton LM. (1988a). Strategic business fits and corporate acquisition: Empirical evidence. *Strategic Management Journal* 9: 279-287

Shelton LM. (1988b). Strategic Business Fits and Corporate Acquisitions: Empirical Evidence. *Strategic Management Journal* 11: 99-115

Shrivastava P. (1983). A Typology of Organizational Learning-Systems. *Journal of Management Studies* 20(1): 8-28

Simon H. (1976). *Administrative behavior*. Free Press: New York

Simon HA. (1991). Bounded rationality and organizational learning. *Organization Science* 2(1): 125-134

Singh H, Montgomery C. (1987). Corporate acquisition strategies and economic performance. *Strategic Management Journal* 8: 377-386

Sombart W. (1913). *Krieg und Kapitalismus*. Duncker & Humblot: Munchen

Sosik J, Jung D, Berson Y, Dionne S, Jaussi K. (2005). Making all the right connections: The strategic leadership of top executives in high-technology firms. *Organizational Dynamics* 34(1): 47-61

Stake RE. (2000). Case Studies. In NK Denzin, YS Lincoln (Eds.), *Handbook of Qualitative Research*: p. 435-454. Sage: Thousdand Oaks, CA.

Stankiewicz R, Carlsson B. (1991). On the nature, function and composition of technological systems. *Journal of Evolutionary Economics* 1(2): 93

Stein J. (1997). Waves of creative destruction- Firm specific learning by doing and dynamics of innovation. *The Review of Economic Studies* 64(219): 265 p.

Stewart TA. 2000. Should you fear disruptive technology, *Fortune*, Vol. 141: p. 249 (242 pages)

Stinchcombe AL. (1990). *Information and Organization*. University of California Press: Berkeley, CA.

Strauss A, Corbin J. (1998). *Basics of qualitative research: techniques and procedures for developing grounded theory* (2nd ed.). Sage: Thousand Oaks, Calif.

Stremersch S, Tellis GJ. (2002). Strategic bundling of products and prices: A new synthesis for marketing. *Journal of Marketing* 66(1): 55

Sutton RI, Staw BM. (1995). What theory is not. *Administrative Science Quarterly* 40: 371-384

Talbot D. 2001. DARPA'S disruptive technologies, *Technology Review*, Vol. 104: p. 42 (49 pages)

Taylor RN. (1975). Psychological determinants of bounded rationality: Implications for decision making. *Decision Sciences* 6: 409-429

Taylor SJ, Bogdan R. (1984). *Introduction to Qualitative Research Methods: The Search for Meaning* (2nd. ed.). John Wiley: New York

Teece DJ. (1982). Towards an economic theory of the multiproduct firm. *Journal of Economic Behavior and Organization* 3: 39-63

Teece DJ. (1986). Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy. *Research Policy* 15: 285-305

Teece DJ, Pisano G. (1998). The Dynamic Capabilities of Firms. In G Dosi, DJ Teece, J Chytry (Eds.), *Technology, organization and competitiveness: perspectives on industrial and corporate change*, Vol. ix: 345p. Oxford University: Oxford

Teece DJ, Pisano G, Shuen A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal* 18(7): 509-533

Tehrani M. (2003). Competitive strategies, strategic alliances and performance in international high-tech industries: A cross cultural study. *Journal of American Academy of Business* 2(2): 610-617 (618 pp.)

Tellis GJ. (2006). Disruptive Technology or Visionary Leadership? *The journal of product innovation management* 23(34): 38

Thorelli HB. (1986). Networks: Between markets and hierarchies. *Strategic Management Journal* 7: 37-51

Toffler A. (1970). *Future shock*. Random House: New York

Toffler A. (1980). *The third wave*. Morrow: New York

Tolly K. 2001. Embracing disruptive technologies, *Network World*, Vol. 18: p. 22 (21 page)

Trautwein F. (1990). Merger motives and merger prescriptions. *Strategic Management Journal* 11: 283-295

Tushman ML, Anderson P. (1986). Technological Discontinuities and Organizational Environments. *Administrative Science Quarterly* 31(3): 439-465

Tushman ML, O'Reilly CA. (1996). Ambidextrous organizations: Managing evolutionary and revolutionary change. *California Management Review* 38(4)

Tversky A, Kahneman D. (1974). Judgment under uncertainty: Heuristics and biases. *Science* 185: 1124-1131

Tyler BB, Steensma HK. (1995). Evaluating technological collaborative opportunities: A cognitive modeling perspective. *Strategic Management Journal* 16: 43-70

Utterback J. (1994). *Mastering the dynamics of innovation.* Harvard Business Press

Utterback J, Acee HJ. (2005a). Disruptive Technologies: An Expanded View. *International Journal of Innovation Management* 9(1): 1-17

Utterback JM, Acee HJ. (2005b). Disruptive Technologies: An Expanded View. *International Journal of Innovation Management* 9(1): 1-17

Verlinden MC, King SM, Christensen CM. 2002. Seeing beyond Moore's law, *Semiconductor International*, Vol. 25: p. 50 (56 pages)

Vizard M. 2002. Steering your platform on wheels, *InfoWorld*, Vol. 24: p. 10 (11 page)

Vogelstein F. 2002. Can Cisco Dig Out Of Its Hole?, *Fortune*:

Von-Hippel E. (1988). *The sources of innovation.* Oxford University Press

Vries MFRKD, Miller D. (1991). *The Neurotic Organization* Harpercollins

Walker G, Weber D. (1984). A transaction cost approach to make-or-buy decisions. *Administrative Science Quarterly* 29(3): 373-391

Walsh J. (1995). Managerial and organizational cognition: Notes from a trip down memory lane. *Organization Science* 6

Walsh ST, Kirchhoff BA, Newbert S. (2002). Differentiating market strategies for disruptive technologies. *IEEE TRANSACTIONS ON ENGINEERING MANAGEMENT* 49(4)

Walter GA, Barney JB. (1990). Management objectives in mergers and acquisitions. *Strategic Management Journal* 11: 79-86

Warner J. 2004. Survival of the Fittest, *Telecommunications Americas*, Vol. 38: p. 20 (21 page)

Weick KE. (1984). Managerial thought in the context of action, *The Executive Mind*: 221-242. Jossey Bass: San Francisco

Weick KE. (1995a). *Sensemaking in organizations.* . Sage Publications: Thousand Oaks

Weick KE. (1995b). What theory is not, theorizing is. *Administrative Science Quarterly* 40: 385-390

Wernerfelt B. (1984). A resource-based view of the firm. *Strategic Management Journal* 5: 171-180

Westley F, Mintzberg H. (1989). Visionary leadership and strategic management. *Strategic Management Journal* 10

Weston JF. 1999. Mergers and performance. Anderson School of Management, University of California: California

Whetten DA. (1989). What constitutes a theoretical contribution? *Academy of Management Review* 14: 490-495

White HC. (1981). Where do markets come from? *American Journal of Sociology* 87: 517-547

Wieland K. 2007. Is WiFi the great disrupter, *Telecommunications International*, Vol. 41: p. 20 (23 pages)

Wikipedia. 2010. Airbus, *Wikipedia*: http://en.wikipedia.org/wiki/Airbus

Wildstrom SH. 2004. At Last, You Can Ditch The Phone Company; VOIP lets you make clear, fast calls over the Net, using a plain phone, *Business Week*: p 26

Williams T, Ackermann F, Eden C. (2003). Structuring a delay and disruption claim: An application of cause-mapping and system dynamics. *European Journal of Operational Research* 148(1): 192-204

Williamson OE. (1975). *Markets and Hierarcies, analysis and antitrust applications: A study in the economics of internal organizations*. Free Press: New York

Williamson OE. (1986). Transaction-cost economics: The governance of contractual relations. In JB Barney, WG Ouchi (Eds.), *Organizational Economics*: 98-129. Jossey Bass

Williamson OE. (1991a). Comparative economic organization: The analysis of discrete structural alternatives. *Administrative Science Quarterly* 36(2): 269-296

Williamson OE. (1991b). Strategizing, economizing, and economic organization. *Strategic Management Journal* 12(Special Issue): 75-94

Williamson OE. (1999). Strategy research: Governance and competence perspectives. *Strategic Management Journal* 20: 1087-1108

Wuebker R, Navoth Z, Rao B, Horwitch M, Ziv N. 1998. Cisco Systems: The Internetworking Company of the Future. Institute for Technology and Enterprise: New York

Yin RK. (1989). Designing single - and multiple-case studies, *Case study research: Design and methods*, Revisited edition ed.: (170 p.), chap. 172, p. 127-160 (134p.). Sage Publications

Yin RK. (2003). *Case study research : design and methods* (3rd ed ed.). Sage Publications: Thousand Oaks, Calif.

Yip GS. (1982). Diversification entry: Internal development versus acquisition. *Strategic Management Journal* 3: 331-345

Zachary GP. 2002/2003. Corporate R&D set free, *Technology Review*, Vol. 105: p. 30 (31 page)

Zahra S, Bhawe N, Gupta A. 2009. Technology Convergence & The Emergence of New Firms, *Academy of Management PDW*: Chicago

Zajac EJ, Olsen CP. (1993). From transaction cost to transactional value analysis: Implications for the study of interorganizational strategies. *Journal of Management Studies* 30(1): 131-145

Zollo M, Singh H. (2002). Post-acquisition Strategies, Integration Capability, and the Economic Performance of Corporate Acquisition. *Strategic Management Review*

Zukin S, Dimaggio P. (1990). *Structures of capital: the social organization of the economy.* Cambridge University Press: Cambridge