

FUNDAÇÃO GETULIO VARGAS
ESCOLA DE ADMINISTRAÇÃO DE EMPRESAS DE SÃO PAULO
DOUTORADO EM ADMINISTRAÇÃO DE EMPRESAS

JANAINA SIEGLER MARQUES BATISTA

**SUPPLY CHAIN TURBULENCE: THE IMPACT OF A MID-RANGE EVENT IN
MULTI-TIER, MULTI-DIMENSION SUPPLY CHAINS**

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Campo do conhecimento: Gestão de Operações e Competitividade

Orientador: Prof. Dr. Luiz Artur Ledur Brito
Coorientadora: Prof. Barbara B. Flynn

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Banca Examinadora:

Prof. Dr. Luiz Artur Ledur Brito (orientador)
FGV-EAESP

Profª. DBA Barbara B. Flynn
Kelley School of Business Indianapolis, USA

Prof. Dr. Mohan Tatikonda
Kelley School of Business Indianapolis, USA

Profª. Dra. Susana Carla Farias Pereira
FGV-EAESP

Prof. Dr. Tomas de Aquino Guimarães
UNB

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“A great human revolution in just a single individual will help achieve a change in the destiny of a nation, and, further, will enable a change in the destiny of all humankind.”

Daisaku Ikeda

ABSTRACT

This dissertation aims at understanding complex multi-tier, multi-dimension supply chains, investigating why and how an event in a focal firm affects members of its own and other supply chains. To fulfill this goal, two approaches were used, a theoretical and an empirical approach. For the theoretical study, we developed a novel way to look at dissemination of the impact of an event over a supply chain through metaphorical transfer. We built upon the physics of stone skipping, analyzing the correspondence between elements from physics and supply chains at the levels of ontology, analogy, and identity. The main contributions of the theoretical study were the development of six propositions and a model of dissemination of the impact of an event over a supply chain. Second, we applied the propositions using a set of qualitative data collected in the cosmetics industry in Brazil. We conducted 131 semi-structured in-depth interviews and 22 site visits, in addition to observation and analysis of documents. The multiple case studies were based on six complex, multi-tier, multi-dimension supply chains encompassing up to seven tiers each. Within and cross-case analysis were conducted. The results of the empirical study are presented in two parts. First, we analyzed the six supply chains in detail and identified six mid-range events that had impacts beyond the source firm. Second, we tested the propositions from the theoretical part of this study and their application to the identified mid-range events. Our results indicated that, differently from the current literature, supply chains are not linear. In multi-tier, multi-dimension supply chains, the same firm can play different roles according to the supply chain it is part of different times. Thus, supply chains are better portrayed as a set of interlocking networks. Our findings also support viewing a supply chain as a chain of individual relationships. Several elements impact the dissemination of the impact of an event over a supply chain. Among them, power of the source firm and the personal social influence of the individuals in the source firm play a significant role. In addition, because individuals make decisions and implement events, it is important to consider that personal heuristics, biases, and locus of control will be manifested by the individuals in all contexts, both internal (focal firm), and external (supply chain links), and that those human irrationalities will impact the perception of the event and influence the continuity and extent of its impact in the supply chain. Our findings also support the notion that the impact of an event is disseminated over a supply chain through its members' weak ties.

Key words: Multi-tier Supply Chains; Metaphorical Transfer; Multiple Case Studies, Behavioral Operations, Social Network Theory.

RESUMO

Esta tese objetivou compreender cadeias de suprimento multi níveis e multi dimensionais, investigando como e porque um evento em uma empresa focal afeta membros de sua propria cadeia de suprimentos e outras cadeias. Para atender este objetivo, duas abordagens foram utilizadas: uma teórica e uma empírica. Para o estudo teórico, desenvolvemos uma nova forma de olhar a disseminação do impacto de um evento na cadeia de suprimentos utilizando transferência metafórica. Nos baseamos na física de pedras que saltam na água, analisando a correspondência dentre os elementos da física e das cadeias de suprimentos nos níveis de ontologia, analogia e identidade. A principal contribuição do estudo teórico reside no desenvolvimento de seis proposições e um modelo para a disseminação do impacto de um evento na cadeia de suprimentos. Em seguida, nós aplicamos tais proposições numa base de dados coletada no setor de cosméticos no Brasil. Foram conduzidas 131 entrevistas em profundidade e 22 visitas à fábricas e unidades de negócio por todo o país. Complementarmente também foram conduzidas observações e análise de documentos secundários. Estudos de casos múltiplos individuais e comparativos foram desenvolvidos baseados em seis cadeias de suprimentos complexas, multi-níveis e multi-dimensionais, que englobaram de cinco a sete níveis cada uma. Os resultados foram apresentados em duas partes. No primeiro, analisamos as seis cadeias de suprimentos em detalhes e identificamos seis eventos de médio porte que tiveram impactos em suas cadeias de suprimentos além da empresa focal onde foi iniciado. Em seguida, aplicamos as proposições do estudo teórico nos eventos de médio porte identificados. Nossos resultados indicaram que, diferentemente da literatura, cadeias de suprimentos não são lineares. Em condições reais, a mesma empresa pode representar diferentes papéis de acordo com a cadeia de suprimento que ela é parte em diferentes momentos. Assim, cadeias de suprimentos são melhor representadas como um conjunto de redes interligadas. Nossos achados também suportam a visão de cadeias de suprimentos como uma rede de relações individuais. Vários diferentes elementos influenciam na disseminação do impacto de um evento em uma cadeia de suprimentos, dentre eles, o poder da empresa e a habilidade de influência social dos indivíduos que fazem parte daquela empresa têm papel relevante. Também é importante considerar que irracionalidades pessoais como heurísticas, vieses, e locus de controle serão manifestados por indivíduos em todos os contextos, interno (empresa focal) e externo (cadeia de suprimentos), e que tais irracionalidades impactam a percepção do evento, a continuidade e extensão de seus impactos na cadeia de suprimentos. Nossos achados ainda suportam a noção de que o impacto de um evento é disseminado na cadeia de suprimentos por meio dos laços fracos construídos pelos membros das organizações.

PALAVRAS-CHAVE: Cadeia de Suprimentos Multi-níveis; Transferência Metafórica; Estudos de Caso Múltiplos; Operações Comportamentais; Teoria de Redes Sociais.

ILLUSTRATIONS

TABLES

Table 1: Dissertation Goals	32
Table 2: Heuristics and main biases.....	54
Table 3: Ontology	63
Table 4: Analogy.....	65
Table 5: Analogy for the stone	71
Table 6: Analogy for throw	76
Table 7: Analogy for collision.....	82
Table 8: Analogy for reaction force formula.....	87
Table 9: Analogy for bounces.....	92
Table 10: Analogy for sink.....	94
Table 11: Propositions.....	100
Table 12: Contact generation for snowball sampling	107
Table 13: Interview protocol	114
Table 14: Characteristics of the focal firms	120
Table 15: Firms by supply chain position	121
Table 16: Firms by type of product or service.....	123
Table 17: Firms by region (ABIHPEC, 2014).....	123
Table 18: Firms by size and comprehensiveness.....	124
Table 19: Overview numbers of interviews and informants	126
Table 20: Within-case analysis: one-page overview.....	133
Table 21: Data accounting log	141
Table 22: “Golden Sheet” structure of information about the firm	143
Table 23: “Golden Sheet” structure of information about the interview	143
Table 24: “Golden Sheet” structure information about the person.....	144
Table 25: “Golden Sheet” structure of the contact information	144
Table 26: Chain of evidence	147
Table 27: Main differences between cosmetics and dermocosmetics	154
Table 28: Focal firms’ channels of distribution.....	158

Table 29: Meaning of the shapes in the supply network representations.....	159
Table 30: Meaning of the colors in the supply network representations	160
Table 31: Identified mid-range events	198
Table 32: Tiers impacted by each mid-range event analyzed in this section	200
Table 33: Informants and firms impacted by D1's acquisition	204
Table 34: Pity-Pat Effect for D1's acquisition	207
Table 35: Informants and firms impacted by D1's event in marketing and sales director ...	211
Table 36: Pity-Pat Effect of D1's new marketing and sales director.....	213
Table 37: Informants and firms impacted by the commercial disagreement	232
Table 38: Pity-Pat Effect for B1's commercial disagreement with PRO.....	236
Table 39: Mid-range events investigated and related propositions	250
Table 40: Similarities and differences between the supply base evaluation of B3 and B4...	256

FIGURES

Figure 1: Mediation of individual characteristics in the decisions made	24
Figure 2: DaVinci sketch of turbulent flow	25
Figure 3: Events as results of decisions	27
Figure 4: Behavioral operations papers by year	28
Figure 5: Relationships between individuals and firms	29
Figure 6: Growth of the cosmetics industry in Brazil	35
Figure 7: Top 15 countries in cosmetics consumption.....	36
Figure 8: Dissertation structure.....	37
Figure 9: Illustration of a supply chain.	39
Figure 10: Supply chain network.....	40
Figure 11: Risk categorization scheme	43
Figure 12: Levels of supply chain.....	45
Figure 13: Types of buyer and supplier relationships	48
Figure 14: Skipping of a round bottom shaped stone (left=simulation, right=experiment)....	67
Figure 15: Skipping of a flat bottom shaped stone (left=simulation, right=experiment)	67
Figure 16: Throw of a stone representation.....	72
Figure 17: Analysis of stone skipping.....	78
Figure 18: Collision process of a flat stone encountering a water surface.....	81
Figure 19: Schematic view of the collision pre-bouncing process	83
Figure 20: Ripples formed by stone collisions with the water	85
Figure 21: Snapshot of a stone-water collision.....	86
Figure 22: Snapshots of a stone skipping simulation.....	87
Figure 23: Pity-Pat effect	90
Figure 24: Forces acting on a stone	93
Figure 25: Graphical representation of propositions.....	101
Figure 26: The physics of stone skipping	102
Figure 27: Model of the dissemination of the impact of an event in a supply chain	103
Figure 28: Embedded case design.....	106
Figure 29: Snowball contact generation.....	108
Figure 30: Examples of beauty products and dermocosmetics products	110
Figure 31: Comparison of researched vs. total cosmetics firms	124

Figure 32: Main job titles interviewed	127
Figure 33: Informants by perspective	128
Figure 34: Final chart of the process to start analyzing the results of the collected data.....	135
Figure 35: Network representation of researched supply chains	159
Figure 36: Position of D1 and D2	161
Figure 37: Interlocking relationships in dermocosmetics supply chains	162
Figure 38: Number of informants in each tier for D1’s supply chain	164
Figure 39: Network representation of D1 supply chain	165
Figure 40: Upstream network illustration for D1’s supply chain	166
Figure 41: Downstream network illustration of D1’s supply chain.....	168
Figure 42: Number of informants in each tier of D2’s supply chain	169
Figure 43: Network representation of D2’s supply chain	170
Figure 44: Upstream network illustration of D2’s supply chain	171
Figure 45: Downstream network illustration of D2’s supply chain.....	173
Figure 46: Beauty products firms highlighted in the researched supply chains	174
Figure 47: Network representation of beauty products supply chain	177
Figure 48: Number of informants in each tier of B1’s supply chain	178
Figure 49: Network representation of B1’s supply chain.....	178
Figure 50: Brazilian biomass areas	180
Figure 51: Upstream network illustration of B1’s supply chain.....	181
Figure 52: Downstream network illustration of B1’s supply chain.....	182
Figure 53: Number of informants in each tier of B2’s supply chain	183
Figure 54: Network representation for B2 supply chain	184
Figure 55: Upstream network illustration of B2’s supply chain.....	185
Figure 56: Downstream network illustration of B2’s supply chain	186
Figure 57: Number of informants in each tier of B3’s supply chain	188
Figure 58: Network representation of B3 supply chain	189
Figure 59: Upstream network illustration of B3’s supply chain.....	190
Figure 60: Downstream network illustration of B3’s supply chain	192
Figure 61: Number of informants in each tier of B4’s supply chain	193
Figure 62: Network representation of B4’s supply chain.....	194
Figure 63: Upstream network representation of B4’s supply chain	196
Figure 64: Downstream network representation of B4’s supply chain	198
Figure 65: Ripples Effect illustration for D1’s acquisition	205

Figure 66: Pity-Pat Effect illustration for D1's acquisition	207
Figure 67: Ripples Effect illustration for D1's change of marketing and sales director.....	210
Figure 68: Pity-Pat Effect for D1's new marketing and sales director	213
Figure 69: The Ripples Effect illustration of D1's new sales model	222
Figure 70: Kinetic Energy principle illustration for D1's new direct sales model	225
Figure 71: Illustration of the exclusivity of the event	227
Figure 72: Timeline for imported chemical products	230
Figure 73: The ripples effect for B1 and PRO's commercial disagreement	234
Figure 74: Pity-Pat Effect illustration for B1's commercial disagreement with PRO.....	236
Figure 75: Tiers impacted by PM 2186/2001	244
Figure 76: Kinetic energy principle illustration for PM 2186/2001	247
Figure 77: Influence of the types of buyer and supplier relationships in competitive advantage.....	257
Figure 78: A supply chain as a network of individual relationships.....	258
Figure 79: Practical model of dissemination of the impact of an event in a supply chain....	268
Figure 80: Illustration of the events in D1's supply chain that were discussed.	272

TABLE OF CONTENTS

1 INTRODUCTION.....	21
1.1 RESEARCH QUESTION AND GOALS	29
1.2 MOTIVATIONS	33
1.3 INDUSTRY	34
1.4 DISSERTATION STRUCTURE.....	36
2 THEORETICAL FOUNDATIONS.....	38
2.1 SUPPLY CHAIN MANAGEMENT RESEARCH.....	39
2.2 THEORETICAL FOUNDATIONS.....	44
2.2.1 Macro Level	44
2.2.1.1 Social Network Theory	44
2.2.2 Micro Level	48
2.2.2.1 Heuristics and Biases	50
2.2.2.2 Locus of Control	55
2.3 THEORETICAL DEVELOPMENT.....	56
2.3.1 Stone-Skipping in Physics.....	60
2.4 METAPHORICAL TRANSFER.....	62
2.4.1 Ontology.....	62
2.4.2 Analogy	63
2.4.2.1 Stone.....	66
2.4.2.2 Throw	71
2.4.2.3 Collision	76
2.4.2.4 Bounces	82
2.4.2.5 Sink	93
2.4.3 Identity	95
2.4.3.1 Propositions	95
2.4.3.2 Models.....	101
3 METHODS	104
3.1. EMBEDDED CASE DESIGN	104
3.1.2 Sampling	106
3.1.3 Sub-Sectors.....	109
3.2 INSTRUMENTS	111
3.2.1 Interview Protocol	111
3.2.2 Pre-Test	115
3.2.3 Procedures	116
3.2.4 Transcription and Translation	116
3.2.5 Triangulation	117
3.3 INDUSTRY	118
3.3.1 Focal Firms.....	118
3.3.2 Supply Chains.....	121

3.3.3 Buyer and Supplier Relationships	125
3.3.4 Individuals	125
3.4 DATA ANALYSIS	129
3.4.1 Within-Cases	129
3.4.1.1 Coding	129
3.4.1.2 One-Page Overview	132
3.4.1.3 Detailed Narrative	134
3.4.2 Cross Case Analysis	134
3.4.2.1 Social Network Analysis	135
3.4.2.2 Master Table	136
3.4.2.3 Pattern Matching	136
3.5 ETHICAL ISSUES	137
3.6 RELIABILITY AND VALIDITY	139
3.6.1 Reliability	139
3.6.1.1 Stability	139
3.6.1.2 Replicability	142
3.6.1.3 Accuracy	145
3.6.2 Validity	145
3.6.2.1 Construct Validity	146
3.6.2.2 Internal Validity	148
3.6.2.3 External Validity	148
3.7 DATA MANAGEMENT	149
4. RESULTS AND DISCUSSION	151
4.1 WITHIN CASE ANALYSIS	152
4.1.1 Network Representation of the Supply Chains	158
4.1.2 DERMOCOSMETICS SUPPLY CHAINS	161
4.1.2.1 Case One: Dermocosmetics 1 (D1)	164
4.1.2.2 Case Two: Dermocosmetics 2 (D2)	169
4.1.3 BEAUTY PRODUCTS SUPPLY CHAINS	174
4.1.3.1 Case Three: Beauty 1 (B1)	177
4.1.3.2 Case Four: Beauty 2 (B2)	183
4.1.3.3 Case Five: Beauty 3 (B3)	187
4.1.3.4 Case Six: Beauty 4 (B4)	192
4.1.4 Identified Mid-Range Events	198
4.2 CROSS-CASE ANALYSIS: DISSEMINATION OF THE IMPACT OF EVENTS IN MULTI-TIER, MULTI-DIMENSION SUPPLY CHAINS	199
4.2.1 Events in D1's Supply Chain	201
4.2.1.1 D1 Acquisition by an Investment Group	202
4.2.1.2 D1's New Marketing and Sales Director	208
4.2.1.3 D1's New Sales Model	216
4.2.1.4 Other Events in D1's Supply Chain: No Impact Perceived	226
4.2.2 Events in B1's and Adjacent Supply Chains	228
4.2.2.1 B1: Commercial Disagreement	231
4.2.2.2 B4: New Projects Allocation to PRO	237
4.2.3 Legislation Event	240
4.2.3.1 Legislation Event: PM 2186/2001	241
5. CONCLUSIONS	251

5.1 GOAL FULFILLMENT	251
5.2 RESEARCH QUESTION	252
5.3 KEY FINDINGS	253
5.4 UNEXPECTED FINDINGS	261
5.5 ACADEMIC CONTRIBUTIONS	265
5.6 PRACTICAL CONTRIBUTIONS	267
5.7 FUTURE STUDIES	268
5.6 LIMITATIONS	271
REFERENCES	274
APPENDIX A: INTERVIEW PROTOCOL	285
APPENDIX B: IRB APPROVAL	287
APPENDIX C: INFORMED CONSENT	290
Informed Consent In Portuguese.....	293
APPENDIX D: GOLDEN SHEET BASIC DATA FOR RESEARCHED FIRMS.....	296
APPENDIX E: GOLDEN SHEET BASIC DATA FOR RESEARCHED INFORMANTS	300
APPENDIX F: LIST OF FINED COMPANIES IN “OPERATION NEW DIRECTION II” BY IBAMA305	
APPENDIX G: MAIN BIASES AND HEURISTICS PERCEIVED IN EACH EVENT.....	306

1 INTRODUCTION

“There is nothing so practical as a good theory”
Kurt Lewin

In this dissertation, we explore the theme of complex multi-tier, and multi-dimension supply chains. We investigate why and how the impact of some events made in a firm are disseminated through its supply chain and others are not. We considered the supply chains in both micro, macro, and integrated levels. As micro level, we considered the individuals within the firms with their complexities and irrationalities. It was important to take that in consideration, because although the relationships in any supply chain are between firms, the decisions are made by individuals. The macro level refers to supply chains with their multiple tiers and connections among them. The integrated level refers to understanding how the micro and macro level are connected and influence each other. To understand this phenomenon, we conducted an in-depth qualitative study, which comprised 131 in-depth interviews, 22 site visits, observations and document analysis. We investigated dissemination of the impact of mid-range events over six multi-tier, multi-dimension supply chains in the cosmetics industry in Brazil, which was selected due to its variety of firms and complexity of buyer and supplier relationships, it is an industry with unusual characteristics (Singhal and Singhal, 2012).

Although most research in OM/SCM studies supply chains as linear, real supply chains are embedded in complex networks (Kim, Choi, Yan, and Dooley, 2011). A supply chain is not just a set of firms, individuals, or a relationship between two or three firms. Nor is it a linear flow of resources and goods. Real supply chains are complex, multi-tier, and multi-dimensional. They are multi-tier because to have a product or service delivered to a final customer, it must go through several tiers of suppliers and buyers. Consider the trivial example of buying a peach body lotion for a friend for her birthday. The tiers in that supply chain

include: the farmer who planted and harvested the peaches (raw material suppliers), the chemical firm responsible for the R&D to come up with an ingredient to make the raw materials usable in a cosmetic formula (raw material converters), the firm which develops a formula, a brand, and everything else needed to meet the customer's need (focal firm). The focal organization will either buy from the raw material converter directly or through a middleman in some cases. Also, that formula needs to go into a particular type of packaging. The raw material suppliers in the packaging industry are usually large multinational firms, which sell the raw material to a plastic firm, for example, which will make the packaging in the size and shape the focal firm wants for its peach lotion. That packaging can come with the label printed directly on the original packaging from the packaging supplier, or the focal firm can buy blank packaging and hire a service from a printing firm to make the label, or it can even buy labels as adhesives and put them on the packaging within its plant, adding another step to its production process. Sometimes, the product will need to be put in a box or other secondary packaging, which may add more suppliers and more steps in the process. Once the product is ready to go to the customer, it will need logistics providers. They can either go to wholesalers and then to retailers, or through other different sales channels, depending upon the focal firm's strategy. Then it comes to a customer decision in buying the peach lotion for her friend. She may even want the opinion of a specialist, such as beautician or dermatologist. Thus, this supply chain has multiple tiers.

In addition to multiple tiers, (the horizontal length of a supply chain), real supply chains are also multiple dimensional, when there is an interlocking (vertical) relationship between supply chains caused by shared elements. Firms in the same industry often have many suppliers in common, such as the raw material suppliers, converters and some of the packaging suppliers. The same firm might play different roles, depending upon which supply chain it is functioning

as part of at a specific time. For example, a large multinational chemical firm might be a first tier supplier for another large firm and, at the same time, be a second or third tier supplier for a smaller firm, which buys from wholesalers or middlemen. The same firm might also act as a buyer or as a supplier. It is buyer if we consider the upstream direction of its supply chain and a supplier if we consider the downstream direction of its supply chain. As suppliers deal with different buyers in different firms, that same supplier may play a different role in different supply chains. Thus, supply chains are also multi-dimension in addition to multi-tier.

Adding to these multi-tier and multi-dimension complexities of supply chains, we also need to consider that within each and every firm there are individuals making and implementing decisions. Bowman and Ambrosini (2000) understand that value perception applies to all purchases, not just those of final consumers. “The same type of judgment, a subjective judgment, is made by a manager when procuring inputs like machines and components, as by an individual when buying a fridge or a car” (p. 3). Ito et al (2012) understand that unconscious aspects as memory, perception, the creative and hidden side of the person influence in the selection, use, evaluation, reflection and representation of person-product interaction ex-ante, during and ex-post consumption, despite the fact that each product has its objective and technical side, it still has the subjective, ludic, imaginative and fragmented side that influences moods, feelings and emotions of consumers (p. 303) and can influence the WTP for it. In line with the authors, Kahneman (2003) suggests that some choices are not directed related to variations of quantity and cost, and that some heuristics or biases can mediate the way people perceive objective issues, such as cost, quality, and delivery just to name a few. Several times it could occur any psychological influence in how people evaluate and make decision, especially related to individual cognitive aspects and Kahneman & Frederick (2002) showed that judgment and preferences are not based primarily on information that was explicit

presented. Thaler (1985) suggest that people appear to respond more to perceived changes than to absolute levels. Figure 1 represents the idea of individual characteristics mediating the perception of competitive priorities and their impacts on the decisions made and implemented.

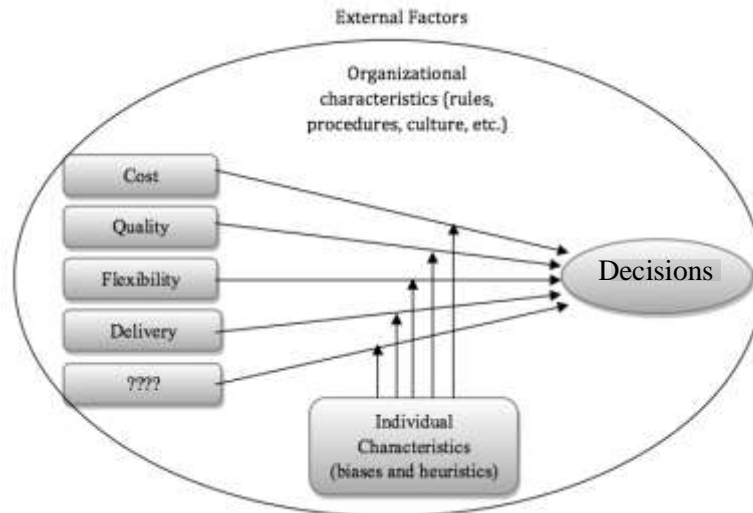


Figure 1: Mediation of individual characteristics in the decisions made

Because firms are connected to a larger network in a supply chain (Choi and Kim, 2008), it is expected that an event initiated in a focal firm will impact other firms in that supply chain. That impact may cause other impacts and other events causing turbulence in those supply chains, as well. Turbulence was first documented by Leonardo DaVinci, about 500 years ago (McDonough, 2004) and is illustrated in Figure 2. Turbulence is defined as a flow process with a chaotic property change in the environment after an encounter or initiation (Falkovich and Sreenivasan, 2006). Nobel Laureate Richard Feynman described turbulence as “the most important unsolved problem of classical physics, stretching roughly from Archimedes to Einstein” (Vergano, 2006).



Figure 2: DaVinci sketch of turbulent flow

Source: McDonough, 2004

A phenomenon analogous to turbulence happens in a supply chain after the initiation of an event in a focal firm. The impact of this event may be spread to its supply chain and beyond. Many different kinds and sizes of events can occur in a firm. Some events are high frequency and low impact events, like small changes and continuous improvement that must be made continuously over the time to allow operational and financial improvements. On the other hand, there are large low probability and high impact events, often in response to disasters (Hora and Klassen, 2013). The latter type of event is the domain of special fields of studies like humanitarian operations and crisis management.

We investigated the dissemination of the impact of an event over a supply chain, thus the high probability and low impact events are not in the scope of this research. On the other hand, although the low probability and high impact events are very important, the greater amount of events a firm will need to manage are events of medium-probability and medium impact, which we are calling mid-range events. We define a mid-range event as any that is not a high

probability, low impact event or a low probability, high impact event. Examples include a change in the director or key person in a buyer-supplier relationship, a merger or acquisition of another firm, the implementation of a new process or technology (e.g.: RFID or EDI), new legislation, or a new internal purchasing policy.

In the OM/SCM research, there is extensive literature on high probability and low impact events (Anand, Ward, Tatikonda, and Schilling, 2009). There is also an increasing amount of research that has been done on low probability and high impact events (Hora and Klassen, 2013). However, there is not much published about mid-range events, with moderate probabilities and moderate impacts.

As no firm exists in isolation in a supply chain, it is important to consider that an event in one firm may be the impetus for events in other firms as well. Thus, we investigated the way that an event in one firm leads to an impact over its supply chain. An event is the result of a decision. It is important to note that some decisions will not have any impact over a supply chain. Suppose that a firm analyzes its current situation and decides to make a change to its purchasing policies. Until the new policy is implemented, it will have no impact on its supply chain. Only after the new policy has been implemented in a firm, will we see impacts on its supply chain or even in other ones¹.

Figure 3 illustrates an event as a result of decisions and its impact in influencing other decisions, which may generate other events and other impacts as well.

¹ The impacts of an event in a purchasing policy in one of the researched focal firms is further explored in Section 4.3.2

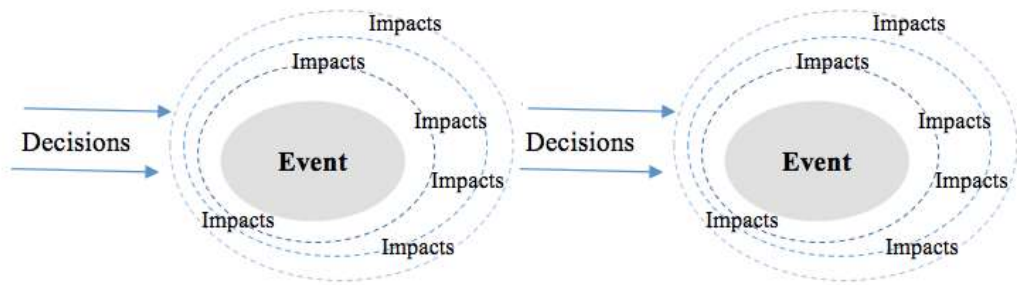


Figure 3: Events as results of decisions

It is also important to consider that an event which happens in one firm might not be perceived in the same way by different individuals, both within that firm and across the other firms it interacts with. Thus, in addition to understanding the macro level of the supply chains, it is also important to understand the micro level, which is made up of the individuals and small groups. Although the relationships in a supply chain are among firms, people, who are not fully rational all the time, make decisions and implement events. As stated by Boyer and Pronovost (2010) “we also publish thousands of mathematically based articles that make limiting assumptions about ‘rational individuals’. I would like to meet some of these rational individuals, because I don’t think I know any” (p. 370). Thus, understanding some of buyers’ and suppliers’ irrationalities that may influence them is important in understanding the dissemination of the impact of an event over a supply chain.

The micro level focuses on human behavior in OM/SCM. Despite the importance of human behavior for the development and performance of all firms, the fields of OM/SCM and Human Resources Management have a long history of independent development (Boudreau, Hopp, McClain, and Thomas, 2003). OM/SCM tends to make the assumption that individuals within the operations systems are “fully rational or at least can be induced to behave rationally” (Gino and Pisano, 2008). Bendoly et al (2006), believes that many different reasons could exist for

this gap, “but most have to do either a lack of awareness on the part of the OM decision maker or a lack of applicability of the tools themselves”. The importance of including human behavior in OM field of research is not recent; researchers such as Cummings (1977), Powell & Johnson (1980) and Powell (1995) have called for this perspective as long as 35 years ago. Hopp’s (2004) article on the 50th anniversary of Management Science journal and Boudreau et al. (2003) issued similar calls. Since then, we have seen an increased attention to behavioral issues in OM/SCM, especially in the last decade. Figure 4 indicates the increasing rate of behavioral operations papers published among the core OM journals.

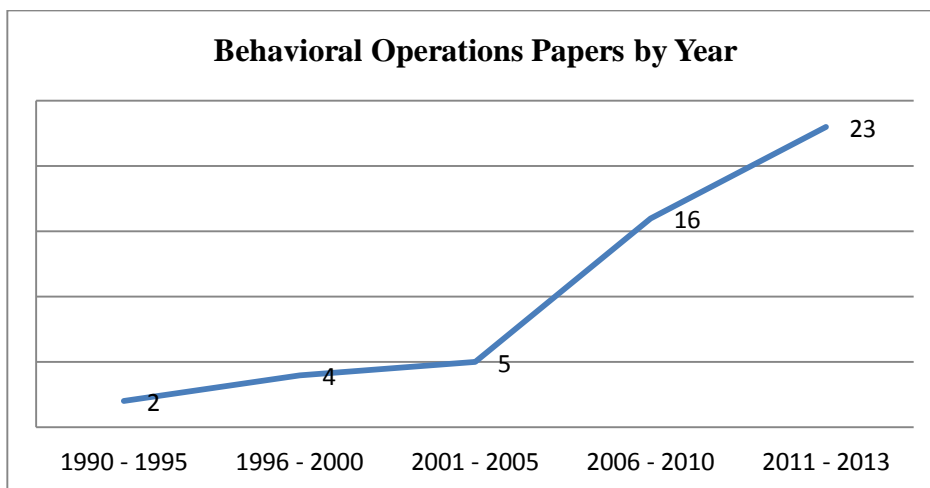


Figure 4: Behavioral operations papers by year

Source: ISI Web of Knowledge

On the flip side, even considering the uniqueness of each individual, each firm has its policies, rules, and contractual relationships, which all the individuals within it are subject. Thus, the relationship between firms and individuals is based on a constant interaction and mutual impact, as illustrated in Figure 5.

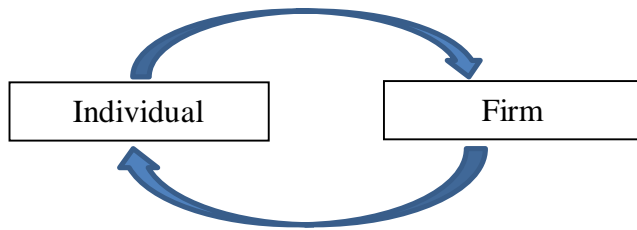


Figure 5: Relationships between individuals and firms

1.1 Research Question and Goals

Due to the complexity of real multi-tier, multi-dimension supply chains, the dissemination of the impact of an event over a supply chain can be seen in different ways and under different levels of analysis. A supply chain is not just a dyad or a triad, although researchers often portray it that way. It is comprised of an uncountable number of buyer and supplier relationships at the macro level. Inside each of its tiers and links, there is a micro level that should be considered, as well. Thus, although a supply chain is a result of relationships among firms, it is important to note that inside each firm there are individuals who interact, make decisions, and decide upon implementation (or not) of an event. It is also important to note that individuals are not fully rational all the time, so some cognitive aspects such as heuristics and biases, and personality traits, such as locus of control, might influence their decision-making and event implementation, as well as the dissemination of its impacts over the supply chain. This approach of looking at the dissemination of impact of a mid-range event over complex multi-tier, multi-dimension supply chains has not been fully explored in OM/SCM, thus our **research question** is:

- **Why and how does the impact of an event in a focal firm affect other members of its own and other supply chains?**

Our **secondary research questions** are:

1. Which types of events have an impact that is disseminated over a supply chain?
2. What are the main elements that cause the impact of an event to be disseminated over a supply chain?
3. How do these main elements influence the dissemination of an event's impact over a supply chain?
4. How are human biases, heuristics and locus of control related to the dissemination of the impact of an event over a supply chain?

Our main **goal** was to **better understand complex multi-tier, multi-dimension supply chains by investigating why and how the impact of an event in a focal firm affects other members of its own and other supply chains.**

Our **secondary goals** are:

1. Identify the main elements that influence the dissemination of the impact of a mid-range event over a supply chain
2. Identify the main types of mid-range events and analyze their impact in the focal firms
3. Investigate and analyze the dissemination of the impact of a mid-range event over multi-tier, multi-dimension supply chains in macro, micro, and integrated contexts.

Due to the complexity of understanding how different contexts and levels of analysis are connected, the best methodology to fulfill the goals of this research was qualitative research.

We conducted 131 in-depth interviews (a total of 5,662 minutes), which were recorded and then transcribed for analysis. In addition, 22 visits to manufacturing plants in the cosmetics industry in Brazil were conducted. Further detail about reasons why we selected the cosmetics industry is provided in Section 1.5.

In order to fulfill these secondary goals, we used several different methods and approaches. To fulfill the first goal, we used a theoretical approach. We synthesized the literature review and proposed the initial development of a new theoretical approach for understanding dissemination of impact of an event over a supply chain. It was developed using metaphorical transfer to generate ontology, analogy, and identity. We built upon the physics of a stone skipping on the water to develop models and propositions (Section 2.4), which were further tested, as described in Section 4.2.

To fulfill the second and third goals, we conducted empirical research, collecting data through in-depth interviews, observations, site visits, and analysis of documents. In the Section 4.1 we present multiple case studies of six multi-tier, multi-dimension supply chains, identifying the main mid-range events that occurred in them. In Section 4.2, we investigate the impacts of those events over the supply chains and test the propositions presented in Section 2.3.

Table 1 provides a summary of the research question and secondary goals. The strategies used to fulfill each one of the goals, as well as their approaches and outcomes, are also presented.

Research Question: <i>Why and how does the impact of an event in a focal firm affect other members of its own and other supply chains?</i>						
	Secondary Goals	Study Approach	Techniques	Method	Outcome	Section
1	Identify the main elements that influence the dissemination of the impact of a mid-range event over a supply chain	Theoretical	Literature Review	Metaphorical Transfer	Models and Propositions	2.4
2	Identify the main types of mid-range events and analyze their impact in the focal firms	Empirical	In-depth interviews, observation, visits, document analysis	Multiple Case Studies	Descriptive Case Analysis	4.1
3	Investigate and analyze the dissemination of the impact of a mid-range event over multi-tier, multi-dimension supply chains in micro, macro, and integrated contexts	Empirical	In-depth interviews, observation, visits, document analysis	Network Analysis and Multiple Case Studies	Test of propositions	4.2

Table 1: Dissertation Goals

1.2 Motivations

This study has several different motivations. As a practical motivation, it is important to understand that mid-range events happen frequently in all types of firms. Thus, developing a framework of the basic elements to be considered during the initiation of an event and being able to understand and predict its supply chain impact will be valuable to managers in different industries. This study also integrates the micro level (individuals) and the macro level (supply chain) perspectives. Specifically, we examine the way that a mid-range event affects buyer-supplier relationships and how its impact spreads over a supply chain. We consider psychological influences, including heuristics and biases, as well as personality traits, such as locus of control, and how they influence the dissemination of the impact of a mid-range event over a supply chain.

As a theoretical motivation, this research responds to the call for the development of more theory that is specific to the context of OM/SCM. The physics of stone skipping provides the foundation for development of research propositions that will add theoretical insights to the research on buyer-supplier relationships. Our theoretical approach is supported by several theoretical perspectives, including social network theory, cognitive heuristics and biases, and attribution theory in order to understand the role of buyers and suppliers in the dissemination of the impact of a mid-range event over a supply chain.

As a methodological motivation, this paper uses a combined methodology. Multi-methods analysis is important in developing and understanding “why” and “how” research questions. Metaphorical transfer is used to align the physics of stone skipping with the dissemination of

the impact of a mid-range event over a supply chain. We follow Chen et al.'s (2013) approach for development and transfer of a metaphor. This approach builds “through the invocation of theory-constitutive metaphors and to ensure the proper borrowing and testing of theories from outside OM/SCM” (Chen et al., 2013, p.580). We develop a theory-constitutive metaphor by showing the ontological, analogical, and identity correspondence between stone skipping and supply chain relationships. A set of six propositions and a model is developed.

Next, we use multiple case studies, combined with social network analysis, as suggested by Kim, Choi, Yan, and Dooley (2011), to understand the relationships between firms, buyers, and suppliers in supply chains. The social network analysis allows us to understand how the data was organized and the interlocking relationships that emerged among the firms and respondents. Finally, we use multiple case studies and social network analysis for testing the propositions generated using the metaphorical transfer.

1.3 Industry

We studied the cosmetics industry in Brazil. This choice was based on the diversity and complexity of its supply chains and buyer-supplier relationships, which offer unique opportunities for the development of research in OM/SCM (Singhal and Singhal, 2012). The use of a single industry allowed us to develop a deep understanding of it. The sample was selected from firms within the cosmetics industry in Brazil, representing a variety of products and services, operations complexity, relevance and location.

The Brazilian cosmetics industry has seen vigorous growth in the past decades, despite the Brazilian economy's slow growth. It has had a 10% average growth per year (over the past 17 years), comprising 3% per year of Brazil's total GDP and 2.2% of manufacturing. Billing "ex-factory", net of sales tax, increased from US\$ 4.7 billion in 1996 to US\$ 43 billion in 2013, with a forecast of about US\$ 51.7 billion for 2015 (ABIHPEC, 2014). Figure 6 shows the growth of the cosmetics industry in Brazil, from 2000 to 2013, plus two years of forecasts (for 2014 and 2015).

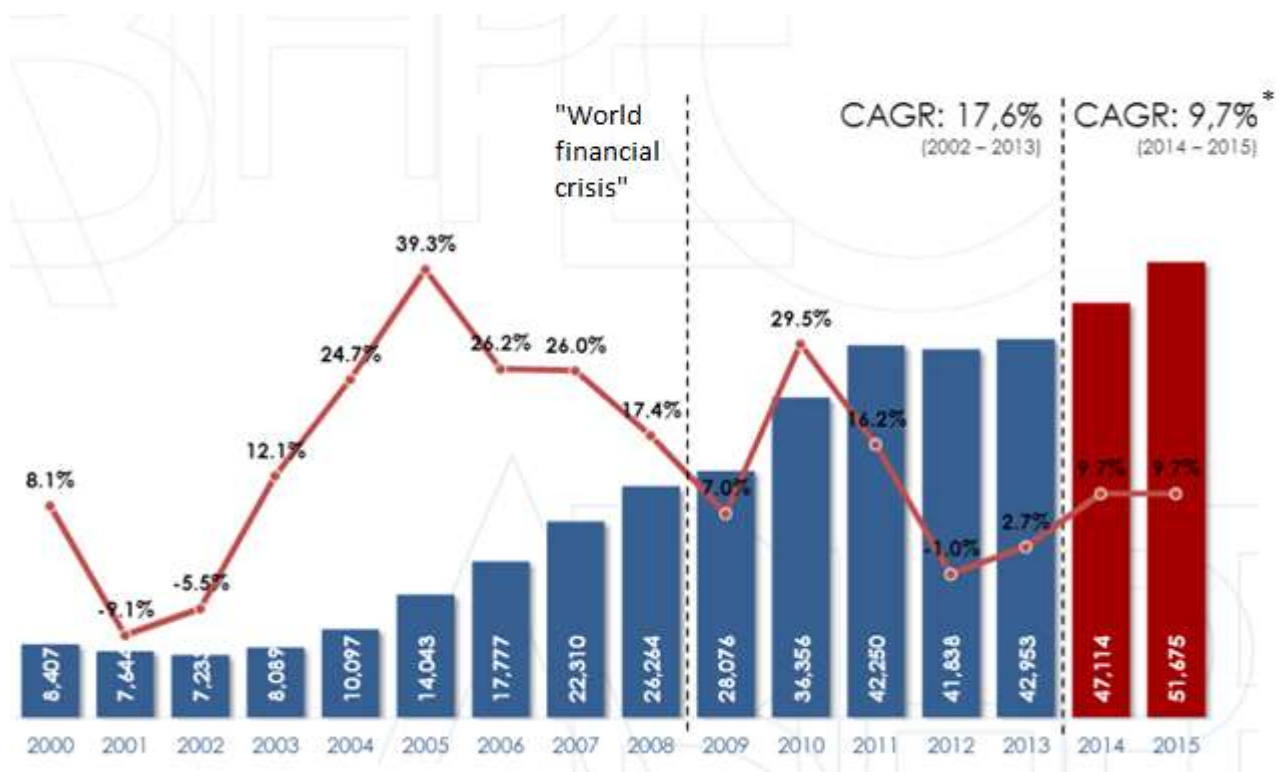


Figure 6: Growth of the cosmetics industry in Brazil

* Forecast

Relative to the global cosmetics industry, Brazil occupies third place, just behind China and the U.S. (Euromonitor, 2013). It is the largest market in the world in perfumes and deodorants, second largest in hair products, men's, children's, bath products, depilatories and solar protection, third largest in makeup and products for oral hygiene, and fifth in skin care. Brazil

represents 9% of the global cosmetics consumption. Figure 7 shows the top 15 countries in cosmetics consumption, with values presented in US billion dollars.

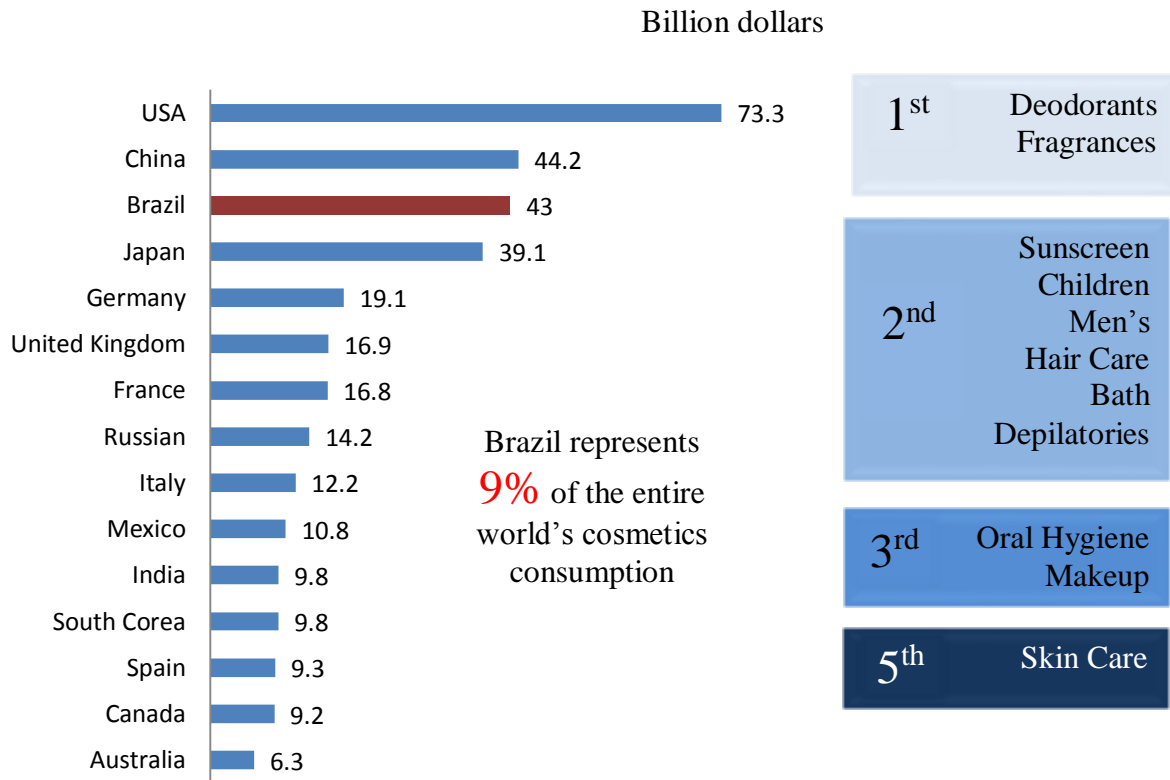


Figure 7: Top 15 countries in cosmetics consumption
Source: Euromonitor (2013) and ABHIPEC (2014)

1.4 Dissertation Structure

This dissertation is divided in five main chapters. Chapter 1, which is this introduction, presents the research questions, goals, and motivation for this research. Chapter 2 presents the theoretical foundations, at the macro, micro level, and integrated level. At the macro level, we present theoretical concepts related to supply chain management and their relationship to social

network theory. At the micro level, we develop a theoretical foundation based on the concepts related to cognitive heuristics and biases and attribution theory. At the integrated level, we present the new theoretical approach using metaphorical transfer built on the physics of skipping stones and present a set of models and propositions. In Chapter 3, we describe the details and process used for data collection. The results in Chapter 4 are presented in two steps. Section 4.1 presents the results of the analysis of the six multi-tier, multi-dimension supply chains. Section 4.2 describes the results of empirical tests of the propositions and models developed in Chapter 2. Finally, Chapter 5 presents our conclusions, including the study's contributions, limitations, and opportunities for future research. Appendices are presented at the end of this document, after the references. Figure 8 shows the basic structure for this dissertation.

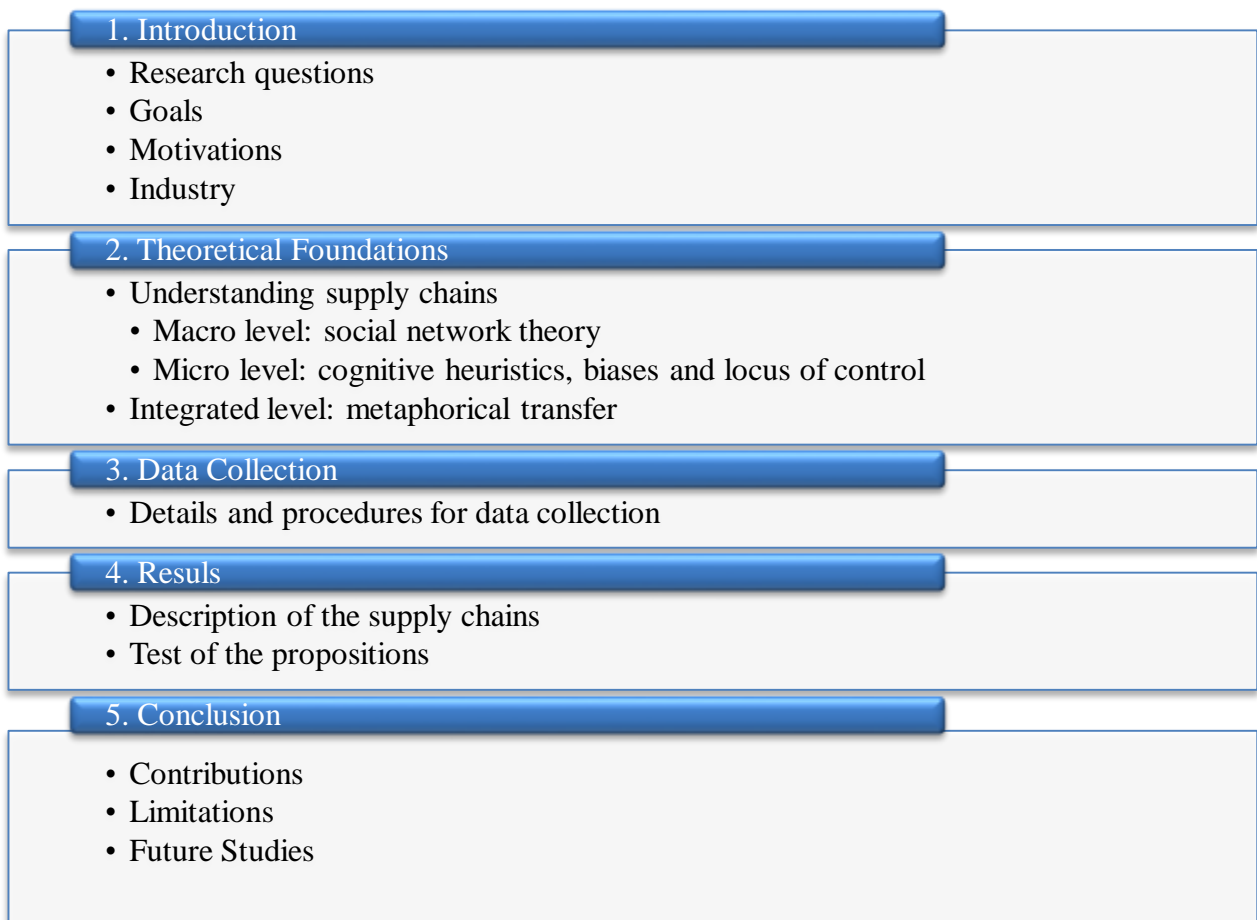


Figure 8: Dissertation structure

2 THEORETICAL FOUNDATIONS

(...) “Middle range theories are a necessity if the process is to be kept manageable, and representations such as metaphors are inevitable, given the complexity of the subject matter”.
Karl E. Weick, 1989

This study has three main theoretical foundations, which help fulfill our goal of understanding complex supply chains, investigating why and how an event in a focal firm affects other members of its own and other supply chains. The first two goals are related to the spread of the impact of a mid-range event through complex supply chains. We initially develop the theoretical foundation for understanding the impact of a mid-range event in a supply chain, at the macro, micro, and integrated level. At the macro level, which is the supply chain, we look through the lens of social network theory. The initiation of a mid-range event is at the micro level, the individuals, which we analyze through the lens of personal heuristics, biases, and locus of control. At the integrated level, we built on the physics principles involved in stone skipping, which we propose as a metaphor for the initial development of a theoretical approach for understanding the impact of a mid-range event over a supply chain.

2.1 Supply Chain Management Research

A supply chain is a set of buyer and supplier relationships within and across firms. The term supply chain management gained increased attention from a research point of view in the late 1990's (Cooper, Lambert, and Pagh, 1997), and became very popular in OM/SCM publications over the last decade (Burgess, Singh, and Koroglu, 2006). Increasing competitiveness, globalized sourcing and multiple channels of sales have forced firms to become better integrated with their supply chain and help improve the performance of their suppliers and buyers, reinforcing the premise that the success or lack of success of a firm is not just a matter of how well it does in isolation. "One of the most significant paradigm shifts of modern business management is that individual businesses no longer compete as solely autonomous entities, but rather as supply chains" (Lambert and Cooper, 2000, p. 65). We follow Chen and Paulraj's (2004) definition of a supply chain as a network of materials, information, and services processing links with the characteristics of supply, transformation, and demand (p. 119), as illustrated in Figure 9.

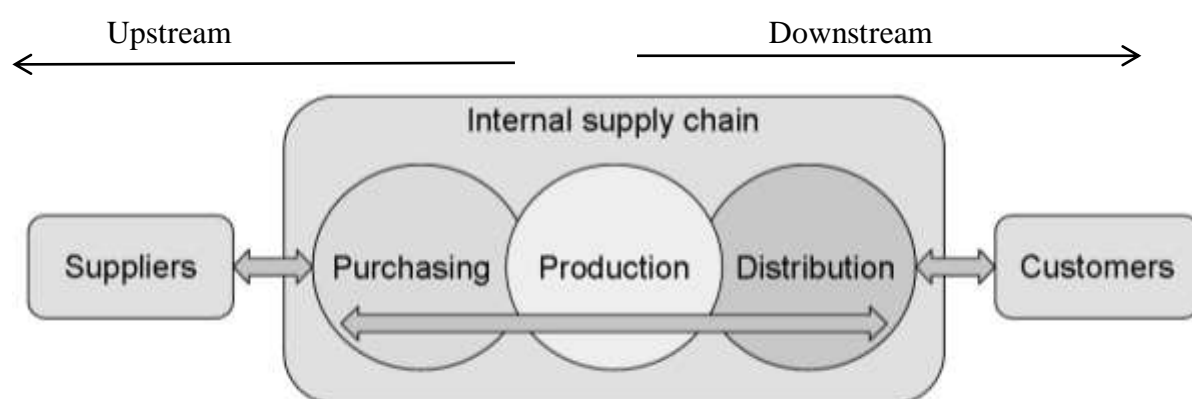


Figure 9: Illustration of a supply chain.
Source: Chen and Paulraj (2004)

A supply chain is a complex phenomenon that involves the relationship among several firms acting as buyers and suppliers at different moments of their relationship. A supply chain is composed of a focal firm and a series of different tiers of upstream suppliers until the initial raw material supplier, and a series of different tiers of upstream buyers until the final customer, as illustrated in Figure 10.

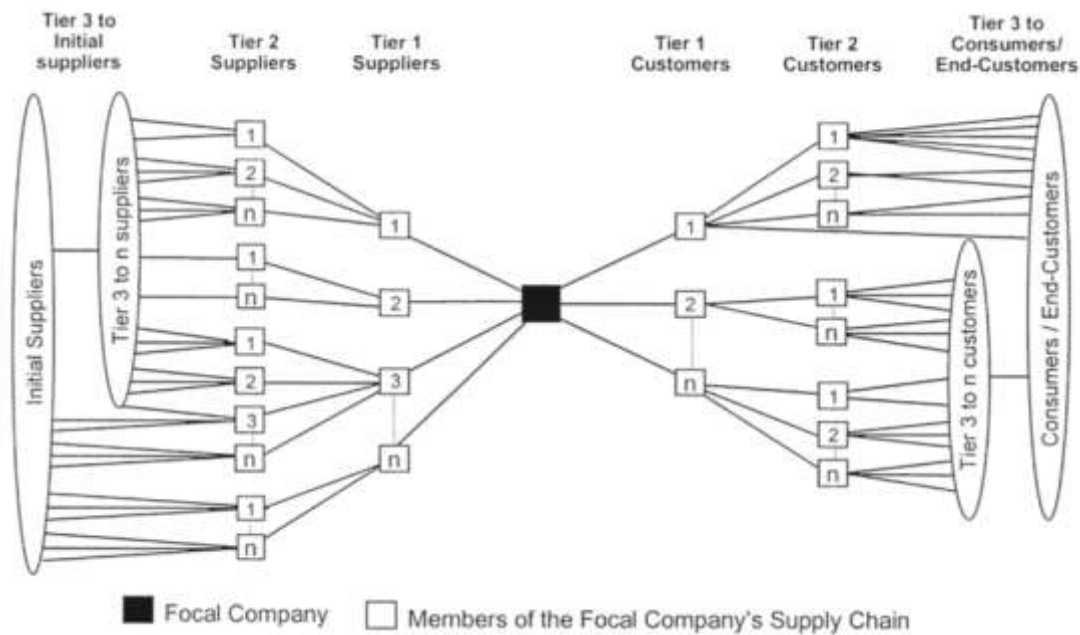


Figure 10: Supply chain network

Source: Lambert and Cooper (1998)

In our research, we considered that supply chains are not just multi-tier, but that they are multi-dimension as well. For example, in Figure 10, consider the focal firm. It is supplied by different suppliers in its first tier (1,2,3,...n). At the same time, each of its suppliers has its own suppliers as well. However, the same first tier supplier might play a different role in another supply chain, depending upon several factors, such as the industry and the size of the focal firm. Although the concept of a supply chain network has been used for almost two decades (Lambert and

Cooper, 1998), most research in OM/SCM refers to a supply chain as a linear relationship between buyers and suppliers, focusing on a simplified conception of supply chains as dyads, in order to isolate important relationships, with a few studies of triads starting to emerge (Choi and Wu, 2009). Even in studies that consider a supply chain as an embedded network, the focus tends to be either upstream or downstream. For example, Kim (2014) conducted research on supplier network embeddedness using the social network perspective, targeting buyers as prospective respondents.

In our study, we address this gap. In order to really understand a supply chain, it needs to be analyzed as a multi-tier, multi-dimension entity, containing individuals who function as both buyers and suppliers. We analyze multiple perspectives of buyer and supplier relationships within and across supply chains. We analyze multiple tiers in the same supply chain and also analyze the role of the same firm in different supply chains, adding interlocking relationships between supply chains to supply chain research. We begin by looking at the mid-range events at the micro level, and then how their impact is disseminated over a supply chain on a macro level.

Because supply chains pass materials, other resources, and information forward and backward (Mentzer, Keebler, Nix, Smith, and Zacharia, 2001) many firms are ultimately involved in the delivery of a product to its final customer. From a focal firm's perspective, upstream and downstream links range from raw material and component producers to the final users, as the product passes through assemblers, wholesalers, retailers, and transportation firms (La Londe and Monster, 1994). There has been a substantial amount of research involving dyads between buyers and suppliers from different firms, in different industries, and using different methodological approaches (i.e. Karuppan and Ganster, 2004; Narayanan, Jayaraman, Luo, and

Swaminathan, 2011; Villena, Revilla, and Choi, 2011; Wu and Choi, 2005). A dyad consists of two firms connected to each other (two nodes and a link). However, a supply chain involves at least a set of three or more entities which are directly involved in the upstream and downstream flow of resources, from a source to a customer (Mentzer et al., 2001). Thus, considering this definition, at least a triad (three nodes, and at least two links) needs to exist in a supply chain. Choi and Wu (2009) encouraged research on triads as the building blocks that capture the essence of a supply network. However, the perspective that we use better represents the complexity of a multi-tier, multi-dimension supply chain.

OM research has extensively studied the impact of small and continuous improvements in a supply chain (Anand et al., 2009), which fall in the category of high probability and low impact events. The understanding of these kinds of events is focused on studies on the development of operational capabilities and maintenance of the competitiveness of firms (Peng, Schroeder, and Shah, 2008).

At the other extreme, the impact of very significant events in a supply chain has also gained increased attention (Hora and Klassen, 2013). These kind of events, which include catastrophic events, can cause serious supply chains disruptions (Knemeyer, Zinn, and Eroglu, 2009) and can be caused by intentional or unintentional causes. Most of the unintentional causes are related to natural accidents, such as hurricanes, tornadoes and floods. There can also be intentional disruptions, which may include theft, contamination/sabotage, or a terrorist attack (Speier, Whipple, Closs, and Voss, 2011). Such low probability, high impact event pose significant risk of disruptions in a supply chain.

The majority of the impact that a supply chain is subject to, however, is related to moderate probability events and with a moderate impact, as illustrated in Figure 11. Examples of moderate probability, moderate impact event, which we are calling mid-range events, include a manufacturing firm moving from a traditional assembly line to a team-based cellular manufacturing process, implementation of new software, or hiring a new CEO (Ford and Foster-Fishman, 2012; Hannan and Freeman, 1984; Porras and Silvers, 1991). As no firm exists in isolation, the dissemination of the impact of a mid-range event through a supply chain is necessarily a complex phenomenon. All firms are related to their micro and macro environments and to other firms, as well. Thus, it is important to consider that an event in a firm, even a mid-range event, may have impact beyond its boundaries.

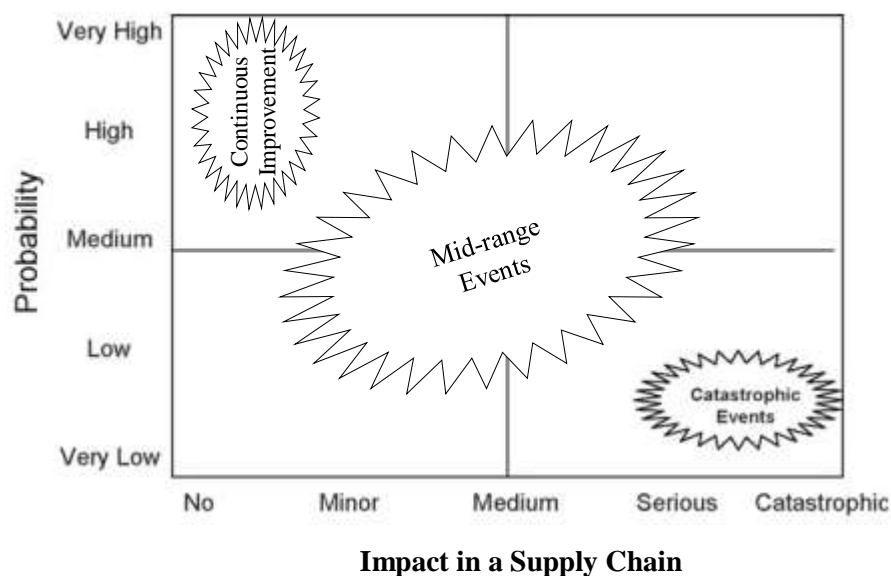


Figure 11: Risk categorization scheme

Source: The authors, based on Brindley (2004) and Knemeyer et al. (2009)

2.2 Theoretical Foundations

Supply chains can be examined from the macro and micro levels. The macro level refers to a network of firms playing different roles in their supply chain channels. The micro level refers to the individuals or small groups inside the firms that comprise the network. Our theoretical background is based on both macro and micro levels. In addition, we included an integrated level where we propose an integrated theoretical approach, using metaphorical transfer.

2.2.1 Macro Level

As the macro level we focus on multi-tier, multi-dimension supply chains. We build upon social network theory as the basis for our analysis.

2.2.1.1 Social Network Theory

The concept of a supply chain as a network of interconnected firms was first highlighted more than a decade ago (Lambert and Cooper, 2000). At the macro level, we use social network theory constructs and follow Kim's (2014) definition of a network as a "broad set of firms that are motivated to accumulate tangible and intangible resources" (p.220). Social network theory is built upon two fundamental units: nodes and links. A node refers to actors or individuals within the network. A link (or tie) is a connection between nodes.

A supply chain consists of the relationships between actors, which can be viewed at four levels. The first is internal to the firm and refers to the departments or business functions involved in the flow of resources to and from the firm. The second level refers to a dyad consisting of immediate buyers and suppliers. Thirdly, it refers to external connections, which include suppliers' suppliers and customers' customers. And fourthly, a supply chain contains “a network of interconnected businesses involved in the ultimate provision of product and service package required by end customers” (Harland, 1996, p. 64), as illustrated in Figure 12. Thus, it is appropriate to conceive of a supply chain as a network, for which social network theory provides a strong theoretical foundation.

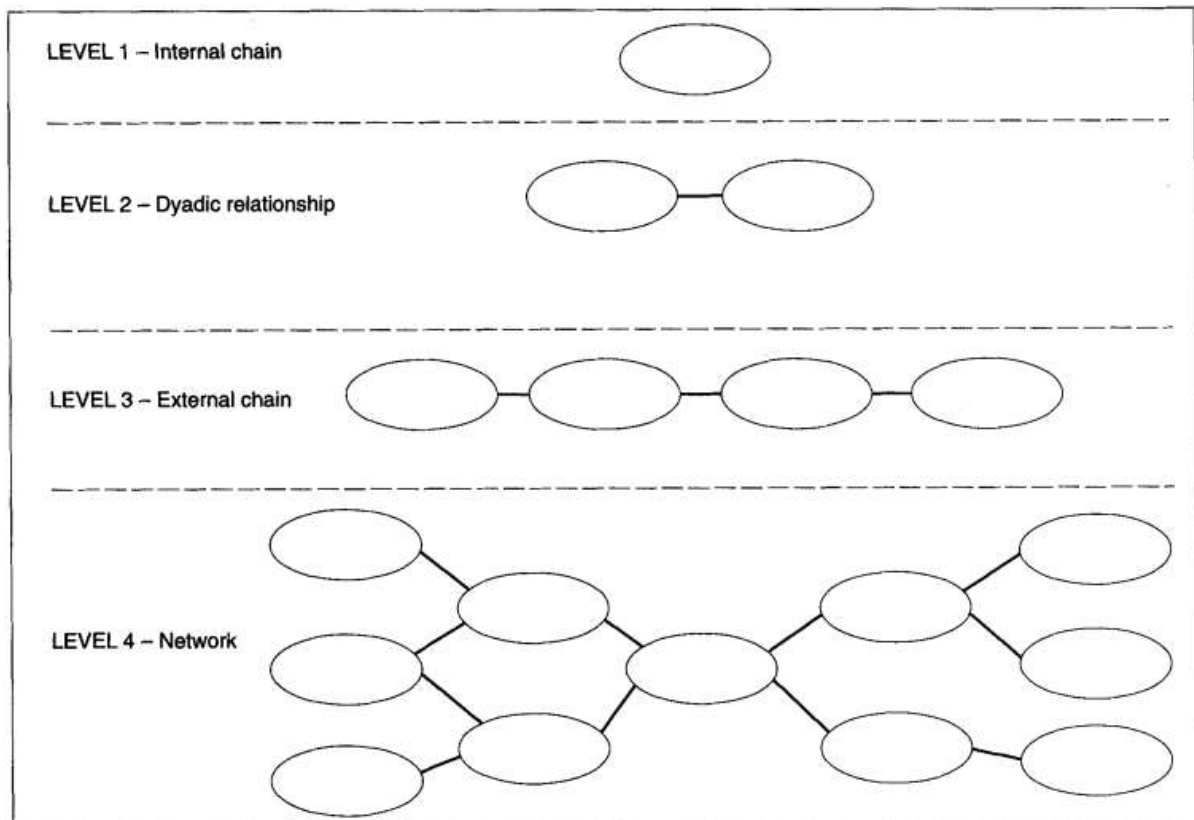


Figure 12: Levels of supply chain
Source: (Harland, 1996)

Social network theory focuses on the type of ties developed between the actors. Ties differ in terms of interaction and strength of the relationship between entities. Interaction can be passive or active. Passive interactions are relationships, which are obligatory in nature, without ongoing social exchange between individuals (Marsiglio and Scanzoni, 1995). Active ties are interactions where there is frequent communication.

The social network construct of strong ties and weak ties (Granovetter, 1973; Granovetter, 1983; Krackhardt, 1992) provides a suitable theoretical lens for understanding buyer and supplier relationships. Strong ties are direct ties between individuals, when a close relationship is developed. Strong ties between buyers and suppliers facilitate cooperation, collaboration, and the development of new processes, products, and innovation (Bellamy, Ghosh, and Hora, 2014). However, strong ties may have a dark side as well, negatively impacting a buyer's ability to make effective decisions, as well as potentially increasing the supplier's opportunistic behavior (Villena et al., 2011).

Weak ties refer to the relationship between acquaintances or acquaintances' acquaintances (Granovetter, 1973). Thus, in a supply chain, a firm would have weak ties with its suppliers' suppliers and with its buyers' buyers. The "strength of weak ties" refers to the fact that "weak ties are far more likely to be bridges than are strong ties" (Granovetter, 1983, p.208), providing the firm with access to external information that it might not otherwise have. The challenge to a firm relies, however, on its ability to properly manage its buyers and suppliers, building smart strong ties, and facilitating the development of strategic weak ties.

The structure of the network is also an important construct in supply chain. As a way to increase the understanding of supply chains at a broader level, social network theory and its importance in understanding the structure and position of the firms in a supply chain has been gaining more attention in the OM/SCM field recently (Kim, 2014; Schoenherr and Swink, 2012; Tsai, Raghu, and Shao, 2013). Structural position refers to the position that a firm assumes in its supply chain. A supplier's position in a network is emerging as one of the most important aspects to be considered in understanding a supply chain network and the performance of the buying firms in that network (Kim, 2014). A central position of a firm allows it to have access to different information through its upstream and downstream supply chain and the associated strong and weak ties. It also plays an important role in connecting different directions of a supply chain or even connecting different supply chains, acting like bridges. Structural embeddedness addresses the importance of understanding the role of buyers and suppliers as embedded in a larger supply network, rather than as existing in isolation (Choi and Kim, 2008; Kim et al., 2011). For example, Bellamy, Ghosh, and Hora (2014) studied the structural characteristics of supply networks and their relationship to innovation output.

Social network theory describes how social ties are developed and their impact on economic outcomes (Granovetter, 1973; Granovetter, 1983; Krackhardt, 1992). The different types of ties in a network also influence the type of relationships developed between buyers and suppliers. A collaborative buyer and supplier relationship is strong and active, since it involves frequent communication and interaction. Examples include joint product or process development or improvement. Contractual buyer and supplier relationships are strong and passive, since they involve constant exchange of resources, even though occur essentially by obligation between the parties. Weak and passive ties may occur between the firm and its competitors, as well as

with its customers' customers and its suppliers' suppliers. Weak ties and active relationships may be exemplified by the arms-length buyer and supplier relationships, as illustrated in Figure 13.

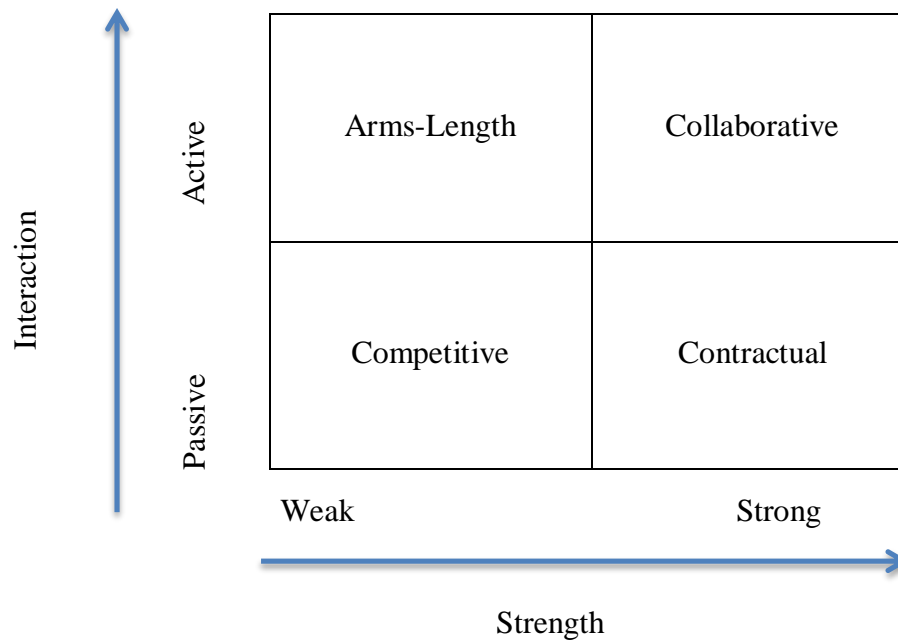


Figure 13: Types of buyer and supplier relationships

In addition to looking at buyer supplier relations with a supply network (Harland, Lamming, and Cousins , 1999), it is also important to examine relationships at the micro level, which refers to the individuals within each firm. Thus, we included the micro level as part of our research.

2.2.2 Micro Level

Individuals and small groups within a firm comprise the micro level for this research. Behind every decision, which is made in a firm, there are individuals. Taking that in consideration, we

used buyers and suppliers as our research subjects and their decisions as one of the units of analysis. These individuals' behaviors will directly or indirectly impact the relationship among the firms they represent. Therefore, like skipping stones in the water, the impact of an event begins at the individual level, but spreads out to a firm and can subsequently have an impact across its supply chain and even on other supply chains.

In analyzing the basic assumptions of decision making and its impacts, we use draw upon behavioral operations research, which investigates the human behavior and cognition of individuals and small groups and its impact on operating systems and processes (Bendoly, Croson, Goncalves, and Schultz, 2010; Gino and Pisano, 2008). Over the last decade a body of researchers studying human behavior in Operations Management field has grown fast. It is called Behavioral Operations and is intrinsically linked to the influence of psychological research in economics field (Behavioral Economics), which main works started with Herbert Simon and its "bounded rationality" (Simon, 1955, 1956, 1957) questioning the "rational actor" and then wide by many different experiments run by Daniel Kanhneman and Amos Tzversky since late 1960's and 1970's until present days (Kahneman & Frederick, 2002a; Kahneman, Knetsch, & Thaler, 1991; Kahneman & Tversky, 1972, 1979; Kahneman, 2003, 2011; Tversky & Kahneman, 1974, 1986). The importance of their works regards on the fact that "Kahneman and Tversky were convinced that the process of intuitive judgment were not merely simpler than rational models demanded, but were categorically different in kind" (Kahneman & Frederick, 2002a, p. 3).

Bendoly et al. (2010) suggest that the most appropriate theoretical foundation for Behavioral Operations is cognitive psychology. Its main contribution is to offer more realism to research findings, by taking into account emotional aspects, heuristics and cognitive biases in judgment

and decision making. Some of the most important researches in heuristics and biases was conducted by Kahneman and Tversky, in the early 1970's. They introduced psychological issues into economic models, demonstrating their findings about how individuals make decisions, in order to incorporate them into the traditional economic view. They explored heuristics that individuals use and the biases they are prone to in different tasks related to judgment under uncertainty, including making predictions and evaluation of evidence (Kahneman, Slovic, and Tversky, 1982; Kahneman and Tversky, 1972, 1973; Tversky and Kahneman, 1974). Their work and the work of others (Camerer, 1999; Loewenstein and Thaler, 1989; Thaler, 1981) was critical to the establishment of the behavioral economics field, whose researchers investigate how and why individuals make decisions, rather than how they should make them, and provides a theoretical and methodological basis for behavioral operations research.

2.2.2.1 Heuristics and Biases

“The core idea of the heuristics and biases program is that judgment under uncertainty is often based on a limited number of simplifying heuristics rather than more formal and extensive algorithmic processing” (Gilovich, Griffin, and Kahneman, 2002, p. xv)

Heuristics are “rules of thumb” or cognitive shortcuts that individuals use in making decisions when time and processing capacity are limited (Bingham and Eisenhardt, 2011; Gino and Pisano, 2008; Newell and Simon, 1972; Tversky and Kahneman, 1974). Gino and Pisano (2008) described the most useful heuristics and biases in the OM field. Carter et al. (2007) identified 76 heuristics and biases and using cluster qualitative analysis, organized them into nine categories.

Although these researchers and many others use the term “heuristics” and “biases” as though they mean the same thing, heuristics and biases are not synonymous, and their categories should not be used interchangeably (Kahneman and Tversky, 1979; Tversky and Kahneman, 1974). Heuristics simply come to mind, they are part of intuitive and automatic thinking (Kahneman & Frederick, 2002; Kahneman et al., 1982). Tversky and Kahneman (1974) tied heuristics to the “natural assessment” elicited by the task at hand that can influence judgment, without being used deliberately or strategically. “Heuristics processes are not exceptional responses to problems of excessive complexity or an overload of information, but normal intuitive responses to even the simplest questions about likelihood, frequency, and prediction” (Kahneman and Frederick, 2002; Tversky and Kahneman, 1983). They are part of intuitive and automatic thinking (Kahneman and Frederick, 2002; Kahneman et al., 1982), and can be very useful, fast and frugal. The main heuristics that are relevant to this research are: i) availability, ii) representativeness, iii) anchoring and adjustment, and iv) loss aversion (Bar-Hillel, 1984; Kahneman and Frederick, 2002; Kahneman, Slovic, and Tversky, 1982; Kahneman and Tversky, 1979; Tversky and Kahneman, 1974), described in Table 2.

Although they can be very useful, heuristics also can lead to systematic and repeated errors, known as biases (Tversky and Kahneman, 1974; Kahneman and Frederick, 2002). Each heuristic can induce several different biases. For instance, the representativeness heuristic, which is the tendency to assume commonality between objects of similar appearance, may induce the tendency to believe that two variables co-vary when they do not (the illusory correlation bias). For the availability heuristic, one common bias is imaginability. Imaginability relates to the fact that, if an event can be easily imagined, it may be judged to have a higher

probability of occurrence than an event which is difficult to imagine. Overconfidence and wishful thinking are related to this bias. Loss aversion may induce several biases, including the status quo bias, which refers to the tendency to remain where they are, because the “disadvantages of leaving the reference point seems larger than advantages” (Kahneman, Knetsch, and Thaler, 1991). In a supply chain, for example, the status quo bias is illustrated by a buyer’s difficulty in switching suppliers and the corresponding tendency to keep buying the same products, services, and quantities from the same supplier.

Heuristic		Biases		References	
Representativeness	Tendency to assume commonality between objects of similar appearance	Base Rate Frequency	Tendency to stereotype, regardless of the prior probabilities of the categories	(Gilovich et al., 2002; Kahneman et al., 1982; Tversky & Kahneman, 1974)	
		Sample Size Intensity	Judgment of a sample statistic independent of sample size	(Kahneman & Frederick, 2002a; Tversky & Kahneman, 1974)	
		Law of Small Numbers	Tendency to consider a small sample as representative of the population	Gino and Pisano, 2008; Kahneman and Frederick, 2002a; Tversky and Kahneman, 1974	
		Insensitivity to Predictability	Tendency to ignore or underutilize the range of predictions	Gilovich et al., 2002; Gino and Pisano, 2008; Kahneman et al., 1982; Tversky and Kahneman, 1974	
		Illusory Correlation	Tendency to believe that two variables covary, when they do not	Carter et al., 2007; Gino and Pisano, 2008; Tversky and Kahneman, 1974	
		Misconceptions of Regression	Tendency to make predictions expecting exceptional results to continue as if they were average	Tversky and Kahneman, 1974	
Availability	Tendency to judge an event is likely or frequent, depending on the ease of recalling or imagining it	Salient Information	Tendency to weigh more vivid information more heavily	(Gino & Pisano, 2008; Tversky & Kahneman, 1974), Camerer, C., & Loewenstein, G. (2004)	
		Confirmation Bias	Tendency to seek information consistent with their views or hypotheses		
		Imaginability	Overconfidence	Tendency to be more confident in their own opinions than they ought to be	Carter et al., 2007; Gino & Pisano, 2008; Tversky & Kahneman, 1974
			Wishful thinking	Tendency to assume that because one wishes something to be true or false, then it actually is	

Heuristic		Biases		References	
Anchoring and Adjustment	Tendency to rely too heavily, or “anchor”, on one trait or piece of information when making decisions	Insufficient Adjustment	Different start points yield different estimates, which are biased toward initial values.	Gino and Pisano, 2008; Tversky and Kahneman, 1974, Ariely et al, 2000	
		Evaluation of conjunctive and disjunctive events	Inconsistency	Tendency to underestimate task-completion times.	Gino and Pisano, 2008; Tversky and Kahneman, 1974
			Planning fallacy	Inability to use a consistent judgment strategy across a repetitive set of cases or events.	
		Assessment of Subjective Probabilities Distributions	Illusion of control	Tendency to believe that one can control, or at least influence, outcomes that they demonstrably have no influence over.	
Loss Aversion	Tendency to value more a loss compared to a symmetric gain	Endowment Effect	Tendency to suffer more with the loss of specific benefit compared to the value of a new situation	Kahneman and Tversky, 1979	
		Mental Account	Tendency to differentiate money sources and expenditures	Kahneman and Tversky, 1979; Thaler, 1981, 1985; Thaler and Sunstein, 2009	
		Hyperbolic Discount	Tendency to react strongly to salient and immediate events than to events in the future	Loewenstein and Thaler, 1989	
		Status Quo Bias	Tendency to remain where one is	Kahneman and Tversky, 1979; Gino and Pisano, 2008	
		Framing Effects	Tendency to judge a problem according to the way is framed		

Table 2: Heuristics and main biases

2.2.2.2 Locus of Control

The locus of control construct is a key element of attribution theory, which study the process by which individuals explain the causes of behavior and events (Kelley and Michela, 1980). It reflects whether individuals attribute the cause of an event to themselves or to their external environment (Rotter, 1966). Individuals deal differently with events, depending on whether their locus of control is internal or external. Those that have an internal locus of control take more precautions and respond more rapidly to problems when they appear, because they believe that most results rely on their own actions. Those who have an external locus of control do not take as many precautions, provide late responses and blame others when a problem occurs. For example, Simons and Baumann (1972, 2012) applied the locus of control concept to explain why more people have died in tornados in Alabama than in Illinois (United States). Their surveys of residents of four counties each in Alabama and Illinois indicated that Illinois residents demonstrated an internal locus of control, which translated into taking more precautions and being more prepared for a tornado. Alabama residents, on the other hand, who were external in their locus of control, took fewer precautions for potential tornadoes, incurring more deaths compared to Illinois (Simons and Baumann, 1972, 2012). The importance of locus of control research has been addressed by authors in several fields (Judge and Bono, 2001; Ng, Sorensen, and Eby, 2006). In OM/SCM research, Davis and Heineke (1994) considered the customer's locus of control and its impact on queue management and the customer's intention to return. Tranfield and Smith (2002) studied the impact of employees' locus of control on teamwork in manufacturing firms. Hong, Pearson, and Carr (2009) proposed a typology for coordination of strategies for product development processes involving multiple suppliers, based on locus of control. However, Harvey, Madison, Martinko, Crook, and Crook (2014) argue that, although attribution theory (locus of control) has a high explanatory potential, it has

been underutilized by organizational scholars in general. Building upon this, we note that the application of locus of control to supply chain management research has been rare.

2.3 Theoretical Development

The absence of theories specific to OM and SCM and inadequate attention to building theories in these fields has been described for a long time (Flynn, Sakakibara, Schroeder, Bates, and Flynn, 1990; Meredith, 1998). “Although recognized as vital to the prospects of any firm, operations management suffers in at least some quarters because there is no recognized theory on which it rests or for which it is famous” (Schmenner and Swink, 1998, p. 97). This is still true today (Chen et al., 2013). Thus, the need and importance of more theorizing efforts aiming at producing better and new theories that was initiated more than 25 years ago (Meredith, 1998) remains a current problem (Carter, 2011).

A theory relates specific concepts, definitions, unique vocabulary, models, and testable propositions (Kerlinger, 1986). Although the borrowing of theories from other disciplines, especially from organizational behavior and economics, is common in OM/SCM (Ketchen and Hult, 2007), simply applying theories from other fields to OM/SCM phenomena is not the same as developing a theory that is unique to the OM/SCM context. As stated by Lewin (1951) and reiterated by Van De Ven (1989), a good theory can be very valuable for both researchers and practitioners. For researchers, a good theory can help the field to move “toward a more

systematic set of findings across studies”. For practitioners, a good theory offers rich managerial findings and implications.

Carter (2011) points out three main reasons why OM/SCM has not probably generated a substantial amount of its own theories so far. First, empirical research in OM/SCM is in an earlier stage of development when compared to more mature counterpart fields, such as management, economics, or marketing. Second, many doctoral programs in OM/SCM usually focus on empirical research using “hard data” (p. 3) instead of qualitative and exploratory studies using inductive data analysis. The third reason is related to second one, since most associate editors who evaluate papers submitted to OM/SCM journals have not been trained to do theory building research. Our research was based on theory building through an extended qualitative study with inductive data analysis. We proposed what Kerlinger (1986) defines as theory, “a set of interrelated constructs (concepts), definitions, and propositions that present a systematic view of phenomena by specifying relationships between variables with the purpose of explaining and predicting phenomena” (p. 9).

We highlight the importance of having unique theories developed for OM/SCM field because, although very important to practice, OM/SCM as a research field still lacks unique theories (Carter, 2011). This study addresses this deficit, using metaphorical transfer (Chen et al. 2013) to develop a theoretical approach to understanding supply chain relationships. It is a response to Schroeder (2008) that the “OM field has been weak on theory development that is subsequently tested” (p. 354).

One useful way to develop theory is through the invocation of a metaphor. Weick (1989) points out that metaphors are particularly useful in the development of middle range theories. Compared to large or unified theories, middle range theories keep the process manageable, and the use of representations and metaphors is informative. The use of metaphors to suggest or make a link to the development of theory is widely used in many domains. For example, consider the law of gravity. Isaac Newton described how he made the connection to the law of gravity using the example of an apple falling on his head, while studying under an apple tree. While the math behind the law of gravity is complicated, the trivial example of an apple – or any other object falling on someone’s head - is very real and easy to understand. Stephen Hawking developed his black hole theory and advanced the big bang theory about the beginning of the universe through connecting very complicated physics principles about how the universe has been expanding to the simple metaphor of mixing a coffee latte in one direction and then in the opposite² (Marsh, 2014).

A metaphor transfers understanding from a better-known “source” to a lesser-known “target”. Another way to say this is that the “source” becomes a mental model used to understand the “target.” Ortony (1993) describes three important characteristics of a useful metaphor: i) compactness, ii) vividness, iii) ability to convey otherwise inexplicable or unnamable qualities. Compactness is “transferring larger chunks of understanding in fewer words”. Vividness is when “the source domain comes, as a whole, from direct sensory experience, it can be more colorful, vibrant and dramatic, capturing one’s attention more so than a concept or abstraction built up from recombined discrete events”. The ability to convey otherwise inexplicable or unnamable quality is the idea that, “since the ‘real’ or literal qualities or inner workings of a

² The described scenes can be visualized in the movie “The Theory of Everything”, which tells the story of the physicist Stephen Hawking. He held the same position as Isaac Newton in the Cambridge University and is considered one of the most brilliant minds of the 20th century along with Albert Einstein.

subject may not be knowable to the speaker or listener (due to mutual lack of experience or the lack of relevant words in their language), a metaphor provides description and explanation that would be otherwise unattainable". Examples include Juliet as the sun, atoms as mini-solar systems, debates as war, time as money, and religion as the "opium of the individuals" (Steen, 2008, p. 213). Examples of metaphors used in the OM/SCM context include the rocks in the river for exposed problems due to JIT's reduced inventory levels, icebergs as cost management, and a bullwhip as a metaphor for the effect of a customer order upstream in a supply chain. These are all examples of what Chen, et al. (2013) refer to as casually invoked metaphors. Although the use of a casually-invoked metaphor can be useful as a teaching strategy, simplifying and illustrating a phenomenon, they are less useful in developing theory.

The use of metaphors has also been used to develop theories about firms (Morgan, 1980, 1983, 1997). The formal process of metaphorical transfer provides a basis for rigorously transforming a casually invoked metaphor into a set of theoretical propositions to guide research. Thus, the development of theory-constitutive metaphors provides a useful guide for borrowing and testing of theories from outside OM/SCM. Properly developed metaphors can be very effective for illustrating and translating complex analogies in organizational phenomena (Tsoukas, 1991; Weick, 1989). We follow Chen, et al.'s (2013) guidelines for the use of metaphorical transfer to develop operations and supply chain management (OM/SCM) theory. We propose the physics of stone skipping as a basis for developing theory about understanding the dissemination of impact of an event over a complex multi-tier, multi-dimension supply chain.

We propose the development of a new theoretical approach for understanding supply chain turbulence, based on the dissemination of the impact of an event through a supply chain, using metaphorical transfer. We selected physics as the science on which to base our metaphorical

transfer. Physics deals with the structure of matter and its motion through space and time. It is concerned with all aspects of nature, on both the macroscopic and submicroscopic levels, along with related concepts such as energy and force. Both managers and academic researchers deal with the “structure of matter” and their “motion through space and time”. Managers’ concerns refer to aspects of “[firms and supply chains’] nature” on both the macro (supply chain) and micro (individual behavior) levels, along with related concepts, such as energy and force. Thus, we use a physics phenomenon as a metaphor for developing propositions related to the dissemination of the impact of an event in a supply chain.

2.3.1 Stone-Skipping in Physics

“There is still [a lot] to be learned from science for stone skipping... Back to your stones!” With this statement, Clanet, Hersen, and Boucquet (2004, p.8) finish their paper which scientifically investigated the physics phenomena behind the ancient art of skipping stones across the water. We agree with Clanet et al. (2004) that there is still a lot to be learned about the science behind stone skipping, but not just in terms of physics. If we consider events that happen in a firm and how their impact disseminates through its supply chain, we can relate them to stone skipping. We use the physics of stone skipping as a theory constitutive metaphor to develop theory for operations and supply chain management research.

Stone skipping is an appropriate metaphor for the dissemination of the impact of an event in a supply chain, for several reasons. Stone skipping is compact because it is a relatively simple to envision. It is vivid because it is colorful and easy to remember, as an adult remembers his or her childhood experiences, and it explains otherwise inexplicable or unnamable qualities

because it exemplifies the dissemination of the impact of a stone through a set of visible points in the water, serving as a reference for the dissemination of the impact of an event over a supply a chain.

Although the art of skipping stones in the water has existed since ancient times, scientific studies behind it are very recent. Boucquet (2003) made some basic assumptions about the best throws, such as the best kind, form, and size of stone. In addition, he proposed a description of the bouncing of the stone on the water in order to estimate the maximum number of bounces achieved by the stone, though the estimation of its velocity, Reynolds number, lift force, friction, and mass. He carefully studied the collisional process of a circular stone with the water surface and stated the importance of its spin velocity in the estimation of the maximum number of bounces. Clanet, Hersen, and Bocquet, (2004) performed a series of experiments on the stone's collision with the water, finding that there was what they called a "magic angle" of about 20° that allowed the stone to perform the maximum number of bounces. Other studies of stone skipping (Clanet, Hersen, and Boucquet, 2004; Humble, 2007; Rosellini, Hersen, Clanet, and Bocquet, 2005; Xiao, 2010), illustrate the basic assumptions of its processes and phases.

2.4 Metaphorical Transfer

“The ancient art of stone-skipping may therefore benefit from modern scientific insight” (Clanet, Hersen, & Boucquet, 2004)

In this section, we fulfill the first secondary goal of this research, which was to identify the main elements that influence the dissemination of the impact of a mid-range event over a supply chain. A metaphorical transfer should “formally demonstrate conceptual similarity or equivalence between the constituent elements of the metaphor and the target (phenomenon)” (Chen, et al, 2013, p. 580). In order to do this, we developed the *ontological*, *analogical*, and *identity* correspondence between stone skipping and dissemination of the impact of an event through a supply chain. These provided the foundation for the development of research propositions.

2.4.1 Ontology

Ontology is the logical correspondence between the constituent elements of the source and the target phenomenon (the “whats”). In developing our ontology, we describe the basic elements of stone skipping and how they correspond to the dissemination of the impact of an event through a supply chain.

We developed ontology for the equivalence between the elements of stone skipping and the dissemination of the impact of a mid-range event in a supply chain, shown in Table 3. The

basic elements of stone skipping are the stone itself, the throw, its collision with the water, the bounces, and the sink. Similarly, the dissemination of the impact of a mid-range event in a supply chain involves the event itself, the firm where it was initiated, the initial impact within the firm, subsequent impact in the supply chain, and the end of its impact.

Stone skipping causes turbulence in the water. After the first and all subsequent impacts of the stone, the property of the water surface changes. A similar phenomenon happens in a supply chain after the initiation of an event whose impact goes beyond the source firm.

Stone Skipping		Supply Chain	
Element	Definition	Element	Definition
Stone	Object thrown into the water	Event	The original implemented decision in a firm
Throw	The act of releasing the stone	Initiation	The initiation of the event in the source firm.
Collision	Moment when the stone touches the water	Initial Impact	Effect of the event in the source firm
Bounces	Subsequent collisions	Subsequent Impacts	New events in other tiers of a supply chain
Sink	Moment when the stone dives into the water	Termination	Moment when the impact of the event ceases

Table 3: Ontology

2.4.2 Analogy

Analogy is “the level where the “hows” and “whys” of the interrelationships among the “whats” (elements) of the metaphor are verified as being equivalent to those of the target” (Chen et al, 2013). Analogy is performed through establishing detailed equivalence between elements of both phenomena.

To illustrate how stone skipping is related to dissemination of the impact of an event in a supply chain, we use the example of an event in a firm's top management team. This is based on a case that we observed during our qualitative data collection. The firm hired a new marketing and sales director, who implemented a number of new policies and procedural changes. For each ontology element presented in Table 3, we developed a detailed equivalence between it and the elements of the dissemination of the impact of a mid-range event in a supply chain, which is shown in Table 4.

Stone Skipping			Supply Chain		
Element	Characteristic	Measure	Element	Characteristic	Measure
Stone	Shape	Round and flat	Event	Type	Strategic
	Size	Radius (R)		Scope	Mid-range (intermediate probability, intermediate impact)
	Thickness	Height (h)		Importance	High
	Weight	Mass (m)		Urgency	High
Throw	Translational velocity	Linear velocity (U)	Initiation	Source firms power	Medium to high
	Rotational velocity (kick)	Spin velocity (\bar{w})		Person's personal social influence	High
Collision	Impact angle	Angle (ϕ)	Initial impact	Personal heuristics and biases	High
	Gyroscopic effect	Torque (t)		Personal locus of control	Internal
	Water surface/ Friction (f)	Mass density		Buyer-supplier relationship	Strong
				Context	Incentives and/or obstacles
Bounces	Lift force (F_{lift})	Number of bounces (Σ)	Subsequent impacts	Contagion	Number of tiers impacted
	Reaction force	$F = f(F_{lift}, V, F_{friction})$		Impact	Impact = f (contagion, source firm power, context)
	Slowdown	Decreasing time between bounces		Dissipation	Decreasing time between impacts
Sink	Drag force	Point where stone sinks (x_f)	Termination	End	Time when impact ceases

Table 4: Analogy

2.4.2.1 Stone

The shape, size, thickness, and weight of the stone play an important role in the success of stone skipping. We propose that this corresponds to the role of the type, scope, importance, and urgency of an event, as its impact is disseminated through a supply chain

Shape

Boucquet (2003) analyzed the throw of both square and circular stones and found that the best stones for skipping are flat and rather circular. Less flat stones make the force more specific to a few points on a stone compared to a flat one, where the gravity force is spread across the stone's entire face, allowing it more reaction force³ to bound. Figure 14 and Figure 15 summarize Yabe et al. (2002)'s experiments comparing the effect of different shapes of stones, which revealed that a greater number of bounces was associated with a flat-bottomed stone shape.

³ Reaction force is further discussed in Section 2.4.4

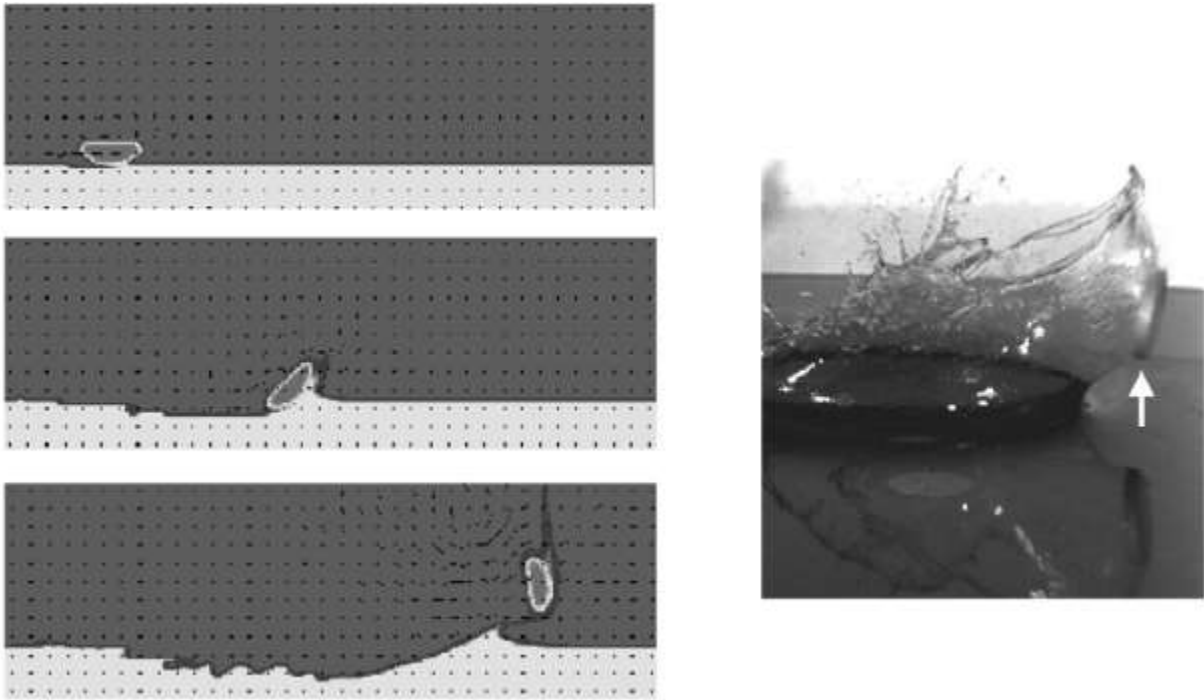


Figure 14: Skipping of a round bottom shaped stone (left=simulation, right=experiment)

Source: Yabe et al (2002)

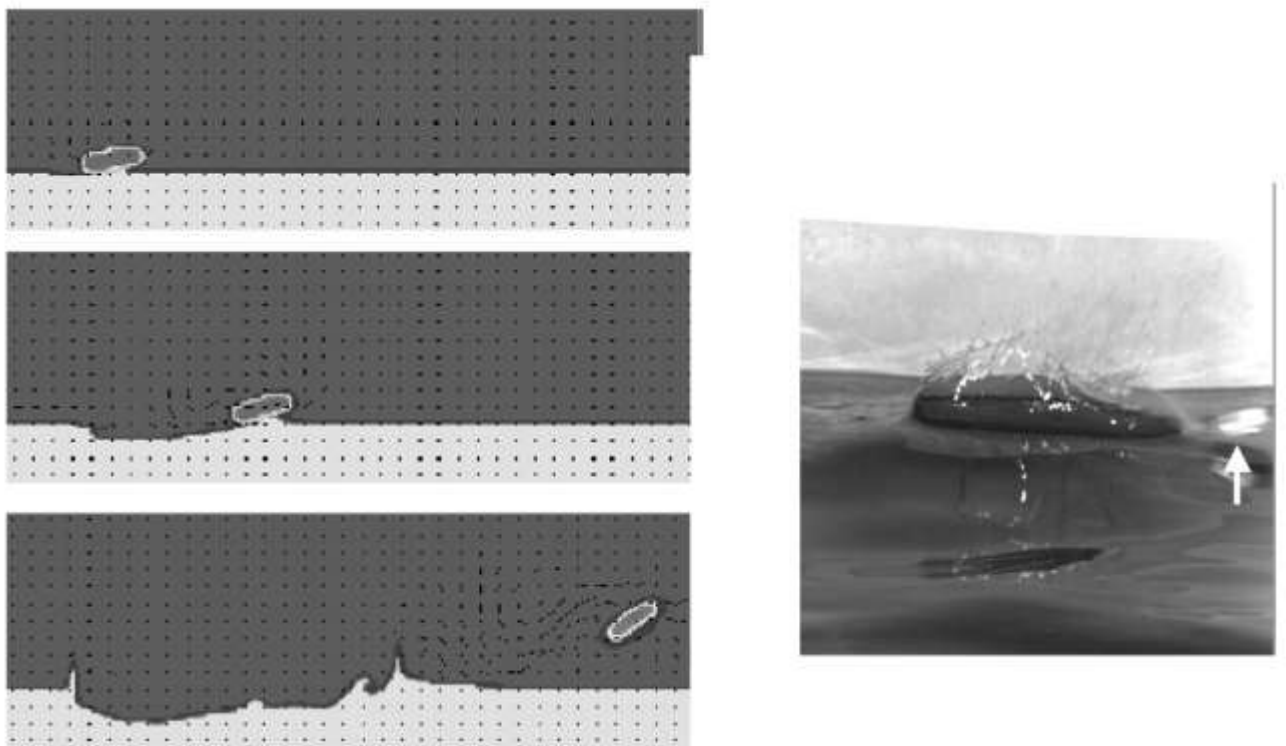


Figure 15: Skipping of a flat bottom shaped stone (left=simulation, right=experiment)

Source: Yabe et al (2002)

The shape of the stone is equivalent to the type of event. A strategic event requires time, attention, and focus on the decision making process. The impact of this type of event is likely to be disseminated through a supply chain because it relates to long-term goals and the way to achieve them.

In our example, the replacement of the director of marketing and sales was a strategic event, based on a decision that was made by the top management team. It had significant implications for the firm and its supply chain because of the influence that is implicit in this position.

Size

Size is another important element in stone skipping. A stone that is too big or too small will negatively impact the angular dependence and lift force coefficient, which are two very important characteristics for a stone to bounce (Clanet, Hersen, and Boucquet, 2004; Rosellini et al., 2005). In general, a good radius (R) for a stone to achieve a greater number of bounces is around $R \sim 2.5$ cm.

The size of the stone is equivalent to the scope of the event. The scope of the events we are considering is mid-range, because they are not high probability, low impact events, nor are they low probability, high impact events. For example, hiring a new director of marketing and sales is not a routine day-to-day event. It required time, effort, and planning for the sourcing and selection processes. It also required a period of acclimation for both the new director and those who were already in the firm. Hiring a new director was not a low probability event, because turnover is not unusual at this level. This was a job title that already existed in the firm; it just had to use time, effort, and resources in order to bring in another person to the position.

The impact of this kind of event is also of moderate impact, since it led to other events and impacts as well, which are further discussed in section 4.2.2.

Thickness

Rosellini et al. (2005) performed a series of experiments that demonstrated that the thickness of the stone had an impact on several elements that impact stone skipping, including the lift force coefficient and the gravity of the stone. Thickness helps to distribute the stone's weight through a more uniform mass (Nagahiro and Hayakawa, 2005; Rosellini et al., 2005). They found that a thickness of ~ 2.75 cm was the most conducive to stone skipping, because the stone thick enough to float, while thin enough to maintain stability.

The thickness of the stone is equivalent to the importance of an event to supply chain members. The impact of an event that is considered important will be disseminated from the focal firm through its supply chain. A more salient event remains in a supply chain member's thoughts and the degree to which they give priority (Michel, et al. 1997) to its implementation.

For example, hiring a new director of marketing and sales was of high importance to the focal firm, first tier suppliers, and first tier buyers, because it was a decision related to changing the sales model. This culminated in the redesign of packaging and labels for more than 300 products, selection of new suppliers, and re-adaptation of the first tier buyers and franchisees. It was of medium importance to the second and third tier buyers because it impacted them, but not substantially. It was more impactful for the middlemen (who were actually primarily women), because they were the intended new sales channel, and for the third tier buyers, the

final users, because they were able to find more attractive products at more different sales points.

Weight

Weight is also a very important element in stone skipping. Because acceleration is inversely proportional to mass (Newton's second law), the stone cannot be too heavy. If it is too light, on the other hand, this will reduce the gravity of the stone, which is the mass density of the object divided by the mass density of the fluid (Nagahiro and Hayakawa, 2005), causing it to sink. Experimental studies have found that a weight of ~ 60 g (the approximate weight of a tennis ball) is ideal for stone skipping.

The weight of the stone is equivalent to the urgency of an event. Urgency in a supply chain relates to time, which is a multi-level and complex construct. We propose that more urgent impact of an event is more likely to be disseminated over a supply chain. If it does not need to be implemented soon, its impact will not be disseminated over as many supply chain tiers. An example is legislation that was passed by the government and prescribes tasks that will need to be implemented soon.

In our example, the top management team was urgently in need of a new director of marketing and sales because it believed that it would help them to regain their market sooner. When the new director started in the firm, she also needed to make several decisions very quickly. She worked to implement her plans as quickly as possible, trying to make each member of her firm aware of the time urgency. Table 5 summarizes the analogy between skipping stones literature and its correspondents in a supply chain.

Stone Skipping	Supply Chain
The best <u>stones</u> are <u>flat and rather circular</u> ; one has to <u>throw them rather fast</u> and with a <u>small angle</u> with the <u>water surface</u> ; a small <u>kick</u> is given with a finger to give the <u>stone a spin</u> and allow <u>bounces</u> .	The best <u>events</u> are <u>strategic rather than operational</u> ; one has to <u>implement them with good amount of source firm power</u> and with <u>personal heuristics, biases and locus of control</u> in the <u>context</u> ; a(n) [even] <u>small amount of personal social influence</u> is necessary for an event to have <u>subsequent impacts</u> .

Table 5: Analogy for the stone

2.4.2.2 Throw

The throw plays a very important role in stone skipping. No matter how ideal the stone's characteristics are, if the stone was not appropriately thrown, it will sink. A good throw of a stone involves substantial speed and a little rotation (World Record, 2013). There are two important critical values of throw velocity: translational and rotational velocity. The number of bounces in stone skipping is proportional to large initial velocities, both translational and rotational (Rosellini et al, 2005).

Analogous to stone skipping, the dissemination of an event in a supply chain relies heavily on the power of the source of the initial event (see Figure 16). Translational velocity is equivalent to source firm power and rotational velocity is equivalent to the personal social influence of the source.

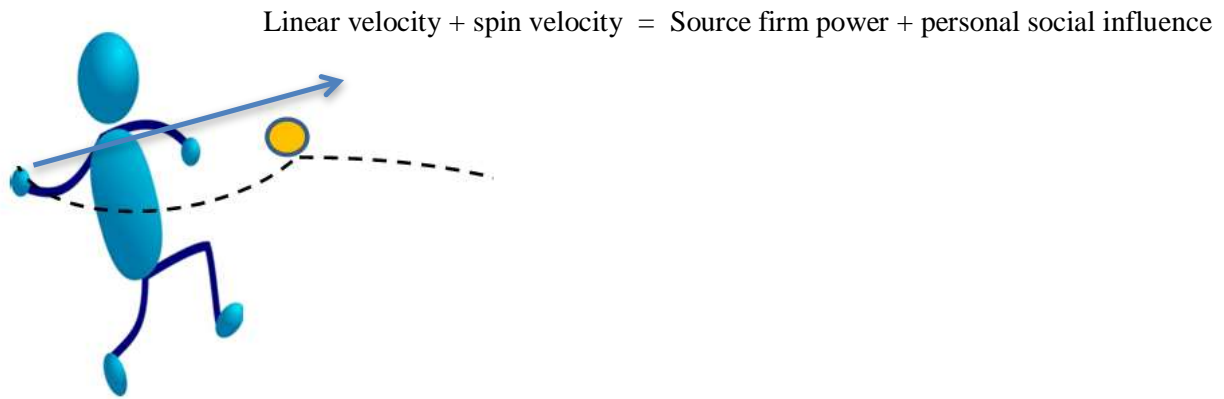


Figure 16: Throw of a stone representation

Translational velocity

Translational (or linear) velocity is measured in terms of linear velocity, which is the motion of the stone from one point in space to another. It is measured in meters per second and is based on mass [of the stone] and acceleration. Linear velocity is the velocity of the stone travelling in a straight line. Experimental studies found that a good velocity for stone skipping is $\sim 3.5 \text{ m s}^{-1}$ (Boucquet, 2003; Clanet, Hersen, and Boucquet, 2004).

In a supply chain, translational velocity is equivalent to source firm power. We build on the research of Astley and Sachdeva (1984) on sources of intra-source firm power, which they describe as a multifaceted and multidimensional phenomenon. Intra-source firm power results from a combination of three sources: hierarchical authority, resource control, and network centrality. Hierarchical authority is related to hierarchical position of a firm in a supply chain. Resource control refers to the firm's capacity for obtaining resources from its environment, as well as the control of supply or distribution of these resources. Network centrality is the position of the firm within the workflow linkages (Astley and Sachdeva, 1984). We expect that

the dissemination of the effect of an event in a supply chain will be associated with the source having strong hierarchical authority, high resource control, and a central position in its supply network.

In the example of hiring a new marketing and sales director, source firm hierarchical authority was high, since the hiring decision was made by the firm president. Resource control was high, since the marketing and sales director had the power to implement several other mid-range events, including hiring or firing mid-level management team members and implementing a new sales model. Network centrality was also medium to high, since the new director had the ability to make changes in product and services characteristics that would influence not only the focal firm itself, but some of its immediate suppliers and customers. In sum, for the impact of an event to be disseminated in its supply chain, its source should be a firm, department, or person with a substantial amount of source firm power (hierarchical authority, resource control, and network centrality).

Rotational velocity

Rotational (or angular) velocity relates to the angular speed of an object and the axis about which it is rotating (Resnick et al, 1966). It is measured in terms of spin velocity, which refers to an object moving on a circular path. High spin velocity is necessary for the stone's stabilization and to allow a greater number of bounces (Rosellini et al, 2005; Clanet et al, 2004; Boucquet 2002). A good spin velocity for stone skipping is $\sim 65 \text{ rot s}^{-1}$.

In supply chain, rotational velocity is equivalent to the personal social influence of the source. In the same way that spin velocity is necessary to stabilize a stone, a substantial amount of personal social influence is necessary to stabilize the dissemination of the impact of an event over a supply chain. Personal social influence was the subject of substantial research in the 1950's (Asch, 1956; Freedman and Fraser, 1966; Milgram, 1974) and is still of interest to researchers (Cialdini and Goldstein, 2004). It is the capacity or ability that a person possesses to influence other individuals' opinions in a direction toward their (the influencer's) own beliefs (Katz and Lazarsfeld, 1955). It is an "attempt to influence a person's beliefs, attitudes, intentions, motivations, or behaviors" (Seiter and Gass, 2010, p.33). We build on Cialdini et al.'s studies, which found that personal social influence is much more related to personal relationships than to source firm power, itself (Cialdini, 1984, 2001a, 2001b; Cialdini, Wosinska, Barrett, Butner, and Gornik-Durose, 1999; Cialdini and Goldstein, 2004; Goldstein, Martin, Cialdini, and Schuster, 2008; Nolan, Schultz, Cialdini, Goldstein, and Griskevicius, 2008). Thus, personal social influence and source firm power are separate constructs.

There are three elements of personal social influence: to be accurate, to affiliate, and to maintain a positive self-concept (Cialdini and Trost, 1998; Cialdini and Goldstein, 2004; Wood, 2000) They are expressed in terms of reciprocity, commitment and consistency, social proof, authority, liking, and scarcity. Reciprocity is the tendency to return a favor. It is a very strong and pervasive social force that transcends countries and organizational cultures (Gouldner, 1960). Consistency and commitment refer to the principle that individuals⁴ tend to be consistent with a commitment that they made orally or in writing and keep to that decision

⁴ Individuals in our research might represent either those ones from the source firm or the target firm, depending on whom we are referring, since we have individuals making and being influenced by decisions made in all the links in a supply chain. This is clarified when we give the examples.

for an extended period of time. Social proof refers to the notion that individuals tend to engage in the behavior they see others engaging in. Authority relates to perceived personal social power and the individual's tendency to follow authority figures, sometimes even in questionable situations (see Milgram, 1960's experiments). Liking states the principle that the more the target likes and approves of the source, the more likely it will be to behave in a way to keep that relationship. Finally, scarcity relates to the idea that individuals tend to value more what they have less of. It has been shown to increase and or generate demand (Cialdini and Goldstein, 2004; Cialdini 2004). Scarcity is also related to loss aversion, which is one of the heuristics studied by Kahneman and Tversky (1974).

In the example, the new marketing and sales director launched a new sales model, which greatly impacted the source firm internally, as well as its first tier suppliers and buyers. The new director demonstrated reciprocity by urging its first tier buyers (franchisees) to adopt the new sales model as quickly as possible, stressing that the franchisees should work hard and make it happen with their customers. Consistency and commitment were triggered in different ways. First, a new contract was made and the signature of each one of the franchise owners was requested (commitment). Second, since most of the franchisees had been with the source firm for a decade or more, they were asked to reiterate their support to the firm's decisions and strategies. Social proof was perceived when already successful franchisees were invited to come to training sessions and group meetings to tell their peers about the success they had experienced using the new sales model. Authority was reinforced by the fact that every time the franchisees talked about the new director, they would cite her credentials and previous experience, stressing that if she had done so much before, what she was proposing must be a good thing for them, too. Liking was achieved on a one-to-one basis, as many franchisees

followed and agreed with the opinions (about the new sales model) of their closest peers. Finally, scarcity was triggered by the suggestion that, if franchisees did not take the opportunity and start working hard quickly, they could lose a great opportunity for their business and lose money and market share. Table 6 shows the analogy between the elements of the throw for skipping stones and their equivalents in a supply chain.

Stone Skipping	Supply Chain
<u>Spin motion</u> induces a stabilizing torque.	<u>Personal social influence</u> induces a stabilizing effect on <u>buyer-supplier relationships</u> .
The initial " <u>kick</u> " that puts a stone in <u>rotational motion</u> is a key factor for a good <u>throw</u> .	<u>Personal social influence</u> is a key factor for good <u>dissemination</u> of the impact of an event over a supply chain

Table 6: Analogy for throw

2.4.2.3 Collision

The collision is a crucial part of stone skipping. By experimentally monitoring the moment of collision of a stone with a water surface, several authors have demonstrated the crucial parameters for successful stone skipping, which are the impact angle, the gyroscopic effect caused by the torque, and friction (Boucquet, 2003; Clanet, Hersen, and Boucquet, 2004; Rosellini et al., 2005).

Impact Angle

The angle with which a stone collides with the water is one of the most important parameters in stone skipping. No rebound is possible when the impact angle is larger than 45° (Clanet et

al. 2004), rather, the stone will sink. Researchers have shown that the greatest numbers of bounces are generally performed when there is a small angle, θ . (Clanet et al., 2004; Nagahiro and Haykawa, 2005). “One unexpected result which emerges from the measurements is the presence of a minimum in the stone-water collision time for a given “magic” angle $\theta \sim 20^\circ$. It is then easy to show that this angle does also maximize the number of bounces” (Clanet et al., 2004, p.8). Changes in linear speed and rotation did not change this relationship, “The dependence of N_{\max} [number of maximum rebounds] on U_0 [initial velocity] is much weaker than the one predicted from the more naive approach” (Clanet et al., 2004, p.8). “The ‘magic’ angle about $\sim 20^\circ$ is accordingly expected to maximize the number of bounces because the amount of energy dissipated during a collision is directly proportional to the collision time” (Clanet 2004; Bouquet 2001).

Figure 17 shows snapshots of a stone skipping experiments performed by Clanet et al (2004), establishing the “magic angle”. It presents chrono-photography of a skipping stone, obtained with an aluminum disc of radius $R = 2.5$ cm, thickness $h = 2.75$ mm, translation velocity $U = 3.5 \text{ m.s}^{-1}$, angular velocity $W = 65 \text{ rot.s}^{-1}$, attack angle $\alpha = 20^\circ$, trajectory angle $\beta = 20^\circ$ ⁵. Time increases from left to right and from top to bottom, with the time increment $\Delta t = 6.5$ ms.

⁵ The physics literature measures two different angles in skipping stone: attack angle (α) and trajectory angle (β). Both angles are essentially the same, so, for order of simplification, we refer to them as the angle (θ).

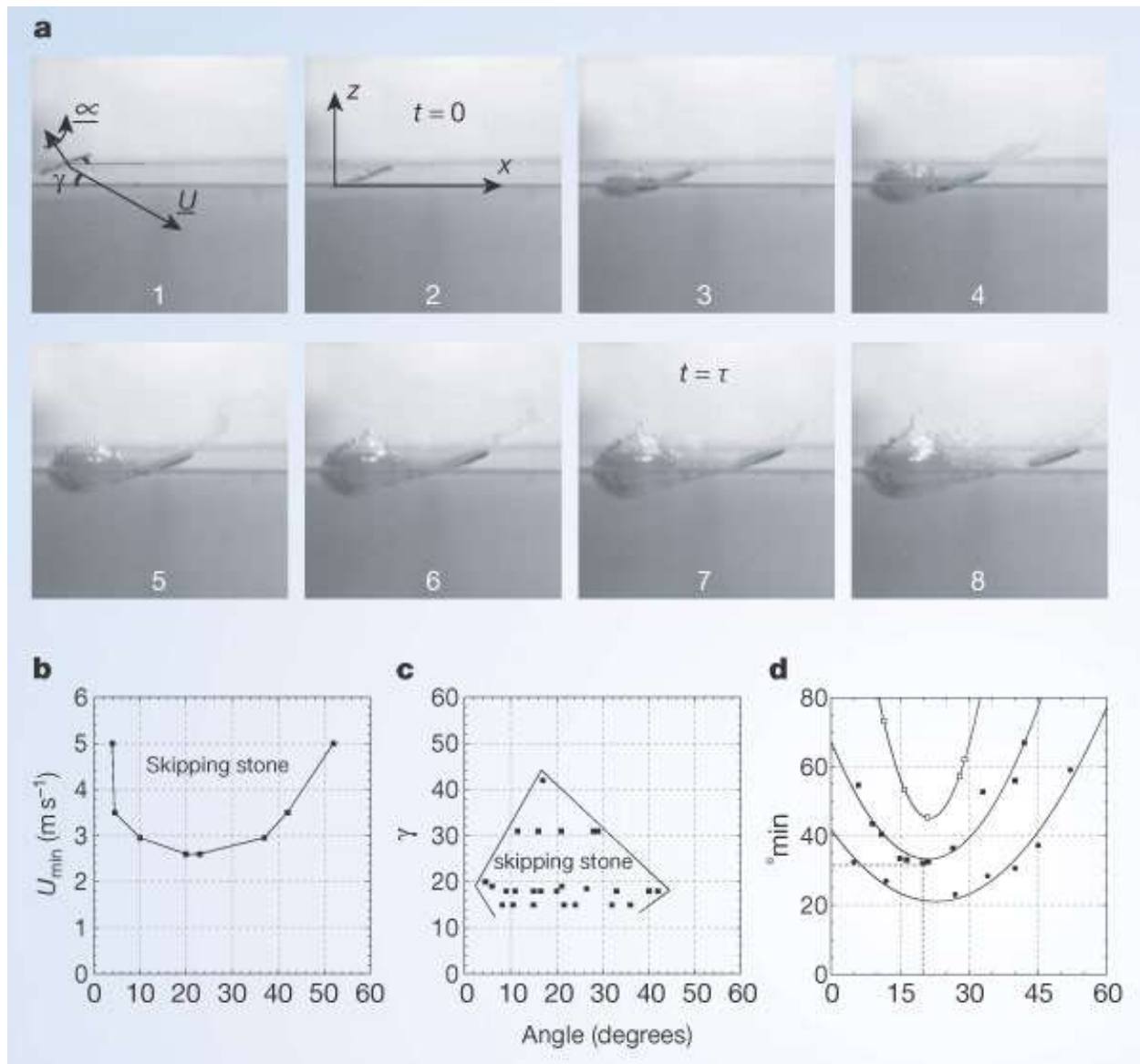


Figure 17: Analysis of stone skipping.
Source: Clanet et al (2004)

In a supply chain, the impact angle is equivalent to the influence of personal characteristics, such as heuristics, biases, and locus of control. Similar to the way that the impact angle is critical in allowing a stone to skip, personal characteristics of the source and the target also greatly influence the dissemination of the impact of an event over a supply chain. The reaction to the impact of an event is proportional to the target's (supply chain members') reaction, which is related to the target's biases, heuristics and locus of control.

In the illustrative example, the initial impact of the event involved individual characteristics and relationships between buyers and suppliers. During the first weeks that followed the hiring of the new director, several biases were exhibited by supply chain members, such as the sales manager, as well as those that were indirectly involved, such as a packaging supplier. These included overconfidence, wishful thinking, hyperbolic discount, framing effects, and intuition. Both internal and external locus of control were also identified, and their implications will be further discussed in detail in Chapter Four.

Gyroscopic Effect

The gyroscopic effect is crucial in stabilizing the stone and allowing it to make more rebounds (Boucquet, 2003; Clanet, Hersen, and Boucquet, 2004). For example, in an experiment that used Russell Byars, a stone skipping champion and world record holder between 2007 and 2013, a slow motion camera found that the stone made 23 spins between each bounce⁶ on the water. Torque, which is the tendency of a force to rotate an object about an axis, together with spin velocity, are responsible for generating the gyroscopic effect during a stone's throw.

The gyroscopic effect is equivalent to the strength of the buyer and supplier relationship in a supply chain. As the gyroscopic effect in stone skipping is a function of spin velocity and torque, buyer and supplier relationships are a function of personal social influence (Cialdini, 1994) and the strength of the ties between buyers and suppliers.

⁶ For more details about the stone skipping in slow motion, check the link: goo.gl/cFUxlq

Buyers and suppliers can be embedded in their relationship with each other (Choi and Kim, 2008; Kim et al 2011) to varying degrees. The concept of structural embeddedness helps to understand that a firm's performance is intrinsically related to its own location on its supply chain. The position which a firm assumes in different supply chains can allow different opportunities and access to other firms' capabilities (Kim, 2014), thus it can facilitate the development of weak ties (Choi and Kim, 2008; Kim et al 2011). As a skipping stone can only be partially immersed in the water, in order to have the greatest impact, the impact of a supply chain event cannot be exclusively related to its source. Strong ties (Krackardt, 1992; Nelson, 1989) are evident in this example, based on time and interaction. The new director's new sales model involved interaction among many different individuals, across a substantial period of time. A multidisciplinary team in the source firm, with members ranging from designers to purchasing managers, was involved in the packaging redesign for more than 300 products. This illustrates the strong ties between the source firm and its supply chain members. Agreement effects and trust were strengthened because of their close interaction. Thus, strong ties indicate a strong buyer-supplier relationship.

Friction

Friction is the resistance between the stone and the water surface. It is related to the water surface's characteristics. Even with ideal throw velocities (linear and spin), if a perfect stone encountered a water surface full of waves on a windy day, the chances of the stone bouncing would be greatly reduced (Boucquet, 2003). Gravity (g) is the specific gravity of the stone, which is its mass density (ρ') divided by the mass density of the fluid (ρ) ρ'/ρ . Gravity force is illustrated in Figure 18, which shows a schematic view of the collisional process of the oblique

water entry of a stone, where incident angle = θ , initial velocity = V_0 , radius = R , thickness = h , angle between the disk and water plane = ϕ , and n = perpendicular direction.

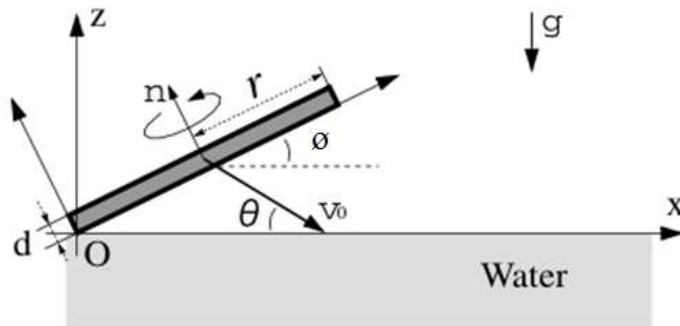


Figure 18: Collision process of a flat stone encountering a water surface
Source: Based on Boucquet (2003) and Nagahiro and Hayakawa (2005)

Friction on the water surface is equivalent to a supply chain context, including the obstacles and incentives for event that might emerge in both macro (supply chain and industry) and micro (firm) environments. In our example, there were several sources of pressure that functioned as incentives for the dissemination of the impact of the event. For example, an incentive was provided by the anticipated increase in firm sales, due to the sales model that was implemented by the new director (the source firm did actually increase its sales by more than 300% in 18 months). However, there were obstacles, as well. Operationally, due to the changes in process and products initiated by the new director, manufacturing plant employees experienced substantial stress and uncertainty. They felt overwhelmed with their work overload, certification of new suppliers, approval initiative for new processes, time and budget constraints. Table 7 shows the analogy between the collision and its correspondents in a supply chain.

Stone Skipping	Supply Chain
The <u>energy</u> dissipated during a <u>collision</u> is minimized for a specific magical <u>angle</u> of the stone, relative to the <u>water surface</u> .	The <u>impact</u> dissipated during the <u>initial impact</u> (of the event) is minimized for a specific <u>set of heuristics, biases, and locus of control</u> , relative to the <u>context</u> .
The <u>initial velocity</u> [of the stone] should be greater than the <u>minimum velocity</u> , in order to perform at least one <u>bounce</u> .	The <u>initial impact</u> [of the mid-range event] should be greater than the <u>minimum power needed</u> , in order to have any <u>subsequent impact</u> .
The <u>attack angle</u> exhibits a strong variation and decreases continuously over the <u>bounces</u> .	Personal <u>heuristics, biases, and locus of control</u> exhibits a strong variation and decreases continuously over the <u>subsequent impacts in a supply chain</u> .

Table 7: Analogy for collision

2.4.2.4 Bounces

The success of stone skipping is measured as the number and length of the bounces. The number of bounces is a function of several factors, including the stone itself, the throw and collision elements. If all the parameters described earlier are in the appropriate ranges, the stone will bounce. Bounces translate all the initial characteristics and convert (or not) them into rebounds. Important characteristics to consider in the bounce process are lift force, reaction force, and slowdown.

Lift Force

Lift force (F_{lift}) is the difference in velocity between the stone and the water (Clanet et al, 2004).

It considers both specific gravity (ρ'/ρ) and translational velocity (V^2). It is important to note

that the mass density of the stone changes during the process of skipping it. This happens as the stone is partially immersed in the water, since the density of a wet stone (S_{wet}) is different from that of a dry one. A stone rebounds only if it is partially immersed during the collision (Boucquet, 2003). Lift is the component of fluid force that is perpendicular to the direction of movement of the stone moving through water. It requires motion and contact between the stone and the water. The lift force along n is illustrated in Figure 19.

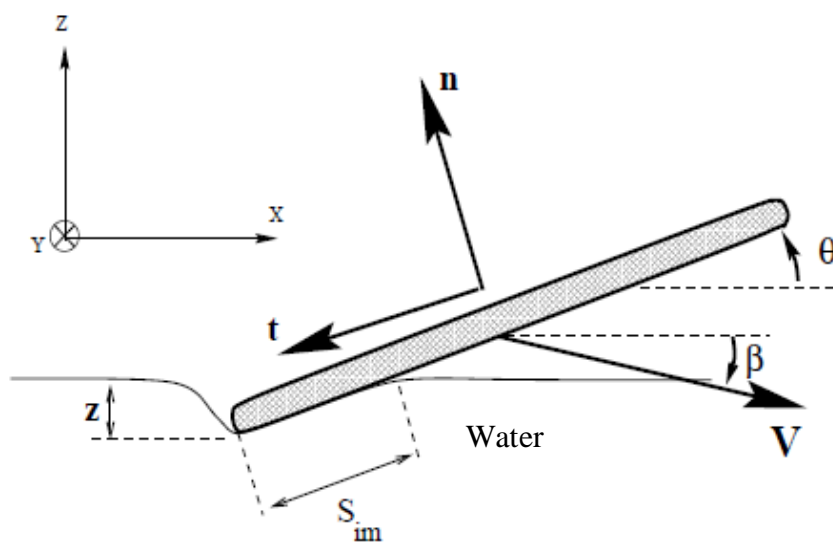


Figure 19: Schematic view of the collision pre-bouncing process
Source: Based on Boucquet, 2003

In a supply chain, lift force is equivalent to the contagion of the impact of an event. As in stone skipping, where a stone only rebounds if it stays partially immersed during the collision, an event will only impact other firms if its impact is not exclusive to the source firm. In other words, if the mid-range event only is important for the source firm, its impact will not be disseminated over the supply chain. However, if the event has the potential to influence other firms, its impact will travel through the supply chain. It may also travel to other supply chains, through interlocking supply chain relationships, building on Granovetter's (1983) strength of

weak ties. As such, the contagion of an event's impact to other firms must travel through "bridges" between firms inside and across supply chains.

In the example, the hiring of the new sales and marketing director had an impact on other firms because of the existence of weak ties between the source firm and non-adjacent links in its supply chain. Weak ties existed between the source firm and relationships that its franchise owners, suppliers, and middlemen had with other firms. The impact of this mid-range event was disseminated through different links, downstream, upstream, and perpendicular, as will be discussed as part of the next topic, the reaction force. The dissemination to these tiers was possible due to existence of weak ties. Examples are related to the selection of new packaging suppliers, the influence of one franchisee on another in the adoption of the new sales model, and the fact that one of the source firm's main competitors knew that it was making those moves, and decided to make its own similar moves.

Reaction Force

Reaction force is an expression of Newton's third law of motion (Bartlett, 2007), which states that, if an object exerts a force on another object, then the second object exerts an equal and opposite reaction force on the first: "For every action [force] there is an equal and opposite reaction" (Taylor, 2005). In stone skipping, the reaction force on the stone results from a combination of lift and friction forces and the quadratic of the translational velocity. It is also based on both the mass density of the stone and the water (Hall, 2006). Because the stone becomes only partially immersed in water, the reaction is proportional to the immersed surface of the stone (Boucquet, 2003). Reaction force produces kinetic energy, which is the energy that

an object possesses due to its motion. The kinetic energy of a thrown stone is proportional to its mass and velocity, $K_e = \frac{1}{2} m \cdot v^2$. Particularly relevant to the dissemination of the impact of an event in a supply chain is the fact that some energy is dissipated during each collision of the stone with the water, due to the combined effect of all the forces. The flow around the area where the stone collides forms a series of ripples, due to the dissipation of energy. These ripples change the water surface, causing some turbulence, which will remain altered for a while, even after the stone has already moved on to its next collision. They increase their radius in time and space until they disappear after some time. Figure 20 illustrates the ripples formed around the point where a stone had previously collided.



Figure 20: Ripples formed by stone collisions with the water
Source: <http://goo.gl/Sogsi2>

It is important to note that a stone does not just touch the water and go on to the next rebound. When a stone collides with the water, it “scoops” or surfs the water a little bit before leaving for the next point, which creates the ripples.

Figure 21 illustrates the moment of a stone-water collision.



Figure 21: Snapshot of a stone-water collision
Source: goo.gl/cFUxlq

The surfing of a stone and reconfiguration of the water around the collision (ripples) were studied by Nagahiro and Hayakawa (2005), as illustrated in Figure 22, which illustrates a simulation of a stone-water collision and the turbulence that the collision causes on the water. It shows three different moments of a collision: immediately before the collision (Figure 22a), partial immersion of the stone in the water (Figure 22b), and departure from the initial point and going to the next collision (Figure 22c). This demonstrates that the place, point, and time are different, even for the same bounce. It is important to note that the impact angle (θ) remains basically the same during the entire process.

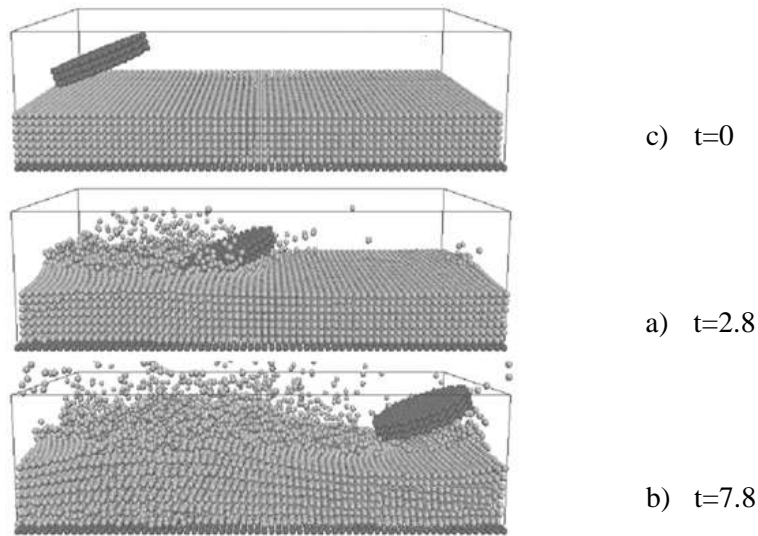


Figure 22: Snapshots of a stone skipping simulation

Source: Based on Nagahiro and Hayakawa, 2005

In order to develop further analogies between bounces in stone skipping and the dissemination of the impact of an event in a supply chain, we build upon the reaction force formula, where C_l = lift coefficient, C_f = friction coefficient, ρ_w = mass density of water, S_{im} = area of the immersed surface, n = lift force, and t = force along the direction of the throw (Bouquet, 2003). Table 8 presents the supply chain analogy for the reaction force formula.

$$\mathbf{F} = \frac{1}{2} C_l \rho_w V^2 S_{im} n + \frac{1}{2} C_f \rho_w V^2 S_{im} t$$

Stone Skipping	Supply Chain
Lift coefficient (C_l)	Contagion
Friction coefficient (C_f)	Context
Mass density of water (ρ_w)	Incentives and obstacles
Translational velocity (V^2)	Source firm power
Immersed area of a stone (S_{im})	Exclusivity of the event to the source firm
Normal vector Lift (n)	Contagion
Direction of the throw (t)	Downstream, upstream direction

Table 8: Analogy for reaction force formula

The rough equivalent for a supply chain is the “translated” formula for the dissemination of the impact of a mid-range event is presented below:

$$\mathbf{Impact} = \left(\frac{1}{2} \text{ Contagion}\right) \times \text{Context} \times \text{Source Firm Power}^2 \times \text{Source} \times \text{Perpendicular direction} \\ + \\ \left(\frac{1}{2} \text{ Contagion}\right) \times \text{Context} \times \text{Source Firm Power}^2 \times \text{Source} \times \text{Up/downstream direction}$$

The formula illustrates that the impact of an event goes simultaneously in different directions related to the source, including upstream (suppliers), downstream (buyers), and perpendicular (competitors). Rather than moving on a linear fashion from left to right (the traditional depiction of a supply chain), the impact is disseminated in all directions through a supply network, analogous to the ripples that form when a stone collides with the water. Because of the ripples effect of the impact, contagion due to dissipation of energy is spread across directions, which is why it appears as $\frac{1}{2}$ in each direction (upstream and downstream). The context is the obstacles and incentives that exist in each supply chain link. Because source firm power plays an important role in the dissemination of the impact of an event, it is quadratic in the formula, stressing the role of the source firm’s hierarchical authority, resource control, and network centrality. This is consistent with Kim’s (2014) work on the strategic role played by different positions in a network (supply chain) in accessing information and developing of strategies and policies.

In a supply chain, the dissemination of the impact of an event is equal to the combination of contagion (lift force), context (friction force), and source firm power (translational velocity). This is illustrated by the intensity, number of links impacted and direction of the impact. The

intensity of the impact continues, due to the time and effort that supply chain members have dedicated to the implementation of the necessary changes. The number of links impacted is the number of other firms, beyond the source, that were impacted by the event. The direction of impact (upstream, downstream, and perpendicular) is analogous to the ripples formed as a stone skips.

Like turbulence on the water surface, the event in our example clearly impacted other links in its own supply chain and in others, disseminating in upstream, downstream, and perpendicular directions. The impact of the change in the director was greater downstream (sales and consumers), especially with the first tier buyers, who had hire new employees with a different profile from what they were used to and purchase several product items different from their traditional mix. The franchisees had to change their approach and relationship with their customers, who acted as middlemen between the franchisee and the final customers. Thus, the second tier buyers were impacted, as well. Even final customers were impacted by the new product design and packaging, since they had more appealing products in higher variety available in the stores for them to choose from. Upstream, the first tier suppliers were impacted, with the greatest impact on the packaging solutions suppliers, due to the substantial redesign required for more than 300 items. Some chemical suppliers were impacted, as well, but the primary impact was on the first tier suppliers. Perpendicular initial impacts were also observed. One of the focal firm's main competitors mentioned that it was "kind of concerned" about the source firm's new strategy because it had observed that some of its own customers had decreased the amount of their purchases, as discussed further in Chapter Four.

Slowdown

The slowdown of a stone is its decrease in velocity that occurs due to energy dissipation. When a stone collides with the water, all bounces do not occur in the same way. There is a decrease in distance between each pair of successive bounces, as well as time between the bounces (Boucquet, 2003). This phenomenon is known as the “Pity-Pat” effect, which is illustrated in Figure 23 showing a trajectory of ten bounces of a stone.

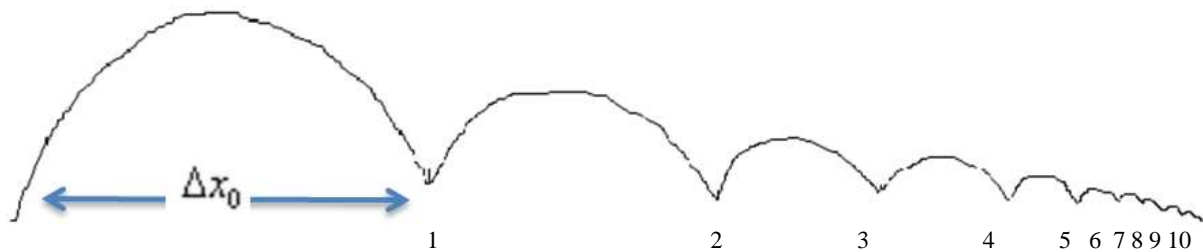


Figure 23: Pity-Pat effect

In a supply chain, slowdown is equivalent to the dissipation of the impact of a mid-range event, which is related to time between impacts. It is far more difficult to be precise in terms of time between impacts of an event in a supply chain, than it is to count stone bounces. However, it is possible to estimate times and “distances” between impacts. One approach is to view the dissemination of the impact of an event in a supply chain as analogous to the innovation diffusion process. Innovation travels through a system based on time of adoption, which relies heavily on human perception (Rogers, 1962, 2003).

In the example, the time between impacts was long in the beginning, but strongly accelerated for the later supply chain links. In the beginning, it was necessary to spend several months in planning, designing, selecting, hiring, and training. After some months, however, the

implementation was much faster than in the initial months and the impact of the change in director was disseminated more quickly through the supply chain. Table 9 contains a summary of the analogy between stone skipping and its correspondents in a supply chain.

Stone Skipping	Supply Chain
The <u>reaction force</u> due to the water is proportional to <u>lift force</u> and <u>friction</u> .	The <u>impact in other firms</u> is proportional to <u>contagion</u> and <u>context</u> .
The <u>lift force</u> is expected to be proportional to the <u>apparent surface of the stone (thickness)</u> and the <u>mass density of the water</u> .	The <u>contagion</u> is expected to be proportional to the <u>importance of the mid-range event</u> and the <u>context</u> .
The <u>lift force</u> is maximum when the <u>stone</u> is only <u>partially immersed</u> .	The <u>contagion</u> is maximum when the <u>mid-range event</u> is only <u>partially related to the source</u> .
The <u>lift force</u> has to balance the <u>weight</u> of the <u>stone</u> , in order for it to <u>bounce</u> .	The <u>contagion</u> has to balance the <u>urgency</u> of the <u>mid-range event</u> , in order for it to have <u>subsequent impacts</u> .
In the absence of <u>spin</u> motion, the <u>torque</u> due to the <u>lift force</u> will induce instability.	In the absence of <u>personal social influence</u> , the <u>buyer-supplier relationship</u> due to <u>contagion</u> will induce instability.
<u>Rotation</u> stabilizes the <u>stone</u> , due to the <u>gyroscopic effect</u> .	<u>Personal social influence</u> stabilizes the <u>mid-range event</u> , due to the <u>strength of buyer and supplier relationships</u> .
A certain <u>spin velocity</u> is necessary, to stabilize the <u>stone</u> .	A certain amount of <u>personal social influence</u> is necessary, to stabilize the dissemination of the impact of a <u>mid-range event</u> .
A finite <u>angle</u> is helpful in increasing the number of <u>bounces</u> .	Specific <u>heuristics, biases, and locus of control</u> are helpful in increasing the number of <u>subsequent impacts</u> .
The <u>water surface</u> exhibits a <u>lift force</u> on the <u>stone</u> , allowing it to <u>rebound</u> .	The <u>context</u> exhibits <u>contagion</u> on the <u>mid-range event</u> , allowing it to <u>have subsequent impacts</u> .
Some <u>energy (reaction force)</u> is dissipated during each <u>bounce</u> , due to the <u>friction</u> component of the force.	Some <u>impact</u> is dissipated during each <u>subsequent impact</u> , due to the <u>obstacles in the context of (each) supply chain link</u> .
The <u>reaction force</u> will decrease the velocity of the stone; after a few <u>bounces</u> , the initial <u>kinetic energy</u> of the stone is fully dissipated and it <u>sinks</u> .	The extent to which a <u>mid-range event</u> is dissipated to the next <u>link</u> will decrease its supply chain impact; after a few <u>subsequent impacts</u> , its initial <u>impact</u> is fully dissipated and it will have <u>no further impact</u> .
The decrease in the distance between two successive <u>bounces</u> is at first rather slow, but strongly accelerates for the last collisions (the Pity-Pat effect).	The decrease in the distance between two successive <u>subsequent impact</u> is at first rather slow, but strongly accelerates for the last links (Pity-Pat effect).
The maximum number of <u>bounces</u> results from the combination of <u>slow down</u> and <u>angular destabilization</u> .	The maximum number of <u>subsequent impacts</u> results from the combination of <u>dissipation</u> and personal <u>heuristics, biases, and locus of control</u> .
Under conditions of large <u>spin velocity</u> , the <u>attack angle</u> remains constant during the entire impact process.	Under conditions of large <u>personal social influence</u> , the <u>heuristics, biases, and locus of control</u> remain constant during the entire impact process.
The <u>attack angle</u> exhibits a strong variation and decreases continuously over the <u>collision (bounces)</u> .	<u>Personal heuristics, biases, and locus of control</u> exhibit a strong variation and decrease continuously over the <u>subsequent impacts</u> .
In general, both C_l (<u>lift coefficient</u>) and C_f (<u>friction coefficient</u>) are functions of the <u>tilt angle θ</u> and <u>incidence angle β</u> . (...) <u>ricochets (bounces)</u> are generally performed with a <u>small tilt angle, θ</u> , and a <u>small incidence angle, β</u> .	In general <u>contagion</u> and <u>context</u> are function of <u>personal heuristics, biases, and locus of control</u> (...) <u>Subsequent impact</u> generally require a lower level of <u>heuristics, biases, and locus of control</u> .

Table 9: Analogy for bounces

2.4.2.5 Sink

Even under perfect conditions, every stone, even those that had almost uncountable bounces⁷ will eventually stop and sink. The sink results from the combination of two previous mechanisms: slowdown and angular destabilization (Boucquet, 2003). Both the slowdown and angular destabilization are influenced by drag force. Drag is a mechanical force generated by a solid object travelling through a fluid that exerts a force in the direction opposite to the direction in which the object is moving (Bartlett, 2007). The combination of drag force and gravity cause slowdown and angular destabilization, causing the stone to sink.

Figure 24 shows the forces acting on a stone just after the collision, where N = normal lift force, V = translational velocity, g = gravity force, and F_{drag} = drag force.

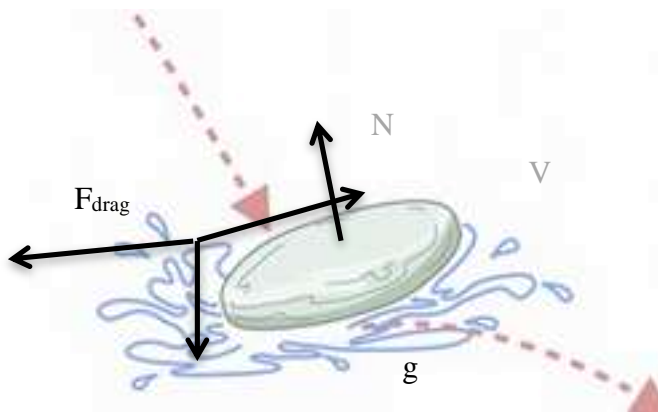


Figure 24: Forces acting on a stone

Source: <http://goo.gl/O3bvhM>

⁷ The current world record according to the Guinness Book of Records is 88 skips by Kurt "Mountain Man" Steiner. The cast was achieved on September 06, 2013 at Red Bridge in the Allegheny National Forest, Pennsylvania. (<http://www.guinnessworldrecords.com/world-records/1/most-skips-of-a-skimming-stone>)

In a supply chain, drag force is equivalent to the end of the dissemination of the effect of an event. No matter how important or powerful the impact of the event has been, there will be a moment when its impact ceases.

In the example, the end of the dissemination of the impact of the mid-range event occurred about 30 months after the beginning of the new director at the source firm, when she left the firm. However, this did not prevent other events nor the continuity of its impact (like ripples in the water), which are natural and expected in a complex environment, like a supply chain. Examples of the continued impact include the fact that the new staff adopted some of her previous ideas, and implemented some of the projects she had initiated. Table 10 presents the analogy between the sink and its correspondents in a supply chain.

Stone Skipping	Supply Chain
If the <u>stone</u> reaches a depth where it becomes <u>completely immersed</u> , the <u>lift force</u> is greatly diminished and will probably not be able to sustain the <u>weight of the stone</u> any longer.	If the <u>dissemination of the impact of the mid-range event</u> reaches the point where it is <u>only related to a specific source</u> , <u>contagion</u> is greatly diminished and it will not be able to sustain its <u>urgency</u> any longer
Even if the <u>initial velocity</u> of the <u>stone</u> is very large, the stone will be stopped by <u>angular destabilization</u> , after a certain number of <u>bounces</u> .	Even if the initial <u>source firm power</u> associated with the <u>mid-range event</u> is very large, its impact will be stopped by the effect of <u>personal heuristics, biases, and locus of control</u> , after a certain number of <u>subsequent impacts</u> .
The <u>collision sequence [bounces]</u> is repeated until parameters at the impact (<u>angles and velocity</u>) prevent the <u>stone</u> from <u>escaping the water</u> and force it to <u>sink</u> .	The <u>subsequent impacts</u> are repeated until parameters at the impact (<u>personal heuristics, biases, and locus of control, source firm power, and personal social influence</u>) prevent the impact of <u>mid-range event</u> from escaping the <u>context</u> and force it to <u>end</u> .
Low <u>spinning stone</u> does not bounce but <u>dives</u> .	<u>The impact of mid-range events</u> associated with low <u>personal social influence</u> do not have any subsequent impact and <u>end</u> .

Table 10: Analogy for sink

2.4.3 Identity

In this section, identity is established. Identity in metaphorical transfer is the generalizable insights that apply to both the metaphor and the target phenomenon (Chen et al, 2013). To show identity, several propositions about dissemination of the impact of an event in a supply chain were developed, based on key stone skipping principles.

2.4.3.1 Propositions

Proposition 1 (“Pity-Pat” Effect Principle). The closer tiers in a supply chain will experience a stronger impact of a mid-range event, which decreases for the farther tiers.

In stone skipping, a stone does not bounce with the same velocity or distance between all collisions. The first bounces occur less frequently and increase in velocity for the later ones. The first bounces have greater distances between them, while the later bounces are closer together. This phenomenon is known as the Pity-Pat effect (Boucquet, 2003; Clanet et al., 2004) and is in accordance to Newton’s law of gravity which predicts that the farther apart the bodies are, the smaller the force will be (Hawking, 1996).

Similarly, a mid-range event in a source firm will have an impact on other firms in its supply chain with different frequencies and at different times. We operationalized the impact of a mid-range event in terms of the number of different tiers that were affected. The Pity-Pat effect

implies that a mid-range event in a focal firm will have a greater impact in the first tier buyers and suppliers, which strongly decreases for the later tiers.

Proposition 2 (“Gyroscopic Effect” Principle). A combination of personal social influence and strength of buyer and supplier relationships will significantly contribute to the extent of the impact of a mid-range event over a supply chain.

The gyroscopic effect occurs due to spin velocity of the throw and is a function of both the spin velocity and torque. The gyroscopic effect is crucial in stabilizing the stone, to allow it to make more rebounds (Boucquet, 2003; Clanet, Hersen, and Boucquet, 2004).

In a buyer and supplier relationship in a supply chain, this principle illustrates the effect of personal social influence (not necessarily related to job title) plus the strength of the buyer and supplier relationship. Analogous to stone skipping, the combination of these factors will significantly contribute to the continuance of the extent of the dissemination of the impact of an event through a supply chain.

Proposition 3 (“Magic Angle” principle): Even a low level of personal heuristics, biases, and locus of control will influence the impact of an event over supply chain.

In a supply chain, the magic angle is equivalent to personal heuristics, biases, and locus of control. Even a low level of them will increase the extent of the impact that an event has over the supply chain links. Thus, the heuristics, biases, and locus of control of buyers and suppliers play a crucial role in the dissemination of the impact of a mid-range in a supply chain.

Proposition 4: (“Lift Force Principle”): The impact of a mid-range event is proportional to its impact on individuals in the supply chain links.

In stone skipping, a reaction against the stone is exerted by the water surface, which allows it to rebound due to the lift force, which is maximum when the stone is only partially immersed on the water. In a supply chain, the impact of a mid-range event (either good or bad) is related to characteristics of buyers and suppliers as well as obstacles and or incentives they might influence. Obstacles include different kind of difficulties the target might show in adapting to a change. Examples can be found in the adoption of a new sales model, which include the fact that the franchisees did not want to hire employees to visit the beauticians and estheticians because of the related costs. Incentives, on another hand, refer to things that encourage making a change. Both obstacles and incentives are subject to buyers and supplier’s perceptions as well.

Proposition 5 (“Kinetic Energy Principle”): The impact of a mid-range event may create its own power and keep impacting other supply chain links beyond the source, even if the initiators try to stop it.

After a stone is thrown on the water, it keeps bouncing due to the kinetic energy it created, which is proportional to its mass, velocity, and gravity. Another example of the kinetic energy of an object is the idea of pushing a big rock down a steep hill⁸. Initially, the rock does not move by itself; it requires the effort of people to push it down. However, once it starts rolling

⁸ See <https://www.youtube.com/watch?v=w5rKDNJHjRc>

down, it creates its own kinetic energy. Even if those who pushed it tried to stop it, they will not be able to do so.

Similar phenomena happen in supply chains. Some mid-range events, after being initiated, take on a life of their own. In a supply chain context, we view kinetic energy as related to the perceived importance and urgency of the event, itself, by supply chain members. Some mid-range events may not be perceived as being as important as others, especially when they only affect the source of the event. Other events, however, are perceived as very important by many different links in a supply chain. For example, legislative changes related to tracking the producer of a product may impact several supply chain links. Another example is the bullwhip effect, which relates to variances in demand distortion as it moves upstream through a supply chain (Lee et al., 1997, Mackelprang and Malhotra, 2015).

Proposition 6 (Ripples Effect Principle): An event in a focal firm may impact other links in the same supply chain and in other supply chains (perpendicular direction).

Probably one of the first images that come to mind when thinking about stone skipping are the ripples that are formed and remain for a while after each rebound. Ripples are formed due to the impact and the cavity in the water created by the stone. They are the outcome of the energy dissipation in each collision (Boucquet, 2003; Nagahiro & Hayakawa, 2005).

In a supply chain, the ripples are equivalent to the fact that a mid-range will continue to impact a context even when it is not “physically” present in that place or time any more. A manifestation of the ripples principle is seen in the example used for the analogy. Although the

new sales and marketing director left the firm, the impact of her decisions continued to influence the new team in the source firm and other links as well, particularly, the first tier buyers. Table 11 presents a summary of the propositions, and Figure 25 illustrates them in a stone-skipping context.

Propositions		Stone Skipping	Supply Chain Propositions
P1	Pity-Pat Effect Principle	The energy dissipation strongly decreases the distance and time between each bounce for the later skips.	The closer tiers in a supply chain will experience a stronger impact of a mid-range event, which decreases for the farther tiers.
P2	Gyroscopic Effect Principle	A gyroscopic effect is a function of spin velocity and torque. It is crucial in stabilizing the stone and contributing to rebounds.	A combination of personal social influence and strength of buyer and supplier relationships will significantly contribute to the continuance of the impact of a mid-range event over a supply chain.
P3	Magic Angle Principle	Ricochets are generally performed with a small tilt angle, θ , and a small incidence angle, β .	Even a low level of personal heuristics, biases, and locus of control will influence the impact of an event over supply chain.
P4	Lift Force Principle	Lift force is the reaction against the stone exerted by the water surface that allows the stone to bounce.	The impact of a mid-range event is proportional to its impact on individuals in the supply chain links.
P5	Kinetic Energy Principle	Kinetic energy is the energy that an object possesses due to its motion.	The impact of a mid-range event may create its own power and keep impacting other supply chain links beyond the source, even if the initiators try to stop it.
P6	Ripples Effect Principle	A series of ripples are formed on the water, due to the flow around the stone during the stone-water contact. The ripples remain and increase their radius, even after the stone has already gone onto its next collision.	An event in a focal firm may impact other tiers in the same supply chain and in other supply chains (perpendicular direction).

Table 11: Propositions

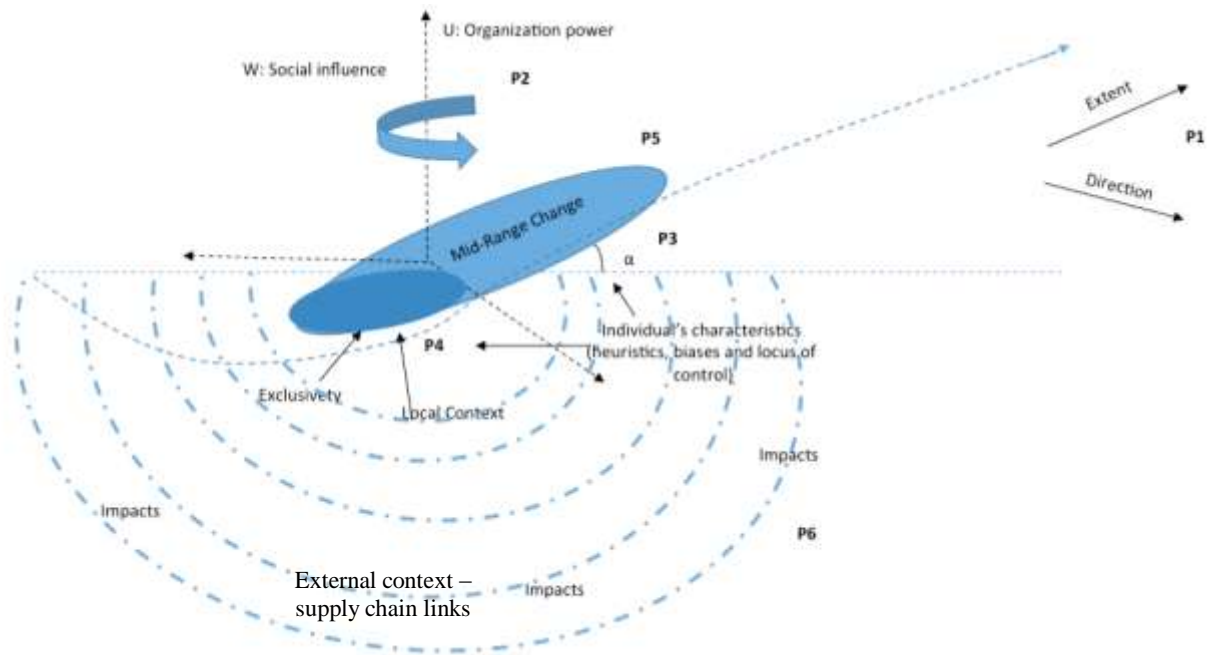


Figure 25: Graphical representation of propositions

2.4.3.2 Models

The intention of this metaphorical transfer was not go through all the science behind the stone skipping, but rather to highlight the main facets of this interesting body of research and make the relevant metaphorical transfer to a supply chain environment in order to lay the foundation for the development of theory. Nagahiro and Hayakawa (2005) stated that a “projectile [only] ricochets off the water surface if some conditions are fulfilled” and, the conditions are the impact velocity (translational velocity plus spin velocity), the angle of impact velocity relative to water surface, and the specific gravity of the object, which is the mass density of the object divided by the mass density of the fluid. Figure 26 represents Nagahiro and Hayakawa (2005)’s statement.

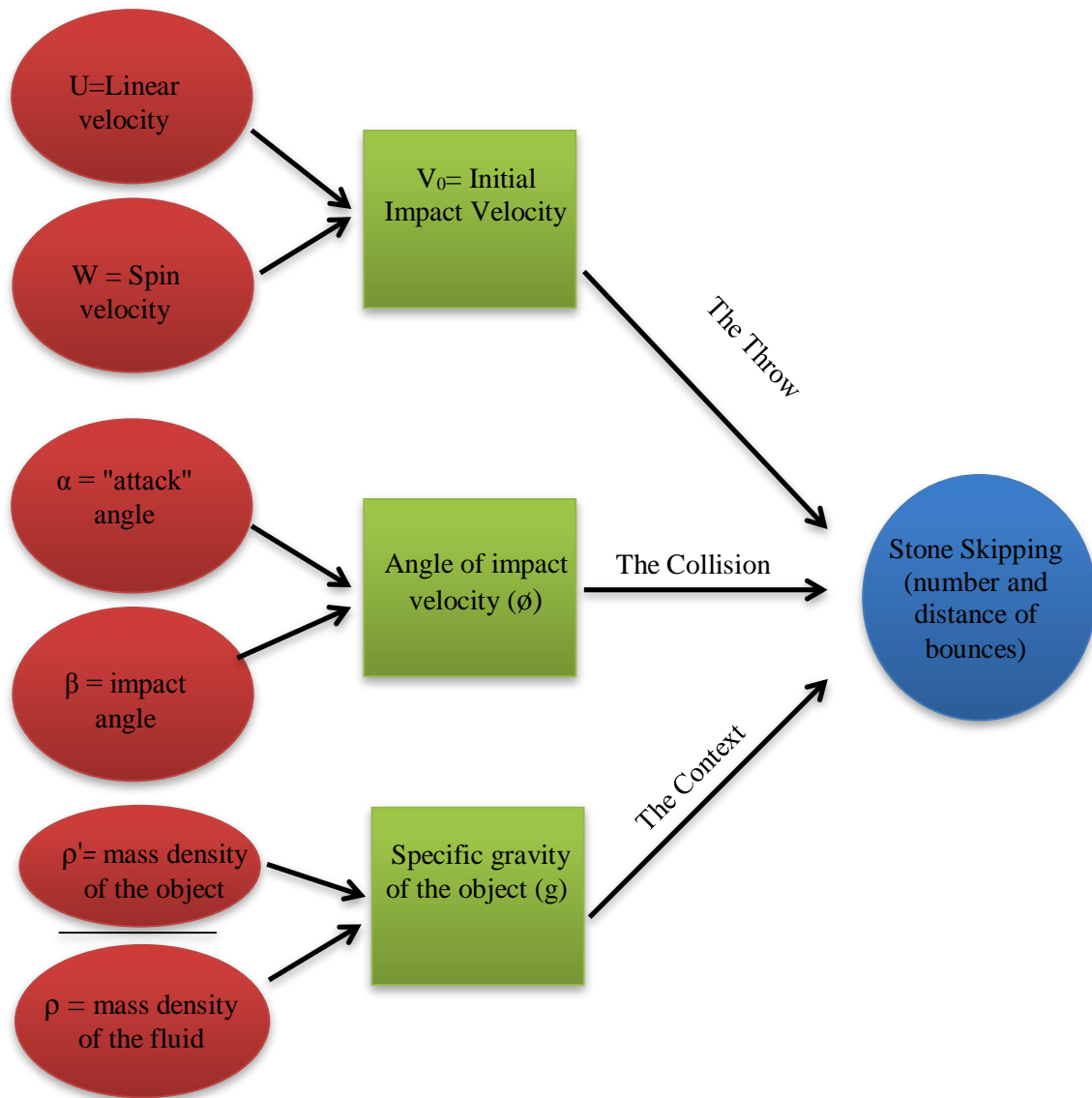


Figure 26: The physics of stone skipping

Source: based on Nagahiro and Hayakawa (2005)

Similarly, many different things can impact the dissemination of the impact of a mid-range event over a set of supply chain links. Although not treated exhaustively, we present a model of the most important features that impact the dissemination of the impact of a mid-range event over a supply chain, through the lens of skipping stones theory. Analogous to model presented in Figure 26, we depicted the most important influences on the extent of the impact. The model considers the importance of aspects of the throw and collision phases, in addition to the

importance of the context in understanding the possible dissemination of the impact of a mid-range event on a supply chain (the bounces). The six propositions stated in the section 2.4 also provide a foundation for Figure 27.

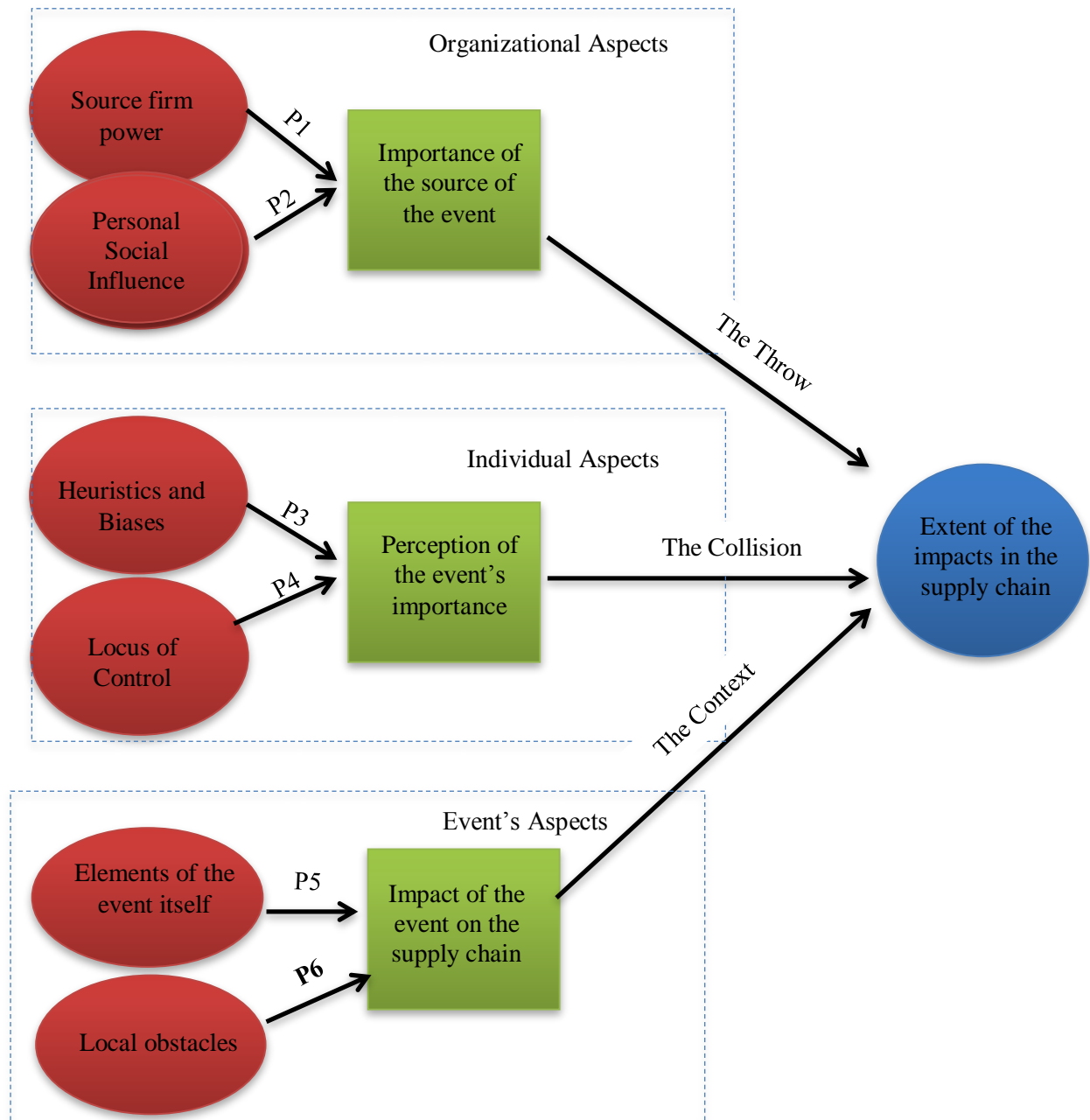


Figure 27: Model of the dissemination of the impact of an event in a supply chain

3 METHODS

In this section we present the main elements used to develop this dissertation. It discusses the design of the study, the process to collect and analyze the data as well.

3.1. Embedded Case Design

Our research focused on the cosmetics industry in Brazil. Data was collected using structured interviews in six supply chains. We followed the field-based data collection methods described by Eisenhardt (1989), Pagell (2004), and others, whose goals are to “not only identify constructs, but also develop an understanding of why identified constructs might be important” (Pagell, 2004, p.464). Suggestions from Krippendorff (2013); Miles, Huberman, and Saldaña (2014); and Yin (2013) were also taken into consideration in building and analyzing the case studies.

This research was developed using an embedded case design. We used different units of analysis for different phases of the research. We conducted our data collection from top to bottom. Initially, we tried to understand: i) the selected industry itself (cosmetics industry); ii) two sub-sectors within this industry (dermocosmetics and beauty products); iii) some supply chains within it, identifying mid-range events; iv) the role of the focal firms in these supply chains; v) the relationship between a buyer and a supplier, after a mid-range event, which could be a relationship within the firm itself (between individuals and departments) or across firms; and finally, vi) we analyzed the individual and his or her personal, heuristics, biases and locus of control. We compared six supply chains, including six focal firms plus four to six links in

each (2-3 tiers of suppliers and 2-3 tiers of buyers). We followed the hypothesis-generating process described by Eisenhardt (1989) and Glasser and Strauss (1967). A logical model was developed and a cross-case synthesis applied.

We investigated six levels in the embedded case analysis. An embedded case study involves more than one unit of analysis (Yin, 2013). Our study investigated the data through multiple levels of analysis in order to understand the data and fulfill the research goals. We began by the industry level by understanding the Brazilian cosmetics industry. In doing that, we found that two sub-sectors emerged, which were beauty products and dermocosmetics. Next, at the supply chain level, we identified and researched focal firms. We then identified their venture partners in their upstream and downstream supply chains, which were their buyers and/or suppliers. Next, we interviewed individuals, in order to understand their roles in the supply chain and relationships after a mid-range event in one of their firms, building the sixth level of analysis. Thus, the embedded case design involved individuals embedded in buyer and supplier relationships, embedded in focal firms, embedded in supply chains, embedded in sub-sectors, embedded in industries. Figure 28 illustrates the embedded case design.

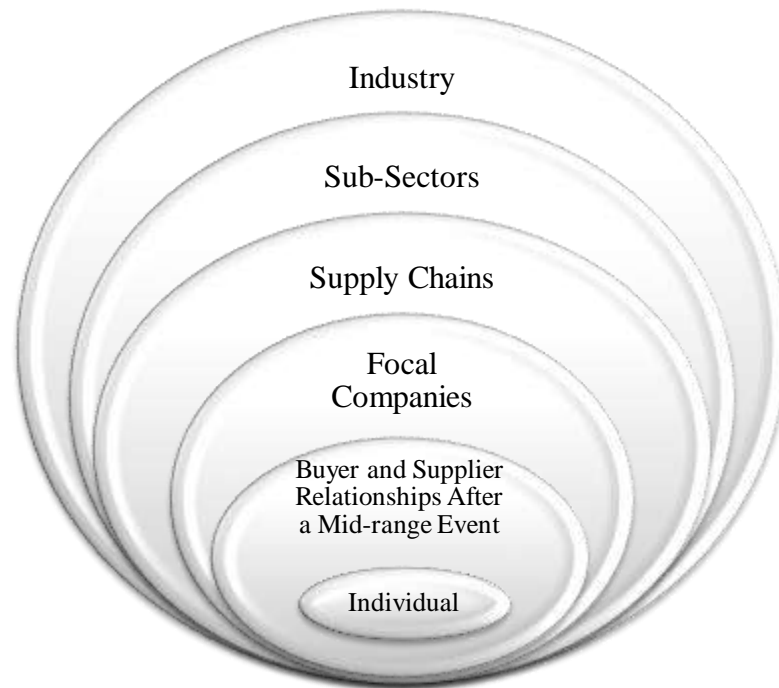


Figure 28: Embedded case design

3.1.2 Sampling

Many of the contacts were obtained through referral sampling, also known as snowball sampling. There were three kinds of initial contacts: i) contacts who did not fit the profile to be an informant but indicated some other individuals who could be interviewed; ii) previous contacts in the target industry who fit in the profile of the target informants and were interviewed; and iii) contacts who were selected due to their importance within the firm or the supply chain they were part of.

Each time a contact indicated another potential informant, we called it a contact generation. For the first type of contact, six individuals indicated seven other contacts who were interviewed (2nd contact generation). From these individuals, two of them indicated three other informants (3rd contact generation). From these three, two indicated three more individuals (4th contact generation) and the last one indicated one more (5th contact generation). In total, 14

individuals who had not been initially identified were interviewed through snowball sampling of contacts. For the second type of contact, five initial contacts resulted in 42 informants. For the third type of contact, ten new contacts were established and resulted in 49 informants. Thus, we interviewed a total of 105 individuals.

Table 12 shows the number of individuals interviewed in each phase of the snowball sampling.

Who contacted directly	Askeded for indication but was not interviewed	1st Contact Generation	2nd Contact Generation	3rd Contact Gen.	4th Contact Gen.	5th Contact Gen.	6th Contact Gen.	7th Contact Gen.	Total						
Previous contacts, but not interviewed	6	6	7	2	3	2	3	1	1	14					
Previous contacts		5	3	16	3	12	1	2	2	4	2	2	1	1	42
New contacts		10	4	14	5	10	4	10	3	5					49
		15	37	25	15	10	2	1	105						

Table 12: Contact generation for snowball sampling

Informants on the buyer side of a firm typically indicated some of their suppliers as potential interviewees. Informants on the sales side of a firm typically indicated some of their clients as potential interviewees.

Figure 29 summarizes the snowball contact generation per interviewed person in our research. Each number corresponds to the code for a person who was interviewed, and this number is related to that person in a separate spreadsheet. Each color represents a link in a supply chain.

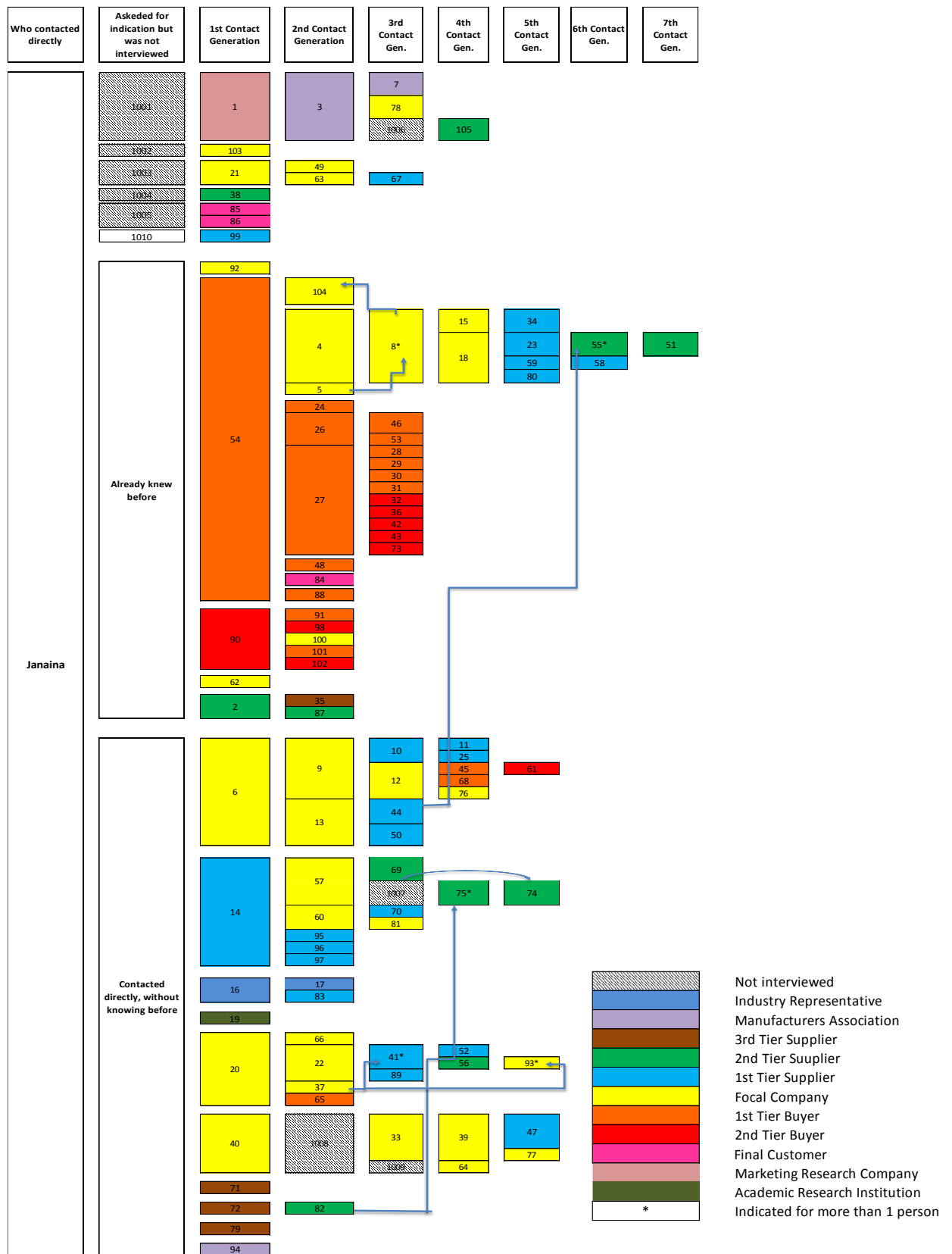


Figure 29: Snowball contact generation

3.1.3 Sub-Sectors

Although considered under the same “umbrella”, the variety of firms and the products and services in the cosmetics industry is very diverse. After developing an initial understanding of the cosmetics industry, we realized that, in order to be able to really deepen our understanding, we would need to divide it into sub-sectors. We divided the industry based on production complexity, including not only the production process itself, but also research and development complexity, marketing complexity, and the complexity of the legislation that the sub-sector was subject to.

Although there were some “gray” categories, two sub-sectors became very clear: beauty products and dermocosmetics. There are many differences between them, but the biggest are related to the regulatory requirements demanded by the Brazilian National Health Surveillance Agency (Anvisa), which is responsible for the regulation and registration of toiletries, cosmetics, and perfumes. Cosmetics are divided into two different categories, based on their inherent risk. Risk I cosmetics are those with basic or elementary properties, and that do not need any detailed information about its way to use, such as a basic moisturizing cream. For this kind of product, a simple notification in Anvisa’s website following an online procedure (with pro forma approval) is sufficient. Usually, within 48 hours of submission, a Risk I product can be launched in the market. On the other hand, the Risk II cosmetics’ approval process is much longer and much more complicated. Risk II cosmetics, such as sunscreens, eye-area creams, or any other cosmetics with treatment properties (i.e. anti-aging, anti-acne, whiteners, anti-cellulitis, etc.) are subject to what are called “registration” processes”, which require proof of efficacy and safety. Risk II products have to be submitted and approved by Anvisa before

marketing. “It usually takes around 60 days before the first manifestation from a local Agency is heard” (Mano, 2014). Risk I and Risk II products correspond to what we are referring to as the beauty products and dermocosmetics sub-sectors, respectively.

Due to the regulatory complexity for dermocosmetics products, many cosmetics firms have decided to work only with beauty products. Those firms that work with dermocosmetics products have to invest substantially more resources into their R&D production processes. Some examples of beauty products and dermocosmetics products within the ABIHPEC personal care products categories are shown in Figure 30.

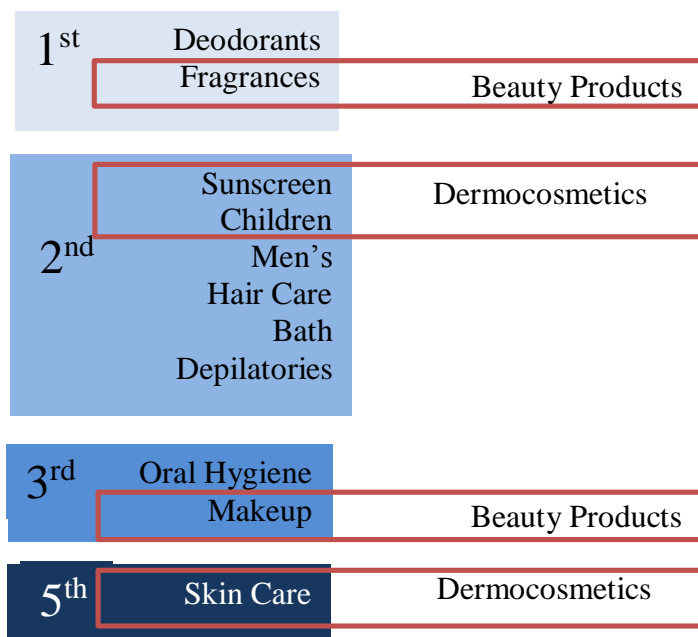


Figure 30: Examples of beauty products and dermocosmetics products

3.2 Instruments

We followed Eisenhardt's (1989) and Yin's (2013) suggestions for developing semi-structured interview protocols. We used open-ended questions, in order to allow us to learn about causal linkages and key transition points in buyer-supplier relationships (McCracken 1988; Zaltman 1997). Since the most of the interviews were conducted in Brazil, the instruments were developed in both Portuguese and in English. The interview protocol differed by respondent function and also by whether the intended respondent was on the buyer side or the supplier side.

3.2.1 Interview Protocol

We collected multi-level data to allow us to develop a better the understanding of the supply chains that were studied. As a result, our interview protocol included questions about the industrial sector we are investigating, the mid-range events that impact the firms within this industrial sector, and the buyer-supplier relationships themselves. The questions on the interview fell into broad categories: 1) Understanding the industrial sector (firm rules, procedures, main goals, etc. for purchasing); 2) Identifying the mid-range events; and 3) Understanding the buyer-supplier relationship (nature of the buyer-supplier relationship before the mid-range event, how the event was perceived by the buyers and how it impacted the relationship with suppliers, what were the main responses to the event, and what were the outcomes).

Appendix A contains the interview protocol. As themes emerged during the interviews, the protocol were modified to include them and allow further probing of key emergent issues. The interview protocol differentiated in focus according to the target and the function of the informant, although several questions were essentially the same for most of them. In order to help the interviewer follow the process, we also listed some prompts to ensure the data collection was going in the expected direction. Table 13 presents the main questions, as they were presented to each interviewee, and also their prompts.

Question	Buyer Side	Supplier Side	Industrial Sector Representative	Prompts
1. Please tell me about your firm*.	✓	✓	✓ * sector	* History, market position * Main challenges, main products/services offered, and main suppliers (kind of supplying – generally)
2. How do you classify your suppliers?	✓			* Service or goods * Commodities or specific * Importance level (critical or non-critical); amount of money
a. How do you classify your clients/customers?		✓		
b. How do you see the _____ (name of the specific) sector?			✓	* Who are the main players? * How is the sector evolving over the past few years? * What are the expectations for the next few years?
3. What do you purchase the most?	✓			* Which item(s) * Portion of the total budget * Frequency of purchase * Number (and representativeness) of suppliers/customers/clients * Number of individuals involved with this purchase/selling
a. What do you sell the most?		✓		
4. How has the relationship with these suppliers* been influenced over the last couple years?	✓	✓ * Customers/ Buyers	* the relationship among buyers and suppliers within the industrial sector	* How complex is the supply chain? * What are the technological challenges? * What are the legal/governmental/sustainability challenges? * What are the geographical challenges? * Were there any (mid-range) event that impacted the relationship in any way?

Question	Buyer Side	Supplier Side	Industrial Sector Representative	Prompts
5. Please tell me about those events and their impacts.	✓	✓	✓	<ul style="list-style-type: none"> * What happened, when it happened, what led to it? * What were the impacts and outcomes? * Was there any impact on purchase policies? * Did you keep the same suppliers/customers? Did you event suppliers/customers? * Did you keep the same kind of purchase/selling (goods or services)? * Was there any impact on the financial costs? * Any other impact?
6. Please tell me about the outcomes and the processes that you went through to arrive at these outcomes.	✓	✓	✓	<ul style="list-style-type: none"> * Good or bad outcomes? * Was it possible to just follow the firm's purchasing policies and rules? * How do you think the firm saw the outcomes? * What do YOU think about the outcomes (positive or negative and why)? * Did you have plenty of time to make the needed decisions? * Was there anything that was needed to be done differently? What, tell me about it? * What was the role of the individuals directly involved in the decision making? * What do you think about their success or failure? * What do you think about your role in the processes and outcomes? * Is there anything you think that should have been done differently? Why?
7. Anything else you would like to share with me?	✓	✓	✓	

Table 13: Interview protocol

3.2.2 Pre-Test

In order to refine the key constructs and the interview protocol, a pre-test was run. The pre-test provided a good background to improve our research questions, model, open-ended interview questions, and prompts. Twelve interviews were conducted in the period between October 30, 2013 and December 16, 2013. To select informants for the pre-test, we drew upon acquaintances who had prior purchasing experience, taking in consideration the individual's familiarity with a buyer-supplier relationship.

We pre-tested our instruments with informants on the buyer side, the supplier side, and industrial sector firms. The interviews were conducted using Skype software or by telephone. They were recorded, transcribed, and those that were conducted in Portuguese were translated into English by the author. The time of the interviews ranged from 30 minutes to 2.5 hours. Some of the interviews were divided into two days, according to the person's availability. In total 12 interviews were conducted during the pre-test phase.

We kept the same basic interview questions structure used in the pre-test for the actual data collection. The main difference was the familiarity of the researcher with the protocol, which we were able to build upon the initial interviews. For the actual data collection, though, we kept the same structure, we allowed the interviewees to talk more openly about the topics and we added questions in order to fulfill our goals as opportunities arose during the time of the interview. In doing this, we were able to conduct the interviews in a more friendly and informal way, allowing the informants to feel more comfortable talking about the topics we were discussing.

3.2.3 Procedures

The following procedures were followed for each interview. First, we identified the possible firms and contacts within the firm. Once we had obtained their contact information (e-mail address or phone number), we proceeded in the following manner: 1) send an e-mail, briefly introducing ourselves and the goals of the research; 2) if they indicated possible willingness to participate, we sent another email with more detailed information ; 3) decide the way the interview would be conducted (in person, phone, or Skype) and schedule it; 4) conduct and record the interview; 5) transcribe the interview; and 6) analyze the interviews.

3.2.4 Transcription and Translation

As soon as an interview was completed we transcribed its content from the recording. A third party hired for this specific purpose did most of the transcriptions. To maintain the fidelity of the transcription, we developed clear procedures for transcription. For example, the transcription recorded the exact words used. If the respondent made a long pause before an answer, we transcribed it as an ellipsis “(...)”. Some body language was also incorporated in brackets “[]” for personal or Skype interviews, since the non-verbal language can be important in data analysis. If the transcriptionist had any questions during a transcription, the researcher listened or watched the recorded interview again.

The decision about which language to use (English or Portuguese) depended upon the decision of the person who was being interviewed. Most of our interviews were conducted in Portuguese.

After transcription, some parts of the interviews were translated into English to allow information triangulation. However, the majority of the transcripts remained in Portuguese, in order to capture the nuances of the language used by the interviewees.

3.2.5 Triangulation

We used three types of triangulation: data triangulation, investigators triangulation, and theory triangulation. Each is described below.

For data triangulation, we used multiple sources of evidence, including interviews, secondary data, observations, and site visits. Sources of secondary data varied by availability for each firm, but included annual reports, supplier guides, presentations, internal brochures, internal news, news in open media sources and legal documents.

For investigators triangulation, we had different specialists evaluating the data that was collected and transcribed, including the main researcher and a board of advisors. This helped to mitigate any potential biases in analyzing the data.

For theory triangulation, we applied several different theoretical perspectives to the same data set, both in developing the interview protocol and analyzing the data. These included social network theory, attribution theory, and behavioral biases and heuristics theories.

3.3 Industry

We started by working with organizations that represented the cosmetics industry as a whole. We selected some international organizations that do market research for this industry, in order to understand who the main players in Brazil were. Following that, we worked with the Brazilian associations that represents the cosmetics, toiletries and fragrances sectors nationally and internationally, known as ABIHPEC. It coordinates various programs, in order to promote Brazilian cosmetics exports. We also worked with another industry association, the Brazilian Association of Cosmetology (ABC), a cosmetics industry manufacturers. The associations plus the marketing research firm provided important assistance generating firm names and contacts.

3.3.1 Focal Firms

When selecting the focal firms, we followed the guidance provided by Eisenhardt (1989) and Yin (2014). Our sample was intentionally selected to be representative in terms of: i) market share in each sub-sector; ii) size of the firm; iii) products manufactured; and iv) length of its existence. The focal firms functioned as both buyers and suppliers. They were buyer firms when they were, for instance, buying chemical ingredients, raw materials, or packaging solutions from their suppliers. They were considered supplier firms when they were dealing with their customers, which could be distributors, franchise stores, or even final customers. We selected two focal firms in the dermocosmetics sub-sector and four firms in the beauty products sub-sector.

We tried to select the focal firms in a way that they could be compared on several criteria. We searched for firms that were comparable in terms of their size, market share, core products manufactured, target main customers, and length of existence. In addition, we grouped the focal firms in pairs to allow deeper analysis. Pair number one includes the two dermocosmetics firms. Pair number two is comprised of two spin-off firms, which sell to a specific niche of final customers. Pair number three contains the two biggest beauty products firms in Brazil, which compete in different sales channels.

Table 14 shows some of the main characteristics of the selected focal firms. The names of the firms were disguised, in order to ensure confidentiality.

Pair	Focal Firm	Sub-Sector	Market Share	# Employees	Core Products	Target Customers	Firm's age
1	D1	Dermocosmetics	Among the top 3 in dermocosmetics	51-200	Body and facial treatment	Esthetic professionals	20+
	D2	Dermocosmetics	Among the top 3 in dermocosmetics	51-200	Body and facial treatment, sunscreens	Esthetic professionals, dermatologists	20+
2	B1	Beauty Products	Niche	51-200	Makeup, fragrances, moisturizing lotions	Consumers	< 5
	B2	Beauty Products	Niche	51-200	Makeup, fragrances, moisturizing lotions	Consumers	< 5
3	B3	Beauty Products	Among the top 3 in beauty products	1000+	Makeup, fragrances, moisturizing lotions	Consumers	20+
	B4	Beauty Products	Among the top 3 in beauty products	1000+	Makeup, fragrances, moisturizing lotions	Consumers	20+

Table 14: Characteristics of the focal firms

3.3.2 Supply Chains

We examined six supply chains, one for each of the focal firms. Each supply chain was comprised of a number of members. Interestingly, there was some overlap between the supply chains, particularly on the supply side (for example, chemical firms where the same firm served as a supplier for more than one of the focal firms). The supply chain member firms were classified by their position in the supply chain (focal firm, 1st, 2nd, or 3rd tier buyer or supplier), by the type of purchased items (commodity or non-commodity), and whether they were mainly goods or services producers.

We researched a total of 49 cosmetics firms and three final customers. Table 15 summarizes the researched firms and their position in the primary supply chain they belong to.

Position in the Supply Chain	Count
3rd Tier Suppliers	5
2nd Tier Suppliers	8
1st Tier Suppliers	18
Focal Firms	6
1st Tier Buyers	9
2nd Tier Buyers	3
Final Customers	3
Total	52

Table 15: Firms by supply chain position

Of the 49⁹ researched firms, 37 were related to product manufacturing and 12 were some kind of service provider. We categorized all of the firms that were related to a delivery of a tangible good as products buyers, suppliers, or manufacturers. Examples of product firms included manufacturers, chemical ingredients manufacturers or distributors, raw-material suppliers, raw-material converters, various sorts of packaging firms, and franchise stores, among others. The service providers were comprised of those firms that mainly exchange non-tangible goods. Examples included industry representative and manufacturers associations, market research firms, third partner logistics providers, outsourced manufacturers firms, some kinds of packaging solutions firms (printing firms), beauty clinics or salons, etc.

Related to the complexity of the products or services, 32 of the firms were related to non-commodities services or goods and 17 were commodities providers. The non-commodities firms produced goods or services which fit in one or both of the following categories: i) they were not easily found and offered by many suppliers, and ii) they would be used as part as the aggregated value of the final product or service. Within chemical ingredients, as an example, the non-commodities firms were those that classified themselves as “specific components” firms or those that were considered as “specific components” suppliers by their buyers. Examples of non-commodities firms include dermocosmetics manufacturers, some chemical ingredients suppliers, and outsourcing manufacturers, among others. The commodities firms were classified as commodities firms when their products or services were generic, did not involve a lot of innovation, customization, or they could be easily provided by another supplier. Examples include cosmetics manufacturers and their franchise stores, some chemical ingredients, etc. Table 16 shows the number of firms by industrial sector and types of supply.

Products	Services
----------	----------

⁹ The three final customers were dropped from the total number (52-3=49).

Commodities	12	5	17
Non-Commodities	25	7	32
	37	12	49

Table 16: Firms by type of product or service

We tried to get informants from firms that were representative of all regions in Brazil, since it is very large, comprising about 3,287,957 square miles¹⁰, composed of 27 federal states divided into five main regions: North, Northeast, Midwest, Southeast, and South. Furthermore, Brazil's regions are not geographically, economically or socially equal, with the most developed region in the Southeast, followed by the states in the South. The Northeast and Midwest are early in their development, and the North area is the least economically developed, since most of its area is occupied by the Amazon Rain Forest. Of the 49 firms in our sample, 48 were in Brazil and the other one was in the U.S. Table 17 and Figure 31 summarizes the firms by region. They show that our sample is representative of Brazil, in terms of geographical distribution.

REGIONS	Total # cosmetics firms in Brazil		Researched cosmetics firms in Brazil	
North	48	1.9%	1	2.1%
Midwest	175	7.0%	3	6.3%
Northeast	258	10.4%	2	4.2%
Southeast	1528	61.3%	36	75.0%
South	483	19.4%	6	12.5%
Brazil - total	2492	100%	48	100%

Table 17: Firms by region (ABIHPEC, 2014)

¹⁰As comparison, United States continental area (48 states – without Alaska and Hawaii) is about 3,119,884 square miles, about 5% smaller than Brazil's continental area.

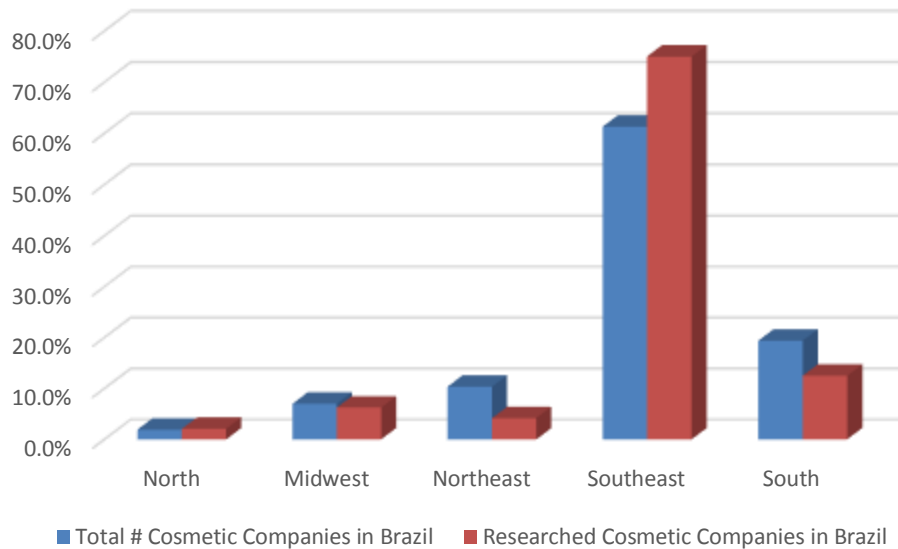


Figure 31: Comparison of researched vs. total cosmetics firms

Source: ABIHPEC (2014) and authors

Our sample contained firms ranging in size from micro (less than 10 employees) to extra-large firms (more than 1,000 employees). In terms of their comprehensiveness, the firms ranged from those which only had an impact in their local community (usually within city borders), to firms which had an international impact over more than 100 countries. Table 18 illustrates our sample of firms by their size and comprehensiveness.

Size	Comprehensiveness				Total
	Local	Regional	National	International	
Micro (<10 employees)	4	-	-	-	4
Small (10-50)	10	4	3	-	17
Medium (51-200)	-	3	12	1	16
Large (200-1000)	-	-	1	5	6
X-Large (>1000)	-	-	2	4	6
Total	14	7	18	10	49

Table 18: Firms by size and comprehensiveness.

3.3.3 Buyer and Supplier Relationships

We interviewed buyers and suppliers, recognizing that a specific firm could function as both a buyer and a supplier within a supply chain. We thus tried to talk to individuals who represented both perspectives within a firm. For example, in many firms, we talked to both the purchasing manager and the sales manager. Informants' job titles included: buyer, purchasing manager, operations manager, supply-chain manager, operations director, supply-chain director, marketing director, CEO, and president. To deeply understand the buying firm's role in a buyer-supplier relationship, we also tried to gather data from the respondents on the other side of the dyad (i.e., a supplier indicated by the purchasing manager, or a franchise store owner indicated by the sales manager). This allowed us to include buyer-supplier dyads as one of the levels of analysis in the embedded case study design.

3.3.4 Individuals

The most detailed level of analysis in the embedded case design was the individual level, summarized in Appendix D. Gathering data from a variety of individual informants allowed us to develop a comprehensive background and deep understanding of each supply chain and how it was impacted by mid-range events.

In total, we conducted 131 in-depth interviews with 117 different individuals distributed across 59 different firms (10 in the pre-test phase + 49 in the actual data collection). 12 of these individuals were interviewed twice and two were interviewed three times, which makes a total of 131 interviews. 14 individuals spoke on behalf of two or more different firms (because they

had worked for more than one), which made a total of 145 informants. We ignored 31 of these informants (10 because they were used during the pre-test phase and 21 because the firms they spoke on behalf were not among the firms targeted for this research). Thus, our research is based on 114 informants. In addition, we made 22 site visits, in order to understand the context more deeply. Table 19 summarizes the numbers of interviews and informants.

Interviewed individuals	
Pre-test	12
Data collection	105
Total # of individuals interviewed	117
# of individuals interviewed twice	12
# of individuals interviewed 3 times	2
Number of interviews	131
# of individuals who talked on behalf of 2 different firms	14
Total of informants	145
(-) Informants not used (pre-test)	10
(-) Informants not used (firms were not on target)	21
Total of informants used in the research	114
Number of site visits	22

Table 19: Overview numbers of interviews and informants

The choice of informants was also based on their relationship to phenomena we were investigating and also: i) their function in the firm (manager, CEO, director, etc), ii) the department they belong to (purchasing, supply chain, sales, marketing, operations, etc), and iii) whether they represent the buyer side or supplier side of the supply chain relationship we are examining. In the industry associations, we interviewed individuals whose titles included market intelligence manager, legal department leader, and external and international relationship manager. Figure 32 illustrates the main job titles interviewed in our research.

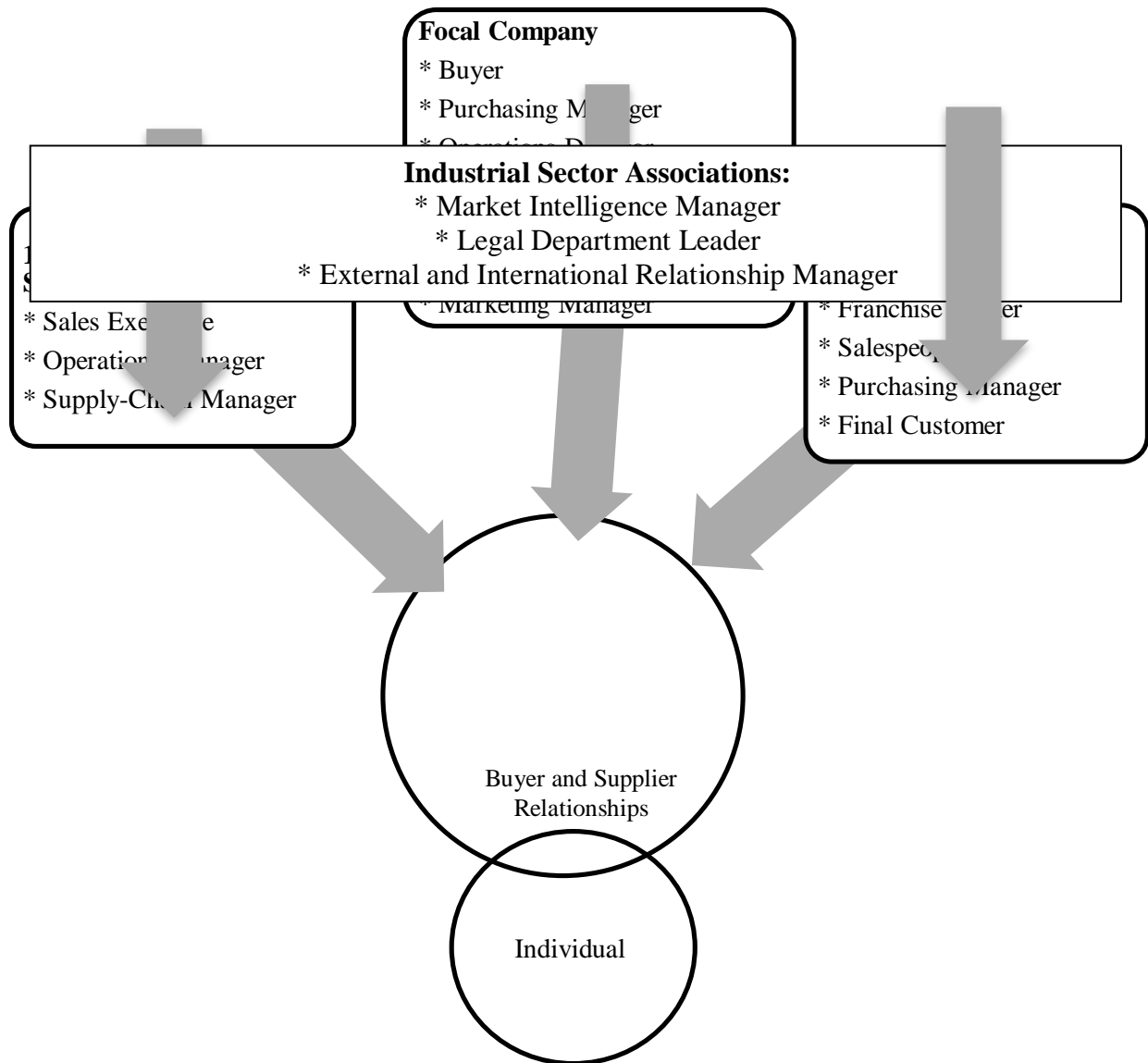


Figure 32: Main job titles interviewed

We interviewed individuals representing different perspectives in each firm. When we talked to a purchasing manager, we considered this as the perspective of the buyer side. On the other hand, if we talked to a sales manager, we considered this as the perspective of the supplier side. On the administrative side, we included informants who did not have much contact with either

suppliers or customers. In addition, we also interviewed some individuals who were very familiar with both sides, from their perspectives as buyers and as suppliers. We called this the strategic perspective. Figure 33 illustrates the percentage of informants from each perspective.

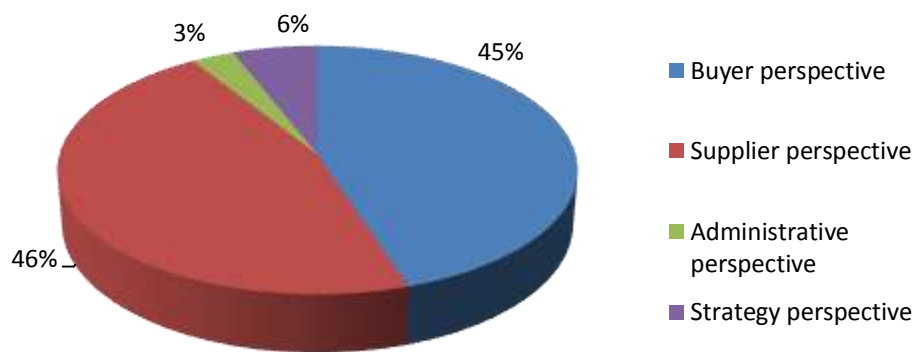


Figure 33: Informants by perspective

3.4 Data Analysis

We analyzed the data in three main different stages: within-case analysis, cross-case analysis and interpretation of the findings through different theoretical lenses, including the proposed stone skipping theory. In order to search for patterns, we will follow Eisenhardt's (1989), Rosenthal and Tatikonda's (1993), Yin's (2013), and Miles et al.'s (2014) suggestions for data analysis.

3.4.1 Within-Cases

Within-case analysis was conducted for supply chain. We began the analysis by coding the transcripts of the interviews. We also coded the secondary data sources, when possible. We developed a one-page overview of each supply chain, which was followed by a comprehensive narrative for each researched supply chain, as described on Section 4.1 that integrated the data from all investigated sources.

3.4.1.1 Coding

To code the collected transcripts, we searched for speech patterns that indicate biases or heuristics, based on Krippendorff (2013)'s framework. Codes are labels that give specific meanings to descriptive or inferential information compiled during the study. Codes are

intrinsically related to inferences in analysis (Miles et al, 2014). Codes were attributed to a specific piece of information after careful reading and reflection on its core content meaning.

We used both, software assisted and manual coding. We began the data analysis using N-vivo software, to help with initial categorization and data analysis. This attached prior key words and tags to segments of texts, which allowed later retrieval and further refinement. We then used manual coding; searching for new and refined patterns, further developing the initial labeling of the data. The codes were developed by the main researcher. As a way to ensure validity, some portions of analysis were triangulated by the board of advisors, as well as the researcher. In case of disagreement about a code, a meeting was held to discuss the criteria and arrive at a consensus about the label to be used. This final code was placed on the coded transcripts. This process was iterative. Example of set of codes, based on Table 2 is shown below, based on one of the interviews run during the pre-test phase and how some codes were attributed to it. In that interview we talked to a supply-chain manager in a very large worldwide manufacturing company. The intention is to illustrate the process we used to code the data collected.

Transcript A: “Usually for indirect components, the total amount is not so important. The most important thing is that I know that supplier for such a long time that I know he will do a good job. This way I can pay attention in other more important purchases. Sometimes I don’t even try another possibilities, don’t even check any other prices or possibilities.”

The interviewee above talks about indirect components. In that case, indirect components mean “commodities products or services”. The combination of the statements: “*I know that supplier for such a long time*”, “*I know he will do a good job*”, and “*Sometimes I don’t even try another possibilities, don’t even check any other prices or possibilities*” were indicators of the presence of the status quo bias.

In another interview, this time with a general supply manager of a major manufacturing base industry in Brazil, we could identify another biases. That interviewee talked about the way they deal differently with each supplier. As an example he uses specific and non-specific supplying (commodities or non-commodities). A portion of the interview is transcribed bellow.

Transcription B: “It’s not official, but I think that we put our suppliers in a kind of layers... If he supplies stuff that I have easily availability of a bunch of other options in the market, *I’ll squeeze*¹¹ him until I can...” –“If he is a strategic supplier, then it’s different... We try to have a personal relationship...”

At this time, another heuristic and bias can be perceived though this interviewee’s words. The statements analyzed were: (...) *“I think that we put our suppliers in a kind of layers”*, and *“If he supplies stuff that I have easily availability of a bunch of other options in the market, I’ll squeeze him until I can...”* –*“If he is a strategic supplier, then it’s different... We try to have a personal relationship with them...”*. These words can be understood as a reflection of opportunism. But also it can be a reflection of the loss aversion heuristic. Loss aversion states that people are risk averse in terms of gains, although they are at the same time risk loving in terms of losses.

To codify locus of control, we will used as a reference the scale of locus of control developed by (Rotter, 1966). Although we did not apply the scale itself, we used its questions as reference to identify internal or external locus of control pattern expressed by the interviewees. Examples could be found in expressions, such as “I cannot do a lot, at the end of the day, even if I do my best, my manger is the one who decides everything here in this company”. This example together with other expressions was used as indicators of external locus of control.

¹¹ The interviewee at this moment made the movement illustrating a squeeze of something with his hands.

3.4.1.2 One-Page Overview

For data reduction and summary, we developed a one-page overview of each direct buyer-supplier relationship identified in the researched supply chains. It was used a form that summarized main findings, just highlighting the identified information. The main goal of the one-page overview was concentrate the most important information regarded to each case in a visually practical and useful manner. This sheet helped the identification of the patterns, both within and across the cases. An example of the one-page overview form is presented in Table 20.

Main Case:	Within Case Relationship:		
People:	Person 1 (name/company)	Person 2 (name/company)	
Function	Executive Manager Director CEO President Founder _____	Executive Manager Director CEO President Founder _____	
Area	Purchasing / Sales / R&D / Strategy / Operations / SCM		
Position in the Supply Chain	1 st 2 nd 3 rd Buyer / Supplier / Focal Company	1 st 2 nd 3 rd Buyer / Supplier / Focal Company	
Relationship Length	Long (5+ years) / Intermediate (1-5 years) / Short (>1 year)		
Relationship supercedes companies?	Yes / No	Obs:	
Relationship Strength	Strong / Medium / Weak	Obs:	
Characteristics:	Good	Service	
	Commodity	Non-commodity	
Mid-range change:			
Impact on purchasing policies:	High / Medium / Low	Obs:	
Outcome:	Positive / Negative / Non-identified	Obs:	
Possible to identify subjective perception?	Yes / No	Ex:	
Locus of Control	(1) Internal / External	(2) Internal / External	
Heuristics:	Related Biases:		
Representativeness	Base Rate Frequency	Intensity to Sample Size	Law of Small Numbers
	Insensitivity to predictability	Illusory correlation	Misconceptions of regression
Availability	Salient Information	Confirmation Bias	
	Imaginability ==>	Overconfidence and/or	Wishful thinking
Adjustment and Anchoring	Insufficient Adjustment		
	Evaluation of Conjunctive and Disjunctive Events ==>	Inconsistency and/or	Planning fallacy
	Assessment of Subjective Probability distributions ==>	Illusion of control	
Heuristic Attribution	Procrastination		
Affect Heuristic	Information avoidance		
Loss Aversion	Endowment Effect	Mental Account	Hyperbolic Discount
	Status Quo Bias	Framing Effects	
Two-Systems Reasoning	Intuition		

Table 20: Within-case analysis: one-page overview

3.4.1.3 Detailed Narrative

A detailed narrative of each supply chain was written, integrating the information from the interviews and other sources of information. In this detailed narrative, we wrote about the six multi-tiers, multi-dimension supply chains. In addition, we described the industry, sub-sector, and the focal firm in that supply chain. We understood that this way we were able to demonstrate through words the main challenges and outcomes of that supply chain, identifying the events which impact had travelled beyond the source firm itself, allowing us to proceed in the analysis of the impacts searching for possible patterns that emerged, and leading us to understand the why and how the impact of some events in a focal firm affect other members of its own and other supply chains.

3.4.2 Cross Case Analysis

Miles et al. (2014) describes cross-case analysis as increasing “the generalizability or the transferability to other contexts” (p. 101), in order to deepen understanding and explanation. Cross-case case analysis was conducted after most of the data collection and within cases analysis were very in an advanced point, allowing preliminary themes to be further assessed, during the later data collection. The use of cross-case analysis within multiple cases allowed us to find patterns, similarities and differences among the data to generate and/or strengthen our theory (Eisenhardt, 1989). We used several approaches to search for patterns across the cases, related to decisions that have been made and implemented, causing the events and the individuals biases and heuristics that influence them.

3.4.2.1 Social Network Analysis

In order to illustrate the characteristics of the supply chains, and to analyze the relationships among the informants and firms, we used social network analysis to allow initial findings to emerge. Sticky notes were used to manually portray the firms and relationships between them.

It became evident that the complexity was not just limited to multiple tiers in multiple supply chains; the same tiers could play different roles in different supply chains. The same firm that was a first tier supplier in one supply chain could represent a second, third, or even fourth tier supplier in another supply chain. Thus, the same firm might be found in different positions as we describe the six supply chains.

Figure 35 represents the final chart manually built as the qualitative representation of the supply chains.

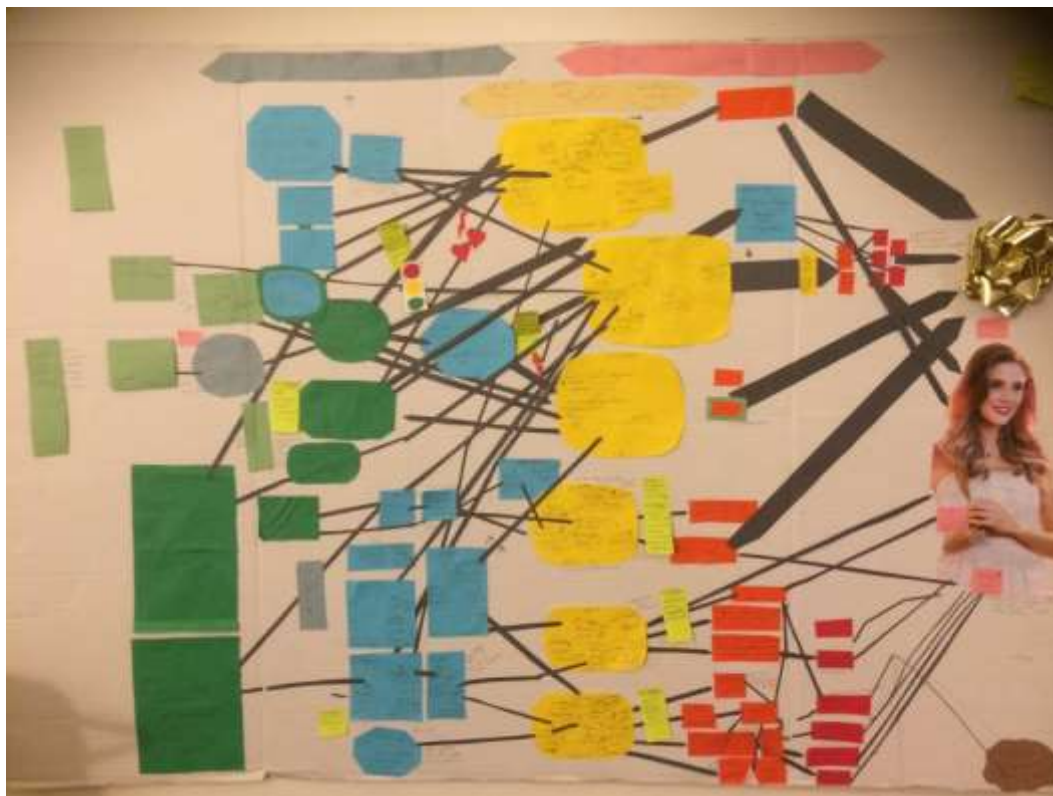


Figure 34: Final chart of the process to start analyzing the results of the collected data

The large number of possible relationships was also considered in the decision to use social network analysis. Taking just one focal firm as an example, six individuals were interviewed from D1. There were 15 possible relationships among the six interviewees, just within D1. Assuming that the relationship between A and B is the same that the relationship between B and A, there are C_2^6 combinations of 6, $2 \text{ by } 2 = 6!/4! \cdot 2!$ - Thus, the six supply chains contain 6,441 possible reciprocal relationships ($B1^{14}_2$). Thus, in addition to the qualitative analysis, social network analysis was used, employing Ucinet 6.0 to gain better understanding of the collected data. The strength of the relationship between the nodes was evaluated using the following qualitative scale: zero = no relationship (no line), one = occasional, two = often, and three = frequent relationship between the firms, which will make the line thicker.

Figure 35 in Section 4.1.1 provides the illustration of the researched supply chains built using Ucinet 6.0

3.4.2.2 Master Table

A master table was developed, based on the data in the one-page case summary sheets. This provided the foundation for developing a series of tables that could let us arrange and group the data in different ways, in order to allow the themes to emerge. Example of the master table created in provided in Section 3.5.1.2 through Table 22, Table 24, Table 23, and Table 25

3.4.2.3 Pattern Matching

To address the possible patterns among the cases, the master table was sorted and grouped arranging the findings in different ways. As an example, we identified similarities and differences among the cases when sorted by locus of control, and differences between those with internal vs. internal locus of control. Following, searching for similarities in the cases, where an internal (or external) locus of control was identified. Some of the matching patterns were provided through the tables and charts presented earlier in this chapter. Examples include Table 16, Table 17, Table 18, and Figure 31.

3.5 Ethical Issues

In order to address all the needed steps to assure confidentiality and other ethical issues involving the informants, we submitted this proposal, as well as all our research protocols, to the Indiana University Institutional Research Board (IU-IRB) and received its approval, as shown in Appendix B.

To address any potential ethical issues, we followed the Ethical Principles and Guidelines for the Protection of Human Subjects of Research addressed in the Belmont Report: Ethical principles and guidelines for the protection of human subjects of research (*The Belmont Report*, 1978) which are: respect for persons, beneficence, and justice. According to the Belmont Report, "respect for persons requires that subjects, to the degree that they are capable, be given the opportunity to choose what shall or shall not happen to them. This opportunity is provided when adequate standards for informed consent are satisfied" (National Commission, 1978). To fulfill this principle, we developed an informed consent document that stressed the voluntariness of the research for the targeted respondents and their understanding of the

research goals, using simple language. We assured their autonomy and freedom to volunteer for research without coercion or undue influence from others. We explained the informed consent document to them, checked if they had any questions, answered their questions, and then asked for their signature. The informed consent document was presented in both languages in which the study was conducted (Portuguese and English), as shown in Appendix C.

Even though the Belmont Report does not address privacy directly, respect for persons also involves “respecting an individual’s right to privacy, the right to control access to one's self and information, and protecting the confidentiality of private, identifiable information about individuals”. In our study, we assured privacy by not using the names of any of the informants. In order to keep the confidentiality of the firms, we developed “labels” for each firm, based on their characteristics. A master list of actual firm names and their labels, as well as their individual informants, was maintained by the researchers, but neither was it revealed in this thesis nor will it be in any reports or research papers.

Beneficence in Belmont Report is defined as “human subjects should not be harmed and the research should maximize possible benefits and minimize possible harms”. This study does not involve any kind of physical, mental or psychological danger or hazards to the informants. The informants participated in interviews, meetings, and site visits. However, we stressed their autonomy in the informed consent document. We re-emphasized their right to not answer a specific question if they did not feel comfortable, to stop the interview at any time, or to quit the study if they preferred to.

Justice is described in the Belmont Report as “the benefits and risks of research must be distributed fairly.” The expected benefits from our study are related to the understanding of

how buyer and supplier relationships evolve after a mid-range event. We told the respondents that their interviews provide evidence about how the way buyers and suppliers deal with “mid-range events” impacts buyer-supplier relationships, value creation and appropriation, the buyer’s competitive advantage, and even the entire industry. We also stressed that the results of this research may help firms understand how to develop better relationships and better performance. An executive summary report was sent to each of the respondents, containing the main findings of this research.

3.6 Reliability and Validity

According to Yin (2013), the quality of a case study is ensured by demonstration of its construct validity, internal validity, external validity and reliability. In the following sections, we discuss their definitions and how validity and reliability were addressed in this research.

3.6.1 Reliability

Reliability refers to the consistency and stability of a measure (Muchinsky, 1996). It is the extent to which a later researcher following the same procedures will come to the same conclusions, minimizing error and bias in the study. Krippendorff (2013) suggests that the way that the data is obtained plays an important role in its reliability. He describes three types of reliability: stability, replicability, and accuracy. We followed Krippendorff’s (2013), Yin (2013) and Miles et al. (2014) suggestions in addressing reliability.

3.6.1.1 Stability

According to Krippendorff (2013), “stability is the degree to which a process is unchanging over time”. He describes how research can be influenced by what he calls *individual inconsistencies*, usually due to interviewers’ insecurity, carelessness, openness to distractions, difficulties in comprehending written instructions, lack of patterns for notes, or relaxed performance standards when tired (p. 271). Stability is also known as a test-retest reliability. To minimize these problems and assure the stability of data collection procedures, we used a data accounting log for each of the interviews, which summarized the name of the firm, the name of the respondents, contact information, sources of information, and key aspects of the contents of each interview. By carefully documenting these details, we made the process used for each interview very clear. Table 21 presents the information structure of the data accounting log for our study, based on Miles et al (2014).

Name of the interviewee			
Firm:			
Country:	Brazil	United States	
Sub-Sector:	Cosmetics	Dermocosmetics	
Position in the Supply-Chain	Focal firm Buyer side or supplier side? ___ Buyer ___ Purchasing manager ___ Operations manager ___ Supply chain manager ___ Supply chain Director ___ Other (please write)	Supplier (1 st , 2 nd , or 3 rd tier) ___ Seller ___ Operations manager ___ Supply chain manager ___ Supply chain director ___ Other (please write)	Industrial Sector Representative ___ Market intelligence manager ___ Legal department leader ___ External and international Relationship manager ___ Other (please write)
Contact information	Source of the contact: Indication? ___ yes ___ no From whom? _____ Indicated someone else? ___ yes ___ No Who?	First contact ___ e-mail ___ Phone ___ Linkedin ___ Personal ___ Other (cite)	1 st contact: ___/___/___ Response back: ___ days 2 nd contact: ___/___/___ Response back: ___ days Agreed to be interviewed? ___ Yes ___ No
Interview	___/___/___ Time: ___ minutes Interviewer: _____ ___/___/___ Time: ___ minutes Interviewer: _____	Source: ___ Face-to-face ___ Skype ___ Phone _____ Place: Interviewer: _____ Informant: _____	Transcription: ___/___/___ Responsible: _____ Translation: ___/___/___ Responsible: _____
Secondary Data	Internal ____ Annual reports ____ Supplier guides ____ Presentations ____ Internal brochures ____ Legal sources ____ Others (please write)	Public: ____ Public source of information ____ News on open media sources ____ News on social media source ____ Legal sources ____ Others (please write)	
Site Visit	___/___/___ Time: ___ minutes	City, State: _____, _____ Others:	
Generated Case(s)	Number(s):	Given name(s):	

Table 21: Data accounting log

3.6.1.2 Replicability

Replicability is a measure of the degree to which a process could be reproduced by different researchers, and in different locations and conditions, and still arrive at the same results. To assure replicability of our study, we systematically organized the data collected for each informant in a comprehensive spreadsheet, which we called the “golden sheet”.

The golden sheet contained all the main basic information for the entire project. It was composed of 106 rows and 28 columns, for a total of 2,720 cells, which allowed us to sort our research data in several different ways. This kind of data organization allows its replicability and enhances reliability. Appendix D and E contain the data for the firms and informants, respectively. Table 22, Table 24, Table 23, and Table 25 show the basic structure of the “golden sheet”.

Interviewee data		Firm Characteristics								
Respondent #	Name	Firm Label	Type of Firm	Commodity?	Product or Service?	Case (SC)	SC Position	City	State	Neighborhood
1	XXXX	EUR	Market Research	Non-Commodities	Services	All Cases	2nd Tier Supplier	Chicago	IL	(USA)
2	YYYY	DC	Chemical Ingredients	Commodities	Products	All Cases	2nd tier supplier	Sao Paulo	SP	
3	ZZZZZ	ABH	Manufacturers Association	Non-Commodities	Services	All Cases	1st Tier Supplier	Sao Paulo	SP	Bela Vista
4	WWWW W	D1	Dermocosmetics Manufacturer	Non-Commodities	Products	Dermo 1	Focal Firm	Sao Paulo	SP	Itaim Bibi

Table 22: “Golden Sheet” structure of information about the firm

Interviewee data		Interview Characteristics					
Respondent #	Name	Interview date	Interview Length	Transcription	How many Interviews?	Site visit together	Length #2
1	XXXX	11/12/2013	30 min.	Ok	1	no	
2	YYYY	12/5/2013	58 min.	Not yet	1		
3	ZZZZZ	1/20/2014	47 min.	Ok	2	yes	150 min.
4	WWWWW	3/19/2014	47 min.	Ok	1	no	47 min.

Table 23: “Golden Sheet” structure of information about the interview

Interviewee's data		Respondent Characteristics							
#	Name	Gender	Spokeon behalf of different firms?	Job Title	Approx. Years of experience	Position in the Firm	Indicated by Whom?	Still in the firm in the end of research?	Suggested Respondents
1	XXXX	Female	N	Senior Manager, Client Consulting	7	Supplier Side	101	yes	FulaoBeltrano (EUR)
2	YYYY	Female	N	Supply Chain Operations EH&S Team Leader	6	Buyer Side	1	yes	Jose (PAN), Maria (DC)
3	ZZZZZ	Male	N	Marketing Intelligence Manager	6	Supplier Side	2	Yes	R. + Mary (ABH), V.A. (B3)
4	WWWWW	Female	Y	Sales and Marketing Director	8	Supplier side	49	No	Peter

Table 24: "Golden Sheet" structure information about the person

Interviewee data		Contacts		
Respondent #	Name	e-mail	Phone # / Skype	OBS
1	XXXX	xxxx@zzzzz.com	+ 1 (XXX) XXX-	Interviewed during the pre-test phase
2	YYYY	xxxx@zzzzz.com	+ 55 (XX) XXXX-XX	My former student
3	ZZZZZ	xxxx@zzzzz.com	+ 55 (XX) XXXX-	
4	WWWWW	xxxx@zzzzz.com	+ 55 (XX) XXXX-	Foi desligada da empresa +- em Julho/2014.

Table 25: "Golden Sheet" structure of the contact information

3.6.1.3 Accuracy

Accuracy is the third and most important component of reliability (Krippendorff, 2013). To assure our study's accuracy, we triangulated the data coding and analysis done by different researchers. We also sought to fine any errors by comparing the work of the coder in training (main researcher) against standards that had been established by the panels of experienced content analysts. This test was conducted using the *split-half technique*. We divided a sample of our transcribed (and translated) interviews into two approximately equal parts and had them coded (one half at a time) by: 1) the main researcher (coder in training), and 2) one of the members of the research board of advisors, who were all specialists and experienced researchers. Then we compared the frequency distributions obtained for the two parts. If the difference between the distributions was statistically insignificant, the data would be considered reliable (Krippendorff, 2014, p. 272). The comparison of the code revealed similarity of the analysis between the analysts indicating accuracy of the analyzed data.

3.6.2 Validity

Validity refers to precision. Validity addresses the quality of the research results and whether these results can be understood as true. A measuring instrument is considered valid if “it measures what it is claimed to measure” (Muchinsky, 1996; Krippendorff, 2013). Dimensions of validity include construct validity, internal validity, and external validity.

3.6.2.1 Construct Validity

Construct validity relates to acknowledgement of what is really being measured. Krippendorff (2013) states that construct validity is particularly important when a construct is “abstract and not able to be observed directly” (p. 331). We used multiple types of evidence to address construct validity, including documents, archival records, interviews, and physical artifacts, as well as direct observation, triangulating the information from different sources to verify its construct validity.

Construct validity was also addressed by the establishment of a chain of evidence. A chain of evidence uses tables to help organize large amounts of data and avoid what Pettigrew (1988) and Eisenhardt (1989) call “death by data asphyxiation”. The chain of evidence traces the flow of information forward and backward. In the chain of evidence document prepared at the beginning of this research, we started by stating a set of “hypothetical conclusions” that might emerge from it. We then identified specific data or evidence that could support these hypothetical conclusions. The interview questions that would lead to the collection of the target evidence were then written, and the research question that would lead to the design of these interview questions was stated.

In addition, each draft case study report was reviewed at least by three knowledgeable researchers in the OM field. Any inconsistencies between them were resolved by discussion and consensus. Table 26 presents the chain of evidence used for this research.

Research Question	Possible Conclusions	Possible Data or Evidence to Support The Conclusion	Specific Study Research Questions	Protocol Questions
<p>Why and how does the impact of an event in a focal firm affect other members of its own and other supply chains?</p>	<ul style="list-style-type: none"> • Strategic mid-range events are better disseminated over a supply chain • The greater the power involved in the initiation of the event, the greater the dissemination of its impact over a supply chain • Buyers with an internal locus of control tend to take more responsibility and support dissemination of the impact of the event over a supply chain 	<ul style="list-style-type: none"> •Interview quotations •Responses to scales •Secondary data •Site visits •Observations 	<p>1. Which types of events have an impact that is disseminated over a supply chain?</p>	<p>1. Please tell me about your company. 2. Do you use any internal policy to classify your suppliers? 3. What do you purchase the most? 4. How do you consider that the relationship with these suppliers have been influenced on the last couple years? What has influenced it?</p>
			<p>2. What are the main elements that cause the impact of an event to be disseminated over a supply chain?</p>	<p>5. Please tell me about an event and its impacts a. What happened when it happened, what led to it? b. What were the impacts and outcomes? c. Was there any impact on the purchase policies? d. Did you keep the same suppliers? Did you change suppliers? e. Did you keep the same kind of purchase (goods or services)? f. Was there any impact on financial costs? g. Any other impact?</p>
			<p>3. How do these main factors influence the dissemination of an event's impact over a supply chain?</p>	<p>6. Let's think about the decisions that led to the outcomes a. Was it possible to just follow the firm's purchasing policies and rules? b. How do you think the firm saw the outcomes? c. What do YOU think about the outcomes (positive or negative and why)</p>
			<p>4. How are human biases, heuristics and locus of control related to the dissemination of the impact of an event over a supply chain?</p>	<p>d. Did you have plenty of time to make the needed decisions? e. Was there anything that should have been done differently? What? Please, tell me about it. f. What was the role of the individuals directly involved in the decision making? g. What do you think about their success or failure? h. What do you think about your role in the processes and outcomes? i. Is there anything you think that should have been done differently?</p>

Table 26: Chain of evidence

3.6.2.2 Internal Validity

Internal validity deals with the interpretability of the data and is considered a *sine qua non* condition (Campbell, Stanley, and Gage, 1963). As our study was exploratory, we followed the hypothesis-generating process used by Eisenhardt (1989) and Glaser and Strauss (1967) for establishing internal validity. In doing so, we paid special attention to what Yin (2013) and Miles et. al. (2014) described as a crucial concern of internal validity for case studies, which is the broader problem of making inferences. Internal validity was ensured through data coding, generation of rival explanations, use of multiple data sources and triangulation.

We generated rival hypotheses to help ensure internal validity, analyzing the data outcomes from different perspectives. This allowed us to address the possibility that the findings might be influenced by the interviews or some other factors. For example, in addition to buyers' individual characteristics, such as their heuristics, biases, and locus of control, we also considered other aspects that could lead to the same results, such as rules, procedures, and firm characteristics. We used multiple data sources to ensure internal validity and followed standard procedures to collect, transcribe, translate and code the data.

3.6.2.3 External Validity

External validity deals with concerns about whether the findings can be generalized beyond the specific study. We addressed external validity by analyzing the implications of our findings through different theoretical lenses. Thus, we used rival theories to explain the same findings.

We used two different theoretical lenses to provide alternative perspectives. They were considered rival explanations because they dealt with different aspects of buyers' characteristics: cognitive limitations and attribution theory. The perspective of biases and heuristics deals with buyer's cognitive limitations, while attribution theory is related to characteristics of buyer's personality, such as locus of control.

The way the research question is presented is also an external validity concern (Yin, 2013; Miles et al., 2014). The form of the research question can "help or hinder the preference for seeking generalizations - that is, striving for external validity" (Yin, 2013, p. 48). Additionally, the techniques used to code and group the data also play an important role in establishing external validity. They were coded and analyzed in different forms, as stated in Section 3.4, due to the different units of analysis in the embedded case analysis design.

3.7 Data Management

Due to the amount of data collected for this research, data management was critically important. We addressed data management through different actions, ranging from protocol development to the archiving or disposal of our research materials. For data protection, we established limits and security policies about who was able to access the research data and under what conditions. There were two different types of data to deal with: physical data and digital data. Information protection consists of three core elements: confidentiality, integrity, and availability. We addressed data confidentiality by limiting information access and disclosure. We developed a table relating the real identity of the interviewee to the label used in the data analysis. This table was developed by the main researcher and kept confidential, in order to preserve the personal data about the interviewees and their firms. An electronic version was kept on the

main researcher's personal computer and also on a Dropbox cloud storage website. This prevented the digital file from being lost due to any physical damage in the computer. The access to these files was safeguarded by a username and a password. A physical copy was kept in the main researcher's archive at Indiana University.

Availability refers to when and how authorized individuals can have access to the data. The authorized personnel, in our case, are the main researcher herself and her advisory board, which is composed of a Brazilian professor at Getulio Vargas Foundation in Sao Paulo, Brazil and two professors at Indiana University in Indianapolis, Indiana, United States. They had access to the digital data through a shared folder kept on the Dropbox website and protected by a password.

Integrity refers to the trustworthiness of information, assuring that the data was not inappropriately modified after it was recorded. One way that we guaranteed the integrity of our data was by following the file path modifications on the Dropbox website, which was set up to allow modifications to the editable files, recording who had made any modification and when. In case of any problems, we will be able to recover previous versions of the files. After the work has been completed, we planned to keep copies of our data for three years, and then destroy them.

4. RESULTS AND DISCUSSION

Our results are organized into two sections in order to fulfill the two secondary goals presented in the introduction to this dissertation (see Table 1). In Section 4.1, the goal is *identify the main types of mid-range events and analyze their impact in the focal firms*. In achieving this goal, we described our cases, which were composed of six supply chains. In Section 4.2, we discuss empirical applications of the propositions stated in Section 2.4, aiming to fulfill the goal of investigating and analyzing the dissemination of the impact of a mid-range event over multi-tier, multi-dimension supply chains in macro, micro, and integrated contexts.

4.1 Within Case Analysis

In this section, we report the results of the analysis of the six main supply chains that were studied. The six supply chains were based on two dermocosmetics and four beauty products focal firms. In addition to the reasons for dividing the industry this way that were provided in Section 3.1.3, we can also examine the differences between the sub-sectors was in terms of product characteristics. “Beauty products are essentially commodities, while dermocosmetics are non-commodities” (Informant #4). The dermocosmetics supply chains are different from beauty products supply chains for several reasons. Dermocosmetics products are much more complex to develop and to sell, when compared to beauty products. However, the customers of dermocosmetics products tend to be very loyal when they find a product that they like and can perceive an improvement in whatever they were treating (acne, aging, cellulitis, etc.). Thus, the dermocosmetics products tend to have a longer product life cycle, which might increase the revenues for the sellers in both the short and long term (ABIHPEC, 2014¹²). There is still a very substantial potential market for dermocosmetics to be explored in Brazil. Although Brazil is ahead of Japan in cosmetics products annual sales, the mix of sales between the two sub-sectors is balanced in Japan, with about 50% in beauty products and 50% in dermocosmetics. In Brazil, on the other hand, the mix is 96% beauty products and just 4% dermocosmetics (ABIHPEC, 2014). Table 27 summarizes the differences between the beauty products and dermocosmetics sub-sectors in Brazil, which we took in consideration when analyzing their respective supply chains.

¹² Information is also based on primary and secondary sources of the data collected for this research.

	Criterion	Beauty Products	Dermocosmetics
1. Products	Popular vs. Specialized Product	Popular and specialized	Specialized
	R&D Intensity	Low	High
	Main Products	Makeup, body and face moisturizers, hair products, nail products, body and face wax products, etc.	Body treatment (cellulitis, stretch marks, localized fat body); facial treatments (wrinkles, shades, acne); sun care and sunscreen products
	Life Cycle	Short	Long
2. Market	Annual Sales	Very high	Very low, compared to beauty products
	Relationship with Customers	Direct relationships	Indirect relationships, usually through specialist advice (for instance, an esthetician or a dermatologist)
	B2B or B2C	B2C	B2B
	Most Influential Channels	TV, popular events, popular artists, celebrities	Specialists, such as esthetic professionals, physical therapists, estheticians, massage therapists; physicians - dermatologists, teachers and tutors in professional esthetic schools.
	Target Customers	Final customers	Esthetic professionals, physical therapists, estheticians, massage therapists; physicians – dermatologists
	Segment	General	Niche
	Customer Loyalty	Low	Medium to high
	Level of Competitiveness	Wide and high	Narrow and high
	Direct Competitors	Global, national and local firms	International brands, national firms, compounding pharmacies, and some medications
	Investment in Advertising	High	Low
	Frequency of Portfolio Renewal	High	Low
Customer Relationships	Short term	Long term	

	Customer purchasing driven	Appearance and fragrance	Service benefit expectations
	Aggregation of Service for sales	Low	High
	Criterion	Beauty Products	Dermocosmetics
3. Supply Chain	Need for Prior-Purchase Training	Low	High
	Responsibility for Customer Training	Nobody, (a friend, a sales person, beautician, hairdresser, other).	Specialists, such as esthetic professionals, physical therapists, estheticians, massage therapists, physicians - dermatologists, teachers and tutors in professional esthetic schools
	Sales Channels	Big retail stores, grocery stores, drug stores, direct sales through catalogs, TV sales, internet	Franchisee stores, specialized stores, “manipulation” or compounding pharmacies
	Number of Suppliers	High	High
	Need for Innovation	Related to fashion market and styles	Related to R&D and new active ingredients
	Regulatory and Legal Requirements	Simple	Complex
4. Buyer and Supplier Relationships	Supplier Risk	Low	High
5. Main Players	Geographical Competition	Specific brands of global players and specific national players	Specific brands of global players and specific national players
	Examples of Global Firms	Avon, L’oreal, Nivea, Mary Kay, Maybelline	La Roc (Johnson& Johnson), Roche (Loreal)
	Examples of National and Local Firms	Natura, O Boticario, L’occitane, Jequití	Valmari, Adcos, Vitaderm

Table 27: Main differences between cosmetics and dermocosmetics

Each supply chain is composed of a focal firm plus two or three tiers in each direction, upstream and downstream. Upstream, we organized the suppliers not just in terms of tiers, but also in terms of the kind of supply, which were information, packaging, and chemicals. Downstream, we organized the buyers in terms of tiers and characteristics, such as franchise stores, retailers, or final customers.

The information suppliers were comprised of national and international cosmetics industry associations and firms. They are responsible for bringing data related to the market and opportunities to the focal firms. They support the focal firms and their suppliers, when needed, and provide opportunities for interchange of information, such as conferences, seminars, and marketing research. Government agencies, like Anvisa and Cegen, were also considered as information suppliers.

Cosmetics packaging suppliers differ in terms of type of packaging: primary packaging, secondary packaging, tertiary packaging, and printing service providers. Primary packaging suppliers supply the packages that are in contact with the product formulation, itself. Examples include tubes and jars of different sizes. The basic concerns regarding this kind of packaging are related to the fact that it will directly interact with the chemical products of the formulation during the entire life cycle of that product, thus “design and usability are important, but quality is crucial” (Informant#13). The most used materials were plastic and glass.

Secondary packaging refers to the external packaging that contains the primary packaging and helps in the visual appeal of the product. “At first, a customer will pay attention to a [cosmetics or dermocosmetics] product, if it attracts their attention; only after then, will that customer pay any attention to that product’s other characteristics [formulation, price, etc.]” (Informant #40).

The secondary packaging also plays an important role in preventing damage to primary packaging and the product itself during transport and storage (Informant #33). The most used materials were paper cartons.

Tertiary packaging refers to the bags and boxes in which the cosmetics are carried when bought by a customer. Although they do not interact with any product's characteristics themselves, they are important part of the visual appeal and extended perceived quality of the products. "I love B3's products, not just because they are good [in terms of quality] and smell very nice, but also, because I think it is a lot of fun to just hang out with my friends in the mall carrying those beautiful and colorful bags" (Informant #85).

The last cosmetics packaging category is printing service providers. These firms are responsible for printing specific information about the focal firm and the specific product on blank tubes or jars. They are important suppliers, especially for small and medium sized beauty and dermocosmetics firms, since they can allow better cost per unit on the final product.

Chemical suppliers, especially the third or second tier suppliers, are usually multinational firms. First tier supplier are usually the middlemen for those large multinational firms, or in a few cases, some medium sized local firms. Some of the multinational firms have plant manufacturing units in Brazil, and many of them have distributors or middlemen there. Depending on the purchased volume, a focal firm can buy directly from a chemical supplier's multinational unit in Brazil or abroad, or if smaller volumes are needed, they can be bought from the middlemen or chemical substitutes can be obtained from the medium sized local firms. The same chemical supplier can function as a first tier supplier selling for large firms, such as B3 or B4; or as second or even third tier supplier when selling to smaller firms, such as D1.

Chemical suppliers play an important role regarding to the innovation within the cosmetics industry. Most of the focal firms attributed their product development to a close partnership with their suppliers, which was responsible for bringing the most innovative products from Europe or the U.S., “We try to keep a very close relationship with our [chemical] suppliers, because through them we can have access to the best that exists, in terms of active chemical ingredients, in the world” (Informant #18). This illustrates the strength and importance of building strategic weak ties (Granovetter, 1983). One important thing to note is that, due to regulatory reasons, every Brazilian cosmetics product is required to have on its label the name and contact of the chemical engineer who is legally responsible for that product in case of allergies or any other problem. Thus, a close relationship between the focal firm and its chemical supplier is not just strategic, it is almost mandatory, since the focal firm relies heavily on its suppliers to support its product development and chemical safety.

Downstream, the supply chains are organized through different sales channels. The two dermocosmetics firms work through the franchise channel. One of them, D2, in addition to the franchisees, also uses traditional sales channels through specialized drugstores and distributors. D1 and D2 do not target the final customer directly; they use their sales channel to target professional estheticians, beauticians, or dermatologists, and then, through them, target the final customers indirectly. The beauty products supply chains also differ among themselves. B1 uses a mix of franchisees and traditional channel distribution, while B2 and B3 mostly use the franchise channel to reach out to the final customers. B4 uses a direct sales model, where there are individual representatives, the “B4 ladies”, who sell B4 products to final customers, usually through personal and close relationships. Table 28 shows the primary focus of the distribution channels. The darker the cell, the more that distribution channel is used.

Pair	Focal Firm	Channel of Distribution		
		Franchising	Traditional Retail	Direct Sales
1	D1			
	D2			
2	B1			
	B2			
3	B3			
	B4			

Table 28: Focal firms' channels of distribution

4.1.1 Network Representation of the Supply Chains

Figure 35 shows the network representation of the six supply chains. The yellow figures identify the focal firms. The blue, green, and brown are the first, second, and third tier suppliers, respectively. In the downstream direction, orange, red, and pink represent the first, second, and third tier buyers, respectively.

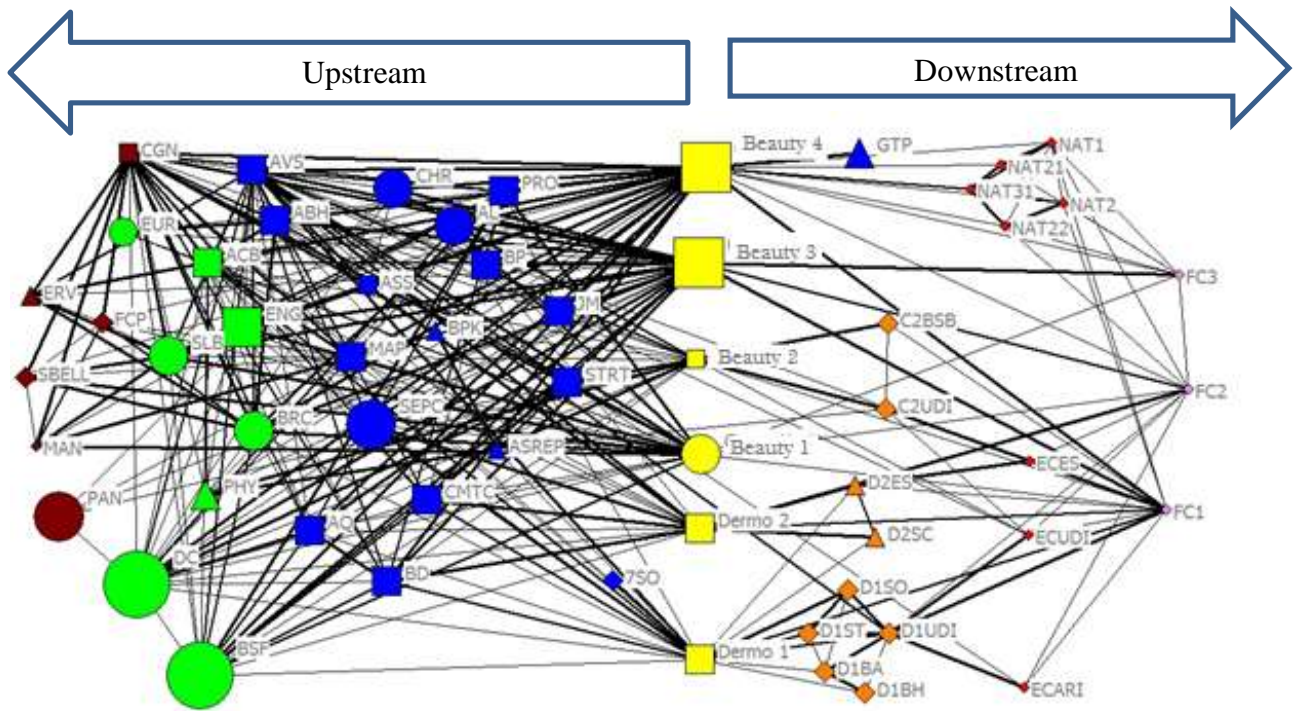


Figure 35: Network representation of researched supply chains

The properties of the nodes and lines were also incorporated into the supply network representation. The nodes represent the tiers, which are the firms. The size of each node represents the size of the firm, which ranged from micro to small, medium, large, and extra-large, as described in Chapter 3. Table 29 and Table 30 describe the meaning of the shapes and colors, respectively, in the supply network representations. Shapes were related to the local comprehensiveness and colors to the firm’s position in its main supply chain.

Local Comprehensiveness (shapes)		
Diamond	◇	Local
Triangle	△	Regional
Square	□	National
Circle	○	Multinational

Table 29: Meaning of the shapes in the supply network representations

Position in the Supply Chain (colors)

Brown		3rd Tier Supplier
Green		2nd Tier Supplier
Blue		1st Tier Supplier
Yellow		Focal Firm
Orange		1st Tier Buyer
Red		2nd Tier Buyer
Pink		3rd Tier Buyer

Table 30: Meaning of the colors in the supply network representations

The lines represent the relationship between the firms. A line connecting two firms indicates that those firms are related to each other, in other words, they have a buyer and supplier relationship. The relationships in

Figure 35 range from dyads and triads to much more complex relationships, where one firm might represent a different tier in different supply chains. The strength of the relationship is illustrated by the thickness of the line. The thicker the line, the stronger the relationship is.

4.1.2 Dermocosmetics Supply Chains

The dermocosmetics supply chains are associated with Dermo 1 and Dermo 2. These supply chains have some unique characteristics, which will be further discussed Sections 4.1.2.1 and 4.1.2.2. Several characteristics that are common to both D1 and D2 supply chains will be presented here. The D1 and D2 supply chains are highlighted in Figure 36.

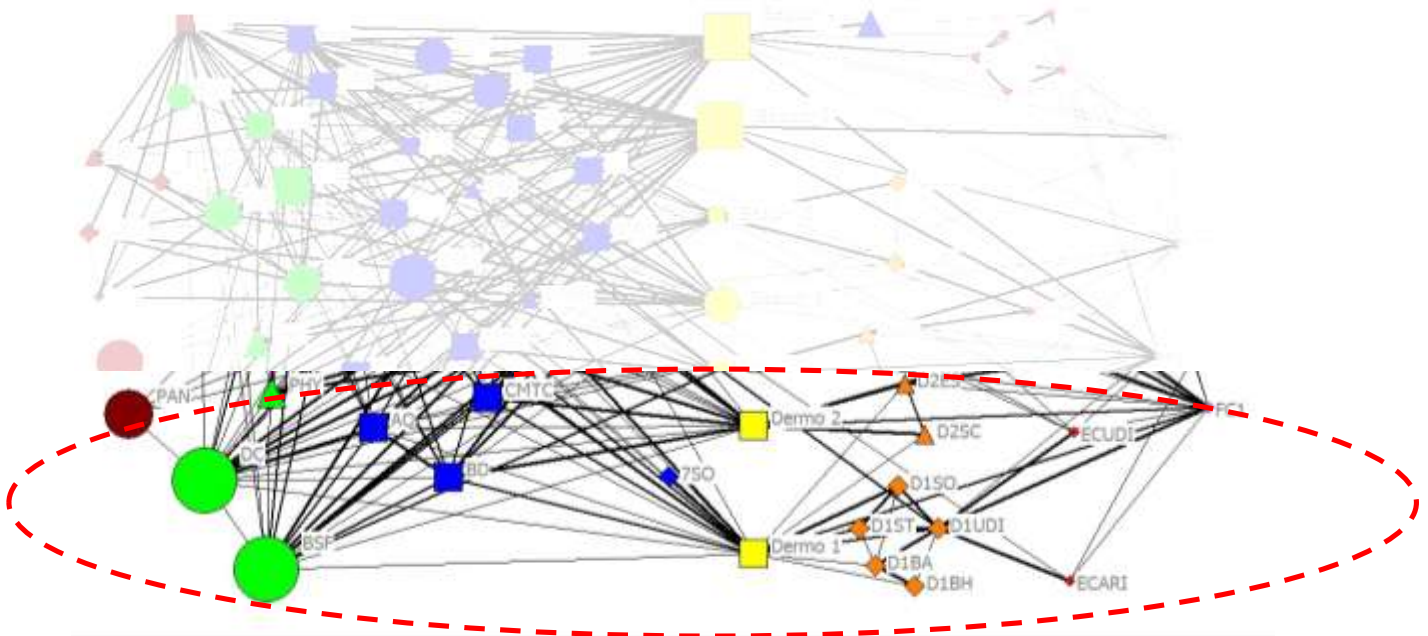


Figure 36: Position of D1 and D2

In Figure 37, we show the dermocosmetics supply chains (D1 and D2) and their respective tiers and relationships. Some firms, such as AQ, BSF, and DC, play different roles in the dermocosmetics supply chains than they do in the general representation of all the researched supply chains. For example, in the basic representation (

Figure 35), DC and BSF are second tier suppliers (green), however in the dermocosmetics supply chain (

Figure 35) these firms are third tier suppliers (brown).

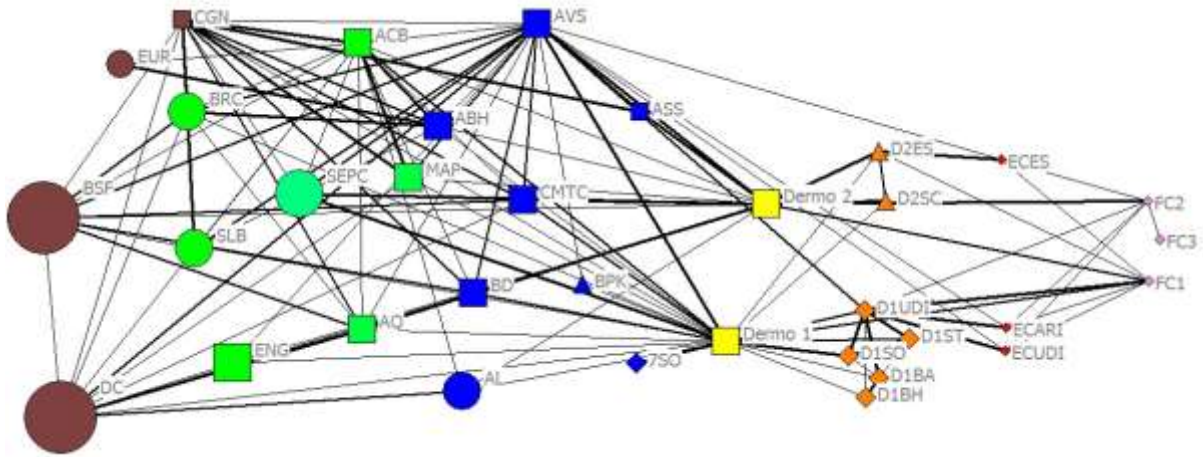


Figure 37: Interlocking relationships in dermocosmetics supply chains

The volume of purchases from suppliers is another big difference in buyer and supplier relationships between dermocosmetics and beauty products supply chains. Beauty products and dermocosmetics firms have very different needs for chemical ingredients or packaging materials. “For the same chemical ingredient that a firm such as D1 or D2 buys 1kg of per month; for large firms such as B3 or B4, we usually sell 1,000 kg per month” (Informant # 80).

For packaging, the differences are not just in terms of volume of the units negotiated in a period of time, it also includes the size of the packaging and labels. “For some beauty products, we have medium or large packaging, such as one or two pounds, however, for dermocosmetics, the packaging is usually smaller (Informant #14)”. One exception is the dermocosmetics that are sold to beauticians and estheticians to use with their clients. In that case, the packaging is sometimes larger, but it is never large for the final customers’ use (Informant #8). In regard to labels, “When I used to work for X (aa very large beauty products firm in Brazil), we usually bought five to six million labels a month, now, working for D1, we buy five to six thousand labels per month” (Informant #8).

In terms of market positioning, packaging for dermocosmetics products is more challenging, compared to beauty products. “When buying a dermocosmetics product, a (final) customer gets

a product, but expects a service” (Informant #4a). For example, when a customer buys a face cream, he or she is buying a product; however, they are expecting, for example, that their wrinkles will be softened (service). This makes the packaging design for dermocosmetics very challenging. It cannot be as attractive as in cosmetics, otherwise it would not be valued as an “almost medication” product. However, it cannot be as simple or as “ugly”, like the packaging for dermocosmetics from compound pharmacies; otherwise it would not translate all the value of the R&D behind the formulation inside the jar.

The chemical formulation needs to be taken very seriously by a dermocosmetics firm. Because of the fact that a customer buys a product, but expects a service, the formulation plays a crucial role in dermocosmetics. In this subsector, the chemical suppliers, usually large multinational firms, drive innovation and bring it to the focal firms. Also, because of the regulatory requirements for dermocosmetics, a close partnership between buyers and suppliers is required. This is in part due to the fact that dermocosmetics are Risk II cosmetics and require a government agency (Anvisa)’s approval, which lasts for five years. “During this five years, we [dermo focal firms] cannot change anything in the product formulation, neither an active ingredient, nor a preservative” (Informants #18 and #13).

In the next paragraphs we will describe each of the studied dermocosmetics supply chains and some of their unique characteristics.

4.1.2.1 Case One: Dermocosmetics 1 (D1)

We will start describing the D1 supply chain by its focal firm. Dermo 1 is a medium size Brazilian national dermocosmetics firm founded in 1980. It started as a compound pharmacy in Sao Paulo, Brazil, and evolved to a franchise sales model. As its sales increased, it built a plant to manufacture its products in a suburban area of Sao Paulo. During the next two decades, D1 developed both its products and sales based on its products formulations that its franchisees were responsible for selling to beauticians and estheticians. D1 was the leader, for more than two decades, of its market until about 2002, when another brand targeting the same customers (beauticians and estheticians) started to grow¹³. To understand more about D1's supply chain, we interviewed 46 informants in different tiers of its supply chain (see Figure 38).

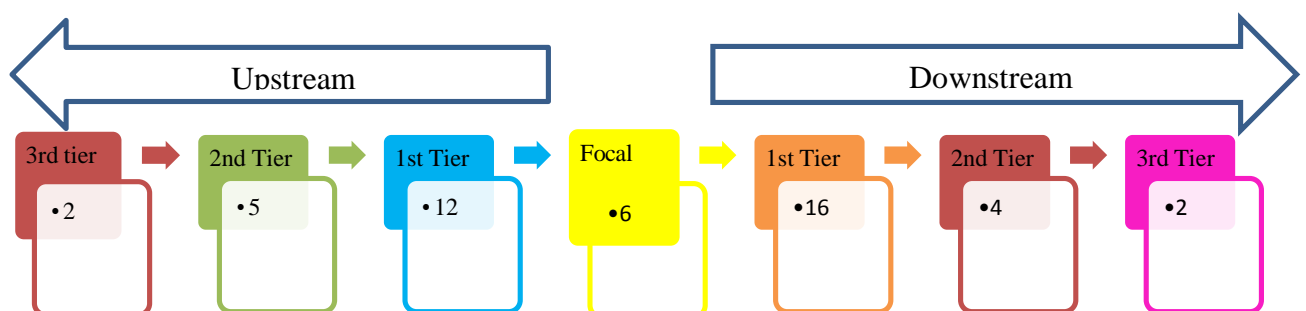


Figure 38: Number of informants in each tier for D1's supply chain

After years of financial struggles and crises in the relationship with several of its franchisees, D1 was bought by an investment group in 2010. Since then, it has implemented several changes in order to regain its position as the dermocosmetics leader firm in Brazil. Three of these events will be discussed in Section 4.2.

¹³ We are referring to D2 and it will be further discussed in Section 4.1.2.2.

In D1's supply chain, we investigated seven tiers, which included the focal firm plus three levels of buyers and three levels of suppliers.

Figure 39 illustrates the network relationships representation of the firms in D1's supply chain and will be used as a reference to present characteristics related to both directions in D1's supply chain.

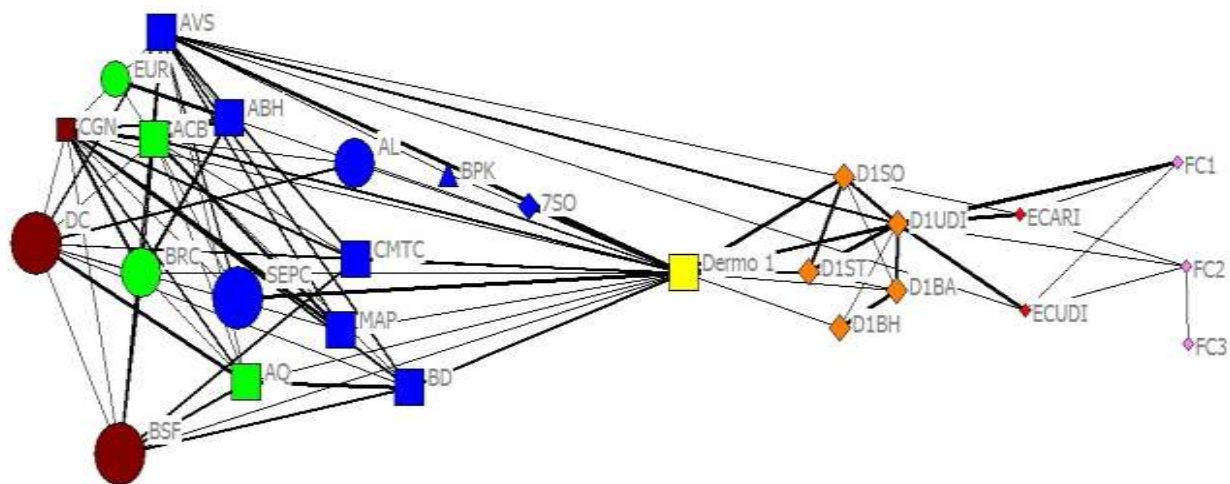


Figure 39: Network representation of D1 supply chain

Upstream, for both packaging and chemical suppliers, D1 believes (Informants #8, 14, 18, and 34) that personal contact is very important, “What I see is that, in this industry, great part of the success of the focal firms relies on the quality of the personal relationship that we [R&D personnel] develop with the individuals from our suppliers who work with us” (Informant #18).

According to the interviewees, D1's relationship with its suppliers tends to be very strong, especially with its chemical suppliers, which is an example of the strong ties concept from social network theory. Due to the fact that D1 is a small size firm, when compared to some very large firms in this industry, most of its innovation is driven by its suppliers. The chemical suppliers are comprised of very large multinational firms. It is through a close and strong

relationship with its middlemen that D1 receives news and becomes informed about global innovation. This fact supports the importance of the weak ties to build bridges, which in the case of dermocosmetics is essential for innovation. “Our suppliers are a very important channel of learning and knowledge for us” (Informant #18). Figure 40 illustrates the upstream firms, which are part of D1’s supply chain.

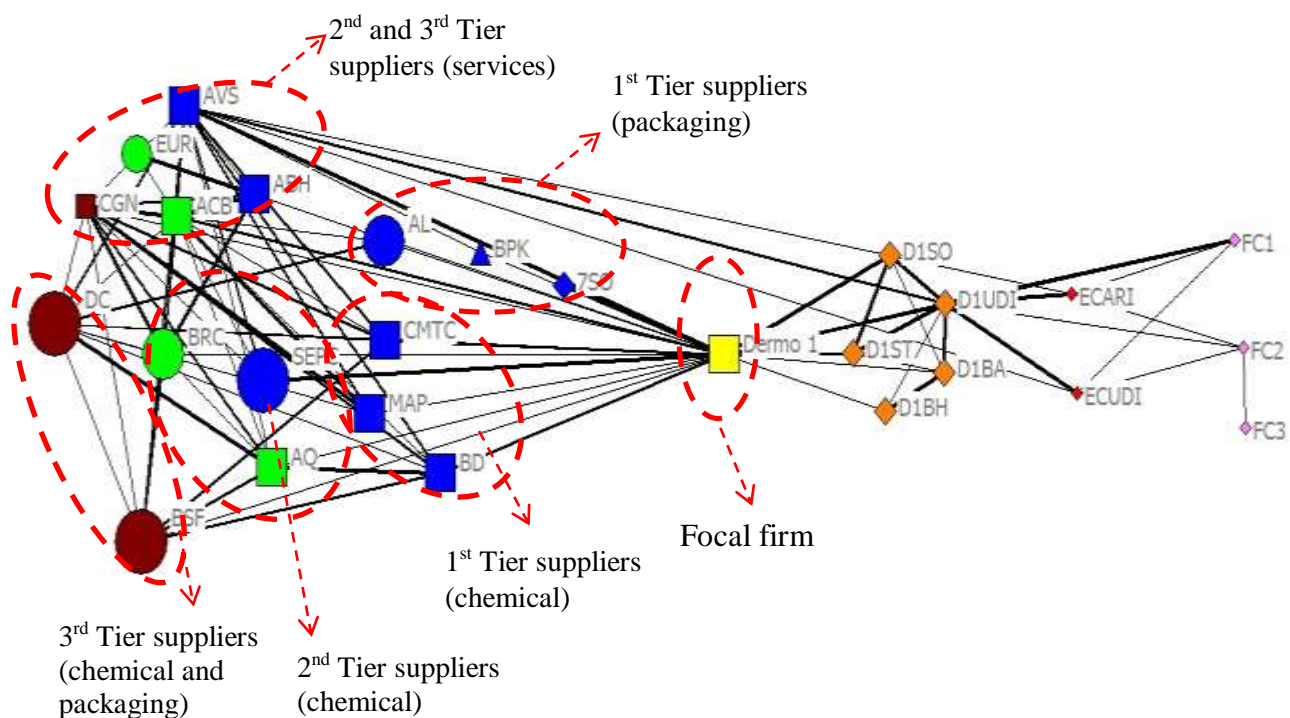


Figure 40: Upstream network illustration for D1’s supply chain

According to D1 informants, the buyer and supplier relationships between D1 and its chemical suppliers have always been very close and strong, since D1’s beginning. However, a substantial difference was noted in the last few years, after the investment group bought D1. The ties between them remained strong, but the difference refers to what informant #15 called professionalism.

“I remember few years ago, when we were in the middle of one of our greatest financial crises, and we did not have enough money to pay our suppliers. Sometimes, I would

personally call a long time manager, director, or even the CEO at a specific supplier and ask for a favor, such as sending us raw materials, even when we have not paid a previous bill(s). And it happened, they supplied us because of the personal relationship they had with D1's founders. It does not happen anymore. First, we make sure that our bills with our suppliers are always paid on time, and secondly, we still have close relationships with our supplier, but they are not personal anymore. If we pay them, they serve us. Otherwise, there is no deal" (Informant # 15).

Packaging was not a big concern for D1 in its early days. "Our products' packaging was really ugly" (Informant #5). D1 always considered that its customers, especially beauticians and estheticians, bought its products "due to what they had inside (chemical ingredients and formulations), not because what they would look like (packaging)" (Informant #5). So, D1, which had begun as a compound pharmacy, kept its very basic packaging, not caring much about its design or materials. Changing its packaging and designs materials was one of the first events that was implemented after D1 was bought by the investment group. Nowadays, D1 keeps a much closer relationship with its packaging suppliers. Its re-design of more than 300 products will be further discussed in Chapter 4.2.3

Downstream, D1 has about 80 franchisees, many of whom are long term franchisees. Some of them were established at the same time as D1, in the early 1980's; and some of the franchisees are in the second, or even third generation of the same family owners. The franchisees are used to having very close relationships with D1's founders. It is not uncommon to see personal relationships among them, such as attending special family parties and weddings.

The strong ties illustrated by these close long-term buyer and supplier relationships have had both good and bad impacts. The franchisees deeply understand D1's products and organization, working as a "big family". The close relationships have extended further on downstream, as the franchisees keep good, close personal relationships (strong ties) with their customers, who are beauticians and estheticians, as do the beauticians and estheticians with their customers. There is even a saying that having "good friends and good beauticians save you good money from your psychiatrist". However, another old saying is that "every family has an uncle or a

cousin who is a criminal”. In this case, that very close relationship, made the tough financial times even tougher for both D1 and its franchising, illustrating the down side of the strong ties. If the beauticians did not receive payment from their customers, they would not pay their bills to their franchise, which would not pay D1, which would not pay its suppliers. This is not a new phenomenon in this market, however, the fact that most of them kept such close relationships prevented them from working more professionally and asking for payments on time. Figure 41 illustrates the downstream firms for D1 network buyers.

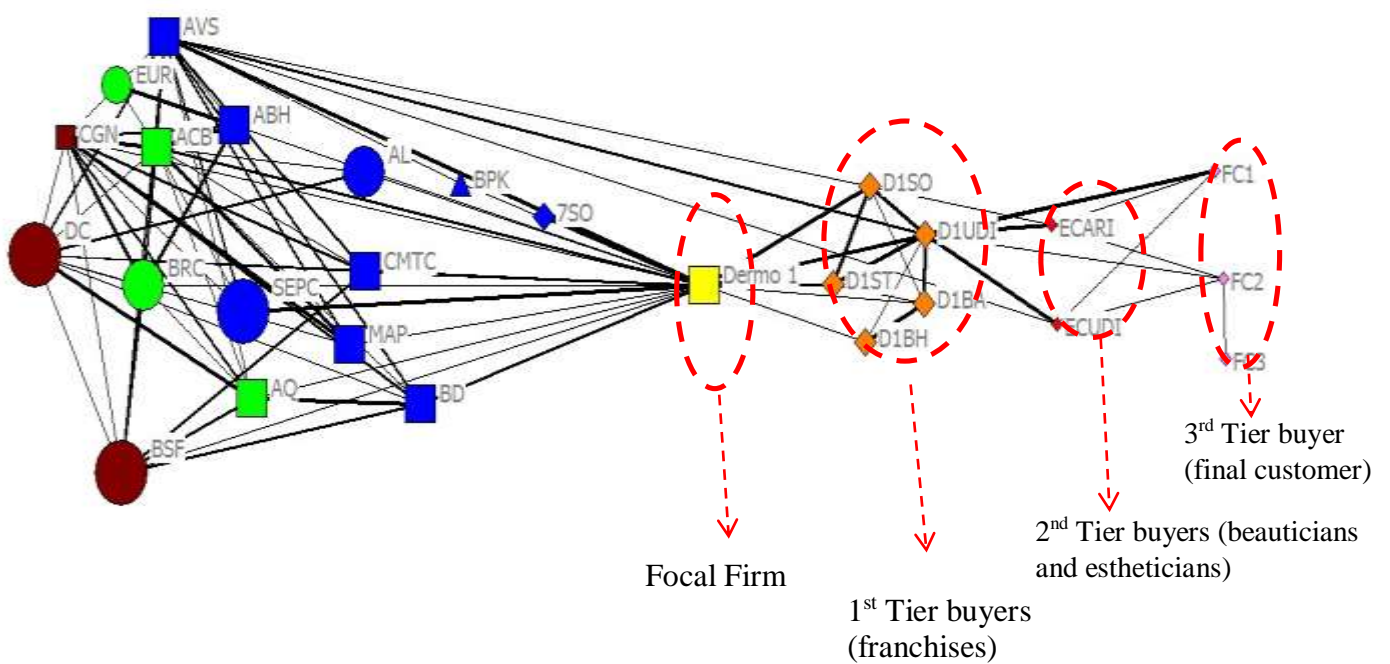


Figure 41: Downstream network illustration of D1’s supply chain

4.1.2.2 Case Two: Dermocosmetics 2 (D2)

Dermo 2 is a medium size Brazilian dermocosmetics firm founded in 1983. Like D1, it also started as a compound pharmacy, in the city of Vitoria, Espirito Santo, Brazil, when its founder arrived from a graduate course in France. Ten years later, it opened its first manufacturing plant. It opened its first store in 1999. By 2006, it had about 40 distributors and is now evolving to a franchise model, which it started in 2012. “Many of our old distributors migrated to this new model and several new franchisees already started in this model. We currently have 93 stores in 20 different Brazilian states. We intend to have about 300 stores opened by 2020” (Informant #6).

To understand more about D2’s supply chain, we interviewed 32 informants in different tiers of its supply chain. In total, we investigated seven tiers of D2’s supply chain, which included D2 plus three levels of buyers and three levels of suppliers (see Figure 42). 14 interviewees talked about their perspective as buyers (buyer side), 17 were on the supplier side, and one had a strategic view.

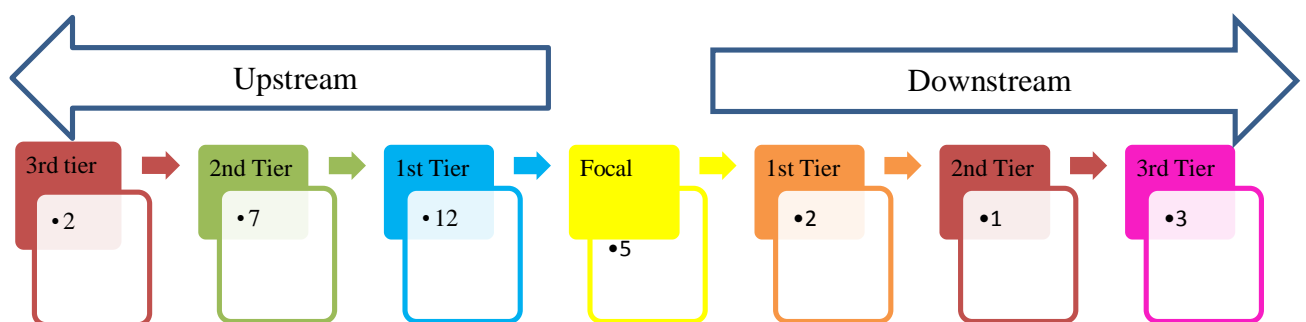


Figure 42: Number of informants in each tier of D2’s supply chain

Figure 43 illustrates the network relationship representation of the firms in D2's supply chain. It will be used as a reference for presenting information about D2's upstream and downstream supply chain.

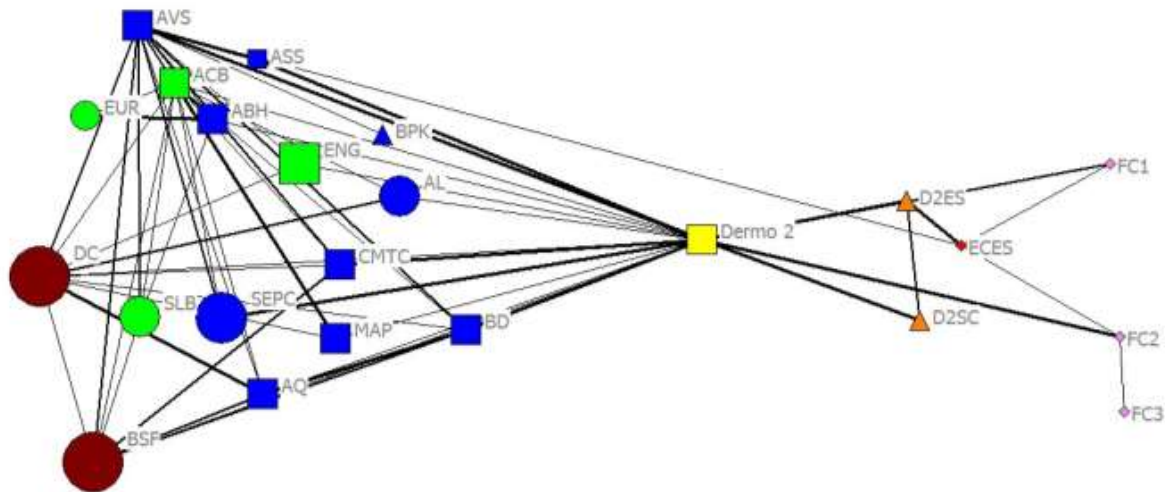


Figure 43: Network representation of D2's supply chain

As mentioned previously, D1 and D2 are very similar firms. Upstream, they have many of the same key suppliers for information, packaging, and chemical suppliers (see Figure 44). Both use their suppliers as a channel for product development. However, even though they are dealing with essentially the same suppliers, D2 works closer to its suppliers, in different and more effective ways, compared to D1. We found three reasons that support this assumption. One is related to D2's size. Both D1 and D2 are medium size Brazilian firms, however, D2 is larger than D1, and as a consequence, it had larger bargaining power in terms of purchased volume, when compared to D1. Figure 44 illustrates the upstream firms that are part of D2's supply chain.

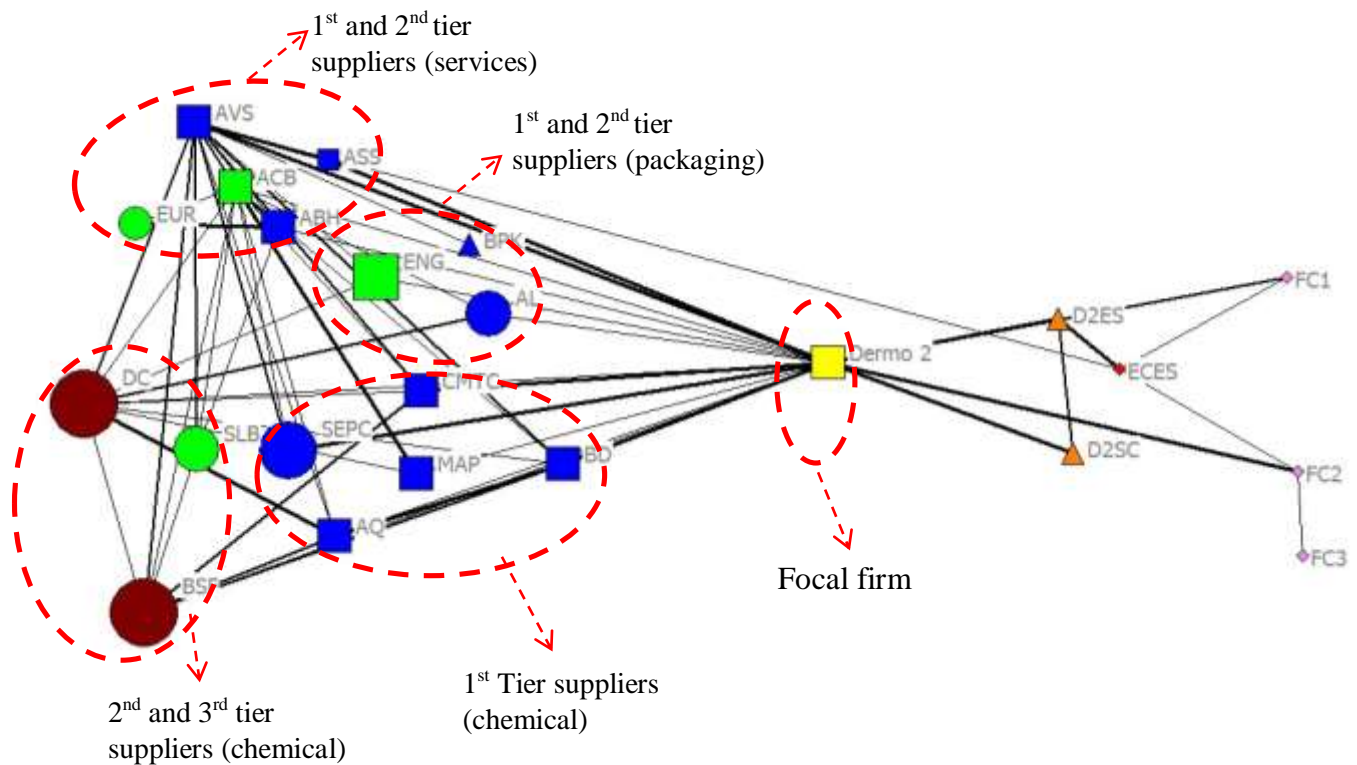


Figure 44: Upstream network illustration of D2's supply chain

Another possible explanation is related to the personal social influence exerted by D2's founder. She was a professional, who is well respected for her education and entrepreneurship by D2's first tier buyers and suppliers. She received several awards from D2's suppliers and is admired by her clients, beauticians and estheticians, who see her as a role model of success.

Finally, it is important to note an important process we perceived in D2, which is the high quality relationship among the D2's employees. Good communication, joint planning and joint decision making are some of the practices that they used effectively on a daily basis. "We recently developed, approved, and launched a product in less than a week", said informant #

6_2. “We had some raw materials which were close to the expiration date, we had to either use them, or lose them. So, R&D, quality, marketing, and OM individuals worked together and came up with a very suitable solution, which was a sales success!” (Informant #6). Another example of the quality of the relationships between D2 and its employees is the fact that the same person has worked as R&D manager since the opening of D2, more than two decades ago.

Downstream, since its inception, D2 has worked in three different distribution channels. The first is through esthetic professionals (beauticians and estheticians), with whom it started and has been working ever since. Esthetics professionals are important because they use D2’s products in their treatments and also recommend dermocosmetics products for their clients to use at home. The next distribution channel is through physicians, especially dermatologists. The use of this channel differentiates D2 from its competitors. Since dermocosmetics is a kind of “two for the price of one” as we described in section 4.1.2 (a product with service characteristics), the dermatologists’ endorsement and recommendations make D2 products much more attractive. “With a good partnership with physicians, D2 grew a lot and became a very respected brand by both the esthetics professionals, and final users as well” (Respondent #6).

D2’s third distribution channel is composed of sales units, which can be franchisees, specialized drugstores, or e-commerce. The focus on these channels is related to the fact that D2 wants to make its products available for purchase through different channels. “We try to make our products available for our final users when they want to buy a D2 product, which was probably prescribed or used on them by an esthetic professional or a dermatologist” (Informant #12). D2 believes that the fact it that works with three different sales channels is

primarily responsible for its competitive advantage (Informant #6). This is supported by the fact that D2 has grown at a rate of at least 20% a year for the last five years, and has been positioned as the leader in dermocosmetics market for several years (Copernico, 2012).

D2 showed the ability to build strong relationships with its tier buyers as well. Since the first tier buyers are the ones who will be directly in contact with the esthetic professionals, physicians, and sometimes even the final users, D2 builds close relationships with them. Examples include using its first tier buyers in the process of product development and empowering its franchisees to act as wholesalers when allowed to sell, for example, to drugstores. Figure 45 illustrates the downstream firms for D2 network buyers.

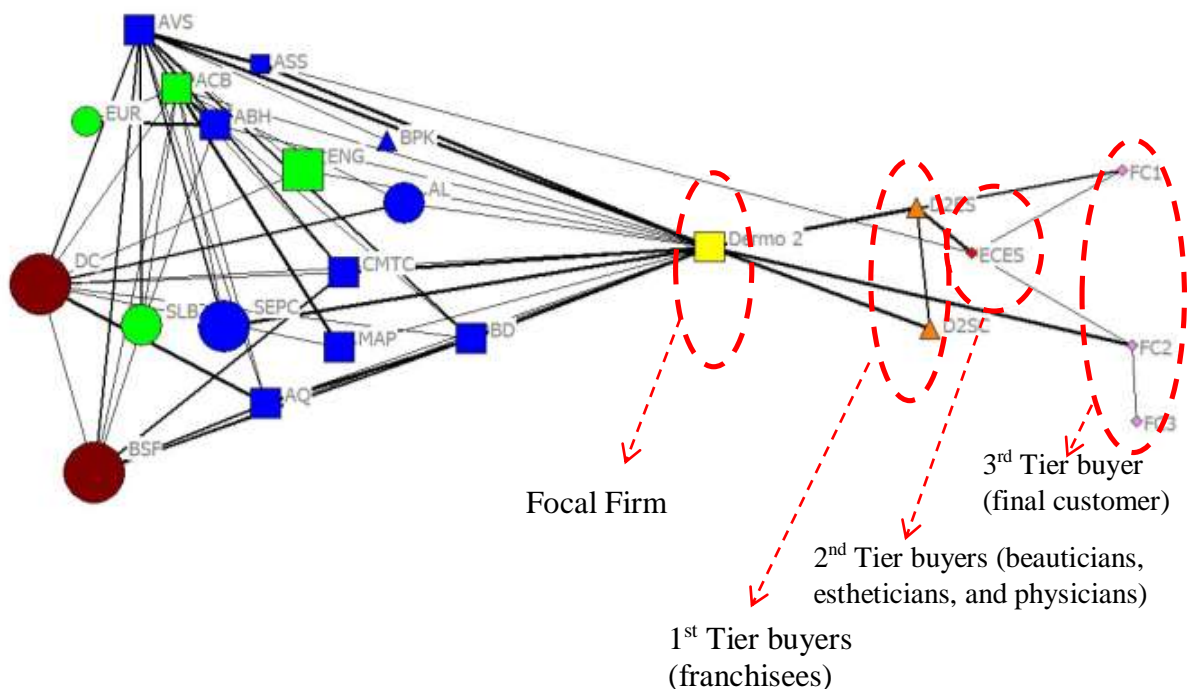


Figure 45: Downstream network illustration of D2's supply chain

4.1.3 Beauty Products Supply Chains

The beauty products supply chains are the Beauty 1, Beauty 2, Beauty 3, and Beauty 4 focal firms' supply chains. These supply chains have some unique characteristics, which will be further discussed in sections 4.1.3.1 to 4.1.3.4. However, several characteristics that are common to all beauty products supply chains will be presented here. The beauty products supply chains are highlighted in Figure 46.

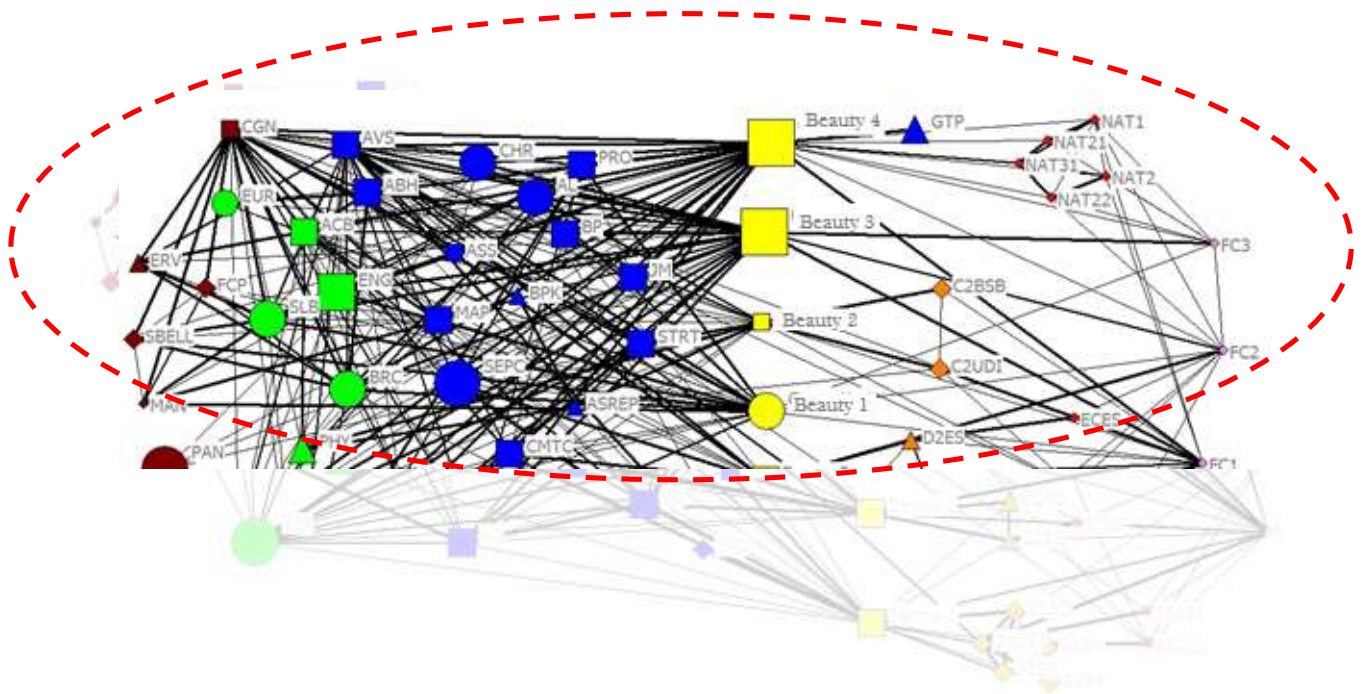


Figure 46: Beauty products firms highlighted in the researched supply chains

Beauty products play an important role in specific target marketing in Brazil as products to use as gifts or presents on special occasions. It is not uncommon to walk into a big mall in the main cities and towns in Brazil and see huge lines in front of the door of some national beauty brand stores during the days before Mother's Day or Christmas.

There are some interesting packaging characteristics of beauty products that we considered in our research. Packaging suppliers are an important part of the costs related to the final price of both cosmetics and dermocosmetics. However, for beauty products in general (make-up, lotions, perfumes, etc), packaging can cost up to 90% of the product's final cost (Miguel, 2014). Our data shows that there are four main reasons for the high cost of packaging of beauty products. First, beauty products are often purchased as a gift, thus they need to be beautiful and attractive. Second, different from dermocosmetics, where the customers are expecting a long term service from the product they are buying, the purchase of beauty products is more impulsive, so the appearance of packaging is crucial (Informants #4, #33, and #81). Third, beauty products follow the fashion industry and are seasonal, thus they need to be always changing to keep up to date. Finally, a beauty product may be related to status and attached to its brand appearance value. All these reasons are related to packaging design, innovation, and the use of different materials, which costs much more money for the focal firm. Informant #33 credits this to the fact that the interaction of the final user with the product packaging lasts for its entire life cycle. "Different from a bottle of water, where you drink the water and throw the bottle out in just a few minutes, a cosmetic will remain on your bathroom shelf or dresser for weeks, sometimes months, or even years", thus packaging is very important.

Chemical formulation is also important in beauty products. Although many times the purchasing is by impulse – since nobody will die if not purchasing the new nail polish color - after it is purchased, performance plays an important role in customers' satisfaction and intention to repurchase the same product or another one from the same brand (Informant # 33, #38, and #40).

A very important characteristic of beauty products' chemical formulation is their fragrance. Like packaging, the fragrance of a beauty product, such as a lotion or perfume, plays a very important role in the purchasing decision by a customer. Fragrances are similar to packaging, both downstream in their relationship with the customers, and upstream. Consider, for example, a perfume. Probably the first image that comes to mind is the bottle. To develop a specific bottle, a very close relationship between the focal firm and a packaging supplier is developed. The bottle is supposed to embody the "soul of the perfume, and the soul of the perfume is its fragrance" (Informant 14). In developing such a complex concept, the focal firm's product development staff needs to work closely with the suppliers, especially the packaging and fragrance suppliers. The fragrance is unique, and once a fragrance supplier develops it, only that specific supplier will be the one to negotiate with. The same happens with the bottle. A packaging supplier will need to develop and/or adapt several of its processes and resources to manufacture that specific bottle to that specific product of that specific focal firm. This involves lots of resources, including time, materials, and equipment. Once that bottle design has been established with a supplier, "it will be a very long term relationship" (Informant #33).

In Figure 47, we show the beauty products supply chains (B1, B2, B3, and B4) and their respective tiers and relationships. Beauty products supply chains do not differ much from the dermocosmetics supply chains in terms of the main players. The greatest differences between dermocosmetics and beauty products supply chains are in the strength of the relationship between buyers and suppliers. Usually, the relationships with packaging and some chemical suppliers, such as fragrance suppliers, are much closer and stronger for beauty products firms, due to both the volume purchased and the length of the relationship.

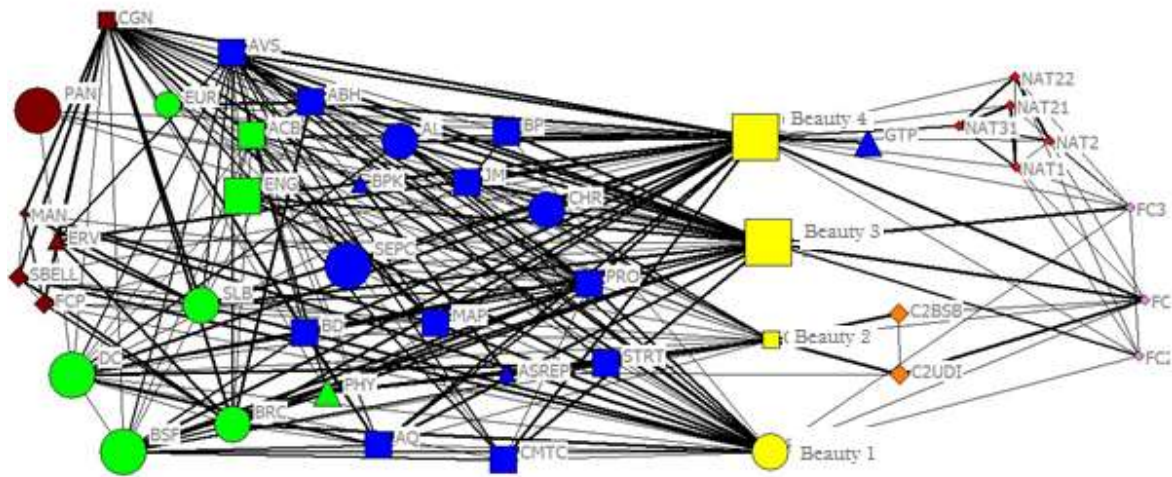


Figure 47: Network representation of beauty products supply chain

In the next paragraphs, we will describe each of the beauty products supply chains and unique characteristics.

4.1.3.1 Case Three: Beauty 1 (B1)

Beauty 1 is a spin-off of a French firm headquartered in Southern France. The firm was established in 1976 and started its operations in Brazil in 1995. At first, it launched the same products that were sold worldwide. By 2009, there were about 45 B1 stores in Brazil, and in 2013 about 100 stores, both wholly owned stores and franchises. In 2013, B1 also launched a local brand made entirely with ingredients inspired by Brazil's rich biodiversity and focusing on the Brazilian market. For this research, we are only focusing on the B1's Brazilian brand. We investigated five tiers of its supply chain, which included B1 plus three levels of suppliers and one level of buyer. There is not a second tier buyer in B1's supply chain structure. To

understand more about B1's supply chain, we interviewed 27 informants in different tiers of its supply chain. We also conducted observations in one of its stores and with another final customer (see Figure 48).

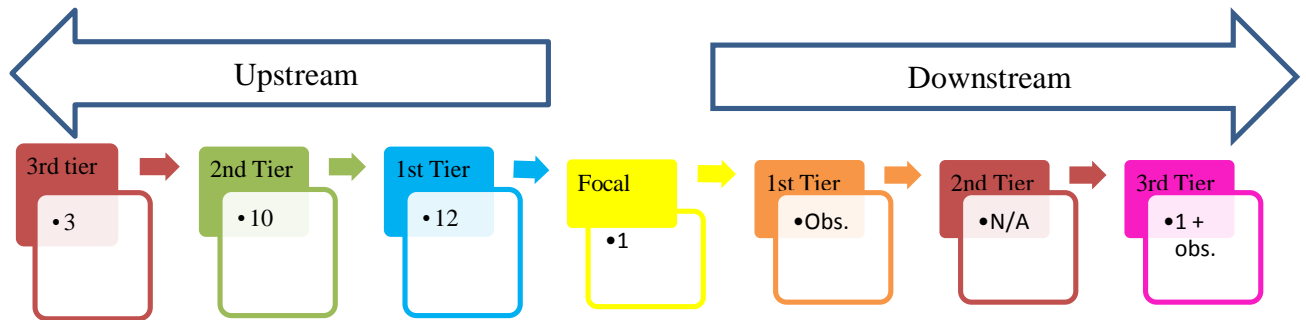


Figure 48: Number of informants in each tier of B1's supply chain

As we were not able to interview as many informants as we had planned for B1's focal firm, we used observation and secondary information as additional sources of data. Figure 49 illustrates the network relationship representation of the firms in B1's supply chain and will be used as reference for characteristics of B1's upstream and downstream supply chain.

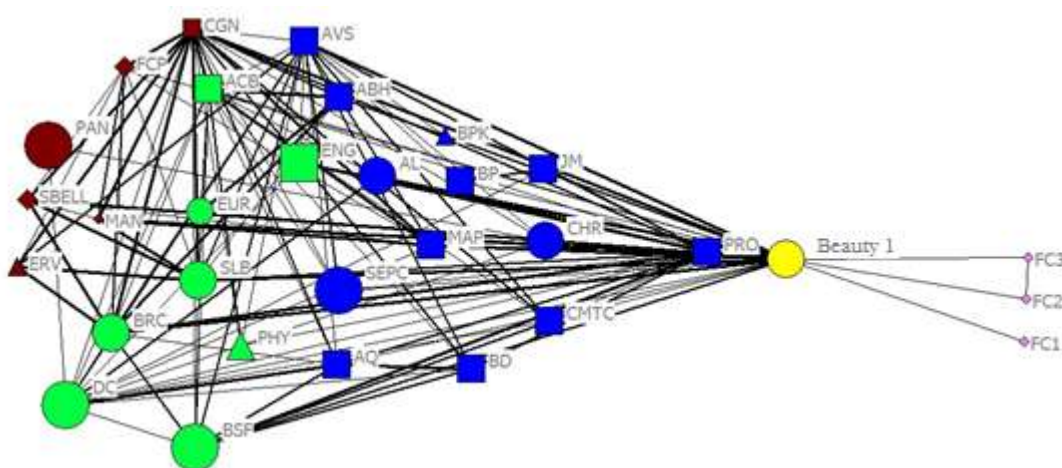


Figure 49: Network representation of B1's supply chain

B1 refers to its Brazilian market as “exciting and dynamic, but also complex because it is very closed and competitive” (Milet and Gallon, 2014). B1 experienced a growth rate of 20% in 2013, which was B1’s fastest-growing market globally. “Brazil is currently the 6th or 7th market for B1, and we aim to make it the first. Therefore, the next step will be the opening of a research and development laboratory in Brazil” (Milet and Gallon, 2014).

Upstream, developing and selecting a supplier that are able to manufacture B1’s products was one of its biggest challenges. In beginning to produce a Brazilian brand, B1 realized that Brazil was a very particular country and, if it wanted to sell its products in Brazil, it would need to produce there. B1 began its journey by deciding to outsource its production. B1 spent several years researching and investigating, in order to better understand the Brazilian cosmetics market to determine how to better sell (its products in the Brazilian market) and buy (materials and services) there.

B1’s supply chain is intrinsically connected through a manufacturing plant that is locally contracted in Brazil to manufacture B1’s products. Further details regarding the contract and negotiation process between B1 and one of its main manufacturing plant are provided in section 4.2.2.1.

One of the main characteristics of B1’s supply chain is its attention and care in the development of suppliers that can translate the Brazilian history B1 was trying to develop and value. It invested in searching for and developing several new raw materials procured from small farms and native Indian communities from great distances, such as the Amazon rain forest. Due to legal constraints, B1 had to go through a very complex, time-consuming and costly process to develop each of its raw materials. The B1 Brazilian brand has products to represent each of the

Brazilian biomass areas, which are the Amazon rain forest, coast areas, Caatinga, Cerrado, Pantanal, and Atlantic forest, as illustrated in Figure 50.



Figure 50: Brazilian biomass areas

Each of these areas in Brazil is very unique in its characteristics and raw material richness, as well as challenges. As an example, personally contacting some communities in the Amazon, requires a four hour flight from Sao Paulo to Manaus, in the Amazon, and from Manaus, a trip on a boat that could last up to three days until reaching a specific native Indian community which has the desired raw material. At the other extreme, Caatinga is a desert-like area. The plants used there are very challenging, as is dealing with the micro farmers. Another challenge B1 has to deal with is the low level of education of the micro farmers in these areas. “Preparing and a signing any kind of contract is very challenging” (Informant #74). However, dealing with all of these challenges of establishing partnerships in with several tiers in its supply chain was crucial for the success of B1 in Brazil. To have the right raw materials requires visiting the raw material direct producers, negotiating with them, usually together with individuals from the firm which will be the raw material converter, the chemical manufacturer.

Challenges also included packaging partnerships at all levels. The buyer and supplier relationship between B1 and its packaging suppliers is very close. B1 tries to use its packaging to tell the story of its ingredients by hiring local artists to design its primary and secondary packaging.

B1 and its first and second tier suppliers also have to deal with political challenges at the federal level. The most challenging is related to government agency called Cegen and will be further discussed in Section 4.2.3. Figure 51 illustrates the upstream firms of B1's suppliers.

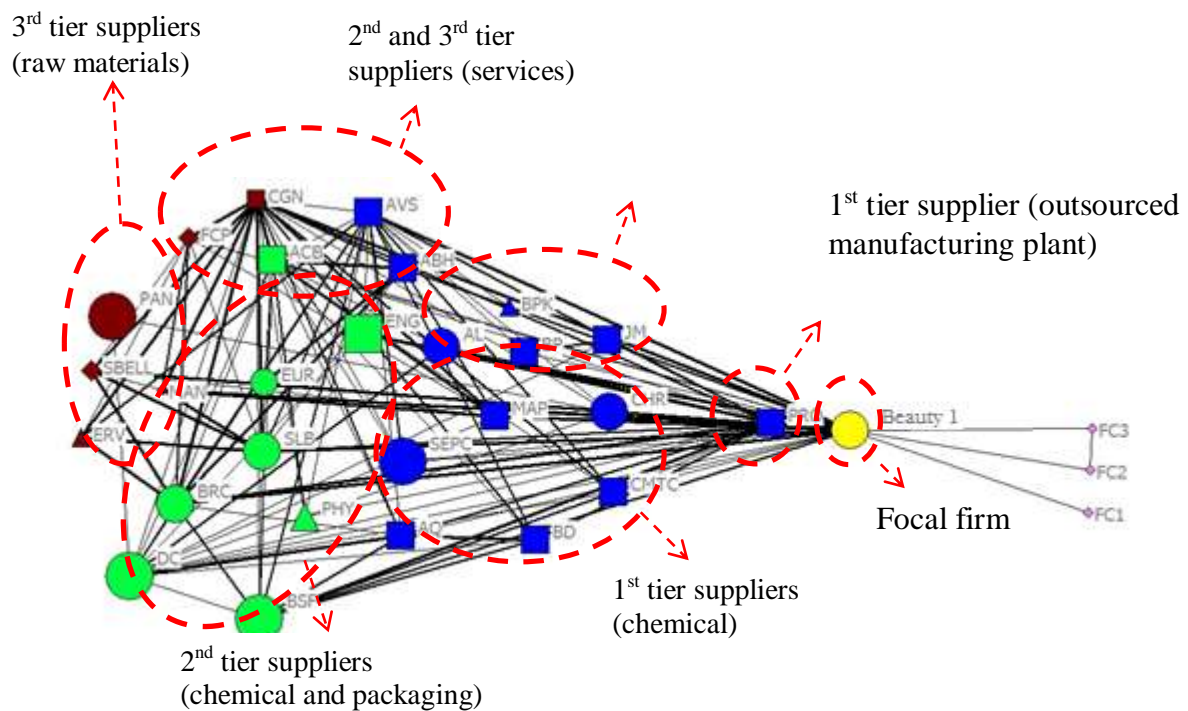


Figure 51: Upstream network illustration of B1's supply chain

Downstream, B1's supply chain focuses on the sales channel through retail stores, mostly franchises. In the summer of 2014, B1 had about 30 stores for its Brazilian brand and was

planning to expand. Its target, unlike the dermocosmetics firms, was the final customer. B1's products are targeted at both personal use and to be given as a gift on special occasions.

In order to increase the perceived value of its products, B1 develops and tells the stories behind each of the Brazilian biodiversity ingredients as part of its sales strategy through finding local artists to illustrate and help with the design of its primary and secondary packaging. Also, several short videos are available on the internet, showing the ingredient in its local environment and describing how it was harvested and prepared. The design of the packaging and its development is also shown in these short videos, using the local artists and farmers themselves to tell the story. This approach is very captivating and individuals bought B1's Brazilian line from stores in different parts of the world, including Italy, Japan, and the U.S. (Research Observation). Figure 52 illustrates B1's downstream supply network.

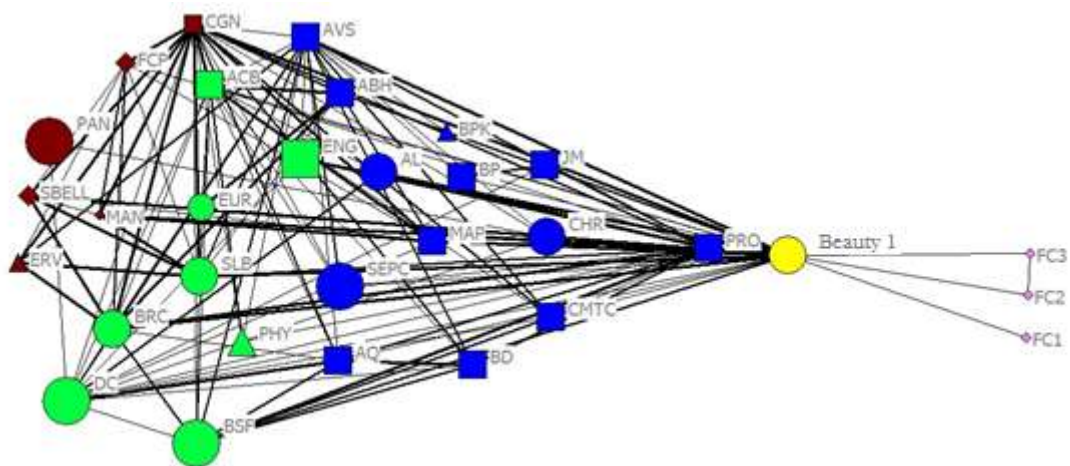


Figure 52: Downstream network illustration of B1's supply chain

4.1.3.2 Case Four: Beauty 2 (B2)

Beauty 2 is a spin-off of a Brazilian business group headquartered in the Mideast of Brazil. The group was formed by 14 firms, the biggest and most important of which is STRT, a household cleaning firm established in 1987. STRT was considered among the ten most important household cleaning products manufacturers in Brazil. Ten years after the beginning of STRT and the group, its cosmetics business started, which we are calling B2. In total, in B2's supply chain we investigated six tiers, which included B2 plus three levels of suppliers and two levels of buyers. The second tier buyer designation is not applicable in B2's supply chain structure. To understand more about B2's supply chain, we interviewed 27 informants in different tiers of its supply chain (see Figure 53).

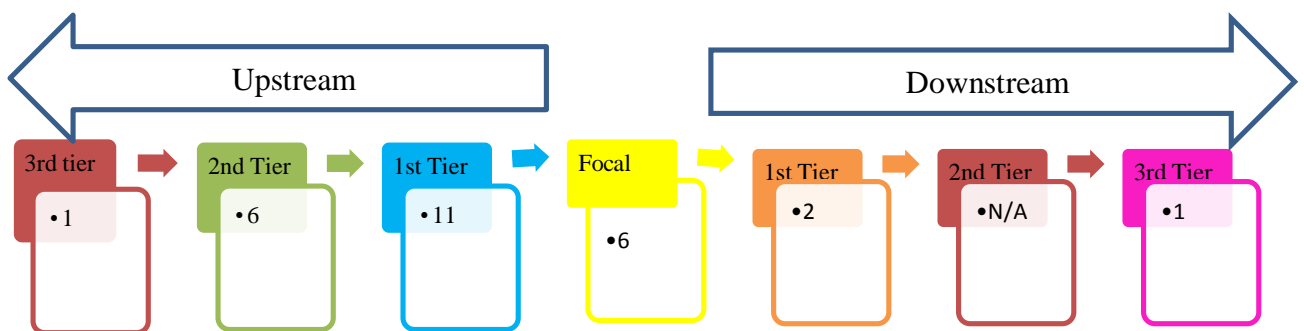


Figure 53: Number of informants in each tier of B2's supply chain

B2's brand and product concepts were inspired after the founders of STRT and B2 travelled to France, more specifically to the Southern part of France. In contrast to B1, which was a French firm producing in Brazil and inspired by the Brazilian biodiversity, B2 was a Brazilian firm, inspired by the Southern France's beauty and story. B2 developed several products and product lines, bringing French concepts and fragrances to the Brazilian customers. "Traditionally, we

Brazilian individuals do not value a lot what we have ‘in our backyard’, we tend to value much more what the international market has to offer for us. That is why we focused on France and its cosmetics and fragrance story” (Informant #93).

Figure 54 illustrates the network relationship representation of the firms in B2’s supply chain and will be used as reference to present characteristics of both directions in B2’s supply chain.

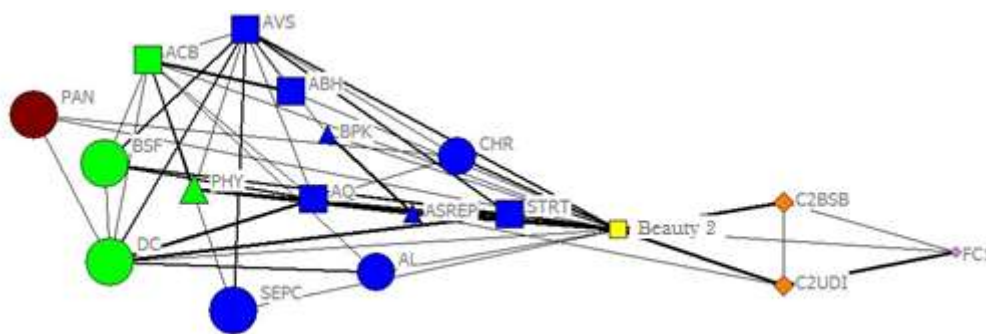


Figure 54: Network representation for B2 supply chain

Upstream relationships were crucial to the beginning of B2. The B2 story begins in 1996 and was driven by market opportunities, and at the same time, the strength of buyer and supplier relationships (strong ties) of STRT with its packaging and chemical suppliers. As stated by informant #8, “Basically, the chemical and packaging suppliers for both the cosmetics and household cleaning industries are the same”. Even when the ingredients are not exactly the same and are bought in different volumes for the housecleaning and cosmetics industries, the same supplier is usually able to produce ingredients for both industries. Since STRT, which we are calling the “mother firm”, already had strong ties (volume and strength of relationships) with its suppliers and perceived marketing opportunities, it decided to start a cosmetics firm, which was the B2’s beginning. A new supplier appeared in B2’s supply chain and is present in

the B3's and B4's supply chains as well. It is a make-up outsourcing manufacturer, labeled CHR (see Figure 55).

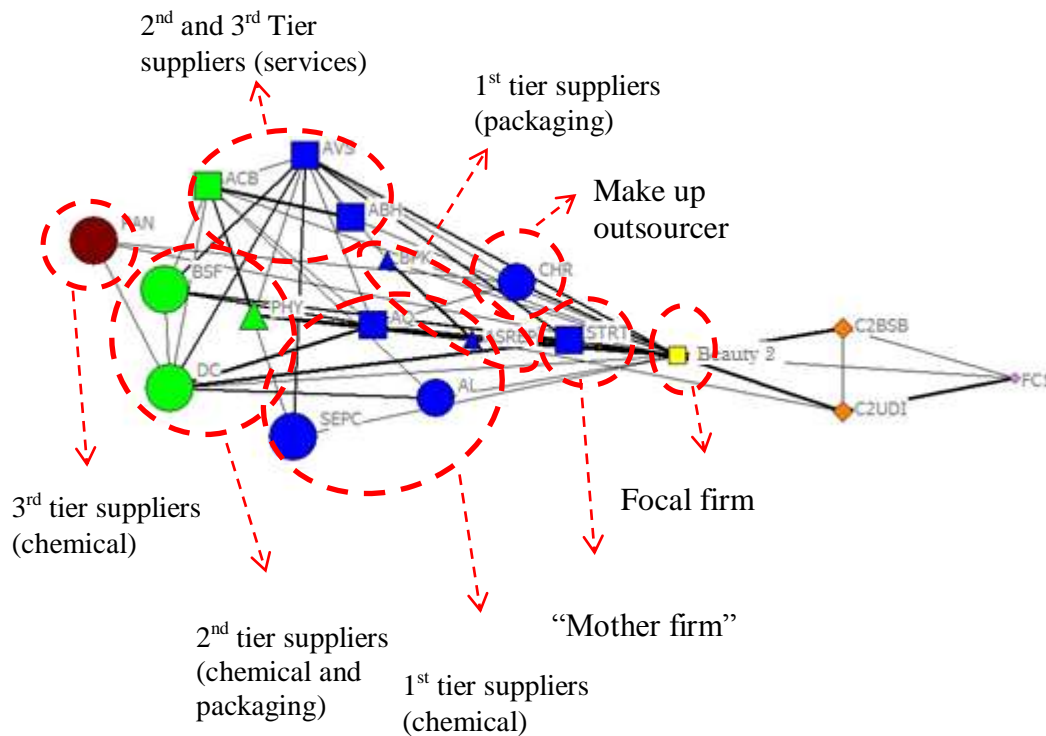


Figure 55: Upstream network illustration of B2's supply chain

Downstream, B2 had to change its sales channel few years after its beginning. Initially, it was focused on the direct sales model, “such as Avon, Mary Kay, or Natura” (Informant #62). B2 had about 500 “B2 ladies”, but then gave up this model after two or three years and adopted the franchise model. “We were trying to develop and sell products with a high level of aggregated value, especially for gifts on special occasions. Through the direct sales model, we were not able to translate that value into sales, which is why we moved to franchise model” (Informant # 62).

The franchise model began about 2011. Up to fall of 2014, B2 had about 55 stores. In the beginning of its franchise model, it committed several mistakes, including not choosing the correct profiles for the franchisees and not picking the best places to open the stores. This illustrates how trial and error is part of B2's culture, as expressed by its CEO, "(...) Well, we actually don't have any planning, here is just about making dreams come true. We sleep dreaming and wake up working to make the dreams become reality!" (Informant # 62).

Despite its lack of planning, B2 is doing well. Besides its 55 franchise stores, it has ten more planned to open through spring 2015. The existing stores are doing well. Informant #65, who is the franchise owner of B2's third store, which was opened in November 2011, said: "We opened our store less than two months before Christmas, and just in the first December alone, we had about 1,600 new customers visiting the store." The focus of B2 is on the development of products and kits for presents and gifts. "Our products are usually bought to be offered as gifts for special occasions. Even the individuals who buy our products for themselves, they buy as presents themselves, like 'I deserve it, I can have it'." Figure 56 illustrates the downstream organization of B2's supply network.

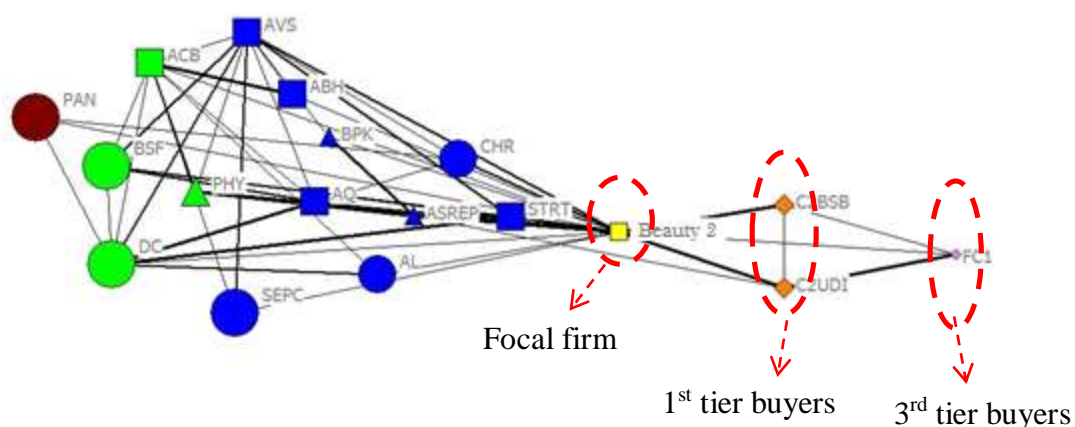


Figure 56: Downstream network illustration of B2's supply chain

4.1.3.3 Case Five: Beauty 3 (B3)

B3 is one of the most important beauty products chains in the world. It is not just the biggest Brazilian beauty products firm, but it is also the largest perfumery and cosmetics franchise in the world. At the end of 2014, it had about 3,800 stores. Although the largest number of its stores is located in Brazil, it also has stores in Portugal, Mexico, Bolivia, Peru, United States, Paraguay, Japan, France, and Venezuela.

B3 is a group formed by four cosmetics sales chains. Three of them were new, with five years or less of experience. This research will focus on B3's main brand, which is its largest and oldest one, which we will just call B3. Analogous to Dermo 1 and Dermo 2, B3 also started as a small prescription drugstore. It started in 1977 in the city of Curitiba, in the southern area of Brazil. However, different from D1 and D2, B3 since its beginning has focused on manufacturing products to be used as gifts and presents for special occasions. One of its initial stores was opened in an airport in southern Brazil. "The idea was that if you were arriving in or from somewhere and had forgotten about buying a present or gift for someone special, you could, for sure, find that something special in a B3 store located in the airport lobby" (Informant 92). B3 grew up during the last 37 years to become huge by itself. By spring 2015, it had about 7,000 direct employees and several thousand indirect employees.

B3's supply chain is one of the biggest and most complex of the researched supply chains, composed of more than 5,000 different suppliers of packaging, chemicals, and services. In total, for B3's supply chain, we investigated six tiers, which included B3 plus three levels of

suppliers and two levels of buyers. The second tier buyer designation is not applicable in B3's supply chain structure. To understand more about B3's supply chain, we interviewed 32 informants in different tiers of its supply chain. We also performed observations in three of its stores (see Figure 57).

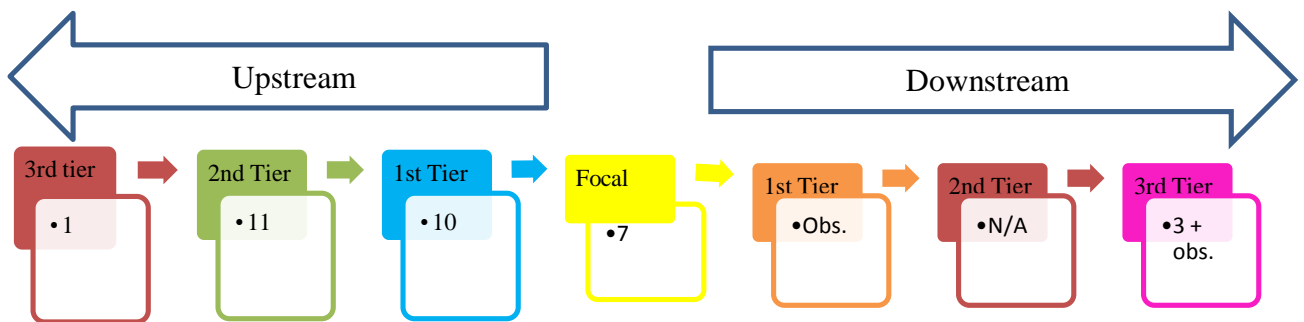


Figure 57: Number of informants in each tier of B3's supply chain

B3's supply chain is both simultaneously complex and very well structured. According to informant #40, "One of our [B3's] main challenges is to manage our internal resources to meet our increasing demand. Due to the complexity of our supply chain, which includes a large number of SKUs and a large portion of our products with a short life cycle, we need to work very close to our suppliers in order to do that". Figure 58 illustrates the network representation of B3's supply chain.

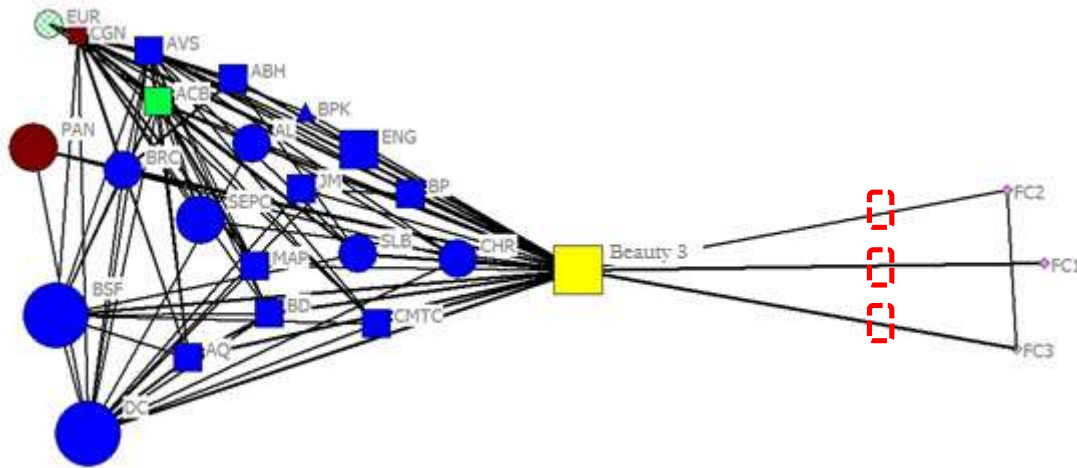


Figure 58: Network representation of B3 supply chain

B3's upstream supply chain is one of its greatest strengths. "We have some venture partners with whom we have been dealing since our first product was launched, in other words, we have some suppliers who are the same for more than 25 years" (Informant #33), illustrating the strong ties that B3 has with its suppliers. B3 organizes its suppliers into direct and indirect suppliers. The direct suppliers are those whose products or services are directly related to final product manufacturing. Indirect suppliers, "deal with anything else, from TV commercials to employees' health plans" (Informant #33)

B3's direct suppliers include chemical, packaging, and service suppliers. Chemical suppliers primarily provide ingredients and fragrances. Packaging suppliers supply material or services related to primary and secondary packaging. Examples of service suppliers include those that provide decorations on the bottles and boxes. Informant #33 describes B3's supply chain of direct supplies as "simpler to be managed" when compared to its supply chain of indirect supplies. One explanation is related to its numbers, "While we have no more than 300 suppliers for direct supplies, we have more than 5,000 active possible suppliers for indirect supplies" (Informant #33), making the development of strong ties difficult. Although B3 has a large

number of suppliers, they are organized by strategic criteria, which are: what and with whom we want to focus? Is this supplier strategic for us? Are we a strategic client for this supplier? Answering questions like these, B3 was able to organize its strategic supply base into 42 strategic suppliers for direct supply (among about 300 possible ones), and 32 strategic suppliers for indirect supplies (among more than 5,000 possible ones). This made the development of strong ties with its strategic suppliers much more feasible.

According to Informant #40, B3's supply chain is "complex and long", however, what we found in our research was that B3's supply chain was complex and rather compact, compared with the other supply chain that we studied. By compact, we mean that we found many more first and second tier suppliers, compared with third or fourth tier suppliers. The reason for this is linked to the fact that B3 buys its supplies more directly from the firms it deals with, no matter whether that supplier is a multinational firm with plants in more than 100 countries or it is a local long-term supplier.

Figure 59 highlights the upstream network representation of B3's supply chain.

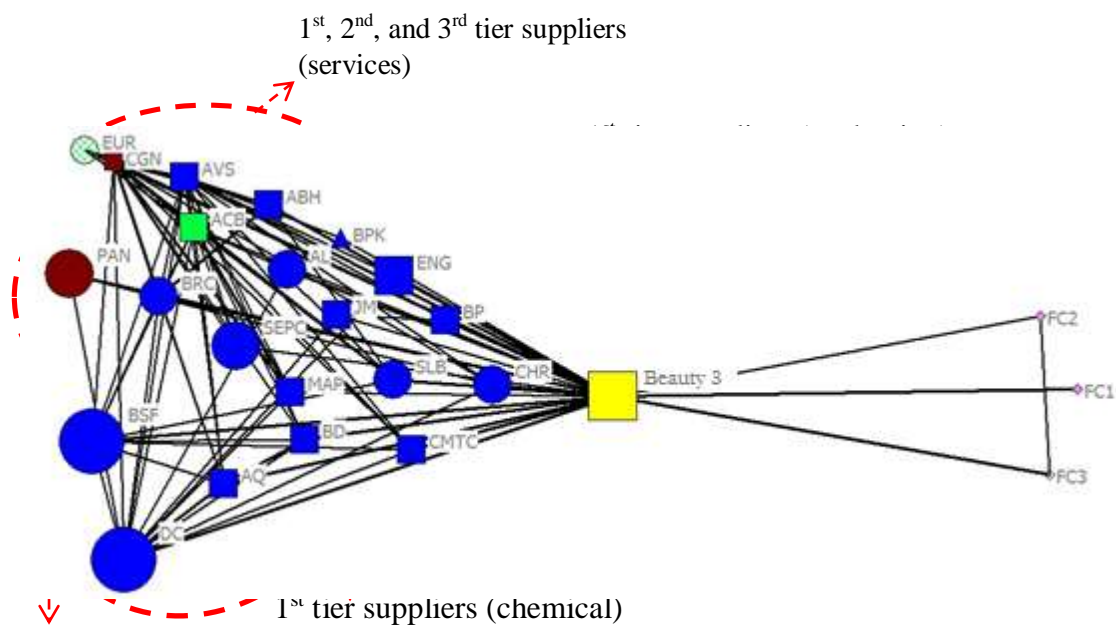


Figure 59. Upstream (chemical) illustration of B3's supply chain

Downstream, B3's supply chain network illustrates high dispersion. Almost 4,000 of B3's sales units can be found in more than 1,750 towns all over Brazil, with 22,000 employees. B3 has about 900 franchise owners, some of whom have been with B3 for more than 30 years, while others are in the second or even third generation of the same family in the business. "It is a very good business. Many of our franchisees start with one store and then open another one, and another one, and so on. They also prepare their kids to become the new entrepreneurs" (Informant #64).

Different from the upstream characteristics of B3's supply chain, which is very international, B3's downstream supply chain is mostly local. Although B3 has stores in ten countries besides Brazil, its main operations are in Brazil, and as noted by one of its executives, "We do not have any intention to go international for the next few years" (Informant #40). The reason stated for this decision was related to Brazilian internal marketing characteristics and opportunities.

"Besides Asia, all the other countries in world are either stagnated or growing in a very low rate. If we take that in consideration, Brazil is just behind China in terms of growing in the market. Everybody wants to come to Brazil. We have seen a huge movement of many international companies coming to Brazil because of our internal marketing. We already have this. We are the [beauty products] leaders here [in Brazil] by far. In other words, we are in the position where many other cosmetics companies in the world would like to be. Why would we go international now? There is no reason for that now and nor in a couple years" (Informant #40).

It is also important to note the 3rd tier buyers' characteristics. B3 has been able to develop a very significant and desirable brand. Its products are desired by a very large range of customers representing different ages and genders. "I love its perfume that looks like my tennis shoes", said a teenage customer. "It is quite impressive how many B3 bags and boxes we may see under our Christmas tree every year" said Informant #84. If you do not know what to buy or how to please someone, just enter a B3 store in a mall and you will, for sure, find something interesting" (Informant #86).

Figure 60 illustrates the downstream representation of B3's supply chain.

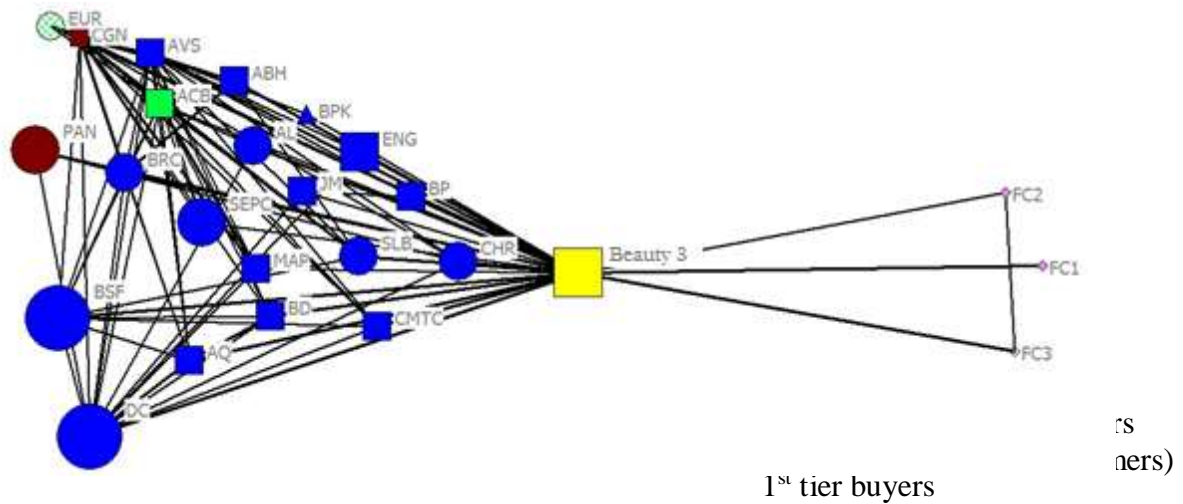


Figure 60: Downstream network illustration of B3's supply chain

4.1.3.4 Case Six: Beauty 4 (B4)

B4 is a Brazilian cosmetics and beauty products manufacturer. It was founded in 1969, and in 1974 it adopted the direct sales model that it uses today. One of its main characteristics is the natural appeal in the essence of its products and production processes. B4 is widely recognized for its care for its environmental impact and its focus on natural-based and ethically sourced products. In 2014 B4 had more than 1.7 million “consultants” (resellers), also called “B4 Ladies”, spread throughout Brazil, Argentina, Chile, Colombia, France, Mexico, and Peru among others. B4 grew to become the leader in cosmetics sales in Brazil and in 2004 it became a public firm, listed on the São Paulo stock exchange. Since 2006, B3 has surpassed Avon's sales in Brazil and is the sixth biggest direct sales firm in the world (Direct Selling News, 2015). Since 2013, however, B3 has lost its position as the biggest cosmetics firm in Brazil to B4.

Together with B3, B4's supply chain is one of the biggest and most complex in the researched supply chains. B4 has more than 6,600 direct employees and many other thousands through its resellers. It has more than 5,000 different suppliers for packaging, chemicals, and services, with a special attention to 33 local communities in specific areas, such as Amazon rain forest, where B4 has close relationships (strong ties). We investigated seven tiers of B4's supply chain, which include B4 plus three levels of suppliers and three levels of buyers. Although we separated the first tier buyer from the focal firm, it is important to note that this person is an employee of B4. However, due to the fact that she is not directly involved with the firm and her area job was much closer to one of a middleman, we separated this tier. To understand more about B4's supply chain, we interviewed 40 informants in different tiers of its supply chain. We also performed observations in two of its sales meetings (see Figure 61).

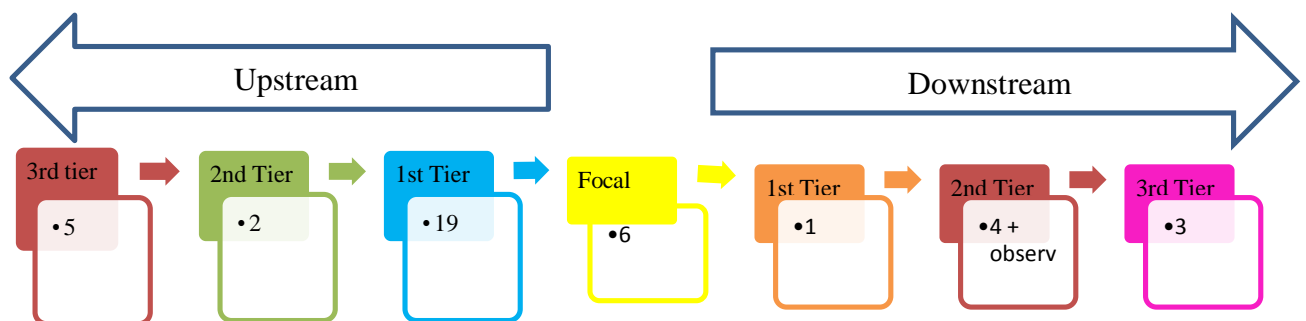


Figure 61: Number of informants in each tier of B4's supply chain

B4's supply chain is very complex and extended. Due to B4's natural appeal in the essence of its products, it has to pay very close attention to its suppliers and basic raw material producers, which includes a high degree of traceability requirements. These requirements have been emphasized during the last few years, especially due to regulatory reasons that will be further

discussed in section 4.2.3. B4's supply chain is illustrated in Figure 62 and provides reference for illustration of B3's upstream and downstream supply chain.

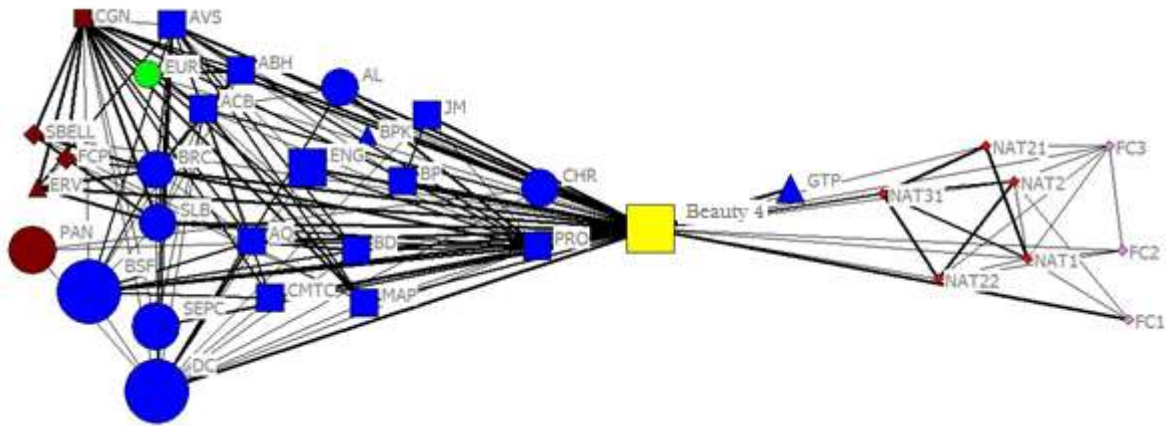


Figure 62: Network representation of B4's supply chain

Upstream, B4 organizes its suppliers in a manner that is analogous to what B3 does. B4 calls its main categories productive and non-productive suppliers. Both categories include sub-categories for packaging, chemicals, and services. The productive suppliers are those whose supplies go directly into the composition of the final product. Although B4 has a very large number of suppliers, about ten percent (~500 suppliers) represent about 70% of the volume purchased by B4.

A great number of suppliers for B3 and B4 are basically the same, thus we focused attention on two distinct groups, the local communities for raw material supplies and outsourced manufacturing plants. The local communities for raw material supplies are small groups of individuals, usually families, who live in distant locations of Brazil and are responsible for the harvest of fruits, flowers, and seeds that compose the Brazilian biodiversity. Access to these communities is very challenging for geographical and logistical reasons, however, B4 has developed strategies to keep its relationship with them as close as possible. In 2014, B4 had

close relationships with 33 communities, 25 of which supplied ingredients used in B4's products. These communities include about 3,100 families who are directly impacted by B4's actions. These families are required to send detailed information about what is being planted and harvested and how it was done. B4 uses iPads and other tablets to allow these families to send the needed information, including pictures. There were strategic reasons behind this, not just because B4 has strong roots in the Brazilian biodiversity, but especially due to regulatory requirements. There is a Brazilian law (MP 2186/2001) that requires traceability of each Brazilian biodiversity ingredient and that the profit from the use of these ingredients is shared with the farmers and communities. We will discuss more about this law and its impact on B4 and other supply chains in Section 4.2.3.

The outsourced manufacturing plants are also an important part of B4's service suppliers. They are placed among the productive suppliers and are strategically selected. The reason why B4 uses some outsourced manufacturing plants is mostly due either to overloaded capacity in its own plants, or due to specialized needs such as makeup, nail polishes, samples, or different sizes for specific products. We will discuss further details about the relationship between B4 and one of its main outsourced plants in Section 4.2.2.2. Figure 63 provides the upstream network representation of B4's supply chain.

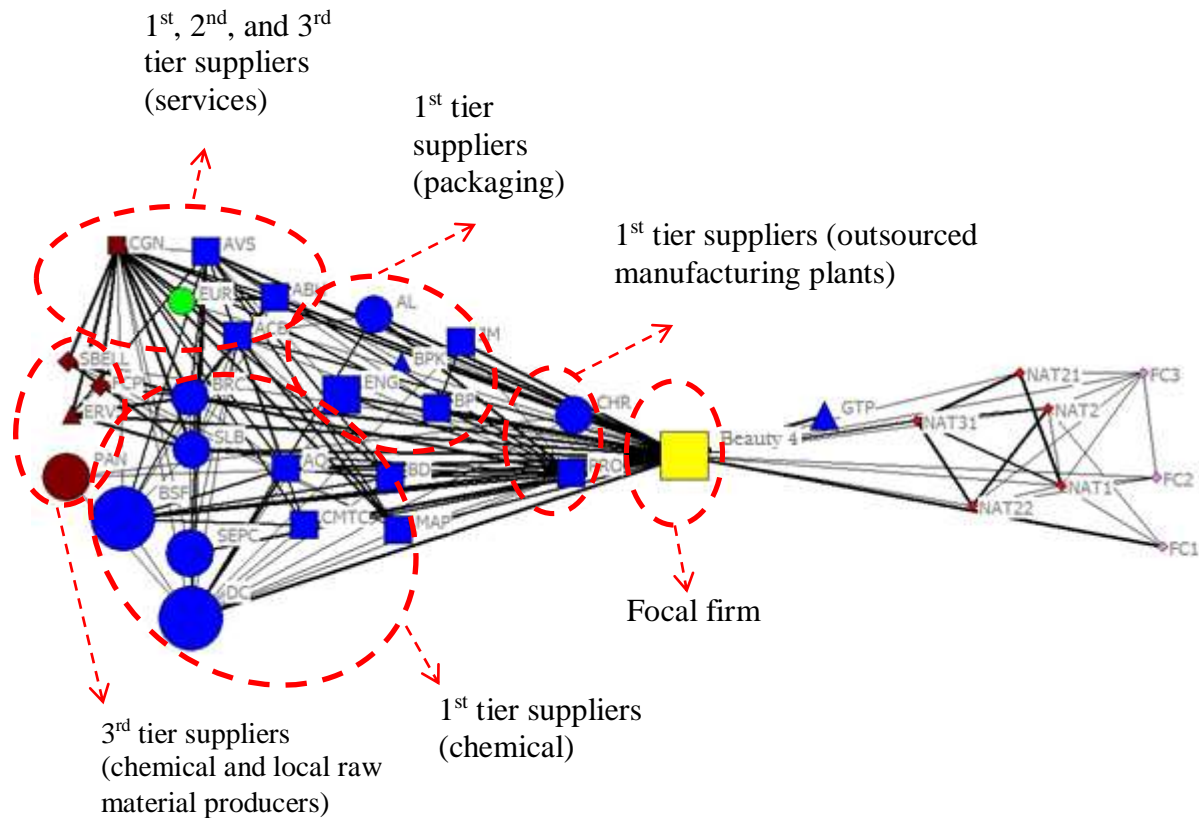


Figure 63: Upstream network representation of B4's supply chain

B4 invests a substantial part of its resources in its downstream supply chain, where logistics and transportation play a very important role. In order to attend to purchasing orders from its resellers, B4 has eight distribution centers and third partner logistics (3PL) spread across strategic geographical areas in Brazil. “We are offering our best level of service in B4's history” (Informant #81). According to B4's annual report (2014), on average 60,000 purchasing orders are picked and mailed per day, and 38% of all deliveries are made in less than 48 hours. Thus, although a distribution center is a first tier supplier in service as a third party logistics provider (3PL), we placed it in the downstream direction of the supply chain, due it being closer to the customers.

B4 uses a direct sales model with a multi-level compensation structure. It has a regional director who is responsible for a specific geographical area. “Usually, a regional director is responsible for about 600 B4 ladies” (Informant #100). This regional director is a B4 employee, however he or she (usually she) is always in her own geographical area and does not participate in hardly any B4 decisions or processes. “We are employees because of legal requirements of the Brazilian law, but we act much more as a middlemen” (Informant #100). Below the regional director comes the B4 ladies’ coaches. They are usually long term B4 ladies who start to build their own network of B4 ladies, and in direct connection with the final customers, there are the B4 ladies. Even if a final customer wanted to, he or she would not be able to buy a B4 product directly on the internet or from any other retail channel; B4 products can only be purchased through one of the B4 ladies. B4 places a lot of value in its 1.7 million B4 ladies, but it understands that the same model adopted in early 1970’s will need to be improved for the 21st century. In December 2014, 15,000 “digital B4 ladies”, as they were called, started virtual businesses.

Although B4 invests a lot of resources in its direct sales channel, it has been losing both B4 ladies and total sales. The reasons might be related to other competitors’ sales models, as stated by informant # 90.

“I have been working with B4 for more than 10 years now. It helps me to pay some of my bills, but not a lot. I saw some friends, some of them who were even B4-ladies’ coaches, however, leaving B4 and joining MaryKay. One of them actually might be considered rich now, she drives the pink car, which would not had happen to her if she had continued to work with B4” (Informant #90)

Figure 64 illustrates B4’s downstream supply chain network.

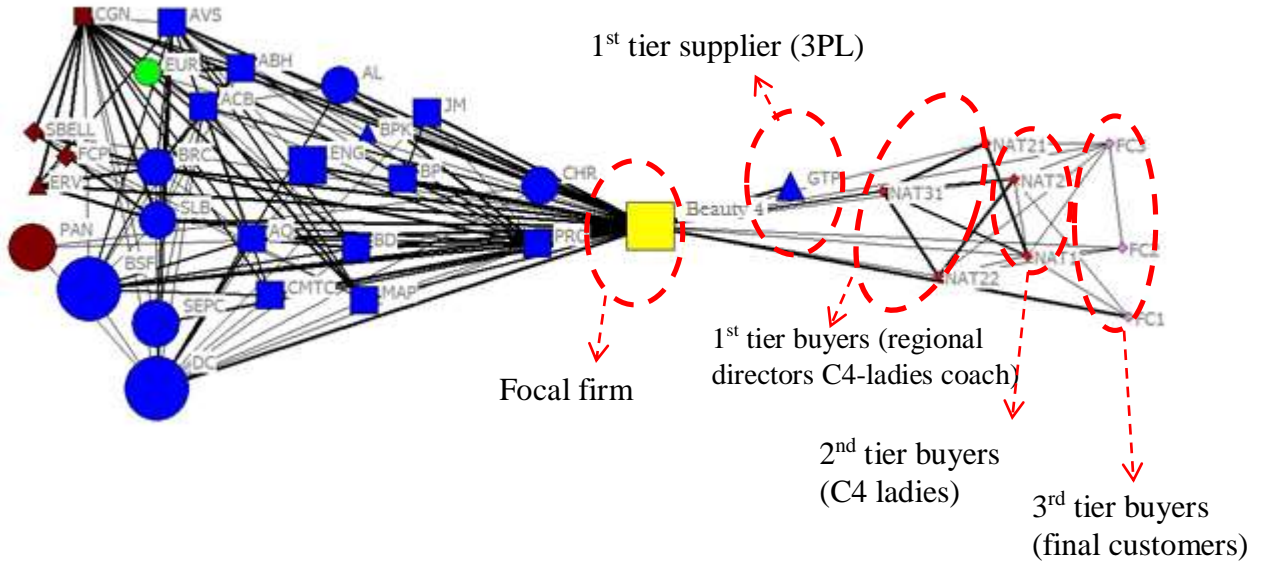


Figure 64: Downstream network representation of B4’s supply chain

4.1.4 Identified Mid-Range Events

Not all events in a source firm will have impacts on member of its own or other supply chains. During this research, six mid-range events that had impact beyond its source organization and which are depicted in Table 31.

Source Case	Mid-range event	
D1	1	Acquisition by an investment group
	2	Event in the marketing and sales director
	3	Event in sales model
B1	4	Commercial disagreement
	5	New projects allocation for specific supplier
Gov	6	Legal event - MP 2186/2001

Table 31: Identified mid-range events

4.2 Cross-Case Analysis: Dissemination of the Impact of Events in Multi-tier, Multi-Dimension Supply Chains

This section aims to fulfill the third secondary goal for this research, which was to **investigate and analyze the dissemination of the impact of a mid-range event over real multi-tier, multi-dimension supply chains in micro, macro, and integrated contexts**. This supports the answer for our research question: “Why and how does the impact of an event in a focal firm affect other members of its own and other supply chains?” We used the data collected as described in Chapter 3 with supply chains as our unit of reference as described in Section 4.1.

In this section, our unit of analysis was a mid-range event and its impact. We analyzed six mid-range events. Five of them were initiated in one of the researched focal firms and one of them was initiated in a government agency. We start each case presentation with a brief explanation about the focal firm, and the main other involved firms. Following the initial information, we present the proposition(s) that will be discussed in the following paragraphs. We analyze each event individually. We focus on a mid-range event and its impact in the source firm itself and on other firms in its supply chain or in other supply chains (see Table 32).

Source Case	Mid-range event		Upstream	Downstream	Perpendicular	TOTAL
D1	1	Acquisition by an investment group	2	2	-	4
	2	Event in the marketing and sales director	1	2	-	3
	3	Event in sales model	2	3	1	6
B1	4	Commercial disagreement	3	3	1	7
	5	New projects allocation for specific supplier	3	-	2	5
Gov	6	Legal event - MP 2186/2001	-	7	-	7
		Total number of impacted tiers	11	17	4	32

Table 32: Tiers impacted by each mid-range event analyzed in this section

4.2.1 Events in D1's Supply Chain

In this section, we discuss six mid-range events that occurred in D1's supply chain. These events began in 2010 when an investment group bought D1. This event led to several other decisions, which led to other events, which led to other decisions and events as well, and so on. The fact that D1 was bought by an investment group impacted a series of other events, such as the hiring of executive professionals, financial and operational investments, the establishment of new processes, rules, procedures, policies, and implementation of new software, among others. Some of these events impacted directly D1 and links in its upstream and downstream supply chain, while others did not.

We are aware that in real complex multi-tier, multi-dimension supply chains, decisions are not made independently of each other. However, to help isolate specific cause-and-effect relationships, we investigated each of the events and its impact separately, to the extent possible. At the end of this section, we discuss other events, from which we could not perceive any impact.

4.2.1.1 D1 Acquisition by an Investment Group

As described in section 4.1.2.1, D1 is a medium size Brazilian dermocosmetics firm, which had been the market leader in products for beauticians and estheticians until the early 2000's. Over the last decade, it experienced several periods of financial crisis. Even after its financial and market struggles, it was still considered one of the three major dermocosmetics firms in the Brazilian market (Copernico, 2012). In the fall of 2010, an investment group bought D1. For this event, we discuss the applicability of two propositions, which are P6: The Ripples Effect and P1: The Pity-Pat Effect. We discuss the propositions in this sequence so that the story behind the case illustrates its evidence.

P6: The Ripples Effect

The following paragraphs give support for P6: **The Ripples Effect**, which states that *an event in a focal firm may impact other tiers in the same supply chain or in other supply chains (perpendicular direction)*. The acquisition had a great impact on D1, both financially and operationally. Financially, because D1 had much greater financial resources, it was able to make new investments, which included investments in R&D, marketing, strategically hiring new employees, and investments in equipment and inventory for raw material and packaging supplies. Operationally, due to a series of investments, D1 built its own manufacturing plant to improve its production levels in terms of quantity and quality. However, the acquisition event was not universally well received within D1. Some individuals who had been working for D1 for many years did not agree with it and resigned. D1 experienced about 50% turnover of its plant employees during the first 12 months following its acquisition by the investment group.

D1's acquisition by the investment group also had impacts in D1's upstream and downstream supply chain. Downstream, it impacted the first, second, and third tier buyers. Upstream, the D1 acquisition impacted the first and second tier suppliers. It impacted different firms in each of the tiers. In total, we could perceive an impact in 18 different firms beyond D1, which is shown in Table 33.

Related to the extent of the impacts, we perceived an impact in both directions, upstream and downstream. Downstream, all of the five franchises researched were greatly impacted. It also impacted the second tier buyers, because with the substantial investments that had been made by D1 since 2010, the franchises could improve their service for their clients (beauticians and estheticians). Examples include having all the products available in the store, avoiding stock outs and lateness in the delivery process for them. The final customers were also impacted by the acquisition of D1, as well. After the investments had been completed, D1's final customers had better product availability in more franchise stores, as well as on the Internet.

Case One: D1's Acquisition by an Investment Group								
Focal Firm	Impacts (Upstream - Suppliers)			Impacts (Downstream - Buyers)			Perpendicular	TOTAL
	1st Tier	2nd Tier	3rd Tier	1st Tier	2nd Tier	3rd Tier	(Competitors)	
D1 (6)	7SOL(1)	EUR (1)	Not perceived	D1FRA(2)	ECUDI(2)	FinCust(2)	Not perceived	
	ACB (2)	DC (2)		D1UDI(11)	ECARI(2)			
	ABH (2)	BSF (1)		D1BA(2)				
	BD (2)			D1ST(1)				
	SEPC (3)			D1SO(1)				
	BPK(1)							
	CMTC(2)							
Total Firms	7	3	-	5	2	1	0	18 + D1
Total Informants	13	5	-	17	4	2	0	41

Table 33: Informants and firms impacted by D1's acquisition

Upstream, the first and the second tier suppliers' effects were mostly related to D1's new ability to make its payments on the due dates without a struggle. Thus, these investments, which allowed the event to have an impact in different tiers on D1's supply chain, provided support for P6, as stated below, which is illustrated in Figure 65.

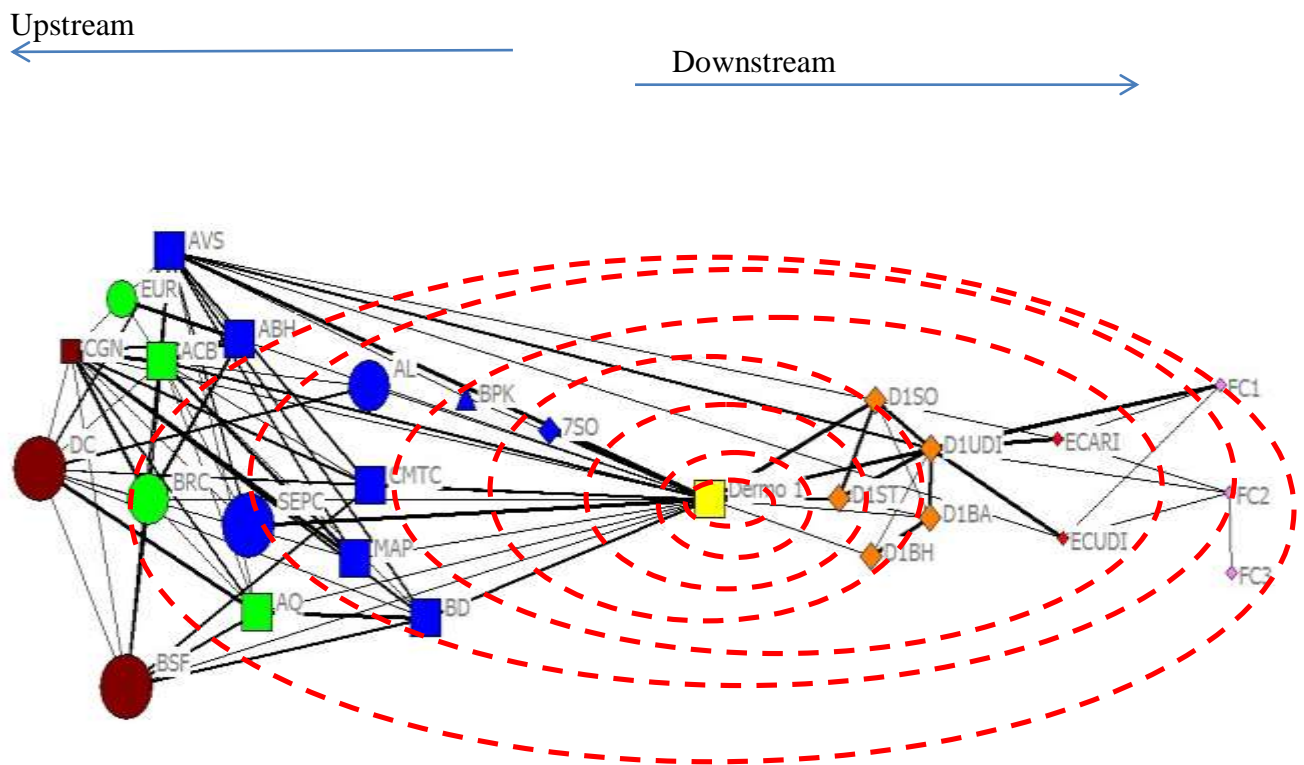


Figure 65: Ripples Effect illustration for D1's acquisition

P6: The Ripples Effect Principle. An event in a focal firm may impact other tiers in the same supply chain or in other supply chains (perpendicular direction).

P1: The Pity-Pat Effect

Next, we describe how this event provides support for **P1: The Pity-Pat Effect principle**, which states that *the closer tiers in a supply chain will experience a stronger impact of a mid-range event, which decreases for the farther tiers*. Related to the intensity of the impacts of D1's acquisition by the investment group, the first tier buyers were the most strongly impacted. This happened because the great majority of D1's franchises were a single brand store, many of them with more than 30 years of relationship with D1. In other words, everything that impacted D1 would directly and strongly impact them, too. We also perceived a great impact for first tier suppliers due to the new way of negotiating and ability to fulfill promises in terms of financial commitments. The next most substantial impact was upon the second tier buyers, the franchise's clients, followed by the second tier suppliers, and finally the third tier buyers, who were the final customers. We did not perceive impacts in the next links or tiers. This phenomenon is illustrated in Figure 66 and Table 34 and provides evidence for the following proposition:

P1: The Pity-Pat effect principle. The closer tiers in a supply chain will experience a stronger impact of a mid-range event, which decreases for the farther tiers

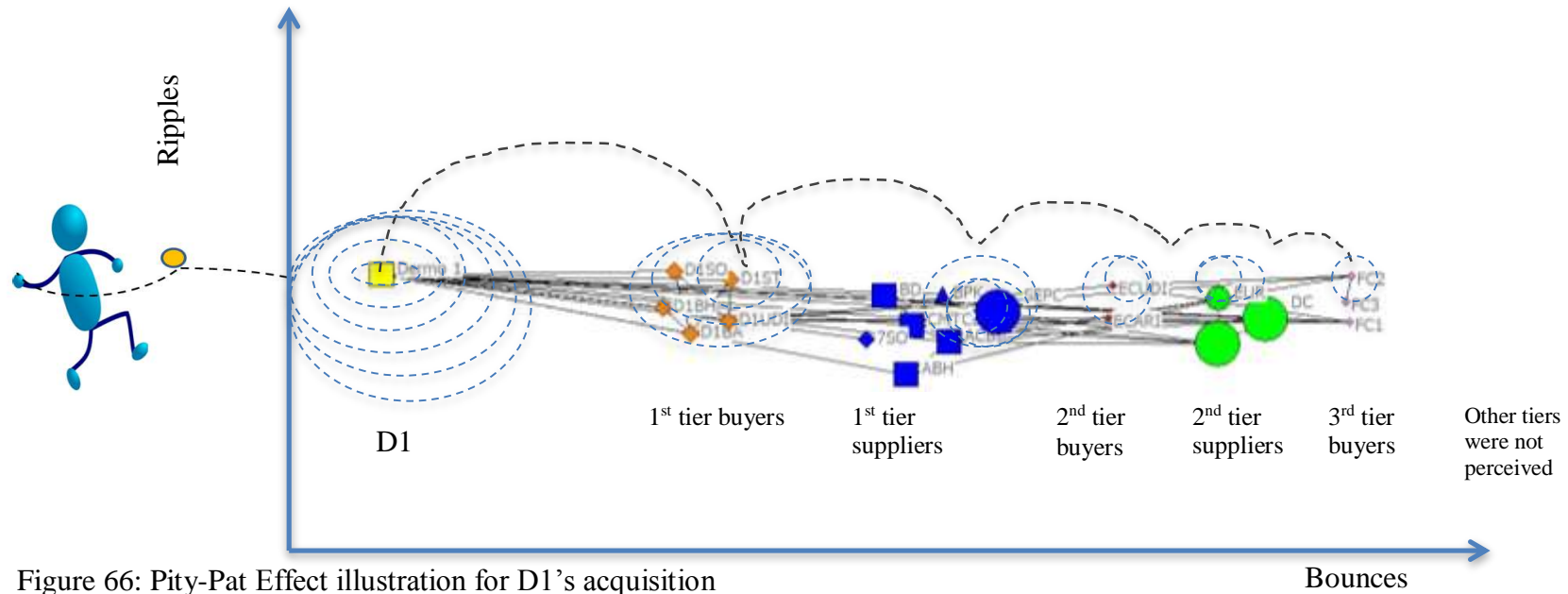


Figure 66: Pity-Pat Effect illustration for D1's acquisition

Source Firm	1 st Tier Buyers		1 st Tier Suppliers		2 nd Tier Buyers		2 nd Tier Suppliers		3 rd Tier Buyers		Other Tiers
Dermo 1	D1SO	*****	7SOL	*****	ECUDI	**	EUR	*	FC1	*	Not perceived
	D1ST	*****	BPK	***	ECARI	**	DC	*	FC2		
	D1 UDI	*****	BD	***			DOW	*	FC3		
	D1BA	*****	CMTC	***							
	D1BH	*****	SEPC	**							
			ABH	*							
			ACB	*							

Table 34: Pity-Pat Effect for D1's acquisition

4.2.1.2 D1's New Marketing and Sales Director

This event also occurred in D1's supply chain, as an impact of the event discussed earlier (D1's acquisition by an investment group). For this change in the marketing and sales director, we will discuss the applicability of three propositions, which were P6: The Ripples Effect, P1: The Pity-Pat Effect, and P3: The Magic Angle Principle, which are discussed in a sequence where the story behind the case illustrates its evidence.

P6: The Ripples Effect Principle

The following paragraphs give support for **P6: The Ripples Effect Principle**, which states that *an event in a focal firm may impact other tiers in the same supply chain or in other supply chains (perpendicular direction)*. About one year after D1 was acquired by the investment group, a recent marketing manager was promoted to be the new marketing and sales director. This event led to several impacts in the focal firm, as stated by Informant #5, "Just one change, which is our new [marketing and sales] director, many other changes [impacts] were promoted in our firm". These impacts were seen in different areas and departments. The departments of marketing and sales, of course, were highly impacted. The employees working in these areas moved together with the new director into several new projects, including the redesign of the packaging for more than 300 products and the launch of a new sales model, among others. Both internally and externally, this event led to simultaneous challenges and opportunities. Internally, one of the first impacts that was seen was related to production and operations. Due to the redesigned packaging and visual appearance for so many different products, employees in purchasing, R&D and manufacturing had to develop new processes and new suppliers. Many

of the manufacturing employees did not deal well with the new time and productivity pressures and resigned from their position at D1.

Upstream, many of D1's packaging suppliers were no longer able to meet the new standards, especially regarding time, quantity, innovativeness and quality. D1's operations and supply chain staff had to develop new suppliers. In doing so, D1 ended its relationship with several suppliers, and at the same time, had to begin new relationships with other suppliers. Downstream, all five franchises were also impacted. They mentioned impacts on their store space and their inventory. "The displays in my store are much more beautiful and attractive to the customers now" (Informant #24). The new packaging became also a way to encourage experimentation with new products by both the second and third tier buyers, which increased sales (Informant #27). Simultaneously, D2 was impacted by the change in D1's marketing and sales director, "We are growing in a rhythm so fast that is bothering our competitors. I've heard from one of our suppliers that D2 scheduled a meeting with its board of directors to discuss what we've been doing here to sell so much" (Informant #5). Thus, overall, we saw impact of the new marketing and sales director in five tiers, one upstream, three downstream, and one perpendicular, which was a direct competitor (see Figure 67). Table 35 presents the impacted firms and the number of informants interviewed in each, supporting the following proposition:

P6: The Ripples Effect Principle. An event in a focal firm may impact other tiers in the same supply chain or in other supply chains (perpendicular direction).

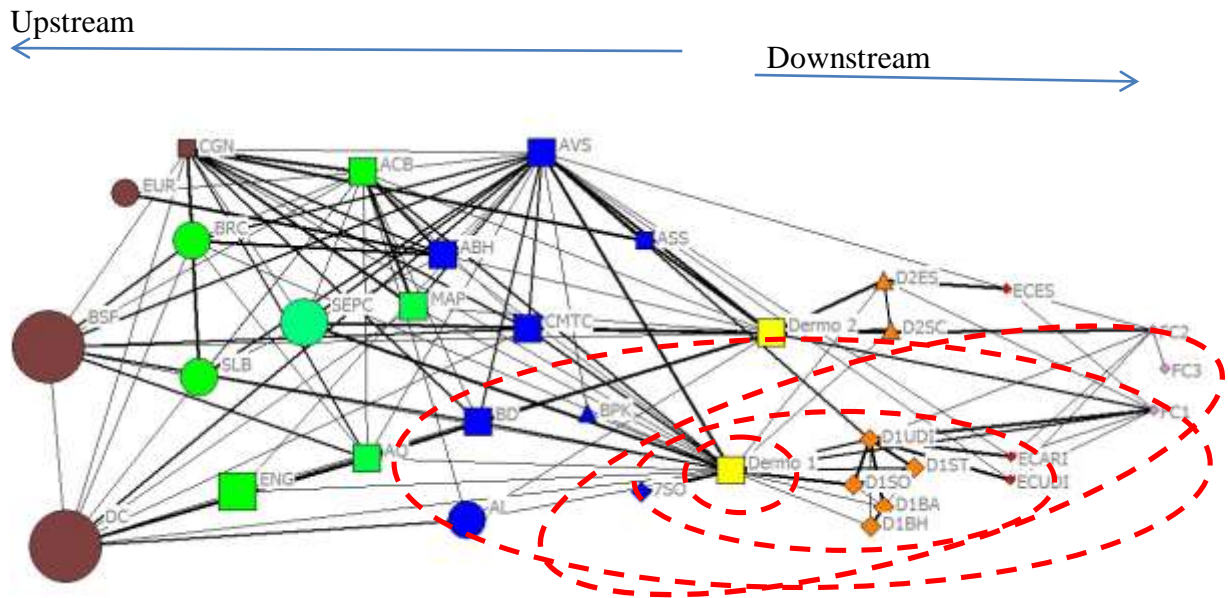


Figure 67: Ripples Effect illustration for D1's change of marketing and sales director

Case Two: Event in Sales and Marketing Director								
Focal Firm	Impacts (Upstream - Suppliers)			Impacts (Downstream - Buyers)			Perpendicular	TOTAL
	1st Tier	2nd Tier	3rd Tier	1st Tier	2nd Tier	3rd Tier	(Competitors)	
D1 (6)	7SOL(1)	Not perceived	Not perceived	D1FRA(2)	ECUDI(2)	FinCust(3)	D2 (8)	
	BPK (2)			D1UDI(11)	ECARI(2)			
	ACB (2)			D1BA(2)				
	CMTC(2)			D1ST(1)				
				D1SO(1)				
Total Firms	4	-	-	5	2	1	1	13 + D1
Total Informants	7	-	-	17	4	3	8	39

Table 35: Informants and firms impacted by D1's event in marketing and sales director

P1: The Pity-Pat Effect Principle

This change also provides support for **P1: The Pity-Pat effect principle**, which states that *the closer tiers in a supply chain will experience a stronger impact of a mid-range event, which decreases for the farther tiers*. Although we observed impacts in different tiers, both upstream and downstream in D1's supply chain, with the new director and the redesign in the packaging for more than 300 products, the impacts were not the same in each tier. The most impacted were at the franchise level (the first tier buyers). We also observed impacts in some of the first tier suppliers, especially those related to packaging services. We also perceived impacts in the second tier buyers, third tier buyers, and finally, some impact in D2, which is one of the D1's strongest competitors. We did not observe impacts in the next links or tiers. This phenomenon is illustrated in Figure 68 and Table 36, providing evidence for the following proposition:

P1: The Pity-Pat effect principle. The closer tiers in a supply chain will experience a stronger impact of a mid-range event, which decreases for the farther tiers.

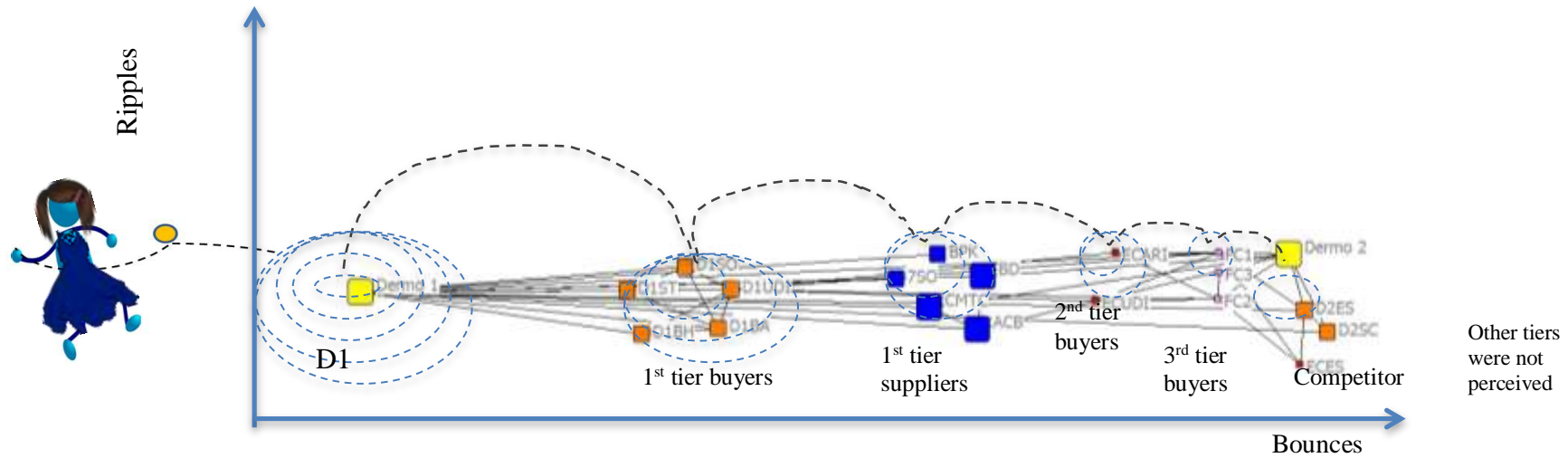


Figure 68: Pity-Pat Effect for D1’s new marketing and sales director

Source Firm	1 st Tier Buyers		1 st Tier Suppliers		2 nd Tier Buyers		3 rd Tier Buyers		Competitors		Other Tiers
Dermo 1	D1SO	*****	7SOL	*****	ECUDI	**	FC1	*	D2	*	Not perceived
	D1ST	*****	BPK	***	ECARI	**	FC2	*	ECES	.	
	D1 UDI	*****	BD	**			FC3		D2ES	.	
	D1BA	*****	CMTC	**					D2SC	.	
			ACB	*							

Table 36: Pity-Pat Effect of D1’s new marketing and sales director

P3: The Magic Angle Principle

The following paragraphs give support for **P3: The Magic Angle Principle**, which states that *even a low level of personal heuristics, biases, and locus of control will influence the impact of an event over supply chain*. Although D1 was a dermocosmetics firm, what we saw in the redesign of most of its products did not translate the image associated with dermocosmetics. Informant #1003, who used to be a D2 third tier buyer, did not know about D1 and decided to Google its name. Her reaction, when she saw the images for D1 was, “It [D1] looks like ‘creminhos’¹⁴”. The same informant went further to state that, “This packaging [D1’s] reminds me of another brand, which is the Xline from B4...” Based on Informant #1003’s comment about the similarities between D1’s new packaging design and B4’s Xline products, we printed both images and asked three final customers interviewed for this research and five other informants from one of D1’s franchise store (Informants 54, 28, 1005, 27, and 26) about them. We showed both images and asked the informants to value them in terms of their recollection from zero (no remembrances) to ten (almost equal). On average, they said that both images were about 70% related to each other.

It is important to note that D1’s new director of marketing and sales was a former B4 marketing and sales executive, who worked several years for B4. When we pay attention to the design of the new packaging of D1’s products, although we are aware that lots of financial and marketing resources were invested, it is possible to note that some of this new director’s experiences as a former B4 employee may have been directly applied to the design of this packaging. This may also be because the same suppliers were considered in the selection of new venture partners.

¹⁴ “Creminhos” can be translated into small creams or lotions, but in this case, the informant used the expression to indicate an undervalue she perceived in the brand due to the colorful appearance of its packaging.

This offers evidence for the influence of some heuristics and biases. For example, the fact that the new director unconsciously chose a pattern for shapes and colors for D1's products that were similar to those for B4's products is an example of the availability heuristic, since her experience was still vivid in her mind. Also, even though the marketing and purchasing team considered several different suppliers, the selected ones were those with which Informant #4 had had previous contact; this is an example of salient information and status quo bias. Illusory correlation was illustrated by the fact that, even though most of the dermocosmetics packaging tend to be more clean and more "medication like", the new director chose a very colorful and curvilinear pattern for D1's dermocosmetics. This illustrates the misconception of the regression bias and the representativeness heuristic. We also perceived insufficient adjustment and illusion of control, when the new director started an entirely new process in D1 based on her previous experience in B4. The two firms were very different in target marketing and channel distribution, so applying similar strategies to such different realities and believing that if they worked in one reality they would work in the other one, are examples of the illusion of control and anchoring and adjustment heuristic. These support the following proposition:

P3: The Magic Angle Principle. Even a low level of personal heuristics, biases, and locus of control will influence the impact of an event over supply chain.

4.2.1.3 D1's New Sales Model

This event also occurred in the supply chain for Dermo 1, as an impact of the event discussed earlier, the start of the new marketing and sales director. This director developed a new direct sales model for D1. For the impact of the direct sales model, we discuss the applicability of five propositions, which were P3: The Magic Angle Principle, P4: The Lift Force Principle, P2: The Gyroscopic Effect, P6: The Ripples Effect, and P5: The Kinetic Energy Principle. The propositions are discussed in a sequence so that the story behind the case illustrated its evidence.

P3: The Magic Angle Principle and P4: The Lift Force Principle

The following paragraphs give support for **P3: The Magic Angle Principle**, which states that *even a low level of personal heuristics, biases, and locus of control will influence the impact of an event over supply chain*. They also offer support for **P4: The Lift Force Principle**, which states that *the impact of a mid-range event is proportional to its impact on individuals in the supply chain links*.

D1's proposed direct sales model was inspired by some other cosmetics firm's sales models, especially beauty product firms that sell directly from the manufacturing plant to individual salespeople (usually women), and then to the final customers. This director, who used to work for B4, brought her experience and applied it to D1 with some additional considerations. Because D1's main target customers are estheticians and beauticians, D1 developed this sales model for them, in a way that the only individuals who would be able to sell D1's products

were the estheticians, who became salespeople with the benefitted from a great markup. Sales were increased a lot, “Because of the direct sales, our sales increased more than 300% in 18 months” (Informant #5).

The impact of this new sales model was mostly perceived in the focal firm and its downstream supply chain. In the focal firm, several processes needed to be redesigned in order to make it happen. At the same time, a huge amount of work needed to be done with the franchisees, D1’s 1st tier buyers. The goal was to help them understand all the beneficial possibilities that the new direct sales model could provide them and the estheticians, in terms of sales and profits. The impact on the franchisees was manifested in different forms, such as increasing sales, in some cases by about 50% (Informants #24, #25, # 88, and #54), or even more than 100% (Informant #53). It also impacted the way that the franchisees hired and paid their employees, their goals for sales, the buyer and supplier relationship (franchise store-esthetician), sales and purchasing processes and volume, among others.

Inventory and financial impacts were also observed for 1st tier buyers, “We liked the new sales model; some change was needed. However, they [D1] created a lot of new products and kits for us to sell. What am I going to do with my old inventory? I have to buy the new ones [products and kits], no matter how many of the old ones I have in my inventory. Who is going to pay for that?” (Informant #25) From the five franchise owners interviewed for this research, we observed indications of their locus of control. Two of them (Informants #46 and #48) exhibited external locus of control, as can be indicated by the following statements, “You know, I’ve been working with D1 for more than 20 years, and I like things the way they are. I know we lost some market share, but that is because of the competition, there is not much we can do by ourselves in this respect. The market is what it is” (Informant #46). “I tried to do

whatever I could, but I just don't agree with this new model, and on top of that, the company [D1] wants us to do all the hard work, they want that we go on the market and fight for the customers; that should be their job" (Informant #48). On the other hand, other franchise owners (even if they did not totally agree with it) did not question the value of the new sales model. They decided to follow the guidance and do their job, as can be noted in the following, "When we buy a franchise, we need to trust our franchiser, I trust mine. I know they invested lots of money in this project and they want us to sell more, because if we [the franchisees] do not sell, they do not sell as a consequence either. I am doing my job and encouraging all my team to do the same" (Informant #54).

The four franchise owners who had the internal locus of control had success in their stores with the direct sales model implementation. The same was not true to the two franchise owners who had external locus of control. One of them (Informant #48) had already been cut from the D1 franchise chain and was in the process of closing his store. The other one (Informant #46) had been losing market share for several years and was in the process of evaluation of whether or not it would be allowed to continue with D1. Another informant (#54) shared that he had been approached to check his interest in establishing a store in Informant #46's area, which he interpreted as a sign that Informant #46 was to be cut soon. These offer support for the following propositions¹⁵:

P3 "The Magic Angle Principle": Even a low level of personal heuristics, biases, and locus of control will influence the impact of an event over supply chain

and

P4 "The Lift Force Principle": The impact of a mid-range event is proportional to its impact on individuals in the supply chain links.

¹⁵ Appendix G presents with the main heuristics and biases observed for the events analyzed in this research.

P2: The Gyroscopic Effect Principle

Next, we cite evidence that supports **P2: Gyroscopic Effect Principle**, which states that *a combination of personal social influence and strength of buyer and supplier relationships will significantly contribute to the extent of the impact of a mid-range event over a supply chain.* Because of the obstacles against the new sales model, individual roles became even more important in the dissemination of its impacts over D1's supply chain. The new director of marketing and sales, who was Informant #4, had a substantial amount of personal social influence herself, as exemplified in Section 4.3.2. Another good example of personal social influence was observed in the role of Informant #54, who was one of the franchise owners interviewed for this research. In terms of reciprocity, he urged both his employees and peers to adopt the new sales model as quickly as possible, stressing that now it was the time for them, the franchisees, to work hard and make it happen with their customers. Consistency was triggered through the idea that each sale, each day, and each person were important. He established tools to follow the performance of each of his salespeople and shared them with his peers, the franchise owners in other areas of Brazil. This also showed commitment, since he made public what his goals were and what he was doing to achieve them. Social proof was perceived in both formal and informal ways. Formally, D1 invited some already successful franchisees (i.e. Informants #88 and #54) to come to training sessions and group meetings to tell their peers about the success they had experienced using the new sales model. Informally, during these meetings and after them, Informant #54 talked to several of his peers encouraging them to work hard, using his own example to show that it was worthwhile. This one on one relationship and the empathy perceived in these conversations also triggered liking between

Informant #54 and his peers, highlighting his personal social influence. This offers support for the following proposition:

Proposition 2 (“Gyroscopic Effect” Principle). A combination of personal social influence and strength of buyer and supplier relationships will significantly contribute to the extent of the impact of a mid-range event over a supply chain.

P6: The Ripples Effect Principle

The following paragraphs give support for **P6: The Ripples Effect Principle**, which states that *an event in a focal firm may impact other tiers in the same supply chain or in other supply chains (perpendicular direction)*. Regarding to the extent of the impact of the direct sales model in D1, its second tier buyers (the estheticians), were also significantly impacted. The estheticians had to try to think and act differently about their professional roles. In the past, they had been only concerned about how well they performed their services for their clients (body and face treatment). Under the new sales model, they were now supposed to encourage their clients to buy their daily dermocosmetics from them. The 3rd tier buyers (final customers) were also impacted by the events in the sales model, since they were able to have access to more appealing D1 products in more places.

The marketing and sales director in this case remained in her position for about 30 months. During that time, she and her team were able to implement many changes and start lots of

others. Even after she left the firm, the changes she had initiated continued to impact D1 (the focal firm itself) and other tiers, including its franchisees (1st tier buyers), direct suppliers (1st tier suppliers), and even its competitors. In the focal firm, the new team used some of the former director's strategies to continue to improve the direct sales model. On the franchisees' side, they kept the employee structure for fulfilling direct sales needs. As a continuous impact for the 1st tier suppliers, we observed that her new standards for supplier selection remained. An impact even farther, over a competitor's supply chain, was observed through the information that one of D1's major competitors had scheduled a meeting with its board of directors to discuss improvements that it would need to implement on its own sales strategies due to "market movements". This was also evidence of the importance of the weak ties in the dissemination of the impact of an event over a supply chain. Thus, we observed that the local context "touched" or impacted by the event will keep changing even after the event itself had moved to another link or even "sunk", supporting P6: The Ripples Effect principle proposition, as shown below and illustrated in Figure 69.

Proposition 6 (Ripples Effect Principle): An event in a focal firm may impact other links in the same supply chain and in other supply chains (perpendicular direction).

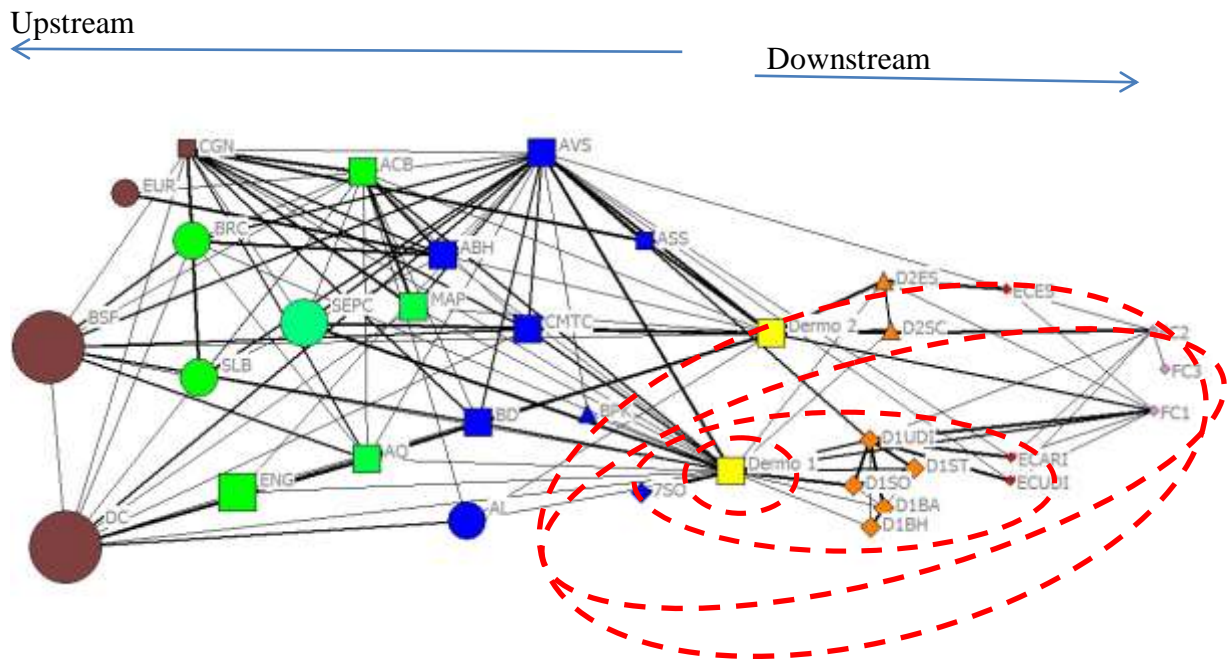


Figure 69: The Ripples Effect illustration of D1's new sales model

P5: The Kinetic Energy Principle

In the new sales model, we also observed indications that support **P5: The Kinetic Energy Principle**, which states that *the impact of a mid-range event may create its own power and keep impacting other supply chain links beyond the source, even if the initiators try to stop it.* The director, who had initiated and implemented the change in the sales model, left the focal firm about 30 months after she initiated this event. The fact that she was not in the firm anymore did not prevent the change she had initiated from continuing to impact both the source (D1) itself and its supply chain. We performed another round of interviews and visited D1 and its franchisees two months after the director had left D1. We observed that impact of the direct

sales model was still being felt and implemented among the franchisees. In addition, some of the franchisees' employees put in continuing effort to keep it expanding. "I know that D1 is reviewing if this [direct sales] model is really applicable to all the stores. But I will keep doing the way they proposed before, that is the way it makes sense for me and my customers" (Informant #27). This supports for the following proposition:

Proposition 5 (The Kinetic Energy Principle): The impact of a mid-range event may create its own power and keep impacting other supply chain links beyond the source, even if the initiators try to stop it.

As additional support for P5: The Kinetic Energy Principle, we will illustrate its concepts using the physics formula for kinetic energy. The kinetic energy of an object mass (m) is given by: $KE = \frac{1}{2} m \cdot v^2$, where m is mass and v is velocity. In our analogy detailed in Section 2.4, mass equals the urgency of an event and velocity, which in stone skipping is combination of linear and spin velocity, equals power, which is a combination of source firm power and individual personal social influence.

For an event to have other impact in a supply chain beyond its source, its urgency (mass) needs to be high. Although high urgency in this research is a qualitative construct, we will assign it a value in order to place it in the KE formula. Thus, we will consider that a "high" urgency event will have a value ranging from 7 to 10 in a 0 to 10 scale. The new sales model implementation was perceived by an "8" in terms of urgency since it presented a good amount of deadline control and awareness of time, in other words, the faster it was implemented, the higher the possibilities for increasing in sales and profitability.

Source firm power needs to be medium to high for an event to have greater impact in a supply chain. In this case, we will consider a value ranging from 5 to 10. D1 cannot be considered a very powerful organization, because of its size and purchased volume. In this case, the source firm power number for D1 will be 5.

Personal social influence needs to be high to help stabilization and further impacts of the event in a supply chain. This was true in the case of D1, as explored earlier in this section. Thus, we will assume that the personal social influence of D1's individuals was a 9. Thus, substituting the proposed numbers into the kinetic energy formula ($KE = \frac{1}{2} m \cdot v^2$), we have:

$$KE = \frac{1}{2} (8) \times (5+9)^2 = 784$$

We are aware that this value does not exactly express anything in an absolute sense, however, it is helpful in illustrating D1's kinetic energy, relative to other firms. This supports the applicability of P5 and reinforces the role of the personal social influence in the dissemination of the impact of an event over a supply chain. Figure 70 illustrates the propagation of the new sales model's influence over D1's supply chain, even after the new director was no longer with D1.

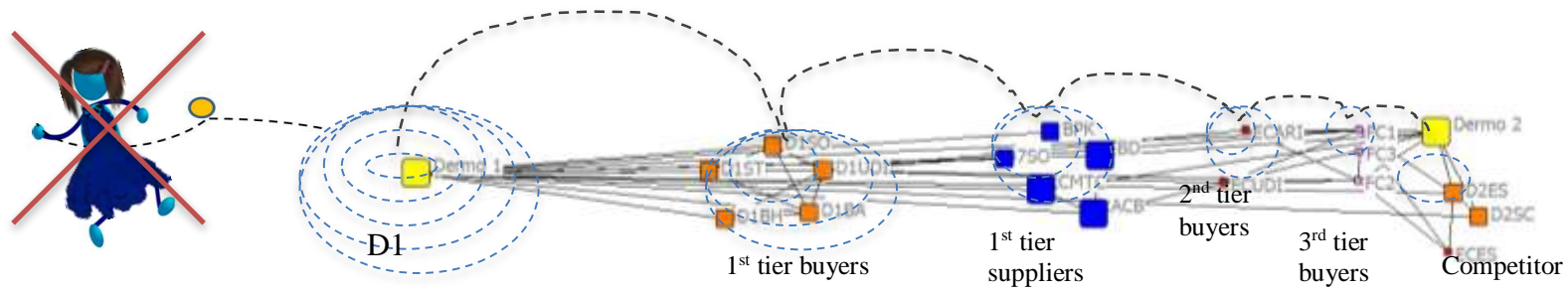


Figure 70: Kinetic Energy principle illustration for D1's new direct sales model

4.2.1.4 Other Events in D1's Supply Chain: No Impact Perceived

We described several events above, for which we could identify an impact in D1's supply chain. However, other events were also implemented at the same time by D1. We identified several other events that did not have any impact in D1's supply chain. One example was the hiring of a new OM director. This person was personally selected and hired by the president of the investment group that bought D1 (high source firm power). He was a very capable person with almost two decades of experience as an OM manager and director at another beauty products firm in Brazil and with very good relationships, both within and across firms (high personal social influence). He, too, initiated several mid-range events. We interviewed the new OM director twice and also made a tour of D1's plant with him. He also provided several good other contacts to be interviewed. However, we did not perceive any impact of his decisions and implemented changes in D1's supply chain. One possible explanation might be related to extent of the changes that he implemented. As described previously, an event whose impact is disseminated in a supply chain should not be totally immersed in the source firm, analogous to a stone that is able skip on the water that should be just partially immersed (see Figure 71), otherwise it will sink.

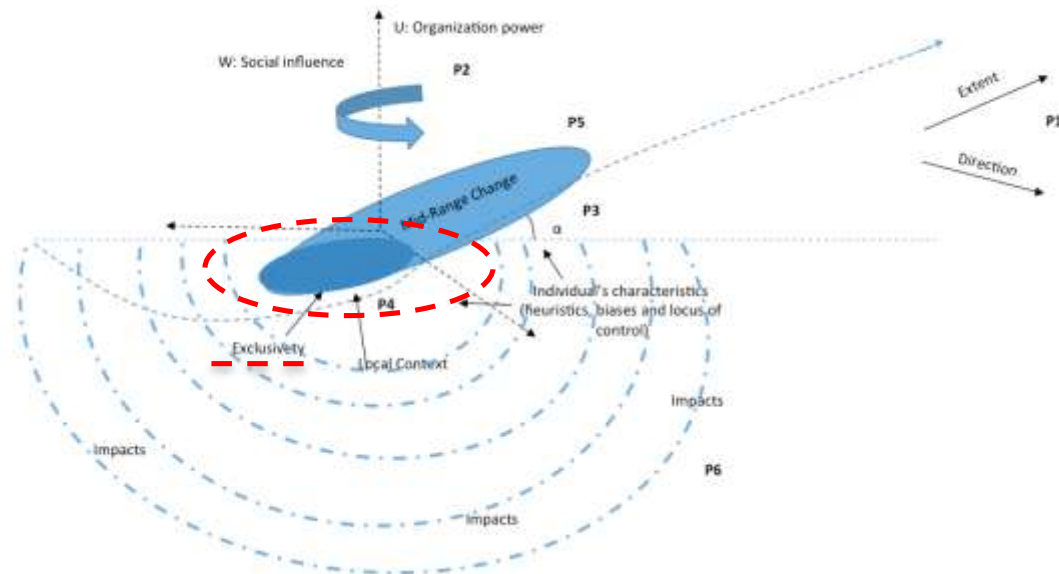


Figure 71: Illustration of the exclusivity of the event

Although the new OM director implemented several important changes, they were mostly related to the focal firm itself. Examples include the reorganization of the manufacturing process, layout of machines, review of production flow, and development of new inventory strategies, among others. Although these are important events, they mostly impact the focal firm and have little or no impact on the immediate tier's buyers or suppliers. Thus, their impact was not disseminated through the supply chain.

4.2.2 Events in B1's and Adjacent Supply Chains

The following mid-range events were initiated after a commercial disagreement between one of the focal firms (B1) and one of its outsourced manufacturing plants in Brazil, which we are calling PRO. This commercial disagreement impacted not just the two firms directly involved, but also some of their supply chain tiers and also directly involved another focal firm (B4). In the next paragraphs, we explain the background that led to these events and their impacts.

PRO is a cosmetics outsourcing firm in Brazil, which had produced for different firms for more than a decade. After three years of negotiations, intense and thorough quality and technological evaluations, PRO became the first firm certified to produce for B1 in Brazil. According to PRO's CEO, this certification was a "great quality endorsement and special victory for PRO."

A couple weeks after certification, B1 and PRO began their actual business relationship. PRO needed to increase its purchase volumes from its core suppliers, especially those related to B1's products, which were almost all international suppliers. Also, PRO's employees and board of directors feel very proud of itself, since it was then B1's core Brazilian outsourcing partner. It increased its production, hired more employees and increased its shifts in order to take care of B1's demand. PRO also had to say "no" to other potential customers, due to the fact that it was very busy with B1's production.

Due to Brazilian legal constraints and the fact that B1 did not have an actual manufacturing plant in Brazil, its contract with PRO was required to be a "full service" contract. In full service contracts, the outsourcing firm is responsible for everything, including the purchasing of chemical ingredients, raw materials, and packaging supplies, up to the payment of federal and

state taxes and fees. During the contract negotiation time, B1 could directly participate in the process of choosing and selecting the suppliers, analyzing their quality, and performance. However, once the full service contract had been implemented, B1 was not allowed to buy its material separately, send it to the outsourcing firm (PRO) and pay for the outsourcing service itself. The contract between B1 and PRO needed a well-managed cash flow from the outsourced firm, in our case PRO. The process is shown below:

1. B1 selects its preferred suppliers;
2. B1 notifies PRO what materials and from which suppliers it wanted PRO to buy;
3. PRO purchases B1's supplies (chemical products, raw materials, packaging, etc.) from the selected suppliers and pays for them;
4. PRO manufactures B1's products, which includes the legal pre-registration, the processing itself, packaging, paying taxes and legal fees, and finally making the products available to be shipped to B1 wholesalers and retailers.
5. B1 pays PRO for its services.

Everything went very well for the first year of production. B1 then decided to have its new Brazilian brand sold in another countries as well. Because of this, B1 asked PRO to increase its production to a much larger (global) scale. PRO explained to B1 that it did not have enough cash flow to afford this new global scale, because it would have to buy everything in much larger quantities. PRO asked B1 if it would be willing to pay upfront. In other words, PRO asked B1 to pay for its materials in advance, allowing PRO to buy its materials and supplies. At this point, it is important to note that many of these materials, especially the chemical ingredients, were imported from Europe and the U.S., so some could take months to arrive at PRO's plant. Thus, PRO would need to buy most of its supplies up to six months in advance and pay for them six months in advance of receiving payment from B1. The timeline below shows the average time spent between placing the order with the international supplier and

actually receiving it at PRO. Figure 72 illustrates the timeline of the number of days for an order from a chemical supplier in Europe to arrive at PRO in Brazil.

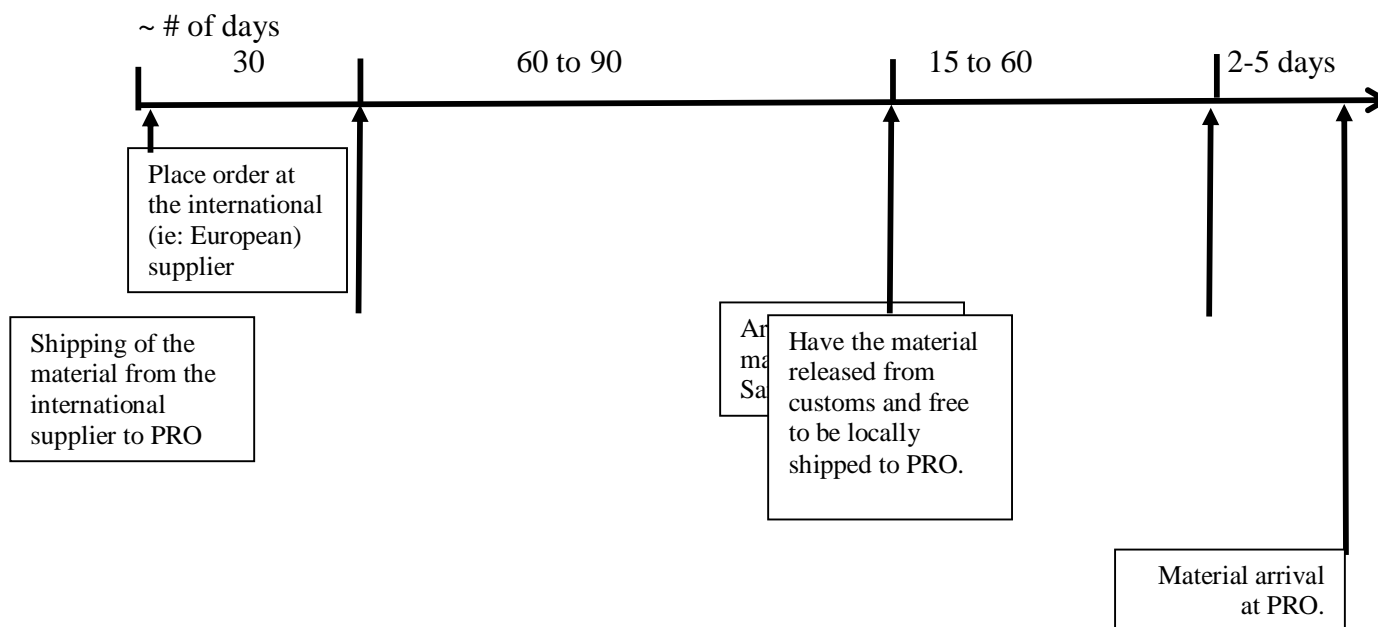


Figure 72: Timeline for imported chemical products

B1 agreed to make the payments in advance and PRO started B1's production for the global market. Everything was going well, until a few months after the update of the contract for expanding production, in fall 2013. B1's Brazilian office contacted PRO and said that it could not afford these upfront payments anymore and that B1's headquarters in France did not want to make them anymore, due to the fact that it was not in B1's commercial policies. At this point, a commercial disagreement between PRO and B1 started.

4.2.2.1 B1: Commercial Disagreement

In this section, we analyze the impacts of the commercial disagreement that occurred in the fall of 2013 between B1 and PRO. In analyzing the impacts of this commercial disagreement, we selected 33 informants from 17 firms. Table 37 shows the label codes for the researched firms in each one of the links in B1's supply chain, as well as the number of informants in each firm. For this event we discussed the applicability of two propositions, P6: The Ripples Effect Principle and P1: The Pity-Pat Effect, which are discussed in a sequence illustrates the evidence.

Event: Commercial Disagreement between B1 and PRO								
Source	Impacts (Upstream - Suppliers)			Impacts (Downstream - Buyers)			Perpendicular (Competitors)	TOTAL
	1st Tier	2nd Tier	3rd Tier	1st Tier	2nd Tier	3rd Tier		
B1 (1)	PRO (6)	BSF (1)	FCP (1)	Probably*	Yes*	Yes (1)	B4 (3)	
	ACB (2)	BRC (1)	MAN (1)					
	ABH (3)	DC (2)	SBELL (1)					
	MAP (3)	ENG (1)						
	SEPC (3)	EUR (1)						
		SLB (3)						
Total Firms	5	6	3			1	1	16 + B1
Total Informants	17	9	3	-	-	1	3	33

* We did not interview anybody from B1's first or second tier buyers, so all the data refers to secondary information gathered from other informants and document analysis.

Table 37: Informants and firms impacted by the commercial disagreement

After the notification that B1 was unwilling to continue with the upfront payments, PRO checked its contracts and realized it did not have enough safeguard mechanisms written in. B1 and PRO were not able to make an agreement to either get the businesses back or soften the losses. Thus, PRO decided to stop producing for B1 and filed a legal complaint in the court. After a couple months, PRO found itself with a loss of more than US\$ 1.5 Million, which was a very large sum considering that PRO was a mid-sized firm.

B1's inventory was still at PRO's plant during our research visit to its plant more than a year after the commercial disagreement started. The problem was that, due to legal constraints, this entire inventory, which was comprised chemical and packaging material, could not be sold or used for anything else. The initial US\$ 1.5 Million of purchases PRO made from European chemical firms was then worth a lot more due to dollar fluctuation against local currency, Brazilian interests and inflation. Informant #14, who was PRO's CEO referred to it as "A great white elephant".

P6: The Ripples Effect Principle

The following paragraphs give support for **P6: The Ripples Effect Principle**, which states that *an event in a focal firm may impact other tiers in the same supply chain or in other supply chains (perpendicular direction)*. Regarding the extent of the impact of the commercial disagreement, PRO, which had always been a very well rated and well-established firm, started experiencing serious financial problems. In less than two months after the disagreement with B1, it had about 80 unpaid bills sent to court. After about six months following this problem, PRO had gone from 180 employees to about 30. In addition, most former PRO suppliers did not want to keep selling to it any more, which made PRO's situation even more difficult. PRO

did not have either material to produce to its other clients or a way to receive revenue from them, since it did not have their production ready. Figure 73 illustrates the impacts of the commercial disagreement, both downstream, upstream, and in a perpendicular direction (competitors) and provides evidence for the following proposition:

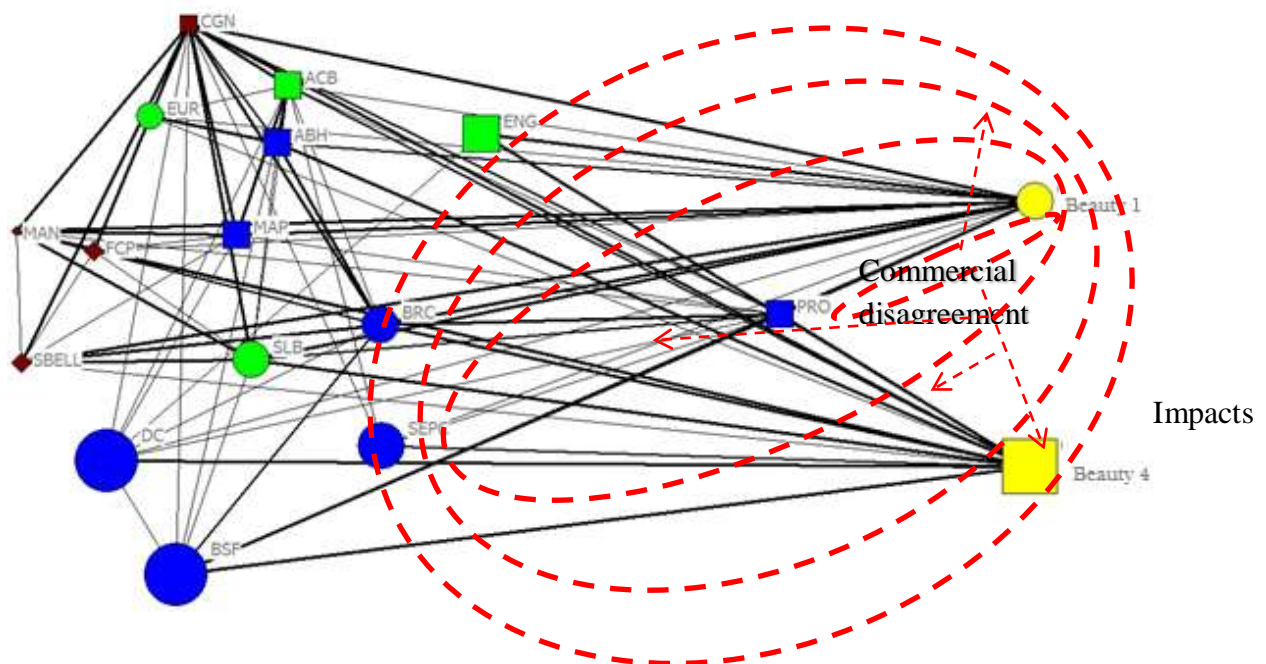


Figure 73: The ripples effect for B1 and PRO's commercial disagreement

P6: The Ripples Effect Principle. An event in a focal firm may impact other tiers in the same supply chain or in other supply chains (perpendicular direction).

P1: The Pity-Pat Effect Principle

We also observed support for **P1: The Pity-Pat effect principle**, which states that *the closer tiers in a supply chain will experience a stronger impact of a mid-range event, which decreases for the farther tiers*. The commercial disagreement occurred between B1 and one of its first tier suppliers, however it impacted several other tiers in C1's supply chain. It impacted B1's

second tier suppliers, which were PRO's first tier suppliers. Those impacts reflexively impacted B4, because PRO was not able to produce for B4 due to its lack of material. They also impacted B1's buyers, as well. We did not directly interview B1 wholesalers or retailers for this research. However, we did interview some final customers who mentioned that they observed a clued label over some of the products they bought from B1 in United States, which was related to the manufacturer.

In Table 38 we show some of the firms that were impacted by the commercial disagreement between B1 and PRO. Together with Figure 74, they illustrate the Pity-Pat Effect for B1's commercial disagreement with PRO, illustrating the support for the following proposition:

P1: The Pity-Pat effect principle. The closer tiers in a supply chain will experience a stronger impact of a mid-range event, which decreases for the farther tiers

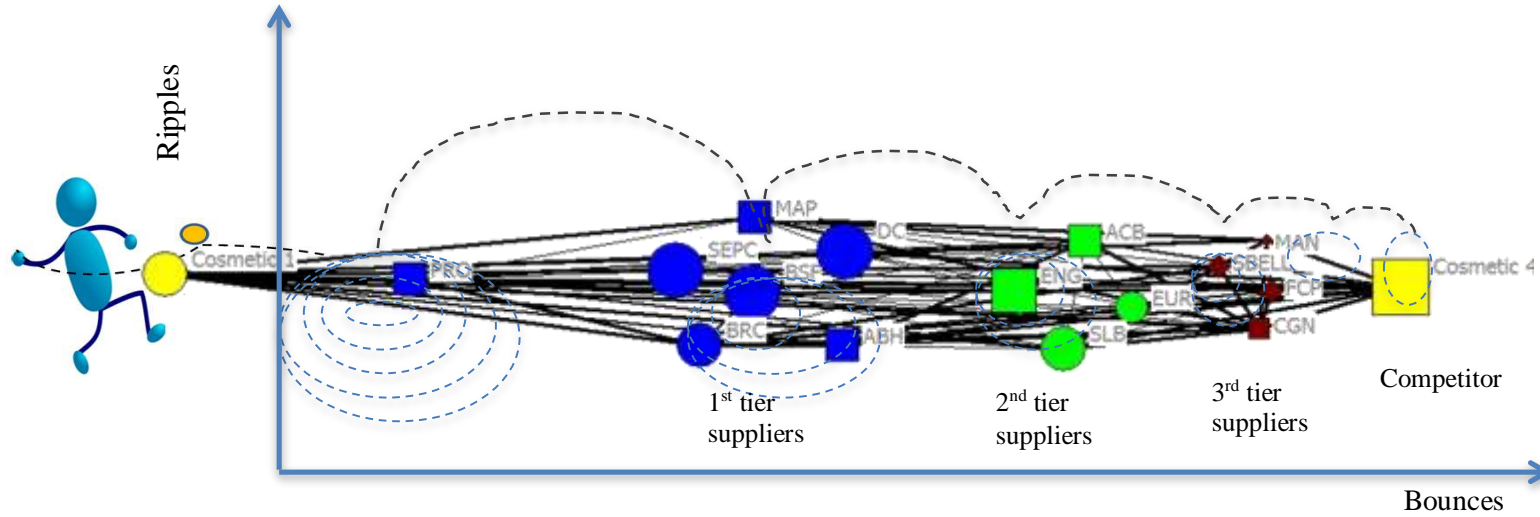


Figure 74: Pity-Pat Effect illustration for B1’s commercial disagreement with PRO

Source Firm	1 st Tier Supplier (direct)		1 st Tier Suppliers		2 nd Tier Suppliers		3 rd Tier Suppliers		Competitors		Other Tiers
	PRO	*****	MAP	*****	ENG	*****	MAN	*	B4	*	
			SEPC	*****	SLB	***	SBEL	*			Not perceived
			BSF	*****	EUR	*	FCP	*			
			DC	*****	ACB	*	CGEN	*			
			BRC	***							
			ABH	*							

Table 38: Pity-Pat Effect for B1’s commercial disagreement with PRO

4.2.2.2 B4: New Projects Allocation to PRO

In this section, we analyze a second event that occurred as an impact of the commercial disagreement between B1 and PRO. It refers to B4's allocation of new projects to PRO. For this event, we discuss the applicability of one proposition, P2: The Gyroscopic Effect.

We could clearly observe the impacts of the commercial disagreement between B1 and PRO on B4 and its supply chain. Although the commercial disagreement occurred between B1 and PRO, its impact reflexively impacted B4, as well (weak ties). It happened because PRO, which was an outsourcing manufacturing plant for B4, was not able to produce for it due to lack of material and other resources. The lack of material was happening because PRO was not able to pay its financial debts with either its suppliers or with the financial institutions with which it had relationships.

The contract between PRO and B4 was a little bit different from the one PRO had with B1. With B1, it was required to have a full-service contract as explained in Section 4.2.2.1. However, B4 could work with PRO using a basic contract for outsourcing manufacturing, since B4 also had a manufacturing plant, itself. Thus, B4 could negotiate and purchase all the raw materials and packaging from its direct suppliers, deliver those materials to PRO and then just pay for the manufacturing service itself. Although B4 could use this kind of contract, it also used a kind of "full-service" contract with some of its outsourcing manufacturers. Thus, B4 negotiated all the commercial and technical conditions directly with its suppliers, then forwarded them to its outsourcing manufacturing plant. There were several reasons B4 decided to pursue a basic contract, including that it could, at the same time, use its purchasing power to negotiate with its suppliers. However, while allowing the outsourcing manufacturer to do all

the operational management, it could save time and resources by managing fewer suppliers. At the same time, this option is beneficial to the outsourcer too because it allows better profits. The great challenge in this contract situation was that PRO had to pay for all the expenses initially and wait until the end of the process, to be paid back by B4.

P2: The Gyroscopic Effect

The event we are analyzing here is the B4's allocation of new projects to PRO. The following paragraphs give support for **P2: The Gyroscopic Effect Principle**, which states that *a combination of personal social influence and strength of buyer and supplier relationships will significantly contribute to the continuance of the impact of a mid-range event over a supply chain.*

B4 has a strict policy for evaluating the performance of its suppliers. It considers several aspects, including quality, logistics, innovation, cost, service, and relationship. In addition to a global grade, B4 evaluates what it calls the supplier's financial health. That is a very important criterion, especially for the outsourced manufacturing plants, since they are responsible for purchasing all the materials and resources to produce the final product for B4 before receiving payment. The reason for the policy is to make sure that the outsourcing manufacturer provider has no financial restrictions, in order to avoid disruptions in B4's supply chain. If a financial restriction is an issue for the outsourcer, the rule was to not use its services until the problem was fixed.

PRO was a B4 outsourcing provider and was facing a very significant financial problem. Thus the natural approach was for B4 to cut its business with PRO until its financial problems had been rectified. However, what happened was totally different from what was expected. B4 actually decided to allocate many more projects to PRO. One of B4's buyers played a very important role in this process. "I wanted to help PRO. It is a good supplier for us, with very high quality and always willing to help when we needed them. Now it needs us, and I want to help them, to keep them in the market" (Informant #60). However, PRO was in a very difficult situation, without cash flow or credit from either the financial institutions or from its suppliers. It was facing a great challenge to even keep its "doors opened". The B4 buyer in this situation, who was Informant #60 in this research, tried to directly help, but did not have the decision power to pay in advance for PRO to help it with its cash flow. On the other hand, this same buyer argued with his management team and was able to allocate more projects to PRO, even with all the financial restrictions it was facing. In addition, the B4 buyer personally contacted each of PRO's major suppliers, which were all B4's suppliers as well, and asked them to sell to PRO. Thus, this buyer personally explained part of the situation to these suppliers, reassuring them that PRO was a very good firm and that it (B4) was allocating more projects to it [PRO], thus it would be able to pay its suppliers on time. This buyer personally contacted a chain of PRO's suppliers, showing them a kind of "moral sponsorship". He had very significant source firm power, since he was representing B4, a very large and important player in Brazil's cosmetics industry. In addition, although he had very little hierarchical power within B4, he was able to bring the history of the relationship between B4 and PRO to his management team, convincing them to not follow the policy and to actually allocate more projects to PRO, helping it to fight through its financial challenges. He used his source firm power and personal social influence to help PRO to obtain financial credit from its suppliers, so that it could keep

producing. This story offers evidence for the following proposition and illustrates a good “throw”.

Proposition 2 (Gyroscopic Effect Principle): A combination of personal social influence and strength of buyer and supplier relationships will significantly contribute to the continuance of the impact of a mid-range event over a supply chain.

4.2.3 Legislation Event

“Brazil is taking great strides to implode your cosmetics, toiletries and perfumery industry. It is truly amazing the capacity of government and Congress to create legal obstacles for the business sector.”

Luiz Ricardo Marinello

The following mid-range event was initiated by the Genetic Heritage Department of the Brazilian Ministry of Environment (CGEN), which is attached to the Brazilian Institute of Environment and Renewable Natural Resource (IBAMA). The impact of the discussed event give support to three propositions, which are P5: The Kinetic Energy Principle, P3: The Magic Angle Principle, and P4: The Lift Force Principle. This event impacted many supply chains in different industries. In the next paragraphs we explain the background that led to this event and its impacts. In this case, we will, sometimes, use the real names of some firms, when we are using public data.

4.2.3.1 Legislation Event: PM 2186/2001

The event we discuss in this section is the The Brazilian Heritage Regulatory Framework 2186-16/2001, also known as the “Anti-Biopiracy Law”. PM 2186/2001 was published by the Brazilian federal government through its Ministry of the Environment in August 2001. The seven-page document has caused problems and confusion since it was published. Its original goal was to “regulate the access to the national genetic heritage, the protection and the access to the associated traditional knowledge, the sharing of benefits and access to the technology and to the technology transfer for their conservation and use” (Brasil, 2001). However, it has worked against some of Brazil’s most important industries, including agriculture, pharmaceutical, and cosmetics. The following paragraphs offer support for P5: The Kinetic Energy Principle, which states that *the impact of a mid-range event may create its own power and keep impacting other supply chain links beyond the source, even if the initiators try to stop it*. This event impacted many supply chains in different industries.

P5: The Kinetic Energy Principle

In 2010, based on PM 2186/2001, CGEN, through IBAMA, fined almost a hundred firms in Brazil, levying more than 59 million dollars in fines in a process called “Operation New Directions”. The argument was that “Brazil’s unique species have been exploited for centuries by businesses, which often make fortunes while overlooking local communities” (Erickson-Davis, 2010). Several firms were fined for not paying fair compensation to the local communities for the use of native material and the associated knowledge. One of the most

substantial fines was imposed on B4 (\$12.6 million) for allegedly including unregistered genetic materials in its products and for not properly sharing benefits with the local communities. This meant that B4 was charged with “biopiracy”. B4 appealed all of the legal actions, providing substantial evidence of what it had been doing since its foundation more than three decades earlier. B4 had been a pioneer in Brazil in reaching agreements to share benefits with traditional communities since the beginning of the firm, when almost nobody talked about these obligations, however, this episode had already caused substantial harm to B4’s reputation.

In 2012, “Operation New Directions II ” levied fines against another 35 firms, for about \$44 million, with even higher fines this time (IBAMA, 2012). The list of all fined firms is available in Appendix F, whose examples include Ambev, Avon, Bayer, Beraca, Boticario, Croda, Eli Lilly, L’oreal, Pfizer, Mapric, Merck, Novartis, and Unilever, to name a few.

Although PM 2186/2001 was created with the noble goal of protecting the local communities, it was actually disturbing not only the big players, but also worked against innocent victims like the local collectors and harvesters in the Amazon rain forest, whom it was supposed to protect (Barreto, 2012). Informant # 19 said, “I feel like we are the new colony of Brazil, the government forgets about us, what they think is not our reality”. Another thing that was not considered by the government were the desires and needs of the local communities. Informant #83 shared several situations when he tried to negotiate with different communities in Brazil, but it was not on the business terms he was used to. “The government is driving us crazy and we are crazy to negotiate and give money to these individuals, but it is hard to arrive at some place, in this case at the Caatinga, and the guy you scheduled a meeting with 30 days back was

taking a nap on a hammock at 2 PM”, said Informant #83. He also shared a story about one of his Amazon suppliers:

“One of my suppliers was a local community in the middle of the jungle, literally, about eight hours by boat from Manaus [the state capital of Amazonas]. They had a machine, which they received from EMBRAPA [another Brazilian governmental agency] that had the capacity to produce 500 liters per month of citronella oil, which was just one of the oils that we had negotiated for that community. However, they were just producing 20 liters per month. I tried hard, several times to convince the leaders of that community to produce the 500 liters that they had installed capacity for, because I had clients for each one of the other 475 liters they were wasting, and thus, losing money. This person avoided this conversation and possible agreement for several months, and then finally, he told me: ‘Doctor, let me explain something to you. There is a special way we live here. That is why we like to live in the forest. We wake up at 4:30 in the morning, and all of us go to work in the middle of the forest [harvest cupuaçu, citronella, and other fruits]. At 11 AM we come back to the village because we need to prepare lunch, take care of the kids, of our animals, and plants. We also like to take a nap and have some fun. We play soccer, another day we have our dance, and then, 5:30 PM at most we go to sleep, because the forest is too closed and it becomes dark very early. If we had to produce this amount [you] the doctor is asking, we will have to either give up enjoying some of these things I just told you, or we will have to allow more individuals to come and live in the village with us, too. I would like neither one of these options’” (Informant #83)

PM 2186 was already recognized as one of the most complicated and confusing pieces of legislation in Brazil. Because of that, several national and multinational firms, which used to buy products from the local communities in Amazon, Pantanal and other biodiverse areas in Brazil had given up. “Even when we try very hard - and we do that - we cannot fulfill CGEN’s requirements [through MP 2186], thus, instead of buying from local suppliers in Amazon rain forest, we are buying from local suppliers in Africa” (Informant #83).

MP 2186/2001 also negatively impacted research and academic institutions. As Informant #19 said on a behalf of a research foundation, “It has been difficult to work. Everything is too much over-controlled since PM 2186. Neither of us, researchers [in Amazon] have enough freedom to access the fauna and flora to do our job for several reasons, including this stuff about associated knowledge” (Informant #19).

Although PM 2186 started in 2001, and was never actually transformed in a law¹⁶, this provisional measure was able to do to Brazil what no other firm in any other country had been able to do: curb the rapid growth and development of its cosmetics industry. Figure 75 illustrates the impact of PM 2186/2001 in the researched supply chains. The star marks its initiation by the government agency. The circles are the impacted links. The dashed circles illustrate indirect impacts. The continuous circles are the directly impacted firms. The firms circled with thicker lines indicate those that were charged and fined by PM 2186/2001.

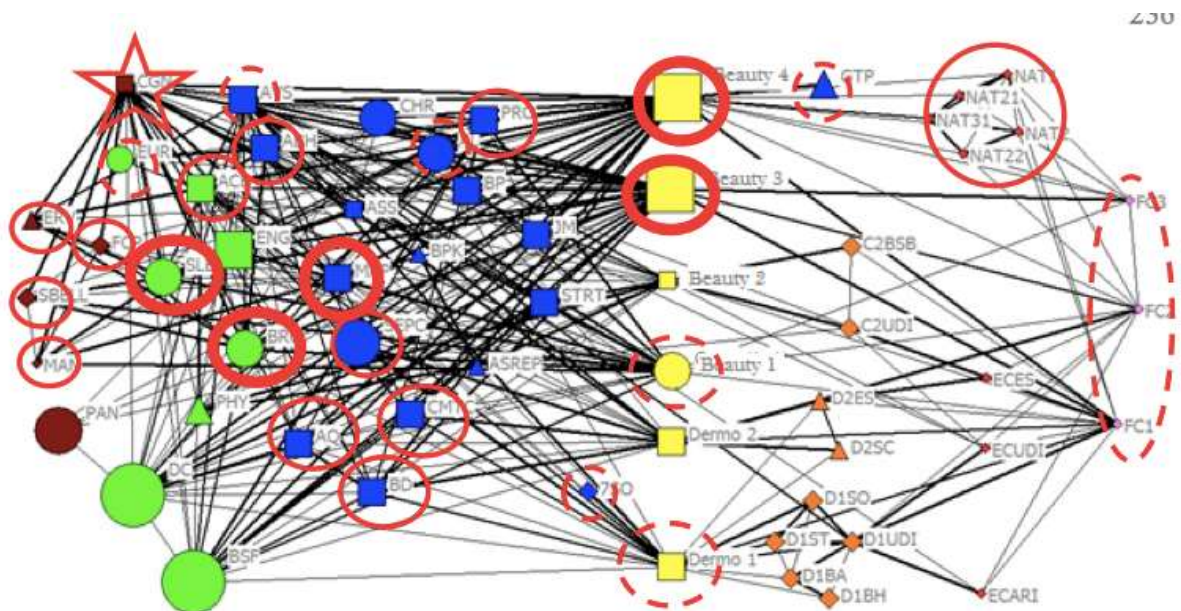


Figure 75: Tiers impacted by PM 2186/2001

In the researched supply chains, we observed impacts in all of the analyzed tiers, from third tier suppliers to final customers, in four of the six supply chains. Some firms were directly impacted, such as the one which was fined during “Operation New Directions I or II”. We also observed several other links and tiers being impacted, as a consequence, thus PM 2186/2001

¹⁶ It was finally approved as a law in May 20, 2015 by the Brazilian Government, as Law 13.120/2015. To learn more check <http://goo.gl/09CPhX>.

created its own energy. Although it was initiated by the Brazilian government with the good intention of protecting its “genetic heritage”, it has been affecting the cosmetics industries in a negative way. PM 2186 became like a monster that nobody liked, but nobody could stop its effects either. The impacts related to the PM 2186-16/2001 are still going on in Brazil, even 14 years it was initiated. PM 2186/2001 is one example of an event that created a lot of “energy” and impacted numerous supply chains links. This provides evidence to support the following proposition:

Proposition 5 (The Kinetic Energy Principle): The impact of a mid-range event may create its own power and keep impacting other supply chain links beyond the source, even if the initiators try to stop it.

As we did in section 4.2.1.3, we will use the kinetic energy formula ($KE = \frac{1}{2} m \cdot v^2$), to illustrate the energy created by PM 2186. As urgency (mass), we will assume that PM 2186/2001 was considered highly urgent by the Brazilian government agency when it was initiated. We base our assumption on parts of the analyzed data, such as, “Brazil's unique species have been exploited for centuries by businesses which often make fortunes while overlooking local communities” (Erickson-Davis, 2010). Thus, we will assign urgency a value of 10 for PM 2186/2001. Organizational power is also a 10, since we are talking about a federal governmental agency, with a substantial amount of power to initiate different events. We assign personal social influence an 8, because although controversial, PM 2186 had lots of supporters inside and outside the government, which can be seen by the fact that, despite all the problems caused by it, it is still valid. Thus, substituting the proposed numbers in the kinetic energy formula ($KE = \frac{1}{2} m \cdot v^2$), the importance of organizational power in continuing to disseminate the impact of the event is evident. This also illustrates that it has greater kinetic power than the event that we previously discussed.

$$KE = \frac{1}{2} (10) \times (10+8)^2 = 1,620$$

Figure 76 illustrates the dissemination of the impact of PM 2186/2001 over different tiers in different supply chains. Unlike the other illustrations presented in this research for the Pity-Pat Effect and the Kinetic Energy Principle, the dissemination of the impact of PM 2186/2001 did not follow a specific pattern over the supply chain tiers. For example, the Kinetic Energy illustrated in section 4.2.1.3 shows the impact going from the focal firm to its first tier buyers, then first tier suppliers, second tier buyers, third tier buyers, and so on. However, the PM 2186 did not follow a pattern of a basic structured network (supplier-focal firm-buyers). Because this event was initiated by a government agency, it directly impacted B4 and then the focal firms, first and second tiers combined, then focal firms', first, second, and third tiers combined and kept increasing its energy. It is also important to note that the network of the impacts generated by the PM 2186/2001 is denser than the earlier ones. That is because it presents a higher level of interlocking relationships (Kim, 2014). Figure 76 illustrates the dissemination of PM 2186's impact over different tiers in different supply chains, and its pattern for dissemination of the impact over the supply chains.

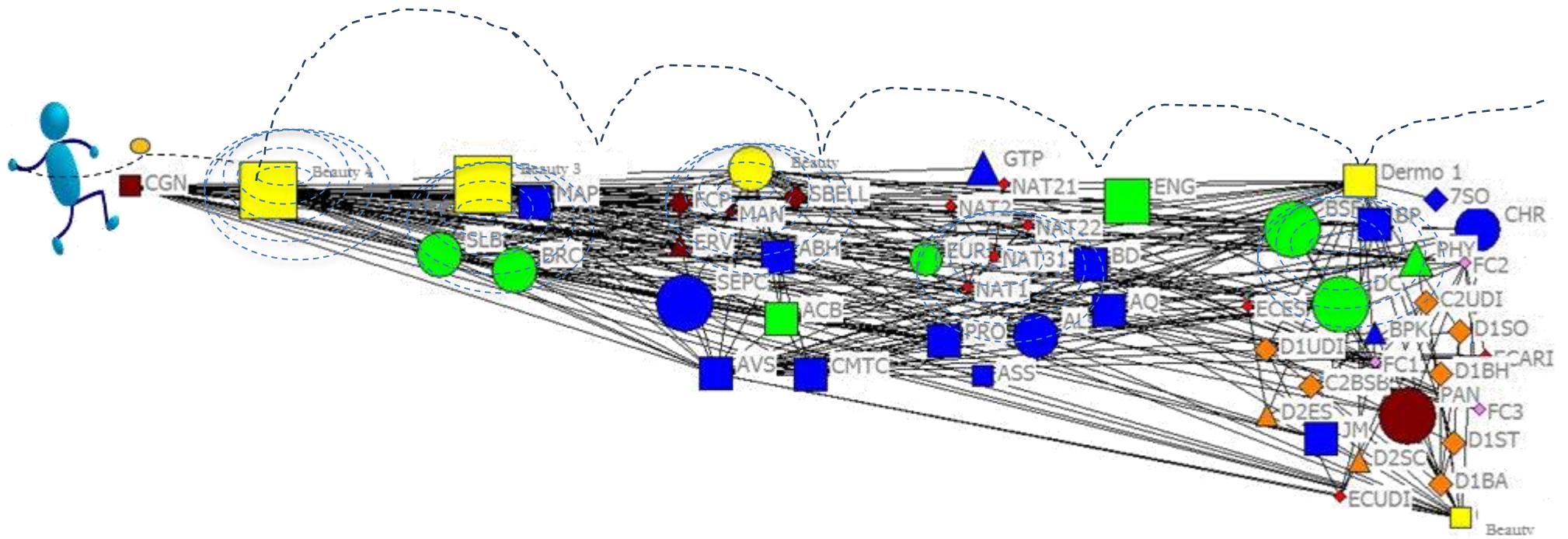


Figure 76: Kinetic energy principle illustration for PM 2186/2001

P3: The Magic Angle Principle and P4: The Lift Force Principle

The analysis of PM 2186/2001 also illustrates support for the individual influence in the event's impacts in a supply chain. The following paragraphs give support for **P3: The Magic Angle Principle**, which states that *even a low level of personal heuristics, biases, and locus of control will influence the impact of an event over supply chain*, and **P4: The Lift Force Principle**, which states that *the impact of a mid-range event is proportional to its impact on individuals in the supply chain links*.

One of the greatest problems with PM 2186/2001 was its lack of clarity. It was considered vague on many points, and thus ended up "classifying everybody as illegitimate" (Ellsworth, 2010). B4 had always taken very good care of the local communities that supplied for it. It also tried to follow all the steps required by PM 2186/2001, however, PM 2186, itself, had lots of limitations and could not give confidence to the firms that they were acting in accordance with its provisions (Informant #105).

Several articles, papers and books have been published over the last 14 years in order to try to develop an understanding and follow PM 2186 (i.e. Ferreira and Sampaio, 2011). In addition to what happened to B4, another one of our researched firms was also substantially impacted by the lack of clarity of PM 2186/2001. MAP was an important supplier in the cosmetics industry and was considered a role model for other firms for how to act correctly, in terms of the biodiversity rules. In 2012, MAP through its CEO (Informant #83) receive an award from the Environmental Ministry at a conference in Rio, which celebrated the 20 years of RIO 92, considered a very important event in regard to sustainability in the world. A couple weeks after

that event, the same firm, MAP, was charged and fined through PM 2186, accused of “biopiracy”. PM 2186 was considered inadequate by scientists and even some sectors of the Brazilian government. Several lawyers and appeals have already proved its illegality. Even though PM 2186 was just a provisional measure, not a bill, and it was ‘stopped’ in the senate in 2007, IBAMA’s president at that time, Abelardo Bayma, decided to move forward with his “Operation New Directions”, rejecting all the objections and saying that the PM 2186 was valid and needed to be used (O Globo, 2012). His decision impacted many firms in several industries, especially the cosmetics industry in Brazil. Another example of the inconsistencies with PM 2186’s interpretation can be seen in B4’s case. After being charged with 84 different infractions during the “Operation New Directions I”, CGEN’s president, himself, stepped in, to rule in favor of B4.

External locus of control was frequently perceived: “it is not my fault; I am just complying with the law”. Also several heuristics and biases were noticed, which are shown in Appendix G, with the main heuristics and biases observed for the events analyzed in this research. The analysis of PM 2186/2001 also gives support for the following proposition:

Proposition 3: The Magic Angle Principle: Even a low level of personal heuristics, biases, and locus of control will influence the impact of an event over supply chain
and

Proposition 4: The Lift Force Principle: The impact of a mid-range event is proportional to its impact on individuals in the supply chain links.

Table 39 offer a summary of the applicability of the propositions stated in Section 2.4 and investigated in this Section 4.2.

Source Case	Mid-range event: Studied Cases	P1: Pity-Pat Effect	P2: Gyroscopic Effect	P3: Magic Angle Principle	P4: Lift Force Principle	P5: Kinetic Energy Principle	P6: Ripples Effect
D1	1 Acquisition by an investment group	✓					✓
	2 Event in the marketing and sales director (redesign of packaging)	✓		✓			✓
	3 Event in sales model		✓	✓	✓	✓	✓
B1	4 Commercial disagreement	✓					✓
	5 New projects allocation for a specific supplier		✓				
Gov.	6 Legal event - MP 2186/2001			✓	✓	✓	

Table 39: Mid-range events investigated and related propositions

5. CONCLUSIONS

In this research, we aimed to understand complex multi-tier, multi-dimension supply chains, investigating why and how an event in a focal firm affects other members of its own and other supply chains. In order to fulfill this goal, we established three secondary goals, which were to identify the main elements that influence the dissemination of the impact of a mid-range event over a supply chain; identify the main types of mid-range events and analyze their impact in the focal firms; and then investigate and analyze the dissemination of the impact of a mid-range event over multi-tier, multi-dimension supply chains in macro, micro, and integrated contexts.

5.1 Goal Fulfillment

In Section 2.4, we worked to fulfill the first goal, which was to *identify the main elements that influence the dissemination of the impact of a mid-range event over a supply chain*. In order to accomplish this, we conducted a theoretical study. We used metaphorical transfer to propose a novel theoretical view, built upon the physics of stone skipping. At the end of this section, six propositions were posed. They considered several elements interacting among each other, including the source firm, the context of the supply chain where that event was initiated, and the individuals involved in both contexts, within the source firm and across firms through buyer and supplier relationships in the supply chain. The main aspects and elements were illustrated in Table 4 and Figure 27, and the summary of the propositions is contained in Table 11 in Section 2.4.

In Section 4.1, we fulfilled the second secondary goal, which was to *identify the main types of mid-range events and analyze their impact in focal firms*. The main characteristics of a mid-range event whose impact tend to be propagated over a supply chain are the types of event which present the characteristics illustrated in in Table 4 in Section 2.4. We accomplished this goal this by conducting an empirical study. We performed a multiple case study in six complex multi-tier, multi-dimension supply chains. For each of the supply chains, we investigated five to seven tiers, conducting interviews and observations in both the upstream and downstream direction of the supply chain and interviewing individuals with different job titles in each tier. In total, we conducted 131 in-depth interviews in 52 different firms. We identified six different types of mid-range events that had an impact beyond their source firm.

In section 4.2, we fulfilled the third secondary goal, which was to *investigate and analyze the dissemination of the impact of a mid-range event over multi-tier, multi-dimension supply chains in macro, micro, and integrated contexts*. We conducted an empirical study, using the mid-range events identified in Section 4.1 and applying the propositions posed in Section 2.4.

5.2 Research Question

Thus, through the fulfillment of all our primary and secondary goals, we answered our research question, which was *why and how does the impact of an event in a focal firm affect other members of its own and other supply chains?* This research showed that for the impact of an event to be disseminated over a supply chain, it needs to fulfill certain criteria, such as: it cannot be exclusive to the focal firm, and it needs to be supported by a substantial amount of source firm power and personal social influence, as well. It is also important to consider that individual

personal heuristics and biases, as well as different locus of control, are important all contexts, including internal (focal firm), and external (supply chain links), and that these human irrationalities will impact the perception of the event and influence the continuity of its impact.

5.3 Key Findings

As expected, we found that the dissemination of the impact of a mid-range event over a multi-tier, multi-dimension supply chain was a complex phenomenon. In analyzing each of the identified mid-range events, we could typically apply more than one proposition, as discussed in detail in Section 4.2. In addition, we also noted some interactions between elements, whose impact deserves additional discussion. The main insights from this research are discussed in the following paragraphs.

5.3.1 The role of power

We found that the role of power was very important in the dissemination of the impact of an event over a multi-tier, multi-dimension supply chain. A helpful way to illustrate the role of power is through its representation in the kinetic energy formula, which is the combination of half of the importance of the change itself (mass) plus the quadratic of power (velocity). In the same way that velocity is a combination of two different velocities (linear and rotational), power involves both the power of the source firm and the personal social influence of the

individuals involved in the dissemination of the impact of the event over a supply chain. Substituting values for each of these elements, we found that the greatest role in the dissemination of the impact of an event was played by the power of the source. At first, personal social influence plays the most important role, thus, influencing the dissemination of its impact over several links in D1's supply chain (for the example of both the change of D1's sales model and the PM 2186/2001 legislation change) and travelling (through D1's weak ties) to other supply chains. Later, for the legislation event, PM 2186/2001 took on power of its own, illustrating the kinetic energy principle, as its impact continued to disseminate over B4's supply chain (and other supply chains), even after the government agency tried to stop it. Similarly, the change of sales model continued to have an impact on D1's supply chain, even after the new director of sales and marketing had left D1.

5.3.2 Strong ties and personal relationships matter

Although buyer and supplier relationships are between firms, firms do not interact; individuals interact, make decisions and implement changes. Strong ties with members of its supply chain help build a firm's competitive advantage (Krackhardt, 1992; Nelson, 1989). One example of the strength of strong ties and the importance of personal relationships between supply chain members was found when we analyzed a similar process that was implemented by the two extra large beauty products firms.

In 2010, both B3 and B4 conducted a process of supplier base evaluation and improvement. At B3, this process was initiated by one of its purchasing managers, who proposed evaluating B3's current main suppliers for chemical ingredients, packaging and services in order to evaluate

their performance and promote competitiveness among them. B4 employed a similar process few months after B3 had initiated its process.

The main difference between them was that B3 conducted its supplier evaluation process in what Informant #33 called an individual, open, transparent, and fair way. “We talked to them one by one, openly, ‘eye to eye’, neither a letter nor e-mail was sent to our suppliers to talk about this project. We talked in person to each one, explaining what we were doing, why, and how we would be doing it” (Informant #33). B3 stated that its intention was not necessarily to promote or increase the competitiveness among its suppliers or make them ‘fight against each other’. Some of its suppliers were very concerned in the beginning, fearing that they could lose B3’s business. However, as time went by, B3’s supplier evaluation process proved to not only be very efficient, but also very worthwhile, too. “Our process was very caring and respectful. Our intention was to grow and help our suppliers to grow with us” (Informant #33). At the end of some months, some of B3’s suppliers had taken the challenge, becoming aware of what they were doing that could be improved, and taking actions to correct their mistakes. As a result, they ended up doing even more business with B3.

Some months after B3 had initiated its supplier evaluation process, Informant #33 became aware (through weak ties – suppliers in common) that its two major competitors [the biggest was B4] had started a similar process to evaluate their suppliers and promote competitiveness among them. According to B3, “our greatest difference was the way we promoted it, our personal attention to our suppliers”. This is credited to the fact that B3 is still a family owned company, and the other two major competitors are open capital firms. “We did it one by one, with care and attention, we did not let gossip spread on the market. When we noticed that some things like these were happening, we called the suppliers and talked to them. We clarified their

questions and made clear to them what our intentions were. Our competitor, on the other hand, made the changes in their standard way, from top to bottom. They said things like, “that’s how it is going to be starting now, you either adapt yourself to it, or you will lose your business with us” (Informant #33).

B3’s personal relationships helped improve its competitive advantage. Four years after it initiated the new process described above, B3 became the market leader. “Of course there were many other variables involved, including our great franchise basis, but the fact that all our business is supply chain oriented, and we have such good and **real** partnerships with our suppliers, I am pretty sure that it made a great difference in our success” (Informant #33). Table 40 illustrates the basic similarities and differences between B3’s and B4’s process for supplier evaluation and the final outcome.

Process: Supply Base Evaluation	B3	B4
Year of initiation: 2010	✓	✓
Who was the #1 in beauty products in Brazil?		✓
Type of process conducted	Individual and personal	Automatic
Four years later, who was the #1 in beauty products in Brazil?	✓	

Table 40: Similarities and differences between the supply base evaluation of B3 and B4

We found that strong ties between buyers and suppliers will influence the focal firm’s competitive advantage, reinforcing P1: The Pity-Pat Effect Principle that supply chain members with closer relationships with the source where the event was initiated will observe a stronger impact as illustrated in Figure 77.

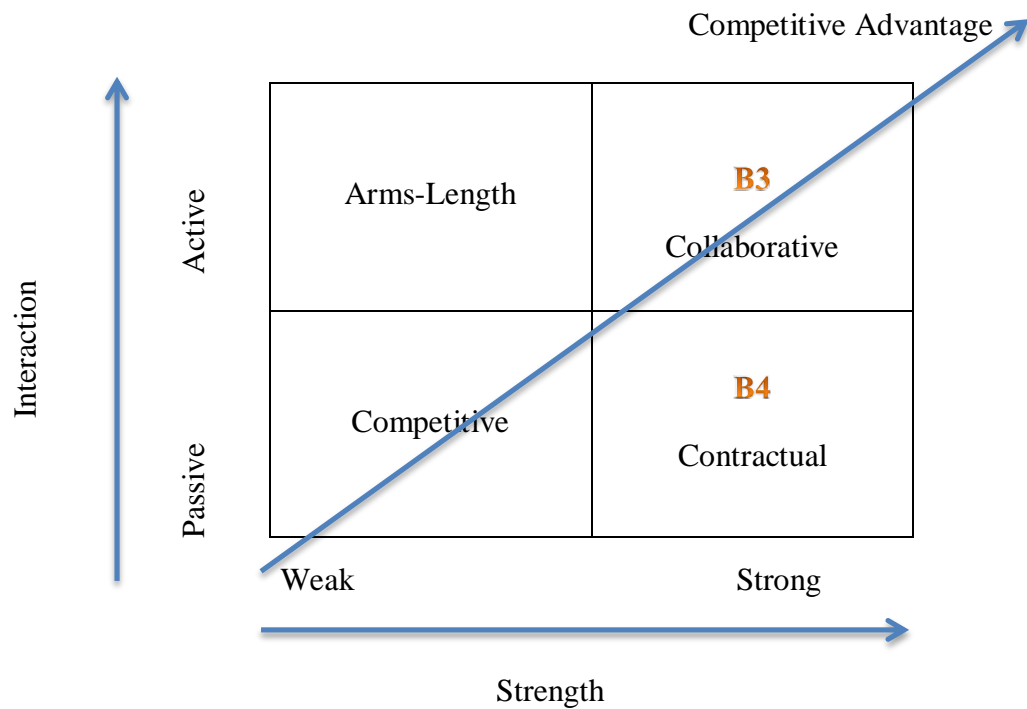


Figure 77: Influence of the types of buyer and supplier relationships in competitive advantage

5.3.3 A supply chain is a chain of individual relationships

The relationship between members of a supply chain is the sum of many small individual relationships between them. Consider the example of the cables from which the Golden Gate Bridge is suspended. As one of the longest suspension bridges in the world, 27,572 fibers compose each of its cables. Similarly, a strong buyer and supplier relationship is composed of numerous individual relationships. Thus, we need to add one more level to the supply chain model illustrated by Harland (1996).

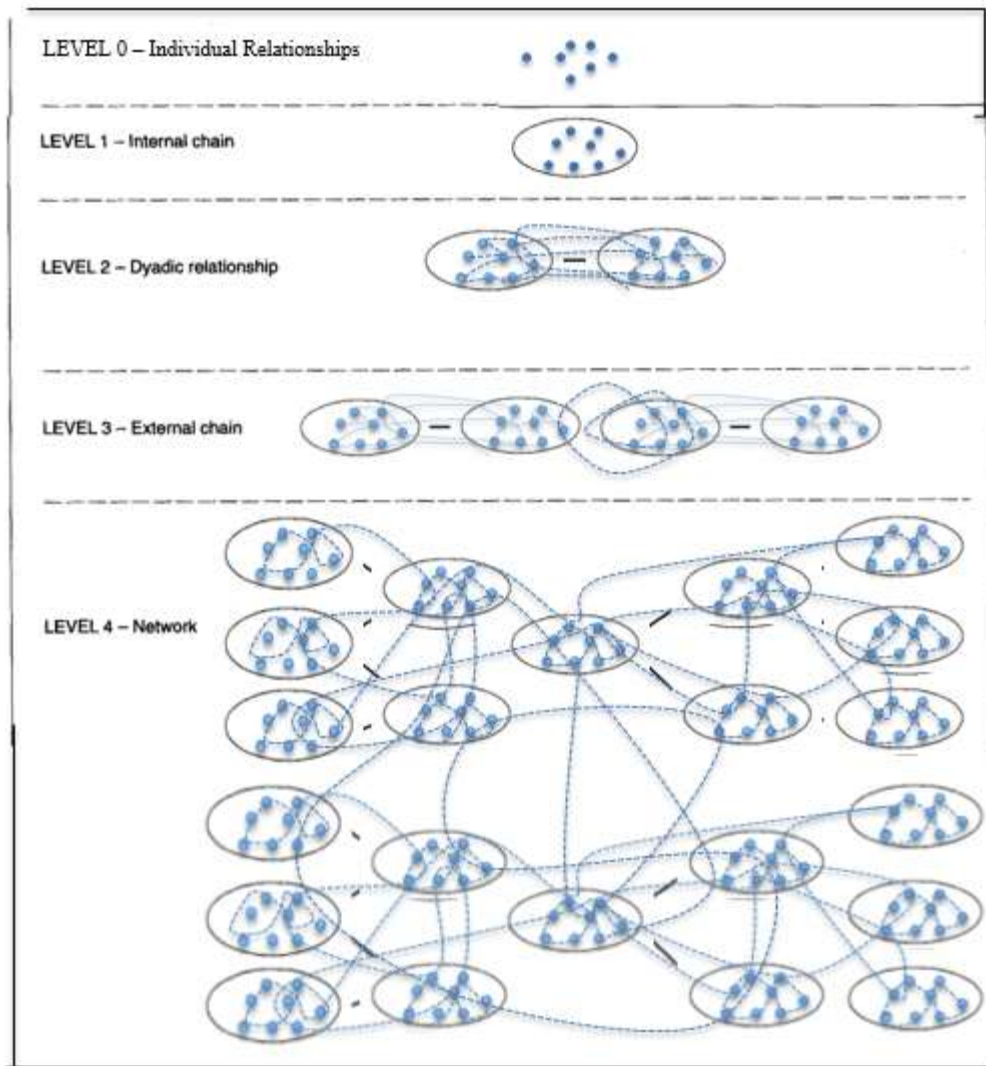


Figure 78: A supply chain as a network of individual relationships

Because individuals make supply chain decisions and implement them, initiating supply chain events, individuals' personal heuristics, biases, and locus of control are important in understanding the dissemination of the impact of an event over a supply chain.

5.3.3.1 Internal locus of control play an important role in supply chain performance

Many different elements are important to the success of a supply chain. Considering that a supply chain is a chain of individual relationships, an individual's capacity and ability to take responsibility for her or himself (locus of control) and act in order to "make things happen", is an important personal characteristic to be considered in an employee or an entrepreneur. Individuals with internal locus of control tend to take the responsibility to themselves and make things happen, regardless of the difficulty of the situation. This is a very important individual characteristic that should be considered in several situations, including the selection of supply chain members.

Consider, for example, the selection of franchise owners. We investigated four focal firms that used the franchise model (D1, D2, B2, and B3). For each of them, the challenge of finding the "right" franchisee was mentioned. In D1's supply chain, we had opportunity to talk to five different franchise owners and were able to assess their individual locus of control, during our interviews with them, analyzing the content of their words and expressions and using the locus of control scale as reference (Rotter, 1966). We found that, especially in a situation where there was an event that caused instability, the individual's capacity to act and take responsibility was essential in the success of the franchise. The two franchise owners who had external locus of control were less successful with their stores, while the three with internal locus of control had much more success with the challenges that they had faced. This indicates that individuals' bounded rationality will influence the dissemination of the impact of an event over a supply chain, giving support for P3: The Magic Angle Principle (even a low level of individual heuristics, biases, and locus of control will influence the impact of an event over a supply chain links), and P4: Lift Force Principle (the reaction to a mid-range event is proportional to the reactions of individuals in the supply chain links).

5.3.4 Impact of an event travels through weak ties

The way a firm is connected to its indirect supply chain members is through weak ties. Weak ties are built through supply chain members' relationships with their own supply chains, and these relationships help in the dissemination of the impact of an event in a supply chain and across supply chains. For example, every spring there is a major international chemical fair in Europe. Several of the R&D managers interviewed for this research prior to the 2014 international chemical fair, mentioned that they were waiting for their suppliers to bring "the news". Based on what their suppliers described during the fair, they would make their own decisions related to which components they would be using in the next new products that they developed.

It was also very common that a R&D manager, together with her or his top team management selected a chemical component to be part of its formula based on prospective weak ties. In other words, they would select a specific chemical component if their supplier made a commitment to bring someone from their suppliers to interact with, for example, give speech about the importance and usefulness of that specific component in one of the focal firm's national sales meetings. Similarly, since the relationship in a supply chain is a relationship among individuals, the impact of an event is disseminated through the bridges built by weak ties. Thus, a specific chemical component becomes available for the later tiers in the downstream supply chain of a dermocosmetics focal firm, if weak ties were built through the focal firm's R&D staff and the supplier's suppliers.

5.3.4.1 Weak ties are crucial for innovation in smaller firms

Because information travels through weak ties in a supply chain, the weak ties built between a smaller firm and its suppliers are crucial in giving it access to information about product and process innovation that it might not normally have access to. Smaller firms may not have access to knowledge and innovation about products and process on their own, due to their lack of resources. Because of this, the existence of bridges built by access to their suppliers' suppliers is crucial to its development and competitiveness. Through their suppliers' suppliers, a smaller firm can build a bridge to channels of innovation that allow it access to resources and information that they would not otherwise have. This was reiterated by several different informants within D1, D2, and B2, the smaller firms we researched. Specifically, the R&D managers described the importance of relationships with their suppliers, especially the core chemical suppliers, in order for them to have access to what was happening in most innovative markets, such as Europe or the U.S. This also supports the premise that a strong relationship between buyers and suppliers (strong ties) will significantly influence the dissemination of the impact of a mid-range event in a supply chain (through weak ties), offering additional support for P2: The Gyroscopic Effect.

5.4 Unexpected Findings

5.4.1 Loss aversion is not very significant in supply chains

Loss aversion and its associated biases is one of the most significant impact heuristics in B2C situations. However, this was not true in our research, which focused on B2B relationships in supply chains. We were expecting to see an important role of the biases associated with loss aversion, such as the endowment effect and hyperbolic discount, which we did not find. There is a very significant body of research on loss aversion and the impact of its associated biases in the consumer behavior literature (Ariely, 2008; Sell, Jr, and Marcon, 2007; Thaler and Sunstein, 2009; Thaler, 1985), thus, since we are talking about purchasing managers and buyers as individuals, we had expected that a similar phenomenon would emerge in a supply chain situation, which it did not.

One explanation for this is the fact that, since professional buyers are buying products and services for someone else, in this case the firm they work to, their loss aversion is not “turned on”. Thus professional buyers, in most of the situations, may not fear in losing a contract or a supplier, for example. They might be much more concerned about how the impact of an event might impact his or her individual situation in the firm, than with the firm itself. They may tend to believe that there will be a similar opportunity if they do not take the first one, thus loss aversion was not significantly manifested in supply chain situations.

5.4.2 Anchoring and adjustment heuristic was even manifested in high level strategic decision making

We expected that the more educated the individual, the more rationally (less influenced by heuristics and biases) he or she would act. We did not find that this was true in situations that involved very highly educated individuals making decisions that involved a significant amount of money. One example is the case of when D1 bought by the investment group. We discussed the impact of this event in D1 and its supply chain and beyond, however, even though we did not discuss the impact for the investment group itself, it was very interesting to see its impact there. D1 was the case for which we had the greatest amount of primary and secondary data, which gave us a kind of longitudinal view of this case.

In the interview with the investment group's president, he made very clear to us the reasons behind his intention to become part of the dermocosmetics business and what drove his decision to buy an existing firm (D1) instead of starting a new firm and brand from scratch. He invested in very good marketing research, but from what we had the opportunity to see, it appears that he relied too heavily, or "anchored", on one piece of the information he had obtained, when making his decision. He believed that estheticians, the market he was targeting, would prefer to keep the same brands they had been using instead of buying a new brand, thus he judged them by the brand loyalty that he expected in this sub-sector. In actuality, the estheticians did not show any particular loss aversion or concern about changing brands, rather, they tended to value "what is new". The investment group invested a very substantial amount of money in D1 and its sales channel over more than three years, based on anchoring it on brand loyalty. At the end of the data collection for this research, we had the opportunity to interview the investment group's president again, and he was starting to show signs of questioning the success of his decision.

5.4.3 High mobility of individuals in the Brazilian cosmetics industry

In the Brazilian cosmetics industry, it is very common that one individual will work for different firms within the same industry at different times in their careers. For example, informant #80 worked for DC, a third tier supplier of the researched supply chains, then moved to another chemical firm, and when we interviewed her, she was with SEPC, a second tier firm in the chemical suppliers. Informant #51 had been a purchasing manager in B4 for several years. Later in his career, he moved to work for SEPC, which was one of B4's suppliers that he had dealt with while he was there with B4. Informant #103 had worked for B3, left to work for another major cosmetics products firm, and then, recently went back to B3 in a strategic position within the firm. Informant #4 worked for B4 and then assumed a strategic position in D1. In all these examples, the same individual played different roles at different times of their careers. However, their previous network contacts helped them in their next move in their careers, exemplifying the existence of the weak ties and their importance in building bridges (Granoveter, 1973). This is important because individuals are sources of information when they move between firms within and across supply chains. In doing so, they provide weak ties to other organizations that can be important for product and process innovation. Because mobility is so high within supply chains in the Brazilian cosmetics industry, the effect of weak ties is very strong.

Overall in our research, we found support for all six of the propositions that we proposed, in different events in multi-tier, multi-dimension supply chains. It was interesting to see the close connection between the micro context (individuals) and the impact of the events being disseminated in the macro context (supply chain).

5.5 Academic Contributions

We developed a set of propositions and collected evidence that provides tentative support for them, using qualitative multiple case study research. In doing so, we applied the model proposed by Chen et al. (2013) for the development of theory using metaphorical transfer. This study also proposed a model for the dissemination of the impact of an event over a supply chain. Our initial theory constitutive metaphor provides a new approach for interpreting, analyzing and predicting multi-tier, multi-dimension, supply chain phenomena, and as such, may provide new and deeper theoretical and managerial insights for supply chain management and other fields of study.

OM/SCM is a field that has been often criticized for the lack of its own theories. Because of this, OM/SCM researchers have borrowed theory from other fields, including economics, management, and psychology. Our study provides a different perspective by building a new theoretical approach specific to the supply chain context based on the physics of stone skipping.

According to Hawking (1996), a theory is considered a good theory if it satisfies two basic requirements, which are accuracy and predictability. “It must accurately describe a large class of observations on the basis of a model that contains only a few arbitrary elements, and it must make definite predictions about the results of future observations” (p. 10). Our theoretical metaphorical transfer satisfied both of these. It indeed describes a large class of observations on the basis of a model that contains only a few elements, as it can be observed through the elements discussed in the analogy part of the metaphorical transfer, of this research (Section 2.4). Our theoretical model also makes definite predictions about the results of future observations (models and propositions). This is especially true if we consider the application

of the propositions. For example, applying the stone skipping model, if there is a great amount of personal social influence in a buyer and supplier relationship, the tendency to have a continued effect and extent of dissemination of the impact of an event over the supply chain is greatly increased. This is basically P2: The Gyroscopic Effect Principle (a combination of personal social influence and strength of buyer and supplier relationships will significantly contribute to the extent of the impact of a mid-range event over a supply chain).

This study is relevant to many different fields of study. As many of the mid-range events studied in this research represent changes, such as a change in sales model or legislation, our study makes a contribution to the change management field. It responds to Todnem By's (2005) call for studies that identify the critical success factors in the management of a change and construct a valid framework to help better understand the success rate of a change's initiatives. Our study is also relevant to process studies of events in firms, since we focused on understanding how and why supply chain relationships emerge, develop, grow, and terminate over time (Langley, Smallman, Tsoukas, and Vand-De-Ven, 2013).

Our findings challenge the organizational change literature, suggesting that it may not be relevant in the context of a supply chain. Weick and Quinn (1999) state that "change never starts because it never stops" (p.381). In our work, however, we propose that the impact of every event will stop at some point in time. Of course, an event can be (and many times it actually is) followed by other different events. Even when an event ceases, its impacts can still remain (see the Ripples Effect Principle).

We also introduced the concept of a mid-range event in a supply chain, which is an event of moderate probability and moderate impact. It is in contrast with common events studied in supply chain management (high probability, low impact) and those that have recently gained increased attention in the field, which are the low probability and high impact events (Hora and Klassen, 2013). It is important to study mid-range events because they are the ones that frequently occur in supply chains and have a significant impact. Thus, developing a framework to understand them is valuable for researchers.

5.6 Practical Contributions

Dealing with all the events that a supply chain is subject to on a daily basis is not an easy task. The events are as diverse in terms of kind, size, and frequency of occurrence as they are in terms of probability of occurrence. Although there is no “one size fits all” model, having a model to serve as a reference help managers focus on the most important factors.

In our model, we are aware that many times, due to several factors within and outside a firm, a proposed event may be already impacting a supply chain on a daily basis. These impacts can be strategic, tactic, or operational, depending on the kind of event and from what source it was initiated, and the context in which its impact is occurring at the moment. The power of the source of an event will greatly impact its velocity and acceptance. On the other hand, the acceptance or denial of the need for a change and dissemination of its impact will also be influenced by the perceptions of the individuals who are involved. Individuals are not fully rational all the time, so rules of thumb, such as heuristics and biases, automatically come to

mind and influence their perception of what has been implemented. Personality traits, such as locus of control, are also important. Thus, considering the most common biases, heuristics and their possible outcomes, can be useful in understanding supply chain relationships in a micro and macro context. A practical model is presented in

Figure 79, which includes all the basic elements identified for the dissemination of the impact of an event over a supply chain in our research.

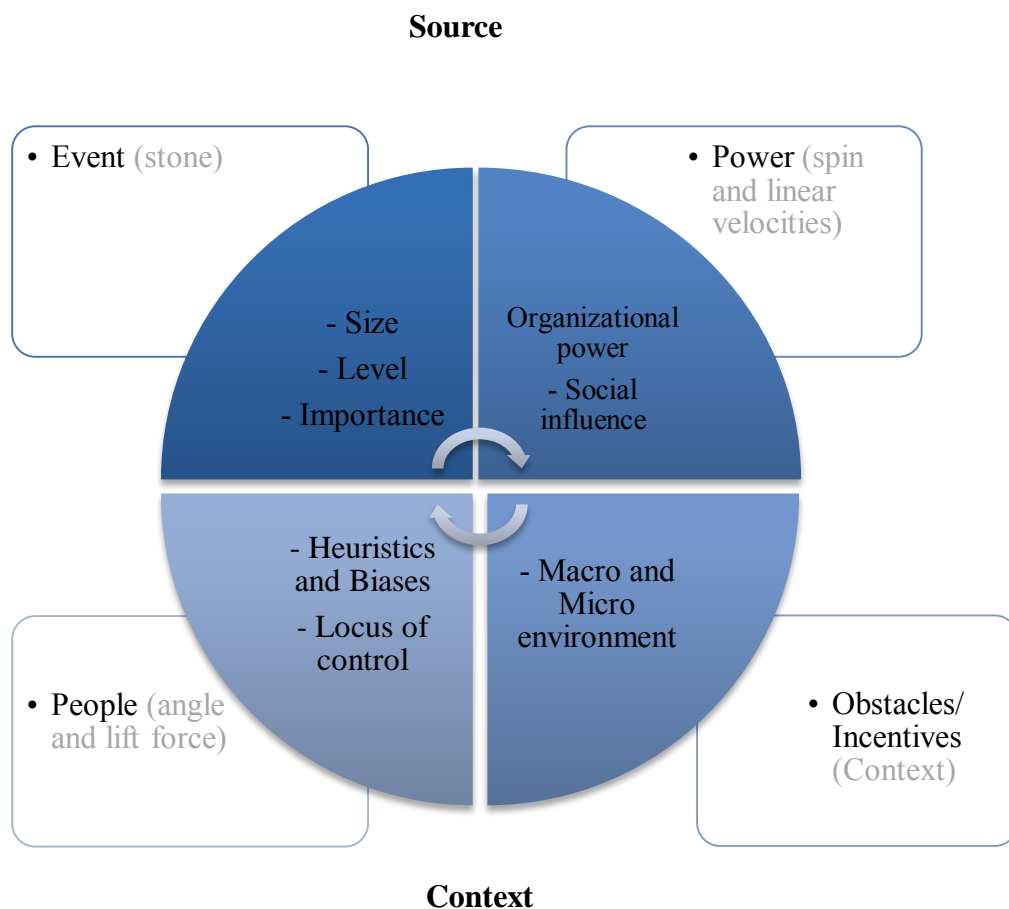


Figure 79: Practical model of dissemination of the impact of an event in a supply chain

5.7 Future Studies

A substantial amount of research has shown that the best stone skipping happens when the stone is thrown at an angle of about $\sim 20^\circ$, which is called “the magic angle”. It is called magic

because it has been proven through different methods (Boucquet, 2003; Clanet, Hersen, and Boucquet, 2004; Clanet, Hersen, and Boucquet, 2004; Nagahiro and Hayakawa, 2005). However, none of this research has yet described the “whys” behind the “magic” number. In our theoretical development for a supply chain context, we can draw similar conclusions. It is undeniable that there are individual influences and human irrationalities such as heuristics and biases related to the dissemination of the impact of an event over a supply chain. However, questions regarding to “how much” this matters still remains essentially unknown. What is important, however, is that even a little portion of individuals’ characteristics can greatly impact an event’s impact over a supply chain’s links. Future studies should isolate and experimentally test some heuristics, biases and personality traits, such as locus of control.

According to Krackhardt (1992), one such important outcome of strong ties is trust. In this research, we associate the power of strong ties with the power that comes from strong buyer and supplier relationships, both within and across firms, however, we do not directly consider trust as one of our elements in the dissemination of the impact of an event over a supply chain. Trust has been extensively studied recently in OM/SCM (Ireland and Webb, 2007, Mesquita, 2007; Wang, Craighead, and Li, 2014; Zhang, Viswanathan, and Henke, 2011), but not in this context. Thus, trust should be further studied as a possible outcome or prediction of the dissemination of the impact of an event over a supply chain.

Future studies should also consider buyer behavior in isolation. Experiments or qualitative studies could try to isolate the most important heuristics and biases that apply to buyers in different types of buyer and supplier relationships. According to Narayandas and Rangan

(2004), the most underestimated behavior in all buyer and supplier relationships is buyer behavior.

This research can be extended to related fields. In accounting, for example, a fact is similar to what we are calling a mid-range event. Depending upon how the new fact (or event) was accounted for, it can have different several impacts. Like skipping stones, an event can just impact another tier when it is implemented and become an event itself, otherwise it is just a intention.

Other metaphors from physics can also be explored, for example space and time constructs. Time is defined as the number of events with respect to before and after, and the place of an object as the innermost motionless boundary of that which surrounds it. It is important to note that both space and time are not absolute; they are always relative to an observer. Any given event and its impact will be perceived differently by different observers (buyers and suppliers) in the firms' macro and micro contexts in a supply chain. The understanding of the basic concepts of the relativity of time and space in a four-dimensional context could be valuable to supply chain management in both an academic and practical context.

In a recent presentation of part of this research at the POMS conference (May, 2015), one of the attendees raised questions similar to these: "What if two or three stones are thrown at the same time on a pond? What happen to their ripples and bounces? What if they chock against themselves in the air before falling on the water? What if they collide basically at the same point at the same time?" All these were very intriguing to think about in the context of

dissemination of the impact of an event in a multi-tier, multi-dimension supply chain and they provide interesting topics to be explored in future research.

5.6 Limitations

Although we analyzed each of the events individually in this research, in real multi-tier, multi-dimension complex supply chains, events and their impacts occur frequently and they do not happen separately or independently of each other. For example, we described D1's acquisition by an investment group. After this event was implemented, several other events followed. We focused on the hiring of a new marketing and sales director and two of the projects that this individual initiated as another event's impacts to be analyzed. However, other related events were also implemented at the same time. We could also have discussed the new manufacturing director, who started at D1 at the same time, or the new plant manufacturing building that was purchased several months after the acquisition by the investment group. However, in order to limit the scope of the case study, we looked at each event separately, in order to be able to better understand it and its impacts. Figure 80 illustrates the three events discussed in Section 4.2.1.

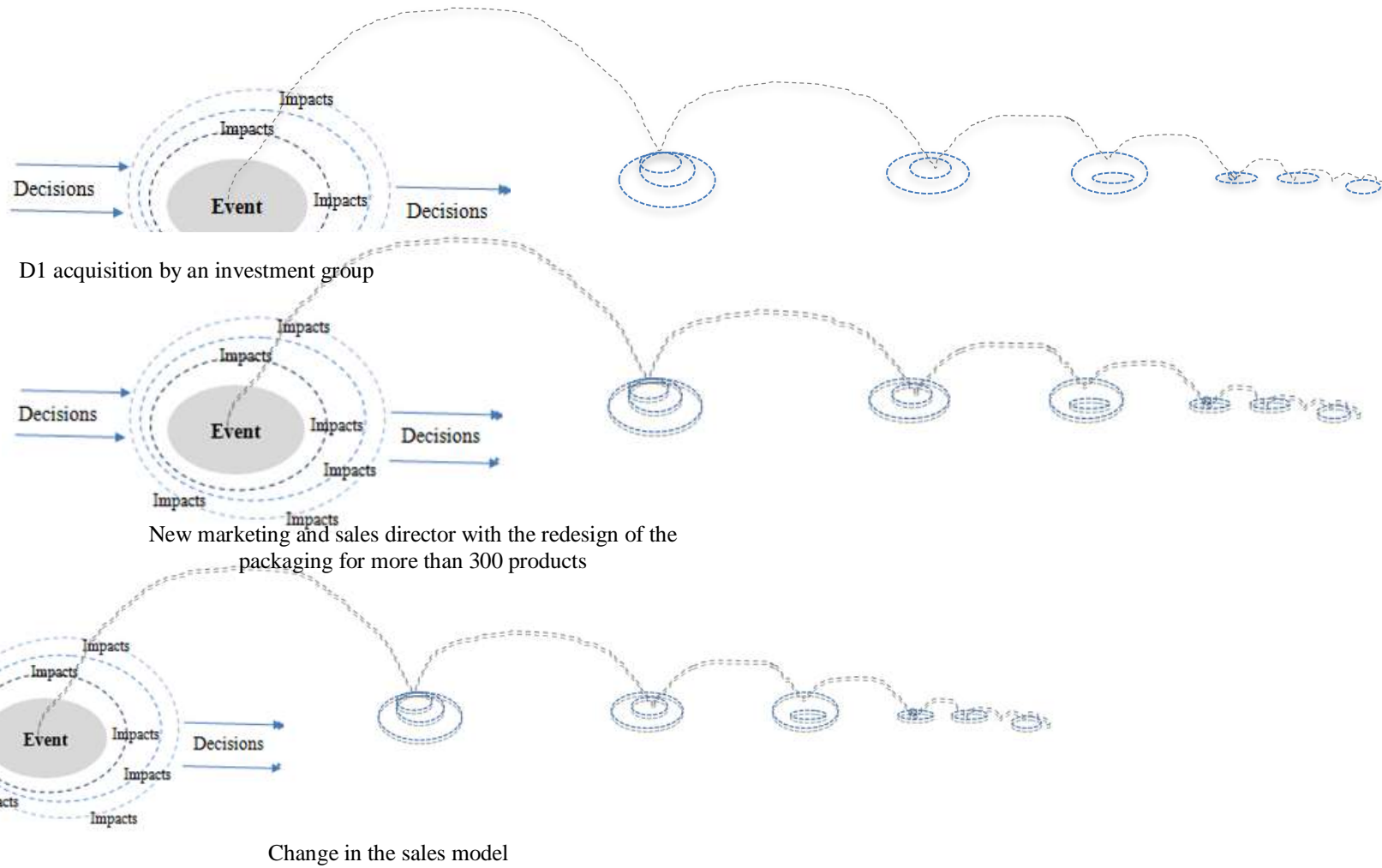


Figure 80: Illustration of the events in D1's supply chain that were discussed.

Also, real supply chains are complex and with many decisions being made and many events being implemented at the same time. Although our conception of supply chains and multi-tier and multi-dimension allowed us to explore the impact of these decisions in a much more realistic manner, we nonetheless made some tradeoffs when we were choosing which proposition(s) were illustrated by each case. We could, for example, have used P2: the gyroscopic effect, to illustrate how the same source firm's power was differently applied, depending on the personal social influence of the individual involved (i.e. the president of the firm, the marketing and sales director, some of the franchise owners, or the sales personnel in each of the retail stores). However, we decided to investigate other propositions in those cases, which also indicates another limitation of this research.

Finally, we presented the results of the dissemination of the impact of an event over complex multi-tier, multi-dimension supply chains. We could have used, at least in some situations, a supply chain flow different from the basic illustration based on Chen and Paulaj (2004). Since most of the events discussed in Section 4.2 were initiated in a focal firm, the traditional model of the upstream and downstream supply chain somewhat limited our illustration of the impacts, since time always goes forward. Thus, to allow the comparison of the extent of the impacts, instead of placing the source of the event in the middle of the network we could have placed the source firm at the right side of the network representing the beginning of the event.

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Appendix A: Interview Protocol

Informant: Buyer Side

Target functions: Buyer, Purchasing Manager, Operations Manager, Supply-Chain Manager, or Supply-Chain Director)

A) Firm information (secondary data)

Date: ____/____/____

Firm name: _____

Industrial Sector: _____

(Some information and numbers about the firm (# of units in the U. S.; # of units outside the U.S.; # of units in Brazil; Headquarter; # of employees, etc.)

B) Interview protocol (draft)

1. Introductory Questions:

Warm-up, acknowledgment

2. Please tell me about your firm.
3. What are the main events that you noticed on your firm (or market) over the last few years?
4. Please tell me about your suppliers. How do you classify them?
5. What do you purchase the most? Who are your most important suppliers?
6. How has the relationship with these suppliers been influenced over the last couple years?
7. Please tell me about that event and its impacts.
8. Please tell me about the outcomes and the processes that you went through to arrive on that outcomes.
9. Is there anything else you would like to comment or tell me?

Questionnaire

About you:

1. Name: _____
2. Gender: ____ feminine ____ masculine ____
3. Age (in years)
 - a) Less than 25
 - b) between 26 and 35
 - c) between 36 and 45
 - d) between 46 and 59
 - e) Over 60 years
4. Function in the firm: _____
5. Time in the firm: _____ years _____ months
6. Time in the function: _____ years _____ months
7. How do you perceive the importance of your job to the firm?
 - a) Crucial importance. The decisions that I, or someone under my supervision make, can highly impact the firm 's results (operational or financial)

- b) Medium importance. The decisions that I, or someone under my supervision make, have relative impact on the firm's results (operational or financial)
 - c) Low importance. The decisions that I, or someone under my supervision make, have low impact on the firm's results (operational or financial)
8. How many individuals in your department? _____
9. How many with similar function as yours? _____ Tell me about it.
10. Are there individuals with similar function as yours in other departments or business units of the firm? Please tell me about that.
11. The annual budget of my department is _____% of the total firm budget.
12. This budget refers _____% to services and _____% to good purchases.
13. Any other specific information?

About educational and professional background

14. Educational background:

15. Professional background:

Appendix B: IRB Approval

KC IRB
 Protocol #: 1403941352
 Investigator: Siegler, Janaina
 Summary Printed 03/26/2014

KC IRB Protocol Summary

Protocol Number: 1403941352
Status: Submitted to IRB
Expiration Date:
Last Approval Date:
Investigator: Siegler, Janaina

Protocol Details

Type: Exempt
Description: BUYER-SUPPLIER RELATIONSHIPS, MID-RANGE CHANGES, VALUE CREATION.
Application Date: 03/26/2014
Reference Num 1:
Reference Num 2:
FDA Application No:
Title: Understanding how buyer-supplier relationships evolve after mid-range changes

Organizations

Type	Organization
Performing Organization	Indiana University

Personnel

Person Name	Units	Role	Affiliate	Training Flag
Siegler, Janaina	IN-BUS BUSINESS	PI	IU	Y

Study Personnel

PersonName	Role	Affiliation	Training
Flynn, Barbara B	Non-Key, Not Interacting	IU	Y

Subjects

Subject	Count
Total	38

Attachments

Description	Attachment Type	Last Updated	Updated By
INST Questions	Data Collection Instrument	03/26/2014 16:07:38	skbaker
EXE	Exempt Research Checklist	03/26/2014 16:07:12	skbaker
Recruitment Materials	Recruitment Materials	03/26/2014 16:07:12	skbaker
Study Information Sheet - Siegler	Study Information Sheet	03/26/2014 16:07:12	skbaker

KC IRB
 Protocol #: 1403941352
 Investigator: Siegler, Janaina
 Summary Printed 03/26/2014

Other Attachments

Description	Last Updated	Updated By
OTH additional details	03/26/2014 16:06:39	skbaker

Roles

Protocol Aggregator

User Id	User Name	Unit Name
	Siegler, Janaina	

KC IRB
 Protocol #: 1403941352
 Investigator: Siegler, Janaina
 Summary Printed 03/26/2014

IRB APPROVAL

This research project, including all noted attachments, has been reviewed and approved by the Indiana University IRB.

Exempt Category(ies), if applicable: (2)

Expedited Category(ies), if applicable:

Authorized IRB Signature: u  IRB Approval Date: March 26, 2014

Printed Name of IRB Member: Senta K Baker

KC IRB
Protocol #: 1403941352
Investigator: Siegler, Janaina
Summary Printed 03/26/2014

Review Comments

Protocol Number: 1403941352
Principal Investigator: Siegler, Janaina
Title: Understanding how buyer-supplier relationships evolve after mid-range changes
Committee Id: **Committee Name:**
Schedule Id: **Schedule Date:**

Review Comments:

* Non-Private Comment

Appendix C: Informed Consent**INDIANA UNIVERSITY INFORMED CONSENT STATEMENT FOR
“UNDERSTANDING HOW BUYER-SUPPLIER RELATIONSHIPS EVOLVE
AFTER A MID-RANGE EVENT”**

You are invited to participate in a research study of buyer-supplier relationships. You were selected as a possible subject because of your relationship with the phenomenon within your firm. We ask that you read this form and ask any questions you may have before agreeing to be in the study. The study is being conducted by Janaina Siegler who is a visiting scholar at Indiana University in Indianapolis and a Ph.D. Candidate at Getulio Vargas Foundation in Sao Paulo, Brazil.

STUDY PURPOSE

The purpose of this study is to understand how buyer and supplier relationships evolve after mid-range events. As mid-range events we consider any events that are seen as important to one firm or the other (the buyer or the supplier). Ex: there is an event in the director or key person in a buyer-supplier relationship, one of the firms is acquired by another firm, there are technological events (e.g.: RFID or EDI), legal events, or any other events that the firms may judge significant. They are mid-range because they are not disastrous to either firm nor are they day-to-day tactical events.

NUMBER OF INDIVIDUALS TAKING PART IN THE STUDY:

If you agree to participate, you will be one of the 38 subjects who will be participating in this research.

PROCEDURES FOR THE STUDY:

If you agree to be in the study, you will participate in an interview with the researcher. This interview is expected to range from 40 to 90 minutes. The interview might be conducted personally or from a distance using telephone or Skype. If you agree, we will record the interview for further transcription and codification.

RISKS OF TAKING PART IN THE STUDY:

There are no direct risks related to the study. However, we assure that in case of any discomfort answering any question you can tell the researcher that you feel uncomfortable or do not care to answer a particular question and in no way will you be pressed to do that. You also can ask to stop the research at any time if you decide you do not want to participate in it anymore.

BENEFITS OF TAKING PART IN THE STUDY:

The expected benefits are related to the understanding of how buyer and supplier relationships evolve after mid-range events. We address that because although buyer-supplier relationships are between firms, decisions are made by individuals. There is evidence that the way buyers and suppliers deal with “mid-range events” impacts buyer-supplier relationships, value creation and appropriation, the buyer’s competitive advantage, and even the entire industry. Also the results of this research may allow better relationships and also better results for either the buyer or the supplier firm. An executive summary report will be sent to you with the main findings of the research.

ALTERNATIVES TO TAKING PART IN THE STUDY:

If you prefer to not take part of the research, you can still help by indicating some other individuals that might be able to participate.

CONFIDENTIALITY

Confidentiality will be ensured by not using the names of any of the informants. Your identity will be held in confidence in reports in which the study may be published. In order to keep the confidentiality of the firms, their names will also be eventd. We will develop “labels” for each firm based on characteristics that emerge from the data that will be collected. A master list of actual firm names and their labels, as well as their individual informants will be maintained by the researchers, but will not be revealed in any reports or research papers. Efforts will be made to keep all your personal information confidential, however we cannot guarantee absolute confidentiality in case of information disclosure required by law. Firms that may inspect and/or copy your research records for quality assurance and data analysis include groups such as the study investigator and his/her research associates, the Indiana University Institutional Review Board or its designees, and (as allowed by law) state or federal agencies, specifically the Office for Human Research Protections (OHRP).

COSTS

Taking part in this study does not lead to added costs to you or your firm.

PAYMENT

You will not receive payment for taking part in this study.

FINANCIAL INTEREST DISCLOSURE

There are no individuals or firms involved in this research that might benefit financially from this study. If you would like more information, please ask the researchers or study staff.

CONTACTS FOR QUESTIONS OR PROBLEMS

For questions about the study or a research-related injury, contact the researcher Janaina Siegler at (317) 853-0226. If you cannot reach the researcher during regular business hours (i.e.

8:00AM-5:00PM), please call the IU Human Subjects Office at (317) 278-3458 or (800) 696-2949. After business hours, please call (317) 993-9513 or (317) 853-0226.

For questions about your rights as a research participant or to discuss problems, complaints or concerns about a research study, or to obtain information, or offer input, contact the IU Human Subjects Office at (317) 278-3458 or (800) 696-2949.

VOLUNTARY NATURE OF STUDY

Taking part in this study is voluntary. You may choose not to take part or may leave the study at any time. Leaving the study will not result in any penalty or loss of benefits to which you are entitled. Your decision whether or not to participate in this study will not affect your current or future relations with the researcher or the participant universities.

SUBJECT'S CONSENT

In consideration of all of the above, I give my consent to participate in this research study. I will be given a copy of this informed consent document to keep for my records. I agree to take part in this study and I agree to have my interview recorded for further transcription and codification.

Subject's

Printed

Name:

Subject's Signature: _____ **Date:** _____

(must be dated by the subject)

Printed Name of Person Obtaining Consent: :

Signature of Person Obtaining Consent:

Date: _____

Informed Consent In Portuguese

INDIANA UNIVERSITY CONSENTIMENTO DE INFOMACAO PARA:

“COMPREENDENDO COMO AS RELAÇÕES ENTRE COMPRADORES E FORNECEDORES EVOLUEM APOS MUDANCAS DE MEDIA COMPEXIDADE”

Você está convidado(a) para participar de uma pesquisa que investiga as relações entre compradores e fornecedores. Você foi selecionado(a) como possível respondente devido a sua proximidade em relação ao fenômeno (relação entre compradores e fornecedores) em sua empresa. Solicitamos que leia este documento e nos solicite o esclarecimento que quaisquer dúvidas que possa ter antes de você concordar em participar do estudo. A pesquisa está sendo conduzida por Janaina Siegler que é pesquisadora visitante na Indiana University em Indianapolis, nos Estados Unidos, e estudante de doutorado na Fundação Getúlio Vargas em São Paulo, Brasil.

1. OBJETIVO DO ESTUDO

O objetivo deste estudo é compreender como as relações entre compradores e fornecedores evoluem após mudanças de média complexidade. Por mudanças de média complexidade, nós consideramos quaisquer mudanças que possam ser vistas como importantes para uma empresa ou a outra (compradora ou fornecedora). Exemplos deste tipo de mudanças podem ser (mas não restritas a): mudança de diretoria ou pessoa chave na relação entre compradores e fornecedores, situação de fusões e aquisições em alguma das empresas envolvidas na relação, mudanças de ordem tecnológica (RFID, EDI, implantação de novo sistema de TI), mudanças de ordem legal, jurídica ou qualquer outra mudança que possa ser entendida como significativa. Elas são consideradas de média complexidade porque não são nem desastrosas para alguma das empresas nem mudanças do tipo contínuas e diárias nas empresas.

2. NUMERO DE PESSOAS PARTICIPANDO NO ESTUDO:

Caso voce aceite participar, você será uma das 38 pessoas entrevistadas que deverão participar do estudo.

3. PROCEDIMENTOS DO ESTUDO:

Caso voce aceite participar do estudo, você participará de uma entrevista com a pesquisadora. Esta entrevista deve durar aproximadamente entre 40 a 90 minutos. A entrevista poderá ser conduzida pessoalmente ou a distância utilizando telefone ou Skype. Caso concorde, a entrevista poderá ser gravada para posterior transcrição, codificação e análise.

4. RISCOS EM FAZER PARTE DO ESTUDO:

Nao há nenhum risco diretamente relacionado ao estudo. No entanto, nós asseguramos que caso sinta qualquer constrangimento ou desconforto em responder qualquer questão, voce terá total liberdade em não respondê-la(s). Você também poderá parar a pesquisa em qualquer momento caso decida que não quer mais participar.

5. BENEFÍCIOS EM FAZER PARTE DO ESTUDO:

Os benefícios esperados do estudo estão relacionados à compreensão de como as relações entre compradores e fornecedores evoluem após mudanças de média complexidade. Nós entendemos que apesar da relação entre compradores e fornecedores acontecerem entre empresas, as decisões são tomadas por pessoas. Existem evidências que a forma com compradores e fornecedores lidam com essas mudanças de media complexidade impactam a relação entre eles, a criação e apropriação de valor, a vantagem competitiva do comprador e, até mesmo todo o setor industrial que estão envolvidos e toda a cadeia de suprimentos. Além disto os resultados desta pesquisa podem propiciar a criação de melhores relações e também melhores resultados para ambas as empresas envolvidas: compradores e fornecedores. Ao final da pesquisa, um sumário executivo detalhado com os principais achados da pesquisa será disponibilizado e enviado à você, caso você tenha interesse.

6. ALTERNATIVAS A PARTICIPAÇÃO DO ESTUDO:

Caso você prefira não fazer parte da pesquisa, você ainda pode colaborar com o estudo indicando alguma pessoa que possa participar.

7. CONFIDENCIALIDADE

Confidencialidade será assegurada não utilizando o nome de nenhum dos respondentes. Sua identidade será mantida confidencial e não será utilizada nos trabalhos que possam ser publicados a partir deste estudo. Para manter a identidade das empresas, seus nomes também serão alterados. Nós desenvolveremos espécies de “labels” para cada empresa com base nas características que possam emergir dos dados coletados. Uma lista principal com o nome dos respondentes, empresas e seus nomes substitutos será mantida em sigilo pela pesquisadora e não serão revelados em nenhum trabalho publicado. Esforços também serão feitos para manter confidencial toda sua informação pessoal. Porém não podemos garantir a absoluta confidencialidade caso a abertura da informação seja requerida por força legal ou judicial. As organizações que poderiam inspecionar e ter acesso a seus dados para garantir a qualidade e segurança da análise dos dados incluem grupos como o grupo de investigação diretamente e seus associados (orientadores da pesquisadora e comitê de avaliação), o Comitê de Ética da Universidade de Indiana e seus designados e, (como requerido pela legislação pertinente) as agências americanas federais ou estaduais, especialmente o Escritório para Proteção de Pesquisa com Seres Humanos (OHRP).

8. CUSTOS

Fazer parte deste estudo não implicará em nenhum custo para você ou sua empresa.

9. PAGAMENTO

Voce nao recebera pagamento por participar desta pesquisa.

10. INTERESSES FINANCEIROS DIVERSOS

Nenhum indivíduo ou empresa envolvidos neste estudo se beneficiará financeiramente a partir desta pesquisa. Por favor fique à vontade para fazer mais questionamentos a este respeito diretamente aos pesquisadores envolvidos.

11. CONTATOS PARA QUESTIONAMENTOS OU QUALQUER PROBLEMA

Para questões relacionadas ao estudo, por favor entrar em contato com a pesquisadora Janaina Siegler no telefone +1 (317) 853-0226 (Estados Unidos) ou +55 (11) 3230-1632 (Brasil). Caso não consiga falar com a mesma no horário comercial (8h as 18h), ou para outras questões, por favor contacte o escritório da Universidade de Indiana para pesquisas com seres humanos no telefone +1 (317) 278-3458 ou +1 (800) 696-2949. O e-mail da pesquisadora para contato é: janaina.siegler@gmail.com ou jsiegler@iupui.edu

Para questões sobre seus direitos como participante da pesquisa ou para discutir eventuais problemas, reclamações ou preocupações sobre a pesquisa, ou ainda para obter informações, contacte IU Human Subjects Office at +1 (317) 278-3458 ou +1 (800) 696-2949.

12. NATUREZA VOLUNTÁRIA DO ESTUDO

Participar deste estudo é voluntário do respondente. Você poderá escolher não fazer parte da pesquisa ou finalizar sua participação a qualquer momento. Suan eventual desistência de participação nao implica em qualquer penalidade ou perda. Sua decisão em não fazer parte da pesquisa não afetará de nenhuma forma sua atual ou futura relação com a pesquisadora ou as universidades participantes.

13. CONSENTIMENTO DE PARTICIPAÇÃO

Considerando o exposto acima, eu concordo em participar da referida pesquisa. Uma cópia deste consentimento será deixada comigo para que eu possa manter em meus arquivos. Eu

concordo em participar do estudo e autorizo que minha entrevista seja gravada para posterior transcrição, análise e codificação pela pesquisadora.

Nome do Respondente: _____

Assinatura do Respondente: _____ **Data:** _____
(deve ser preenchida pelo respondente)

Nome da pessoa obtendo consentimento:

Janaina Siegler M. Batista

Assinatura da pessoa obtendo consentimento: _____ **Data:** 18/03/2014



Appendix D: Golden Sheet Basic Data for Researched Firms

	Codes	Firm´s main business	Commodities or not	Products or Services	Main Position in the SC	Size of the firm	Abrangencia	State
1	ACB	Industry Representative	Non-Commodities	Services	2nd Tier Supplier	Medium	National	SP
2	ABH	Manufacturers Association	Non-Commodities	Services	1st Tier Supplier	Medium	National	SP
3	Derma 2	Dermocosmetics Manufacturer	Non-Commodities	Products	Focal Firm	Medium	National	ES
4	D2SC	Franchisee Store	Non-Commodities	Products	1st Tier Buyer	Small	Regional	SC
5	D2ES	Franchisee Store	Non-Commodities	Products	1st Tier Buyer	Small	Regional	ES
6	AL	Packaging Solutions	Non-Commodities	Products	1st Tier Supplier	Large	International	SP
7	AQ	Chemical Ingredients	Non-Commodities	Products	1st Tier Supplier	Medium	National	SP
8	ASS	Legal Consultant	Non-Commodities	Services	1st Tier Supplier	Small	National	DF
9	BSF	Chemical Ingredients	Non-Commodities	Products	2nd Tier Supplier	X-Large	International	SP
10	BRC	Raw Material Converter	Non-Commodities	Products	2nd Tier Supplier	Large	International	SP
11	BD	Chemical Ingredients	Non-Commodities	Products	1st Tier Supplier	Medium	National	SP

	Codes	Firm's main business	Commodities or not	Products or Services	Main Position in the SC	Size of the firm	Abrangencia	State
12	BPK	Packaging Solutions	Commodities	Products	1st Tier Supplier	Small	Regional	MG
13	BP	Packaging Solutions	Commodities	Products	1st Tier Supplier	Medium	National	RS
14	CGN	Governmental Agency	Non-Commodities	Services	1st Tier Supplier	Small	National	DF
15	CHR	Outsourcing Manufacturer	Non-Commodities	Products	1st Tier Supplier	Large	International	SP
16	CMTC	Chemical Ingredients	Non-Commodities	Products	1st Tier Supplier	Medium	National	SP
17	DC	Chemical Ingredients	Commodities	Products	2nd tier supplier	X-Large	International	SP
18	ENG	Packaging Solutions	Non-Commodities	Products	2nd Tier Supplier	Large	National	SP
19	ERV	Raw material supplier	Non-Commodities	Products	3rd Tier Supplier	Medium	Regional	RS
20	ECARI	Beauty Clinic or Salon	Commodities	Services	2nd Tier Buyer	Micro	Local	MG
21	ECES	Beauty Clinic or Salon	Commodities	Services	2nd Tier Buyer	Micro	Local	ES
22	ECUDI	Beauty Clinic or Salon	Commodities	Services	2nd Tier Buyer	Micro	Local	MG
23	EUR	Market Research	Non-Commodities	Services	2nd Tier Supplier	Medium	International	USA
24	FCP	Academic Research Institute	Non-Commodities	Services	3rd Tier Supplier	Small	Local	AM

	Codes	Firm's main business	Commodities or not	Products or Services	Main Position in the SC	Size of the firm	Abrangencia	State
25	GTP	3rd Partner Logistics	Non-Commodities	Services	1st Tier Supplier	Medium	Regional	MG
26	JM	Packaging Solutions	Commodities	Products	1st Tier Supplier	Medium	National	RS
27	Cosmetic 1	Cosmetics Brand	Commodities	Products	Focal Firm	Large	International	SP
28	MAN	Raw material supplier	Non-Commodities	Products	3rd Tier Supplier	Micro	Local	BA
29	MAP	Chemical Ingredients	Non-Commodities	Products	1st Tier Supplier	Medium	National	SP
30	Cosmetic 4	Cosmetic Manufacturer	Commodities	Products	Focal Firm	X-Large	National	SP
31	Cosmetic 3	Cosmetic Manufacturer	Commodities	Products	Focal Firm	X-Large	National	PR
32	PAN	Chemical Ingredients	Non-Commodities	Products	3rd Tier Supplier	X-Large	International	SP
33	PHY	Chemical Ingredients	Non-Commodities	Products	2nd tier supplier	Medium	Regional	SP
34	PRO	Outsourcing Manufacturer	Commodities	Services	1st Tier Supplier	Medium	National	SP
35	Cosmetic 2	Cosmetic Manufacturer	Commodities	Products	Focal Firm	Small	National	MG
36	B2BSB	Franchisee Store	Commodities	Products	1st tier Buyer	Small	Local	DF
37	B2UDI	Franchisee Store	Commodities	Products	1st tier Buyer	Small	Local	MG
38	SEPC	Chemical Ingredients	Non-Commodities	Products	1st Tier Supplier	X-Large	International	SP

	Codes	Firm's main business	Commodities or not	Products or Services	Main Position in the SC	Size of the firm	Abrangencia	State
39	7SO	Packaging Solutions	Commodities	Services	1st Tier Supplier	Small	Local	SP
40	SBELL	Raw material supplier	Non-Commodities	Products	3rd Tier Supplier	Small	Local	SP
41	SLB	Raw Material Converter	Non-Commodities	Products	2nd Tier Supplier	Large	International	PR
42	STRT	Chemical Industry	Commodities	Products	1st Tier Supplier	Medium	National	MG
43	Dermo 1	Dermocosmetics Manufacturer	Non-Commodities	Products	Focal Firm	Medium	National	SP
44	D1BA	Franchisee Store	Non-Commodities	Products	1st tier Buyer	Small	Local	BA
45	D1BH	Franchisee Store	Non-Commodities	Products	1st tier Buyer	Small	Local	MG
46	D1ST	Franchisee Store	Non-Commodities	Products	1st tier Buyer	Small	Local	SP
47	D1SO	Franchisee Store	Non-Commodities	Products	1st tier Buyer	Small	Local	SP
48	D1UDI	Franchisee Store	Non-Commodities	Products	1st tier Buyer	Small	Local	MG
49	ASREP	Comercial Representative	Commodities	Products	1st Tier Supplier	Small	Regional	MG

Appendix E: Golden Sheet Basic Data for Researched Informants

	Informant	Firm	Job Titles	Department	Position in the Firm	Gender
1	1	EUR	Manager	Sales	Supplier Side	Female
2	2	DC	Manager	Supply Chain	Buyer Side	Female
3	3	ABH	Manager	Marketing Intelligence	Supplier Side	Male
4	4_a	COSMETICS 4	Manager	Sales	Supplier Side	Female
5	4_b	DERMO 1	Director	Sales	Supplier Side	Female
6	5	DERMO 1	Manager	Sales	Supplier Side	Male
7	6	DERMO 2	Director	Operations	Buyer Side	Male
8	7	ABH	Manager	Foreign Trade	Supplier Side	Male
9	8	DERMO 1	Director	Operations	Buyer Side	Male
10	9	DERMO 2	Manager	Purchasing	Buyer Side	Female
11	10	CMTC	Analyst	Sales	Supplier Side	Male
12	11	CMTC	Analyst	Sales	Supplier Side	Male
13	12	DERMO 2	Manager	Sales	Supplier Side	Male
14	13	DERMO 2	Manager	R&D	Buyer Side	Female
15	14	PRO	CEO	Strategy	Strategy	Male
16	15	DERMO 1	Manager	Purchasing	Buyer Side	Female
17	16	ACB	Manager	Administrative	Supplier side	Male
18	17	ACB	Director	Administrative	Supplier side	Female
19	18	Dermo 1	Manager	R&D	Buyer Side	Female
20	19	FCP	Consultant	Academic Research	Buyer Side	Male
21	20	Cosmetics 2	CEO	Strategy	Supplier Side	Male
22	21	Cosmetics 4	Manager	IT	Administrative	Male

	Informant	Firm	Job Titles	Department	Position in the Firm	Gender
23	22	Cosmetics 2	Manager	Purchasing	Buyer Side	Female
24	23	BD	Analyst	Sales	Supplier side	Female
25	24	D1UDI	Director	Finance	Buyer side	Male
26	25	CMTC	Manager	Purchasing	Buyer Side	Female
27	26	D1UDI	Director	Purchasing	Buyer side	Female
28	27	D1UDI	Analyst	Sales	Supplier Side	Female
29	28	D1UDI	Analyst	Sales	Supplier side	Female
30	29	D1UDI	Analyst	Sales	Supplier Side	Female
31	30	D1UDI	Manager	Sales	Supplier side	Female
32	31	D1UDI	Analyst	Sales	Supplier side	Female
33	32	D1UDI	Analyst	Sales	Supplier side	Female
34	33	Cosmetics 3	Manager	Purchasing	Buyer Side	Male
35	34	7SOL	Director	Sales	Supplier side	Male
36	35	PAN	Director	Operations	Supplier Side	Male
37	36	ECARI	Small Businnes Owner	Services	Buyer Side	Female
38	37	Cosmetics 2	Manager	R&D	Buyer Side	Female
39	38	BSF	Manager	Sales	Supplier Side	Male
40	39	Cosmetics 3	Manager	R&D	Buyer Side	Male
41	40	Cosmetics 3	Director	Supply Chain	Buyer Side	Male
42	41_a	BPK	Comercial Representative	Sales	Supplier Side	Female
43	41_b	ASREP	Comercial Representative	Sales	Supplier Side	Female
44	42	ECUDI	Esthetician	Services	Buyer Side	Female
45	43	ECUDI	Esthetician	Services	Buyer Side	Female
46	44	BD	Director	Sales	Supplier Side	Female
47	45	D2ES	Small Businnes Owner	Franchising	Buyer Side	Female
48	46	D1BH	Small Businnes Owner	Franchising	Buyer Side	Female

	Informant	Firm	Job Titles	Department	Position in the Firm	Gender
49	47	AL	Director	Innovation	Supplier Side	Male
50	48	D1BA	Small Businnes Owner	Franchising	Buyer Side	Male
51	49	Cosmetics 4	Manager	Human Resources	Administrative	Male
52	50	ASS	Director	Legal	Supplier Side	Female
53	51_a	Cosmetics 4	Analyst	Purchasing	Buyer Side	Male
54	51_b	AQ	Manager	Purchasing	Buyer Side	Male
55	52	ASREP	Comercial Representative	Sales	Supplier Side	Male
56	53	D1SO	Small Businnes Owner	Franchising	Buyer Side	Female
57	54	D1UDI	Small Businnes Owner	Franchising	Buyer Side	Male
58	55	Aqia	Manager	Sales	Supplier Side	Female
59	56	PHY	President	Strategy	Strategy	Male
60	57	Cosmetics 1	Manager	Quality	Buyer Side	Male
61	58	SEC	CEO	Strategy	Supplier side	Male
62	59	SEC	Manager	Purchasing	Buyer Side	Female
63	60	Cosmetics 4	Analyst	Purchasing	Buyer Side	Male
64	61	ECES	Esthetician	Services	Buyer Side	Female
65	62_a	STRT	President	Strategy	Strategy	Male
66	62_b	Cosmetics 2	President	Strategy	Strategy	Male
67	63	Cosmetics 4	Manager	Innovation	Buyer Side	Male
68	64	Cosmetics 3	Manager	Franchising	Supplier Side	Female
69	65	B2BSB	Small Businnes Owner	Franchising	Strategy	Female
70	66	B2UDI	Manager	Operations	Supplier Side	Female
71	67	CHR	Director	Sales	Supplier Side	Male
72	68	D2SC	Small Businnes Owner	Franchising	Buyer Side	Female
73	69	ENG	CEO	Strategy	Supplier Side	Male
74	70_a	JM	Comercial Representative	Sales	Supplier Side	Male

	Informant	Firm	Job Titles	Department	Position in the Firm	Gender
75	70_b	BP	Comercial Represent.	Sales	Supplier Side	Male
76	71	MAN	Farmer	Farming	Supplier Side	Male
77	72	SBELL	Farmer	Farming	Supplier Side	Male
78	73	ECARI	Esthetician	Services	Buyer Side	Female
79	74	SLB	Manager	Purchasing	Buyer Side	Male
80	75	SLB	Manager	R&D	Buyer Side	Male
81	76	Dermo 2	Analyst	Marketing	Supplier Side	Female
82	77_a	EUD	Manager	Marketing	Buyer Side	Male
83	77_b	Cosmetics 3	Manager	Marketing	Buyer Side	Male
84	78	Cosmetics 3	Manager	Marketing Intelligence	Supplier Side	Male
85	79	ERV	Farmer	Farming	Supplier side	Female
86	80_a	DC	Comercial Represent.	Sales	Supplier Side	Female
87	80_b	SEC	Analyst	Sales	Supplier Side	Female
88	81	Cosmetics 4	Manager	Marketing	Supplier Side	Female
89	82	SLB	Manager	Marketing	Supplier Side	Female
90	83_a	MAP	CEO	Strategy	Strategy	Male
91	83_b	CGN	Consultant	Legal	Buyer Side	Male
92	84	FNCUST_G	Final Customer	Final Customer	Buyer Side	Female
93	85	Final Customer	Final Customer	Final Customer	Buyer Side	Female
94	86	Final Customer	Final Customer	Final Customer	Buyer side	Female
95	87	DC	Manager	Supply Chain	Buyer side	Female
96	88	D1ST	Small Businnes Owner	Franchising	Buyer Side	Male
97	89	STRT	Manager	Purchasing	Buyer Side	Male
98	90	Cosmetics 4	Vendor	Sales	Buyer Side	Female
99	91	Cosmetics 4	Manager	Sales	Buyer Side	Female
100	92	D1UDI	Small Businnes Owner	Franchising	Buyer Side	Female

	Informant	Firm	Job Titles	Department	Position in the Firm	Gender
101	93	Cosmetics 2	Director	R&D	Strategy	Female
102	94	ABH	Consultant	Legal	Administrative	Male
103	95	PRO	Director	Finance	Supplier Side	Male
104	96	PRO	Director	Sales	Supplier Side	Male
105	97	PRO	Director	R&D	Supplier Side	Male
106	98_a	Cosmetics 4	Vendor	Sales	Buyer Side	Female
107	98_b	MKY	Director	Sales	Buyer Side	Female
108	99	GTP	Director	Operations	Supplier Side	Male
109	100	Cosmetics 4	Director	Sales	Supplier Side	Female
110	101	Cosmetics 4	Manager	Sales	Supplier Side	Female
111	102	Cosmetics 4	Vendor	Sales	Supplier Side	Female
112	103	Cosmetics 3	Director	Operations	Buyer Side	Male
113	104	Dermo 1	President	Strategy	Supplier Side	Male
114	105	BRC	Manager	Sustainability	Buyer Side	Male
115	1001	Not Interviewed	Previous contact in industry	Indication	Contact Side	Male
116	1002	Not Interviewed	Previous contact in industry	Indication	Contact Side	Female
117	1003	Not Interviewed	Previous contact in industry	Indication	Contact Side	Female
118	1004	Not Interviewed	Previous contact in industry	Indication	Contact Side	Female
119	1005	Not Interviewed	Previous contact in industry	Indication	Contact Side	Female
120	1006	Not Interviewed	Previous contact in industry	Indication	Contact Side	Female
121	1007	Not Interviewed	Previous contact in industry	Indication	Contact Side	Female
122	1008	Not Interviewed	Previous contact in industry	Indication	Contact Side	Female
123	1009	Not Interviewed	Previous contact in industry	Indication	Contact Side	Female
124	1010	Not Interviewed	Previous contact in industry	Indication	Contact Side	Male

Appendix F: List of Fined Companies in “Operation New Direction II” by IBAMA

1. Age do Brasil indústria e Comércio
2. Amazon Secrets Cosméticos
3. Ambev – companhia de Bebida das Américas
4. Anidro do Brasil Exportações
5. Avon Industrial
6. Avon International Operations
7. Bayer
8. Beraca Sabará Químicos e Ingredientes
9. Biofarma Farmacêutica
10. Biolab Sanus Farmacêutica
11. Botica Coemrcial Farmacêutica
12. Casa Granado
13. Croda do Brasil
14. Dupont do Brasil
15. Eli Lilly do Brasil
16. Fluidos da Amazônia
17. Fundação Dom Aguirre
18. Galderma Brasil
19. Glaxosmithkline Brasil
20. Hypermarcas
21. L’oreal Brasil
22. Laboratório Sklean do Brasil
23. Laboratórios Pfizer
24. Mapric Produtos Farmacosméticos
25. Merck
26. Nazca Cosméticos Indústria e Comércio
27. Novartis
28. Petit Savon Indústria e Comércio
29. Produtos Roche Químicos e Farmacêuticos
30. Sabic Innovate Plastics South América
31. SS Comércio de Cosméticos e Higiene Pessoal
32. Unilever Brasil Industrial
33. Vedic Hindus Ind. Com. Imp. E Exp.
34. Vitaderm
35. Weleda

* Lei de Acesso

Para ter acesso à informação pública do governo federal, é preciso preencher um cadastro no E-SIC (Sistema de Informação ao Cliente) e fazer um pedido formal, por meio de um formulário online no site Acesso à Informação. Qualquer cidadão pode ter acesso aos dados.

Appendix G: Main biases and heuristics perceived in each event

HEURISTIC	Biases	Events						
		D1's Acquisition	D1 New Mkt Sales Diretor	D1 New Sales Model	B1 Commercial Disagreement	C4 New Projects Allocation	MP 2186/2001	
Representativeness Heuristics	Base rate frequency				*		**	
	Sample size intensity	***			***		***	
	Law of Small Numbers	***			*		***	
	Insensitivity to Predicability	*			***		***	
	Illusory Correlation	***			***		***	
	Misconception of Regression		***		***		***	
Availability	Salient Information		***				***	
	Confirmation Bias	*	***				***	
	Imaginability	Overconfidence			**	**		***
		Wishful thinking			**	*		***
Anchoring and Adjustment	Insuficient Adjustment	**	**	**	*		***	
	Evaluation of Conjunctive and Disjunctive Events	Inconsistency					***	
		Planning Falacy						***
	Assesment of Subjective Probabilities Distributions	Illusion of control	**	**	**		***	
Loss Aversion	Endowment Effect	*				***	***	
	Mental Account					*		
	Hyperbolic Discount					*	***	
	Status Quo		***	***		***	*	
	Framing Effects	*				**	**	
Locus of Control	Internal	**	*	**	*	***		
	External	*		**	**		***	