Fachbereich Wirtschaftswissenschaft

INTERNATIONALIZATION OF SMALL AND MEDIUM-SIZED ENTERPRISES RELATED TO THEIR DYNAMIC SUPPLY CHAIN FLEXIBILITIES

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Angabe der beiden Gutachter
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Declaration

I declare that this thesis has been composed solely by me and that it has not been submitted, in whole or in part, in any previous application for a degree. The work was made without unauthorized aid. No other than the specified sources and aids were used. Except where states otherwise by reference or acknowledgment, the work presented is entirely my own.

Date & Place

September 10th, 2018, Bremen

Signature of author

Sylvia Novillo

Acknowledgment

"The fear of the Lord is the beginning of wisdom; and the knowledge of the Holy One is understanding." Prov. 9:10

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encouraged me to keep up going when I wanted to give up. Thank you for supporting and understanding me in all the ways you could to achieve my goal. We accomplished it together. Thank my little son, Andres Daniel, for joining your mom in her crazy adventure. Thank you for keeping me focused and awake to do not waste the precious time that belongs to you. You are my greatest blessing and inspiration, the reason for giving my best effort, my greatest reason for being thankful and keep smiling even during the saddest moments. Finally, I express my deep thankfulness to my parents, who are my first role model of loving, sturdiness, and perseverance, for their love and supporting me in every possible way during my time in Bremen.

Abstract

During the last two decades, the internationalization of small and medium-sized enterprises (SMEs) has called the attention of policymakers, practitioners, and academia. The main reason behind this is due to the role that SMEs play in the economic growth and job creation in their nations. It has been recognized as a positive effect on productiveness and competitiveness in firms that perform export operations. There is also a positive impact on the innovative capabilities of exporting manufacturing SMEs. However, due to the complexity and uncertainty of international environments, internationalization has become a high-risk strategy to be embraced, especially for SMEs. To define an internationalization strategy, it is necessary to integrate the SMEs attributes and capabilities as well as understand the dynamics and complexity of international scenarios. Flexibility is one of the largest recognized capabilities of SMEs which has been used by these firms to overcome their lack of resources and poor capabilities. This capability leads to a closer link to customers and suppliers which allows at the same time a faster response to both sides. Moreover, SMEs need to adopt a network orientation to cope with the nowadays supply-chain competitive scenario. Hence, manufacturing SMEs require a sustainable competitive advantage to enhance their internationalization considering an integrative perspective. This paper addresses this gap by providing an integrative approach to investigate the implementation of supply chain flexibility (SCF) for sustaining SMEs internationalization.

A multi-disciplinary perspective was adopted to develop an integrative approach for addressing the research gap. Three are the areas of study included in this paper, i.e. SMEs internationalization approaches, SCF, and logistics capabilities. Furthermore, four main methodologies were implemented to examine the relationships between the areas of interest. First, it was elaborated an integrative conceptual framework based on the review of the literature related to the areas of study. This conceptual framework presented five relational functions (i.e. knowledge management, market management, network management, resource management, and innovation management) to enhance the internationalization process of SMEs. Furthermore, this conceptual framework discussed the relationships between the relational functions, trust, commitment, logistics capabilities, and SCF to obtain a sustainable competitive advantage for the internationalization process. Second, a system dynamics approach was implemented to understand the networking process during the internationalization process of SMEs. Based on the statements of the conceptual framework,

this approach allowed the recognition of the positive effect of trust and commitment as well as the development of logistics capabilities in developing SCF. However, there is a balancing relationship between commitment, resource management, and innovation management with respect to SCF configuration. Third, it was implemented the interpretive structural modeling (ISM). Based on the conclusions from previous methodologies as well as on a case study conducted with chocolate manufacturing SMEs in Ecuador, the ISM model defined a path for achieving SCF strategies and to generate a sustainable process for SMEs internationalization.

The paper is among the first on integrating the three areas of study to provide a deep understanding of the relationships between these areas and how these relationships impact the internationalization process of manufacturing SMEs. Furthermore, this paper provides critical elements supporting manufacturing SMEs in their decision-making process to define internationalization strategies with respect to the flexibilities of the supply chain as a source of sustainable competitive advantage.

Key word: SMEs internationalization, supply chain flexibility, logistics capabilities, system dynamics approach, interpretive structural modeling (ISM), sustainable competitive advantage

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List of Abbreviations

3PL	Third-party logistics provider
4PL	Fourth-party logistics provider
AHP	Analytic hierarchy process
ASEAN	Association of Southeast Asia Nations
CAD	Computer-aided design
CADD	Computer-aided process planning
CSCBMs	Collaborative Supply Chain Business Models
DMCs	Demand-management capabilities
EDI	Electronic data interchange
ERP	Enterprise resource planning
FDI	Foreign direct investments
GDP	Gross Domestic Product
HR	Human Resource
ILCs	Integration logistics capabilities
IMCs	Information-management capabilities
Inn-MaRF	Innovation-management relational function
IoT	Internet of Things
IS	Information Systems
ISM	Interpretive Structural Modeling
IT	Information technology
JIT	Just-in-Time
KBV	Knowledge-based view
Know-MaRF	Knowledge-management relational function
Mar-MaRF	Market-management relational function
MBE	Multinational Business Enterprises
MRP	Manufacture resource planning
Net-MaRF	Network-management relational function
PDM	Product data management
PLM	Product lifecycle management
R&D	Research and Development
RBV	Resource-based view
Res-MaRF	Resource-management relational function
RFID	Radio-frequency identification
SCA	Supply Chain Agility
SCF	Supply Chain Flexibility
SCM	Supply Chain Management
SCO	Supply Chain Orientation
SMCs	Supply-management capabilities
SMEs	Small and Medium-sized Enterprises
SWOT	Strengths-Weaknesses-Opportunities-Threats

1 Motivation and research outline

1.1 Motivation of the thesis

Small and Medium-sized Enterprises (SMEs) have a great capacity to stimulate the countries' economies regardless of income, population or territory. Worldwide, they are considered as an essential force in driving gross domestic product (GDP) growth and sustaining employment (World Trade Organization Secretariat 2016). For instance, SMEs are considered the backbone of Europe's economy as there are 23 million SMEs in Europe representing around 99% of all businesses where 57% of them are sole proprietorships (European Commission 2018a). They provide two-thirds of total private-sector employment, leading 80% of the total job creation and produce more than half of the European-Union added value (European Commission 2014). In Latin America, these enterprises contribute over 20% to the GDP and cover 87% of private employment places in the region (Saavedra and Hernández 2008).

The use of the acronym SME has been extended to refer in general terms all the enterprises that are not qualified as large enterprises. The enterprises are classified as *'small'* enterprise or *'medium'* enterprise with respect to the number of employees and/or annual turnover as each government or internationalization organization has determined (World Trade Organization Secretariat 2016). Despite the lack of a standard agreement on determining the parameters of those variables, the analysis of the MSME Country Indicators, published by the International Finance Corporation, indicates that in most of the countries the definition for *'small-size enterprise'* correspond to a range between ten to fifty employees, while *'medium-size enterprise'* refers to the range between fifty to 250 (Kushnir et al. 2010). In the case of the European Union, the Member States have adopted a single and common definition according to the EU recommendation 2003/361 of the European Commission (European Commission 2003). This recommendation qualifies an enterprise, whether as a *'micro'*, *'small'* or *'medium'* –size enterprise, based on the following aspects: the staff headcount and either turnover or balance sheet total, as shown in Table 1-1.

Table 1-1 SMEs definition according to the EU recommendation 2003/361

Company category	Staff headcount	Turnover	or	Balance sheet total
Medium-sized	< 250	≤ € 50 m		≤ € 43 m
Small	< 50	≤ € 10 m		≤ € 10 m
Micro	< 10	≤ € 2 m		≤ € 2 m

Source: European Commission 2018b

During the last two decades, the internationalization of SMEs has called the attention policymakers, practitioners, and academia as well as many governments and international organizations have supported their internationalization due to the role that this group of enterprises plays in the economic growth and job creation in their nations (Daszkiewicz and Wach 2012; Edinburgh Group 2012; European Commission 2014). This measure is employed in order to make these enterprises more competitive and, as a consequence, to consolidate their role in the growth of their countries (European Commission 2010). In the European Union, SMEs are considered the cornerstone of the European economy as they concentrate the majority of businesses in this continent. Moreover, they have a large capability of employment generation, reporting around 85% of new jobs during the last years (De Kok et al. 2011). Therefore, through European Commission, the Member States of the European Union are developing mechanisms and policies to support the growth, strengthen and internationalization of these enterprises (European Commission 2008, 2011). At the center of the Commission's action is the Small Business Act for Europe (SBA) that provides a comprehensive SMEs policy for the EU and EU countries. In that policy, it is highlighted the importance of supporting the internationalization of SMEs, their competitiveness and innovation as well as the promoting the conformation of networks.

Networks expand the capability of the individual SME (Spanikova et al. 2014). These networks can be of two different types, i.e. support networks and co-operation networks. A particular case of the latter is supply chains which promote enhance competitiveness (Directorate-General for Enterprise and Industry 2007). Supply chain is defined as a complex and dynamic network of entities through upstream and downstream linkages. These entities perform different processes and activities to produce products and services with an added value regarding the requirements of the ultimate consumer (Mentzer et al. 2001). To enhance the competitiveness across the supply chain and inside each partner, the firms needed the synchronization of the individual competencies, capabilities, procedures, and resources to

provide an accurate response to the dynamic of the business environment (Duclos et al. 2003; Mentzer et al. 2004). The particular nature and attributes of logistics allow this synchronization in an active among both internal and external functions of the firm (Gligor and Holcomb 2014a). Furthermore, developing, coordinating, and integrating logistics capabilities across the supply chain constitutes *"valuable factors in enabling firms to respond to changing business conditions in an efficient and effective manner"* (Gligor and Holcomb 2012). As a consequence, higher levels of flexibility are achieved in the supply chain that is beyond the single firms (Mandal 2016). Thus, improving supply chain flexibility (SCF) constitutes an advantage over competitors (Singh and Acharya 2013).

Nowadays, the phenomenon of internationalization has gained great importance, most of the companies are moving towards it, whether they share a portion market from another country or compete in the domestic market with companies from abroad. Customers are now more demanding and have more knowledge about the products and solutions that different providers in the market have to offer for them. Current literature provides details about this phenomenon and how important is the SMEs role in this scenario due to their flexible capabilities and position on the supply chain. However, it is necessary to provide a holistic approach to support SMEs their internationalization process by enhancing their own capabilities and integrating supply chain partners to set a suitable SCF strategy. This work contributes to addressing this gap. With this in view, Figure 1-1 depicts the main aspects that motivate this research, and the relationship among them.

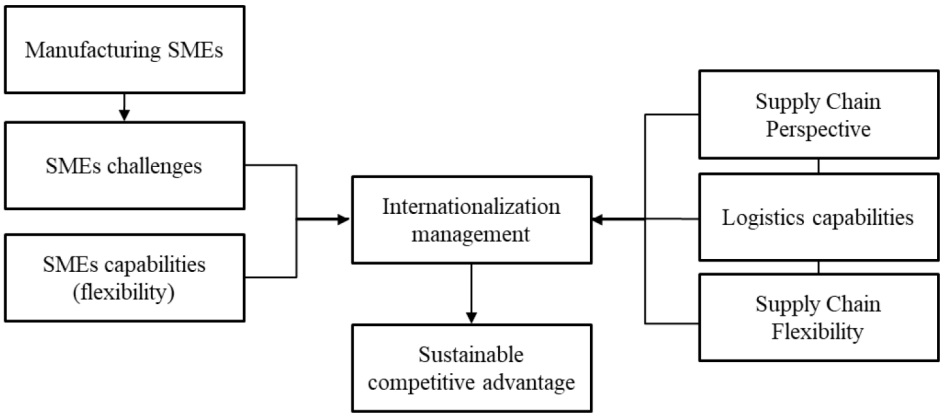

Figure 1-1 Research motivation

Why manufacturing SMEs?

The degree of contribution of SMEs to the economic health, job creation and productiveness is stimulated by the productive sector on which they are involved. Table 1-2 presents the distribution of SMEs per productive sector.

Table 1-2 Sectoral distribution of MSMEs (%)

	Manufacturing	Trade	Services	Agriculture/other
Developed	22.0	25.0	52.0	1.0
Developing	19.9	30.6	41.0	8.5
G20 developing	21.0	31.0	44.0	3.0
Other	18.0	32.0	41.0	8.0
Least-developed countries (LDCs)	24.0	23.0	37.0	16.0
Total	20.0	30.0	42.0	8.0

Source: World Trade Organization Secretariat (2016)

It is observed that most of the SMEs, in all the economies, operate in the service sector, mainly in retail trade and wholesale (World Trade Organization Secretariat 2016). However, these activities might not aggregate significant value to impact on the GDP. On the other hand, the manufacturing sector not only generates added-value products, but also stimulates the development of further productive sectors and its integration, increasing the positive impact on the contribution to the GDP. In addition, the manufacturing sector represents the 30% of SMEs exportations and the 17% of their imports (OECD 2013).

The contribution of manufacturing SMEs to the employment generation has been directly and positively related to six characteristics of the firm, i.e. 1) the international orientation of the firm, particularly to export activities, as well as the orientation of the sector, in which the SMEs operate, to exportations; 2) the intensity of capital; 3) the degree of innovation in the product as well as in the processes; 4) the degree of skilled workforce; 5) owned by foreign shareholder; 6) the age and experience of managers and decision makers (Deijl et al. 2013). Moreover, numerous aspects of the business context in which SMEs are embedded, particularly the *"reliability of the power network"* (infrastructure quality), the access to financial resources, and the ease of the business procedures, have a direct impact on the SMEs' rates of employment growth (Deijl et al. 2013). Thus, this work is focused on the internationalization of manufacturing SMEs due to their importance in the generation of added value activities, in both developed and developing economies, that contribute to increase GDP as well as in the generation of employment in their nations.

Manufacturing SMEs have to face diverse challenges, such as their lower productivity rate, which is generally endorsed to their limited access to investment or credit, their poor capability to leverage with economies of scale, their lack of resources and capabilities, and the quality of the interactions with their suppliers and customers (Alvarez and Crespi 2003). In

contrast, large firms have higher productivity rates due to their capability to coordinate the use of their resources, have access to more specialized inputs, and incorporate skilled workforce and machinery to take advantage of economies of scale (Alvarez and Crespi 2003; World Trade Organization Secretariat 2016).

Among the advantages of manufacturing SMEs is their capability to distribute information within their communication channels in a faster way as well as the flatter organizational structure that characterizes this type of enterprises. These characteristics might constitute an advantage with regard to prompt their innovation capability to give a quick response to the variations in the need of the customers as well as in the business environment (Rogers 2004). Flexibility is one of the largely recognized capabilities of SMEs which has been used by this enterprises to overcome their lack of resources and poor capabilities (Singh et al. 2008; Ismail et al. 2011; Zhang et al. 2014; Child et al. 2017). Flexibility leads the firm to have a closer link with customers and supplier which allows at the same time a faster response within these links (Ismail et al. 2011).

Why manufacturing SMEs internationalization?

Internationalization constitutes a high-risk strategy to embrace by any firm due to the uncertainty and complexity of interacting with parties abroad and dealing with international customers with different requirements as well as social, cultural, political and economic contexts (Leonidou 2004; Bianchi and Wickramasekera 2013). Nevertheless, nowadays the firms are already interacting with international parties and competitor in a direct or indirect way. Hence, by adopting an international orientation, the firms gain a competitive edge over their competitors that have limited their operations to the domestic market (Leonidou 2004). Moreover, there has been identified a positive effect on productiveness and competitiveness in the firms that perform export operations and, it has been showed a positive effect on the innovative capabilities of this group of firms (Johanson and Vahlne 2009; Love and Roper 2015; Child et al. 2017).

For this reason, it is needed to develop sustainable competitive advantages to enhance the internationalization of SMEs regarding a holistic approach integrating their attributes, capabilities, dynamics and the complexity of international and competitive scenarios (Singh et al. 2008; Zhang et al. 2014).

Why a supply chain perspective?

As manufacturing SMEs get involved in internationalization processes, they need to evaluate its condition and address the urgency in making strategic decisions. These decisions include among others the product to be offered, market selection, production capacity, logistics, and adaptability to new requirements (Araque and García 2015). Moreover, the supply chain configuration and its characteristics have to be assessed due to their direct impact on the performance of any market. These evaluations and decisions are crucial as they determine the success or failure of the enterprise on international markets.

The complexity of the international scenarios has increase as the competitive context has shifted during the last three decades from individual enterprises competition to a supply chains' competition (Christopher 2011). Therefore, SMEs require to coordinate and integrate of their resources, capabilities, operations and strategies with their supply chain partners to provide and satisfactory response to their customers (Gligor and Holcomb 2012, 2014b). As a consequence of this coordination, the supply chain will achieve higher levels of flexibility further each single firm (Gligor et al. 2013) which might lead to have a competitive advantage (Singh and Acharya 2013). Finally, it is precisely the lack of a network perspective from the manufacturing SMEs that has been identified as one of the critical factors that impact negatively on their internationalization process, particularly in the case of SMEs from developing economies (Ciravegna et al. 2014a; Araque and García 2015).

Why a supply chain flexibility and logistics capabilities?

The flexibility of a firm depends on its network relationships and the international scenario on which the firm is doing business or willing to do so. Therefore, although SMEs are flexible by nature, this may be affected while interacting in a supply chain. For this reason, SMEs need to include SCF as part of their strategy with the aim of remaining flexible as they growth internationally (Novillo and Haasis 2017). Henceforth, firms that adopt SCF will have a competitive advantage over other firms (Singh and Acharya 2013).

In a supply chain context, firms to coordinate, integrate and combine their logistics capabilities among the other partners in the network as part of a competitive advantage (Gligor and Holcomb 2012, 2014b; Christopher 2016). Although in general terms logistics refers to the flow of material and the related information flow in order *"to serve the customer in a cost-effective way",* the strategic significance of logistics as part of the achievement of a

competitive advantage has been relegated by the enterprises until recent decades (Christopher 2016). Further, Gligor and Holcomb (2012) described how by combining the logistics capabilities of the firms at a network level increases the supply chain agility. Finally, there is a positive impact of the logistics capabilities on SCF and on the overall performance of the supply chain (Swafford et al. 2008; Yi et al. 2011; Moon et al. 2012; He et al. 2014; Jin et al. 2014; Mandal 2016).

1.2 Research questions

As the interest on the phenome of SMEs internationalization has increased during the last two decades, the extensive body of knowledge in this field has contributed to have a better understanding about the internationalization process of these enterprises. The same consideration needs to be made with respect to the literature on logistics capabilities as well as on SCF which has shed light on the nature of these capabilities as well as their impact on the supply chain and firm performance. However, there is a lack of an integrative analysis of these main areas of study to provide a holistic approach to understand the relationship among them and their impact on the internationalization process of SMEs.

In order to fill this gap, this work will address the following main research question:

How to sustain the internationalization processes of manufacturing SMEs through the development of SCF to address the dynamics of foreign markets?

With the aim of answering this question, further research issues need to be considered as listed below.

- What is the state of the art of SMEs internationalization approaches?
- What is the state of the art of SCF?
- What is the state of the art of logistics capabilities?
- What are the relationships among the areas of study?
- How to integrate these three main areas of interest into a unified framework?
- What is the role of logistics capabilities and SCF for sustaining the internationalization process of SMEs?
- What is the dynamics of the networking process for implementing SCF strategies in SMEs' internationalization?
- What are the variables to involved for implementing SCF strategies in the internationalization processes of manufacturing SMEs?

- How are those variables related to each other?
- How to implement SCF strategies for SMEs internationalization?

1.3 Guideline of the research methodology

To address the aforementioned research questions, this work adopts a qualitative approach to integrate multiple disciplines in a unified framework focusing on the conceptual, managerial, collaborative, and decision-making aspects of these disciplines, while legislative, technical and bureaucratic issues are not considered. Figure 1-2 depicts the mix of methodologies that have been used to accomplish the present research.

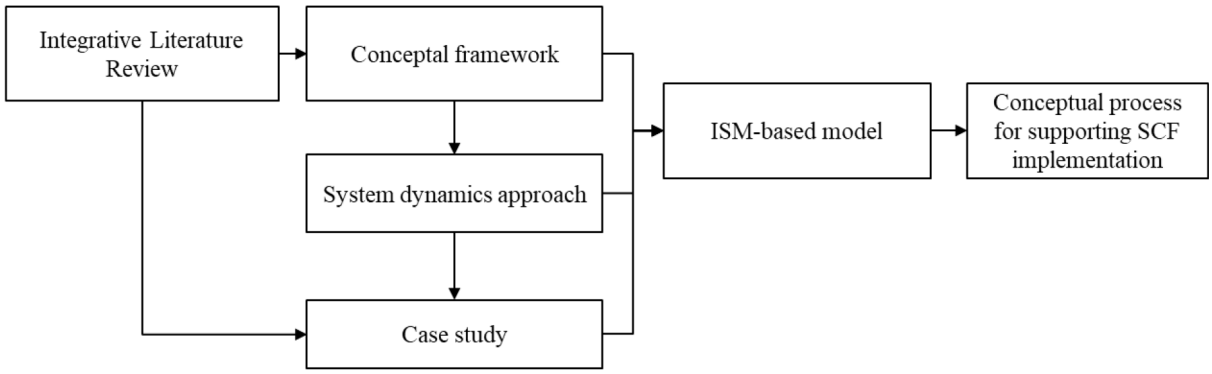

Figure 1-2 Reserch methodoly mix

a) Integrative literature review

One of the main methodologies used in this work is the integrative literature review. The main objective of this review is to identify key concepts and approaches with respect to the main areas of intereste for this work, i.e. SMEs internationalization, logistics capabilities and SCF. It has been analyzed literature sources as journal papers, books and official reports related to the questions addressed.

b) Conceptual framework

The emerging concepts from the analysis of the literature review and case study have been summarized, classified and integrated under a conceptual model to develop new concepts and explain the relationships among the identified concepts from the areas under study.

c) System dynamics approach

Based on the statements of the aforementioned conceptual framework, the system dynamics approach presented in this work is used as a methodology to describe, analyze and discuss the

behavior and relationships between the identified components of the internationalization networking process of manufacturing SMEs.

d) Case study

To have a deeper understanding of the areas under study a case study has been done on in the way in-depth face-to-face interviews with representatives of chocolate manufacturer SMEs in Ecuador that have been successful in their internationalization process. In addition, secondary sources have been used to allow triangulation. From the analysis of the case study as well as the literature review, the variables that impact the implementation of SCF strategies for SMEs internationalization.

e) Interpretive Structural Modeling (ISM)

This methodology is used to analyze the linkages between the variables identified as involved in the development of SCF during the internationalization process of a manufacturing SME. Lastly, a conceptual process is presented for developing a managerial roadmap for SCF implementation.

1.4 Thesis structure according to the research questions

Chapter 1 introduces the motivations behind this work, the research questions, and the brief description of the methodologies used to address those questions. Chapter 2 describes the state of the art resulted from the literature review of SMEs' internationalization approach, logistics capabilities, SCF, trust and commitment to provide the theoretical foundation to answer the further research questions. Chapter 3 presents the discussion to develop the integrative conceptual framework to manage the internationalization of SMEs from a supply chain perspective by proposing five relational functions (i.e. knowledge management, market management, resources management, network management, and innovation management) to develop logistics capabilities that will lead to the achievement to SCF strategies. Chapter 4 discusses the finding to the case study and describes the variables included in the ISM model used to map the implementation of SCF for the internationalization of manufacturing SMEs. It further presents a conceptual model as a system approach to managing the implementation of the roadmap. Finally, Chapter 5 addresses the conclusions from this work.

2 Analysis of theoretical framework and basic relational aspects

2.1 Logical arrangement of the Chapter

This chapter provides the theoretical background and its analysis with respect of the areas of research included in this work, i.e. SMEs internationalization theory, supply chain management (SCM), SCF, logistics capabilities, and trust and commitment. Figure 2-1 depicts the structure of its content.

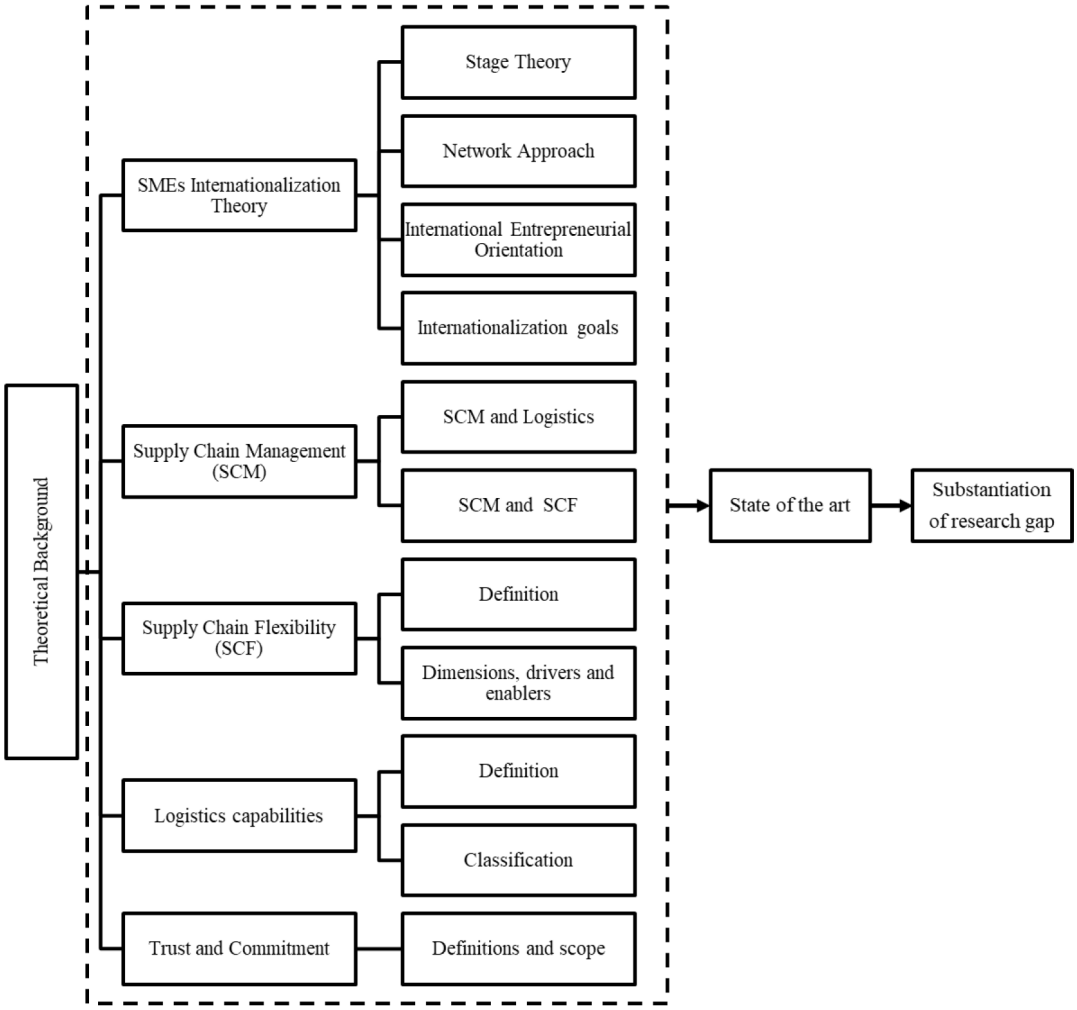

Figure 2-1 Structure of the Chapter

The content exposed in this chapter aims to tackle the questions related to the state of the art of the three studied disciplines (Section 1.2), i.e. SMEs internationalization, SCF, and

logistics capabilities. In Section 2.2, it is first introduced the three SMEs internationalization theories considered for the purpose of this work: stage theory, network approach and internationalization entrepreneurial orientation. The analysis of these three approaches provides a comprehensive picture of SMEs internationalization phenomenon from different perspectives, allowing the identification of the main elements involved in this process and the followed patterns by the firms. It is also included the description of the SMEs international goals. Section 2.3 elaborates a synthesis of SCM and its connections with logistics and SCF. This will provide the theoretical foundation to develop the sections of SCF and logistics capabilities. Section 2.4 presents a comprehensive analysis on the evolution of SCF, its definition, as well as the main dimensions, drivers and enablers of this supply chain capability. Section 2.5 offers its definition and the classification of these capabilities that serves to the aim of this research. The definitions and scope of the social attributes of trust and commitment are described in section 2.6. Finally, section 2.7 summarizes the state of the art in the areas of research as well as exposing the substantiation of the research gap addressed in this work.

2.2 SMEs internationalization

SMEs internationalization is a complex phenomenon. This has captured the attention of scholars who have analyzed firm's internationalization from different approaches to provide theoretical and managerial elements to enhance the design and implementation of internationalization strategies among SMEs. At this point, it is necessary to provide a brief explication and scope of the term *internationalization*. Internationalization involves several levels, processes, dimensions, and perspectives (Etemad 2004). Moreover, its meaning might differ depending on the context on which is it used (e.g. politics economic or management) or the geographical extension to which it is referred (e.g. globalization, internationalization, regionalization, Europeanization). Indeed, in the scientific ground, there is an important distinction among the level of analysis, i.e. micro (firm), meso (industry) and macro (economy) (Daszkiewicz and Wach 2012). Therefore, a brief review of the terms internationalization, globalization and regionalization is presented.

The term internationalization can be traced back to the earliest times of human history, when it was used in the economy context of ancient civilizations. Nevertheless, it was during the Middle Ages when the cross-bordering exchange of goods became systematic in Europe (Cantos 1999). Internationalization is defined by Zweig (2002) as *"the expanded flow of*

goods, services, and people cross state boundaries, thereby increasing the share of transnational exchange relative to domestic ones, along with a decline in the level of regulation affecting those flows". Similar definitions have been given by other authors, underlining the different processes and factors that are part of the scope of internationalization, i.e. marketplaces, production-factors accessibility (i.e. capital, mains of production and labor) and regulations (Wong and Grinols 1995; Zhang 2008). To summarize, internationalization is the wider and classic term which refers to every single economic and business operation performed in any foreign territory.

Globalization is a much younger concept compared to internationalization. Due to the development of new commutation technologies (specially the extended use of internet and cellular communications), the fall of the wall in Germany, and the establishment of economic regions around the globe, the use of this new term became popular among scholars during the 1990s (Daszkiewicz and Wach 2012). The phenomenon of globalization is related to the variety of different globally ties and forces among the economic systems creating a strong interdependency among various countries and regions, increasing the diversity of products, and services transactions, the international financial flows as well as the transference of technology as a consequence (Ruigrok and van Tulder 1995; Axinn and Matthyssens 2002). These new ties and forces constitute the new framework on which enterprises operate and guide their internationalization processes. However, the globalization of a firm is regarded as the highest internationalization level. It is also seemed as a business strategy that largely depends on global economy and international economic environment. Finally, *regionalization* is the contrast of globalization, where both together constitute the two extremes of the so called *"globalization-regionalization"* process, where nowadays economy's state has been described as *semi-globalization*, i.e. global standardization is part of the globalization strategy while the *"regional adaptation"* addresses the regionalization requirements (Ghemawat 2007).

Considering the aforesaid, at the micro level of firm's internationalization process (Figure 2-2), in its wide sense, business internationalization involves every activity, degree and level of any internationalization activity performed by any business unit. On the other hand, in the strict sense, business internationalization is narrowed to the simple and single international exchange made inner neighboring or nearby countries. Business regionalization is a broader concept referred to the business international operations performed within the territorial expansion of an economic region or group of countries in the same continent (if it is in a

different continent it corresponds to multi-nationalization). In this context, business globalization comprehends a wider territorial international expansion. In this case, the main operational market, in which an internationalized firm functions, corresponds to the global market.

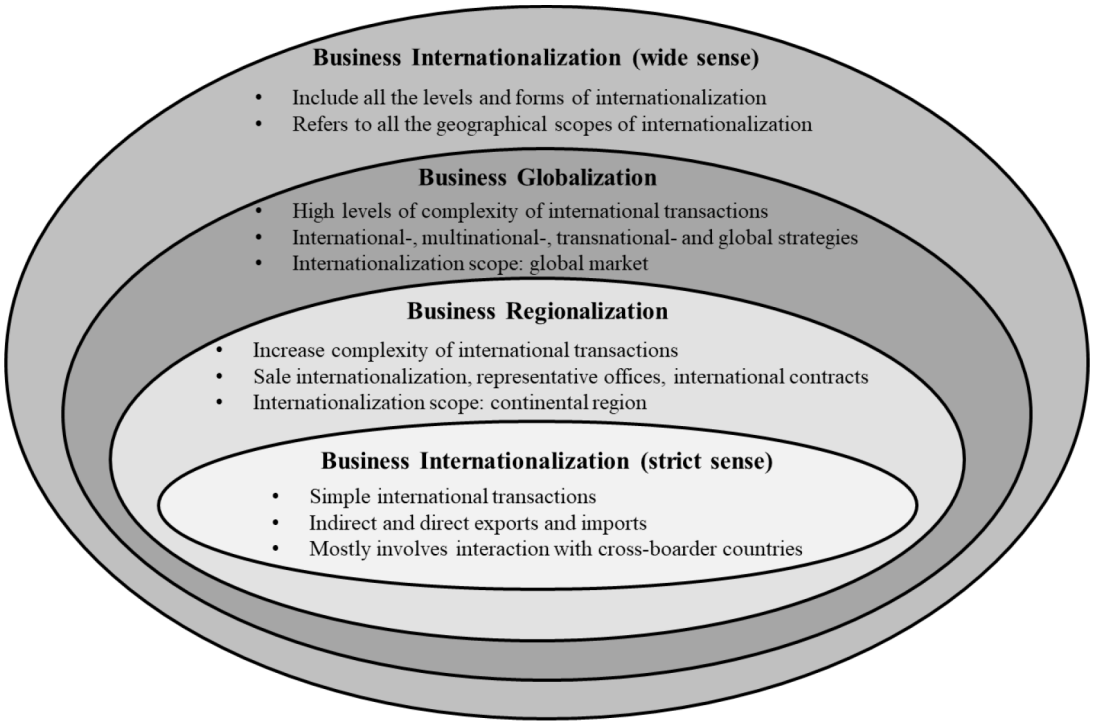

Figure 2-2 Understanding internationalization process at the micro level of the firm
Source: Author

For the purpose of this work, the wide sense of the term 'internationalization' is considered. It will refer to all internationalization activities from which an SME develop a meaningful business relationship with international partners, independently of the territorial expansion where these activities take place. This includes internationalization activities such as resource seeking (imports), market seeking (exports), international outsourcing, and foreign direct investments (FDI) among others.

Table 2-1 summarizes the forms of entrance to international markets depending on the intensity of internationalization considering four degrees.

Table 2-1 Range, intensity, and modes of business internationalization

Degree of Internationalization Intensity	Modes
0. Activity on domestic market	– domestic transactions – indirect import – direct import
1. Sale Internationalization	– indirect export – direct export – transit trade – barter trade – representative office
2. International Cooperation	– subcontracting – piggybacking – licensing of trade-marks – franchising – management contracts – turn-key operations – strategic alliances
3. Foreign Affiliates	– branch – subsidiaries • joint venture subsidiary • wholly-owned subsidiary
4. Business Globalization	Above mentioned modes are used within the fourth strategies: – international company – multinational company – transnational corporation – global firm

Source: Daszkiewicz and Wach (2012)

Furthermore, three main approaches have been included in to develop the integrative conceptual framework proposed in this work, i.e. the stage theory of internationalization, the network approach, and the international entrepreneurial orientation approach. Although this work studies the internationalization of manufacturing SMEs from a network perspective, within the context of supply chain, these three approaches provide critical elements that are necessary to be taken into account when designing internationalization strategies for SMEs,

e.g. the learning processes and acquisition of market knowledge of the firm, the market commitment and its impact on the decision making process during the internationalization process, the design of differentiation strategies, among others.

2.2.1 Stage theory of internationalization

This theory is considered the classical and relevant research's stream explaining the internationalization of SMEs (Daszkiewicz and Wach 2012). This considers the process the internationalization of a firm as an *"evolutionary process"*. The internationalization as firm's expansion from this perspective is defined by Cavusgil (1984) as *"the firms' ability to initiate, to develop, or to sustain business operations in overseas markets"*. This theory anticipate that firms increase their participation in foreign markets going from one internationalization stage to the next one, i.e. the firms should start operating in local/domestic markets to expand gradually their international activities reaching later stages (Figure 2-3).

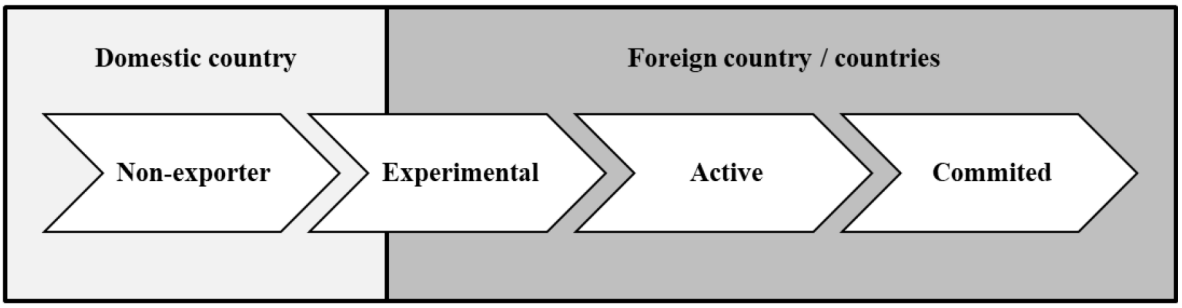

Figure 2-3 Evolutionary process of firm's internationalization from the stage theory perspective

Source: Author

The firms in the first stage are the ones that work only in local or domestic markets without performing any kind of export operation. Additionally, the firms that undertake export activities start by giving small steps, e.g. obtaining information, know-how and experience to enable them for further export activities. It is crucial for the firms to evaluate the market conditions and risks, as well as their own knowledge, resources and capabilities to choose the optimal mode of entrance for export markets. Table 2-2 presents a brief summary of various stage models from the literature.

Table 2-2 Summary of selected stage models

Stage Models Characteristics	Source
'Johanson – Wiedersheind' Model 1. No importing or export activity; might be casual. 2. Exporting through sale agents to neighboring countries. 3. Export to more distant countries, instituting sales subsidiaries. 4. Manufacturing/production operations in foreign markets.	Johanson and Wiedersheim-Paul 1975
'Bilkey – Tesar' Model 1. Managers are not interested in exporting. 2. Firm fills unsolicited orders but does not actively pursued export markets. 3. Managers actively explore exporting (passive exporter). 4. Firm begins experiment with exporting. 5. Firm becomes an active exporter. 6. Firm becomes a committed exporter.	Bilkey and Tesar 1977
'Uppsala' Model Observations: 1. Not regular export activity 2. Selling via agent 3. Establishing a sales subsidiary 4. Establishing a production subsidiary Dynamic model to explain internationalization with two set of aspects, i.e. state (market knowledge and market commitment) and change (commitment decisions and current activities)	(Johanson and Vahlne 1977)
'Czinkota' Model of Export Development Strategies 1. Firm is not interested in exporting – firm is not analyzing export opportunities. 2. Firm is partially interested in exporting. Export is uncertain activity. 3. Firm is planning export activity and analyses opportunities of exporting. 4. Firm is experimenting with exporting. 5. Medium experienced exporters. 6. Big experienced exporters.	Czinkota 1982
'Cavusgil' Model of Export Stages 1. No engagement in export activity; sales in domestic market only, firm is not interesting in exporting. 2. Reactive engagement in export. Firm is seeking information about export opportunities. 3. Limited export to neighboring countries. Limited experience and engagement. 4. Active engagement- systematic export to new countries. 5. Engagement – resource allocation between domestic and foreign markets.	Cavusgil 1984
'Moini' Three-Stage Model 1. Non-exporters. 2. Partially interested exporters. 3. Growing exporters. 4. Regular exporters.	Moini 1995

'Leonidou-Katsikeas' Three-Stage Model 1. Pre-engagement- preceding firm's involvement in international activity. 2. Initial 3. Advanced	Leonidou and Katsikeas 1996

Source: Based on Daszkiewicz and Wach (2012)

While the number of stages is different among the studies, the classification raised from assessing the internationalization of surveyed groups of firms. Hence, these studies have a static lineament. In addition, exporting constitute the most common strategic entry mode used among internationalized SMEs as it constitutes a cost-effective way and offers high-levels of flexibility for entering new international markets rapidly (Leonidou 1995; Zhao and Zou 2002; Botero Mesa et al. 2012); thus, research on this area, as well as the stage theory itself, is related manly to the export activity, its evolution and firm's export performance (Sousa et al. 2008). However, adopting this perspective limits the analysis of internationalization activities that might be adopted for internationalizing firms. Finally, a relevant model in this field is the Uppsala Model proposed by Johanson and Vahlne (1977), which is examined in detail in the section below.

2.2.1.1 The Uppsala Model for Internationalization

Johanson and Vahlne (1977), from the University of Uppsala, conducted an empirical observation to examine the internationalization process of Swedish firms. From the observations, it was identified that the firms progressively enlarged their international involvement. Therefore, the author referred to internationalization as *"a process in which a firm gradually increases their international involvement. ...is the product of a series of incremental decisions"*. As the firms started to gain experience in foreign markets, it would go a step further in their participation by promoting agreements with sales agents to represent them in the foreign market. As the sales increase in that market, the firms replaced the sales agents with their own sales subsidiary, and as the sales continued increasing the firms founded their own production subsidiary in the foreign market to avoid trade barriers. The authors called this internationalization pattern as the *establishment chain*.

After comparing the previous theories of internationalization presented by Penrose (1966), where the author identified internationalization pattern to explain the deviations among them, Johanson and Vahlne developed their model based on two key assumptions, i.e. lack of knowledge about foreign markets and uncertainty.

The author proposed a dynamic model (Figure 2-4), where the consequence of one decision (or a set of decisions) in one cycle of events, constitute the input of the next.

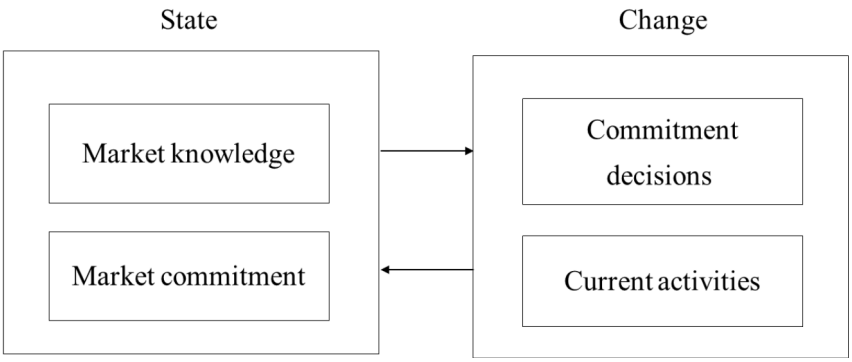

Figure 2-4 The basic mechanism of internationalization: state and change aspects
Source: Johanson and Vahlne (1977)

The model presents firm's curve of learning as one of the main drivers of the internationalization process. It has two key states: the knowledge of the market (i.e. markets and operations abroad) and the commitment[1] to the market (i.e. how many resources are committed in a certain market abroad).

As the firm gains knowledge from its experiences abroad, this will impact the firm's decisions regarding its degree of resource committed to that specific market as well as on the activities resulted from those decisions. Therefore, internationalization *"is the product of a series of incremental decisions"* which drive the commitment degree to the next level and motivates the learning process. Hence, *"the model focuses on the gradual acquisition, integration and use of knowledge about foreign markets and operations, and on the incrementally increasing commitments to foreign markets. In particular, attention is concentrated on the increasing involvement in the individual foreign country"* (Johanson and Vahlne 1977).

The first state, ***market knowledge***, included diverse types of knowledge (e.g. identifying business opportunities, learning experiences and experimental knowledge, market knowledge). This knowledge was classified based on how it is gained (Penrose 1966), i.e. objective knowledge (teachable knowledge), and experimental knowledge or experience (it is

[1] The authors defined commitment was defined as the product of the size of the investment times its degree of inflexibility (Johanson and Vahlne 2009). In other words, the more specialized the investment to a specific market, the higher the commitment to that market

gained through personal experience, and difficult to be transferred as objective knowledge). Finally, the authors made a distinction among market specific knowledge and general knowledge. The former refers to the knowledge about the particular features and requirements of the particular foreign market (e.g. business practices, specific characteristics and patterns of their customers' behavior). General knowledge includes the body of knowledge that is useful in general terms to the firm regardless the geographical location (e.g. general customer's characteristics and preferences, marketing methods, distribution configuration).

With respect to ***market commitment***, the authors included two elements to this state, i.e. the amount of resources that are committed to a specific market and its degree of commitment (how feasible is the use of the committed resource in a different market). Another aspect of market commitment is related to the investments' size in the foreign market (e.g. marketing, engineering, organization, and workforce). In addition, the authors presumed that commitment building and gaining knowledge requires time. Further, the internationalization process will long as the projections and operations are beneficial.

Moreover, two main changing mechanisms are also included:

1. The ***commitment decisions*** that the firms undertake to reinforce their position in the foreign market changes the internationalization degree of the firm. Decision result as a response to detected market opportunities and/or threats. The capability to identify possibilities and necessities for firm's actions relies on its experience.
2. By learning from their current activities and operations in foreign markets, the firm will change it internationalization degree. Generally, a delayed relation exists among the current activities and their consequences. The occurrence of the consequence depends on how continuously the activity is repeated. As long the delay takes, the commitment to the market will increase. The complexity and differentiation of the product will increase the total commitment as a result of the current activities. Further, current activities constitute a primary source of experience.

Finally, the authors introduced the concept of *'psychic distance'* or liability of foreignness defined as *"the sum of factors preventing the flow of information from and to the market"*. This concept was used to visualize the differences of culture, language, trade barriers, the level of industrial development, among other factors and how they influence the information transferred and received from international markets. In this regard, Leonidou (2004) handled a

systematic review of 32 empirical studies to identified and analyze the main export barriers (Figure 2-5). These barriers were categorized into internal (i.e. functional, marketing, and informational) and external (i.e. governmental issues, procedural issues, environmental and task issues).

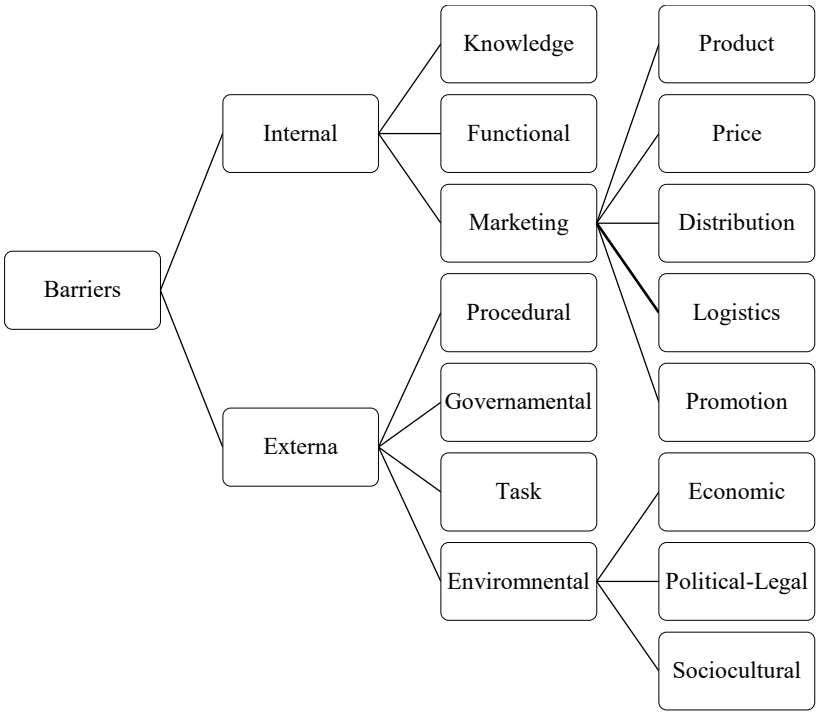

Figure 2-5 Classification of export barriers
Source: Based on Leonidou (2004)

This study showed that those barriers related to international customer behavior, information inefficiencies, price competitiveness and politic-economic obstacles had a *"systemically strong obstructing effect on export behavior"*. Therefore, an integrated and effective flow of information will improve the access of the firm to more geographical distant markets, leading to the reduction of the liability of foreignness, stimulating the learning process and enhancing the decision-making process to allow an accurate market commitment.

2.2.2 The network approach for internationalization

A network might be defined as the set of linkages among different entities that perform value-creating activities to deliver products or services as required by the end-customer (Christopher 2016). In the context of internationalization, the term network has been defined as *"sets (of)*

two or more connected exchange relationships" (Axelsson and Johanson 1992). Hence, the internationalization network approach focuses on the development of linkages between various entities involved in the value-creating activities (e.g. producer, supplier, customers, and colleagues) as a strategic decision, that includes the exchange of resources and development of capabilities among the members to reach international markets. With this in view, Aldrich and Zimmer (1986) presented a new angle *"which views entrepreneurship as embedded in networks of continuing social relations"* while Birley (1985) acknowledged the role of networks in accelerating the start-up process of small firms. Since these observations were made, the study of SMEs' networking processes has been extended to analyze different research areas such as new venture, SMEs internationalization among other.

There are different types of networks and criteria to classify them. Nevertheless, Perry (2012) proposed a classification of SMEs networks based on the relationship in which it is grounded (Table 2-3).

Table 2-3 SMEs networks' classification

Network type	Linkage characteristics	Examples	Issues
Family and ethnic	Bounds based on familiar and personal relationships, build in close-knit communities	Family business, overseas Ecuadorian, ethnic minority enterprise	Enclave economies, depends on ethnic resources, impact on racism
Place	Share common goals and values enhanced by geographical proximity and commitment	Silicon Valley, Third Italy	Origins as a barrier to replication, variations between industrial districts, sustainability
Organizational	Ownership or investment links or membership of industrial organizations	Chamber of production, chamber of commerce, business associations	Scope of influences on industry cooperation, SMEs status in vertical and horizontal groups
Buyer-supplier	Joined efforts to enhance supplier's role	Relational subcontracting	Impact of global manufacturing, use of vendor rating, Degree of change in subcontracting

Source: Perry (2012)

The author identified four categories, i.e. (1) personal and ethnic networks, (2) geographical closeness, (3) the integration within the organization, and (4) supplier-buyer relationship. Although these networks' categories overlay, it is necessary to identify these interactions among various network types. In addition, different methods to describe the network might differ with respect to their focus of analysis, i.e. taking as a unit of study the whole network,

including the different connections, or a single firm and its paired linkages (dyads) (Birley et al. 1991). To analyze the relationships with respect a single firm is to differentiate their extra-firm, intra-firm and inter-firm links.

The process of SMEs' internationalization has been extensively investigated from a network perspective during the last two decades (Coviello and Munro 1997; Coviello 2006; Ellis 2011; Fernhaber and Li 2013; Felzensztein et al. 2015). Johanson and Mattsson (1988) analyzed the internationalization of a firm considering two network perspectives in foreign markets, i.e. the significant network structure and the business network owned by the firm. Based on their findings, the author developed a model highlighting the impact of the external network structure on the business network owned by the firm (Figure 2-6).

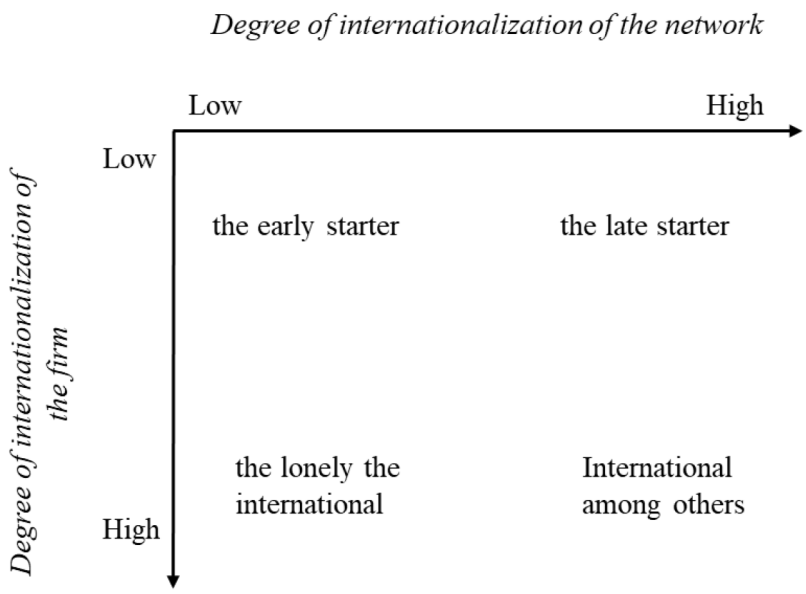

Figure 2-6 Internationalization and the network model
Source: Johanson and Mattsson (1988)

From the network approach perspective, internationalization is understood as a relational process in which linkages are constantly created, improved, sustained and finished to reach firm's objectives. Four stages were identified from their study:

1. The early started. At this stage where the network has a low degree of internationalization as well as the firm, the internationalization process might be problematic due to the difficulties in developing an international network and the high costs associated to develop it.

2. The lonely international. In this case, the network has a low degree of internationalization while the firm has a high degree of internationalization. The greatest challenges at this stage are the coordination of international activities and the adjustment of resources.
3. The late starter. When the firm has a low degree of internationalization while the network has a high degree, it will generate a firm's dependency on the firm that are part of the already established network. These other firms might prevent or delay the entrance of the firm to the international market. On the other hand, the customer or providers might prompt the firm to take part of the international network.
4. International among others. The firms as well as the network have a high degree of internationalization. The firm operates across international networks, where the distinctions between the countries reduce over time. One of the best alternatives for expanding the international growth of the firm is to employ external resources.

Chetty and Patterson (2002) argued that a social exchange perspective contributes widely to understand SMEs' internationalization processes, as social exchange theory has been transferred on social networks to business networks. Therefore, a social exchange perspective shed light on how SMEs overcome the problems of lack of knowledge, limited resources, and credibility when internationalizing.

After publishing the original Uppsala model for internationalization on 1977, the authors revised their first approach in the light of a series of studies pointing out the importance of networks relationships in the internationalization of firms, particularly as the international markets started to change as a consequence of the globalization forces (Coviello and Munro 1995, 1997; Chetty and Patterson 2002). On 1990, Johanson and Vahlne introduced a internationalization network approach arguing that firm's internationalization depends on the business networks linkages in foreign markets. The existing network relationships impact on the decision made by the firm with respect to the entrance to a specific foreign market and on selecting the entry mode. Further, Johanson and Vahlne (2009) presented a review of the original model and developed the new model based on two main assumptions, i.e. building trust and commitment as well as learning are preconditions for internationalization which are based on the network relationship and the potential they offer; and, the markets are relational networks where the firms are tied to each other in complex, asymmetric, numerous and imperceptible patterns.

To analyze firm internationalization, the authors adopted a general business network model. They adopted a perspective considering the business network as the structure of the market in which is embedded the internationalizing firm and on the supporting structure of the business network of the international market. Extensive literature has showed that a firm develops a set of lasting, close and diverse linkages with relevant customer and providers (Holm et al. 1996; Coviello and Munro 1997; Ellis 2000; Hadley and Wilson 2003). As the firm is linked to an additional number of business connections, the firm operates in connected relational business networks (Andersson et al. 1994). The term connected *"means that exchange in one relationship is linked to exchange in another. These webs of connected relationships are labeled business networks"* (Johanson and Vahlne 2009).

Furthermore, the exchanges that take place in the interconnected relational network generate new knowledge that might be accessible to the firm. The generation of knowledge results from the exchange between the knowledge producer and the knowledge user. Hence, the relationships of the business network offer an extended basis of knowledge to the firms (Hadley and Wilson 2003). In addition, the connections with the partners constitute an important source of business information related to every actor in the network, from the closer partner to the more distant entities. Therefore, firms have access to advanced knowledge about their business network. The success of a firm depends on how well it is positioned in one or more networks. The authors stated that every event occurs within the context of a business relationship; therefore, a firm is an *'insider'* when it is well-positioned in a significant network or networks. The essential processes of learning as well as building trust and commitment are largely based on the relationships of the firm within its business networks. In contrast, an *'outsider'* is a firm that has no position in a significant network. When a firm tries to access an international market without having a relevant position in the business network, it will struggle with the liability of foreignness (i.e. physic distance) and outsidership. Although it seems that an outsider firm is not able to develop international activities in that market, somehow the process of internationalization takes place (building trust and commitment as well as learning processes might initiate). According to the authors' perspective, the environment of the firm is integrated by networks that have an impact on the way how the firm learns, builds trust, cultivates committed relationships as well as recognize and uses its business opportunities.

In the original model, Johanson and Vahlne (1977) argued about the fundamental role of knowledge in the internationalization process of a firm. Particular attention was played to the

knowledge that results from experience in current activities as critical for the learning process. As a consequence, the experiential learning provides a more differentiated sight of firm's capabilities as well as the international market. After the inception of resource-based view (RBV), the interest in organizational learning has been growing in general as well as internationalization context (Welch and Welch 1996; Dove 1999; Esper et al. 2007; Yeung et al. 2007; Laghzaoui 2011). In this respect, different studies have identified the importance of the general internationalization knowledge (i.e. the knowledge which reveals firm's capabilities and resources that enable it to engage international operations) (Loustarinen 1988; Eriksson et al. 1997). As the author reviewed the model, they acknowledge the high importance of general internationalization knowledge that was not pointed out in the original model. This general knowledge concerns a number of different types of experience such as core business, acquisitions, partnerships, foreign market entrance, specific entry mode, alliance, among other particular forms of internationalization experience.

With respect to their business network perspective, the authors included to the *'reviewed'* model the notion of *"relationship-specific knowledge*". This knowledge is generated from the exchange among two partners which involves knowing about the heterogeneous capabilities and resources of each other. Additionally, the business network perspective recognizes the potential source of new knowledge that results from the interaction among the seller's producer knowledge and the buyer's user knowledge.

The previous model did not consider any dimension related to emotional or affective processes which were explicitly included in the revised model. This was to acknowledge the importance referred in the literature concerning trust, social capital, and similar approaches that comprise both cognitive and affective components. The authors stated that affective dimensions play a significant role in understanding the linkages that constitute a crucial element in the revised model. Trust has been identified as a relevant element for developing and establishing relationships (Johanson and Mattsson 1988) and business networks. Moreover, trust might replace knowledge, for example if a firm has not the required market knowledge. People are prompted by trust to share information, joint opportunities and it is a key element in conditions of uncertainty. Trust is critical in the early stages of the relationship. It is also the main antecessor of commitment. The authors pointed out that it is important the presence of both trust and commitment to achieve outcomes that stimulate productivity, effectiveness and efficiency.

When the authors proposed their original model, they argued that market knowledge and market commitment affected *"perceived opportunities and risks which in turn influence commitment decisions and current activities"* and *"that the commitment to a market affects the firm's perceived opportunities and risk"* (Johanson and Vahlne 1977). The research on the field of opportunity recognition has gained significance (Crick and Spence 2005). Hence, the authors recognized that they did not provide enough attention to the dimensions of recognition and development of opportunity in the experiential learning process. In their review, the authors argued that it is possible to combine findings from the literature with their business network perspective to go a step ahead in analyzing opportunities in the internationalization process. The argument is that a crucial element of market knowledge is the capability of *'recognitions of opportunities'* as this element drives the internationalization process. Therefore, opportunity development is a process described as sequentially, interactive and gradually accumulating learning (recognition) and commitment (utilization) of an opportunity, with trust acting as a catalyst. This process begins by creating market, financial and technological linkages with different network's partners and gradually expands from the domestic market to international markets. Finally, the process to identify and exploit opportunities in the network perspective is highly related to the relationship development process and the internationalization process.

When revising the internationalization model, the authors identified that the outcome of the strengthening actions made by the firm to gain a relevant network position is related to enhancing or protection of its market position. Within the network context assumed by the authors, the differentiation among entrance and expansion in the international market becomes less significant, as networks are assumed to be borderless. In this approach the authors considered that the traditional view of entrance, i.e. to overcome several entry barriers, becomes less relevant than to strengthen firm's position in the network by undertaking internationalization (Johanson and Vahlne 2003). Further, with respect to the significant network more than the liability of foreignness, outsidership is the root of uncertainty. However, it is necessary to analyze how the resources are aligned as well as the coordination of processes in the foreign market to identify whether the liability of outsidership and/or the liability of foreignness represent the main problem to entry to the target market. The network's internationalization levels as well as its competitiveness degree influence in the firm's internationalization levels as well as its competitiveness. As a result, the relationships within the network prompt the internationalization process of a firm (Johanson and Mattsson 1988).

The new model presented in 2009 had also a dynamic approach. It also contains two groups of variables, i.e. state-, and change- variables, also named stock and flow, that are important to the two sides of a linkage (Figure 2-7).

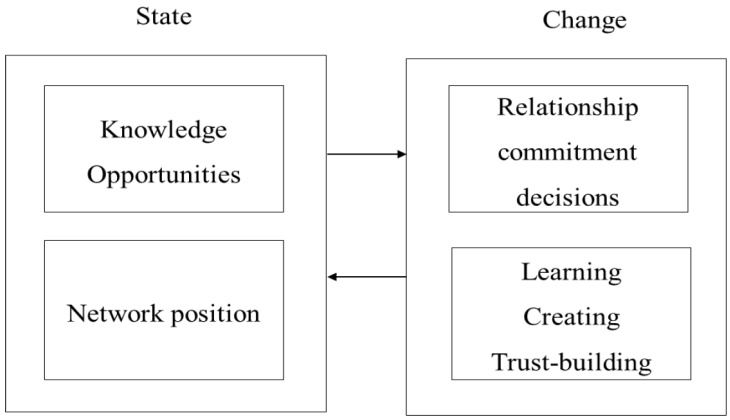

Figure 2-7 The business network internationalization process model (the 2009 version)
Source: Johanson and Vahlne (2009)

These variables are interacting with each other, as the current state influences the change and the other way round. Hence, the new approach shows an increasing, dynamic learning process, as well as trust- and commit- building. As the body of knowledge increases, it might impact positively or negatively on trust- and commit- building. In an extreme situation, which in fact might be highly probable to occur, the focal firm and/or the counterpart of the relationship might indeed end the relationship or at least decrease the commitment. These procedures might take part at any place of the network in which the focal firm operates and on the two sides of a shared relationship.

Despite the shared basic structure between the original model (1977) and the new model (2009), Johanson and Vahlne introduced some new elements and made some conceptual changes. They added into the *'knowledge'* concept the capability of *'recognition of opportunities'*. This capability is developed by establishing market, financial and technological relationships with counterparts in the network as the focal firm expands its relation with other firms and gradually increases its activities from local markets to foreign markets. Moreover, opportunities form part of the body of knowledge. The authors argued that the explicit introduction of this variable in the new model reflects the importance of opportunities as a key component of the body of knowledge that drives the internationalization process. Further, they also introduced as important elements of knowledge such as strategies, capabilities, needs and the networks that are linked to the firm

in its organizational context. On the other hand, the authors labelled the second variable *'network position'*. In the previous model, this variable corresponded to the *'market commitment'*. Within the network perspective, Johanson and Vahlne assumed that the process of internationalization is undertaken in the network context. The character of the relationships is defined by a specific level of trust, knowledge, and commitment. Moreover, as result of having high levels of these three components, the efficiency of creative processes will be enhanced.

With respect to the change variables, the author named the first change variable *'relationship commitment decisions'*. This variable is based from the original model. The term *'relationship'* was included to make it clear that commitment refers to both relationships or to the networks of relationships. The second variable was changed from the original model from *'current activities'* to *"learning, creating and trust-building"* to make more explicit the result of in progress activities. The original notion of in progress operations/activities had the intention to point out the impact of consistent daily activity on increasing trust, knowledge, and commitment. The concept of learning is introduced to emphasize greatest levels of notion.

The new model of internationalization presents some implications due to its business network perspective. To begin with, firm's internationalization is grounded on its networks' relationships[2]. Therefore, the first step of the firm in international markets depends on those relevant partners that have defined internationalization as the way to enhance the business and have committed their efforts in that direction. These partners might be located in the local market or overseas. The authors considered two main explanations for looking after foreign expansion:

1. In the case when a partner, with who the focal firm has a relevant relationship, is going to international markets, or is already there, and is willing to be followed by the focal firm. The focal firm will show its commitment to the relationship by joining its partner abroad.
2. The possibility of recognizing a motivating business opportunity.

[2] Network's relationships have been classified into two groups, i.e. the soft network or social network which is characterized by exchanging resources and information among familiar and informal relationships; the hard business networks or business network established through exchanges with suppliers, customers, competitors and they can be formalized by establishing contracts or associations, such as industry clusters and joint ventures; and institutional networks which refer to the network relationships that are present among the focal firm and open-access, publically funded institutions (Oparaocha 2015).

The second issue arises when the firm asks, which is the right foreign market to go? Johanson and Vahlne argued that the answer is where the partners and the focal firm identify opportunities. Another possible answer is the international market where the relevant partner has a solid position. This might constitute the first internationalizing footstep; however, this process might go on from one market to another, depending on the partners' efforts and activities of the focal firm. The next question should be, how ought to the process begin? Due to the nature of the business network perspective, determining a starting point should be regarded as arbitrary (Coviello 2006). Irrespective of which event is considered as the starting point of firm's internationalization, the entrance to the first foreign market, or the development of a particular relationship, the new model from a network perspective proposes that the answer is in the state variables, i.e. trust, knowledge or commitment of the firm to a particular relationship.

Vahlne and Johanson (2013) took a step further and develop a new model bases on their previous network model from 2009. The authors contextualized the evolved model within a multinational business enterprises (MBE), regarded as a network of relationships, to explain their internationalization evolution. This time, they included a dynamic capabilities perspective as well as integrated building blocks from management and entrepreneurial theory for uncertain environments on which MBE evolve (Figure 2-8).

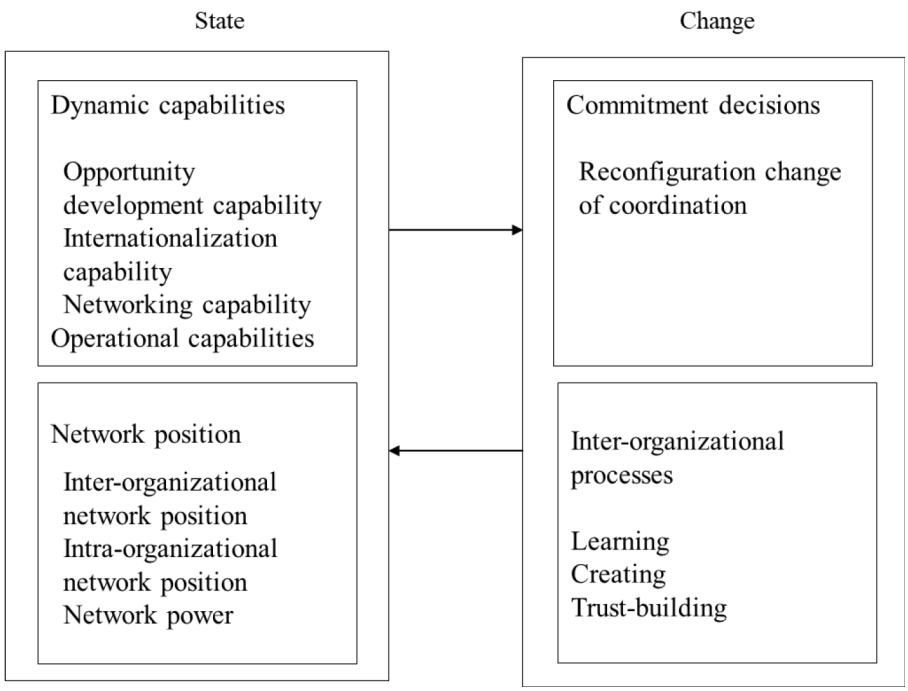

Figure 2-8 The Uppsala model of MBE evolution
Source: Vahlne and Johanson (2013)

As in the previous models (1977 and 2009), this model has two types of change variables, i.e. the current inter-organizational processes of creating or learning new knowledge as well as building trust; and the commitment decisions of the organization to a specific strategy, project or party and two state variables, i.e. dynamic capabilities and networking position.

The commitment decisions variable recognizes the decisions that drive the growth and emerge process. These decisions can be made internally, if the decision to commit any resource is related to the focal firm, or with external partners, in the case of tangible investment shared among the partners. Commitment also refers to the volume and degree of committed resources and its feasibility to be used in alternative projects, as well as to intangible commitments, e.g. the public statement to adopt a new strategy or position. The inter-organizational processes change variable comprehends creating and learning knowledge. This knowledge is obtained by owned experiences, transferred or imitated from other members of the organization. Trust is also considered as a precondition for learning and commitment as the social capital endorses these two processes which in turn endorse the growth of social capital (Nahapiet and Ghoshal 2000; Madhok 2006).

On the left side of the model, two state variables are included, i.e. operational and dynamic capabilities, and network position of the focal firm. The dynamic and operational capabilities are influenced the two change variables described above. Three critical dynamic capabilities have been identified in the model, i.e. internationalization capability that comprises the ability to develop foreign markets considering different market conditions; the capability to recognize opportunities and to activate the required resources from the firm as well as the partners tackling the opportunity; and the capability to generate, coordinate and maintain linkages in a network context. The network position variable includes inter-and intra-organizational network position, as well as network power.

2.2.3 International entrepreneurial orientation

International entrepreneurship was defined by McDougall and Oviatt (2000) as *"a combination of innovative, proactive, and risk-seeking behavior that crosses or is compared across national borders and is intended to create value in business organizations"*. This approach emerged from the literature on the subject of entrepreneurship. The term *'international entrepreneurship'* was coined by Morrow (1988) and provides an entrepreneurial perspective to understand the process of firm's internationalization (Freiling and Schelhowe 2014). The researchers adopted this perspective to investigate the process of

internationalization in the case of *'born global'*[3] firms. The instant internationalization of these firms represented a paradigm to the traditional internationalization stage theories. As a consequence, extensive research has been conducted at a firm, industry and macro-level to analyze the specific variables that drive these new patterns of internationalization (Morrow 1988; Oviatt and McDougall 1994, 2005; Knight 2001). On the basis of an extensive research on *'born global'* firms, the scope for research on the field of international entrepreneurship is wide and full of possibilities and opportunities (Oviatt and McDougall 2005). Further, it has been extended to areas such as technological learning (Zahra et al. 2003; Weerawardena et al. 2007), organizational learning (Weerawardena et al. 2007; Freiling and Zimmermann 2014) or opportunity recognition (Acedo 2006).

One relevant trend of entrepreneurship theory that has been evolving since the 1990s addresses the issue of which are the entrepreneurial functions that have to be performed to sustain a competitive advantage and guarantee the survival of the organization over time. In 1755, Cantillon was already dealing with the entrepreneurial functions and on his seminal work the author defined an entrepreneurial person as the one who is willing to manage uncertainties and undertake risks. The major construct identified from the literature to understand entrepreneurial processes is the entrepreneurial orientation (Knight and Cavusgil 2004; Jantunen 2005; Freiling and Schelhowe 2014). The construct of entrepreneurial orientation captivates the decision-making practices, styles and methods exploited by owners and managers to perform entrepreneurially. Moreover, this construct shows the way in which a firm precedes in value creation activities irrespective of which type of entrepreneurial activities the firm is undertaking (e.g. new market entrance) (Lumpkin and Dess 1996).

Miller and Friesen (1982) conducted an empirical study to model the entrepreneurial processes at a firm-level. The authors recognized three main processes, i.e. proactive processes to take advantage of opportunities in new markets before competitors; taking risks in developing new products; and, the readiness to commit in product innovation. On this ground, various researchers (Oviatt and McDougall 1994; McDougall and Oviatt 2000; Knight 2001; Zhang et al. 2012; Covin and Miller 2014; Felzensztein et al. 2015) have identified these three key components i.e. innovativeness, proactiveness, and risk-taking, as the entrepreneur leading behaviors for SMEs' internationalization processes.

[3] Also named *'born international'* are the firms that adopt from its inception internationalization activities– *"that is, companies that expand into foreign markets and exhibit international business prowess and superior performance, from or near their founding"*. (Knight and Cavusgil 2004)

Innovativeness refers to firms' capability to *"promote new and creative ideas, products, and processes designed to service the market"* (Felzensztein et al. 2015). This capability is needed to develop more innovative strategies to attend the demand from growing, diverse and sophisticated international markets in order to succeed. This notion is grounded in innovation theory due to its implication to entry in new international markets and relates innovative generation or improvement of products, services, strategies and further business operations linked to the entry of the firm to new markets (Zaltman et al. 1973; Knight 2001). The internationalization process itself constitutes an innovation as it is also regarded as the way to create or entry into new markets (Cavusgil 1980; Knight 2001). This innovative dimension is related to the development of new and creative ways to overcome the challenges that the firm has to confront. This involves the capability to generate or improve products, services and it is extended to the development of novel administrative methods and technologies to perform organizational functions (e.g. manufacturing, distribution, purchasing and sales). In addition, innovation is also considered a link between firm performance and market orientation (Menguc and Auh 2006; Weerawardena et al. 2007), where it is necessary of both external learning (including network- as well as market-learning for new technology acquisitions) and internal experimental learning (including R&D) to enhance the innovative dimension (Arora and Gambardella 1990). Concretely, innovativeness includes the firm's capability to prompt the design, generation and implementation of creative and new ideas, processes, products and services to attend the market's needs (Lumpkin and Dess 1996). Hence, the internationalization of the firm promotes its learning processes, and as a result the firm improves its innovative performance (Felzensztein et al. 2015). Nevertheless, innovation activities are generally related to risks. Therefore, it is necessary for the organizations to prevent themselves from the probable negative impact of those risks (Freiling and Schelhowe 2014).

Proactiveness is firms' ability to gain, use, and interchange knowledge from the market in a way that the firms are enable to commit their resources in a target market. This behavior leads the firms to take risky decisions and the subsequent actions related to those decisions (e.g. products innovation, production and marketing processes, customer service) for overcoming the liability of foreignness. In this sense, proactiveness is contrary to reactiveness and stands for an aggressive posture with respect to the competition, highlighting the performance and follow-up of activities to reach firm's goals (Knight 2001). In other words, this dimension refers to the firm's initiatives to make the first moves with competitors instead to follow them.

Additionally, proactiveness enables the firm to obtain, exchange and exploit intensively related knowledge (Felzensztein et al. 2015).

The risk-taking dimension involves designing, planning and implementing operations and ventures representing substantial likelihoods of costly failure. Several managers, interviewed by Knight (2001) in a case study research, highlighted the *"importance of willing to take risk in launching foreign ventures, especially to psychically distant countries"*. The predisposition to take risks encompasses a firm's behavior which enables it for assuming risky and important resources engagements in the market (Miller and Friesen 1978). Furthermore, Fosfuri and Tribó (2008) pointed out that the processes of co-learning and information sharing are part of the practices among the risk-taking firms; hence, they are capable to cultivate knowledge capabilities and recognize opportunities faster than their competitors. Internationalized firms designate greater amount of production, human, financial, and technological resources overseas than firms that only operate locally. With this in view, it might be said that the internationalized firms are willing to undertaking the related risks as they consider that it enhance their relationship with the customers, improve their ability to learn from competitor, and to establish effective collaborative efforts with providers, distributors, and official institutions overseas (Prashantham 2011; Felzensztein et al. 2015).

2.2.4 Remarks on the performance of SMEs' internationalization process

Traditionally, the study of business internationalization was focused on understanding the internationalization process of large companies with plenty of resources (Johanson and Vahlne 1977). Nevertheless, since the 1990s the internationalization of small and medium firms with restricted resources, compared to the large companies, called the attention for several research (Cavusgil 1984; Oviatt and McDougall 1994; Coviello and Munro 1997; Knight 2001; Sousa et al. 2008). From the literature, three main dimensions have been identified to measure the performance of the internationalization processes of SMEs, i.e. speed, geographical scope and intensity (Knight 2001; Oviatt and McDougall 2005; Crick 2009; Gonzalez-Perez et al. 2016). These dimensions reflect the effectiveness and sustainability of creating-value activities and strategies implemented by the internationalized SMEs and their partners in the business networks.

Speed refers to the number of years passes from the inception of the firm until reaching a minimum edge of export sales (Felzensztein et al. 2015). However, even recognizing that decision makers are prompted by different factors to generate international sales at specific

speeds, there is no a strict agreement among scholars on what defines a *'rapid internationalization'*. This is due to the differences observed between different SMEs, for example, there have been identified firm have reached an international venture after only two years from its inception (Oviatt and McDougall 1994; Cavusgil and Knight 2015), while other SMEs have reported five or six year from their foundation to their internationalization (Musteen et al. 2010). With this in view, McDougall et al. (2003) defined an international new venture as *"a firm that began receiving revenues from international business activities while not more than six years old".* Moreover, there is also a debate in relation to the starting point in time from when start to measure the internationalization process, e.g. from the very moment of the foundation of the firm or after the inception of the plan for internationalization. In this sense, Spence and Crick (2006) pointed out that in some cases various managers planned to start a business or international operation, both formally or informally, before its registration, probably due to they were looking for the right moment and opportunity, before they can, in fact, launch their own business. For the purpose of this work, speed is referred to the number of year passed after the inception of the firm and its plan to entry to the target market(s). In other words, the speed is the time that the SME needs to reach a target market after planning the entrance to that specific market.

The geographic scope, or the entry markets, refers to the number of markets attended and reflects the geographical distance and diversity among the market penetrated as well as the commitment to those markets (Crick 2009). From an study by the McKinsey Company, Rennie (1993) acknowledge the proposition that born global firms were *"small and medium-sized companies that successfully compete virtually from inception against large established players in the global arena".* An extensive literature has demonstrated that the size of a firm does not constitute a necessary barrier for becoming international (or even global) (Bell et al. 2004; Etemad 2004; Ciravegna et al. 2014b; Felzensztein et al. 2015). Furthermore, depending on the industry in which the SME operate, it does not contend in opposite to large established players, e.g. specific niches of market (Fillis 2001; Etemad 2004; Crick 2009). In relation to this work, geographic scope refers to the target markets that the firm is willing to entry or to increase its penetration as well as the geographic localization and diversity related to those markets.

Intensity is mostly measured as the total export sales over the total sales in a year (Cavusgil 1984), and differentiates domestic firms, even the ones responding to unsolicited orders, from the firms that depend on the foreign transactions for their incomes (Gonzalez-Perez et al.

2016). However, the literature also raises the question of 'commitment' related to the undertaken entry modes to the target markets and the volume of foreign sales. Rugman (2006) raised the concern about the degree of commitment of the born global firms to serve all the three markets. Likewise, it has been recognized that markets' extensive diversification, in addition to factors such as risk and goals assessment, might result in lower commitment levels and low-market incomes in each marketplace depending on the resource owned by the firm (Shrader et al. 2000). It also has to be noticed that most of the firm would have different levels of commitment and spread sales unevenly overseas in terms of entry modes (Crick 2009). With respect to this work, intensity refers to the volume of foreign sales of the firm as well as the actions to develop a major commitment to the foreign market.

In conclusion, based on its resources, capabilities and business networks, SMEs, in coordination with their network partners, will determine the geographical scope they are willing to target, design the strategy and determine the speed to reach that market, and the finally perform subsequent strategies and actions to expand the intensity of their international.

2.3 Supply chain management (SCM)

Regarding the context of this research, it is important to provide a brief review on the concepts of supply chain, network, SMC, SCF and logistics capabilities. The differences and relations among these concepts will provide the elements to set the broad scenario of this work.

At the present time, the concept of supply chains is understood as groups of firms that are relatively stable and are involved in the system of production, distribution and delivering final goods or services, having as starting point the supplier of the supplier to reach the end-customer (Duclos et al. 2003; Stevenson and Spring 2007; Christopher 2016). Indeed, the supply chain is a system that encompasses single logistics systems coordinating their performance to achieve a mutual goal. Figure 2-9 depicts this classic conception of a supply chain.

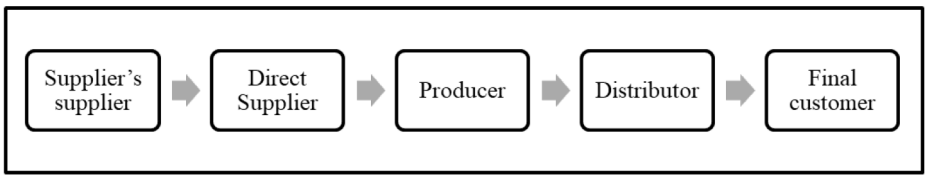

Figure 2-9 Classic supply chain
Source: Lummus et al. (2003)

Furthermore, Christopher (2000) described that: *...” the supply chain is the network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate customer”*. From this definition, it is suggested that the supply chains are included among the types of networks. Figure 2-10 exemplifies this idea of a firm being at the center of a network between suppliers and customers (Christopher 2011).

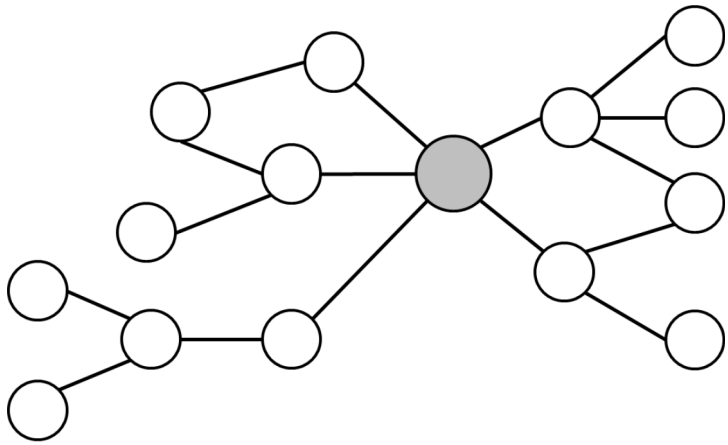

Figure 2-10 Supply chain network
Source: Christopher (2011)

The term ‘chain’ can be exchanged by ‘network’ as in real *‘supply chain’*, as a firm is embedded in system with multiple suppliers which are indeed, supplied by other suppliers, as well as multiple customers that are the bridge to the end-customer.

Encompassing this observation it has been proposed that a *‘supply chain’* might be more exactly defined as *“a network of connected and interdependent organizations mutually and co-operatively working together to control, manage and improve the flow of materials and information from suppliers to end users”* (Aitken 1998).

2.3.1 SCM and logistics

SCM and logistics, the management of the material and information flows from the sourcing, through the creating/adding-value processes to the final consumer, is acknowledge as an essential element of the organizational strategy (Mentzer and Williams 2001; Christopher and Towill 2002; Rutner et al. 2012). SCM and logistics also play a key role in the firms’ competitiveness (Spillan et al. 2013). Decision-makers manage their supply chain and

logistics processes to develop strategies that contribute to the delivery of products with competitive prices, high-quality and to provide consistent service levels. Furthermore, the integration of logistics and supply chain systems are recognized as an inter-organizational practice that enhances the performance of the firm as well as of the whole supply chain (Bagchi et al. 2006; Prajogo and Olhager 2012).

Although the concepts of logistics and SCM are closely related, it is important to make a distinction among them. In one hand, logistics refers to the strategic set of actions for planning, performing and monitoring the efficient and operational flow and store of resources, information and services inside the firm and across the supply chain from the sourcing point to the consumption place in order to fulfill customer needs (Mentzer et al. 2004). On the other hand, SCM is referred to the set of resources, actions, and processes of each member of the supply chain that might be seem as an individual logistics system integrated in a network. Supply chains' success relays on the high degree of the individual logistics-system capabilities, mainly in a competition based on quality and time (Duclos et al. 2003). Furthermore, SCM also pursues the coordination and integration of internal and inter-firms' capabilities, at strategic and operational levels, to perform as a strong and unified market force. SCM as an *'integrative philosophy'* guides the partners in a supply chain to join efforts to generate innovative solutions with the aim of creating individualized, exclusive and inimitable sources of customer value. Therefore, SCM include logistics among other functions across the supply chain and within the firm and its partners to satisfy customers and create value for them (Mentzer et al. 2001; Christopher 2016). In conclusion, SCM synchronize all the functions that promote a customer/market-orientation among the supply chain partners.

2.3.2 Antecedents and consequences of SCM

Mentzer et al. (2001) examined the main factors that act as antecedents of SCM and the consequences of SCM at the strategic level (Figure 2-11).

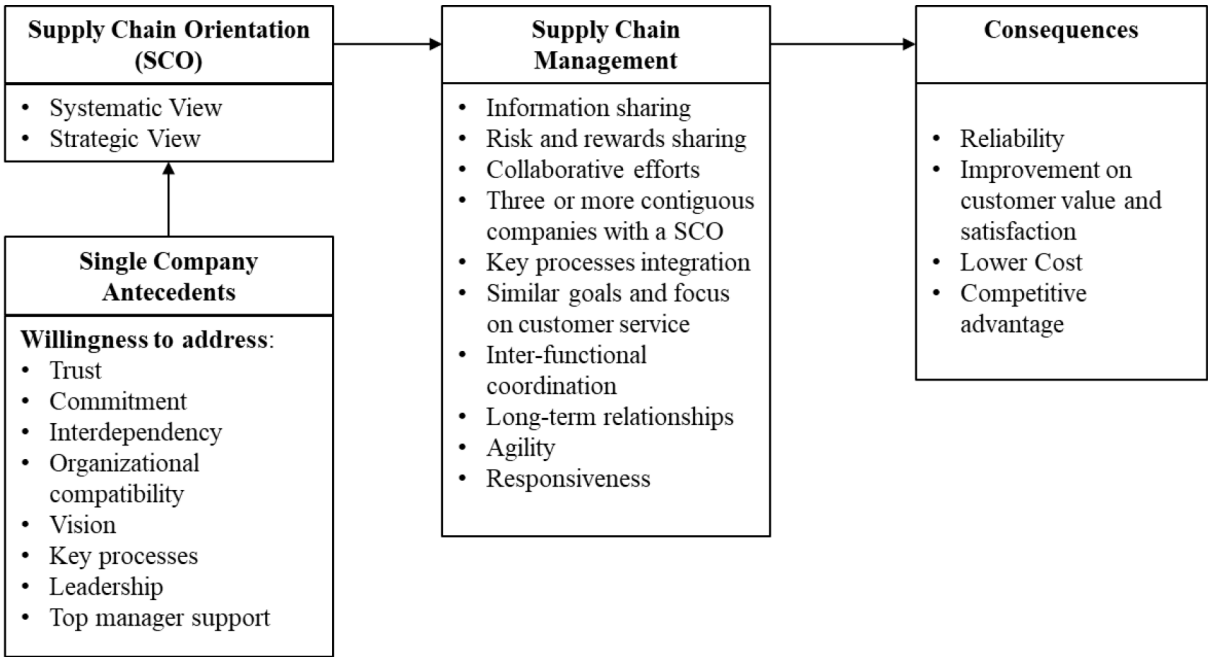

Figure 2-11 SCM antecedents and consequences
Source: Adapted from Mentzer et al. (2001)

The authors identified the factors that improved or inhibit the implementation of supply chain orientation (SCO) (i.e. *"recognition by an organization of the systemic, strategic implications of the tactical activities involved in managing the various flows in a supply chain"*) as antecedents of SCM. The authors identified trust and commitment, among the SCM antecedents, as key factors to promote cooperative efforts between the parties and to achieve long-term relationships. The other factors are interdependence (the necessity of the firm to keep interactive relationships with the supply chain members to reach its goals), organizational compatibility (similarities in tactical, operational procedures and organizational culture and behavior, as well as complementary objectives and aims), shared vision and agreement on key processes, leadership, and top management support. It is necessary the strategic and systematic alignment of various firms in a supply chain to address these antecedents towards SCO. This alignment will lead the firms to achieve SCM. The main goal of SCM is to increase the competitive advantage across the supply chain as well within its members (Mentzer and Williams 2001; Christopher 2016). As the result of implementing SCM, the firms, within the supply chain, enhance customer value and satisfaction as well as achieving a sustainable and profitable position to face the competitive forces present in a market.

2.3.3 SCM and supply chain flexibility (SCF)

From the decade of the1940's, the study of operations research gained the attention from scholars who dedicated their research efforts to find methods which lead to optimize the supply chain performance. Many supply chain managers have realized that having a lean supply chain is not enough to cope with the turbulence and uncertainty of the business environment. It is necessary to develop flexible supply chains to address these challenges present in the supply chain environment. Furthermore, supply chain's success is direct related to the high degree of capabilities from single logistics systems, especially on competitive scenarios based on quality and time. With this in view, SCF emerges as part of SCM to enhance the achievement of SCM goals as shown in Figure 2-12.

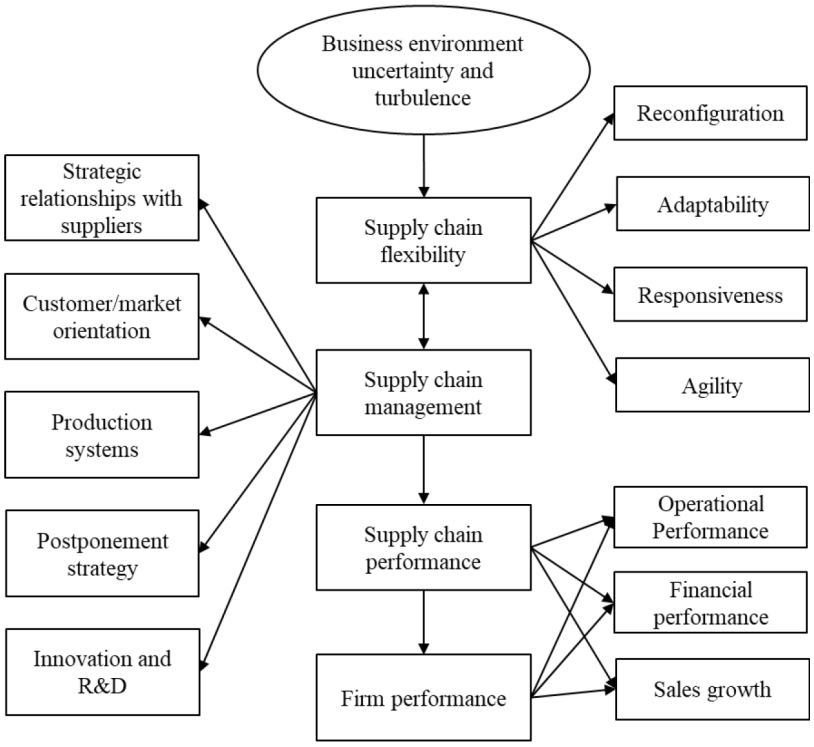

Figure 2-12 Impact of supply chain flexibility in SCM
Source: Author

Several changes have taken place during the last decades in managerial practices at firm and supply chain level. The *uncertainty* and *turbulence* of the business environment has increased due to the fluctuations and volatility of the demand, just-in-time production systems, global sourcing, mass customization, new technologies' requirement and so on. *SCF*, as a capability of the supply chain and SCM strategy, has a direct impact on the ability of the supply chain to *reconfigure* its structure in case of any change in customers' demand or disruptions in the sourcing. Furthermore, it enhances the *adaptability* of the supply chain partners to respond to

new requirements or changes in the demand, e.g. product volume, product mix, delivery conditions. Throw the integration of the supply chain, SCF also enables the supply chain capability of providing an *agile* and quicker *response* in accordance to the uncertainties and changes in the supply chain environment, e.g. coordination of actions and operations to regulate production and distribution flow in case of demand volatility. On the other hand, the *implementation of SCF strategies needs to be conducted by SCM practices*. Through SCM practices, it will be determined the *strategic relationships with key suppliers* to achieve the required flexibility upstream, the adoption of *customer/market-orientation*, the development of flexible *production systems*, as well as *postponement*, *innovation* and *R&D strategies* across the supply chain. Finally, *SCF* has a *direct and indirect impact* on the *operational performance, financial performance* and *sales growth* both at the *supply chain level* and at *the firm level* (Inman et al. 2010; Merschmann and Thonemann 2011; Blome et al. 2014). The following section will provide the basic elements to support this argument about the scope of SCF.

2.4 Flexibility in the supply chain

Nowadays, the manufacturing scenario that SMEs have to face when internationalizing has become highly competitive, complex, dynamic, and filled with uncertainty. This manufacturing scenario is characterized by increasingly sophisticated customers that demand customized products in shorter lead times, and where the probabilities of any disruption in sourcing has increased (Duclos et al. 2003; Lee 2004). Previously, the manufacturing firms that relied on order winning through a production based on low cost standardization now have to develop more flexible structures in order to compete. Therefore, the importance of flexibility to meet customers' demand and improve responsiveness has been acknowledged by researchers (Fisher et al. 1994; Vickery et al. 1999; Stevenson and Spring 2007; Danese et al. 2013; Singh and Acharya 2013). Hence, flexibility is recognized as a strategic capability (Jan Eppink 1978; Lau 1996; Krajewski et al. 2005; Zhang 2005; De Toni and Tonchia 2005; Brozovic 2016). This strategic capability allows the response, choice and adaptation of an appropriate strategic option to face opportunities, competence and uncertainties regard to the competitive forces in the marketplace maintaining a high performance (Das and Elango 1995; Lau 1996; Brozovic 2016).

The literate of flexibility has been evolving through the last decades, and nowadays is a *"well-established research domain in decision sciences and has been relatively widely*

accepted in practice" (Tiwari et al. 2015). The study of this capability has evolve since its initial emerge on the literature on Manufacturing in the 1980s and 1990s (Slack 1983; Sethi and Sethi 1990; Gerwin 1993; Upton 1994; Koste and Malhotra 1999), when it was observed a positive impact of manufacturing flexibility on firm performance (Swamidass and Newell 1987; Vickery et al. 1997). The complexity of the manufacturing scenario shifted as the firms have become more reliant on sourcing suppliers, service providers, which has increased the need to manage the whole value chain, integrating each echelon from the provider of raw material to the final customer and overcoming the traditional boundaries of the firm (Fisher 1997; Lummus et al. 2003; Stevenson and Spring 2007). As the literature started to acknowledge the importance of the SCM (Christopher and Towill 2002), the research on flexibility also went a step further from the flexibility on manufacturer to the flexibility on the supply chain (Vickery et al. 1999; Krajewski et al. 2005; Schmenner and Tatikonda 2005; Slack 2005). To achieve the flexibility required, firms have to perform actions beyond its own sphere in order to add value to the customers, suppliers and distribution channels, as well as its own organization (Martínez Sánchez and Pérez Pérez 2005; Kumar et al. 2006). Nevertheless as researchers have adopted different perspective to analyze this capability, this has led to an extended fragmented knowledge regarding SCF (Tiwari et al. 2015). Therefore, in the section it is presented a comprehensive synthesis of the relevant aspects regarding SCF that are related to the aims of this research.

2.4.1 The evolution of the concept of supply chain flexibility

From the decades of 1980s and 1990s, the concept of flexibility has evolved since the first studies on manufacturing systems that called the attention of researchers, who focused mainly on the physical resources and internal firm performance (Slack 1983; Sethi and Sethi 1990; Upton 1994; Koste and Malhotra 1999). From the early literature, flexibility was defined in terms of uniformity, mobility, and range, i.e. the capability to make any product within a defined range maintaining an acceptable performance, the capability to move the line from producing one type of product to producing another one, and the different states that a system can adopt (Slack 1983; Upton 1994).

From the analysis of the studies on manufacturing flexibility, five aspects related to this capability have been identified, i.e. dimensions; hierarchy; types; timeframe, and uses (Slack 1983; Sethi and Sethi 1990; Gerwin 1993; Upton 1994, 1995; Koste and Malhotra 1999; Koste et al. 2004; Hallgren and Olhager 2009; Thomé et al. 2014). Nevertheless, this work

focused more on the flexibility at the firm level. From a survey conducted by Sethi and Sethi (1990), the authors identified that most of the research was mainly on manufacturing flexibility taxonomies, specially, basic-, system- and aggregated flexibility, pointing out that the studies were considering only the physical resources; e.g. the flexibility of a manufacturing system that are utilized to provide flexibility in manufacturing processes. Hence, after almost two decades of relegating the study of this concept to manufacturing flexibility field, which is internal in nature to a firm, researchers started to analysis this capability within the context of the supply chain due to the increase of complexity, uncertainty and dynamics in nowadays business environments (Narasimhan and Das 2000; Prater et al. 2001; Jack and Raturi 2002). Narasimhan and Das (2000), through a survey research, found the impact of supply chain management and sourcing practices on manufacturing flexibility. Likewise, Vickery et al. (1999), researching the furniture sector, broadened the scope of manufacturing flexibility of the firm level to the supply chain environment. The authors recognized a positive association between the firm performance and SCF principally launch flexibility, and volume flexibility.

From the first decade of 2000', the literature on SCF has emerged. A conceptual model for SCF was developed by (Lummus et al. 2003). This model consists of five components: supply network, organizational design, logistics processes, operational systems, and information systems (IS) flexibility. Martínez Sánchez and Pérez Pérez (2005) investigated the relationship between the firm performance and the SCF among the suppliers in the automotive industry. They identified that volume flexibility turns to be highly important, as well as the necessity of tailor-made flexibility strategies according to the features of a given supply chain. These research made a significant contribution by linking flexibility from a firm level analysis to the supply chain context and acknowledging that the influence of the elements of flexibility differ from chain to chain. Moreover, in contrast to manufacturing flexibility, SCF involves the implied necessity of flexibility between and within all the supply chain partners (Duclos et al. 2003).

Firms need to take into account the impact of flexibility not only into its internal organization, but also how to relate it with the flexibility of the rest of firms in a supply chain that has to face higher complexities as the business environment is constantly changing and becomes global (Blome et al. 2012). Therefore, manufacturing flexibility results insufficient with the regard of addressing uncertainty and risk at a supply chain level, thus, there is the need of SCF to address these issues. Nevertheless, it is not a straigthforward task to implement SCF

as it involves numerous challenges related to its conceptualization and operationalization through the supply chain. A unified process-based view is embraced by SCF which integrate the core procedures such as procurement, logistics, sourcing, and distribution (Tiwari et al. 2015). Therefore, it visualizes a more wider concept for flexibility as adopts a value chain perspective (Vickery et al. 1999). Lummus et al. (2003) presented SCF as a logical extension of the flexibility of manufacturing system, e.g. it can be compared to the flexibility for routing starting at the shop floor with the benefits of dual sourcing policies at the supply chain level. In supply chain contexts, diverse sources of uncertainty need to be faced, such as information delay, customer demand, lead-times, and product quality (Tiwari et al. 2015). In this regard, supply chain need to be understood as a complex system, where the entire performance of the system depends on the individual performance of each part of that system. As a consequence, the flexibility of the whole supply chain is the result of the flexibility of its individual partners (Duclos et al. 2003). Hence, the firms need to develop systems that have the proper flexibilities and alignment upstream and downstream to address the uncertainties of the environment.

2.4.2 Defining supply chain flexibility (SCF)

The concept of flexibility has been studied from different perspectives. In the literature an extensive number of definitions have been stated considering diverse elements of flexibility which makes difficult to agree on how to arrive to a common definition which has led an extended fragmented knowledge (Kumar et al. 2006; Tiwari et al. 2015). For example, Das and Elango (1995) defined strategic flexibility as *"the ability of an organization to respond to changes in the environment in a timely and appropriate manner with due regard to the competitive forces in the marketplace"*. However, certain general principles have been identified from the literature on flexibility.

In the literature of manufacturing flexibility, this capability is mainly related to uniformity, mobility and range, i.e. the capability to shift from performing one product to another, the diverse states that a system is able to adapt, and the capacity to perform acceptable well while producing any good taking into consideration a defined range (Slack, 1983; Upton, 1995). Koste et al. (2004) extended this to *'range-number'* (extent of possible *'options'* that a resource or system is able to achieve) and *'range-heterogeneity'* (the degree of variance between the *'options'*). Additionally, Slack (1983) and Upton (1995) acknowledged that flexibility constitutes a capability that is always present in some degree as it is, in part, a

measure of potential behavior; therefore it does not need to be demonstrated in order to exist, and therefore the full capability of being flexible is not reflected automatically in the product that is produced by a plant (or supply chain). The cost and time required to move from one state to another has been discussed as important aspects of the trade-off between flexibility and efficiency (Slack 1983; Carlsson 1989; Duclos et al. 2003; Ebben and Johnson 2005; Ishfaq 2012). Table 2-4 present an overview of the literature regarding the main features of strategic flexibility (Brozovic 2016).

Table 2-4 Features of strategic flexibility

Main features (dimensions)
Strategic flexibility as a reactive ability only (includes responsiveness and adaptation to changes in the business environment)
Strategic flexibility as a proactive ability as well
Strategic flexibility as a fast, swift, quick, prompt, timely response
Time aspect: short, medium or long term
The choice of an appropriate strategic option
Intention

Source: Brozovic (2016)

Lau (1996) provided a definition strategic flexibility as *"a firm's ability to respond to uncertainties by adjusting its objectives with the support of its superior knowledge and capabilities".* In a previous work (Lau 1994), the author presented a conceptual framework for attaining strategic flexibility (Figure 2-13). This framework provides a general depiction of organizational flexibility. On this work, Lau (1994) began to acknowledge that the strategic flexibility goes further the manufacturing capabilities of the organization and the importance of the relationship between the manufacturing firms, the suppliers and the customers.

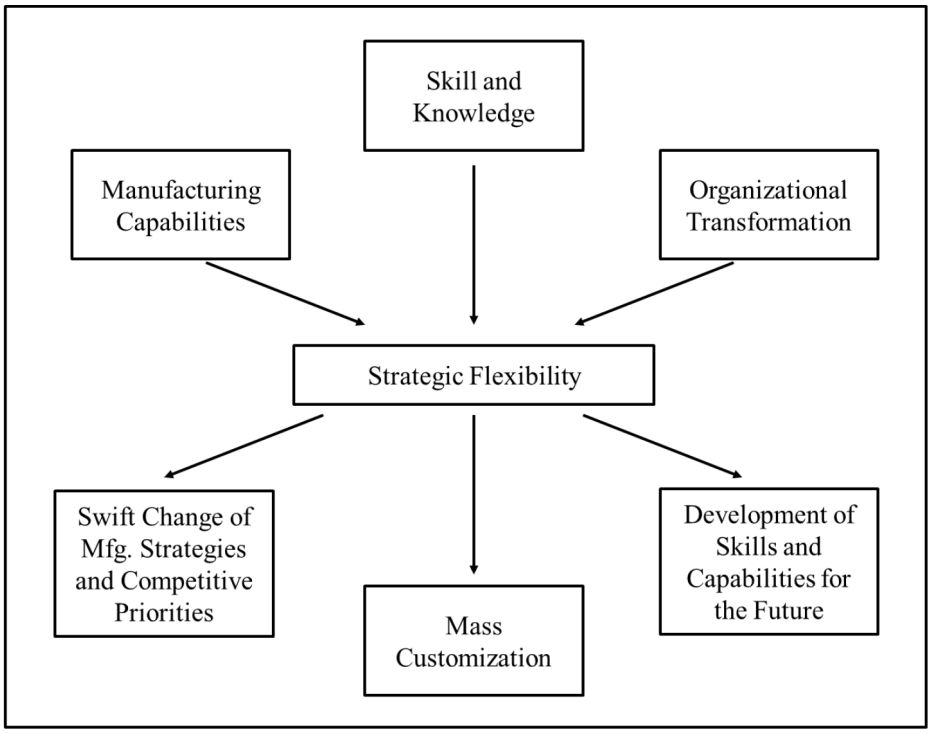

Figure 2-13 A Framework for attaining strategic flexibility
Source: Lau (1994)

The alignment of manufacturing capabilities, the skills and knowledge of the organization, its suppliers and customers, and organizational transformation, enhanced the attaining of strategic flexibility. Furthermore, this strategic flexibility allows a swift change of manufacturing strategies and competitive priorities, the development of skills and capabilities for future challenges and to face mass customization.

Some authors have focused on the design of the supply chain as an extension of flexibility and strategy at the plant and firm level, e.g. if demand increases, a plant with high levels of flexibility in the volume of production might be able to address the variations of the demand internally, while a plant with low levels of flexibility in the production volume might intensively depend on subcontractors. Likewise, external supply chain's suppliers and customers can be compared to work centers on the shop floor when adopting dual sourcing policies. Nevertheless, by building on previous theory of manufacturing flexibility, an inward focus prevailed in the definitions (Harrison and Kelley 1993; Vickery et al. 1999; Narasimhan and Das 2000; Olhager 2003; Martínez Sánchez and Pérez Pérez 2005). Prater et al. (2001) described flexibility as *"the degree to which the firm is able to adjust the time in which it can ship or receive goods"*. The authors identified two elements related to flexibility, i.e. the promptness; and, the capability to adjust the speed, destinations and volumes.

After a deep study inside first-class companies, Lee (2004) presented a *"triple-A supply chain"*. The author analyzed from inside how these companies focused on building supply chains able to distribute products and services to their customer at the possible lower time and cost. When Lee (2004) compared all the cases, he concluded that although efficiency in the supply chain is necessary, it does not ensure that the firms will have an advantage over their competitor. The companies capable to build adaptable, agile and aligned supply chains, those have a real edge to compete. Adaptability is the capability to modify the design of the supply chain in order to meet changes in the market structure, and adjust the network according with the products, technologies and strategies requirements. Agility is the capability to respond smoothly, quickly and cost-efficiently to short-term variations in any node of the supply chain. Alignment is the firm capability to line up its interest with the other partners' interest by generating incentives so that firms share costs, risks and rewards equitably and increase their performance. Other definitions focus on the robustness of the buyer-supplier relationship. Das and Abdel-Malek (2003) defined SCF in terms of the *'elasticity'* between the buyer and supplier relationship under a fluctuating environment on the supply. The authors claimed that *"a highly flexible relationship is one in which there is little deterioration in the procurement price under different supply conditions"*.

SCF components that many authors seem to agree the most is the flexibility at the interior of the firm and between the firms that are involved in an exchange operation. In addition, it is intended to address the uncertainty and risk in the operations and procedures two contexts. Based on these observation, Tiwari et al. (2013, 2015) stated *"a supply chain is said to be flexible if it can ensure smooth undisrupted supply of the products from supplier to the end user under all uncertain or risky environments, with the least variation in the difference between the demand and supply at every demand—supply node, and without much penalty or impact on the supply chain resources and the costs incurred"*.

Kumar et al. (2006) provided a broad definition for SCF as *"the ability of supply chain partners to restructure their operations, align their strategies, and share the responsibility to respond rapidly to customers' demand at each link of the chain, to produce a variety of products in the quantities, costs, and qualities that customers expect, while still maintaining high performance"*. This definition is the one that will serve for the purpose of this research. SCF is defined as the ability of the supply chain to respond, align and compensate accurately to changes in the customer demand, the interruptions in the supply or any other event that occurs in a dynamic and uncertain environment, with little penalty in time, effort, cost or

performance. Additionally, the system approach presented by Duclos et al. (2003) is also considered, as the *"[flexibility of entire] supply chain is the result of the flexibility components at each node of the supply chain and their interrelationships"*. Furthermore, SCF is the capability to produce a quick response to any disruption upstream or downstream along with variations in other environmental constraints e.g. capacity restrictions, exchange rate, and lead-time (Stevenson and Spring 2007).

In addition, SCF has been identified as a predecessor of supply chain agility (SCA) (Christopher 2000; Prater et al. 2001; Pujawan 2004; Swafford et al. 2006, 2008; Gligor and Holcomb 2012; Gligor et al. 2013). SCA is the supply chain ability to survive to constant disturbing, changing and unpredicted occurrences in business's environment (Swafford et al. 2000). Therefore, it is the permanent readiness of an organization to embrace changes in a proactive or reactive, rapid or inherently fashion through simple, economical and high-quality linkages and components with its environment.

It is the persistent readiness of an organization to reactively or proactively, inherently or rapidly, embrace change, through simplistic, economical elements, high quality, and relationships with its environment (Conboy 2002). In a comprehensive study of SCF conducted by More and Subash Babu (2008), the authors emphasized three main aspects regarding the relation between flexibility and SCA:

- There is a high emphasis on quality, flexibility and speed as instruments to respond to the uniqueness of market- and customers demand (Pujawan 2004).
- At a strategic level, the survival of a firm is determined by the quality, flexibility and speed.
- Flexibility (i.e. the degree to which an organization is capable to regulate the time in which a new or different state can be reached), and speed (i.e. the time needed to adapt a new or different state)

Swafford et al. (2008) analyzed the role of information technology integration and SCF as predecessors of SCA.

During the last decades both concepts, i.e. agility and flexibility, have evolved within overlapping and confusion between the definition, extension and scope. Nevertheless, flexibility as a supply chain capability is embedded in all processes, operations, activities, functions, subsystems, resources, and so on, and should be considered from machine level to strategic level across the supply chain boundaries and within its partners in order to achieve

SCF. Therefore, it can be said that agility constitutes a strategic tool that stems from different components such as flexibility, responsiveness, lean and time-based competitions. Agility is an extension of the flexibility concept and might be attained in any system as there is an inherently flexibility to give a quick response to disturbing and uncertain events (Gligor et al. 2013). Moreover, it can be argued that SCF does not indispensably need to be agile in nature, but to have SCA it is necessary to be flexible in nature. On the other hand, although agility is based on flexibility and responsiveness, it is also a component of cost and quality of products and services (Gunasekaran et al. 2008; More and Subash Babu 2008).

In conclusion, SCF has been identified as a key lever or priority strategy to achieve a sustainable competitive advantage by the firms and organizations that require new innovative ways to address the dynamics, uncertainty, and turbulence of business environment (De Meyer et al. 1989; Narain et al. 2000; Stevenson and Spring 2007; More and Subash Babu 2008; Singh and Acharya 2013; Tiwari et al. 2015). Therefore, managing SCF has emerged as a new competitive strategy to provide volume, cost and time-related efficiency whereas responding to the demand of the customers. This might also provide an edge to moderate firm- and supply chain vulnerability in a highly competitive and changing environment.

2.4.3 SCF dimensions and types

For the purpose of this work, it is necessary to have a good understanding of flexibility dimensions and types at a firm level as well as at a supply chain level. Therefore, this section will be provided a comprehensive review regarding these two aspects of the flexibility.

Stevenson and Spring (2007) identified three generic principles of flexibility, i.e. it is also a multi-dimensional and complex capability; this capability is always present and does not need to be demonstrated; and it is difficult to measure, challenging to gain and hard to imitate. Moreover, if the unit of analysis is flexible in one dimension, it does not imply that it is flexible in another. Hence, comparing two different supply chains, they might have the same degree of flexibility but in complete different aspects. Although the level of flexibility might be measured at the current time, when the flexibility *'potential'* is included, the measurement complexity increases. Moreover, some dimensions of flexibility influence others, e.g. supply chain design flexibility is influenced by sourcing flexibility (Gosling, Purvis and Naim, 2010).

Slack (1983) recognized five flexibility dimensions, i.e. quality, product mix, delivery, new product, and volume. Later, Gerwin (1993) defined seven flexibility dimensions, while Koste and Malhotra (1999) and Narasimhan and Das (2000) included three other types. Vokurka and O'Leary-Kelly (2000) summarized them in fifteen, i.e. material handling, operations, machine, labor, automation, product, routing, process, new design, expansion, volume, delivery, production, program and market. Sethi and Sethi (1990) stated that there are at least fifty types of flexibility and sometimes the definitions of those flexibilities varied from author to author and they were not always precise.

Stevenson and Spring (2007) developed a hierarchical taxonomy of SCF based on the different components of manufacturing flexibility, where at the shop floor are included the operational flexibilities while at the network level are involved the to supply chain flexibilities. Gosling et al. (2010) recognized vendor and sourcing flexibility as two key internal flexibility types in SCF. They suggested that the external flexibilities of a supply chain system are determined by these two flexibilities. In one hand, vendor flexibility includes the flexibilities regarding warehousing, sourcing and logistics. On the other hand, sourcing flexibility involves the supply-chain reconfiguration capability of the focal firm, its capability to enhance the supplier responsiveness and the firm's capability to adapt to the changes in the market. The authors argued that all of these SCF components can be achieved by integrating sourcing and vendor flexibility into purchasing decisions. More and Babu (2011) analyzed the relationships among different SCF types and established a contextual relationships among them. Additionally, the author identified the relevant factors to different SCF types and evaluated the dynamics between them.

Manders et al. (2016) recognized 95 dimensions in SCF from a systematic literature review and categorized them into seven business areas: procurement, manufacturing, marketing, product development, logistics, organization and information. Appendix A presents the overview of the thirty-one most used dimensions of SCF identified from the literature which includes their definition necessary to the following sections of this work. Furthermore, Figure 2-14 depicts a conceptual diagram, adapted by Tiwari et al. (2015) from the SCF hierarchical taxonomy presented by Stevenson and Spring (2007), which shows the SCF dimensions at each hierarchical level.

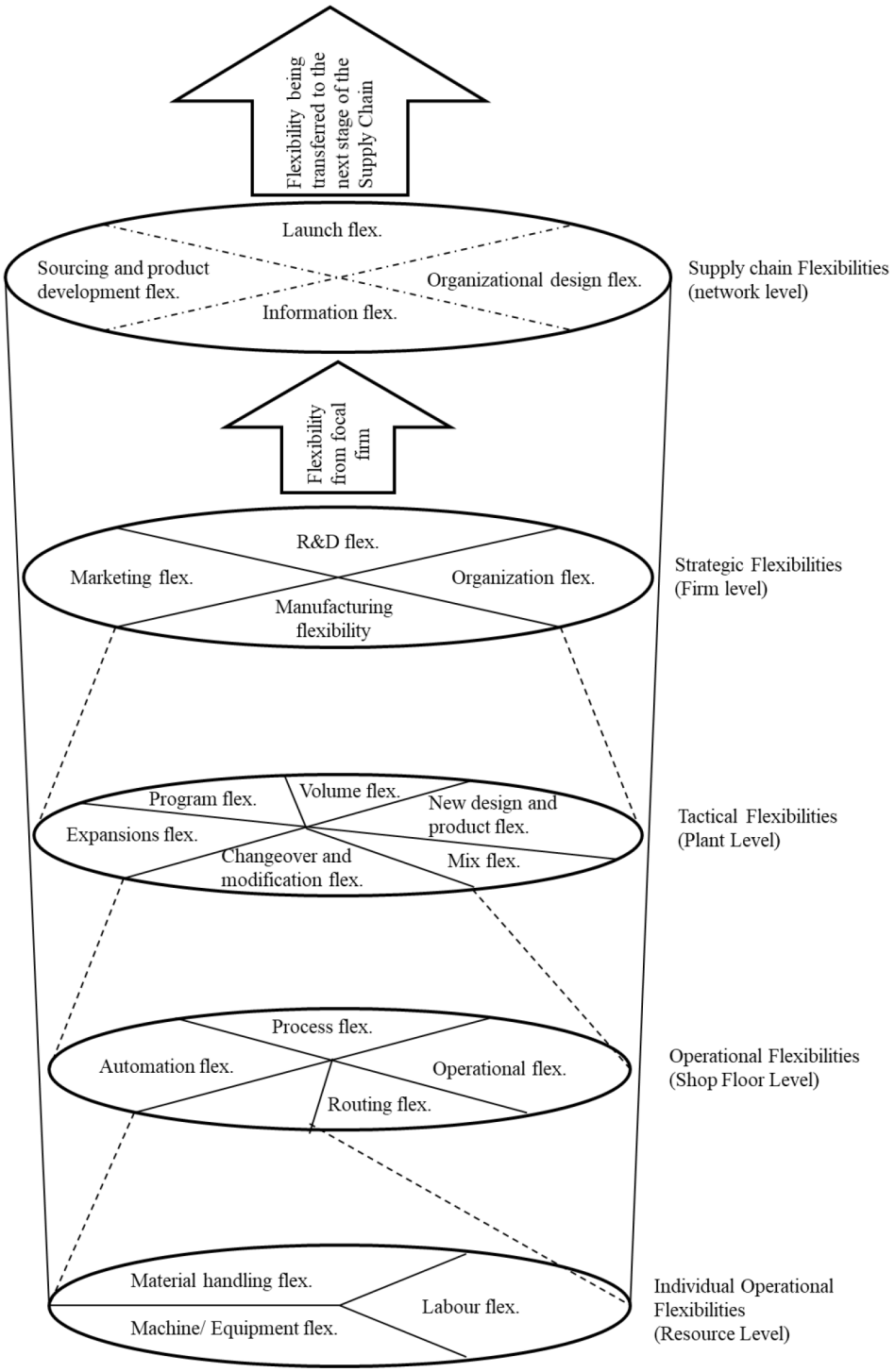

Figure 2-14 A conceptual diagram of flexibility at various hierarchical levels in a firm
Source: Adapted from Tiwari et al. (2015)

Stevenson and Spring (2007) took the existing manufacturing flexibility framework as the starting point to build up the hierarchy of flexibility, placing supply chain flexibility dimensions above manufacturing flexibility and hence subdivided it into four levels: resource,

shop floor, plant and firm. Each level included the internal issues inherent to them with a wider variety of *"internal-/external-firm flexibility sources"* (non-manufacturing) and services at a network level, in relation to sourcing, logistics and procurement. This enables visualizing intangible features e.g. inter-organizational relationships' value (the network value is larger than the sum of the parts). In spite of the fact that manufacturing is commonly linked to flexibility, services also are highly important to enhance SCF. Among the components included in SCF are new product (or launch), product, volume, postponement, sourcing, delivery (or distribution), and responsiveness (to target market).

A variety of flexibility types at the inter-organizational level allows a more comprehensive concept of flexibility (Lummus et al. 2003; Stevenson and Spring 2007). These types include re-configuration flexibility as the mobility with which the supply chain can re-align or re-adapt and is determined by the resilience of the current structure of the supply chain; dormant flexibility as the SCF is to some extent a contingent resource; logistics flexibility as the ability to cost-effectively deliver and receive product as sourcing and customers location change; network alignment as the alignment of the capabilities of the supply chain partners to meet supply chain aims and compete as a chain; and relationship flexibility as the capability to generate collaborative efforts and relationships upstream as well as downstream.

Esmaeilikia et al. (2014) presented a framework based on three dimensions with SCF measures of tactical supply chain planning and optimization. The three dimensions are: supply flexibility (i.e. sourcing decisions and make-and/or-buy decisions); manufacturing flexibility (i.e. manufacturing diverse product types on each plant, tactical production expansion and backlogging), and distribution/logistics flexibility (i.e. flexible options for transporting and warehousing processes). However, Thomé et al. (2014) argued that these flexibility types are internal to the supply chain due to the indifference of the customer on how the supply chain achieves flexibility (e.g. connecting current partners or adding new ones through flexible logistics). Moreover, they stated that customers are concern about these four flexibility types: the ability of the supply chain to introduce new products; change its product mix and volume; and how it manages the delivery in accordance with their requirements. These external types were early identified in the context of manufacturing flexibility (Slack 1983, 1987). Nevertheless, to enhance volume flexibility it is required a close coordination between the focal firm and its providers to be able to address demand fluctuations. Therefore, volume flexibility has a direct impact on the performance of the supply chain as it enables the supply chain to prevent of out-of-stock conditions when there is an unexpected increase on

the demand or to prevent overstocking problems (Fatemi 2010). The flexibility to introduce rapidly new products and the mix of them as well as the capability to adjust the lead times according to customers' expectations, constitute external flexibilities that necessitate the integration and synchronization of several value activities all through the supply chain (Fatemi 2010). Table 2-5 provides an overview of flexibility types at different supply chain levels and a short definition of each is provided.

Table 2-5 Categorization of different types of flexibility at supply chain level

Type of flexibility at different levels in supply chain	Definition of flexibility	Source
Backward integration	Ability of supply chain to extend its participation in other supply chains	Heim (2000); More and Subash Babu (2011)
Forward integration	Ability of a supply chain to allow companies of other supply chains to participate in it	Heim (2000); More and Subash Babu (2011)
Full integration	Ability to incorporate backward and forward integration in a supply chain	Heim (2000); More and Subash Babu (2011)
Range	Supply chain ability to manage diverse functions, processes and activities simultaneously	Upton (1995)
Adaptation	Ability of firm to quickly adapt and adjust to internal and external variances like technological changes, management changes, etc.	Kara et al. (2002); Stevenson and Spring (2007)
Re-structuring/re-configuration	Ability of supply chain to re-align its structure as per requirements of the industry in response to market change and/or customer's need	Kara et al. (2002); Stevenson and Spring, (2007); Chou et al. (2010); Iravani et al., (2005)
Target Market	Ability of supply chain partners to respond quickly, efficiently and in a cost effectively to the changing and evolving market	Sanchez and Perez (2005)
Expansion	The ease with which a firm can increase for long-term the capacity and capabilities of the system	Sethi and Sethi (1990) and Stevenson and Spring (2007)
Offering	Ability of supply chain linkages to incorporate modifications and changes in product or service jointly and aligned with current partners	Gosain et al. (2005)
Partnering	Ability of a supply chain to easily and quickly change supply chain partners in the interest to pursue the benefits from the changes in the business environment	Gosain et al. (2005)
Supplier selection/relationship flexibility	Ability to develop trust and a collaborative relationship throughout the participating firm of the supply chain	Johnson (1999); Chan et al. (2006); Stevenson and Spring, (2007)
Financial	Flexibility in managing wage structure of employees. At network level, it acts as alignment strategy for partnering firm	Sethi and Sethi (1990); More and Subash Babu, (2011)
Information dissemination	Ability to synchronize, integrate and co-ordinate information within and across the supply chain network	Zhang et al., (2002); Duclos, et al. (2003); Martínez Sánchez and Pérez Pérez (2005); Stevenson and Spring (2007)
Time based	Related to agility of the entire SC network	Brown and Bessant (2003)
Total system	Sum of flexibilities at all functional departments	Kara et al. (2002)
Horizontal inter-organizational	To manage and control partners based on type of competition (quantity, quality, cost, etc.) and number of competitors, etc.	Chan et al. (2006)
Vertical flexibility		Hopp et al. (2010)

Source: Adapted from Tiwari et al. (2015)

More and Subash Babu (2008) proposed three domains for SCF dimensions, i.e. core flexibility dimensions, global flexibility dimensions, and supplementary flexibility dimensions. The authors identified each domain with a number of flexibility types.

2.4.3.1 Core SCF Dimensions

Regarding the core flexibility dimensions, these refer to the major flexibility dimensions associated to the core business process in a supply chain context (Appendix B). The core SCF dimensions are grouped into eight categories. The first category, manufacturing/production, includes the dimensions that enable the adjustment of manufacturing strategies to manage order variation and forecast uncertainty. The category of product based flexibility involves the dimensions that are immediately perceived by the customer as they allow delivering the accurate product at the right time. The sourcing/procurement flexibility category groups the dimensions related to the ability of the suppliers to adapt to manufactures' requirements for providing a rapid response to the customers. The fourth category, logistics/distribution flexibility, involves the dimensions that allow a quality-time based competition, as they permit the adaptation of production- and distribution schedule to cope with unpredicted changes in the demand.

The information technology (IT) flexibility includes the dimensions that enable the coordination, integration and synchronization of information within and across the functional areas of the organization and supply chain. Organization flexibility dimensions are associated to the decision flow across the supply chain and the later monitoring of the implementation of decisions made across the organizational structure. Human resources (HR) flexibility groups the dimensions that impact the workforce in the organization such as human motivations, skills and abilities. Finally, market based flexibility includes the dimensions that enable the adaptation of manufacturing systems to a fluctuating market environment and the market entry- and exit barriers. This involves the capability to build close relationships with the customers, develop mass customized products as well as adapting the current production to the requirements of the market. Last, the development of these dimensions depends on the organizations' capability to recognize market trends and changes within the limitations of their value chain.

2.4.3.2 Global SCF dimensions

The aim of reaching and improving SCF is to have a better performance in a competitive scenario. Firms' competitiveness is mirrored by how and with which strategies, activities and resources the firms address the issues that affect their performance. The group of global flexibility dimensions is largely recognized by the inherent ability that an organization has to self-place at any place and at any time (More and Subash Babu 2008). The spatial and time aspects are not limited to a given business process, but collectively they are regarded as the set of fundamental organizational capabilities as well as the way in which the organizational potential strengths are positioned to harness their benefits. Therefore, the types of global flexibility are acknowledged as essential in the supply chain competitive context. Furthermore, the majority of flexibility dimensions in this domain can be utilized at any stage or point in the supply chain. The main flexibility dimensions related to this domain are listed in Table 2-6. It is also provided a brief definition of each dimension.

Table 2-6 Global SCF dimensions

No.	**Global SCF dimensions**	**Definition**
1	Quality flexibility	The ability to provide cost- and time-effectively a product within the a certain satisfaction criteria required by the customer (Quinn et al. 2010).
2	Action/Active/Reactive flexibility	This refers to the organization's ability to change the course of action after a modification is required (Stevenson and Spring 2007; Tiwari et al. 2015).
3	State/Passive/Proactive flexibility	The ability to build a system that is easy to modify if a change is required.
4	Program flexibility	Time length on which a system can work unattended (Sethi and Sethi 1990; Stevenson and Spring 2007).
5	Expansion flexibility	The ease with which a firm can increase for long-term the capacity and capabilities of the system (Sethi and Sethi 1990; Stevenson and Spring 2007).
6	Mobility flexibility	The ability of the system to make rapid structural-, infrastructural-, production-, processes-, and management-policy changes in an effort to respond quickly to changing market demand (Kara et al. 2002; Sparrow 2012).
7	Lead time flexibility	The ability to modify lead times to satisfy customer expectations (Wang 2008).
8	Systemic flexibility	The ability to develop a network for collective learning and sharing common resources to enhance output mix and output quantity (Sak and Taymaz 2004).

9	Order processing flexibility	Supply chain ease to replace or modify the quantity, production, and lead time of a processing order.
10	Range flexibility	Supply chain ability to manage diverse functions, processes and activities simultaneously (Upton 1995).
11	Application flexibility	The ability to design and produce a flexible system capable of performing multiple tasks (Kara et al. 2002).
12	Speed flexibility	The capability to design and deliver responsiveness to fluctuating customer demands and technologies (Kara et al. 2002).

Source: Based on More and Subash Babu (2008)

2.4.3.3 Supplementary SCF dimensions

The flexibility domains described above discussed the flexibility dimensions related to the core business process as well as the set of dimensions that are considered collectively across the supply chain and within its partners. These dimensions need to be supported by supplementary dimensions to enhance their performance. For example, the flexibility of the supply chain network might be improved by adopting flexible processes and operations between two nodes or partners within the supply chain, thus this might be termed as associativity flexibility dimension as it incorporates total supply-chain network flexibility, distribution network flexibility and supply/sourcing network flexibility. It is possible to identify a number of such flexibility dimensions, e.g. strategic flexibility, customer flexibility among others (More and Subash Babu 2008).

2.4.4 Drivers and enablers of SCF

The need of flexibility in the supply chain is fashioned by different factors or situations that become flexibility drivers. Further, each one of these drivers are associated with an uncertainty, e.g. a firm can face sourcing uncertainty which might drive the decision of the focal company to maintain a pool of suppliers, then sourcing constitute an upstream flexibility driver; and similarly, a firm faces demand uncertainty that represent a downstream flexibility driver (Jack and Raturi 2002; Pujawan 2004; Tiwari et al. 2015; Shibin et al. 2016). In contrast, the sources of flexibility or enablers, are the activities or elements (capabilities) performed to address the uncertainty (Tachizawa and Thomsen 2007; Kumar et al. 2008; More and Subash Babu 2008; Tiwari et al. 2015; Shibin et al. 2016). Kumar et al. (2008) studied the relationship among flexibility enablers (e.g. multiple sourcing, information sharing, adaptability, rerouting) that were hierarchized in order to understand the influence of

these enablers in a global supply chain. The degree of integration in a supply chain produces an important impact in the achievement of SCF. The integrated and flexible supply chain represents a competitive advantage to leadership domestically as well as abroad in a dynamic scenario characterized by uncertainty in customers' demand. Moreover, Gligor and Holcomb (2012) highlighted the role of logistics capabilities as enablers of SCF. The degree of process and information integration, responsiveness flexibility and collaborative relationships in a supply chain will allow the accurate response to various sources of uncertainty. Figure 2-15 depicts a conceptual diagram of the locations of SCF drivers.

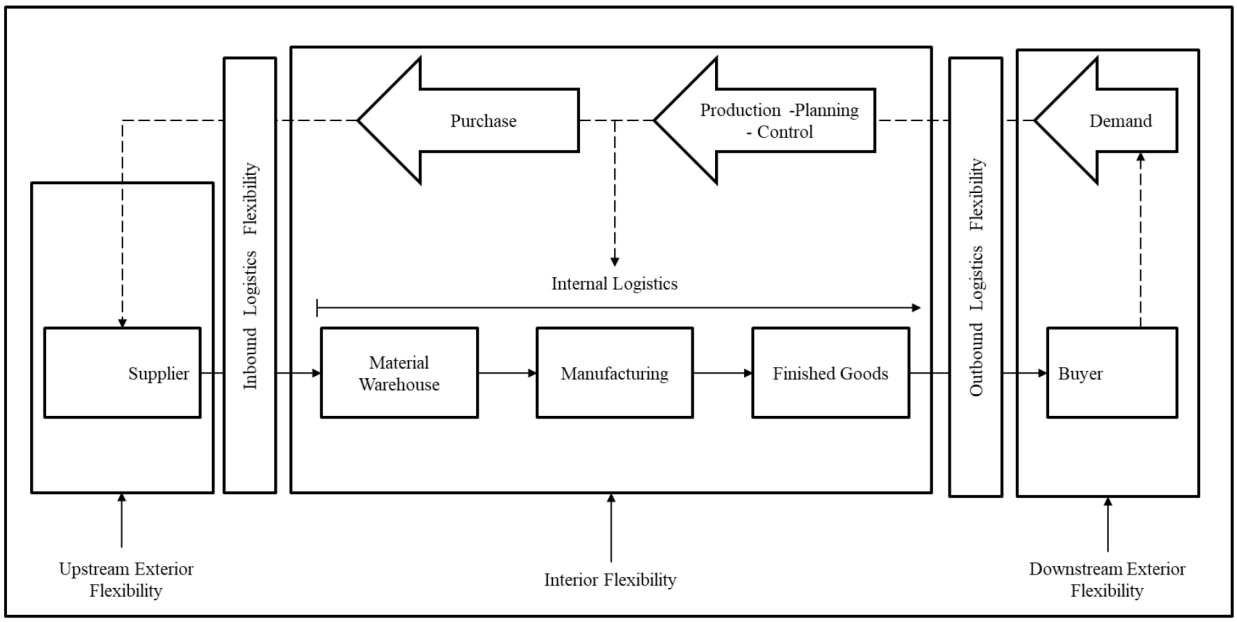

Figure 2-15 A conceptual diagram for SCF and locations of its drivers
Source: Tiwari et al. (2015)

Each flexibility driver is linked to a source of uncertainty, e.g. customers are responsible for demand uncertainty which constitutes a driver for downstream exterior flexibility, and similarly suppliers might be for responsible for sourcing uncertainty which constitutes a driver for upstream exterior flexibility and this might also determine just-in-time (JIT) purchasing policy from maintaining a suppliers' pool instead of relying on a single supplier.

More and Babu (2008) recognized three relevant forces to achieve the appropriate degree of flexibility through a dynamic management of the system in order to decrease the supply chain vulnerability. These three forces characterized as stimuli, inhibitors and enablers, can be

internal or external to the firm environment, and therefore the relationship dynamics among them needs to be understood to achieve SCF implementation and requirements.

Stimuli are defined as the factors that might persuade supply chain partners to respond to the dynamics and uncertainty of the environment by taking actions in order to restructure supply-chain processes and/or operations (More and Subash Babu 2008). These factors are mostly linked to the uncertainties, turbulence, fluctuations, unpredicted strategies, actions or changes in the multifaceted supply chain environment that may come into being. The supply chain network is often working at suboptimal mode with respect to the key performance measures due to the presence of these stimuli. For example, there are several stimuli in the customer domain, referred to pressure for a mix of products, lower prices, consistent product quality, quick and reliable delivery, among others. As it is noted, not all the stimuli might be beneath the scope of management control, therefore, it is necessary to identify and map the stimuli and their impact within the partners and across the supply chain boundaries. Table 2-7 presents a summary of the domains and stimuli identified from the literature (Pujawan 2004; Tachizawa and Thomsen 2007; More and Subash Babu 2008; More and Babu 2011; Angkiriwang et al. 2014).

Table 2-7 Domains and stimuli

No.	**Domains**	**SC stimuli**
1	Customer	Pressure for mix products, lower prices, quick and reliable delivery, consistent product quality
2	Market and/or market strategies	Change of customer location; intensify buyers concentration; market structure, market trends, segmentation of multiple markets, saturation of markets
3	Demand	Last-minute order modification, lost orders reduction, rushed orders, volume and mix fluctuation, forecasting inaccuracy, seasonality effect
4	Competitors	More flexible competition scenario, broader competition, behavior of competitors
5	Product	Short product shelf life, shorter lifecycle of the product, product complexity, low piece commonality, necessity of rapid launch of new products, requirement of customized and innovative products, need for time-sensitive products

6	Manufacturing or production system	Uncertainty for production scheduling; machine set-up time, uncertainty of production capacity, probability of machine failure, inspection inconsistency, manufacturing strategy variability, maintenance and repair uncertainties, upstream production fluctuations, need for customized products and mass customization process
7	Logistics or distribution system	Global distribution requirements, transit order, need of shipping delay reduction, transport link disruptions
8	Sourcing or procurement system	Uncertainty of supplier capacity, key suppliers loss, unexpected disruption of supply, delivery frequency uncertainty, JIT purchasing requirements, uncertainty on upstream relationships, requirement of special material features
9	Practices and strategies across the chain	Necessity for delivery-based, cost-based and/or time-based competitive strategy, implementation of demand-management strategies (engineer-to-order, make-to-order, make-to-stock, innovate-to-order, assemble-to-order), necessity for enhancing responsive supply chain
10	SC processes	Low or non-competitive processes, unpredicted process failure, process variance, requirement for analogous process, lead time fluctuations
11	SC network	Global supply chain network, uncertainties in the network environment
12	HR or labor	Workforce variation/shortage/availability, modifications on the workforce expectations, personal attitude and behavior, discouraged risk-taking behavior
13	Technology	Reduction of the lifecycle of technology, requirement for rapid technology modifications, necessity for technological innovations, unpredicted information-technology system failures
14	Social factors	Necessity of international agreements, cultural distance, political instability, unclear governmental policies, economic turbulence, privatization
15	Major environmental factors	Unpredicted earthquakes, flood, hurricanes, terrorism, short-term weather changes, unexpected accident in any stage of the supply chain
16	Others	Inventory variability, planning and policies-uncertainties, SKU complexity, operational issues, etc.

Source: Based on More and Subash Babu (2008)

Further, firms are willing to compete under low uncertain and unexpected changes, as the higher the uncertainty the higher the damage to the overall supply chain structure and performance. Therefore, the supply chain network requires enhancing its flexibility capability.

Nevertheless, this capability depends on diverse processes, operations, functions, activities, competences, capabilities and subsystems. Moreover, the complete benefit of flexibility relies on the aims or strategies pursued by the organization and the precise dimensions and levels of flexibility needed, as this capability is application-oriented and context-specific. Nevertheless, there are several paths to enable and enhance SCF within and across the supply chain partners. These paths are related to strategies, techniques, process, methods, practices, and tools that enable the achievement of the required dimension and level of flexibility, and they constitute SCF enablers. From the literature (Tachizawa and Thomsen 2007; More and Subash Babu 2008; Shukla et al. 2010; Hock Soon and Mohamed Udin 2011; Sparrow 2012; Angkiriwang et al. 2014; Shibin et al. 2016), Appendix C provides a classification of these enablers according to their position at different segments of the supply chain, i.e. sourcing/procurement, manufacturing, logistics/distribution, organization, across the supply chain and HR.

As the supply chain is able to identify and deploy proper enablers, it can increase its flexibility. Nonetheless, a number of interior and exterior aspects might constrain the SCF. These aspects, recognized as inhibitors, interrupt the path to achieve the aims that the supply chain pursues. The majority of these inhibitors are common to all the enablers and dimensions of flexibility. Due to this, implementing the necessary enablers, and managing and controlling the processes results difficult at any level or segment or in the whole supply chain. From the literature (Pieter Van Donk and Van Der Vaart 2005; Tachizawa and Thomsen 2007; More and Subash Babu 2008; Thomé et al. 2014; Shibin et al. 2016), a comprehensive list of these inhibitor is presented in Table 2-8.

Table 2-8 SCF inhibitors

Sc. No.	**SCF inhibitors**	**Sc. No.**	**SCF inhibitors**
1	Market constraints	32	Adopting a customer mentality
2	Geographical challenges	33	Dynamic relationships
3	Volatile product prices	34	Internal processes of the organizations
4	Trade barriers	35	Lack of collaborative approaches
5	Cost variability	36	Lack of visibility in the supply chain
6	Non-competitive processes	37	Cultural difference
7	Marketing practices uncertainty	38	Low moral
8	Logistics complexity	39	Lack of discipline
9	Product complexity/difficult design specifications	40	Lack of world view approach or focused view
10	Lack of retailer experience	41	Functional structure of organizations
11	Cost-focus	42	Discount-based push strategies

12	Contracts and contractors	43	Lack of common vision and fashion
13	Information complexity	44	High diversity of business
14	Information intensity	45	Some government laws and regulations
15	High SKU complexity	46	Inter-company barriers
16	High SKU complexity	47	Commercial pressures
17	Bottlenecks in supply chain flows	48	Short term focus
18	Supply chain network complexity	49	Poor personal relationship
19	Individual competencies in the SC partners	50	Different trading strategies
20	Rules and regulations within and across the supply chain	51	Misunderstanding decisions and their implications
21	Conflicting objectives of supply chain partners	52	Demand of shareholders for high returns on investment
22	Independent and conflicting plans	53	Labor union issues
23	Lack of loyalty	54	Labor absenteeism and turnover
24	Lack management support	55	Labor strikes
25	Poor decision making	56	Risk taking discouraged people attitude
26	Independent supply chain participants	57	Employees sabotage
27	Poor communication	58	Workforce violence
28	Decentralized control	59	Interventional barriers within the firm
29	Technological complexity	60	Financial budget
30	Dedicated technology	61	Common cynicism
31	Resource limitations or constraints	62	Functional silo mentality

Source: Adapted from More and Subash Babu (2008)

Kumar et al. (2008) studied the relationship between the flexibility enablers and develop a framework to hierarchizes them and understand their mutual influence in global supply chain. The authors used an interpretive structural modelling (ISM), as a tool to identify the importance of each enablers regarding their dependency and driving power. This might help to enhance flexibility in a global supply chain. From the review of the literature, the authors identified the lack of research regarding the flexibility enablers to improve this capability in a global supply chain context and how these enablers are related and interact among each other to map the achievement of flexibility for a global supply chain. Flexibility drivers are the circumstance or element that generates the requirement for flexibility which are linked to an uncertainty type upstream or downstream. At the operational level, there are uncertainties as mix uncertainty, volume uncertainty and delivery uncertainty (Slack 1983; Pieter Van Donk and Van Der Vaart 2005; Tachizawa and Thomsen 2007; Mohammed 2012). While disturbance in supply chain and production schedule is associated to delivery uncertainties, demand volatility is associated to mix uncertainty and volume uncertainty. The volume and mix uncertainties are related to demand volatility while delivery uncertainties are associated

to disruptions in the sourcing and production schedule (Kumar et al. 2008). On the other hand, the sources of flexibility are the performed activities to face the uncertainties. As Kumar et al. (2008) recognized, at the context of global supply chain, the flexibility is the consequence of the flexibility of different components and sub- components (known as *'enablers'*) of the supply chain. The authors categorized these components in three hierarchical levels of flexibility for a global supply chain, i.e. strategic level, operational level, and performance level (Appendix D).

In general terms, the operational-level-enablers are derivative of the strategic-level-enablers and similarly the operational-level-enablers lead to the performance-level-enabler. However, in some cases, the enablers might have a close-loop relationship with other enabler and might drive each other. By using ISM methodology, Kumar et al. (2008) analyzed the interdependency and hierarchy of these enablers including their dependencies and driving power. From their findings, the authors concluded that delayed product differentiation, security and demand variation were the enablers with a high driving power which determine their strategic importance. They also found that there are enablers with low-dependence and low-driving power i.e. manufacturing systems flexibility, stability of economy, alternative logistics arrangements, location flexibility, and cultural and linguistic compatibility. Although sourcing flexibility and supplier flexibility presented a low-driving power, these enablers have a high dependency.

The drivers and sources of flexibility in the supply chain might be identified in three positions of the supply chain, i.e. inside the focal firm, external to the focal firm and across the supply chain partners. Table 2-9 provides a summary of the drivers and sources of flexibility in the supply chain identified from the literature (Jack and Raturi 2002; Lummus et al. 2003; Tachizawa and Thomsen 2007; Kumar et al. 2008; More and Subash Babu 2008; More and Babu 2011; Danese et al. 2013; Tiwari et al. 2015).

Table 2-9 Summary of drivers and sources of supply chain flexibility

Position in supply chain	Driver of flexibility	Sources
Internal (focal firm)	*Within firm*: Issues with system control, co-ordination, material handling, labor, machine purchasing, process, operation, etc.	Adaptability, alignment, internal collaboration, system integration, real time information sharing

External	*Upstream (supplier):* Unresponsive supplier, unreliable supplier, delivery uncertainty, single supplier dependence, risks and disruptions, mix-volume uncertainty	Multiple sourcing, flexible sourcing, supplier management, improved supplier responsiveness, inventory buffers, information sharing, mutual transparency
	Downstream (buyer): Demand uncertainty (volatility, seasonality, forecasting errors)	Sharing information such as real time demand forecast, maintaining optimal buffers
	Logistics (inbound/outbound): Lead time uncertainty, delivery uncertainty etc.	Integration with logistics provider, collaborative transportation management, third party logistics, alternate transportation modes
Across firms	Issues related with information sharing, new product development and its launch	Systems integration, real time information sharing, collaboration, partnering, restructuring supply chain, alignment

Source: Tiwari et al. (2015)

In order to enhance the flexibility across the supply chain and within the partners of it, it is possible identify different methods that are commonly embraced by the firms. These practices or strategies allow them to increase SCF while addressing the uncertainties and risks of the business environment. Table 2-10 summarizes the main strategies identified from the literature.

Table 2-10 Supply chain strategies to enhance flexibility

Strategy	Source
Relationship among partners in supply chain	Tiwana (2008); Skipper and Hanna (2009); Chan et al. (2009); Kuo et al. (2010); Jüttner and Maklan (2011); Yi et al. (2011); Gosling et al. (2013)
Information sharing	Lummus et al. (2005); Schmenner and Tatikonda (2005); Stevenson and Spring (2007, 2009); Chan and Chan (2009); Skipper and Hanna (2009); Ogulin et al. (2012); Urtasun-Alonso et al. (2014)
Supplier quality management programs	Zsidisin and Ellram (2003); Stevenson and Spring (2009)
Supplier selection	Swafford et al. (2006); Stevenson and Spring (2009); Gosling et al. (2010)
Supplier development	Zsidisin and Ellram (2003); Stevenson and Spring (2009); Gosling et al. (2010)

Supplier certification	Zsidisin and Ellram (2003); Stevenson and Spring (2009); Gosling et al. (2010)
Flexibility and adaptability	Lee (2004); Chan and Chan (2010); Engelhardt-Nowitzki (2012)
Flexible Manufacturing Systems and Process	Jayant and Ghagra (2013); Angkiriwang et al. (2014); Manders et al. (2016)
Postponement	Prater et al. (2001); Duclos et al. (2003); Stevenson and Spring (2007, 2009); Christopher and Holweg (2011); Angkiriwang et al. (2014)
Single vs multiple sourcing	Das and Abdel-Malek (2003); Pujawan (2004); Swafford et al. (2006); Gosling et al. (2010); Angkiriwang et al. (2014)
Reducing supplier switching costs	Pujawan (2004); Swafford et al. (2006)
Internal integration	Swafford et al. (2006); Christopher (2011); Danese et al. (2013)
External integration	Lee (2002); Swafford et al. (2006); Christopher (2011); Danese et al. (2013)
Global vs domestic sourcing	Lee (2002); Stratton and Warburton (2003); Omar et al. (2012); Jayant and Ghagra (2013)
Alternative transportation modes	Prater et al. (2001); Pujawan (2004); Swafford et al. (2006); Kumar et al. (2008); Angkiriwang et al. (2014)
Inventory buffers	Fisher (1997); Stratton and Warburton (2003); Christopher (2011)
Joint product development with suppliers	Lee (2002); Stevenson and Spring (2009); Christopher (2011); He et al. (2014)
Long-term relationships with supplier	Stevenson and Spring (2007, 2009); Gosling et al. (2010)
Third-party logistics provider (3PL) **Fourth-party logistics provider (4PL)**	Prater et al. (2001); Lee (2004); Pujawan (2004)
Subcontracting/outsourcing	Stevenson and Spring (2009); Angkiriwang et al. (2014)
Flexible supply contract	Stevenson and Spring (2007); Jayant and Ghagra (2013); Angkiriwang et al. (2014)
Responsive pricing	Jayant and Ghagra (2013)

Source: Author

As it has been discussed, each type and dimension of flexibility is affected by different elements and situations of uncertainty. For instance, an unpredicted change in the demand would affect the focal firm performance as well as the overall supply chain. Moreover, the existing dimensions and levels of flexibility across the supply chain at the interior of the firms respond in different ways to this uncertainty. In one hand, at the supply chain level this issue could be addressed by maintaining a safety stock at various partner firms that might suffer least penalty for keeping it, on the other hand, at the firm level, the solution might be to generate volume flexibility through supply contracts or having a pool of suppliers, and in both cases that will depend on the supplier flexibility which allows postponement flexibility or

pooling suppliers. Similarly, each flexibility dimension and type is influenced in different ways depending on the different elements of uncertainty. Hence, SCF plays a moderating role on uncertainties existing in the business environment. As a result, implementing SCF has a positive impact on the industries where this capability is stimulated.

The main components of SCF, i.e. manufacturing flexibility, IS flexibility, supply system flexibility, logistics flexibility, and decision-making flexibility are essential from a strategic point of view (Tiwari et al. 2015). A system with manufacturing flexibility is capable to provide an adequate response to changes in the variations in the external scenario. This can be achieved by producing goods with a consistent quality, on time, and cost effectively to meet the customer demand. A system with logistics flexibility allows appropriate transportation options at an efficient cost with respect to changes in the external distribution conditions of the environment. Furthermore, this simplifies the delivery of the right good or service at the right time and the right place to respond to the demands of customer or partners. Additionally, the IS flexibility supports the alignment of the alterations of the dynamics of the supply chain during its entire life cycle. Supply chain's IS should be scalable, reconfigured, or reconstructed in a feasible and viable fashion such that modifications can be adjusted according to the external stimuli. Decision-making flexibility at the strategic level refers to the capability to define and make a decision with the basic assumption of rationality. This can be achieved by promoting among the policymakers and decision makers permitting flexibility preferences, flexible decision goals to obtain a satisfactory result at some high level of aspirations, flexible constraints that might be modified with the span of the decision-making process, and when needed progressively relaxing the decision-making process constraints.

In conclusion, it is highly important in the case of manufacturing SMEs to identify and map the dimensions and main stimuli, drivers and enablers of flexibility that affect the achievement of their internationalization goals. Moreover, the manufacturing SMEs should include in this analysis the effects of the flexibility dimensions and types across the supply chain on which they are embedded as the focal firm. This will enhance the decision-making process to adopt an effective SCF strategy. It is also necessary to recognize which flexibility strategies might be affordable for the manufacturing SMEs as well as the whole supply chain.

2.4.5 Models of SCF

Several approaches have been developed by scholars to describe and understand SCF. The models are wider categorized as conceptual, mathematical, empirical and simulation. The conceptual models provide a visual and physical picture of theoretical constructors, factors and parties involved. Mathematical and simulations models are generated to offer a deeper

understanding of SCF implementation and its late-effects. Finally, empirical models provide elements to study the linkages among diverse parameters.

Kumar et al. (2006) proposed a conceptual framework to implement and manage SCF consisting of three stages, i.e. required flexibility-identification procedure; implementation and shared responsibility; and control and evaluation (Figure 2-16).

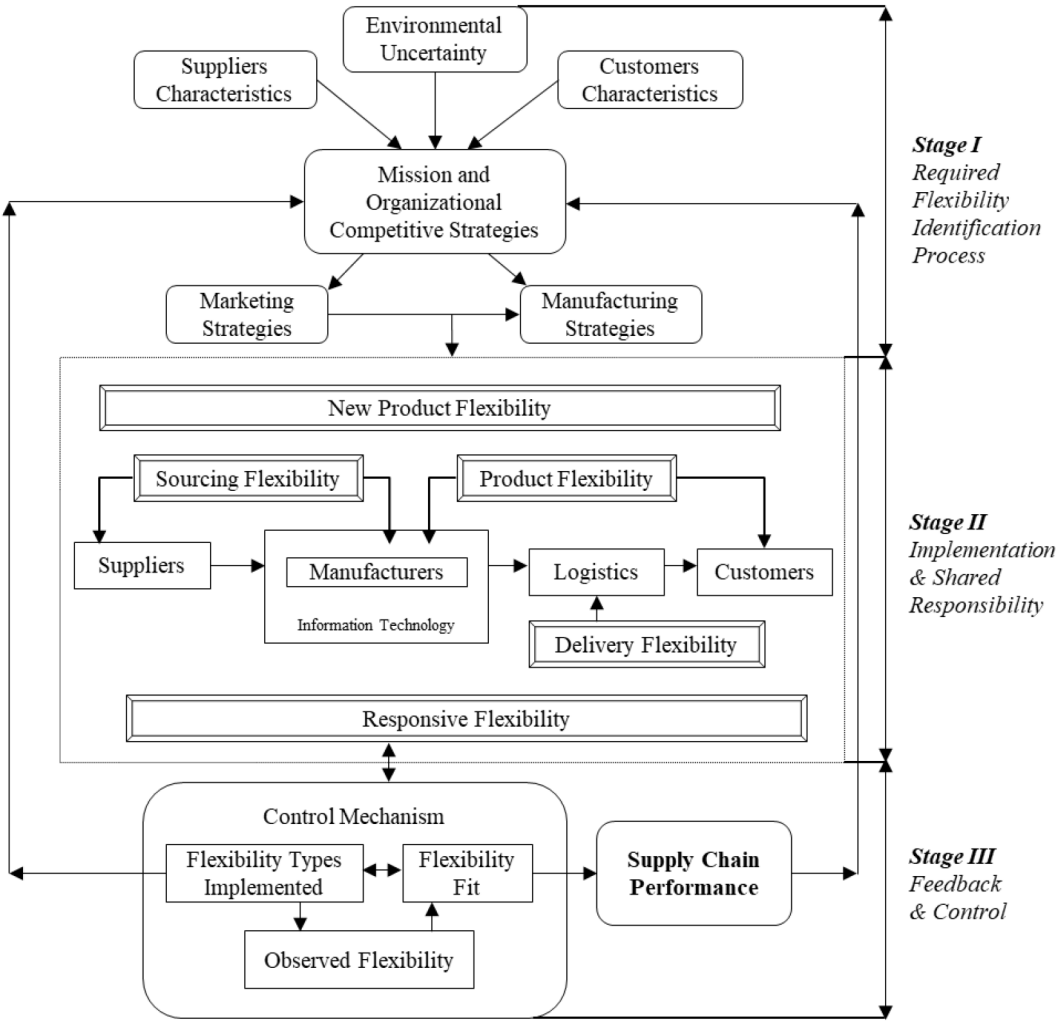

Figure 2-16 Conceptual framework for the implementation and management of SCF
Source: Kumar et al. (2006)

The main goal of the first stage involves the processes to identify the required flexibility to design the appropriate competitive strategy. Therefore, it is necessary to measure all the factors that affect this process: environmental uncertainties as well as customers- and suppliers- characteristics and the relationships with them. The analysis of these three factors provides the required elements to develop the competitive strategies, i.e. operational strategy (mainly related to the production flexibility) and marketing strategy (related to the distribution

or access flexibility). Depending on the functional strategies, the dimensions, types and level of SCF are also identified, e.g. responsive flexibility, sourcing flexibility, new product flexibility and delivery flexibility. Once the flexibility components have been recognized, the second stage (i.e. implementation and shared responsibility) involves the development of the indispensable flexibility tools inside the system of the supply chain (e.g. skilled workforce, information exchange technologies, strength key relationships) to reach those components. A key element at this stage is the implementation of adequate information technology to enhance the strategic integration across the supply chain. The final stage, feedback and control, depicts the relevance of including a feedback loop. In this model, the control mechanism consists in continuous monitoring and evaluating the operational and strategic fit (co-alignment) among the implemented flexibility dimensions and the observed flexibility dimensions.

2.4.6 Flexibility and Trade-offs

Enabling flexibility at different levels of the supply chain might increase its complexity which at the same time has usually a negative impact on flexibility. Although flexibility is essential, this has an effect over different supply chain parameters. When it comes to performance, before introducing flexibility strategies it is necessary to analyze the trade-offs and associated cost. In this section, it will be discussed a number of trade-offs between SCF and some parameters of the supply chain to present an overview of the research conducted on this issue.

Flexibility cost

In an empirical study conducted by Boyer and Lewis (2009) to analyze the need for trade-offs in operational strategy, the authors observed that the decision makers perceive the need for assessing the competitive priorities, the impact on the cost, delivery, quality and flexibility, and the adoption of the operations strategy. From their findings, it was established and inverse relationship between flexibility and cost. This inverse relationship has been validated by several scholars (Duclos et al. 2003; Nair 2005; Beamon 2007; Shukla et al. 2010). Hindo (2007) presented the case of 3M Company, where the lack of structure and flexibility had enabled a high creativity capacity as a competitive advantage, but also how this scenario produced a high cost on inefficient workflow and bloated workforce. In some cases, the effects of flexibility are measured on terms of cost and time (Das and Abdel-Malek 2003; Ishfaq 2012). Wang (2008) studied the trade-offs between order quantity and delivery-lead time flexibility. The author found that if the cost of unit holding dominates the total cost,

order quantity flexibility might offer an important opportunity for save costs. Nevertheless, as setting order quantity flexibility it has to be included the service level of the firm to gain a greater benefit. On contrast, lead time flexibility permits enhancing the service level and reducing the shortage cost in situations where the shortage cost is relatively high.

Flexibility and efficiency

Through a comprehensive analysis of the case study of Toyota Production Systems, Adler et al. (1999) pointed out the trade-off between flexibility and efficiency. *"Much organization theory argues that efficiency requires bureaucracy, that bureaucracy impedes flexibility, and that organizations therefore confront tradeoff between efficiency and flexibility".* From their analysis, the authors detailed four organizational mechanisms, i.e. partitioning, meta-routines, ambidexterity and switching, to moderate this paradox. Further, Pettit et al. (2010) proposed a conceptual framework, from the literature review and focus group methodology, for a mechanism to balance between vulnerabilities and capabilities, including flexibility, to manage plant disruptions and supply chain uncertainties in an effective way. From their findings, they concluded that ensuring resilience in the supply chain will provide an edge where the firms will obtain a more profitable strategy in long-term.

In the regard of small firms context, Ebben and Johnson (2005) conducted an empirical study to analyze the relation between efficiency and flexibility strategies by using configuration theory. The authors found that the firms that combine both strategies, i.e. flexibility and efficiency had significant underperformance. They also found, the firms that had chosen only flexibility strategies did not show a significant difference in their performance compared to those that had chosen only efficiency strategies. Nevertheless, this points out the contrary nature of these two strategies. Therefore, it is important to set the strategies having in mind the *'long-term health of the organization'* avoiding mixing these strategies.

Flexibility and uncertainty

The sources of uncertainty are related to several events, factors, and entities regarding the context of supply chain, e.g. dynamics demand in terms of quantities, product features required, lead time required, uncertainty with respect to competitors' behavior and actions, reliability of suppliers' lead time, quality and quantity provided, information accuracy, among others. Van Der Vorst and Beulens (2002) defined uncertainty as *"in which the decision maker does not know definitely what to decide as he is indistinct about the objectives; lacks information about (or understanding of) the SC or its environment; lacks information*

processing capacities; is unable to accurately predict the impact of possible control actions on SC behavior; or, lacks effective control actions". The authors conducted a qualitative research, based on a multi-disciplinary literature review and case studies from food firms, to understand why, whether how and with whom those firms managed the sources of uncertainty by implementing effective strategies to address the uncertainties proposed a model to identify the uncertainty sources with the aim to generate supply chain redesign strategies. For instance, increasing manufacturing flexibility, reducing or changing the parties involved or eliminating non-value-adding activities are strategies to address supply, manufacturing and distribution uncertainty.

From the research lead time, order quantities, specification of end-customer requirement as key sources related to supply chain uncertainty which have been also identified as key cause of the bullwhip effect (Disney and Towill 2003; Ščukanec et al. 2007; Campuzano and Mula 2011). An extensive literature on manufacturing flexibility on SCF recognizes flexibility as a capability on which build upon strategies to cope with uncertainty (Gerwin 1993; Upton 1995; Lee 2002; Garavelli 2003; Stevenson and Spring 2007; Kumar et al. 2008; Hallgren and Olhager 2009; Gosling et al. 2010, 2013; More and Subash Babu 2010; Merschmann and Thonemann 2011). Further, some authors have argued that firms as well as supply chain might encourage a certain level of uncertainty in the environment to obtain a competitive advantage derive from their capability of flexibility (Gerwin 1993; Lau 1996; Stevenson and Spring 2007). Gerwin (1993) described that while flexibility can be used as a capability to provide an adaptive response to the uncertainty in the environment, it also can be deployed to create uncertainties that the competitors cannot take action on. Further, Prater et al. (2001) conduced a case study on five companies to propose a mechanism of trade-off between components of uncertainty with agility aspects by linking the two called supply chain exposures, i.e. external vulnerability (demand & forecasting uncertainty and complexity) and SCA (sourcing flexibility & speed, manufacturing flexibility & speed, and delivery flexibility & speed). The authors defined exposure as the level on which SCA has to be *'overextended (i.e. vulnerable)'* and as a result, requires to be reconfigure, adjusted, or adapted to address the concerns in the international supply chain environment. Furthermore, they examined and identified two main issues of European industries, i.e., designing and establishing an effective an efficient supply chain structure, and accurate forecasting.

In spite of the value of flexibility as a competitive capability to face uncertainties, there is an unavoidable interaction and trade-off between the roles played by flexibility and uncertainty

in the frim and supply chain levels. Therefore, supply chains and firms have to develop instruments to provide a comprehensive strategy oriented to reduce the *"sources of unwanted uncertainty"*.

Supply chain relationships

To achieve a flexibility strategy through the broad network and address the sources of uncertainty it is necessary to establish collaborative relationships within the complete supply chain. An extensive literature has studied the importance of collaborative relationships between the supply chain partners (Lee 2002; Bagchi et al. 2006; Zacharia et al. 2009; Omar et al. 2012; Nagarajan et al. 2013; Angkiriwang et al. 2014; Wu et al. 2014). There have been identified relevant benefits of collaboration among the supply chain partners, e.g. lower cost, waste reduction, warehousing and location design, traceability, JIT policies, shared risks and decision-making uncertainty reduction generated from the development of trust and commitment among the supply chain entities (Handfield and Bechtel 2002; Gao et al. 2005; Sanjay and Patil 2011; He et al. 2014). Nevertheless, these collaborative relationships might be opposite to the capability for providing a rapid response to unpredicted events. Whereas the uncertainty might be reduced by signing long-term contracts with suppliers based on the developed trust and mean that they are willing to perform small modifications within a short-time notice, the dependency generated from the contracting diminishes the dynamic and short-term flexibility provided by spot-purchasing practice and *'arms-length'* relationships. Therefore, it is noticeable the trade-off when building relationships across the supply chain between (re-design/re-configuration) flexibility and uncertainty. The impact of building collaborative relationships across the supply chain for new product development has been also addressed on the literature (Dowlatshahi 1998; Handfield and Nichols Jr. 2002; Yi et al. 2011; He et al. 2014; Wu et al. 2014). The early involvement of suppliers on the development of new products has a positive impact on the reduction of product complexity, time and cost while enhancing consistency in quality, ease manufacturing, and parts commonality. This also can have a positive effect on flexibility (Narasimhan and Das 2000; Martínez Sánchez and Pérez Pérez 2005; Schmenner and Tatikonda 2005; He et al. 2014) through designing modular product which allows to modify rapidly the production of the product and re-manufacturing. However, developing this kind of collaborative relationship across the entire supply chain partners is expensive, impractical and highly increases the conflict with SCF strategy. There are key issues that need to be consider when defining whether or not to establish a collaborative relationship in long-term with a specific provider as it will affect the SCF which

are mainly the type of end-product (e.g. innovative or functional), product design sensitivity, the life cycle of the product, the flexibility to exit a contract, the volatility of the market, number of alternative providers, and if the component is a core part of the product (Gosling et al. 2010, 2013). Table 2-11 provides a comparison of the essential differences between flexibility and robustness.

Table 2-11 Differences between robust and flexible supply chain

Robust supply chain	**Flexible supply chain**
It is passive or proactive in nature	It is active or reactive in nature
An internal concept	An external concept
Fault-tolerant, preventive, fool proof features or fail-safe	Capable of performing many functions,
Defined as a state being that is immune or resistant to variations	Defined as a readiness state that has the capability to respond to variations
Related to a state flexibility	Related to action flexibility
The capability to accommodate any unpredicted modifications such that the initially desired future state can still be accomplish	The ability to contract, expand, defer, constraint or abandon any investment towards the desired goal
The ability to endure fluctuations, disruptions or uncertainties in the supply chain environment caused specifically by SCF	Intrinsic capability to modify a policy in order to adapt and successfully accommodate to fluctuations, disruptions or uncertainties, in the supply chain environment
Communicates the notion of stability and predictability	Sensitive to disturbances, changes in the environment, or sources of uncertainty
Related to uncertainty reduction	Related to uncertainty adaptation
Mainly decision-maker who are averse of risk prefer robustness strategies	Mainly decision-makers who are risk takers prefer flexibility strategies

Source: Based on More and Subash Babu (2008) and Angkiriwang et al. (2014)

On one hand, the core partners of the supply chain with whom develop long-term relationships will constitute the robust foundation of the supply chain and provide the support for addressing uncertainty. On the other hand, inter-changeable and backup supply chain entities with which keeping relationships for a short-term will constitute the part of the supply chain that can be re-configured in an easier way. Nevertheless, the point to which this is an evolving or deliberate strategy is not clear (Stevenson and Spring 2007). Therefore, decision makers have to balance the use of both flexibility and robustness to have a better performance.

The design of supply chains

Since supply chains characterized by been proactive are able to increase their responsiveness than the reactive supply chains, it has been argued that the network design should include both aspects, i.e. uncertainty reduction(Van Der Vorst and Beulens 2002; Yi et al. 2011) and flexibility (Duclos et al. 2003; Danese et al. 2013). The best performing supply chains are the ones capable to anticipate variations in the business environment, prior they take place (i.e. *'absorptive or learning network'*), and build contingent structures by establishing at least two supply chain configurations in place (Lee 2004). Allowing modularity and contingency in the design of the supply chain, e.g. multiple sourcing provides a degree of SCF and it also constitutes a potential source of competitive advantage. The network structure has to be configured on the basis of the prime supply chain members that are robust enough to alter or accommodate in the marketplace. Placing the *"customer order de-coupling point"*, also called as the *'order penetration point'*, in the supply-chain process flow is one of the key strategic decisions to make while designing the supply chain configuration (Stevenson and Spring 2007). In spite of the fact that this is closely related to the features of the product, at the same time this generates a trade-off for supply chain responsiveness (between flexibility and speed), with effects over the uncertainty level (Yi et al. 2011). Fatemi (2010) described postponement flexibility as the capability to maintain the generic form of the products as late as possible downstream to include the specific requirements of the customer in the last stages. Whereas postponement allows keeping the generic form of the products until the later stages of the supply chain processes (forecast-driven), augmenting speed, placing the de-coupling point in the early stages of the supply chain enables higher degrees of SCF. This enlarges the structure of the supply chain that is built upon the information and requirements of the customer (demand-driven) hence also diminish uncertainty. On this regard, a strategy oriented to reduce uncertainty is identified to be in accordance with one to increase flexibility. Although placing the de-coupling point upstream reduces uncertainties and generates flexibility benefits, there remains a trade-off with efficiency (Adler et al. 1999; Pettit et al. 2010). Fredriksson and Gadde (2005) conducted a case study analyzing the structure of Volvo cars' supply chain. They described how if the company had placed the de-coupling point in the earlier stages of the supply chain, the measure would have ruined the manufacturing economies. A large number of supply chains gain balance by producing mass-customized products. Figure 2-17 depicts the positioning of the de-coupling point, nevertheless in several cases, it is recognized that it is unclear if this decision is an evolving or a deliberate strategy (Stevenson and Spring 2007).

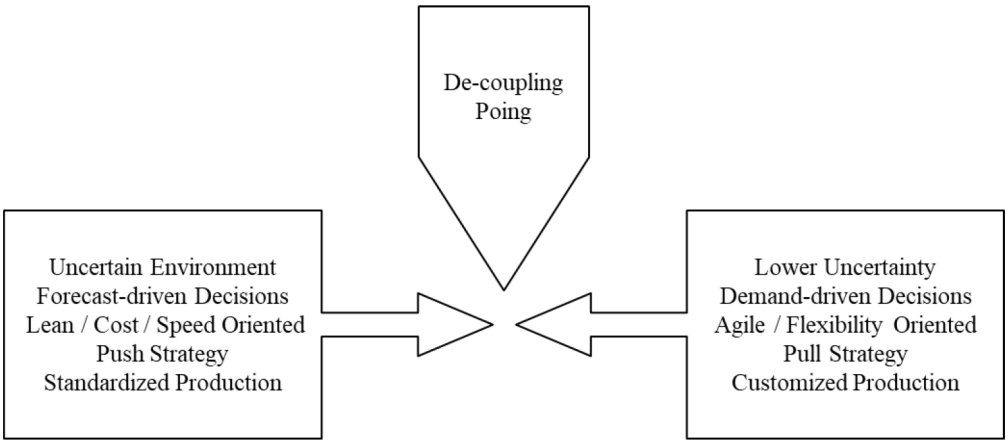

Figure 2-17 Position of the customer order de-coupling point
Source: Stevenson and Spring (2007)

Information sharing and inter-organizational information systems

One of the important means of neutralizing the *'bullwhip effect'* and reducing uncertainty is sharing information across the supply chain parents (Van Der Vorst and Beulens 2002; Ščukanec et al. 2007). However, the implementation of inter-organizational IS represents several challenges for SCF. It is necessary to incorporate as many partners as possible to gain the main benefits and for cost effectiveness (Stevenson and Spring 2007; Campuzano and Mula 2011). Moreover, it has also been acknowledge that the widely adoption of information technology is limited as the appropriate infrastructure is not available everywhere (Cagliano et al. 2005; Vaaland and Heide 2007). Particularly, many SMEs struggle with the adoption of IS due to their limited financial resources whereas the benefits of the information systems, adopted between the supply-chain partners, are not shared equally (Sahin and Robinson Jr 2005). As a result, this diminishes the motivation of some partners to *'buy-in'*. Furthermore, an entirely flexible supply chain is the one that is able easily to undo relations in the network structure and build new ones. Nevertheless, it is required a degree of committed to connect IS whereas the IS technologies adopted by the organizations might not be flexible enough. Sezen (2008) conducted an empirical study to investigate the comparative impact of supply chain information sharing, supply chain design and supply chain integration on flexibility, resource and supply chain performance. From a correlational analysis, the author concluded that as the information shared between the partners of the supply chain increases, the time to make any modification to face unpredicted events decreases, and thus it might increase the products, operations, and delivery flexibility. On the contrary, high levels of integration and synchronization across the supply chain, in some cases, might have a negative impact on their

willingness and capability to make rapid modifications in established relationships (White et al. 2005). Furthermore, information sharing by itself cannot assure the necessary flexibility without an adequate degree of quality in the supply chain design. It is important to acknowledge that the configuration and design of the supply chain and will require reconfigurations and modifications as long the chain is in business.

Controllability and Flexibility

Kim and Park (2013) empirical studied 193 manufacturing firms to analyze three manufacturing capabilities: integrating capability (i.e. firms' ability to synchronize and integrate various components and functions of their supply chain), flexibility (i.e. firms' ability to manage turbulence and uncertainties, internal and external), and controllability (i.e. firms' ability to control their processes to improve accuracy and efficiency as well as to better address requirements). The authors found that the relationship between controllability and flexibility has a convex shape. This indicates that for firms with lower level of flexibility there is a negative relationship between controllability and flexibility, while for firms with higher flexibility it was found a positive relationship between controllability and flexibility. They concluded that a synchronizing and integrating supply chain functions can mitigate the trade-off among flexibility and controllability to a significant extend.

To summarize, different trade-off between flexibility and other capabilities and functions of the supply chain have been discussed in the literature (e.g. flexibility and speed, flexibility and uncertainty, flexibility and responsiveness). In this sections it has been discussed some of the more relevant for the purpose of this work. However, regarding the complexity and multidimensional nature of SCF, it is necessary to study aggregated models for identifying trade-offs between competitive priorities, and the accumulative impact of SCF dimensions among themselves, in conjunction with their influence on the supply chain (More and Subash Babu 2008; Tiwari et al. 2015).

2.5 Logistics capabilities

The concept of *'capability'* refers to the set of skills and knowledge that enables the performance of different task(s) or to be competent in different fields with a high effectivity. Furthermore, a capability within the strategic management is related to the organizational capacity to manage the adaptation, coordination, integration, and reconfiguration of processes, resources, abilities, and functional competencies to provide an effective response to the

business environment. Morash et al. (1996) defined logistics capabilities as *"those attributes, abilities, organizational processes, knowledge, and skills that allow a firm to achieve superior performance and sustained competitive advantage over competitors"*. Further, Stank et al. (2005) argued that capabilities are the combination of process, body of knowledge and dynamic routines that allows identifying how the resources are used, structured and harmonized with the rest of the environment. Moreover, the capabilities constitute a complex set of skills and knowledge that define organization's general ability, assets, capacity, and efficiency. Thus, they have the aim to enable organization's achievement of a higher performance and a sustainable competitive advantage.

With respect to logistics, Mentzer et al. (2004) presented the ground of a unified theory of logistics to understand the strategic role and capabilities of logistics within the firms. Figure 2-18 depicts the propositions included in their theoretical frame. According to the authors, the logistics capabilities constitute an essential element for the management of the supply chain.

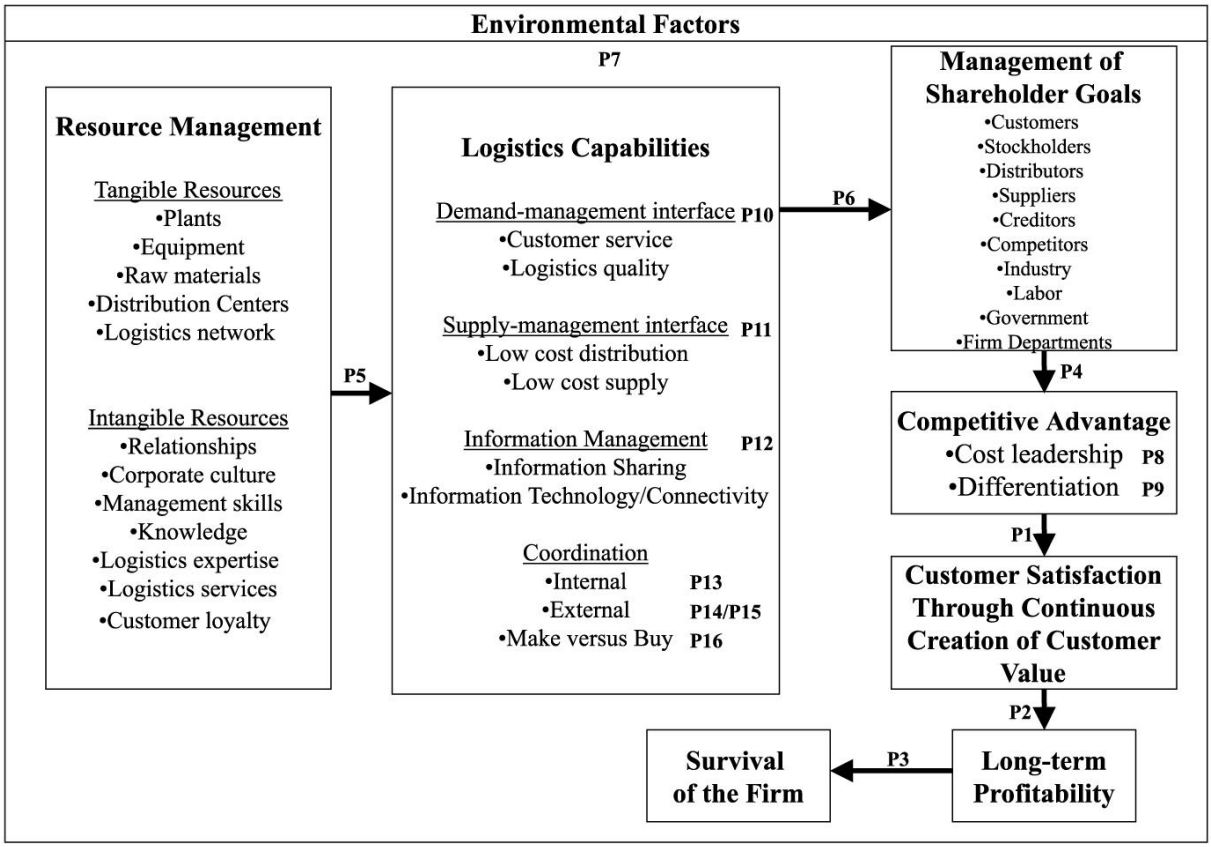

Figure 2-18 A unified theory of logistics according to Mentzer et al.
Source: Mentzer et al. (2004)

The authors explained how firms, since the 1980's, started to manage time as a source of competitive advantage. This new source of competitiveness allows firms to understand the evolution of customer demand, improve quality, reduce waste, explore new markets, promote new entrepreneurships, and enhance creativity as well as innovativeness. Therefore, logistics capabilities become crucial in a quality and time-based competition. Additionally, the logistics systems of many firms (especially the ones that operated in markets of convenience goods or commodities) were the source of competitive advantage *"rather than their marketing strategies"*.

Nowadays firms within a supply chain require coping with the challenges (e.g. demand uncertainty, volatility, sourcing/distribution disruptions, technology, and global competition) present in the business environment. These challenges affect the behavior, decision-making process and goals achievement of the supply chain as a whole system as well as the firm's individual system embedded in it. Therefore, the supply chain partners to adjust to the changing stakeholders' requirements, and provide an adequate response to these challenges by enhancing its organizational memory and learning process (Mentzer et al. 2004; Esper et al. 2007). Logistics capabilities promote the alignment, adaptability, combination and reorganization of available resources, structural skills and functional competences oriented to increase the overall performance (Gligor and Holcomb 2012). Although, logistics capabilities have a efficiency function, they have enhance firms' competitiveness (Morash et al. 1996; Lynch et al. 2000; Mentzer and Williams 2001; Zhao et al. 2001; Sandberg and Abrahamsson 2011) *"through creating economic (cost leadership) and market-based (differentiation) values"* (Mentzer et al. 2004).

Several empirical studies have been conducting with respect to the logistics capabilities (Morash et al. 1996; Stank and Lackey 1997; Zhao et al. 2001; Cho et al. 2008; Sandberg and Abrahamsson 2011; Gligor and Holcomb 2014b, a; Wang et al. 2015; Mandal 2016; Lin and Lai 2017). Morash et al. (1996) conducted an empirical study to analyze the impact of logistics capabilities on the business performance. From an extensive review, the authors classified the logistics capabilities into two main value disciplines, i.e. demand-oriented capabilities and supplied-oriented capabilities. Whereas the former stresses the external interface and closeness of the firm with the customer, time-oriented competition and the achievement of aligned objectives and goals; the latter emphasized the operational capabilities of distribution. From their findings, they concluded that the responsiveness to target markets, time-oriented competition as logistic capabilities represent an important capability for firm

success and also a competitive advantage. They also concluded that the development of the logistic capabilities has to be based on *'specific performance objectives'* to generate a valuable competitive advantage. Further, Stank and Lackey (1997) investigated empirically the role played by the logistics capabilities to improve the performance of Mexican maquiladora firms. The capabilities related to the integration and agility competences proved to be especially important to logistical performance. From the results, the authors recognized their benefits in the improvement of integration inside the firm and across the supply chain members. Last, customer-focused Mexican maquiladoras showed a higher overall logistical performance particularly regarding the capabilities: 1) that ensured a smooth information flow inside the firm and between the supply chain partners; 2) those regarding the development of local processes and personnel that enhanced the time response to variations in the demand and/or supply; and 3) enable the measurement of their improvements by meeting operational standards.

Zhao et al. (2001) conducted a survey to identify the relationship between the performances of two logistics capabilities: customer-focused capabilities (i.e. the capabilities that generate and manage trustful and committed relationships with the customers) and information-focused capabilities (i.e. the capabilities to manage information sharing, connectivity and information technologies). The authors concluded that there is a direct impact of customer-focused capabilities on firm performance. In contrast, information-focused capabilities have no direct impact on firm performance. In fact, information-focused capabilities are driven by customer-focused capabilities. Cho et al. (2008) examined the impact of logistics capabilities in the context of e-commerce market environment. Through a multiple-item constructs, the authors measured the relationship between the logistics capabilities of a firm, logistics outsourcing (by using 3PL); i.e. the firm uses the service of an external logistic provider to carry out part or all of its logistics functions), and firm performance. Four findings were obtained from their research. First, they found a positive relationship between logistics capabilities and firm performance in the case of e-commerce market. Second, logistics outsourcing has a negative impact on firm performance. Third, there is no association between the internal strength of firm's logistics capabilities and the use of 3PL. Fourth, firms with strong internal logistics capabilities might affect negatively their performance when outsourcing.

Gligor and Holcomb (2014a) analyzed the impact of cooperation, communication and coordination, as supply-chain-partners' behavioral elements, on the achievement of integrated

logistics capabilities across the supply chain partners. After analyzing the data collected in an internet-based survey, the author concluded that the integration of logistics capabilities is directly and positively influenced by the three behavioral elements. Moreover, they also found that the integrated logistics capabilities have an impact on the relational and operational performance. The findings show that the integrated logistics capabilities improve the relationship with the customers and generate superior customer value as well as offer the possibility to lower the overall cost of the firm. In a different study, Gligor and Holcomb (2014a) conducted an empirical research to examine the role of logistics capabilities in the achievement of SCA. They found that logistics capabilities act as predecessors of SCA. The logistics capabilities perform a unique and strategic role in enabling the firms to respond effectively and timely to the uncertainties and fluctuations of the market.

Wang et al. (2015) examined the relationship of logistics capabilities and supply chain uncertainty in the Australian courier firms. The author processes the data obtained through an internet-based survey using the factor analysis. The results of the analysis supported the role of logistics capabilities in mitigating the uncertainties and risks threating the supply chain of the firms. It was recognized the importance of developing logistics capabilities to support the high performance and unique transport model required by e-commerce markets with 24 hours shopping transactions. Further, Lin and Lai (2017) conducted a survey to investigate the relationship between the logistics capabilities and the performance of 221 photonics manufacturing firms in Taiwan. The authors validated their hypothesis about the positive impact that warehousing, transportation and information, as logistics capabilities, on the performance of the firm. They found that in particular, information technology capability was highly related to the firm performance followed by warehousing capability.

Logistics capabilities are a critical component in the management of the supply chain and logistics. These capabilities enable the coordination of core tasks and functions inside the firm as well as across the supply chain partners. The following subsections will present a classification of the logistics capabilities used for the purposes of this work and the role of logistics capabilities as a source of SCF.

In 1995, the Global Logistics Reseach Team from the Michigan State University in cooperation with the Council of Logistics Management in the United States conducted a large scale study on logistics capabilities. From the study, they chosen 17 capabilities that were grouped into four cathegories including integration capability, agility capability, positioning capability and measurement capability. Later, Mentzer et al. (2004) proposed a *"unified*

theory of logistics" based on the analysis of the strategic relationship between resource management, logistics capabilities and the creation of value within the theories-of-the-firm framework. The conceptualized *'theory of logistics'* explained the role logistics in creating value for the customers. Through these capabilities the firm can manage its own resources in concordance with the management of stakeholders goals which results in a competitive advantage. The authors classified these capabilities into four comprehensive cathegories, i.e. supply-management interface (low sourcing and delivery costs); demand-management interface (logistics quality and customer service); coordiantion capabilities (interior and exterior); and information management (information sharing and information technologies). Esper et al. (2007) analyzed the process that firms followed in order to develop and gain logistics capabilities and how these capabilities were used as a sustainable competive advantage. The authors included in their classification of the logistics capabilities the measure capability (controlling the achievement of business objectives). Further, Gligor and Holcomb (2012) described a conceptual framework of how by combining the logistics capabilities of the firms at a network level increases the SCA.

Table 2-12 presents a summary of the logistics capabilities that have been classified by different scholars (Michigan State University. Global Logistics Research Team 1995; Morash et al. 1996; Stank et al. 1999, 2005, Mentzer et al. 2001, 2004; Zhao et al. 2001; Esper et al. 2007; Jack et al. 2010; Gligor and Holcomb 2012).

Table 2-12 Research summary of logistics capabilities

Capability	**Description**	**Source**
Demand-management capabilities	· Differentiation of products and services. · Customer service including the accommodation to unique and/or unplanned customer requirements. · Unique value-added activities.	Morash et al. (1996); Stank and Lackey (1997); Bowersox et al. (1999); Lynch et al. (2000); Zhao et al. (2001); Mentzer et al. (2004); Esper et al. (2010); Gligor (2014; Wang et al. (2015)
Supply-management capabilities	· Total system cost minimization where cross functional trade-offs are considered explicitly. · Effective time-management to avoid wasted capital and inventory; · Effective use of resources to allow standardization, postponement speculation, and modularization. · Accurate response to demand variations to minimize the impact in the order cycle process.	McGinnis and Kohn (1990); Murphy and Farris (1993); Daugherty and Pittman (1995); Morash et al. (1996); Mentzer and Williams (2001); Lowson (2003); Esper et al. (2007, 2010)

Information-management capabilities	· Acquires, analyzes, stores, and distributes tactical and strategic information both inside and outside the firm. · Involves the application of IT, connectivity and networks.	Stank and Lackey (1997); Closs et al. (1997); Mentzer et al. (2004); Esper et al. (2007); Jack et al. (2010); Gligor and Holcomb (2014a, b); Lin and Lai (2017)
Integration logistics capabilities	· Collaboration state among the internal and external organizational components necessary to achieve a unified effort to meet organizational goals.	Michigan State University. Global Logistics Research Team (1995); Kahn and Mentzer (1996); Daugherty et al. (1998); Bowersox et al. (2003); Stank et al. (2005); Esper et al. (2007); Gligor and Holcomb (2012, 2014a, b)
Measurement capabilities	· Monitoring internal and external operations. · Aligned with strategy to make accurate, detailed, relevant, and timely information accessible for strategic planning and daily decision making. · Enables the translation of business objectives into measurement specific operational and financial targets.	Michigan State University. Global Logistics Research Team (1995); Stank and Lackey (1997); Fawcett et al. (1997); Gilmour (1999); Bowersox et al. (2000); Holmberg (2000); Esper et al. (2007)

Source: Adapted from Esper et al. (2007)

Gligor and Holcomb (2012) remarked three key aspects to be considered as part of the logistics capabilities, i.e. differenciation, efficiency and effectiveness. Demand-management capabilities enable the accomplishment of differentiation strategies while supply-manament capabilities enhance firm's efficiency. The effectiveness of the processes are improved by collaborative efforts through the integration capabilities. Finally, information exchange capabilities are required to share information and knowledge. They also provide the basis to measure the performance in order to control the achievement of the pursued goals.

A more comprehensive analysis of the group of logistics capabilities considered for the purpose of this work is provided in the sections below.

2.5.1 Demand-management capabilities (DMCs)

These capabilities have been also termed as customer integration capabilities (Bowersox et al. 1999), value-added (Lynch et al. 2000) or customer-focused capabilities (Zhao et al. 2001; Esper et al. 2007). They refer to the ability to provide product/service differentiation. This

differentiation should be a long-term distinctiveness with customers enhanced by value-added activities, customer service and logistics quality. The firms, as well as the whole supply chain, are supported by these capabilities to target a given customer base, meet or surpass their expectation by delivering unique activities of value-added (Lynch et al. 2000; Esper et al. 2007). Two main dimensions are included in the customer service capability, i.e. responsiveness as the adjustment to unplanned and/or unique requirements of the customers, and flexibility as the adaptation to unpredicted operational events (Mentzer et al. 2004; Wang et al. 2015). On the other hand, logistics quality is the capability to ensure the flow of products or services in accordance with customer standards and needs. This capability is part of the overall customer service and integrate four dimensions: delivery quality, availability, timeliness, and related communication with the customers (Mentzer et al. 2004). At the same time, these dimensions are combined within a wider services quality processes, and different attributes e.g. product quality and price, to better understand the purchasing patterns of industrial customers (Mentzer et al. 2001). The firm will enhance its core competency and achieve innovative ways to compete in the market when the demand-side logistics capabilities are combined in a unique fashion over time to overpass competitors (Gligor 2014).

DMCs have been analyzed with the RBV (Esper et al. 2007; Gligor and Holcomb 2014a). The firms assign resources to foster competencies and capabilities that represent the greatest possible leverage. The purpose is to enhance their performance at the lower cost. The firms owing the ability to obtain capabilities and resources that are hard to imitate, exceptional, incommutable, will reach a competitive advantage over their competitors. Furthermore, the eventual goal of the firm is to reach above-normal returns by product differentiation (e.g. the firms should offer, to their customers, products that have distinctive and with an attractive feature/price relationship regarding the ones offered by the competence), or low-cost products which otherwise are easily substituted by the ones offered by the competitors (Day and Wensley 1988; Porter 1998; Stank et al. 2005).

The knowledge-based view (KBV), a variant of RBV, regards the firm as a generator of a unique and positive productive value through organizational learning (Mentzer et al. 2004; Esper et al. 2007). Organizational learning comprehends the organization members performing as learning entities that respond to fluctuations in the interior and exterior of the environment. The organizational learning process involves the identification and correction of errors in how the firms operate, and embedding the outcomes within the organization (Esper et al. 2007). As logistics capabilities are inimitable skills that are gained by learning

processes, preserved, and improved in quality- and time-based competition, these capabilities constitute a core competency of the firm and the supply chain. *"Core competency is essential because the real sources of a firm's success are due to firm-specific (idiosyncratic) resources, such as management skills and behavior, attained through collective learning"* (Mentzer et al. 2004).

The logistics function enables the achievement of unique capabilities (i.e. coordination skills and logistics management) together with unique resources (i.e. physical logistics network and links) supporting the firms to provide differentiated products to their customers (i.e. the mix of products with customer service), high quality service as well as low cost. Consequently, the firm, and its supply chain, will reach a competitive advantage in the market.

2.5.2 Supply-management capabilities (SMCs)

This group of capabilities comprehends two dimension of the operational capabilities, i.e. total-system cost minimization and efficient logistics processes (Mentzer et al. 2004; Esper et al. 2007; Gligor and Holcomb 2012). Total-system cost minimization is the core of this group of capabilities and it is measured as the total-system process optimization. It involves the explicit trade-offs' consideration of all cross-functional costs to reach the minimal total-system cost possible. Moreover, the SMCs enhance the capacity to generate logistics solutions that are creative, proactive, and timely whit the aim to solve customer-specific-requirement-, events-, or emergency problems. Through these capabilities, it is possible to simplify and implement standardized core logistics activities across the supply chain partners, as well as inside the firm, to optimize the flows of the supply chain (Lynch et al. 2000).

Although the SMCs are closely related to the traditional logistics functions of reducing cost and capital, the customer-service function drives cost reduction, as the cost should not be shortened at expenses of the customer-service level. For instance, by implementing quality- and time-based practices (e.g. vendor management inventory, quick response, and JIT), the firm and the supply chain increase the service speed while eliminating sources of waste. Other attribute of these capabilities is their use of organizational modes to coordinate production processes at a lower cost than the competition (Mentzer et al. 2004). In some cases, it might be easier to coordinate the internal organizational structure to minimize the investment level of logistics systems (i.e. facilities and inventory) as well as reduce the variable cost related to the storing and movements of products, instead of using 3PLs transactions.

2.5.3 Information-management capabilities (IMCs)

The role of coordinating the flows of products and services as well as the information flow related to them is unique to the logistics function in both sides of the supply chain, i.e. upstream (material and manufacturing management) and downstream (physical distribution). Therefore, information management as logistics capabilities collects strategic and tactical information accessible inside and outside the firm, to process, store, and disseminate it through information-technology systems available within the supply chain partners (Zhao et al. 2001; Mentzer et al. 2004). IMCs involve three main dimensions, i.e. information sharing (viz. exchange of strategic, tactical, technical, and financial data), information-technology (viz. hardware, software, and network design and investment to exchange and process information) and connectivity (viz. capacity for data exchange in a responsive, functional and timely standard) (Zhao et al. 2001).

Regarding nowadays competitive scenario, the information has to be accurately shared inside and across the supply chain partners to allow a joined response. Information sharing is defined *"the willingness to exchange key technical, financial, operational, and strategic data"* (Michigan State University. Global Logistics Research Team 1995). Moreover, information sharing is at the core of supply-chain collaborative efforts and is a key element of cooperation in SCM (Chen et al. 2011). Hence, it is necessary to build exclusive IMCs to address the need of specific information of supply chain partners. For instance, adopting lean logistics strategies where inventories are replaced by information, demands to eliminate unneeded old technology and provide a quick response to fluctuations in customers' requirements.

From the RBV, these types of capabilities contribute to achieve a superior performance. One of the dynamic capabilities of the firm and across the supply chain is the capability to understands the flow and storage of information, jointly learn how to synchronize different productions skills, have a two-way communication performance between the supply chain partners, and learn the way to integrate multiple technology streams (Mahoney 1995; Lin et al. 2016). Moreover, organizational learning constitutes a source of sustainable competitive advantage (Esper et al. 2007). Hence, these capabilities are considered critical in business environment with conditions of volatility or uncertainty (Gligor and Holcomb 2014a). Thus, IMCs are necessary to mediate the exchange of market-related information in a timely and accurate fashion to enhance the coordination and decision-making process within and across the supply chain partners. Gligor and Holcomb (2014a) concluded, from their empirical

research, that IMCs have an indirect impact on SCA as these capabilities are not enough to contribute directly to the creation of specific capabilities in the firm or supply chain (Zhao et al. 2001). Finally, they play an important role in managing and integrating the knowledge related to flexibility, responsiveness, and relevancy (Zhao et al. 2001).

2.5.4 Integration logistics capabilities (ILCs)

ILCs involve two dimensions, i.e. internal coordination logistics capabilities and external coordination logistics capabilities. Logistics provides the platform to involve other functional areas to work with closely to plan, integrate and synchronize cross-functional activities (Mentzer et al. 2004; Gligor and Holcomb 2014a). To simplify synchronous and synergistic activities, logistics prompt the implementation of cross-functional policies standardization and procedures standardization, compliance, simplification, and structural adaptation within the organization. Strategic logistics encompasses the ability to coordinate and integrate several interdependent operations simultaneously across major functional areas, thus enabling additional dimensions and ways in which logistics can create incremental customer-value (Langley Jr. and Holcomb 1992). Logistics capabilities are key elements in the strategic integrative process as they constitute a source of expected benefits of enhancing effectiveness (customer service) and efficiency (capital and cost reduction) through information processing and two-way communications (information management) in a strategic context (generating customer value) to gain a sustainable competitive advantage, all expected at long-term organization survival and profitability (Esper et al. 2010). Logistics capabilities should lead to the achievement of competitive customer service superior to the competitors at the lower total-cost possible to generate customer value (Bowersox et al. 2002). Thus, the logistics personnel are in a particular position to dynamically coordinate with other functions the pursuit of two goals, i.e. effectiveness and efficiency, to reach the goal of generating customer value.

Externally, through the expansion of logistics outside the structure of the firm to involve customers as well as suppliers, the parties encompassed in the logistics processes will gain benefits including enhancing customer value, operational effectiveness, and asset productivity (Langley Jr. and Holcomb 1992). The firms that adopt a supply chain perspective perceive logistics as one of the main strategic initiatives of the firm. As a result, logistics constitute a unique capability to synchronize and integrate internal and external resources within and across the supply chain partners, enabling them to generate and develop the firm's supply

chain capability by joining operational and systems interfaces to reduce redundancy whereas preserving operational coordination (Mentzer et al. 2004).

In highly uncertain environments affecting the flow of both sides of the supply chain (i.e. upstream and downstream), logistics plays a crucial role to enable a rapid adaptation of the production and decrease inventory, leading consequently to a reduction in the total cost. When information is particularly a core resource in the firm, logistics becomes more important (Småros et al. 2003). In contrast, the logistics boundary-spanning capabilities are not present if potential opportunism (i.e. selfish pursuing behavior with astuteness to take advantage of circumstances (Heritage American Dictionary 2011)) avoids collaborative efforts and relationships between the supply chain partners. Therefore, it is required to build relationships between the different firms that participate in a supply chain before starting to work together in the pursuit of a common goal (Bowersox et al. 1999; Mentzer et al. 2001; Hansen et al. 2008). Additionally, vertical integration/coordination is a feasible option to acquire information from the business environment. For example, Vaaland and Heide (2007) examined empirically the information-technology gap between SMEs and large enterprises, where SMEs clearly place far beyond the large enterprises. The author proposed horizontal cooperation or vertical integration as a feasible solution to address this issue.

Empirical research has showed the positive impact of integrated logistics capabilities across the supply chain partners in both the firm and supply chain performance (Prajogo and Olhager 2012; Gligor and Holcomb 2014b; Mandal 2015; Mandal and Rao Korasiga 2016). The ability to integrate the logistics capabilities existing across the supply chain constitutes a dynamic capability. In markets characterized by high-velocity in the transactions, dynamic capabilities are unstable, experiential and hard to replicate procedures (Eisenhardt and Martin 2000). Thus, from the RBV, the skill to join logistics capabilities across the supply chain partners represents a dynamic capability that might lead to gain a sustainable competitive advantage. The sustainable competitive advantage analyzed in this work is SCF.

The RBV and the constituency-based view provide understanding about the role of logistics in SCM. The constituency-based view maintains that each functional area is an expert contributing with unique resources to the firm (Anderson 1982). Pfeffer and Salancik (2003) stated that the organizational behavior reveals the organization's coalitional nature and the fashion in which the organization responds to the different forces present in the environment. Further, the authors argued that diverse organizational processes, regarded as *"structures of coordinated behaviors"*, might be understood by the willing for flexibility and autonomy in

contrast to the necessity for exchanging resources in a stable way, i.e. sustainable resources exchange. A managed supply chain involves these types of parties as customers, distributors, suppliers, creditors, stockholders, government, labor, among different concerned publics. The firms guarantee the sustained sourcing of core resources by developing cooperative relationships in long-term. Ensuring demand as well as resources is possible as SCM occurs in an expanded supply chain consisting of external alliances or coalitions between suppliers, manufactures, distributors, and carriers, who are functional experts (Mentzer et al. 2001). Like with internal coalitions (i.e. firm's functional areas), every supply chain partner, taking part in the implementation of SCM, is inhibited by the aims of the other partners. Therefore, SCM entails agreement among supply chain goals, and visions as well as on the logistics' role within the supply chain. The main goals of SCM is to achieve economic benefits, create customer value and satisfactions and to gain a competitive advantage in the long-term for all the participants as well as the supply chain as a whole (i.e. as external alliance) (Mentzer et al. 2001). These goals are obtained by efficiently coordinating the internal and external transactions and processes.

In conclusion, logistics plays an exclusive role in enabling the implementation of SCM due to is unique attribute of coordinating cross-functional processes and actions, inside and outside the firm to perform a synchronized operation. Further, the role of logistics capabilities in SCM has be explained with respect to the RBV, constituency-based view as well as dynamic capabilities (Mentzer et al. 2004). Through the development of logistics capabilities the organization is able to perform its central competence of design of the supply chains, the development of core capabilities within a joined supply chain (Christopher 2016). Finally, the coordination and development of these logistics capabilities within the supply chain enhances its value-creation activities and they constitute a major source of competitive advantage.

2.6 Trust and commitment

Trust and commitment are critical elements in developing any kind of relationship. In the case of network relationships, trust and commitment enhance evidently the possibilities for having a successful performance in the supply chain. These two concepts are rooted in the social exchange theory.

Social exchange theory emerged from the integration of diverse areas of research as social psychology, philosophy, anthropology, economics, sociology, behavioral psychology, engineering and computer science (Cook and Emerson 1978; Ellis 2000; Cook and Rice

2003; Daudi et al. 2016). This theory is based on the proposition that entities relation with each other expecting a recompense in return (Emerson 1976). Indeed, the anticipation for recompense or the prevention of a negative retribution yields the motivation to interact with social beings both, as groups or individuals. In addition, the interaction incentive depends on the balance between the interaction recompense and the interaction cost (Yang et al. 2008; Kale et al. 2009). If as a result of the interaction one of the parts does not gain the anticipated recompense, then the disappointed party will purposely avoid further exchanges (Homans 1974). Or said it in other words, as long as a particular interaction is recompensed, the higher is the probability to repeat that interaction. In the supply chain background, this theory provides a better understanding of the dynamic in the relationship between supplier and manufacturer. For instance, (Narasimhan et al. 2009) pointed out how the supplier expects a reward from the manufacturer due to its contribution to the manufacturing firm via its SCM policies. A set of elemental economic reinforcement and psychological principles are responsible for modeling the people interaction at individual or group level. This comprises a group of behavioral attributes, i.e. trust, commitment, power, justice, relative dependence, and reciprocity (Bock and Kim 2002).

Researchers have study social exchange attributes (e.g. trust, commitment, power, reciprocity) to explain the influence and relationship of these attributes and the firm /network performance (e.g. Morgan and Hunt 1994; Kwon and Suh 2004; Hua et al. 2009; Johanson and Vahlne 2009; He et al. 2014; Wu et al. 2014; Mandal 2016). Several studies have examined collaborative and information sharing behavior at an inter-firm level in the supply chain context (Kwon and Suh 2004; Yang et al. 2008; Omar et al. 2012; Tewari et al. 2013; Mandal 2016). Among these studies trust and commitment have been highlighted as the key behavioral attributes that provide stability within the supply chain relationship (Kwon and Suh 2004; Yang et al. 2008; Chen et al. 2011; Day et al. 2013; He et al. 2014; Wu et al. 2014).

Trust is characterized as the human behavior that include reliability, the wordy of another and integrity that leads to the reliability among each part of a relationship (Johanson and Vahlne 2009). Gambetta (2000) stated that trust corresponds to the possibility perceived by the trustor that a trustee will perform an action. Rotter (1967) stated that *"one of the most salient factors in the effectiveness of our present complex social organization is the willingness of one or more individuals in a social unit to trust others. The efficiency, adjustment, and even survival of any social group depend upon the presence or absence of such trust"*. In the context of

collaborative networks, Daudi et al. (2016) defined trust as *"of confidence trustor– party develops in trustee–party based on the expectation that trustee–party will perform a particular action necessary to trustor–party, irrespective of the ability to monitor or control trustee–party"*. In addition, Thorgren et al. (2011) handled an study to explain trust and the building of trust among allies in a multipart alliance. They examined the mechanisms that allow partner firms to build trust in a scenario with free-riding risk and the relationship between these mechanisms and the firms' size. From their study, they concluded that trust is *"at the core of establishing successful exchange in every alliance with several members where the risk of free-riding is apparent"*. Therefore, trust is a relevant factor in developing a relationship among supply chain partners. The absence of such ability in the supply chain leads to inefficiency and ineffectiveness performance reflected in transactional costs (e.g. certifications, inspections); thus, *"the presence of trust improves measurably the chance of successful supply chain performance"* (Kwon and Suh 2004).

Commitment is defined as *"an exchange partner believing that an ongoing relationship with another is so important as to warrant maximum efforts at maintaining it; that is, the committed party believes the relationship endures indefinitely"* and has been drew on the notions of commitment from marriage, organization and social exchange theory (Morgan and Hunt 1994). Within a relationship, the notion of commitment refers to the willing for maintaining a *'valuable relationship'* indeterminately. The value of the relationship is directly related to the importance assigned to that particular relation. The willing for a lasting relationship is reflected in the efforts and actions of the involved parties for sustaining the relationship. On the other hand, in the context of firm's internationalization, (Johanson and Vahlne 2009) referred to commitment as the degree of inflexibility where it is a network relationship or a particular investment in the market. In other words, it is the degree of dependency between the exchange partners as commitment-building requires the investment of effort, time and short-term sacrifices for gaining mutual benefits in long-term. The degree of commitment will last and growth as long as the partners perceive that maintaining a particular relationship is in line with their interest in long-term despite the dependency to pay for it.

Morgan and Hunt (1994) conceptualized the relational exchange in marketing and the impact of trust and commitment as key factors that lead the relationship marketing to productive, effective and successful relationships (Figure 2-19) .The authors proposed a theory labelled 'key mediating variable' to frame one side in the relationship exchange and the commitment

and trust in the side's relationship. As trust and relationship commitment constitute key constructs, the auhtors positioned these two elements in the middle of five relevant predecesors (i.e. shared values, relationship benefits, communication, relationship termination costs, and opportunistic behavior) and five consequences (i.e., cooperation, decision-making uncertainty, propensity to leave, acquiescence, and functional conflict).

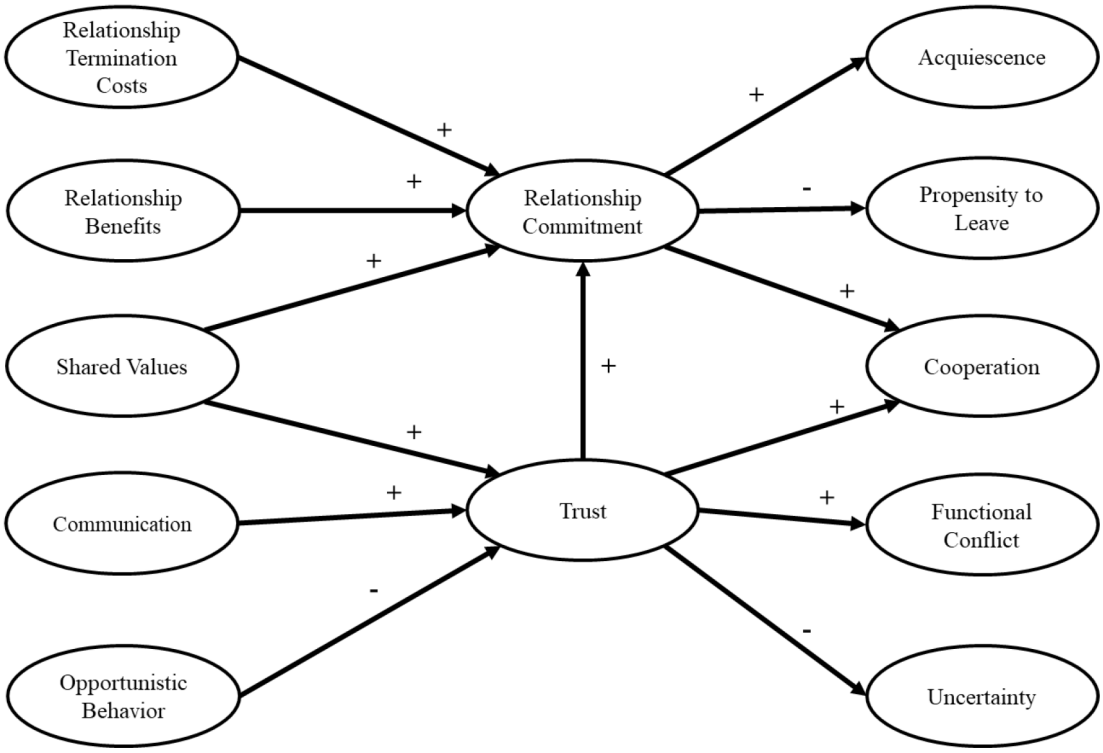

Figure 2-19 The key mediating variable model of relationship management
Source: Morgan and Hunt (1994)

Morgan and Hunt stated that trust and commitment are 'key due to their function of encouraging marketers to (1) decline short-term substitutes in favor of the long-term benefits expected by engaging with the current partners, (2) support to retain the relational investments by collaborating with exchange partners, and (3) regard probable high-risk activities as being safe due to their confidence that their partners will not proceed opportunistically. Hence, when both social attributes are present, they generate outcomes that prompt effectiveness, productivity and efficiency. Furthermore, the author tested their model using data collected from a retailers of automobile tire and supported their key mediating variable model.

Kwon and Suh (2005) examined the relationship between several constructs from transaction cost analysis (including behavioral uncertainty, asset specificity, and partner's opportunism), social exchange theory (information sharing) and the level of trust. From their findings, the authors provided empirical evidence that the levels of commitment have a strong relationship with the levels of trust as it was previously hypothesized by Morgan and Hunt (1994). They also found that information sharing has a positive impact on improving the level of trust by reducing partner's uncertainty behavior. Finally, they argued *"that commitment is a key in achieving supply chain integration and trust is a root in fostering such commitment"*.

Yang et al. (2008) investigated the antecedents of relational stability in supply chain alliances in relation to goal interdependence and the social exchange theory. In the context of alliances, the authors argued that the mutual respect for suppliers and buyers is the result of relational commitment as well as it removes the necessity for competition from rivalries. Furthermore, trust constitutes a stimulus that generates more satisfactory working atmospheres for supply chain partners. Trust provides incentives for cooperative efforts, increases the reliability of contractors, and decreases uncertainties and risk. Finally, the based on the findings, the authors suggested that trust and commitment are two relevant precursors for relational stability impacting the performance within the alliance.

For the purpose of this work, trust is the social attribute that enables the development of effective social-business networks, and act as a mechanism for learning and gain new knowledge. Indeed, the lack of knowledge can be overcome through trusty relationships as in the case of firms that run a foreign business by trusting in a middleman despite firm's lack of knowledge (Johanson and Vahlne 2009). Trust is also seem as a precondition for learning (Vahlne and Johanson 2013). The existing social capital sustains the learning processes which in turn sustain the development of further social capital. Trust is also a precondition needed to enhance commitment among the partners in a supply chain. The presence of trust enhances the efficiency and effectiveness by reducing the necessity to establish formal contractual conditions which allows faster times of set-up, and the transaction costs (e.g. inspection, verification, certification costs) (Kwon and Suh 2004; Chen et al. 2011; Ellis 2011). On the basis of trust, commitment is the willingness of establishing a more stable relationship through the exchange of resources and efforts which also leads to increase the relationship dependency and resources inflexibility. Finally, from the business network approach for internationalization, this work adopts Johanson and Vahlne (2009) propositions regarding building trust and commitment as necessary preconditions for internationalization.

2.7 Lessons learned and substantiation of the research gap

The participation of SMEs in trade international markets has slightly increased during the last two decade (World Trade Organization Secretariat 2016). This phenomenon has received the attention from scholars to investigate the antecedents and course of actions of SMEs internationalization (Sousa et al. 2008; Zhang et al. 2014; Kahiya and Dean 2016). SMEs benefit from internationalization as it constitutes a source for gaining new knowledge, improving productivity and innovativeness (Love and Roper 2015). On the other hand, internationalization constitutes a high-risky strategy to embrace, particularly for SMEs, due to the risks associated with international markets' uncertainties (e.g. foreign customers' consumption behavior, volatility of international markets, new trade barriers), the liability of foreignness and outsidership (Leonidou 2004; Johanson and Vahlne 2009) , political danger (Delios and Henisz 2003) among other factors that might impact negatively the performance of the firm. Therefore, it is crucial for SMEs to achieve a sustainable competitive advantage to succeed and sustain their internationalization process.

2.7.1 SMEs internationalization theories

Three main theories on SMEs internationalization have been presented in the previous Section 2.2 to provide a better understanding of the internationalization process among this group of enterprises. Table 2-13 presents a summary of the relevant elements identified from their analysis necessary to keep in mind for the following chapters of this work.

Table 2-13 Summary of SMEs internationalization theories

Approach	Definition	Key Elements	Sources
Stage Theory of Internationalization	Firms' evolutionary process	• Market knowledge (learning experiences) • Market commitment • Liability of foreignness	Roger (1962); Bilkey and Tesar (1977); Johanson and Vahlne (1977); Cavusgil (1980), (1984); Leonidou (2004)
Network approach	Relationships model internationalization processes of a firm	• Network position (Outsidership) • Networking capabilities • Trust building • Internationalization capability • Opportunity recognition capability • (Re) configuration	Anderson (1982); Birley (1985); Johanson and Vahlne (1990, 2009); Coviello and Munro (1997); Chetty and Patterson (2002); Hohenthal (2006); Vahlne and Johanson (2013)

International entrepreneurship orientation	Entrepreneur orientation to create value	• Innovativeness • Pro-activeness • Risk-taking • Internationalization goals (scope, speed, intensity)	Oviatt and McDougall (1994, 2005); McDougall and Oviatt (2000); Etemad (2004); Crick (2009); Freiling and Schelhowe (2014)

Source: Author

First, the ***stage theory*** regards internationalization as an evolutionary process by which a firm gets involved in foreign markets in a progressive way. Three elements are identified as essential for the internationalization process of the firms, i.e. market knowledge, including the flow of information and learning experiences of the firm in foreign markets; the commitment to the market as the resources committed to a specific market and their degree of flexibility to be used in a different market; and, the liability of foreignness, as the number of elements that disturb the flow of information between the firm and the market.

With respect to the ***network approach***, the internalization of a firm depends on its process of establishing relationships among the business network of the firm is involved. Hence, the network position (outsidership) is the critical element of this approach. To overcome the outsidership, the firms depend on its networking capabilities and the trust building among the counterparts. The internationalization capability and the opportunity recognition capability lead the decisions with respect to the market commitment and the reconfiguration of the organizational structure to operate in the foreign market. In the case of SMEs, it has been widely recognized the importance of the ***entrepreneurial orientation*** in their internationalization process through the innovativeness, pro-activeness, and risk-taking behaviors to generate customers value in foreign markets as well as to enhance the processes to over the liability of foreignness and the liability of outsidership. Finally, ***three dimensions of the internationalization goals have been described, i.e. geographical scope, seed and intensity***.

Furthermore, Table 2-14 presents a summary of the enablers and barriers identified from the analysis of these aforementioned theoretical approaches for SMEs internationalization.

Table 2-14 Summary of enablers and barriers for SMEs internationalization

Description	Factor	Enablers / barriers	Authors
International orientation	Internal	Enabler	Cardoza et al. (2015), Sousa et al. (2008), Leonidou (2004), Fillis (2001),Cavusgil (1984)
Flexibility	Internal	Enabler	Hessels & Parker (2013), Johanson & Vahlne (2009), Sousa et al. (2008),
Innovation, proactive and reactive orientations	Internal	Enabler	Johanson & Vahlne (2009), Sousa et al. (2008), Fillis (2001)
Collaboration	Internal	Enabler	Hessels & Parker (2013), Cardoza et al. (2015), Johanson & Vahlne (2009), Sousa et al. (2008), Fillis (2001),
Development of new products or product adaptation for foreign markets	Internal	Enabler / Barrier	Kahiya & Dean (2016), Sousa et al. (2008), Leonidou (2004), Cavusgil (1984),
Insufficient skills and planning	Internal	Barrier	Kahiya & Dean (2016), Cardoza et al. (2015), Hessels & Parker (2013), Sousa et al. (2008), Leonidou (2004), Fillis (2001),
Lack of financial resources	Internal	Barrier	Kahiya & Dean (2016), Cardoza et al. (2015), Sousa et al. (2008), Leonidou (2004),
Lack of knowledge related with foreign business practices	Internal	Barrier	Kahiya & Dean (2016), Cardoza et al. (2015), Hessels & Parker (2013), Johanson & Vahlne (2009), Leonidou (2004), Fillis (2001),
Lack of information management	Internal	Barrier	Cardoza et al. (2015), Hessels & Parker (2013), Johanson & Vahlne (2009), Sousa et al. (2008), Leonidou (2004), Fillis (2001), Cavusgil (1984),
Lack of production capacity and technology access	Internal	Barrier	Kahiya & Dean (2016), Cardoza et al. (2015), Hessels & Parker (2013), Johanson & Vahlne (2009), Sousa et al. (2008), Leonidou (2004)
Lack of time management	Internal	Barrier	Kahiya & Dean (2016), Leonidou (2004)
Scope for growth	External	Enabler	Kahiya & Dean (2016), Cardoza et al. (2015), Sousa et al. (2008), Cavusgil (1984)
Environmental turbulence	External	Barrier	Cardoza et al. (2015), Hessels & Parker (2013), Johanson & Vahlne (2009), Sousa et al. (2008), Leonidou (2004), Fillis (2001)
Complexity of foreign distribution channels	External	Barrier	Kahiya & Dean (2016), Johanson & Vahlne (2009), Sousa et al. (2008), Leonidou (2004), Cavusgil (1984)
Transportation / distribution costs	External	Barrier	Kahiya & Dean (2016), Leonidou (2004)

Source: Author

2.7.2 SMEs and flexibility

To achieve a sustainable competitive advantage, it is necessary to establish competitive priorities. The competitive priorities constitute a comprehensive set of activities that the manufacturing firm has to complete for supporting business's strategy. Flexibility, is one of the broadly recognized competitive priorities (Fisher 1997; Swafford et al. 2000; Carpinetti et al. 2000; Mentzer et al. 2004; Singh et al. 2008; Blome et al. 2012). In relation with SMEs flexibility, several studies have recognized the positive impact of flexibility as a capability among the SMEs that allow them to overcome their limited capabilities and lack of knowledge and resources (Dreyer and Grønhaug 2004; Singh et al. 2008; Ismail et al. 2011; Zhang et al. 2014; Child et al. 2017). Flexibility enhances relationship closeness between the focal firm and its customers, as well as with its providers, enabling it to provide rapid response to the changes within these ties (Stevenson and Spring 2007; Ismail et al. 2011). Gelinas and Bigras (2004) analyzed the conditions of SMEs that allow or prevent their integration of logistics. Their findings suggested that SMEs seemed *"dynamically suited to integration"* in some aspects. In one hand, SMEs flexibility, the simplified process for decision making, the levels of organization and operational closeness, as well as the entrepreneurship growth and the sustainability of its goals were the recognized features as *"well-suited with integrated logistics"*. On the other hand, the authors classified as inauspicious *the "firms' focus on effectiveness rather than efficiency, their tendency to underutilize information technologies, and their short-term strategic planning"*. Verdú-Jover et al. (2006) proposed a mechanism to evaluate and compare the flexibility fit (co-alignment) among SMEs and large firms within the frame of the European Union. The authors also assessed the impact of flexibility co-alignment (i.e. the flexibility of the firm corresponds to the flexibility required or determined by the industry) on the performance of the firm. After processing the data collected from 417 European firms, the results showed that in general terms, SMEs with good levels of co-alignment have a positive impact on the performance of the firm. They also found that SMEs have a greater meta-flexibility (i.e. capacity degree of information processing) in comparison with the large firms, therefore allowing the flexibility fit to adjust accordingly to the variations in the environment. Nevertheless, the flexibility fit does not reflect immediately the SMEs' greater meta-flexibility.

Zhang et al. (2014) surveyed a large group of manufacturing Chinese SMEs to examined the effects of three types of organizational flexibility (i.e. strategic flexibility[4], structural flexibility[5], and operational flexibility[6]) in the context of SMEs from emerging markets and how these firms can benefit from them when internationalizing. The results revealed the positive impact of strategic flexibility on SMEs internationalization performance. Furthermore, from the findings, the authors also emphasized the importance of strategic flexibility for SMEs to manage their internationalization process to compete in uncertain international markets (Eisenhardt and Martin 2000). Therefore, strategic flexibility is not for exclusive use of large firms. It has to be considered as an *'organizing principle'* (Zhou and Wu 2010) to manage the process of internationalization of any firm, regardless its size. On the other hand, the findings presented a negative impact of operational flexibility on internationalization performance in the case of SMEs. The authors argue that as the complexity and dynamics of international business environments increase, it is not enough for the international SMEs to compete based only on their flexible manufacturing capabilities, as they are not effective to manage the unpredictable changes in international markets. Furthermore, due to the lack of managerial skills among SMEs from emerging market, maintaining high levels of operational flexibility implies dealing with high managerial costs which in turn increases the production costs, particularly in the case of product diversification. Finally, the results showed that structural flexibility has no relevant influential effects in the relationship between internationalization and performance.

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[4] Strategic flexibility is referred by the authors as the set of capabilities associated with the organizational or environmental goals, and implies variations in the nature of organizational activities (Volberda 1997). Furthermore, strategic flexibility support firms to cope with the uncertainty and turbulence of international markets. Firms with this type of organizational flexibility have less inertia which allows performing a prompted reaction to any change in the environment.

[5] Structural flexibility involves the managerial capabilities of communication process, decision-making process and adapting the structure of the organization to fit with the changes in the environment (Volberda 1999). This type of flexibility also decreases internationalization costs and therefore, allows low-cost competitiveness in international markets. Internal structural flexibility reduces de cost to manage the changes within the organizational structure. On the other hand, external structural flexibility decreases the costs of production by allowing SMEs to focus on their core business in which they are competitive. By collaborating with outsider SMEs are able to carry out the complementary business. This external structural flexibility can be gained by the firms through building relationships with outsiders, e.g. JIT purchasing, as well as co-designing, co-making subcomponents. Hence, this type of structural flexibility enhances SMEs linkages with their business partners promoting the learning process of SMEs during their internationalization.

[6] From the perspective adopted by the authors, operational flexibility involves a set of routines that the firm might perform depending on its current structure and goals, and bear on the operational volume rather than the undertaken types of operations in the firm (Volberda 1999). Operational cost can be reached by maintaining high inventory levels, hiring temporal workforce, or outsourcing. This type of organizational flexibility offers benefits two main grounds, i.e. the firms are flexible to modify their volume of production to satisfy the seasonal variations of the market; and the firms are able to diversify the features of the product to meet the variety of requirements among different markets.

Within the context of manufacturing-based SMEs, Ismail et al. (2011) presented a 'top-down' strategic agility framework for supporting these firms in developing resilience when performing in fluctuating business environments (Figure 2-20).

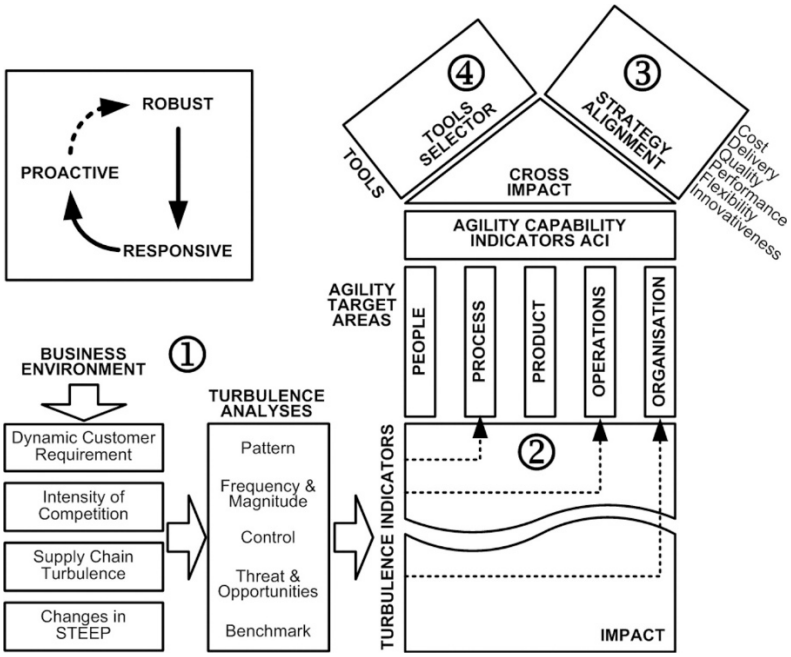

Figure 2-20 Stages of implementing operational agility
Source: Ismail et al. (2011)

Based on previous work in relation with the implementation of manufacturing agility in SMEs, the authors developed the framework that relied on the assumption that resilience takes place as a consequence of implementing both, strategic and operational capabilities. They integrated multi-strategy assessment tools (i.e. strategic tools and approaches as well as operational agility tools) to prioritize SMEs capabilities to reach a degree of *'strategic readiness'*. It is necessary an iterative process through three different stages (i.e. robustness, responsiveness, and pro-activeness) to enhance operational agility. The first stage, robustness is reached by preventing and coping with the influence of factors that might weaken the firm in its operating context. During the second stage, to maximize responsiveness to market requirements, interactions are regulated to align the robust capabilities and processes of the firm. By improving its skills and capabilities, the firm is better positioned to involve in searching for new markets, looking for new customers, or designing new products, in a proactive way. The iteration of the process is needed due to the recognition of new opportunities as well as the detection of vulnerabilities. Furthermore, the authors carried out

two case studies within manufacturing SMEs to demonstrate the way to apply the proposed approach.

Although, the aforementioned studies provide a relevant starting point to understand the role of flexibility in manufacturing SMEs as a capability to adapt and align in an accurate and agile fashion to fluctuations and uncertainties in a competitive dynamic business environment, it is necessary to adopt an integrative perspective of flexibility as a competitive priority between the SME and its supply chain partners to gain a sustainable competitive advantage.

2.7.3 SMEs and SCM practices

It is required adopting SCM strategies and practices to cope with nowadays supply chain competitive scenario. Moreover, the size and flexibility of SMEs, its ability to innovate, the shorter manufacturing lead time, the capability for dealing with customers' particular requirements, the involvement of managers in operational decisions, and the new accessible information technologies have been recognized as factors that stimulate SCM practices among these group of firms (Hudson et al. 2001; Thakkar et al. 2008). Moreover, the flexibility of a firm depends on its network relationships and strategies structures (Hua et al. 2009; Gligor and Holcomb 2012) and the international scenario on which the firm is doing business or willing to do so. Therefore, although SMEs are flexible by nature, this may be affected while interacting in a supply chain. For this reason, SMEs need to include SCF as part of their strategy to remain flexible as they growth internationally (Novillo and Haasis 2017).

Fawcett et al. (2009) proposed a theoretical framework for assessing the feasibility of SCM strategies and practices. They surveyed small, medium and large firms, as well as conducted in-depth interviewed with small firms to benchmark the feasibility of *'collaborative supply chain business models'* (CSCBMs) by using a contingency-RBV approach. The benchmarking the feasibility of CSCBMs among small ventures exposed a curios contradiction. Although improved supply chain collaboration seems to be attainable for many SMEs, only a few of them are promoting SCM as a source of strategic advantage. Both, interviews and surveys responses pointed out that the emerging competitive and aggressive business environment demands higher levels of dependence on CSCBMs. Indeed, the small firms' managers affirmed that their firms were accomplishing higher performance due to supply chain collaboration and that the barriers to implement SCM did not threaten them. Nevertheless, small firms are not actively pursuing the development of collaborative enablers

and further SCM strategies to gain a competitive advantage. Adopting that managerial approach places small firms in a vulnerable position in a fluctuating competitive scenario. The growth strategy of the small firm will determine the level vulnerability. Therefore, to enhance the growth strategy and survive in nowadays global supply chain environment, small businesses need to generate collaborative capabilities endorsed by SCM. Finally, Table 2-15 presents the three alternative SCM strategies based on the growth strategy of the small firm suggested by the authors.

Table 2-15 Alternative small-usiness approaches to CSCBMs

Type of entrepreneur	Management strategy	Approach to SCM
Status Quo, Niche Player	Management is satisfied with being a niche player and a going concern. The strategic focus is lifestyle and reliable income	Management largely ignores SCM initiatives that are viewed as costly, complex, and challenging to implement
Grow and sell player	Management's primary concern is to establish a successful track record that signals strong potential for future growth. The goal is to become an attractive acquisition target	Management views collaboration as a vehicle to make the company appear to be an attractive acquisition. The company may strive to align itself to one strategic partner in the hope of being acquired by the partner. Although SCM is viewed as important, efforts to develop a SC-enabled business model tend to be superficial. By leveraging SCM more fully, these companies can become more attractive to a wider range of companies and consequently more valuable to the market
Long-term growth player	Management's focus is to grow the company consistently over time. The goal is to become a large, successful industry leader	Management realizes that long-term growth requires a business model capable of making the transition from a small player to a big player in the industry. SCM becomes a means of helping the company insinuate itself into existing or emerging supply chains. Strategic investment in SC capabilities assures participation now while promoting growth over time

Source: Fawcett et al. (2009)

In a further study, Hsu et al. (2011) surveyed 165 suppliers of automotive manufacturers located in five ASEAN (Association of Southeast Asia Nations) countries to analyze the relationship of entrepreneurial management competences and SMEs' performance. First, they identified from the literature a new construct termed the *'entrepreneurial supply chain management competences'* defined as *"multidimensional concept that reflects the extent to which firms adopt a bundle of SCM competences to compete in a supply chain"*. This notion point toward the processes and intangible capabilities owned by the SME and that are necessary for its SCM achievement, which as a consequence will lead to higher performance. Multiple dimensions are included in the competences such as the adaptation of SMEs to new

supply chain channels by developing broader interactions with providers and customers, and gaining knowledge about the environment of the supply chain. The entrepreneurial SCM competences were measured with respect to five constructors of first-order i.e. proactiveness orientation, coordination capability, relational capital, innovation orientation, and risk-taking characteristics. Further, from the data collected in the survey, the authors found that the five constructs are relevant to the entrepreneurial SCM competence, and they have a positive indirect impact on SMEs performance through the SCM strategies of the firm. Additionally, this study also revealed how the intangible, fundamental resources of manufacturing SMEs such as proactiveness, innovativeness, risk-taking behavior, relational capital skills and coordination capabilities, provide a leverage to overcome the lack of tangible resources and financial support to succeed in competitive international and global markets. The findings also showed that the performance of manufacturing SMEs' relies on well-conceived developed and management of specific SCM competencies as well as on the quality of the management team. The uniqueness of the social structure, the causal relationships and the particular circumstances inside each manufacturing SME's management team leads to reach distinctive competencies on each firm. Therefore, the entrepreneurial SCM competences constitute a unique and inimitable resource that involves a set of specific capabilities owned by the firm.

Regarding a supply chain framework, Awais Ahmad Tipu and Fantazy (2014) studied the relationship between flexibility, strategy, and performance through a quantitative research by using a survey among Canadian manufacturing SMEs. From the review of literature, the author identified constructs to be tested with the path analysis technique. From the results, it was recognized a direct impact of strategy on flexibility and from flexibility to supply chain performance. The firms have to invest resources and time to improve delivery and new product flexibility dimensions to enhance their innovative strategy. On the other hand, the firms require to heavily investing to enhance the flexibility dimensions of product, sourcing, and delivery when adopting a customer-oriented strategy. Firms adopting a follower strategy do not require investing in any particular flexibility dimension. Finally, the results revealed the important role of IMCs to improve IS flexibility dimension to enhance the overall performance of the supply chain. An important remark made by the authors is the managers' duty to consider carefully which flexibility dimensions should be developed as not all of them contribute to the improvement of the overall performance. In the case of SMEs with limited resources, it is crucial that managers evaluate cautiously the flexibility requirements

according to their strategic needs; if not the consequences should be competitively counterproductive.

Considering the aforesaid, manufacturing SMEs need to develop the appropriate set of capabilities and competences to achieve SCM strategies which will result in a competitive advantage. Therefore, it is critical to align and coordinate the internationalization strategies, operations, and commitment across the whole business network. It is also necessary a functional frame to manage this coordination, and the development of unique capabilities to reach the intended outcomes.

2.7.4 SCF, logistics capabilities, trust and commitment related to the supply chain performance

There is an extensive literature considering the relationship between logistics capabilities, SCF, firm performance as well as the performance of the supply chain as a whole (Mentzer et al. 2004; Stank et al. 2005; Zhang 2005; Swafford et al. 2008; Fantazy et al. 2009; Gligor and Holcomb 2012, 2014a; Jin et al. 2014; Mangla et al. 2014; Awais Ahmad Tipu and Fantazy 2014; Fantazy and Salem 2016). Moreover, research has also been conducted to examine the relationship among various of these areas, i.e. SCF, logistics capabilities, trust, and commitment, and evaluate its impact on the performance at a supply-chain level as well as at a firm-level (Morgan and Hunt 1994; Zhao et al. 2001; Kwon and Suh 2004; Hua et al. 2009; Chu et al. 2011; Omar et al. 2012; He et al. 2014; Wu et al. 2014; Mandal 2016). Additionally, existing literature on the areas of interest has been conducted mostly in large firms from developed markets (Gelinas and Bigras 2004; Verdú-Jover et al. 2006; Felzensztein et al. 2014; Mellat-Parast and Spillan 2014; Zhang et al. 2014; Gonzalez-Perez et al. 2016).

Zhao et al. (2001) researched the relationship between customer- focused capabilities and information-focused capabilities and how trust and commitment influenced the performance of these two capabilities supply chain logistics capabilities and the firm performance. They found that firms' closeness and commitment have a significant influence on customer-focused capabilities (or DMC) and that these capabilities are also highly related to the performance of the firm. Additionally, the authors found an influence of IMCs on customer-focused capabilities that in turn were revealed to prompt firm performance. Kwon and Suh (2004) tested empirically the relationship between trust and commitment with the performance of the supply chain and supply chain integration. After surveying a group of supply chain

practitioners, the findings revealed that, to a considerable extent, the trust of a firm in its supply chain partner depends on behavioral uncertainty (negatively) and the both sides' specific shared assets (positively). In their conclusions stated how trust is responsible of a major improvement of supply chain performance and as a result increases the chance to succeed. The authors also found that information exchange leverage the level of trust. Additionally, they also found a positive relationship between trust level and commitment degree.

Chen et al. (2011) examined the role of information availability, information quality and information sharing in developing trust and commitment among the supply chain partners. The authors proposed a research model based on the previous studies to develop their hypothesis (Figure 2-21).

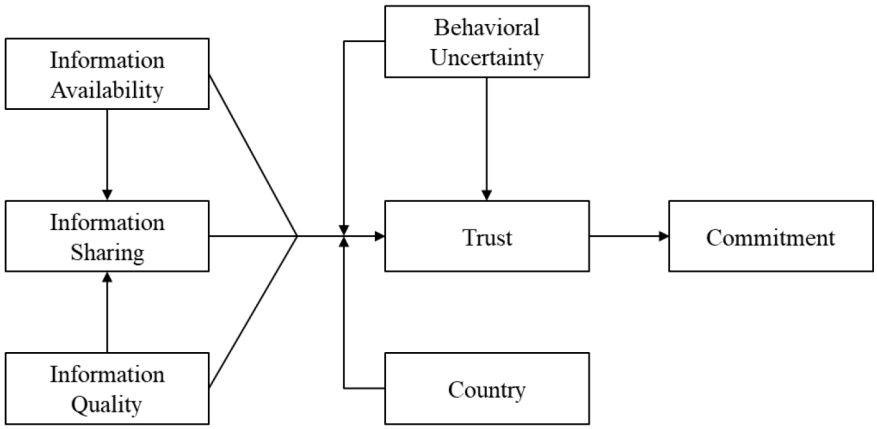

Figure 2-21 The antecedent factors on trust and commitment in supply chain relationships
Source: Chen et al. (2011)

The authors conducted an empirical study testing their hypothesis among supply chain practitioners in Canada and Taiwan to later compare their responses. The results showed that there is a positive relationship among the observed level of information availability and information quality with the level of trust. There is also a positive relationship between the perceived level of information quality and the level information sharing. The perceived level of trust has a positive impact on the level of commitment. Finally, the findings exhibited that the variable country modulates the relationship between trust and information sharing.

With respect to flexibility, Chu et al. (2011) examined a conceptual framework to induce supplier flexibility (i.e. delivery flexibility, mix, volume and new product) through social

mechanisms (trust and shared vision[7]). The authors hypothesized that the shared vision and the trust of the buyer in its providers have a positive impact on the aforementioned supplier's flexibility dimensions. They also argued that the trust of the buyer in its providers support the development of a shared vision. The hypotheses were tested by a large group of supply chain management experts. The findings revealed that trust has a direct effect on the dimensions of delivery and volume flexibility. Moreover, they also showed that shared vision has a direct influence on the flexibility dimension of new product, delivery and mix. Finally, shared vision moderates the impact of trust in the supplier's flexibility dimensions of new product, mix and delivery.

Finally, Mandal (2016) conducted a survey in order to study the relationship between social exchange attributes (in this study i.e. trust, commitment, power and reciprocity), the logistics capabilities and SCF performance. He found that these attributes have a positive impact on integrated logistics capabilities. Moreover, the author also found that these capabilities have a positive impact on SCF and in turn in the overall supply chain performance.

2.7.5 Answers on the related research questions to this Chapter

The theoretical frameworks of the areas of interest for this work have been presented in the previous sections of this chapter, i.e. SMEs' internationalization, SCF, logistics capabilities and the social attributes of trust and commitment. While there is a large body of literature regarding the impact of logistics capabilities on the flexibility of the supply chain and its main performance as well as the extensive research conducted to analyze the influence of trust and commitment on logistics capabilities and its impact on SCF and supply chain performance, manufacturing SMEs as the focal firms have received little attention in the literature. Furthermore, in the context of internationalization there is a lack of research examining the relationship of SCF strategies, the development of logistics capabilities and SMEs internationalization approaches. Table 2-16 provides a brief summary of the studies that have been conducted considering the areas of interest as well as their main contributions.

[7] A shared vision implies to have a common, accurate, explicit image of a sincerely aspired state in the future. As the interacting parties share a vision, they will have a common understanding of how to coordinate the use of strategic resources, operations and processes (Chu et al. 2011).

Table 2-16 Overview of selected literature

		Discussed field					
Author	**Methodology**	**Internatio-nalization**	**SMEs Flexibi-lity**	**SCF**	**LC**	**Trust and commitment**	**Contributions**
Yavuz et al. (2016)	Panel data analysis	Yes	Yes	No	No	No	It analyzed the impact of resources flexibility during the internationalization process of new ventures. The study identified the importance of allocation flexibility particularly during the early stages of internationalization. However, it seems that once the firm gets mature the important aspect is to have enough the resources to operate in the market regardless of their configuration.
Di Maria and Ganau (2017)	Econometric Modelling	Yes	Yes	No	TSE	Commitment	The study analyzed the impact of three distribution strategies with different degree of market commitment flexibility. The results of this empirical study suggested that commercial distribution agreements have a higher impact on the intensity of SMEs' expectations as well as on SMEs' export diversification in comparison to FDI mode or local traders.
Fantazy and Salem (2016)	Structural equation modeling	No	Yes	Yes	TSE	Commitment	The study identified a direct positive impact of supply chain strategy to new product development flexibility which in turn has a positive effect on financial and non-financial performance.
Awais Ahmad Tipu and Fantazy (2014)	Path analysis technique	TSE	Yes	Yes	No	No	The research found a positive relationship among strategy, flexibility and performance. In the case of SMEs in Pakistan, the firms adopt a follower strategy to achieve non-financial and financial performance. On the other hand, Canadian SMEs adopted innovative and customer-oriented strategies to improve their overall performance.
Prange and Verdier (2011)	Literature review	Yes	Yes	No	TSE	Commitment	The authors proposed two opposing types of dynamic capabilities to support the internationalization process of new ventures, i.e. explorative (includes discovery, risk-taking, experimentation, flexibility, and innovation) and exploitative (refers to control, certainty, and risk reduction) capabilities. Further, they introduced the concept of third-order capabilities to balance trade-offs and maximize the internationalization performance, which is measured in terms of survival and growth.

Table 2-16 Overview of selected literature *(Continue)*

Weerawardena et al. (2007)	Literature review	Yes	No	No	IMCs	TSE	It combines the extended RBV of competitive advantage with organizational learning theory to present a conceptual framework to explain the accelerated internationalization of born global firms. It is proposed that the international entrepreneurial orientation, learning capabilities, networking capabilities, marketing capabilities, and knowledge-intensive have a positive impact on the accelerated internationalization of the firm.
Dreyer and Grønhaug (2004)	Panel data analysis	TSE	Yes	TSE	No	No	From a RBV perspective, the empirical research studied the impact of flexibility among SMEs to overcome uncertainty and gain a sustained competitive advantage. The results showed that the combination of various and balanced dimensions of flexibility are needed by the firms to cope with the uncertainty and turbulence of business environments.
Zhang et al. (2014)	Least square regression	Yes	Yes	TSE	No	No	The study showed the positive impact of strategic flexibility on the internationalization process and performance of SMEs from emerging markets.
Rundh (2011)	Analysis of variance (ANOVA)	Yes	Yes	No	TSE	No	The author analyzed the relationship of flexibility and entrepreneurship to the performance of exporting SMEs. The study showed the importance for responsiveness to the market. It also confirmed the necessity of serving the market with product quality and the significance of flexibility with respect to export markets.
Hsu et al.(2011)	Multiple regression	Yes	Yes	Yes	Yes	No	From a literature review, the authors proposed five entrepreneurial SCM competences (i.e. risk-taking characteristics, proactiveness orientation, innovation orientation, coordination capability and relational capital). Further, they empirically measured the positive impact of these competences in SMEs' performance through the firm's SCM strategies.
Ismail et al. (2011)	Case study	TSE	Yes	TSE	TSE	No	From a previous work, the authors presented a framework for implementing manufacturing agility in SMEs and developed a set of multi-strategy assessment tools for SMEs to prioritize their capabilities to reach a level of "strategic readiness". The framework was tested in two manufacturing SMEs, showing the importance of developing appropriate operational and strategic capabilities in SMEs such as agility.

Notes: TSE: To some extend

This chapter has analyzed an extensive body of knowledge to address the research questions related to the current state of the art with respect to the analysis of the areas of interest:

- What is the state of the art of SMEs internationalization approaches?
- What is the state of the art of SCF?
- What is the state of the art of logistics capabilities?
- What are the relationships among the areas of study?

The answers on these research questions are as follows:

- With respect to the state of the art of SMEs internationalization approaches, this work has studied three approaches, i.e. stage theory of internationalization, network approach and international entrepreneurship orientation (Section 2.2). Although the existing body of knowledge is fragmented constituting a difficulty for studying the phenomenon of SMEs internationalization, there have been possible to identify key aspects with respect to its processes and management (see Table 2-13).
- Regarding the state of the art of SCF (Section 2.4), the extensive literature in this area has resulted in a fragmented body of knowledge. Nevertheless, from its analysis, it has been elaborated an overview on the scope of SCF, its dimensions, the strategies to develop SCF, as well as the drivers and enablers that impact its implementation. Several theoretical and empirical studies have been examined allowing a better understanding of this supply chain capability and its impact on the supply chain performance as well as on the firm. Moreover, it has been exposed the positive impact of developing SCF through SCM practices to enhance SMEs performance (Sections 2.7.2 and 2.7.3).
- Logistics capabilities have been identified as the organization's enablers for achieving a higher performance and value creation through the coordination, integration and synchronization of internal and external functional areas of the organization, the management of its resources and the common goals of shareholders (see Section 2.5). Furthermore, these capabilities have been classified into five categories, i.e. DMCs, SMCs, IMCs, ILCs and measurement capabilities.
- While investigating the areas of interest, two social attributes, i.e. trust and commitment, have emerged as linking elements among these areas. In addition, through these social attributes, the literature has recognized a positive impact on

flexibility and logistics capabilities at the firm level as well as in the supply chain context. However, there is little literature examining in an integrative manner at least three of the following aspects SMEs internationalization theories, trust and commitment, SCF, and logistics capabilities. Furthermore, the majority of the research has been conducted in developed economies as well as in emerging economies such as China. There are few, if any, integrative studies related to the areas of interest analyzing this context in the case of countries from developing countries of Latin America.

The current state of the art presents the challenge to integrate the dispersed body of knowledge into a conceptual framework to define the roles and relationships among the areas of interest described previously in this Chapter. It is important to provide a framework for understanding *how* manufacturing SMEs integrate SCF strategies on their internationalization process. Furthermore, it is essential to identify the key elements among these areas and define a decision path for the implementation of SCF strategies during the internationalization process of manufacturing SMEs. Finally, it is needed a mechanism to support the decision making process and design for implementing such path. The following chapters will address these issues based on the findings of this Chapter.

3 Design of an integrative conceptual framework for SMEs internationalization and the supply chain dynamic capabilities

3.1 Integrating the concepts

This chapter addresses the main research question of this work, i.e. *how to sustain the internationalization processes of manufacturing SMEs through the development of SCF to address the dynamics of foreign markets?* In doing so, this chapter also addresses the issues related to the relationships among the areas of study, how to integrate them into a unified conceptual framework as well as how logistics capabilities and SCF constitute a sustainable competitive advantage for SMEs internationalization (Section 1.2). These issues are discussed from a holistic perspective to present an integrative conceptual framework that constitutes the theoretical basis of the existing links among the areas of interest. Before developing an integrative conceptual framework, it is important to recognized critical elements to be considered into that framework and the relationships among them. Figure 3-1 depicts the core aspects extracted from the state of the art analyzed in Chapter 2.

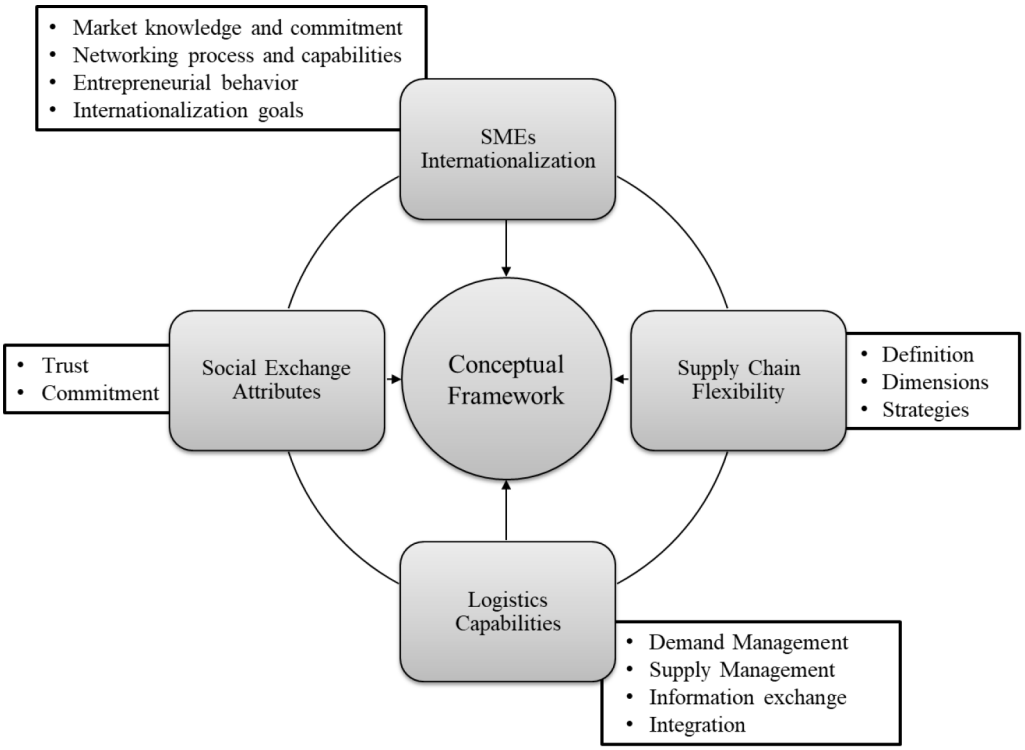

Figure 3-1 Integrative elements of the areas of interest

Three approaches have been investigated in the regard of SMEs internationalization, i.e. stage theory of internationalization, network approach, and international entrepreneurial orientation (see Sections 2.2.1, 2.2.2, and 2.2.3). The *market knowledge* and *market commitment* are recognized as key elements that define the internationalization process of the firms. For instance, depending on the market knowledge, the firm forecasts the degree of acceptance of the current product or the need for adopting it to the different requirements according to each foreign market; the adaptation or differentiation strategy will be based on the degree of commitment of the firm to assign the required resources for that specific market. In addition, the internationalization process of a firm is highly related to its *network position* and the *capabilities* that allow the firm the interaction with its counterparts. As the firm is willing to operate in international markets, it requires to interact with various counterparts to support its operations (e.g. international shipping, distribution and sales, sourcing, among others) and depending on their position in the value chain, some relations will become more important and robust than others. With this in view, the *entrepreneurial behavior* of decision makers is essential and is characterized by proactiveness, innovativeness, and risk-taking. Finally, three dimensions of the internationalization performance of SMEs have been identified, i.e. geographical scope, speed, and intensity (Section 2.2.4).

Flexibility is one of the capabilities recognized among SMEs, that enable them to overcome their limited resources and capabilities. Furthermore, to enhance their flexibility, it is

necessary for SMEs to adopt a SCO and develop *SCF strategies* to cope with the international, dynamic and supply chain competitive environment. The SCF strategies need to be considered in the internationalization process of the SME. Hence, it is important to develop the required dimensions and degree of SCF (e.g. volume flexibility, manufacturing flexibility, distribution flexibility) to provide the appropriate response in quality, time and quantity to the changes and various requirements of the customer in international markets (Section 2.4). The *logistics capabilities* enable SMEs coordination of internal and external functions of the firm with its counterparts. Thus, they allow the coordination and join efforts to develop the accurate SCF strategy according to the dynamic of the business environment. Finally, from the examination of the areas of interest, the social attributes of *trust* and *commitment* among the supply chain partners have emerged as preconditions to the internationalization process, as well as for the development, coordination and coordination of logistics capabilities and SCF. The following sections of this Chapter discuss the relationships among the areas of interest and present a unified conceptual framework to answer the aforementioned research questions.

3.2 Conceptual Framework

From the literature review presented in Chapter 2 (i.e. SCF, internationalization approaches, and logistics capabilities), and the analysis of these areas, it is proposed a conceptual framework for SMEs internationalization focused on the development of logistics capabilities to achieve SCF strategies as a sustainable competitive advantage for internationalization presented in Figure 3-2.

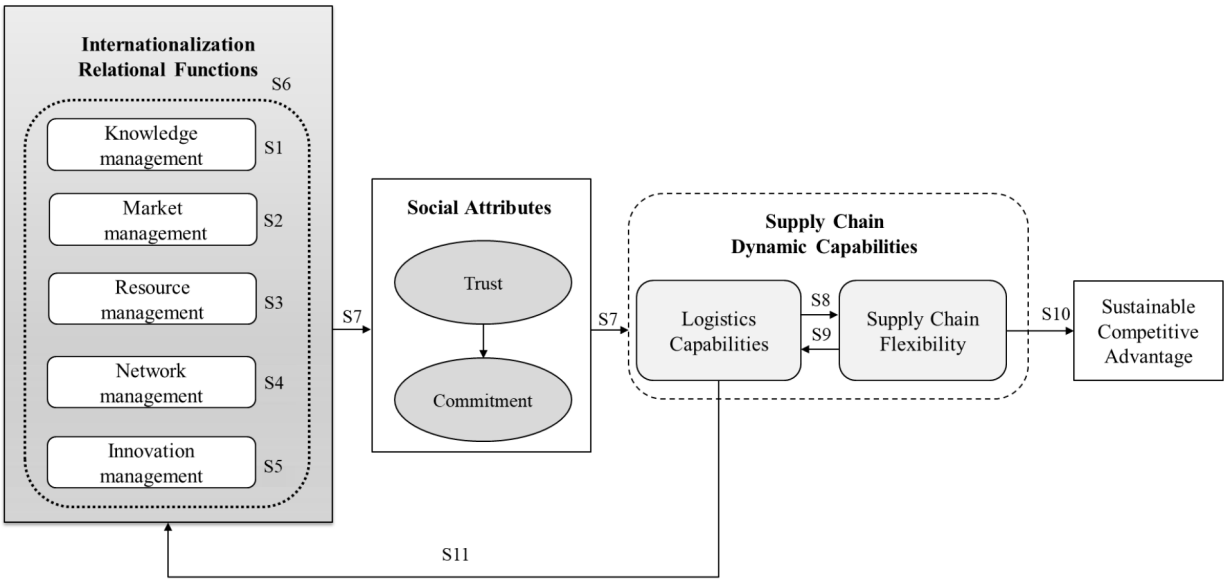

Figure 3-2 Conceptual Framework

This integrative conceptual framework has organized the core aspects extracted from the literature review as described in Sections 2.7 and 3.1. It is organized into four main components, i.e. internationalization relational functions, social attributes, supply chain dynamic capabilities and sustainable competitive advantage. The internationalization relational functions (discussed in the Section 3.2.1) will manage SMEs' internationalization strategies in coordination with the internal and external functions of the SME. This coordination relies on the development of the supply chain dynamic capabilities (i.e. logistics capabilities and SCF) (discussed in the Section 3.2.3 and 3.2.4), which in turn is affected by the degree of trust and commitment among the supply chain partners (discussed in the Section 3.2.2). Finally, the combination of these three components might constitute a sustainable competitive advantage for the internationalization of manufacturing SMEs (discussed in the Section 3.2.4).

3.2.1 Internationalization relational functions

From the review on SMEs internationalization approaches, five relational functions for managing the internationalization process of SMEs have been identified, i.e. knowledge management, market management, network management, innovation management and resource management (Novillo and Haasis 2017). These relational functions are related to management of the market knowledge and learning processes, market commitment and strategy, networking processes and capabilities and entrepreneurial behavior and capabilities (Section 2.7.1). Table 3-1 provides a brief description of each internationalization relational function and the key elements considered from the internationalization theories analyzed in Section 2.2.

Table 3-1 Definition and key elements of the Internationalization relational functions

Internationalization Relational Functions	Definition	Internationalization Approaches	Key Elements
Knowledge management	Integration of body of knowledge built up by activities and experience in foreign markets and interactions with supply chain partners. Coordinates the decision-making	Stage Theory International entrepreneurship Network model	• Market knowledge • Liability of foreignness • Internationalization barriers • Opportunity recognition capability • Creating and learning knowledge • Pro-activeness • Risk-taking

	process inside the firm and within the supply chain		• Internationalization goals (scope, speed, intensity)
Market Management	Design and implementation of internationalization strategy according to the analysis of market requirements and knowledge	Stage Theory International entrepreneurship Network model	• Market knowledge • Market commitment • Internationalization capability • Internationalization goals (scope, speed, intensity) • Market seeking • Pro-activeness • Risk-taking
Resource-management	Management of available resources and coordinate the flow of raw material, production and distribution	Network model International entrepreneurship	• Market commitment • Resource seeking • Opportunity recognition capability • Operational and dynamic capabilities
Networking management	Position and partnership of the firm within the supply chain network. Manage collaboration and integration among partners	Network model International entrepreneurship	• Network position • Networking capabilities • Trust building • Outsidership
Innovation management	Coordinate efforts to develop new and creative products, services and processes based on the coordination of previous relational functions	International entrepreneurship	• Innovativeness • Pro-activeness • Risk-taking

Source: Author

These internationalization relational functions are responsible for setting *"firm's internationalization strategies and coordinate its internal functions as well as the relationships, functions and efforts within its business network"*. Through these functions, *"the firm will be able to accomplish internationalization objectives through the effective use of the available resources, functional competences, and organizational abilities within the supply chain"* (Novillo and Haasis 2017). Therefore, these functions allow the integration and

coordination of strategies which involves the management of information, resources, processes and capabilities within the supply chain network where SMEs are embedded. This integration and coordination is enhanced by the development of logistics capabilities inside the firm and across the supply chain which enables the alignment of firm's strategy downstream and upstream the supply chain. This alignment stimulates the adoption of SCF strategies in order to give a quick response to any change in the demand, sourcing or in the business environment with a lower penalty in the performance. Further, the adoption of SCF contributes to enhance the competitive advantage (Vickery et al. 1999; Martínez Sánchez and Pérez Pérez 2005; Merschmann and Thonemann 2011; Singh and Acharya 2013).

The following sections provide a deeper analysis of each function and its role in the achievement of SME's internationalization goals by developing logistics capabilities and implementing SCF strategies.

3.2.1.1 Knowledge-management relational function for SMEs internationalization (Know-MaRF)

The main internationalization strategies and goals are set from the knowledge-management relational function (Know-MaRF) in coordination with the market-management relational function (Novillo and Haasis 2017). Firms acquire market knowledge from its experiences abroad, learning processes, imitating, as well as from the flow of information within its supply chain partners (e.g. information related to the behavior of consumers' demands, a specific business practice in a certain market, or the procedures for customs clearance in a specific port). This also includes the capability to recognize business opportunities regarded as the capacity to identify, make a decision and mobilize the necessary resources accordingly (Vahlne and Johanson 2013) as well as design or adjust the related processes (e.g., use the current distribution channel to introduce a new line of products, introduce the product or service to a new market after the signature of a trade agreement). This capability is critical to the internationalization process as it leads the creation, implementation or adjustment of the adopting strategy in international markets by assessing future opportunities (e.g. adopting a specific mode of entrance). The market knowledge, including both general and specific knowledge, are crucial factors to succeed internationally (Johanson and Vahlne 2009). Thus, this relational function enables the SME to coordinate and align its body of knowledge, inside the firm as well as with its supply chain partners, to define the internationalization strategy to reach the internationalization goals. The internationalization strategy comprises both, the marking strategy as well as the manufacturing strategy (c.f. Kumar et al. (2006) in Section

2.4.5). Furthermore, the Know-MaRF in coordination with the other four relational functions will set the required dimensions and degree of flexibility (Section 2.4.3) to align the internationalization goals and strategies, inside the firm as well as within the supply chain partners.

The Know-MaRF also manages the creating- and learning-knowledge processes. Through this function, the gained body of knowledge is analyzed in order to overcome the liability of foreignness and internationalization barriers (see Section 2.2.1) by drawing the internationalization strategy that the firm will adopt. From the stage theory of internationalization, it has been identified how the external and internal internationalization drivers model the adoption of SMEs strategies in accordance with the degree of internationalization and commitment of the firm with the foreign markets (Cavusgil 1984; Leonidou 2004; Kahiya and Dean 2016). In addition, the development of new knowledge increases the proactiveness, innovativeness and risk-taking of the firm (Etemad 2004; Vahlne and Johanson 2013; Nonaka and Toyama 2015). Hence, it is important to develop IMCs to enhance the management, acquisition, analysis, storage, and share of tactical and strategic information both inside and outside the firm (Mentzer et al. 2004; Gligor and Holcomb 2014a). These logistics capabilities enhance organizational learning processes by integrating information from the supply chain partners and their business environment. They ease the communication across the supply chain network including the customers, the identification of opportunities, as well as taking riskier decisions. Sharing information stimulates the collective processes of learning when implementing new processes, incorporating new organizational and manufacturing capabilities, and adopting technology trends (Mentzer et al. 2004; Weerawardena et al. 2007).

In some circumstances, when the supply chain partners lack the needed knowledge, they share efforts to gain it together. In addition, as both, firm's body of knowledge as well as the collective body of knowledge, increase, the decision-making processes improves (Vahlne and Johanson 2013). Indeed, the knowledge curve is impacted by the firm's integration into the international business network. The social attribute of trust motivates decision makers to exchange information and to share efforts without the need of a comprehensive and formal agreement among the parts (Morgan and Hunt 1994). Furthermore, trust is a crucial element to develop new knowledge and have a successful learning process, particularly at the early stages of internationalization due to the unknown risks of foreign markets (Johanson and Vahlne 2009).

The processes of sharing information and actions coordination among the supply chain partners are iterative which reinforces the trust among them (Novillo Villegas and Haasis 2018). This results in a more committed relationship that might enhance the development of logistics capabilities among the partners (e.g. adopting more sophisticated information exchange technologies) (Morgan and Hunt 1994; Wu et al. 2014). Moreover, the commitment among the partners leads to share more tactical and strategic information prompting the alignment of their internationalization strategies in response to market demands. In turn, these actions stimulate to improve IMCs within the supply chain partners (e.g. adopting information systems flexibility) (Zhou and Wu 2010; Moon et al. 2012). As a consequence, this boosts the learning processes, information flow as well as reduces the time needed to obtain the required market knowledge.

With respect to knowledge creation, Nonaka and Takeuchi (1995) and Nonaka et al. (2000) presented the '*SECI*' model to explain how the interactions between tacit knowledge[8] and explicit knowledge[9] generate new knowledge in an organization (Figure 3-3). The authors acknowledge the fact that knowledge creation is a 'self-transcending', spiral and continuous process. There are diverse mechanisms from which new knowledge can be obtained overcoming the boundaries of old knowledge.

		Tacit knowledge	Explicit knowledge
IN	Tacit knowledge	**Socialization**	**Combination**
	Explicit knowledge	**Externalization**	**Internalization**

Figure 3-3 SECI model: four modes of knowledge creation
Source: Nonaka and Takeuchi (1995)

The process of knowledge creation is based on the interactions among the tacit knowledge and the explicit knowledge, which is identified as *'knowledge conversion'*. Furthermore, four

[8] The authors described tacit knowledge as rooted in the subjective, personal and difficult to formalize knowledge. It is mainly based on routines, procedures, values, ideals, actions, commitment, emotions and subjective intuitions. Hence, tacit knowledge is hard to transfer to other parties, as this requires a 'simultaneous processing' due to it is an analogue process in nature.

[9] The explicit knowledge is suitable to be communicated and shared in systematic and formal data and language, e.g. manuals, instructions set, scientific formulae. Moreover, it is possible to gather, process, transfer and store easily this type of knowledge.

modes of knowledge creations have been recognized, i.e. socialization, externalization, combination and internationalization.

Socialization (from tacit knowledge to tacit knowledge) is the process of knowledge conversion of tacit knowledge by sharing experiences among the individuals within a group (e.g. operating and living in the same environment, spending time together). In this sense, tacit knowledge is gained by the firms through its experience interactions with its customers or suppliers. This form of knowledge creation eases the necessary exchange of experiences and other forms of tacit knowledge from the firm with its closest partners and customers increasing the distribution of information flexibility among them (De Leeuw and Volberda 1996). Furthermore, socialization constitutes a support to raise the permanent collective learning of the firms (Nonaka and Takeuchi 1995) as well as to enhance the value of their knowledge. Externalization (from tacit knowledge to explicit knowledge) is the process of systematizing tacit knowledge into explicit transferable notions for the firm, its supply chain partners or any individual (Nonaka and Konno 1998). As the experiences and tacit knowledge is expressed by the individuals in the form of instructions, lectures, models, manuals and so on, it becomes transferable and more flexible to be distributed (Nonaka and Toyama 2015). This prompts the management-decision-making processes allowing a faster response to the changes and uncertainties of the environment (Mihi Ramírez et al. 2012). The integration of IMCs encourages the externalization of tacit knowledge among the supply chain partners, enhancing the flexibility of distribution of information which in turn improves the accuracy, time of response and implementation of the decision-making process (Patrakosol and Lee 2009; Moon et al. 2012).

Combination (from explicit knowledge to explicit knowledge) is the process of generating and integrating explicit knowledge into sets of more systemic and complex explicit notions. These notions are gathered (inside the firm or externally to it), combined, processed as know knowledge. The use of IMCs facilitate the combination and distribution of this explicit knowledge (Nonaka et al. 2000). This includes the distribution and sharing of strategic knowledge at operational level as well as supply chain strategic level. The last mode of knowledge creation of this model is internalization (from explicit knowledge to tacit knowledge).

Internalization implies the appropriation of explicit knowledge to make it tacit. It mainly consists on 'learning-by-doing', where the explicit knowledge, e.g. manufacturing operational procedures, requires to be trained in practice to gain the complete knowledge (Nonaka et al.

2000). Various scholars have observed the positive impact of knowledge internalization on enhancing the levels of flexibility of distribution of information enabling the organization to better response to changes in the environment (Sethi and Sethi 1990; Volberda 1996; Kenney and Gudergan 2006; Ho 2009; Mihi Ramírez et al. 2012).

The creation of market knowledge is a core capability to enhance flexibility (Nonaka and Konno 1998; Mihi Ramírez et al. 2012), which in turn is critical to the supply chain as a whole as well as to the focal firm to cope with the uncertainty of international business environments (Stevenson and Spring 2007, 2009). Volberda (1996) recognized flexibility as a managerial assignment due to its effects on generating and stimulating the ability to monitor the firm. Moving a step further, flexibility is the managerial assignment to monitor the supply chain's business environment allowing an agile recognition of market opportunities as well as enhancing the alignment of the supply chain strategy to act accordingly (Lee 2004; Kenney and Gudergan 2006). Hence, flexibility of distribution of information constitutes a key element on performing this managerial task (Nonaka and Takeuchi 1995).

Distribution of information flexibility has been referred as *"the capability of handling information flows in manufacturing which permits changes in manufacturing volume without higher costs and increases ability to control the firm"* (Mihi Ramírez et al. 2012). Nevertheless, this limits the scope of this type of flexibility to an operational level of the firm. Due to the essential role played by information in structuring and managing the implementation of strategies, the configuration of the organizations as well as relationships among the supply chain partners, it is important to adopt a wider perspective of this type of flexibility to include the whole supply chain. The distribution of information flexibility, in the supply chain, supports the integration of information within the functions inside the firm as well as among the supply chain partners (Kenney and Gudergan 2006). This integration involves various types, modes and sources of knowledge in relation to the strategic resources and capabilities of the firm (Mihi Ramírez et al. 2012). It further involves the knowledge integration referred to markets, customers, products, and services, which is distributed to the personnel, systems, operations, and processes of both, the focal firm and its supply chain partners. This knowledge integration capability enables higher levels of organizational flexibility to adapt to the changes in the business environment (Volberda 1997; Grant 1999). This capability is part of the distribution of information flexibility, in addition to the use of further knowledge to restructure the current knowledge. Furthermore, the learning outcomes from the knowledge creation processes are necessary to generate new operations, tactics and

strategies in logistics which will promote the development of further supply chain capabilities (Esper et al. 2007). Hence, the management of knowledge, including organization learning, offers the continuous process of developing new knowledge and the enhancing the use of resources as well as capabilities to enhance the flexibility within the supply chain. However, as the firms commit their efforts in a relationship to gain experience, knowledge and information, this generates dependence among them, decreasing the flexibility to reconfigure the structure of the supply chain as 'dependency is an unavoidable by-product of a beneficial relationship' (Johanson and Vahlne 2009).

The internal and external alignment of firms with their supply chain partners is crucial (Lee 2004). From a strategic point of view, business processes including marketing, manufacturing, logistics, and purchasing, are required to be in adjusted inside the firm as well within the supply chain partners to reach a competitive advantage (Dwayne Whitten et al. 2012). Hence, it is essential to develop organization flexibility to achieve the required alignment (Section 2.4.3). Integrating and synchronizing the logistics capabilities is needed to enable the alignment across the supply chain (Mentzer et al. 2004; Mandal 2016). Particularly, sharing information as well as knowledge allows spreading costs, risk and benefits among all the supply chain partners (Dwayne Whitten et al. 2012). Finally, the achievement of a sustainable competitive advantage is the consequence of organizational learning (Mentzer et al. 2004; Esper et al. 2007) as well as flexibility (Volberda 2003; Dreyer and Grønhaug 2004; Singh and Acharya 2013) among other elements. Therefore, this discussion points to the initial statement of this integrative conceptual model:

> *S1. The knowledge-management relational function (Know-MaRF) is the core function to manage the processes and capabilities to gain market knowledge to define the internationalization strategy as well as the required logistics capabilities and SCF (dimensions and levels), inside the SME and with its supply chain partners.*

3.2.1.2 Market-management relational function for SMEs internationalization (Mar-MaRF)

Internationalization has become a relevant strategy for the development and growth of several SMEs, despite the inherent high-risk of this strategy (Leonidou 2004). Having an international orientation constitutes an advantage in relation to the competitors that prefer to operate only in domestic markets. Indeed, the survival of many SMEs depends on their success in international markets due to the small size or saturation of local markets. Research has shown

that the number of SMEs involved in international business, particularly through export marketing strategy, has increased during the last decades (World Trade Organization Secretariat 2016). Furthermore, the achievement of internationalization goals (i.e. geographic scope, speed, and intensity) depends on to the internationalization strategy adopted by the SMEs. The strategies adopted depend on the resources and capabilities of the firm (e.g. market knowledge, opportunity recognition capability, internationalization capability, networking capability, production capacity) as well as the resources, capabilities and structure at its service in the business network and its position in the international market (Section 2.2). Therefore, it is necessary to manage the implementation of the marketing and distribution strategies as well as the process, capabilities and resources related to it through the market-management relational function (Mar-MaRF).

Different marketing strategies have been analyzed in the literature. It has been studied to identify the drivers of the behavior of exporting firm's (Sousa et al. 2008; Cadogan et al. 2012), its impact on export performance (Johanson and Vahlne 1990; Francis and Collins-Dodd 2000; Freiling and Schelhowe 2014), the adoption of international niche strategies by SMEs (Moore and Manring 2009; Dimitratos et al. 2011; Roitzsch et al. 2012), or born global firms (Sharma and Blomstermo 2003; Crick 2009; Cavusgil and Knight 2015). Nevertheless, the export marketing strategy has been recognized as the most relevant factor of export performance (Cavusgil and Zou 1994; Botero Mesa et al. 2012; Zhang et al. 2014; Gonzalez-Perez et al. 2016). Given the impact of implementing an internationalization strategy in relation to the firm's performance in international markets, it is critical that the firm adopts the appropriate strategy in accordance with the internal and external condition of the business environment. With respect to the export marketing strategy, Cavusgil and Zou (1994) presented a conceptual framework based on the co-alignment of the export marketing strategy and export performance (Figure 3-4).

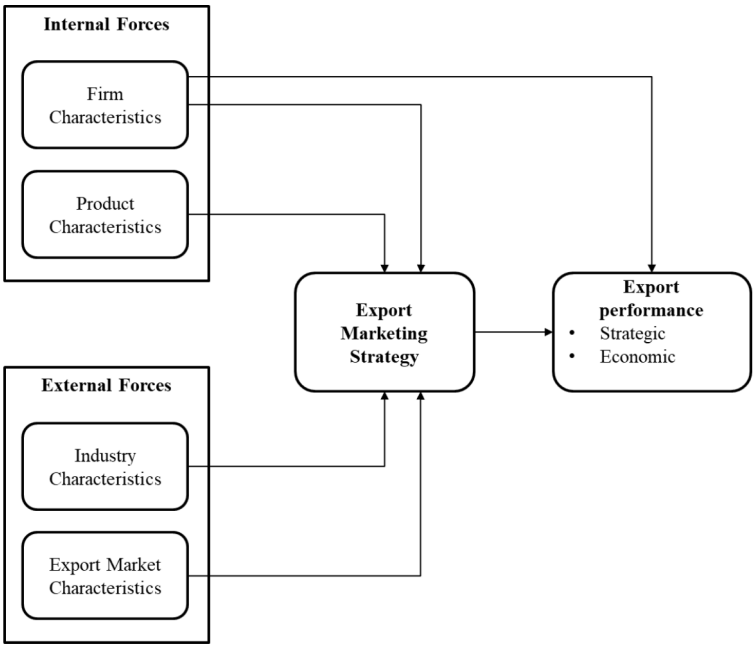

Figure 3-4 Export marketing strategy and performance
Source: Cavusgil and Zou (1994)

The authors tested empirically the model by using path analysis. The findings supported their contention that firm's international capabilities and export marketing strategy constitute core determinants of export performance. The marketing strategy has to be aligned with the internal forces or variables (i.e. the characteristics of the firm as well as the features of the product) and the external forces (i.e. the characteristics of the industry and the export market). Furthermore, the export performance[10] of the venture depends on both, the marketing strategy as well as the characteristics of the firm (e.g. the ability of the firm to execute the selected strategy). The internationalization capability of firm enables it to identify better foreign markets conditions, choose the best markets, articulate the appropriate marketing strategy, and implement it effectively (Cavusgil and Zou 1994; Vahlne and Johanson 2013). It also comprises the commitment to the internationalization strategy and the support to distribution channels. Further, when designing the marketing strategy, it is necessary to consider the degree of marketing adaptation or standardization in function of the organization, product, market and industry features. Product standardization or adaptation represents a critical variable, especially in the case of export marketing strategy. The requirements related to

[10] The authors referred to the export performance as the extent of the firm´s goals achievement through defining and implementing the export marketing strategy with respect to the exported product into an international market. The goals are strategic (i.e. expansion of the market, increasing the awareness of firm/product, hold or gain a position in foreign market) and economic (i.e. costs, sales or profits).

product safety, quality standards, technical specification, recycling among others, might differ on each foreign market according with its legislation and customer preferences. The firm has to be capable to adapt the product according to these requirements as well as defining the required differentiation to succeed in those markets (O'Cass and Julian 2003; Rundh 2011).

The international distribution network also constitutes a critical variable to include when designing the marketing strategy. Moreover, the degree of vertical integration across the supply chain might also represent a challenge for an SME to participate in international markets (Rundh 2011). The international distribution strategy depends on the capabilities and resources of the firm and it might lead to flexible and speed distribution forms (i.e. collaborative or independent) or high market control (i.e. sales subsidiaries) (Di Maria and Ganau 2017). Hence, selecting the suitable international distribution strategy constitute a critical decision for SMEs regarding their limited resources and capabilities. The development of agreements-based distribution forms represents a strategic alternative for SMEs to reduce the risk by the explicit export commitment and orientation to collaborative internationalization efforts among the parts involved (Contractor and Lorange 2002; Hessels and Parker 2013). Thus, these forms of international networks support SMEs to reach two goals at the same time, maintaining their typical flexibility while overcoming the lacks related to their size (Hutchinson et al. 2005). In an empirical study conducted among a large group of Italian manufacturing SMEs, Di Maria and Ganau (2017) found a positive impact of choosing the appropriate distribution strategy (i.e. set the distribution strategy regarding the internal resources of the firm as well as the market conditions) on the export performance measured in terms of export diversification (geographic scope) and intensity. With respect to intensity, collaborative forms of distribution are largely used by SMEs as a mean to access to external resources, sustain their participation in international markets and constitute a driver for export turnover. In line with Vahlne and Johanson (2013), their results also confirmed the importance of networking opportunities to gain market knowledge. In relation to SMEs' export diversification the author emphasized the need of additional internal capabilities to address the complexity of managing diverse markets and the relevance of agreements-based distribution for export diversification. However, based on the characteristics of the international target market, SMEs require the capability to identify the appropriate partner in that market to establish collaborative exchanges. The horizontal integration is also an important strategy to be considered by using local networks (i.e. export consortia) as a way to overcome the liability of outsidership.

The norms, cultural values, and non-trade barriers have to be included when defining the marketing strategy to meet the requirements of the foreign market (Rundh 2011). This is critical especially when there is a large liability of foreignness among the target markets and the firm (Johanson and Vahlne 1977). Hence, it is important to gain the related market knowledge to reduce the liability of foreignness. Costs, price and investments are crucial variables as they are affected by several factors and they have a direct impact on the profit and competitive position of the international venture (Rundh 2011; Cadogan et al. 2012; Di Maria and Ganau 2017). To develop collaborative internationalization efforts as well as vertical and horizontal integration is it necessary to build trust and committed relationship between the SMEs and their partners in the business network (Johanson and Vahlne 2009).

The competitive, uncertain and changing market conditions need to be addressed by the distribution and marketing strategy. Including strategies to increase the flexibility among the SMEs and its supply chain partners will allow them to overcome this challenging environment. Providing a rapid and effective response to demand customers or aligning and adjusting the product /distribution conditions as required by the foreign market's authorities represent examples on which increasing SCF constitute an important strategy to address them. The firm and the whole supply chain need to evaluate the information at their service and provide a response as efficient and rapid as the available resources enable them. It is important that all the stages in the supply chain are aligned to react on market figures and sales. Although flexibility is a complex and multi-dimensional concept (see Sections 2.4.2 and 2.4.3), it is important to identify and leverage the necessary dimensions to meet the conditions of the foreign market. This is possible by the available resources, skilled workforce, technologies, and information inside the SMEs as well as within the supply chain partners. With respect to marketing flexibility, it is crucial to establish a close relationship with the customer to understand its behavior and preferences to be able to act on time which constitute the responsiveness to the requirements of the customer and variations in market environment.

In light of the aforesaid, it is required to develop suitable mechanisms to exchange relevant information among the supply chain partner to develop suitable marketing and distribution strategies. Furthermore, it is needed the collaborative efforts among them to succeed in the implementation of the selected strategies. Therefore, the development of DMCs, the implementation of IMCs, and the integration of logistics capabilities ILCs (Sections 2.5.1, 2.5.3 and 2.5.4) constitute a critical task of this relational function. The coordination of the

flow of information is a key element for a timely and effective delivery of customer order. Furthermore, the information that results from the close relationship with the customer needs to be analyzed to enhance the marketing strategies. This analysis should involve the key partners of the supply chain to ensure an accurate use of the information. Finally, the degree of execution of these tasks depends on the level of trust and commitment among the supply chain partners. This leads to the following statement:

> *S2. The market-management relational function (Mar-MaRF) manages the design and implementation of the marketing and distribution strategies according to the available resources and integration of logistics capabilities to achieve the required dimensions and degree of flexibility inside the SME and within its supply chain partners to reach the internationalization goals.*

3.2.1.3 Resource-management relational function for SMEs internationalization (Res-MaRF)

The capability of opportunity recognition (see Section 3.2.1.1) as well as the design of marketing and distribution strategies (Section 3.2.1.2) depends largely on available resources among the SME and its supply chain partners. Hence, it is important the right leverage of these resources, limited in the case of most SMEs, to them in order to reach the internationalization goals and strategies.

The resource-management relational function (Res-MaRF) sets suitable strategies and processes for acquiring, developing, adapting, coordinating and integrating the supply and use of the available resources within the supply chain network. There is an extensive literature recognizing the key role of business networks in enabling SMEs to develop their limited resources by accessing to the resources at their service in the network (Pihkala et al. 1999; Johanson and Vahlne 2009; Cadogan et al. 2012; Bianchi and Wickramasekera 2013; Vahlne and Johanson 2013; Felzensztein et al. 2015; Di Maria and Ganau 2017). However, the degree of accessibility to highly specialized and transferable resources (except the most strategic), which are available to certain extent through network relationships, is contingent on the networking capabilities of the firm (Section 3.2.1.4). The access and coordination of these resources begin by identifying firm's own resources and capabilities as well as the potential available resources and capabilities from the supply chain partners. This knowledge constitutes the foundation for the allocation strategy for those resources.

The decisions related to the allocation and the uses of the available resources need to align with the achievement of the both operational and marketing strategies. As the knowledge and commitment increase among the supply chain partner, the riskier but also highly beneficial these decisions become (Oviatt and McDougall 2005). Adopting an entrepreneurial orientation (Section 2.2.3) might lead to optimizing the decision of entry mode according to the opportunities in the business environment and the constraints on resources (Felzensztein et al. 2015). In order to leverage the use of those potential resources, it is necessary to coordinate SMEs' own resource with the ones of their partners to gain a mutual benefit. The main goal of coordinating the use of those resources across the business network is to piece together productivity (Johanson and Vahlne 2009). However, this represents a challenge as it requires the management of the operations and activities of each party involved (Hohenthal 2006; Allred et al. 2011). As the international operations take part in various countries, it becomes more difficult to manage those resources across the business networks. In addition, the liability of foreignness also affects the effective coordination between the parties. This brings to light the need of the appropriate capabilities to manage the possible allocation of resources and responsibilities among the network structure (Johanson and Vahlne 2009). Hence, by adopting a SCO and SCM practices, particularly SCF, SMEs will be able to effectively manage the available resources in coordination with its supply chain partners.

To manage the allocation and use of the available resources within the supply chain depends on the degree of flexibility of those resources. Resource flexibility has been conceptualized as the degree of commitment of those resources to a particular operation, process or market (Johanson and Vahlne 1977). It includes the time and cost that reallocating the resources will represent (Yavuz et al. 2016). Furthermore, it is also necessary the capability to recognize the opportunities upstream, to develop new providers, as well as downstream, to adopt the appropriate inventory policy, for increasing the SCF. Hence, logistics flexibility, sourcing flexibility and production flexibility (Section 2.4.3) need to be considered due to their impact on the quantity, time and cost to allocate, reallocate, adjusting and aligning the resources within the supply chain. The implementation of SCF strategies enhance the alignment of resource allocation, the ability to ship and receive goods effectively and rapidly in case of any fluctuation or change upstream or downstream (Prater et al. 2001; Stevenson and Spring 2007; Singh and Acharya 2013).

From the RBV of the firm points out to importance of the decision to define the configuration of supply chain and firm resources as a mean to reach superior performance as well as a

sustainable competitive advantage (Barney 1991). Nevertheless, integrating these resources within the supply chain partners demands collaborative efforts as well as high levels of coordination. With this in view, developing logistics capabilities within the supply chain network represents a crucial task. Esper et al. (2007) recognized the importance of increasing logistics capabilities inside the firm in coordination with the supply chain network. This might contribute to reach a sustainable internationalization strategy due to its positive impact on reducing the total operational cost across the supply chain, optimize the allocation of products, resources, and operations, enabling standardization, modularization and postponement strategies. In this light, the trust and commitment among the partners will stimulate and reinforce the efforts to develop the logistics capabilities. In conclusion, the main goal of the Res-MaRF is to optimize the use of the available resource to attend appropriately customers' demand. Thus,

> *S3. The resource-management relational function (Res-MaRF) manages the flexibility, allocation, and use of the resources inside the SME and in coordination with its supply chain partners to align them according to the operation and marketing strategies.*

3.2.1.4 Network-management relational function for SMEs internationalization (Net-MaRF)

Nowadays, to survive in competitive scenario, it is vital the coordination and integration of strategies, processes and capabilities among the firms that take part in a supply chain network (Mentzer et al. 2001; Christopher 2016). It is even more critical in the case of firms performing in foreign markets. The firms need to evaluate the conditions, opportunities and the access to an international market as well as its capability to address the urgency in making strategic decisions (Etemad 2004; Vahlne and Johanson 2013) (see Section 2.2). These strategic decisions include market selection, production mix, capacity and volume, product features, innovation or adaptation of the products, adaptability to new requirements for trading, among others. This emphasizes the importance of the supply chain network configuration due to its direct impact on how the firm and the supply chain partners will serve and perform in international markets (Johanson and Vahlne 2009).

In light of the aforementioned, the network-management relational function (Net-MaRF) leads the networking processes of the firm in order to develop strategical relationships within the international business context (see Table 3-1). The internalization strategy of a firm is influenced by the relationships and position of the firm within the business network.

Therefore, the Net-MaRF manages the networking processes of SMEs to enhance their relationships and position in the supply chain and reach their internationalization goals. A firm willing to be involved in internationalization markets needs to be well positioned in one or more networks to succeed. In other words, the firm needs to be an *'insider'* in relevant networks. If the firm has non relationship that supports a relevant position in the network, then the firm is an *'outsider'* (Johanson and Vahlne 2009). Under these circumstances, the firm might face both, the *'liability of outsidership'* and the liability of foreignness. Therefore, this managerial function depends on the networking capabilities of the firm to overcome the *"outsidership in relation to the relevant network"* (Johanson and Vahlne 2009).

Networking capabilities were defined by Pihkala et al. (1999) as the *"abilities such as communicating skills, cooperativeness, ability to share a vision, trust, ability to act as a network broker, customer orientation, ability to use market information, knowledge of co-operative arrangements and market orientation"*. Compared to large enterprises, SMEs are more vulnerable when internationalizing due to their limited resources (financial and others) that increases the risk of their internationalization process as they lack a backup to face market fluctuations. Several SMEs mostly serve international markets with the same product without distinction where these markets are geographically located. In addition, they also search for a counterpart to their competencies in the foreign market (Oviatt and McDougall 1994; Weerawardena et al. 2007). There is an extensive literature showing the importance of networking processes during the internationalization of a firm (Welch and Welch 1996; Coviello and Munro 1997; Ellis 2000; Chetty and Patterson 2002; Musteen et al. 2014; Felzensztein et al. 2015; Nyuur et al. 2018). Additionally, these relationships are grounded in social exchange processes which involve continuous and sequential interactions among the participant firms (Johanson and Vahlne 2009). These processes lead to build trust and create knowledge, and in the long run increase the degree of commitment. Furthermore, studies have also revealed that firms maintain strong, lasting and close relationship with their relevant clients and providers (Daszkiewicz and Wach 2012). It is high probable that those firms are involved in a series of further business relationships, operating in a network sharing information, knowledge, resources, strategies, and goals. Then, this constitutes a supply chain network when the upstream and downstream linkages perform such exchanges.

This relational function also manages exchanges and interactions among the firms allowing the access to highly transferable and specialized resources as well as information available in the network where the firms are embedded. Furthermore, the Net-MaRF is responsible for

enhancing the development of the capability to recognize opportunities y generating collaborative efforts in that regard (Johanson and Vahlne 2009). Networking processes accelerate the processes of acquiring market knowledge, internationalization learning, implementing of new processes, technologies, and methods, and developing capabilities and experience, to take advantage of externalities and compete against more established and larger rivals in foreign markets (Ellis 2000; Felzensztein et al. 2014). Indeed, international networks play a significant role in the penetration goals in foreign markets (Johanson and Vahlne 2009). In addition, the networking processes prompt the productivity, creativity and innovation inside the firm and across the supply chain network (Johanson and Vahlne 2009; Love and Roper 2015). Developing networking capabilities is an essential process to gain a strategic position in the supply chain network and overcome the lack of tangible resources. Johanson and Vahlne (1990) acknowledged the impact of the network's degree of internationalization as well as the degree of competitiveness, on the degree of internationalization and competitiveness of the firm (see Section 2.2.2). In fact, Musteen et al. (2014) found that the '*international network tie strength'* has a positive indirect impact on the performance of the first internationalization project through the obtained marked knowledge. Hence, the relationships of the firm among its supply chain partners constitute an incentive for the internationalization process of the firm.

Networks are important to develop and test new ideas, garner resources, and recognize opportunities to design new organizational structures in accordance with the business environment (Weerawardena et al. 2007). Networks constitute a source of relevant information that provides critical elements to lower the impact of the uncertainty and risk intrinsic to internationalization processes. Liesch et al. (2002) recognized the importance of developing and maintaining effective, significant and superior networks as a key element to succeed in international markets. However, there are important considerations to bear in mind when designing new organizational structures, in this case a supply chain network. Thus, the Net-MaRF coordinates the process to design the required supply chain structure according to the needs on each foreign market. The goal of supply chain network design (SCND) is to plan an effective and efficient network structure in the supply chain, for a new entry or exit of an entity or to re-engineer the current network, for raising its total value and achieving the pursued strategies and goals. Decisions regarding location, chain's tire number, facilities capacity, and raw material/product flows across the network structure have to be integrated in the design. Market conditions and environment uncertainties drive the decisions with respect of some of these variables. From the literature, three levels of decisions, i.e. operational,

tactical and strategic, have been identified and summarized in Figure 3-5 (Farahani et al. 2014).

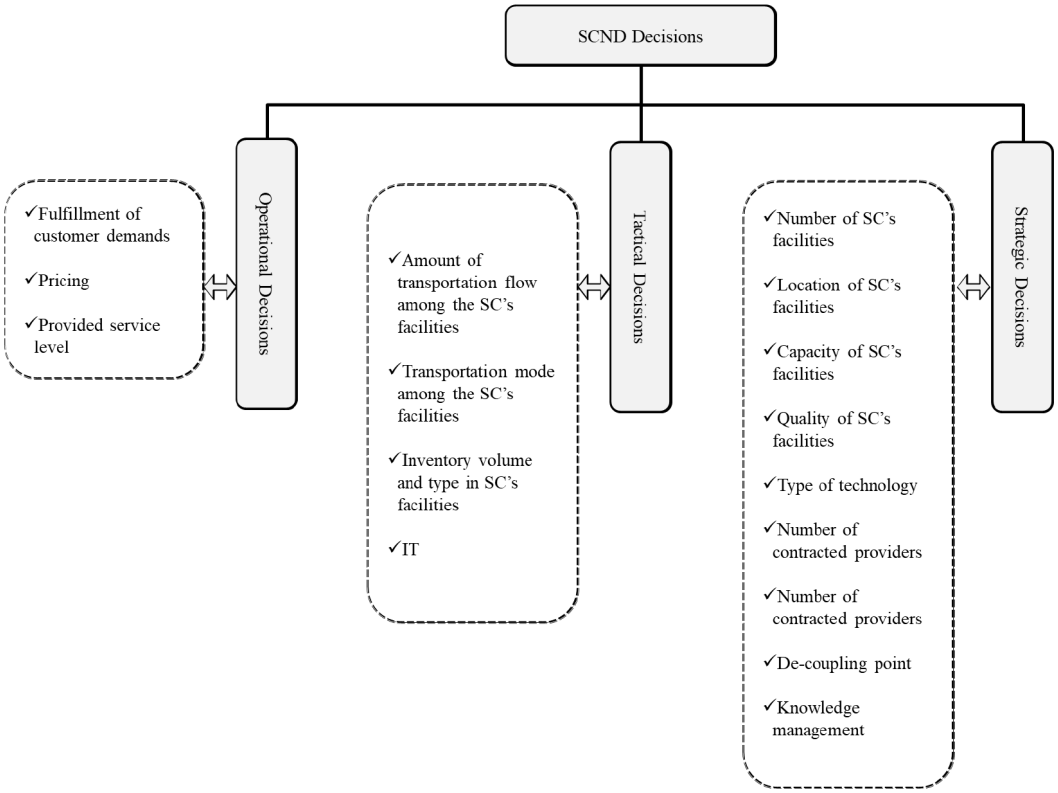

Figure 3-5 Decision levels in SCND
Source: Farahani et al. (2014)

The design of the supply chain is also determined by the flexibility within the supply chain (see Section 2.4.3). To develop flexible strategies, firms need to integrate both demand and supply sides and implement flexible process among the partners. Furthermore, flexibility is an essential capability to prompt cooperation among exporting partner as it leads to effectively implement marketing strategies and improve the performance (Cavusgil and Zou 1994; Zhang et al. 2014). Thus, to gain flexibility among the supply chain it is required the alignment among supply chain partners which is possible due to a mutual understanding (Martínez Sánchez and Pérez Pérez 2005). Flexibility is a desirable capability in the supply chain as it is perceived as a mean of attaining fast and/or on-time response and delivery of the right volume and quality of product or services at the appropriate price. Stevenson and Spring (2009) conducted an empirical study to identify the inter-firm practices used in the context of buyer-supplier SCF and how those practices affect the flexibility among the partners and the

configuration of the supply chain. The authors found multiple SCF practices and grouped then into ten categories (Figure 3-6).

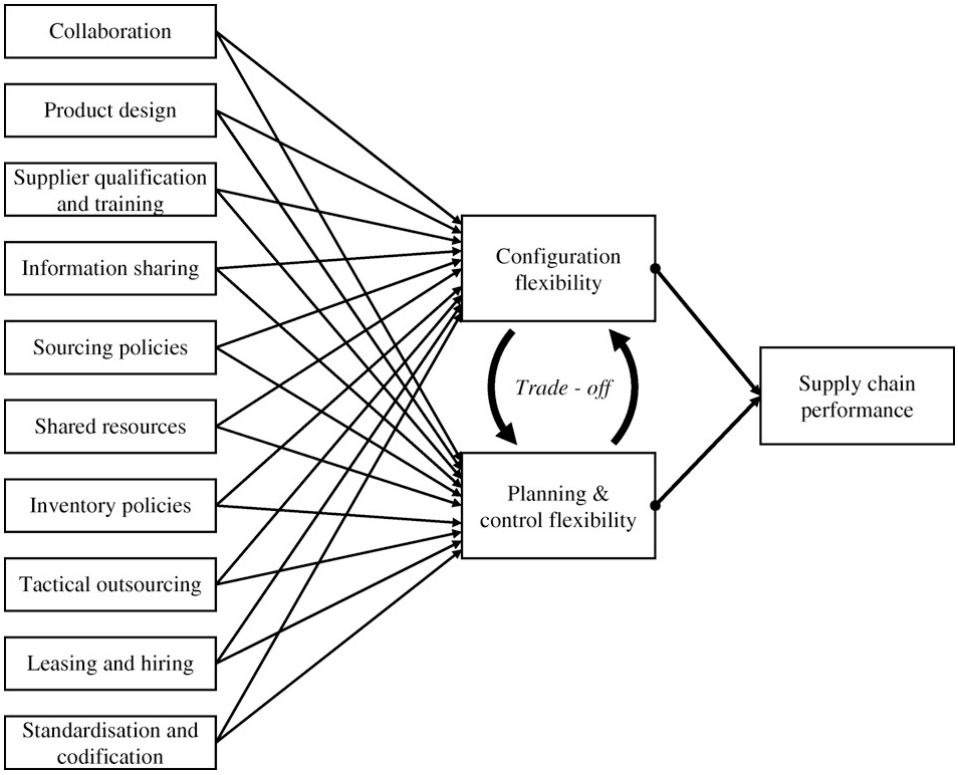

Figure 3-6 SCF practices and trade-offs
Source: Stevenson and Spring (2009)

The author identified that the firms use tactical outsourcing to reduce their internal need of flexibility. They also recognized that firms enhance SCF by developing committed relationships with strategic counterparts. However, firms make complex trade-off between *'configuration flexibility'* (i.e. the ability to shift partners) and *'planning and control flexibility'* (i.e. the ability to modify the design, volume, and timing of supply).

Firm willing to incorporate strategies of supply chain requires necessarily a supply chain orientation and the strategies at the firm level must be consistent whit its orientation to the supply chain and its *"objective of competing through agile response"* (Gligor 2014). In international markets, the supply chain network needs to be flexible enough to capture and cope with the dynamics and uncertainty of those markets. Hence, by adopting a supply chain orientation to join collaborative efforts and integration across the supply chain, manufacturing firms are capable to maintain a competitive advantage in global markets (Omar et al. 2012).

Hua et al. (2009) found that the flexibility co-alignment perceived between suppliers and distributors leads to trust among the partners and this trust enhances the overall performance. The authors also found that the increase of trust leads to higher levels of flexibility among the suppliers and distributors, which means that there is a reinforcing relationship among these two counterparts. The social attributes of trust and commitment have a direct positive impact on integrated logistics capabilities which in turn positively impact on SCF and the performance of the whole supply chain (Mandal 2016). Moreover, the perceived supplier dependency as a result of a commitment relationship in the supply chain has a positive relation with SCF (Martínez Sánchez and Pérez Pérez 2005). Developing logistics capabilities allows an even more effective and committed relationship to exchange information and share efforts, resources and risks (Mentzer et al. 2004; Prajogo and Olhager 2012; Gligor and Holcomb 2014b). These capabilities generate value-added activities enhancing the adoption of differentiation strategies (Mentzer et al. 2004; Gligor and Holcomb 2012; Wu et al. 2014). The integration of logistics capabilities within the supply and demand sides of the supply chain improves the management of supply and demand activities to create superior customer value and reduce the overall costs (Esper et al. 2010; Gligor 2014; Gligor and Holcomb 2014b; Mandal 2015). Therefore, based on the preceding discussion it is presented the following statement:

> *S4. The network-management relational function (Net-MaRF) coordinates and integrates networking- and logistics- capabilities as well as the processes for structuring the supply chain network to align the required SCF (dimensions and levels) with the internationalization strategies and goals.*

3.2.1.5 Innovation-management relational function for SMEs internationalization (Inn-MaRF)

The development of new products as well as the adoption of them according to the requirements of different foreign markets represents a critical issue for SMEs as it might determine their survival and growth in those markets. Nevertheless, SMEs need to optimize their costs at the same time as been innovative (Hanna and Walsh 2002). In comparison with large enterprises, SMEs need to cope with several issues regarding their process of innovation. For instance, SMEs usually cope with skilled workforce bottlenecks, financial and technological constraints, among others. However, they have the advantages of been more flexible and entrepreneurial among other attributes. Indeed, *"the relative strengths of large business are predominantly material (economies of scale and scope, financial and*

technological resources, etc.), while those of small firms are mostly behavioral (entrepreneurial dynamism, flexibility, efficiency, proximity to the market, motivation)" (Vossen 1998). SMEs' strengths in terms of exporting and innovation are related to their entrepreneurial behavior of risk taking, been flexible to give a rapid response to new market opportunities (Love and Roper 2015).

The issues faced by SMEs in their innovation processes impact on their innovation performance, i.e. the outcome achieved after the new product development process (Pullen et al. 2009). Nevertheless, it has been recognized the relevant role of innovation performance in achieving SMEs competitive advantage (O 'regan et al. 2006; Pullen et al. 2009; Jin et al. 2014). Thus, SMEs require finding a mean to increase their level of innovation performance. Furthermore, the combination of resources and organizational characteristics are relevant denominators for organization's innovation performance. In this sense, (Pullen et al. 2009) identified the necessity of aligning SMEs internationalization strategy with the processes of new product development (i.e. formalization, marketing R&D, and integration), and the internal organization with SMEs environment. Furthermore, with respect to the business model concept[11] , it is assumed that the linkages among business elements (i.e. core competitive capabilities, innovation and network relationships) need to be in line with the competitive strategy of the firm (Onetti et al. 2012). The literature on international entrepreneurial orientation suggests that to overcome the liability of foreignness and reach prompt internationalization, international new ventures should be capable to capitalize network relationships by offering innovative products and /or services (Knight and Cavusgil 2004; Coviello 2006). Hence, it is necessary to define a mechanism to coordinate the adaptation of the product or new product development, the resources and capabilities available for that, and integrating the required processes and activities among the supply chain partner to achieve the internationalization strategy (DaSilva and Trkman 2014).

Innovation-management relational function (Inn-MaRF) manages the coordination and integration of market-knowledge, entrepreneurial behavior and the available resources and competences to generate value and differentiation strategies. This involves the coordination of transnational partners within the supply chain network. Duclos et al. (2003) stated that *"a critical need in today's competitive environment is the ability to design and introduce new*

[11] DaSilva and Trkman (2014) argued that 'business models represent a specific combination of resources which through transactions generate value for both customers and the organization'. Business models comprise the integration and configuration of certain business dimensions to create value (Clauss 2017). SMEs are able to create value by combining their resources through internationalization, which also constitute a business model itself (Child et al. 2017).

products as customer's needs, materials and technologies change". Moreover, firms are forced to make strategic planning of its resources and the regime of the innovation with respect to the customer demand and competitors (Lummus et al. 2003). Hence, SMEs as well as the supply chain require adopting an entrepreneurial orientation to design, generate and introduce new products providing a rapid response to the requirements of foreign customers. On his empirical study, (Rundh 2011) found that manufacturing SMEs' capability to offer flexibility, innovative products, and product quality have a positive impact on the export marketing strategy. Moreover, developing SCF constitute a key strategy to face nowadays competitive, uncertain and turbulent markets, particularly in the case of mass customized or innovative products (e.g. high-tech products) (Lummus et al. 2003; Stevenson and Spring 2007). SCF has a direct impact on innovation, which is a key component to reach a competitive advantage (Jin et al. 2014). This is due to both the internal flexibility dimensions that might lead to product innovation (e.g. product development flexibility) and the external dimensions that include having interactions with providers to assist the innovation or adaptation of the product (e.g. supply flexibility, logistics flexibility) (Section 2.4.3).

In developing innovativeness, *"value chain flexibility reflects the current state of embedding process innovation into the supply chain operations and being proactive in managing supply-demand fulfillment"* (Hock Soon and Mohamed Udin 2011). SMEs require defining their functional responsibilities in coordination with its supply chain partners. This task needs to be performed in an effective and rapid fashion. Therefore, developing logistics capabilities across the supply chain will prompt new product/service development, as well as optimize the processes to achieve a competitive advantage through differentiation strategies (Esper et al. 2007; Liao and Marsillac 2015). In addition, as higher as the levels of market knowledge, trust, and commitment are, the more innovative and efficient processes will be Johanson and Vahlne (2009). To develop new products within the supply chain, it is necessary to have a committed relationship to support the risky decisions and responsibilities that innovative processes demand. Particularly, the development of IMCs across the supply chain plays a critical role when developing new products and increasing new product flexibility to obtain the required knowledge and align the actions to the marketing strategy in this respect (Liao and Marsillac 2015). On the other hand, customer integration and supplier integration have positive impact on new product performance through the mediating for manufacturing flexibility, trust and commitment (He et al. 2014).

Bearing the previous discussion, two statements are positing:

S5. The innovation-management relational function (Inn-MaRF) manages the processes to develop SCF strategies as well as logistics capabilities within the supply chain to increase SMEs' innovativeness and support new product development in line to the internationalization (marketing) strategy.

S6. The five relational functions for managing SMEs internationalization interact among them to coordinate the alignment of the decision-making process, activities, resources, logistics capabilities and SCF strategies within SMEs and their supply chain partner to achieve a sustainable competitive advantage for internationalization.

3.2.2 Trust and commitment as enablers of supply chain dynamic capabilities for SMEs internationalization

In order to achieve the goals of the internationalization strategies in the context of a supply chain, it is necessary to identify the role of trust and commitment in enhancing the effectiveness and efficiency of complex social networks such as supply chain (Section 2.6). When analyzing the aforesaid internationalization relational functions, it seems that these two social attributes, i.e. trust and commitment, act as enablers of the exchange processes among the presented functions, e.g. creating and transferring tacit market knowledge, designing and launching new products abroad, defining the supply chain network structure, developing supplier flexibility. Johanson and Vahlne (2009) recognized the role of trust- and commitment- building as two preconditions necessary for internationalization. The authors explicitly included these social attributes in their network approach of internationalization (Section 2.2.2). The internationalization process of a firm is the result of the sum of trust and commitment among the different actors of this process, e.g. the trust of the firm in its suppliers and the commitment of the suppliers to the firm that allows their aggregated commitment to the customers in foreign markets. Trust and commitment are key factor for the firm to overcome the liability of foreignness among the parties as well as to gain an inside position in the supply chain network to effectively access to these resources and information (Johanson and Vahlne 2009). It is also important to emphasize that *"when both commitment and trust – not just one or the other – are present, they produce outcomes that promote efficiency, productivity and effectiveness"* (Morgan and Hunt 1994). Trust prompts entities to share information and join efforts to overcome uncertain circumstances. It plays a critical role during the early phases of a relationship, which might lead to more committed relationships to

jointly explore and undertake internationalization opportunities as *"trust is a major determinant of commitment"* (Morgan and Hunt 1994).

Mentzer et al. (2001) identified trust and commitment among SCM antecedents (Section 2.3.2) to enhance the adoption of SCO. The authors argued that trust has an impact on enhancing cooperative relationships as well as coping with risks and difficulties. Further, commitment constitutes a key component for long-term relationship success that is a necessary element to achieve SCM goals by prompting empowerment and resources commitment. In regard to logistics capabilities, trust and commitment are crucial components for establishing logistics alliances and supply chain integration (Moore 1998; Omar et al. 2012; Day et al. 2013). Therefore, it is necessary to set a trustful relationship among the supply chain partners as the trust built among them will motivate cooperative efforts. A higher trust in the partnership might lead to more open communication and disposition to make risk decisions (Hua et al. 2009; Wu et al. 2014). To embrace risk decisions, the firms will compromise its efforts leading to a more committed relationship.

Within the RBV, trust is recognized as a fundamental precursor to develop suppliers and relational capital (Barney 1991; Mahoney 1995; Chen and Barnes 2007). High levels of trust among the relationships result in relevant benefits for the partners within the supply chain such as boosting relationship satisfaction, improving firm performance, overall increasing cooperative efforts, reducing relational conflicts, lowering cost of governance (Moore 1998; Handfield and Bechtel 2002; Dyer and Chu 2003; Johnston et al. 2004; Day et al. 2013; Mandal 2016). Furthermore, with respect to the relational view (RV), trust has been recognized as a key construct as it serve as a node of internal and inter organizational interactions and processes as well as lead the establishment of further relational capital (Madhok 2002; Day et al. 2013). The RV formulates on the RBV of the firm as it recognize that irreplaceable relationships constitute a source of competitive advantage (Dyer and Singh 1998). Further, the RV includes four elements of competitive advantage among the firms, i.e. the routines for sharing knowledge, the specific assets within the relation, effective governance and the access to complementary capabilities and resources.

The RV perspective considers relational advantages among the firms such as the relationships among the supply chain partners (Palmatier et al. 2007; Omar et al. 2012; Day et al. 2013; Gligor and Holcomb 2014b). According to the RV, *"relational advantage accrues to firms best able to invest in key relationships to enhance partner capabilities through inter-firm learning"* (Day et al. 2013). This points out to the commitment resulting from increasing

relational advantage. When implementing SCM practices, it is necessary to identify relationships to commit with to join efforts for reducing transaction cost and enhancing competitiveness to achieve mutual long-term benefits. Hence, trust and commitment play a key role in the development of the relational capital, enhancing the development of further capabilities and resources within the supply chain partners. The degrees of flexibility and logistics capabilities within the supply chain largely depend on the relational capital of the firms.

> *S7. Trust and commitment leverage the governance and decision-making processes among the supply chain partners to effectively perform the managerial tasks of the internationalization relational functions and the development of SCF and logistics capabilities.*

3.2.3 Logistics capabilities as enablers of SCF

For the purpose of these work, it is necessary to acknowledge the role of logistics capabilities in the development of further supply chain capabilities such as SCF. In Section 2.5, it has been presented a comprehensive analysis of logistics capabilities. They have been identified as a source of flexibility to cope with the uncertainties present in the supply chain environment (Novillo and Haasis 2017). The alignment and coordination of the logistics capabilities presents in the supply chain partners will increase the flexibility among them. This understanding will provide further elements to understand the relationship between logistics capabilities and the achievement of SCF strategies regarding SMEs internationalization. From a supply chain perspective, the integration of logistics capabilities will contribute to develop further supply chain capabilities (Mentzer et al. 2004; Gligor and Holcomb 2014a). In an empirical research conducted by Mandal (2016), the author identified a positive influence of integrated logistics capabilities and SCF. The author argued that ILCs improve planning actions to meet contingencies in a proactive way enhancing the development of SCF. In a large-scale survey, Jin et al. (2014) analyzed the effects of IMLs, particularly information-technology infrastructure, as enablers of information sharing and SCF in a manufacturer's supply chain. Their findings suggest that information-technology enabled sharing capability acts as a predecessor for improving SCF. From the integrative analysis of Sections 2.4.4 and 2.5, Figure 3-7 depicts the relationship between flexibility drivers, logistic capabilities and SCF.

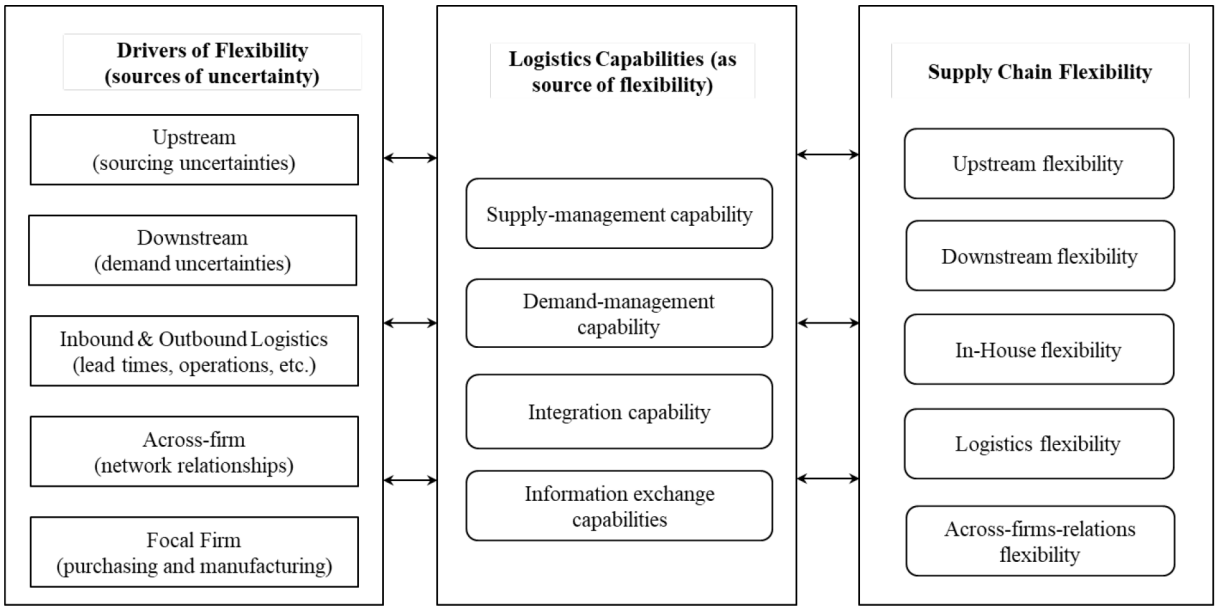

Figure 3-7 Relationship between flexibility drivers, logistics capabilities and SCF
Source: Adapted from Novillo and Haasis (2017)

In a dynamic and uncertain business environment where new paradigms have been set (e.g. supply chain competitive scenario, quality- and time-based competition), logistics capabilities generate competitive advantages such as the enhancement of customer value creation, the assessment of productivity and increases functional effectiveness (Morash et al. 1996; Lynch et al. 2000; Mentzer et al. 2004; Sandberg and Abrahamsson 2011; Gligor and Holcomb 2014b). As logistics has two domains, i.e. internal and external, it has the unique attribute to allow the coordination of internal functional areas of the firms as well as to the external ones (Sections 2.3.1 and 2.5). The internal dimension is responsible for the direct coordination, organization, design and integration of cross-functional processes inside the firm (Morash et al. 1996). Due to its external dimension, logistics allows the firm to expand its boundaries linking its functions with the ones of suppliers and customers (Langley Jr. and Holcomb 1992). Strategically, logistics creates the capability of integrating and synchronizing interdependent operations related to the flow of products, services and information through major functional areas i.e. physical distribution and resource management. This unique attribute allows the firm to create a supply chain capability by the integration of resources, procedures, and systems and operational interfaces to sustain the coordination in the operations *"while decreasing redundancy"* (Mentzer et al. 2004).

The supply chain as a whole as well as each firm within the supply chain has to face diverse sources of uncertainties. In the upstream side, the uncertainties are related to the sourcing (i.e.

the unpredicted events that might interrupt, affect, or disturb the smooth flow of supplies from external factor to the manufacturing firm). These uncertainties refer to factors such as delivery uncertainty, unreliable supplier, supplier dependency, mix-volume uncertainty, unresponsive supplier and risks and disruptions in the material flow due to logistics complexities. With this in view, the development of SMCs, ILCs among the supplier and the focal firm as well as the IMCs constitute a source of upstream flexibility by enhancing the transparency among the parts, information sharing processes, supplier responsiveness and inventory buffers. SMCs promote policies and practices that lead to total-system cost minimization by enhancing the effective management of time and the elimination of wasted capital and inventory. They also enable the capability the effective use of resources to achieve SCF strategies such as JIT purchasing or supply, in-transit inventory bean, direct shipments, supplier market research, multiple sourcing, reconfiguring sourcing network, response buffer (time or capacity), supplier market research, pack product in transit. In the other hand, due to ILCs it is possible to establish collaborative efforts among suppliers and manufacturing firms by developing supplier integrated manufacturing, closer relationships with suppliers, strategic partnership, partnership network, flexible contracts, coordination with downstream processes and functions, coordination on discount policies, and co-packing. The coordination of these SCF practices and strategies are possible through the integration of information technology systems such as electronic data interchange (EDI) or internet platforms, e-logistics, internet of things (IoT), web services, among other, to enable electronic transactions such as order placement and purchasing, real time sourcing planning, tracking and traceability.

On the other hand, the downstream of the supply chain is exposed to demand uncertainties (e.g. forecasting inaccuracies, product mix, seasonality and volatility) due to the unpredicted changes in the consumer behavior. The manufacturing firms have to cope with demand uncertainties by managing the appropriate manufacturing systems, production processes, product design and development, value-creation activities, and inventory policies. The development of internal ILCs enhance plant layout and its flexibility, design, develop and coordinate manufacturing processes for standardization, modularization and postponement speculation. They also improve the flexibility among the functional areas in charge of product design and launch by developing common components, co-design, modularization, packaging design and development. Furthermore, to achieve flexible policies and strategies, it is necessary to implement IMCs that prompt manufacture resource planning (MRP), enterprise resource planning (ERP), product data management (PDM), product lifecycle management (PLM), computer-aided process planning (CADD), computer-aided design (CAD) among

others. To ensure an accurate response to the customer requirements, it is critical the integration of the information and processes between the manufacturers and distributors to coordinate and collaborate for delivering the products in the required conditions to the final customer. ILCs and IMCs provide the support for planning, developing, setting and reconfiguring, distribution centers location, facilities and capacity, Kanban, inventory positioning, time-based pricing, stocking points, delivery modes, frequencies and quantity. Moreover, it is also necessary to develop DMCs among the focal firm, distributors and logistics providers to align the value chain. This will improve the downstream flexibility by allowing the integration of real-time demand information to provide an accurate response to the real time changes of the demand, new product development and launch, as well as maintaining optimal inventory and delivery policies and operations.

The two sides of the supply chain are joined by inbound- and outbound logistics which are also affected by different sources of uncertainties (e.g. lead time uncertainties, delivery conditions uncertainties, delays on logistics operations among others). In order to cope with these issues, it is needed to enhance logistics flexibility by promoting the integration of logistics providers (e.g. 3PL, 4PL) in the SCF strategy. Regarding inbound logistics, SMCs and ILCs enable SCF by enhancing transportation planning and operations with respect to sourcing geographical location, modes of transportation, frequencies, number of carriers and delivery modes, quantity order. These operations are achieved by establishing and coordinating information exchange processes among the parties involved through IMCs. On the other hand, outbound logistics requires the development of ILCs and IMCs to allow the collaboration and information sharing among supply chain partners and 3PL / 4PL, coordination of multiple locations, number and frequencies per delivery mode per product, logistics postponement, cross docking, milk-run deliveries, co-packing, retail consolidation, direct shipments, distribution warehousing capacity and location, structure of control and flexible contracts. IMCs enable the information sharing to reach outbound flexibility through tracking and traceability information-technologies such as radio-frequency identification (RFID), IoT, e-logistics, freight audit among others.

The relationship across the supply chain partners are also affected by uncertainties such as the development of new products, product launch and issues related with sharing information. Therefore, it is required to develop logistics capabilities, especially ILCs and IMCs, to promote collaborative efforts, partnering, supply chain reconfiguration as well as alignment to the shared goals and strategies, and as a consequence enhancing the flexibility among the

supply chain partners. Implementing sales-data sharing' points, automatic and continuous replenishment, B2B collaboration platforms, long-term and short-term flexible contracts, as well as involving the final customer to the chain, formulating rapid partnerships, the willingness to reach a win-win supply chain relationship by all partners and strategic partnership increase SCF within and across the supply chain. IMCs (e.g. IoT, RFID, e-Kanban, EDI) allow the integration and synchronization of information systems, real-time communication, e-commerce, tracking systems and customer services systems.

In light of the previous analysis, this integrative conceptual model presents the following statements:

S8. Logistics capabilities enable SCF across the supply chain and within the supply chain partners. There is a positive impact of logistics capabilities on SCF and they act as antecessor of SCF.

S9. SCF strategies drive the development and implementation of logistics capabilities inside the SMEs and across the supply chain partners.

3.2.4 Logistics capabilities and SCF: supply chain dynamic capabilities

To develop the theoretical arguments of this work, it is important to bear in mind the theoretical foundation with respect to SCF and logistics capabilities presented in Sections 2.4 and 2.5 respectively. Further, a perspective of RBV extended with dynamic capabilities perspective is adopted. The main statement of RBV is that firm's competitive advantages and firm's sustainable competitive advantages are grounded on their rare, valuable, non-substitutable, and imperfectly imitable resources (Barney 1991; Day 1994). On the other hand, effective dynamic capabilities enable temporary advantages allowing the firm to be ahead of competitive forces while enhancing firm's competitive advantage (Teece 2007; Blome et al. 2012). With this in view, for a firm to reach a higher performance it is necessary to develop new processes, generate new products as well as implement new business models and organizational forms (Teece 2007). Therefore, possessing dynamic capabilities enhances firm's supply chain capabilities (e.g. reconfiguration speed, flexibility, agility) while coping with nowadays fast-moving and dynamic international environment (Ambrosini and Bowman 2009). This research embraces logistics capabilities and SCF as a new pattern able to gain a sustainable competitive advantage for the internationalization of manufacturing SMEs.

A fundamental area of study in strategic management is to understand the sources that enable the achievement of sustainable competitive advantages to survive in highly uncertain and competitive scenarios (Porter 1998; Teece 2009; Hill et al. 2014). Figure 3-8 depicts the relationship between the *'strengths-weaknesses-opportunities-threats'* (SWOT) analysis that has been used to analyze how firms gain competitive advantages and sustainable competitive advantage (Barney 1991).

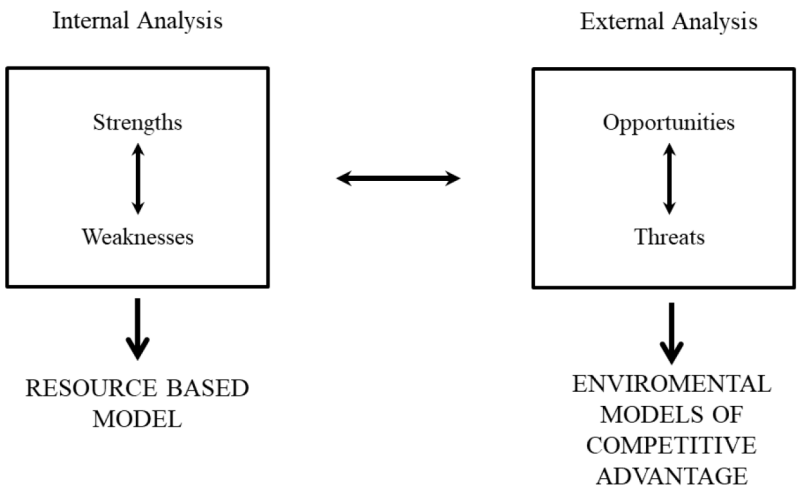

Figure 3-8 A 'SWOT' analysis to gain competitive advantages from the resource based model and models of industry attractiveness

Source: Barney (1991)

This framework proposes that firms gain sustainable competitive advantages by taking environmental opportunities through the development of strategies that enhances firms' internal strengths while overcoming internal weaknesses and minimizing environmental threats. Two main models have emerged from this framework, i.e. environmental models and resource-based model.

The environmental models focus on the environmental conditions that enhance high levels of firm performance (Porter 1980, 1998). For instance, Porter (1980) presented a *'five forces model'* on which provides a systematic description of the about the relationship between the different competitive forces that work at the industry level and the way on which these forces define the profitability among industry segments and different industries. This competitive forces approach might be employed to support the firm defining a position in an industry from where the firm can best bear upon the competitive forces to firm's aims or protect it against them. The impact of the idiosyncratic attributes of the firm received little emphasis on much of these environmental models (Barney 1991; Porter 1998). According to these models, the

resources that are under firm's control and the strategies that the firm pursues, are identical among the firms within an industry (Rumelt 1997). From the environmental models' perspective (Barney 1986; Adegbesan 2009), the resources are homogenous and mobile within the firms in the same industry (i.e. strategic resources can be purchased and exchanged in factor markets (Porter 1980; Barney 1991). On the other hand, resource-based model (also called resource-based view (RBV)) analyzes the relation among the internal attributes of a firm and its performance. This means that from RBV perspective, assume that it is possible to identify the heterogeneity and immobility of firm's strategic resources (Mahoney and Pandian 1992; Amit and Schoemaker 1993; Mahoney 1995) and thus they constitute a source of competitive advantage and sustainable competitive advantage (Barney 2001). Firm and organizational resources involve all the assets, capabilities and competences, knowledge, processes, information, among other attributes that are controlled by the firm/organization to design and implement strategies that enhance its effectiveness and efficiency (Daft et al. 2010). These resources constitute strengths that can be used to design and implement firm/organization strategies (Porter 1998; Etemad 2004).

Barney (1991) analyzed the relation between firm resources and sustainable competitive advantage regarding the postulate that the strategic resources are distributed heterogeneously through the firms and that the differences in the distribution of strategic resources are steady over time. Figure 3-9 presents the framework proposed by the author to synthetizes this relationship.

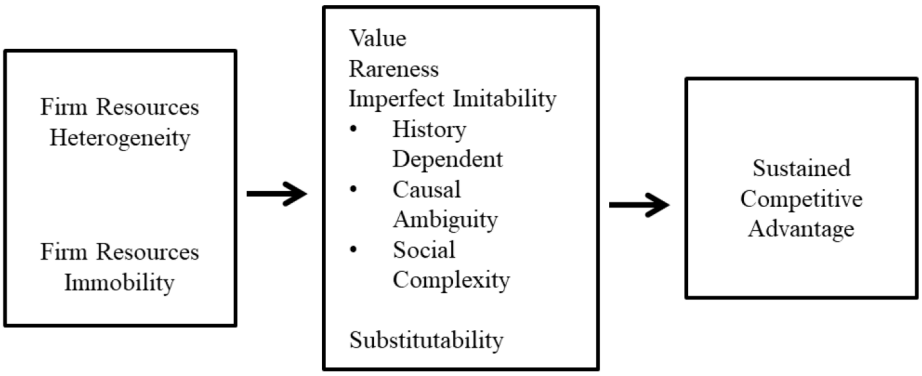

Figure 3-9 Relationship between resource heterogeneity and immobility and sustained competitive advantage

Source: Barney (1991)

First, Barney (1991) defined competitive advantage as the firm capability to *"implement a value creating strategy not simultaneously being implemented by any current or potential*

competitor". Further, the author stated that a sustainable competitive advantage is achieved by a firm when *"it is implementing a value creating strategy not simultaneously being implemented by any current or potential competitors and when these other firms are unable to duplicate the benefits of this strategy"*. For a strategy to become a sustainable competitive advantage depends on the probability that it can be duplicated by the competitors (Barney 1991; Rumelt 1997). Therefore, a strategic resource to be source of sustainable competitive advantage has to be immobile and heterogeneous. Moreover, these resources must fulfill four characteristics, i.e. they have to be valuable[12], they have to be rare among firms' existing and potential competitor[13], they have to be imperfectly imitable[14], and there is not strategically equivalent substitutes for these resources[15] (Barney 1991). Further, Grant (1999) stated that whereas some capabilities are recognized by using standard functional approach, the most significant capabilities most of the times are generated from integrating individual functional capabilities. Hence, resources coordination and integration are the core functions of capabilities.

Teece et al. (1997) extended RBV to explain the achievement of competitive advantages in dynamic markets. In these markets, that are characterized where the competitive scenarios are uncertain, unpredicted and rapidly changing, the firm requires to develop *dynamic capabilities* for building, integrating and reconfiguring internal and external competencies. Furthermore, for gaining a sustainable competitive advantage in nowadays rapidly changing business environment characterized by strong international competition, and geographically disperse network and organizational sources of manufacturing and innovation, it is necessary the capability to identify and develop *"a competence that is truly distinctive"*(Learned et al. 1969), knowledge that is difficult-to-replicate (Alavi et al. 2001) as well as dynamic capabilities that are unique and difficult-to-replicate (Teece 2007).

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[12] The strategic resources have to be useful to nullify environmental threats and/or exploit opportunities).

[13] The access to these resources must be limited to a small number of firms. To achieve some strategies, it is required a specific mix of resources, which also can be qualified as rare.

[14] For a strategic resource to be imperfectly imitable is has to reach at least one of three conditions, i.e. firm's ability to gain specific set of resources depends on a unique historical condition; a causally ambiguous relation between the possessed resources and the sustained competitive advantage of a firm; and/or the social complexity, including interpersonal relationships among the workforce in the firm, firm's reputation among customers and suppliers, culture, traditions, among other, in which lays on the development of the resources gained by the firm.

[15] There has not been a strategic resource equivalent in value but by they are not imitable or rare by themselves. This is the case of two valuable resources that are not strategically equivalent and one of those resources is rare and imperfectly imitable, the strategies generated from these resources would constitute a sustainable competitive advantage as the exploited resources to generate and implement the strategy are rare, imperfectibly imitable and valuable.

Dynamic capabilities can be defined as *"the firm's ability to integrate, build and reconfigure internal and external competences to address rapidly changing environments. Dynamic capabilities thus reflect an organization's ability to achieve new and innovative forms of competitive advantage given path dependencies*[16] *and market position*[17]" (Teece et al. 1997). These capabilities are strategic routines and organizational precursor by which decision makers modify firm's basis acquire- and shed- resources, combine them and reintegrate them to develop new value-creating strategies. These capabilities might be bounded to constantly generate, expand, upgrade, defend, and preserve significant the unique asset base of the firm. Teece (2007) disaggregated the dynamic capabilities into three features, i.e. the capability to detect, identify, and frame opportunities and threats; the capability to grab opportunities; and the capability to sustain competitiveness by the combination, enhancement, protection, and if needed, reconfiguration of the tangible and intangible assets of the organization.

In the regard of RBV, its use has been extended from the strategic and general management research to the fields of SCM and production research (e.g. Zhao et al. 2001; Mentzer et al. 2004; Fawcett et al. 2009; Allred et al. 2011; Hollos et al. 2012; Gligor and Holcomb 2014a). For instance, Fawcett et al. (2009) presented a theoretical framework to benchmark the viability of SCM in business-model-design process regarding manufacturing SMEs. The core of their model was a RBV approach as managers require identifying alterations in the business environment from where adaptively amalgamate firm and supply chain resources to generate an imperfectly imitable collaborative capability. In a case study research, Yeung et al. (2007) analyzed the relationship between innovativeness, organizational learning and organizational performance grounded in the RBV perspective. Hsu et al. (2011) utilized a RBV approach to determine the set of SCM's internal entrepreneurial competences (i.e. innovation integration, risk-taking characteristics, proactiveness orientation, relational capital, and coordination capabilities), supply chain strategies and manufacturing SMEs performance. Further studies have extended RBV perspective to the dynamic capabilities concept (e.g. Ponomarov and Holcomb 2009; Sandberg and Abrahamsson 2011; Blome et al. 2012; Fujun Lai et al. 2012; Mandal 2015). With respect to internationalization processes and dynamic internationalization capabilities, where internationalization processes draw the paths followed by firms that have undertaken worldwide opportunities, flexibility has been recognized among

[16] It refers to the strategic alternatives that are to firm's service and the absence or presence of incrementing returns and attendant path dependencies. In this sense, the paths ahead depend on the path that is traveled.

[17] The market position of a firm relies on the coherence of its external and internal processes and actions, learning processes as well as on its specific assets. These specific assets involve the knowledge assets that are difficult-to-trade as supplementary assets to them as well as its relational and reputational assets.

with innovation and experimentation as an exploratory dynamic capability (Prange and Verdier 2011). Volberda (2003) analyzed the notion of flexibility within the context of strategic management theories. The author argued that due to the attributes of flexibility to leverage among preservation and change, administration and entrepreneurship, keeping knowledge and creating new one, it constitutes an operational as well as a managerial *'design task'* of dynamic competitive advantages. With respect to the managerial task, it includes the generation of capabilities and speed of response that enable firms to cope with unexpected, uncertain and fluctuating environments.

Conner and Prahalad (1996) argued that the survival of a firm relies on firm's capability to perform in comparison with competitor and if it can reach a sustainable competitive advantage. Diverse organizational processes, e.g. order processing and purchasing, manufacturing, inventory management) might be enhanced and become more efficient and effective as organizations gain new resources and capabilities. Therefore, the development of logistics capabilities might constitute a competitive advantage for the firm as well as for the supply chain as *"the more global de competition in an industry, the more critical logistics capabilities are to firm (and supply chain) success"* (Mentzer et al. 2004). From an integrative literature review, Ponomarov and Holcomb (2009) developed a conceptual model (Figure 3-10) for identifying the relationship between dynamic integrated logistics capabilities during the three phases of supply chain resilience, i.e. event readiness, efficient response and recovery.

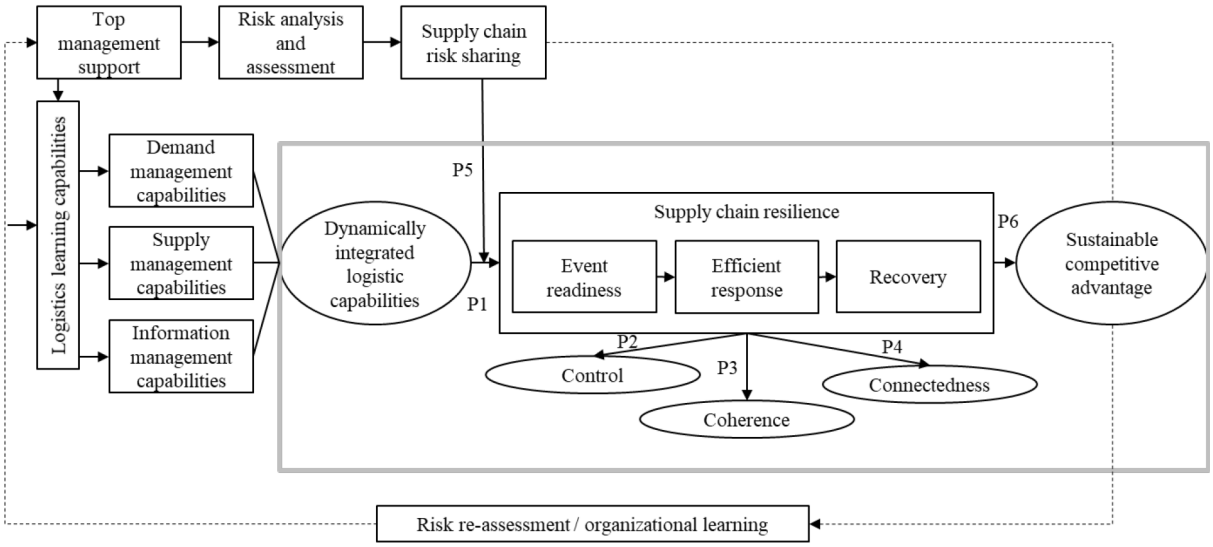

Figure 3-10 Relationship between logistics capabilities and supply chain resilience
Source: Ponomarov and Holcomb (2009)

The logistics capabilities included in their conceptual framework are logistics learning capabilities, DMCs, SMCs, IMCs and ILCs and from an extended perspective of the RBV, the authors argued how the dynamically integrated logistics capabilities enable the achievement of supply chain resilience which guides to sustainable competitive advantage. The authors, defined supply chain resilience in terms of level of flexibility, ability to adapt, maintenance and recovery. The generalized conceptual model stated the following propositions:

P1. The better the dynamic integration of logistic capabilities, the greater the supply chain resilience.
P2. The greater the resilience of the supply chain, the better it maintains control of logistics capabilities when disruptions occur.
P3. The greater the resilience of the supply chain, the better it maintains coherence of logistics capabilities when disruptions occur.
P4. The greater the resilience of the supply chain, the higher the levels of integration (connectedness) across logistics capabilities when dealing with disruptions.
P5. The greater the level of risk sharing in a supply chain (based on continual risk analysis, assessment and top management support) the stronger the relationship between logistics capabilities and supply chain resilience.
P6. The greater the supply chain resilience, the greater the sustainable competitive advantage.

The authors concluded that in order to address the dynamic nature of global environment, it is necessary to develop logistics capabilities across the supply chain to generate competitive advantages. Indeed, supply chain partners require achieving resilience across the supply chain to differentiate from competitors through the dynamically integrated logistics capabilities which will constitute a sustainable competitive advantage.

While the model proposed by Ponomarov and Holcomb (2009) addressed the impact of logistics capabilities during the phases of supply chain resilience to enhance the achievement of sustainable competitive advantage, the present conceptual framework of this work discusses the impact of developing of logistics capabilities and SCF as supply chain dynamics capabilities to achieve a sustainable competitive advantage to enhance the internationalization process of SMEs. At this point, it is also important to refer to the differences among supply chain resilience and SCF. While the former one is seem as the capability to rebuild and bounce back from any disruption or risk event (More and Subash Babu 2008; Ponomarov and Holcomb 2009). Organizations use different strategies to increase their resilience such as redundancy, modifying the corporate culture, developing flexibility in the supply chain, among others (Sheffi 2005; More and Subash Babu 2008). Particular level of resilience might be obtained by scheming flexible networks, where the SCF increases effectively the levels of

supply chain resilience while also increases the operational efficiency and garners mutual benefits (Sheffi and Rice 2005). Thus, it might be argued that SCF precedes supply chain resilience (More and Subash Babu 2008). In addition, the present conceptual framework adopts a social exchange perspective analyzing the role of trust and commitment in the integration and synchronization of these capabilities during SMEs internationalization.

Mellat-Parast and Spillan (2014) conducted a large scale survey to empirically analyze the effectiveness of logistics integration and supply chain integration on the competitiveness of manufacturing firms. The author employed a RBV of competitive advantage as well as transactional cost economic theory to identify the impact of supply chain and logistics strategies on the integration of supply chain/logistics practices (viz. information and processes integration) and its further impact on firm's competitiveness. From the results, it was identified a driven role of supply chain/logistics strategies on logistics decisions and supply chain integration. Hence, it is necessary a proper understanding and determination of supply chain/logistics strategy of the firm to achieve the expected benefits from the integration with customer and suppliers. The integration within supply chain partners is reached when the supply chain members share activities as joint planning and execution. Moreover, their findings provided empirical evidence of the key role of integrating processes across supply chain and logistics activities as crucial factors in improving firm's competitive advantage. In contrast, the results did not show a significant relation between supply chain/ logistics information integration which is in line with previous findings of Zhao et al. (2001). In this respect, both studies explained that information integration and IMCs do not constitute a source of competitive advantage on themselves (Teece et al. 1997) rather their embeddedness to support the alignment and achievement of further capabilities and strategies.

Sandberg and Abrahamsson (2011) studied how two Swedish best prices retail companies generated a sustainable competitive advantage from their effective use of logistics capabilities. The authors grounded their analysis on the RBV perspective to elaborate the relationship among dynamic and operational logistics capabilities and sustainable competitive advantage (Figure 3-11).

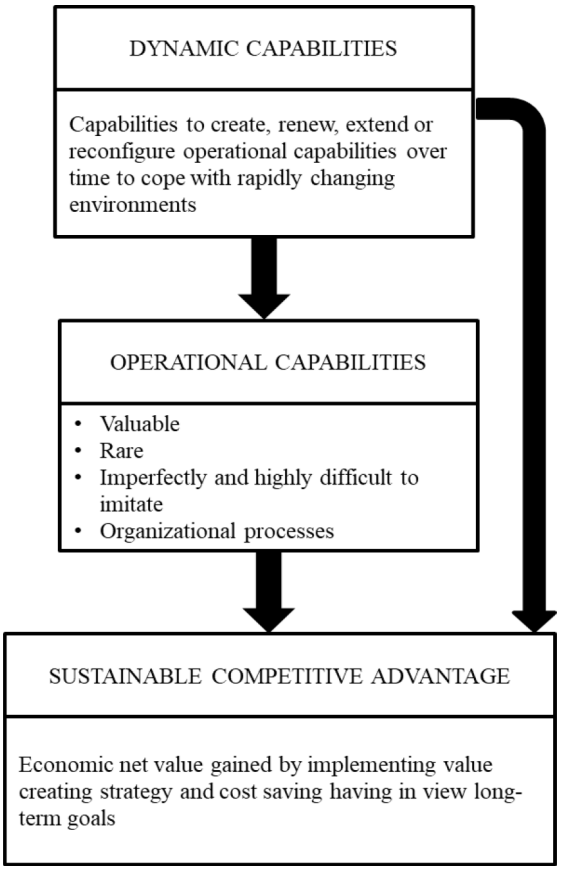

Figure 3-11 Dynamic and operational capabilities and their link to sustainable competitive advantage

Source: Sandberg and Abrahamsson (2011)

The author integrated in the same framework the RBV and dynamic capabilities perspective to depict the relationship among the operational capabilities and dynamic capabilities. Regarding dynamic environments, the effectiveness of an operational capability to be used as a competitive advantage is restricted to a certain period of time. Hence, it is necessary to combine the operational capabilities with dynamic capabilities that generate, modify and expand them over time to achieve a sustainable competitive advantage. In this study, capabilities were defined as *"complex bundles of individual skills, assets and accumulated knowledge exercised through organizational processes that enable firms to co-ordinate activities and make use of their resources"* (Olavarrieta and Ellinger 1997). Inside the tow companies, the authors identified that the integration of logistics processes and information technology systems was developed over a long time constituting a valuable, rare an imperfectly imitable operational capability. Indeed, the operational capabilities identified from these companies were the effective integration of information technology systems and logistics processes. Moreover, from the two case studies the identified dynamic capabilities,

that renewed the operational capabilities to sustain them, corresponded to managerial presence and knowledge, learning, control, cross-functional teamwork, and supply chain relationships. From the findings, the authors concluded that the combination of effective and efficient logistics operations as well as adjusted, well-functioning, in-house-developed information systems constituted a sustainable competitive advantage while the dynamic capabilities sustained the operational capabilities.

Regarding flexibility, uncertainty and sustainable competitive advantage, Dreyer and Grønhaug (2004) analyzed the role of diverse flexibility dimension in achieving a sustainable competitive advantage in high-uncertain environments. They conducted an empirical study among Norwegian fish processors, where the results exhibited the positive impact of flexibility on the competitive position between the firms analyzed. The authors also identified the difficulty faced by managers in leveraging different flexibility dimensions, as some of these dimensions are in conflict with other. Decision makers have to remember that the concerned industry has a major influence on the capabilities and the combinations of them that are necessary. Finally, the findings showed the possibility to reach a sustainable competitive advantage in highly uncertain scenarios. The firms in the study that have achieved a sustainable competitive advantage corresponded to those that have developed flexibility dimensions that fit various factors related to the sources of uncertainty in their industry. They found that it is possible to achieve high levels of flexibility without affecting the productivity. Indeed, the combination of flexibility and productivity was recognized by the authors as a valuable and rare resource, imperfectly imitable and non-substitutable.

With respect to SCF, Jin et al. (2014) analyzed the relationship among IT-enabled sharing capability (viz. IMCs), SCF and firm's competitive performance (Figure 3-12).

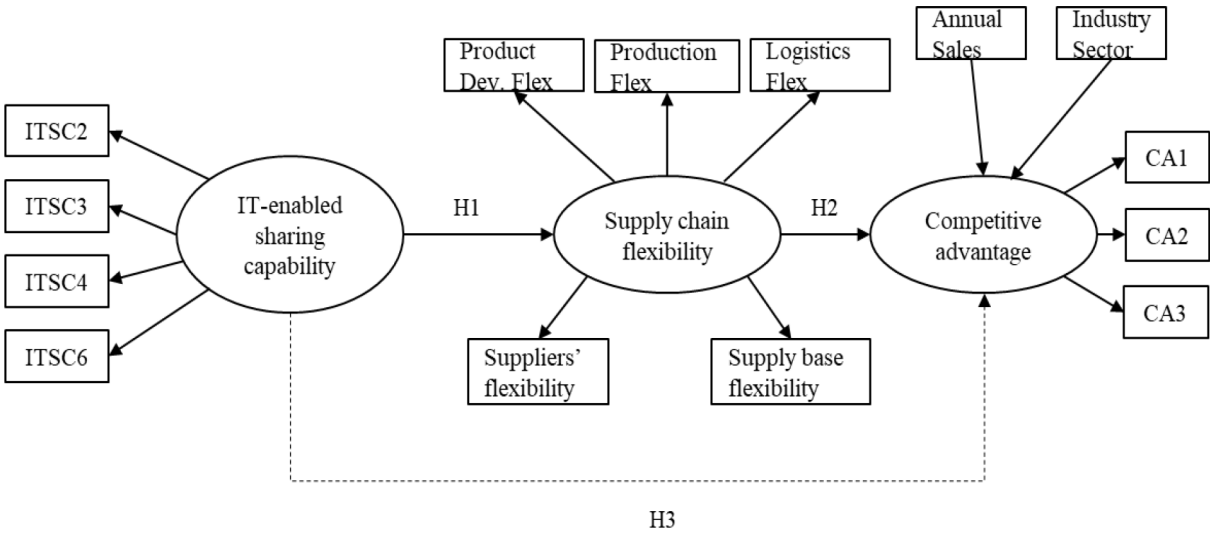

Figure 3-12 Relationship among IT-enabled sharing capability, SCF and competitive advantage

Source: Jin et al. (2014)

The authors collected the data from U.S. manufacturing firms using a large-scale survey to test three hypothesis, i.e. *"IT-enabled sharing capability has a direct positive relationship with the flexibilities in a manufacturing firm's supply chain"* (H1); *"a manufacturing firm's supply chain flexibility has a direct positive relationship with the firm's competitive performance"* (H2); and, *"IT-enabled sharing capability has an indirect positive relationship with a manufacturing firm's competitive performance through the firm's supply chain flexibility"* (H3). They adopted a dynamic extended perspective of RBV to address the aforesaid assumptions. IT-enabled sharing capability involve two aspects, i.e. firm's capability for managing intangible information including all the significant functions inside the firm and among its supply chain partners as well as customers; and, the capability of the firm to develop a tangible structure to exchange information within the internal as well as with the external functions of the firm and its supply chain partners. SCF was measured by the flexibility of the manufacturing firm for developing new products, production flexibility, supplier's flexibility, logistics flexibility, and the flexibility of the supply foundation. The competitive advantage was measured in terms of product quality, the capacity for launching new products and dependable delivery. The results obtained from a Structural Equation Modeling of the collected data showed that IT-enabled sharing capability had a direct positive impact on the SCF of the firm in the researched dimensions. Furthermore, manufacturing firm's SCF has and positive impact on firm's competitive performance. The authors also

observed that IT resources did not contribute directly to the competitive performance of the firm regarding the dynamic extended perspective of RBV. Nevertheless, it was found an indirect impact on firm's competitive performance *"through SCF but not mediated by SCF"*. Although the study by Jin et al. (2014) was limited to investigate the relationships between of IT-enabled sharing capability (viz. IMCs), SCF and manufacturing firm's competitive performance from a dynamic RBV perspective, this provides evidence of the positive impact of IMCs and SCF as dynamic capabilities in the competitive performance of a firm.

Gligor and Holcomb (2012) developed an integrative conceptual framework to understand the role of integrated logistics capabilities in achieving SCA. The authors argued that the integration of logistics capabilities at the supply chain level will have increase SCA across the supply chain as well as among its partners. In a further study (Gligor and Holcomb 2014a), the authors proved their conceptual assumption and adopted a dynamic extended RBV to empirically examine the relationship among the ILCs[18] and SCA. The results showed a positive impact of ILCs on SCA and provided empirical evidence of the core and unique role of logistics capabilities in supporting supply chain members to respond in an effective and timely fashion to uncertainties and fluctuations in the market. Further, Mandal (2016) among its study, the author examined the relationship of ILCs, SCF and competitive performance from a dynamic RBV perspective. It was identified a positive influence of ILCs on SCF. In the regard of SCF and supply chain performance, it was found that SCF supports the firms to achieve the expected service level by the customers. It was also found, from a relational perspective, that SCF prompts the value chain for creating, improving, and maintaining the relationships within the supply chain partners.

From these previous research, it can be stated that logistics capabilities and SCF constitute supply chain dynamic capabilities, as they are developed, integrated and reconfigured across the supply chain as well as inside the supply chain partners to cope with the fast-changing environments while maintain an acceptable level of performance (Teece et al. 1997). For the purpose of this work, SCF has been defined as *"the ability of the supply chain to respond, align and compensate accurately to changes in the customer demand, the interruptions in the supply or any other event that occurs in a dynamic and uncertain environment, with little penalty in time, effort, cost or performance"* (page 47). Moreover, logistics capabilities have

[18] The integrated logistics capabilities analyzed in this study corresponded to integration of demand-management interface capabilities and information-management interface capabilities across the supply chain

the unique attribute to integrate internal and external functional areas of the firm and the supply chain to reach a common goal (Mentzer et al. 2004).

The combination of logistics capabilities and SCF across the supply chain in order to achieve a competitive strategy will also lead to the achievement of a sustainable competitive advantage as long as the combination of these capabilities constitute a valuable, rare, imperfectly imitable and non-substitutable resource (Barney 1991; Teece et al. 1997). Therefore, the way how decision maker manages and structure their resources and capabilities will lead to the achievement of a competitive and sustainable advantage in foreign markets, the role of decision makers is to select and develop effective resources and competences. Furthermore, the concept of sustainability might have also a dynamic perspective, where the continuous renewal of the combination of these two groups of capabilities or the renewal of the processes operated with them is required (Sandberg and Abrahamsson 2011). For instance, in order to address demand volatility, the supply chain will require to design and implement a SCF strategy to cope with this uncertainty. Hence, a certain combination of logistics capabilities (e.g. SMCs, IMCs and ILCs) in conjunction with certain dimensions of SCF dimensions (e.g. supplier flexibility, volume flexibility) will generate a new unique, valuable, inimitable resource. As demand volatility requires continuous adaptation from the supply chain, the effective combination of the logistics capabilities and SCF dimension will constitute a dynamic capability.

Finally, the aforementioned internationalization relational functions (i.e. Know-MaRF, Mar-MaRF, Re-MARF, Net-MaRF, and Inn-MaRF) enhance SMEs' competence to coordinate, share and integrate information, operations, capabilities, processes and resource with their supply chain partners to reach internationalization strategies. Implementing of SCF strategies and developing logistics capabilities enable the alignment and adjustment of the supply chain network to those strategies. The need of superior levels of knowledge, innovativeness and flexibility requires a continuous interaction among the supply chain partners through the logistics capabilities. This iteration contributes to enhance SCF strategies and as a result to sustain the competitive advantage for internationalization.

Hence, the final propositions arise:

> *P10. The effective combination of logistics capabilities and SCF constitute dynamic capabilities of the supply chain as well as a source of sustainable competitive*

advantage for SMEs internationalization, due to their value, rareness, imperfect imitability and non-substitutability of that combination.

P11.The development of logistics capabilities enables the continuous interaction among the SME and its supply chain partners to enhance the managerial tasks of the internationalization relational functions.

3.3 A system dynamics approach for SMEs internationalization networking process

This section addresses the question of *what is the behavior of* the relationship between the internationalization relational functions, logistics capabilities, SCF, trust and commitment with respect to the networking process of the SMEs internationalization. It is based on a previous publication (Novillo Villegas and Haasis 2018) and presents the analysis of the linkages between SMEs internationalization, logistics capabilities, and SCF from an integrative perspective to address this gap in the literature. It is analyzed the networking process of SMEs internationalization by using a system dynamics approach in order to determine the behavior of the relationship between the internationalization relational functions (i.e. Know-MaRF, Mar-MaRF, Net-MaRF, Res-MaRF and Inn-MaRF), SCF, logistics capabilities, trust and commitment. The analysis of these relationships provides a better understanding of the role of trust and commitment as enablers of SCF through the development of logistics capabilities in the networking process of SMEs internationalization. This work constitutes the basis to prove further hypothesis and empirical research in order to develop strategies regarding SCF as a sustainable competitive advantage for SMEs internationalization.

The phenomenon of SMEs internationalization has received significant attention by policymakers, practitioners, and researchers due to the role of this group of enterprises in the economic health and growth of many countries (Love and Roper 2015) (Section 1.1). Nevertheless, SMEs lack resources and have limited capabilities (e.g. innovativeness) thus these firms require to develop a sustainable competitive advantage based on their main capabilities (e.g. flexibility) in order to compete in complex, dynamic, and uncertain environments (Gelinas and Bigras 2004; Singh et al. 2008; Ismail et al. 2011; Zhang et al. 2014). During the last decades, this complexity has increased as the competitive scenario regards a supply chain context (Christopher 2011). With this in view, the firm has to coordinate its core strategies, capabilities, resources and actions with its supply chain partners

to provide an adequate response to customers' demand. To enhance this coordination across the supply chain, firms have to build up, synchronize and integrate their logistics capabilities (Gligor and Holcomb 2012; Gligor 2014). Consequently, this will lead to higher levels of flexibility within the supply chain (Gligor 2014). Johanson and Vahlne (2009) presented a network approach for internationalization, and they stated that *"relationships offer the potential for learning and building trust and commitment"*, where the last two are considered as *"preconditions for internationalization"*. Furthermore, Mandal (2016) conducted an empirical study where he found a direct and positive influence of trust and commitment on logistics capabilities. He also identified a positive impact of integrated logistics capabilities on supply chain flexibility (SCF) as well as on the overall supply chain performance.

Section 3.2 examined each aspect aforementioned and presented an integrative conceptual framework of the areas of study. However, the relationships between the components of the conceptual framework (i.e. internationalization relational functions, trust, commitment, logistics capabilities and SCF) need to be analyzed with respect to the networking process of SMEs and its supply chain during the internationalization. Hence, this section presents a system dynamics approach to study the dynamics of the behavior of between these components and how does it affect the internationalization process of SMEs.

3.3.1 System dynamics approach and the components of the networking process for SMEs internationalization

A system perspective has been used to have a better understanding of the interaction between the components of interest (Morecroft 2015). System dynamics approach is a mathematical modeling technique used as a methodology to describe, analyze and discuss the nonlinear behavior of complex systems, issues or problems (Forrester 1996). This approach was first designed as a methodology to comprehend the impact of organizations' policies on the success or failure of these organizations in relation with the fields of control engineering and management. Forrester (1961) introduced the so called 'Industrial Dynamics' which was defined as *"... the study of the information-feedback characteristics of industrial activity to show how organizational structure, amplification (in policies), and time delays (in decision and actions) interact to influence the success of the enterprise. It treats the interactions between the flows of information, money, orders, materials, personnel, and capital equipment in a company, an industry, or a national economy"*. Nowadays, the use of system dynamics has been extended to diverse disciplines such as education science (Forrester 1996), urban

development (Forrester 1971), biological and medical modelling (Hansen and Bie 1987), energy and the environment (Ford and Lorber 1977), theory and supply chain management (Angerhofer and Angelides 2000), among others.

Most of the times, a problem is analyzed in linear terms, this is from an open-loop perspective without considering feedback terms. The problem is observed as an input of information which leads to a certain action that results in an output. With respect to the impact of the networking process in SMEs internationalization, Johanson and Vahlne (2009) stated that firm's internationalization depends on the firm's network relationships and its networking capabilities (i.e. the ability to communicate, cooperate, share market orientation, trust, networking efforts through information and knowledge exchange (Pihkala et al. 1999)). Thus, adopting a linear perspective it might be said that the networking process takes the marked knowledge of the organization to reinforce the relationship between the network partners and as a result, this stimulates the internationalization of the firm (Figure 3-13).

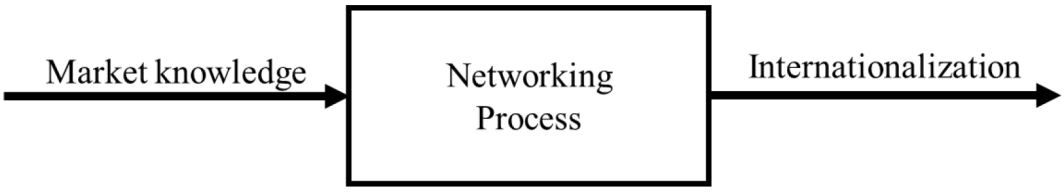

Figure 3-13 Internationalization Networking Process

For the purpose of this work, the networking process refers to the formation of relationships that enable SMEs building a supply chain network through which the firms will develop their internationalization process. Therefore, due to the non-linear relationships of the networking and internationalization process, it is necessary a closed-loop perception, in which the core standpoint adopted by system dynamics is that *"feedback and delay cause the behavior of systems, i.e. that dynamic behavior is a consequence of system structure"*(Angerhofer and Angelides 2000). The networking processes that take place in the supply chain where the SMEs are embedded for their internationalization represents a complex network of feedback loops. Each event or change in this complex system *"is set within a network of feedback loops"* (Forrester 1996), and the feedback loops constitute the structures where each change takes place.

With this is view, it is necessary to define the components and concepts considered in the internationalization networking process. Leonidou (2004) defined firms' internationalization as *"the ability to initiate, to develop, or to sustain business operations in overseas markets"*. Five internationalization relational functions have been recognized in the Section 3.2.1, to manage the SMEs internationalization process. Know-MaRF constitutes the core function to manage the process and capabilities to gain market knowledge to define the internationalization strategy (Section 3.2.1.1, S1), where market knowledge refers to the body of knowledge based on the experiences and information gained overseas (Johanson and Vahlne 2009). Mar-MaRF manages the decision-making process for designing and implementing the internationalization strategy, particularly the aspects related to the marketing and distribution strategies (Section 3.2.1.2, S2). As the SMEs designs the internationalization strategy, it is necessary align the innovation strategies of the firm and its supply chain network through Inn-MaRF to manage for designing and implementing the required innovation strategy (i.e. differentiation, adaptation and/or development of new products) in line with the demands of the international market (Section 3.2.1.5, S5). Through Re-MaRF, SMEs manage the potential available resources in the supply chain network to achieve the internationalization strategies including the innovation strategies (Section 3.2.1.3, S3). The decision-making process during the internationalization of the firm is affected by the network position of the firm (Johanson and Vahlne 2009). Hence, Net-MaRF integrates and coordinates the networking capabilities and processes to structure the supply chain network to achieve the internationalization goals and strategies (Section 3.2.1.4, S4).

SCF, as described in Section 2.4.2, is the supply chain capability to reorganize partners' operations, align their strategies, and share efforts to give a quick response to customers' demand or any other fluctuation in the supply chain or its environment with a little penalty in the performance (Stevenson and Spring 2007; Tiwari et al. 2015). As the networking process refers to the formation of supply chain relationships, the present system dynamics approach focuses on the SCF dimensions related to the organization area (mainly relationship flexibility, organization flexibility, configuration flexibility, inter-organizational relationship flexibility) (see Appendix A and Appendix B). Logistics capabilities are the result of combining dynamic routines to align and restructure core skills, competences and resources in order to enhance the overall performance (Gligor and Holcomb 2012). These logistics capabilities can be categorized into four groups analyzed in Sections 2.5.1, 2.5.2, 2.5.3and 2.5.4. Both, SCF and logistics capabilities constitute supply chain dynamic capabilities that enable the achievement of a sustainable competitive advantage for firms (Section 3.2.4, S10).

Two social attributes, i.e. trust and commitment, have emerged from the examination of the literature review, as preconditions for internationalization and the development of logistics capabilities and SCF (Section 3.2.2, S4). Trust is a key element for relationship development and business networking; then trust implies the ability to rely on the behavior and actions of another firm. This motivates information exchange and cooperative efforts between the parts involved in the relationship. Hence, trust may lead to commitment if the parts are willing to establish a more permanent relationship (Johanson and Vahlne 2009; Gligor and Holcomb 2012; Mandal 2016). Commitment is the willingness of exchanging efforts reflected as an investment in the relationship; hence as the commitment increases the relationship dependency also increases (Johanson and Vahlne 2009; Mandal 2016).

3.3.2 Describing the networking process for SMEs internationalization from a dynamic perspective

Figure 3-14 presents the system dynamics approach to identify the interaction of each component in the internationalization networking process.

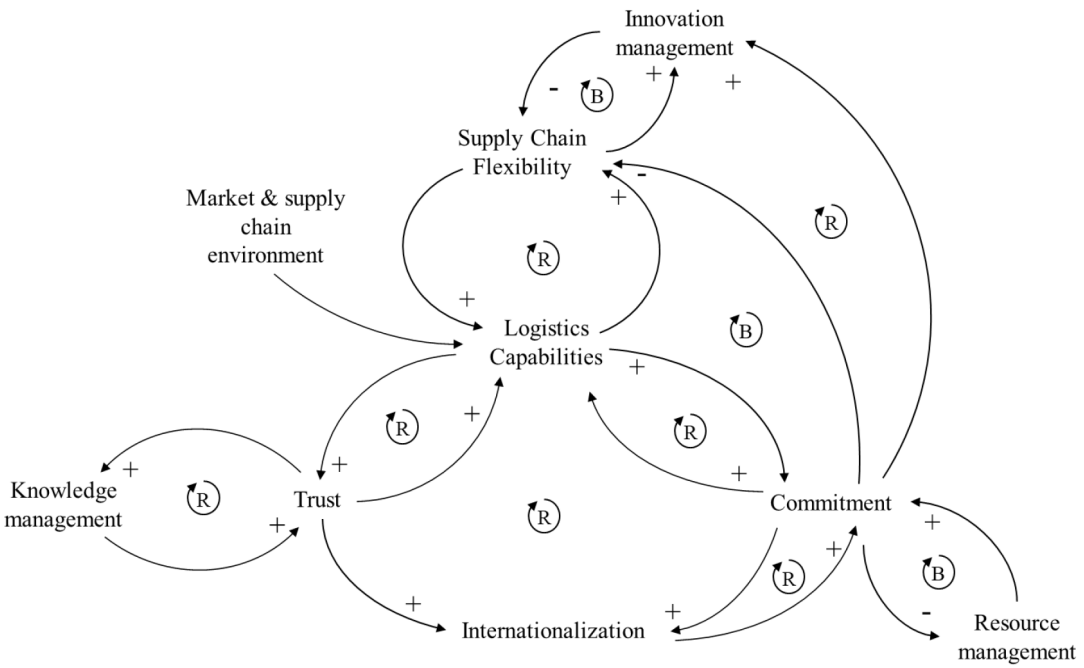

Figure 3-14 Relationship analysis of the components of internationalization networking process

Source: Adapted from Novillo Villegas and Haasis (2018)

The market and supply chain environment is accessed by the firms through the logistics capabilities, in the first instance by information-management capabilities (IMCs). The information obtained from the environment is processed in the system through logistics capabilities (particularly IMCs) acting as enablers of trust (Chen et al. 2011). Trust is reinforced by the logistics capabilities among the network partners. The trust among the partners stimulates the exchange of information necessary for the learning process and opportunity recognition that takes place in the internationalization relational function of knowledge management. On the other hand, as the firms gain market knowledge, this increases the trust among the partners and the further exchange of information, which might lead to increase the quality and number of exchanges. As trust rises through the logistics capabilities (e.g. improving the IMCs between the partners by sharing more strategic information to enhance the opportunity recognition processes among the supply chain partners), the relationship commitment also increases. Furthermore, both trust and commitment also reinforce the effect on logistics capabilities across the network e.g. information exchange capabilities and integration capabilities need to increase as trust and relationship commitment increase. These three reinforcing loops (i.e. the loops between knowledge management, trust, logistics capabilities and commitment) have a direct positive effect of logistics capabilities on the internationalization of the firm. It is important to bear in mind that Know-MaRF defines the policies to determine the degree of commitment in the development of logistics capabilities within the different supply chains in which the focal firm is embedded to enhance its position in the supply chain of its interest. In addition, Know-MaRF and Mar-MaRF identify and determine the degree of SCF alignment required as part of the internationalization strategy to entry, operate or exit in a certain country, region and industry through a specific supply chain network (***S1*** and ***S2***, Sections 3.2.1.1 and Section 3.2.1.2 respectively). Hence, the alignment of logistics capabilities across the supply chain partners reinforce SCF (Gligor and Holcomb 2012; Mandal 2016), and this in return stimulates the development of logistics capabilities (Gligor 2014), e.g. to improve the agility in the response to customers' demand it requires to enhance the development and alignment of supply-management capabilities (SMCs) and integration-logistics capabilities (ILCs) within the supply chain partners.

The networking process increases the access to potentially available resources which might be strategically used and allocated through the Res-MaRF to achieve the internationalization strategy increasing the firms' commitment to a certain market or relationship. As the SMEs internationalization growths the commitment the certain markets, providers, and distributors

growths as well. However, the increase in the relationship commitment means the reduction to the use or relocation of the committed resources to that relationship (market) (Johanson and Vahlne 2009; Yavuz et al. 2016). This increase in the commitment generates has an opposite relationship with SCF. As the commitment increases, the flexibility of the relationship will decrease e.g. the investment that a firm does in a specific relationship with a supplier limited the firm to invest those resources in other supplier and this creates a dependency to that particular supplier. Nevertheless, the market commitment motivates a customer-oriented strategy which stimulates the development of coordinated efforts among the supply chain partners (Johanson and Vahlne 2009; Stevenson and Spring 2009; Gosling et al. 2010).

By adopting a customer-orientation strategy as part of the internationalization strategy, the firms require the development of demand-management capabilities (DMCs) to align their efforts on serving the customers (Mentzer et al. 2004; Esper et al. 2010; Gligor 2014). The development of DMCs, among the supply chain partners, stimulate the alignment of innovative strategies to serve the customer in diverse international markets coping with the differences of the requirements among them (Esper et al. 2010), increasing its market commitment (Vahlne and Johanson 2013). The acquisition and development of knowledge within the supply chain enhance the formulation of the appropriate innovation strategy to respond to the market demands (Mihi Ramírez et al. 2012). This process depends on the DMCs that stimulate the integrative efforts (ILCs) and information flexibility existing among the supply chain partners involved in the internationalization process (Liao and Marsillac 2015). On the other hand, the networking process stimulates the formation of relationships among the business network of the firm. As the firm develops these linkages, the options for innovativeness will increase (Musteen et al. 2014). Once the firm is committed to a relationship, the collaborative efforts to concrete an innovation initiative will limit the level of SCF (particularly on the dimension of organization flexibility, configuration flexibility, and inter-organization relationship flexibility) as well as reduces the resources available for other initiatives (Bagchi et al. 2006; He et al. 2014; Nyuur et al. 2018).

The analysis of this system dynamics approach provides a better understanding of the relationships between the components of the networking process of SMEs internationalization from a theoretical perspective. Although it is presented the first phase of system dynamic, it is possible to observe the dynamics of the relationships between the internationalization relational functions, SCF, logistics capabilities, trust, and commitment that have been identified as part of the internationalization networking process. The study of the behavior

between these components has not been addressed from an integrative perspective in the literature nor as a dynamic process (Novillo and Haasis 2017; Novillo Villegas and Haasis 2018). By implementing a system dynamics approach, it is possible to recognize the role of trust and commitment in moderating SCF as part of the internationalization strategy of SMEs. It is also observed how the five relational functions interact with each other to develop the internationalization strategy. As the firms gain market knowledge, they also enhance the structure between the supply chain partner to manage of their resources, develop network relationships and innovation. The interactions between the internationalization relational functions (to align, coordinate, and accomplish the internationalization strategy) depend on the level of trust and commitment as well as the alignment of logistics capabilities and SCF between the supply chain partners. This provides positive evidence for ***S6***, *"the five relational functions for managing SMEs internationalization interact among them to coordinate the alignment of the decision-making process, activities, resources, logistics capabilities and SCF strategies within SMEs and their supply chain partner to achieve a sustainable competitive advantage for internationalization"*.

In addition, it is identified the enabler role that trust and commitment play as social attributes in the internationalization networking process of SMEs. This role is reinforced by the positive relationship between logistics capabilities and SCF. Although in general terms trust and commitment enable SCF through the enhancement of logistics capabilities (Mandal 2016), as internationalization increases the relation commitment also does, which leads to an opposite relationship between commitment and SCF. It has been established that increasing commitment results in a reduction of flexibility in the relationship among the supply chain partners, and hence commitment plays a moderate role on SCF, which also results in a limitation of SMEs flexibility. From these observations, it is possible to affirm ***S7*** *"Trust and commitment leverage the governance and decision-making processes among the supply chain partners to effectively perform the managerial tasks of the internationalization relational functions and the development of SCF and logistics capabilities"*.

This system dynamics approach provides an integrative perspective on the behavior between logistics capabilities and SCF during the internationalization networking process. The process starts mainly with the exchange of information between the different actors of the internationalization process (e.g. manufacturers, customers, providers, sales representatives, distributors, carriers) within a certain degree of informality in the relationships, which allows a wide number of options for structuring a network (Musteen et al. 2014; Storer et al. 2014).

As the members of the network align their efforts to provide an agile response to the customer demand and the changes in the foreign market, it is necessary to enhance the degree of SCF among the partners in the supply chain which in turn requires the development and integrate of logistics capabilities among them supporting ***S11*** (Section 3.2.4). In addition, the reinforcing behavior between logistics capabilities and SCF has a positive impact on SMEs internationalization. From this analysis, it might said that ***S8*** and ***S9*** (Section 3.2.3) are confirmed. Finally, it is recognized that the dynamics of the behavior between the components of the networking process allows a unique combination among them, particularly on how logistics capabilities and SCF are structured might constitute a sustainable competitive advantage for SMEs internationalization (Section 3.2.4, ***S10***).

Additional to the theoretical observations, it is also important to notice some managerial implications. SMEs decision makers, mainly in developing countries, have to be aware of the reinforced relationship between trust, commitment and logistics capabilities in order to enhance SCF. Decision makers need to integrate into their internationalization strategies the accurate development of logistics capabilities and the balance of the firm's commitment to a certain supply chain to remain flexible enough as a sustainable competitive advantage. This Section has presented the theoretical foundation of a system dynamic approach to develop the further investigation presented in Chapter 4.

4 Development of a road to SMEs internationalization through the implementation of SCF strategies

4.1 Research methodology

This chapter addresses the research question of *how* manufacturing SMEs implement SCF strategies for their internationalization process. In doing so, the integrative conceptual framework and the system dynamics approach presented in Chapter 3 constitute the theoretical foundation to investigate the role of logistics capabilities and SCF strategies in achieving a sustainable competitive advantage for SMEs internationalization. With this goal in view, two qualitative methodologies have been applied, i.e. the interpretative structural modeling (ISM) and the case study approach. The remainder of this chapter is structured in three further sections. Section 4.2 introduces the case study and the discussion of the findings that contribute to the construction of the ISM model. Section 4.3 presents the description of the ISM methodology and includes the identification of the key variables and the ISM model is developed. Finally, Section 4.4 provides a conceptual tool to implement SCF strategies during the internationalization process of manufacturing SMEs.

4.2 Case study

A qualitative and exploratory case study was conducted to identify the contextual relationships between the variables that are involved in the implementation of SCF strategies for SMEs internationalization. Both, the conceptual framework presented in Chapter 3 as well as the case study provide the foundation for the development of the ISM model. Case study as a research strategy allows a deep understanding of organizational complex phenomena in a specific-context from the integrative analysis of single or multiple cases (Ridder et al. 2009; Lorentz and Ghauri 2010; Starman 2013; Yin 2017). Qualitative case studies have contributed with novel theoretical insight in different research areas e.g. international business (Ghauri 2004), dynamic capabilities (Ridder et al. 2009), among others. For the purpose of this research, it was employed the case study approach as it enables theory building from the analysis of common patterns among the cases (Eisenhardt and Graebner 2007). This research strategy is frequently used to investigate explanatory research questions such as *how* or *why* questions (Ghauri 2004). As these types of research questions deal with *'operational links'*, it

is necessary to trace these *'links'* over time instead of counting occurrences, incidence or frequencies. In addition, it is a methodology used to examine contemporary events through systematic interviewing and direct observation (Yin 2017). This research strategy comprises the collection of relevant data related to the research question. The data is collected through diverse sources of information such as personal interviews, reports (verbal or written e.g. financial reports, sales reports, operating statements) and observations. It is necessary to obtain sufficient information that allows the characterization, deep understanding and explanation of the particular characteristics of the case, as well as to emphasize the common features among the different cases. Finally, the case study approach provides an integrative perspective to investigate a subject from various dimensions and from the analysis of the identified components and elements *"to draw [them] together in a cohesive interpretation"* (Ghauri 2004).

For the purpose of this research, the selection of manufacturing SMEs (less than 250 employees) responds to several reason. First, this group of enterprises constitutes a source of development, growth, and welfare to the national economies (Lim and Kimura 2010; European Commission 2014) which points out to the necessity of understanding their behavior and interaction within their business network (Daszkiewicz and Wach 2012). Second, the existing research on the areas of interest (i.e. trust, commitment, logistics capabilities, SCF and internationalization) has been conducted mostly in large firms from developed economies (Gelinas and Bigras 2004; Verdú-Jover et al. 2006; Stevenson and Spring 2009; Felzensztein et al. 2014; Mellat-Parast and Spillan 2014; Zhang et al. 2014; Gonzalez-Perez et al. 2016). As most of the theoretical frame has been developed and tested on large organizations with a large amount of resources for internationalization, it becomes necessary to examine the applicability of this frame in the case of SMEs due to their differences in networking behavior, international experience and access to resources (Crick and Spence 2005; Stevenson and Spring 2009). Third, to enhance the growth of developing economies, it is needed to generate value-added activities related to the raw materials that are been exported and represent an important component of their GDP (World Bank 2017). After establishing the selection criteria for the case studies, a comparative scenario that allows the understanding of the relationships under study was drawn (Yin 2017): manufacturing SMEs related to added-value activities that process a key commodity for a developing economy (Gilbert 2008). The agroindustry sector was chosen due to the importance of this industry to

developing economies such as Ecuador's economy[19] (Austin 1992). Furthermore, chocolate industry was chosen as cocoa represents one of the main exported commodities from Ecuador supplying worldwide around the 65% of the *'Arriba Nacional'* variety (recognized as the one with the higher quality in flavor and aroma (Jahurul et al. 2013)) (UTEPI 2007; PRO Ecuador 2017). Figure 4-1 presents the configuration of the cocoa-chocolate supply chain (Gilbert 2008).

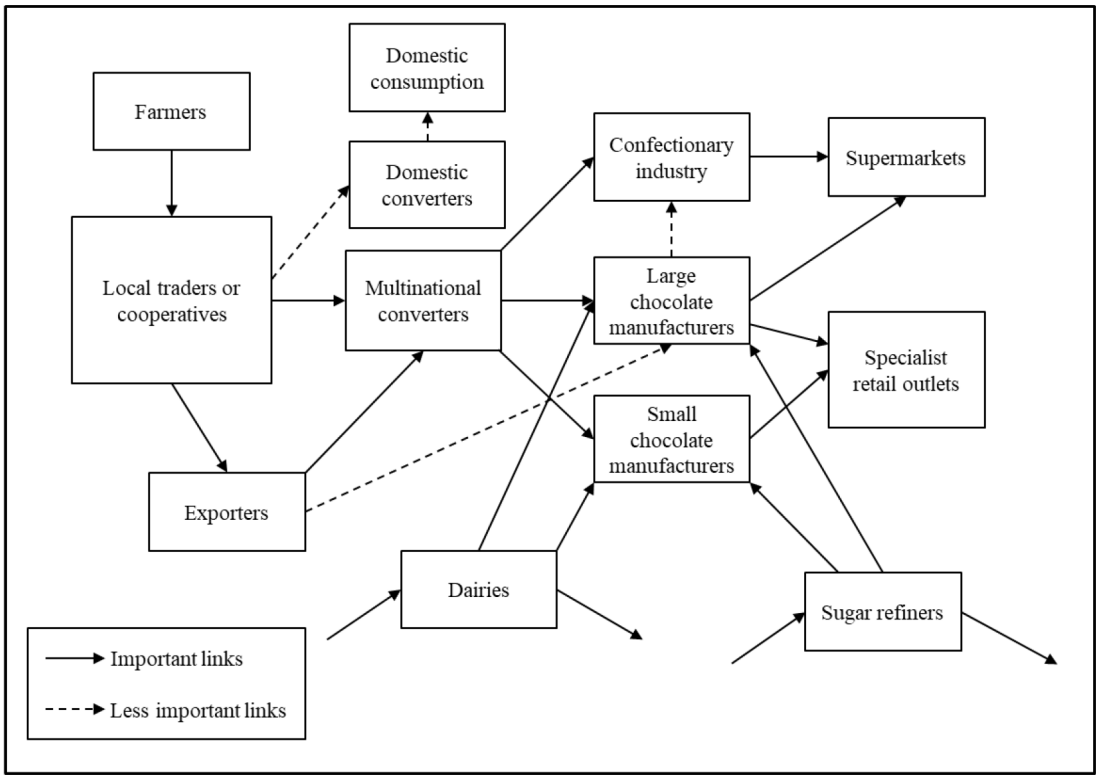

Figure 4-1 The cocoa-chocolate supply chain
Source: Gilbert (2008)

The enterprises studied set up their supply chain within the context presented above. These enterprises where chosen from the PRO Ecuador[20] database of exporting chocolate producer. The presented study investigated how these manufacturing SMEs achieve their

[19] An agroindustry refers to the added-value activities to process, manufacture, and commercialize agricultural raw materials. This includes the transformation of agricultural raw material into food among other products (Austin 1992).

[20] The Institute of Promotion of Exports and Investments (PRO Ecuador), as part of the Ministry of Foreign Trade, supports Ecuadorian exporting firms as well as manages the statistical information related to their export performance.

internationalization goals by implementing SCF strategies through the internationalization relational functions, while coping with this structure (Figure 4-2).

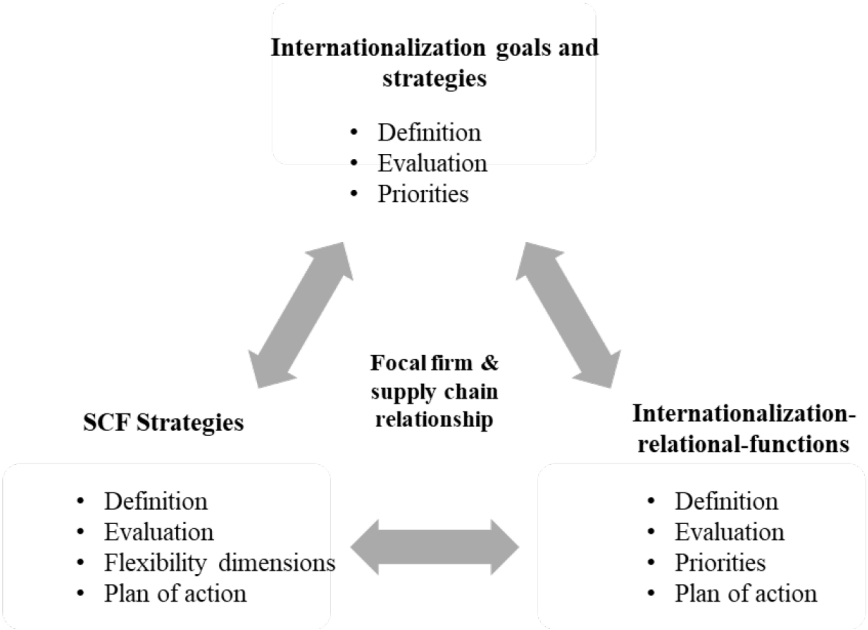

Figure 4-2 Case study framework

The unit of study is the manufacturing SME, as the focal firm, and its relationships across the whole supply chain. The research focused on how internationalization goals are defined and prioritized in coordination with the internationalization' relational-functions where in turn it is defined the SCF strategies. The analysis adopted a temporal perspective to identify how the capabilities and strategies changed over the time to reach the pursued goals.

4.2.1 Data collection and analysis

The internationalization of manufacturing SMEs, particularly from developing countries, requires the development of a sustainable competitive advantage in order to succeed in international markets. This section presents the case study that was conducted to study how SMEs implement SCF strategies as a sustainable competitive advantage for their internationalization process. After contacting the managers of these firms and explaining the purpose of the study, representatives of two SMEs agreed to be interviewed (Table 4-1). Semi-structured interviews were used as the main method for collecting primary data. These semi-structured interviews were formulated to ask the main question, supported by detailed questions to obtain a deeper understanding of the matter (Yin 2017).

Table 4-1 Overview of manufacturing SMEs under study

Firm's Name[1]		**Late Co.**	**Choco Lt.**
Manufacturing Sector		Organic Chocolate	Organic Chocolate
The number of years passed by from the inception to the first significant exportation (over 30% of total production)		4 Year	1 Year
International Markets		More than 10 international markets	3 main international markets
Market intensity		Over 85% of their production is exported	Over 75% of their production is exported
Average increase of volume exportation per year		Up to 7% annually	Up to 4% annually
Upstream	Current Configuration	Pools of direct suppliers from multiple origins in Latin America	Cooperatives of farmers from a single origin.
	Current Processes	Crop, harvest and post-harvest processes (fermentation, and drying)	Crop, harvest and post-harvest processes (fermentation, and drying)
Manufacturing	Current Configuration	Own facilities and machinery	Subcontract some manufacturing facilities
	Current Processes	Selection, roasting and ground of cocoa beans to produce cocoa liquor. Chocolate production New products development Warehousing	Selection, roasting and ground of cocoa beans to produce cocoa liquor. Chocolate production New products development
Downstream	Current Configuration	Commercial representatives Retailers Direct sales (on-line and trade fairs)	Warehousing Retailers Direct sales (trade fairs)
	Current Processes	Distribution Sales Customer service	Distribution Sales

[1] *SMEs' names are pseudonym due to confidentiality purposes*

The interviews were designed based on selected authors from the integrative literature review of Chapter 2 (Leonidou 2004; Johanson and Vahlne 2009; Fantazy et al. 2009; Chu et al. 2011; Rundh 2011; Moon et al. 2012; Omar et al. 2012; Zaefarian et al. 2013; Wu et al. 2014; Gligor and Holcomb 2014b; He et al. 2014; Tiwari et al. 2015; Kahiya and Dean 2016; Mandal and Rao Korasiga 2016) (Appendix E).First the questions focused on the manufacturing SMEs internationalization process to subtract information about the relationships with customers and suppliers and their joined efforts to achieve internationalization goals. Further questions went more in deep to analysis the impact of SCF strategies and dimensions in achieving those goals. It was also investigated the integrative role of logistics capabilities among the internationalization process of these firms. This allows comparing the perception of the areas under study among the manufacturing SMEs as well as their perception and management of the supply chain where there are embedded. A total of 4 in-depth face-to-face interviews were conducted within representatives from the firms. From

both SMEs, the participants were the respective CEO founders and their sales managers. The interviews were conducted at the facilities of the firms in Ecuador, between the months of January to March of 2017. Further, two in-depth face-to-face interviews were conducted with experts in the field of SMEs internationalization, the head director of the Commercial Office of the Republic of Ecuadorian (PRO Ecuador) in Hamburg-Germany, and the director of the *"Observatorio de la pequeña y mediana empresa –PYME"* (Observatory for SMEs) at the Andean University *"Simón Bolívar"* in Quito-Ecuador. Spanish was the language used for the interviews as it is the mother language of the interviewees. Each interview lasted around 90 minutes. The interviews were digitally recorded, transcribed, condensed and coded to facilitate the analysis. Interviewees' relevant quotations were abstracted, grouped and compared. It was also collected data from secondary sources as web sites, articles, videos, reports, and brochures to simplify triangulation (Ghauri 2004; Yin 2017). Each case was analyzed separately from both primary and secondary data. It was used the pattern-matching logic for examining the cases, as recommended by Yin (2017).

4.2.2 Case study findings and discussions

The first step before starting the process the case of both firms the first step was selecting the target market to evaluate the current knowledge and experience as well as the main barriers to overcome for drawing a proper plan of action. This section is organized around the managerial functions discussed in Chapter 3. Furthermore, the findings and discussions are presented as a sequence of events linked to the internationalization relational functions. This will provide critical elements for developing the ISM model to implement SCF strategies as a sustainable competitive advantage for the internationalization of manufacturing SMEs.

4.2.2.1 Know-MaRF and SCF strategies

The management of the knowledge about the market configuration draws the main internationalization strategies and plan to follow. This allows concentrating the learning experience, planning and efforts of each partner on its core business, both upstream and downstream, as well as the aligning the learning capabilities of each partner to enhance their decision-making process. However, before starting the internationalization process, it is necessary to understand the strategic core procedures across the supply chain to enhance the identification of opportunities and threats and improve the whole processes. In this sense, the CEO founder of Late Co. explained:

"This is a learning process that begins with the crop, the processing of cocoa beans, the manufacturing of the chocolate and the interest of the foreign markets, generating a mutual interest in the chain… The quality lies in the knowledge of all the people, each one of us in the chain started to understand from the beginning of the process… how is the crop process, fermenting, roasting and so on, testing and learning from our mistakes."

Furthermore, the definition of their internationalization goals of geographic scope, speed and intensity (Section 2.2.4) was affected by the lack of experience, market knowledge and planning. The limited knowledge about the preferences of the target market was recognized as one of the factors that impact negatively in the speed at intensity goals. This also affected the main performance at the beginning of their international operations. Hence, the interviewees recognized this as one of the critical barriers to overcome, as the following excerpt reflected:

"We wanted to export … but it was not a good idea to start without a plan from the beginning as this is actually a very complex process, especially for SMEs where it is important to gain some knowledge about the international market and operations and define the structure for the decision-making processes."

In order to start this internationalization process as well as designing the internationalization strategies, the firms pointed out the role of their entrepreneurial orientation in taking their first steps in that direction by looking for sources of information among governmental institutions as well as their social ties in foreign markets. This orientation allowed the initial exchange of information among the counterparts. However, the incapability to obtain proper information also affects their knowledge of the business practices to prevent some opportunistic behavior, as the sales representative in Choco Lt. expressed from their experience:

"The lack of information and knowledge played on us very badly. Also, as part of this ignorance, we did not know who to trust and which kind of information we should share. One of our first providers took advantage of it and that costed us our first exportation."

The information quality, availability, and sharing as well as the efforts to establish more effective IMCs between the firms and their partners has enhanced levels of trust and flexibility across the chain improving their visibility and time to respond to fluctuations in the business environment. Late Co. representative commented:

"The main lack of knowledge we faced in our first exportation was the knowledge related to the logistics operations related to our own product. We didn't know about the issues of transport and distribution, and we trusted our logistics provider, who didn't advise us properly. After that experience we started to ask more to our distributors, representatives and logistics provider about the main practices. We established key relationships with who now we share more strategic information to avoid delays and risks."

The gained experiences, trustful relationships, as well as the development of the logistics capabilities across the chain, have prompted collaborative learning processes among the firms. For instance, Late Co. works side by side with their suppliers to generate new knowledge to integrate the sourcing and manufacturing processes as they have identified the coordination and integration of knowledge as a critical source of strategic advantage. This also stimulates the development of SCF to align and adapt the internationalization strategies, as the firms start to integrate their decision making process with their counterparts. For example, the sales manager of Choco Lt. explained:

"…as we have a good relationship with our providers and distributors, we are always sharing information, which is the current situation and future expectations of the market so we can plan to increase the intensity, the entry to new markets, or the development of new products and what we need to do, like for example if we can increase our production volume, how fast we can manufacture a new chocolate …"

The integration of learning processes, based on trustful relationship and IMCs, leads to more committed efforts among the key partners to align their goals in order to achieve their internationalization strategies. Late Co. representative explained how this impact on their business due to the importance of traceability, quality initiatives, appellation of origin in the case of food products, particularly the organic niche market. The committed relationship built with their suppliers stimulate the alignment of suppliers' efforts to improve all the requirements from the high quality demanding international market (Mandal 2016). The development of new products, technics, or technologies, as well as training programs are done in collaboration between the suppliers as well as with the distribution channels to ensure the adaptability and alignment to the main goals and vision. As Late Co. CEO founder shared:

"Our success is highly related to a conductive global strategy that we have adopted across the chain."

Discussion

The findings allow identifying the linkages between the internationalization goals, the Know-MaRF and the development of SCF. In accordance to the literature review (Johanson and Vahlne 1977; Leonidou 2004; Kahiya and Dean 2016), the gained of body of knowledge and the accurate management of this body has a significant influence particularly at the beginning of the internationalization process of the SMEs in this study. The need to overcome the lack of knowledge related to opportunity recognition, export procedures, and foreign business practices triggered the entrepreneurial behavior of the firms. This entrepreneurial behavior prompted the capability of sharing information to obtain the required knowledge to internationalize their products (Mihi Ramírez et al. 2012). In line with He et al. (2014) and Wu et al. (2014), as the exchange of information increases among the parts, a mutual understanding takes part and the degree of trust also stimulates a higher development of information exchange capabilities (IMCs) among the counterparts, e.g. sharing not just tactical information but more strategic one to enhance the planning process. Nevertheless, the appropriate leverage of trust in sharing information and coordinating operations is critical to identify key counterpart that will not behave opportunistically (Sambasivan et al. 2013), which costed a big loss for both firms at the beginning of their operations. This reflects the need of balanced trust and logistics capabilities to avoid opportunistic behavior from one of the parts in the relationship (Johanson and Vahlne 2009). Furthermore, as the level of trust and the logistics capabilities increase between the studied firms and their partners, a more committed interactive learning process started to take place (e.g. developing training programs) which is in accordance with the findings of Johanson and Vahlne (2009); Vahlne and Johanson (2013) and Wu et al. (2014). This has led to integration of inbound logistics capabilities between the manufacturing SMEs and their suppliers. Furthermore, as Gligor and Holcomb (2012) argument, the development and alignment of logistics capabilities increase the flexibility across the supply chain. In the cases under study, the development of logistics capabilities, particularly IMCs, has enabled the firms to identify key processes across the chain where generating new knowledge enhanced the flexibility dimensions such us information flexibility and organization flexibility. This also has allowed them to underline their internationalization strategy to address the requirement of their target markets. The firms have enhanced their capability to recognize opportunities and leverage their internal flexibility the collaboration with their suppliers and retailers. The IMCs across the supply chain play an important role for learning processes as the information flow among the partners become more flexible (Mihi Ramírez et al. 2012). However, while the development of IMCs among

the supply chain partners prompts higher levels of ILCs, this increases the commitment with their supplies and customers losing flexibility for reconfiguring the chain, as has been identified in the case of both SMEs. In the other hand, this allows control and planning flexibility reducing the uncertainty and risks by sharing a long-term vision (Stevenson and Spring 2009).

In accordance with Morgan and Hunt (1994); Johanson and Vahlne (2009) and Wu et al. (2014), these findings suggest that as the levels of trust and the integration of learning processes increase the firms will join efforts to collaborate in the achievement of a long-term strategy. The trust, and commitment to a long-term relationship has trigger the development of IMCs between the firms and their key partners to enhance their market knowledge, decision making process as well as their planning process (Prajogo and Olhager 2012). Furthermore, as the firms are able to communicate and commit to a long term goals this stimulates the development of further logistics capabilities such as SMCs, DMCs as well as the development of flexible strategies based on the integration of the supply chain partners (Jin et al. 2014; Mandal 2016; Manders et al. 2016), e.g. the collective learning about the harvesting, fermenting and drying process trigger the collective effort for enhancing those process which in turn enhanced the quality to the final product. As the firms commit their efforts in a relationship to gain experience, knowledge and information, this generates dependence among the network partners (Johanson and Vahlne 2009), the manufacturing firms require to leverage the benefits from committing their efforts for gaining knowledge and developing critical flexibility dimensions among the firms. This leverage will also impact their internationalization goals in terms of defining geographical scope, the speed on which the firm will be able to reach that scope and the intensity in that market. As the firms gain knowledge and flexibility, it is possible for them to easier identify market opportunities in new markets or to increase the intensity in the current ones.

From these findings, it is argued that the management of body of knowledge, referred to the export procedures and business practices abroad, affects the speed of internationalization as the lack this knowledge means a delay until it is overcome. It is also observed that the set of knowledge, experience among the manufacturing SMEs and their partners gained through the IMCs, information flexibility and strategic flexibility might be considered as a sustainable competitive advantage for internationalization, supporting ***S1*** and ***S10*** (Sections 3.2.1.1 and 3.2.4 respectively). Finally, these findings point out to the dynamics between the knowledge process and the networking process as presented in the system dynamics approach (Section

3.3.2), where it was argued how as the firms gain market knowledge, they will enhance their supply chain structure to achieve the internationalization strategy. The SMEs leverage their learning processes and networking process through the levels of trust and commitment between the supply chain partners which drives the collaborative efforts to develop logistics capabilities and core SCF dimensions.

4.2.2.2 Mar-MaRF and SCF strategies

Both firms set their marketing planning with an international orientation defining the target market(s) as well as the type of product(s) with which they were willing to serve in those markets. These two aspects determine various barriers needed to be overcome to enable their participation in foreign markets (Leonidou 2004; Sousa et al. 2008; Kahiya and Dean 2016). The behavior of chocolate consumers has changed over the last years becoming more conscious and demanding higher quality, preferring chocolates with the appellation of origin, organic, new flavors, and sustainable. This has stimulated the emergence of new business models to satisfy these high requirements from the market. In addition, the firms need to assess their strength, weakness, opportunities and threats with respect to foreign competition. The participation in trade fairs has offered them a good frame to evaluate their market position and potential as well as to identify market trends to outline a plan of action.

Other aspects considered by both SMEs, when designing the marketing strategy, are the tariff and non-tariff barriers due to their impact on pricing, distribution costs, and competitiveness in the target market, e.g. the recent trade agreement signed with the European Union where the Ecuadorian chocolate has a reduced tariff to enter to European markets (European Commission 2017) allowing them to set a more competitive price in these markets. With respect to the non-tariff barriers, the firms are subject of both public and private quality certifications and trade labels (Aragrande et al. 2005; Lee et al. 2012). The closeness to the market as well as the degree of commitment to it affect the marketing decisions to address both, tariff and non-tariff barriers. After their initial experiences, both firms have recognized the importance to integrate both sides of the supply chain to make the right decisions and plan of actions to overcome a tariff and non-tariff barrier, e.g. to certificate a sustainable production. All these efforts have demanded higher levels of commitment among the suppliers, the focal firms as well as the retailers to share the risks and benefits of the required investments. For instance, one of the firms in coordination with their suppliers and one of their most important retailers have invested in the highest quality certification of sustainability, due to the added value that this label represents to the customers, gaining a

competitive advantage in European markets. As the level of commitment among the partners has increased, this also has stimulated the degree of information exchange (IMCs) and integration among their operations (ILCs). However, in this effort, the firm has chosen strategic suppliers to pool the raw material with a particular label to be able to offer different certifications to different segments of the market.

The proximity or distance to the customers is affected by the liability of foreignness experienced particularly as a cultural barrier. To overcome this cultural barrier, the SMEs need to generate their counterparts' trust. In the case of the Ecuadorian firms, they perceive that they require *'double or triple'* times the efforts to gain the trust of their potential customers due to the lack of presence of Ecuadorian producers in international markets of organic chocolate, as all the participants pointed out. Their proactive behavior has enabled them to generate trust from their counterparts to cause the exchange of information that hopefully might lead to establishing a commercial relationship. The CEO founder of Late Co. stressed,

> *"To be honest, it was really hard to be taken seriously and get involved in the business network. I believe this has something to do with our cultural background because someone from the USA does not recognize any relationship with someone from Latin America. However, if someone comes from Germany, they believe him immediately. In our case, we have to insist constantly to be acknowledged and generate the trust of potential customers. Then, we gain their trust in our quality and our integrative concept. The same amount of effort was needed upstream to generate trustful suppliers with the quality required."*

In the effort to generate downstream trust, the SMEs have integrated into their processes simple but effective IT solutions for e-commerce and involved a 4PL provider to enhance the flexibility and reliability on the commercialization and distribution processes to the final customer. Through these solutions, the firms have enhanced their proximity to their final customers and joined efforts with their supply chain partners to overcome the changes in the demand and adapt their products, distribution strategies or any process that might impact the relationship with their customers.

Discussion

Several aspects need to be considered and assess during the whole internationalization process of the firm. In this process, it is important to determine the proximity to target markets and the

final customers as well as identifying the competitors in those markets. Defining the internationalization strategies and goals, planning the actions and the effective achievement of them depend on the capability of the firm to recognize its opportunities, the trends, and needs of the market as well as the critical barriers to overcome (Leonidou and Katsikeas 2010). The proximity to the market and the capability to cope with the competition require an entrepreneurial and flexible approach (Rundh 2011). The increasing level of sophistication of customers' demands has triggered the development of new business models (Child et al. 2017). In the case of the industry under study, chocolate consumers are demanding sustainable, healthy, high-quality, innovative and exotic flavors from the manufacturer. Thus, the firms need to identify sources of differentiation to develop an effective internationalization strategy. By adopting an entrepreneurial orientation as well as a supply chain orientation and flexible approach, the firms have addressed these requirements. Being aware of the local restrictions in form of trade tariffs, legal regulations, and market trends depend on the information exchange downstream (Rundh 2011) and finding ways to overcome those restrictions depends on the level of commitment to the market as well as the level of collaboration among the supply chain as a whole (Vahlne and Johanson 2013; Felzensztein et al. 2015; Kahiya and Dean 2016).

The internationalization strategy and marketing plan need to be aligned with the production planning and distribution strategy to enhance the competitiveness of the firm in foreign markets (Fantazy et al. 2009; He et al. 2014). The firms of this study have developed their internationalization strategy and integrated their suppliers as well as their distributors in the planning process. The success of their internationalization strategy and the achievement of internationalization goals are highly related to the strategic coordination between the two sides of the supply chain. Furthermore, in line with the system dynamics approach presented in Section 3.3.2, the findings showed that as the SMEs of the study and their partners start to incorporate IMCs, the level of trust and commitment increases triggering the development of DMCs and SMCs among the firms promoting a more customer-oriented strategy to provide a rapid response to the market as well as adopting strategies to avoid intermediation, reducing cost and delivery time.

Enhancing the market management between the SMEs and their supply chain partners has improved the commitment and the effectiveness of the efforts of each partner to align their efforts to cope with the requirements of the market and share a common goal and vision. This impacts the capability of the supply chain network, that the SMEs have established with its

providers and retailers, to overcome the changes in different foreign markets (Johanson and Vahlne 2009; Stevenson and Spring 2009; Rundh 2011; He et al. 2014). Hence, as the MRF coordinates and integrates the internationalization strategy among the other four relational functions, these actions have a direct impact on the achieving the scope, speed, and intensity goals. Finally, from the findings it is argued that the achievement of the internationalization goals and strategies depend on the ability to overcome the market barriers by coordinating the logistics capabilities among the firms and enhancing the flexibility of core dimensions, which enables the manufacturing SME to respond and serve in the foreign markets with a reliable product as well as productive and distribution structures, confirming ***S2*** (Section 3.2.1.2) where it has been defined the importance of Mar-MaRF as a managerial function to coordinates the marketing strategies and committed efforts of internationalization through the development of logistics capabilities and SCF strategies.

4.2.2.3 Res-MaRF and SCF strategies

The lack of resources and the appropriate management of the existing ones constitute an important issue that a manufacturing SME has to face, particularly when pursuing internationalization. The firm needs to identify the expectation from the international market, its own resources, abilities, and the production and distribution capacity as well as its limitations and barriers (Johanson and Vahlne 2009). Therefore, sharing resources and risks becomes an important strategy to overcome these barriers and enhance its capabilities. Nevertheless, sharing resources and risks require high levels of trust between the partners (Morgan and Hunt 1994; Wu et al. 2014).

As pointed out previously, the manufacturing SMEs required a plan to enhance the use of their own resources and capabilities to avoid risk as well as unnecessary costs and time. They also identified the crucial sources of uncertainty that might affect the access to raw material as the main element for their manufacturing process. In this sense, the development of suppliers of organic cocoa had a direct impact on their internationalization process, as the interviewees from both SMEs reported. Furthermore, the negotiation of raw materials plays an important role in building trust when developing suppliers (Stevenson and Spring 2009). Cocoa's price is affected by different factors (e.g. the annual volume of production, climate conditions through the year, producers' price policies) which in turn increase sourcing uncertainty (Gilbert 2008). Cocoa suppliers have learned the importance of gaining a fair price through the added-value activities that they have developed and manufacturers such as Late Co. and Choco Lt. pay that price in exchange for a high-quality raw material and the traceability

required by consumers of organic products. Moreover, Late Co. has established a strong and trustful relationship with its suppliers, that has led to collaborative efforts to address the high fluctuation of cocoa price in international markets or when the manufacturer faces delays in the collect. One of the interviewees of Late Co. commented:

> *"The farmers know that we pay a good price and that gives them a good reason why to improve the quality of their cocoa crops. Sometimes we share working capital with them to support their initiatives and when we face a delay with some important customer the suppliers extend our credit."*

To achieve this level of collaboration, the relationship among the partners demands higher degrees of commitment to match the resources and efforts across the chain. Hence, the firm has adopted some information exchange tools to increase the transparency in the relationships and the information shared across the firms (IMCs). Late Co. promotes suppliers' integration to leverage their limited resources, generate added-value processes and offer high-quality raw materials as demanded downstream. By doing so, Late Co. has promoted the integration among producers from different countries to increase the variety of raw materials and certifications to serve different markets. The horizontal integration in the supply side has enabled sourcing flexibility and differentiation strategies as the manufacturer is not directly related to a single supplier but to a pool of them. In contrast, Choco Lt. has selected a single origin sourcing as strategy to serve with a particular appellation of origin. However, as this limits its volume flexibility, Choco Lt. promotes the integration among different manufacturing SMEs in order to *"solve their common lack of resources"* and participate together in international trade fairs or to negotiate with a particular retailer.

To produce a high-quality organic chocolate, the manufacturer requires a high-quality organic cocoa, which means adequate processes of crop, cultivate, harvest, fermentation and drying by the supplier. Further the processes of roasting, grinding and pressing are critical processes that determine the quality of the chocolate (Putri et al. 2015). Late Co. has focused its efforts in developing a flexible manufacturing system by integrating the suppliers in the process as the managers of the SME consider this approach as the best option to leverage the flexibility of the raw material and develop an extensive variety of products. In this sense, although the inter-organizational relationship flexibility is affected reducing their capability to act independently, this integration has increases the capability of the chain to reduce the sourcing risks and focus the collaborative efforts and resources where they have identified critical problems that impact the overall performance. This also has increased the levels of trust and

commitment among the supply chain partners, reducing the need to supervise suppliers' processes closely:

> *"We control the quality of the cocoa beans, but now also the farmer knows that he needs to deliver a good quality to gain a fair price. Thus, we are very important to them as they are very important to us. They really pay us good attention as they understand how important it is that we all do our part. It is a thing of mutual need… Now we are able to select from the best raw materials available. Our process starts there as when you want to deliver a high-quality chocolate, you need a high-quality cocoa. We joined our efforts to develop the whole value chain from the crop to the customer and working on allocating the resources and money where they are needed. Of course, this is not easy so we plan how to achieve it."*

The effective use of the available resources in the network depends on the level of trust and planning in the manufacturers' supply chain. The degree of planning, coordination, and integration has also allowed the allocation of the resources and optimized the management of raw materials and finished product inventory. All the interviewees have remarked the importance of synchronizing the inbound and outbound logistics activities to reduce costs and transit times, particularly high from the origin country due to the limited frequencies and lack of direct connection to some of the markets served by the SMEs. To address these issues, one representative from Choco Lt. explained:

> *"We have the flexibility to purchase JIT in the case of the raw materials. For the distribution we allocated the inventory of finished product in a strategic warehouse in our foreign markets. From there we can deliver the chocolates to our retailers increasing the flexibility in the minimum order that they can place. If we keep the inventory in our home country, it will represent higher cost and time for both sides as then the minimum order from the origin is one pallet and this is not attractive for a single retailer due to the related logistics and transportation costs to move that single pallet."*

Finally, Choco Lt., by managing the export processes from the origin country as well as the import processes in the target markets, has increased the flexibility to distribute the product in a larger number of retailers, which constitutes a competitive advantage.

Discussion

Internationalization requires a high level of resources and capabilities. Manufacturing SMEs are willing to remain flexible as it gives them the chance to overcome their lack of resources and limited capabilities while at the same time they grow in international markets (Rundh 2011; Zhang et al. 2014). First of all, it is important to identify their own capabilities and resources for understanding their potential and limitations to operate in international markets. With a clear picture of their strengths and weakness, the firms evaluate their priorities and potentialities to serve in the target market. The firms required a plan to enhance the use of their own resources and capabilities as well as to access to the sources of critical resources and disruptions of the supply chain. Bearing this in mind, the speed of internationalization will depend on the capability of the firm to overcome the critical lacks of resources or until it can access them. In the case of the analyzed SMEs, both firms commercialize organic chocolate. As part of their main strategy to serve in foreign markets, the manufacturing SMEs required a minimal provision of organic cocoa beans to produce their chocolates. Hence, both firms needed to address this issue from the beginning of their operation. The development of strategic alliances with farmers has reduced the risk of disruption of the raw material, not just in volume, but also in quality and fair price. From the analysis of the interviews, it is argued that to achieve that level of commitment and collaboration started through the progressive development of logistics capabilities among the manufacturing firms and their suppliers, particularly the development of IMCs among the partners at the beginning of the operations. This makes it is possible to identify the opportunities access to external resources available in the business network (Johanson and Vahlne 2009). Strategic alliances are established by building trust between the partners leading to the development of SMCs, DMCs, and ILCs (Kwon and Suh 2004; He et al. 2014).

In accordance with Stevenson and Spring (2009) and Omar et al. (2012), the findings of this study point out to the impact of internal and external integration to pool resources and risks. As the trust increases between the supply chain partners, they join more committed efforts to coordinate their logistics capabilities enhancing the use of their resources and reducing the cost and time on managing them. Furthermore, in line with Stevenson and Spring (2009); He et al. (2014) and Mandal (2016), the study showed that as the levels of trust, commitment and the coordination of logistics capabilities increased among the supply chain network, this prompted higher levels of production flexibility, volume flexibility and mix flexibility as well

as the implementation of SCF strategies such as JIT purchasing and sourcing, flexible manufacturing and distribution processes among others.

From this study, it is observed the importance of having a coordinated structure and synchronization among the strategic and marketing planning as well as the management of the network to enhance the management of the potential available resources in the supply chain network. Furthermore, the implementation of SCF strategies improves the effective management of those resources and the degree of its achievement depends on the degree of commitment among the partners, which supports affirmation made on this regard in the system dynamic approach (Section 3.3.2). Therefore, the degree of trust, commitment and the integration of logistics capabilities will impact on the type of SCF strategy to adopt and it should provide an edge to the firm and its supply chain to cope with the structure of the industry and the new trends of international markets (Prater et al. 2001; Verdú-Jover et al. 2006). In some cases, it might be necessary to develop more flexible structures and allow the reconfiguration of the supply chain for enabling the access to wider sources of resources upstream or downstream. It was the case of the firms under study, where the structure of the industry had little flexibility for the entrance to new competitors, particularly manufacturing SMEs. The firms promoted both horizontal and vertical integration to have access to raw materials that were not available for small manufacturers and on the other side, to have access to international markets by sharing resources for distribution. As Stevenson and Spring (2009) remarked *"there is usually a long-term and/or greater commitment to a particular supplier - which might be seen to reduce flexibility - but an anticipated increased responsiveness as a result of the increased importance of the customer to the supplier's business"*.

Finally, these findings provide evidence to confirm ***S3*** (Section 3.2.1.3), as it is identified the impact of resource management in the internationalization process of the studied SMEs. It is observed that the SCF strategies oriented to improve the management of the resources among the firms impact the achievement of internationalization goals. By the strategic allocation of inventory of finished product, the SMEs have been able to serve different markets while reducing the distribution costs, delivery time and product waste, which has a direct impact on their pricing. Furthermore, by increasing production, volume and mix flexibility the firms are able to intensify their participation in the foreign market (Jin et al. 2014; Manders et al. 2016). Finally, the speed of the internationalization process is impacted by the management of resources and the degree of sourcing, production and logistics flexibility. Therefore, the particular combination of resource management, knowledge, planning, logistics capabilities

and flexibility among the manufacturing SMEs and its partners might be considered as a sustainable competitive advantage as long as it might be valuable, rare, inimitable, and hard to replace (Barney 1991; Sandberg and Abrahamsson 2011; Teece 2014), supporting ***S10*** (Section 3.2.4).

4.2.2.4 Net-MaRF and SCF strategies

The ability to overcome the 'liability of outsidership' minimizing the risks of foreign exchange by establishing strategical relationships, to gain an important position in the business network, requires a significant effort from manufacturing SMEs (Johanson and Vahlne 2009). This is particularly true in the case of highly structured markets such as the chocolate market, where the manufacturing firms from developing economies have to strive for a position in this market due to the dominance of traditional firms from developed economies (Gilbert 2008). In the case of Ecuador, the whole production of organic cocoa was exported as raw material with little added-value for decades (UTEPI 2007). Moreover, the organic food market is a highly competitive segment, where customers are more demanding and interested in the whole process of production, from *'the bean to the bar'*, as has been pointed by the majority of the interviewees. This reality has been faced by both of the manufacturing SMEs in this research. Both have experienced the difficulty of been an *'outsider'* when searching for providers or distribution channels, participating on international trade fairs or creating a direct contact whit the customer. Hence, it has been critical for these SMEs, the ability to identify alternative supply chain configurations through which they can operate in international markets while coping with their internal limitations as well as their position in the business network. They have been able to configure their supply chains to avoid as much intermediation (upstream and downstream) as possible to remain flexible in their core process and to develop collaborative efforts with their supply chain partners. One of the key aspects, in this regard, is the international entrepreneur orientation of the decision makers that enhanced their capability to search and recognize key relationships and structures among their current social ties as well as through public entities such as PRO Ecuador. This has enabled them to operate in the target markets by trusting and sharing information without compromising themselves with strict agreements, as expressed by one of the sales manager of Choco Lt.:

> *"We handle the sales on our own to avoid intermediaries. Our chain is directly for the manufacturer to the retailer and the final customer. We also take part in the trade fairs to have a closer contact with the customers and hear their direct feedback. This*

has a direct impacted on our decisions related to the volume and production mix, the development of new products, packaging, and the distribution strategies to respond immediately".

In the case of Ecuadorian manufacturing SMEs, the interviewees remarked the lack of trust from manufacturing SMEs to potential business partners as they perceive opportunistic behavior as a major threat. Nevertheless, this lack of trust has resulted in diminishing the capability for opportunity recognition (geographic scope and speed) and market development (intensity). The firms of this study have undertaken an entrepreneurial orientation to overcome this threat. This entrepreneurial orientation has conducted the internationalization process from starting with a relationship based on sharing tactical information and low levels of mutual trust, to later undertake actions for joining training and certification programs, developing new providers, to finally coordinating the strategic decision with their supply chain partners. For these SMEs, this has constituted an edge to compete in a highly structured and tie traditional market as in the case of cocoa value-chain. The firms maintain a close relationship with their suppliers allowing for identifying critical upstream issues and developing collaborative efforts to improve the performance of this side of the chain. For instance, Late Co. and its farmer suppliers have developed new techniques for the harvest and fermentation processes adding value to the raw material. Although this is not a conventional fashion to interact in the cocoa value-chain, the firm understands that the problems in sourcing have a direct impact on the production processes as well as on the quality of its products. Moreover, whereas they have established collaborative efforts, the manufacturer has no obligation to buy all the production, and the supplier has no obligation to sell all his production to the manufacturer. This allows to both sides having a mutual benefit and remain in a flexible relationship. Similar actions are also performed downstream where retailers and manufacturers have developed trustful commercial relationships based on the integration of information and distribution processes. Nevertheless, the need to develop more committed relationships emerges as the business growth as well as the risks. One of the interviews of Choco Lt. explained:

"Having this flexible relationship with our retailers is a strength to us. We handle everything in a highly flexible relationship. We do not manage formal contracts… but we have been analyzing this option with our main retailers to avoid further conflicts as they can occur anytime."

The networking process determines the degree of mutual dependence among the partners (Johanson and Vahlne 2009; Novillo Villegas and Haasis 2018). In the case of these manufacturers of organic chocolate for international markets, once the firms begin to exchange information and develop collaborative efforts with their suppliers, their dependence increases which reduce their capability to swift from supplier to supplier due to the cost and effort that represents developing a certificated producer of organic cocoa. On the other hand, the networking process is critical for developing alternative SCF strategies (e.g. vertical integration and/or horizontal integration) that enhance the alignment of the supply chain partners to the main internationalization strategies. The firms have integrated their suppliers to produce and internationalize high quality and sustainable organic chocolate, adapted the key processes of each partner across the supply chain to achieve their internationalization goals. In addition, they have joined efforts to provide an agile response to the changes in the sourcing (which is critical due to the degree of dependence on the raw materials for the production of chocolate) as well as to address the volatility of the demand. Finally, as the CEO founder of Late Co. remarked:

> *"The alignment of all the actors, to the internationalization and sustainability strategies, has played a key role in our success."*

Discussion

As described the networking process presented in Section 3.3, the findings of this research showed a continuous interaction based on the trust, commitment level and coordination of activities to achieve the common goals and welfare while sharing the cost and risks. Moreover, for internationalizing manufacturing SMEs, this process enhances the leverage of firms' internal flexibility while performing collaborative efforts with their partners (Ismail et al. 2011; Zhang et al. 2014; Novillo Villegas and Haasis 2018). In a highly structured, competitive and traditional industry as the chocolate, new participants need to be capable of coping with this existing value chain. From the analysis of the studied SMEs, this capability to overcome *'liability of outsidership'* relies on their networking process as the internationalization of a firm is affected by the existing relationships and the position that the firm has in the business network (Johanson and Vahlne 2009).

It was observed how the proactive behavior, previous knowledge, and networking capabilities of decision makers triggered the development of their logistics capabilities allowing the identification of key relationships to trust and establish committed efforts (Pihkala et al. 1999;

Child et al. 2017). To be able to participate in international markets, it was necessary for the firms to develop flexible organizational structures inside the established value chain. Hence, the firms started the process by gathering information among their current social ties as well as from information available on the Internet. This is in line with the findings of Ellis (2011), who identified how network ties and international entrepreneurship enhanced their internationalization process through their communication capabilities. Moreover, as the exchange of information (IMCs) increased among the SMEs and their counterparts, the level of trust also increased which leads to align efforts by sharing a common interest (Chen et al. 2011; Novillo Villegas and Haasis 2018). In accordance with Wu et al. (2014), The findings of this study showed how through the development of logistics capabilities, these small firms have been able to configure their supply chain integrating actively their suppliers as well as their distributors enabling them to compete in foreign markets and reducing the risks of foreign exchange. As found in Hessels and Parker (2013), the firms have relied on the trust built between them and their partner to establish informal but committed efforts and structures which has a significant impact on their internationalization process and goals. Hence, as the levels of commitment increases in the relationship between the manufacturer and the supplier, it also becomes more interdependent allowing the vertical integration across the supply chain partners (Stevenson and Spring 2009). That is observed in both studied SMEs, as the vertical integration is a key element to ensure the quality and traceability of their products. Therefore, the trust between the partners constitutes a key element to integrate their processes and promote collaborative efforts (Morgan and Hunt 1994; Wu et al. 2014; Mandal 2016). Furthermore, the development of logistics capabilities stimulates the vertical integration across the supply chain (Gligor and Holcomb 2012). Moreover, the SMEs have identified the need for each partner to remind as flexible as possible to be able to adapt to any change required by the market. Consequently, it is important to determine the needed degree of commitment and integration within the supply chain for achieving the requirements of the international market. As Stevenson and Spring (2009) concluded, the firms in a supply chain have to evaluate the trade-off between the reconfiguration of the supply chain or the achievement of flexibility dimensions of flexibility (e.g. planning and control flexibility).

With this in view, the management of the networking process has impacted the internationalization process by enabling the synchronization and coordination of the knowledge, internationalization strategies and the use of resources among the manufacturer SMEs and their supply chain partners. These findings provide support the affirmations of ***S4***, ***S7, S8, S9*** and ***S10*** (sections 3.2.1.4, 3.2.2, 3.2.3, and 3.2.4) and the networking process

described in the system dynamic approach exposed in Section 3.3. As the SMEs developed more committed relationships and coordinated their learning processes, the capability to identify opportunities and threats increased although their inter-organizational relationship became less flexible. In the case of these manufacturing firms, the decision of the geographic scope is influenced by the existing business and social linkages of the firms in the target market. Furthermore, the flexibility to adapt and develop new relationships within the existing value network constitutes a key factor in determining the speed and intensity of firms' participation in international markets. It will take more time for the internationalization process in the case when the firms are not able to establish a trustful relationship in the foreign markets (Kahiya and Dean 2016). Further, the networking management across the supply chain influences the intensity and flexibility of participation in foreign markets, as they impact the provision of raw materials, volume, and mix of production, as well as the distribution strategy of final products in the target market (Di Maria and Ganau 2017; Novillo and Haasis 2017). Finally, the fashion on which the manufacturing SMEs constitute their business network in the further implementation of SCF strategies within their supply chain partners has become a key element for their sustained competitive advantage in international markets.

4.2.2.5 Inn-MaRF and SCF strategies

Serving in various markets and segments of those markets requires permanent innovative efforts to adjust and adapt the internationalization strategies, processes, and products of a firm and its supply chain network to those markets (Knight and Cavusgil 2004). These innovative efforts need to be aligned to the internationalization strategies and respond to the market trends and customers' requirements. It is important to evaluate the capability of the firm for adapting the current products, generating new products, or enhancing their processes to be competitive in international markets. The experts interviewed pointed out that it is not enough to prove the product quality required by the customers. It is also needed the capability to cope with the market trend, the demand for new product features as well as improving the processes of crop, manufacturing, packaging, and distribution. Being innovative has been described by one of the representatives of Late Co. as a mutual learning processes where it is required the internal and external coordination of the core functions to generate effective innovative efforts. These innovative efforts have prompted the development of innovation processes, methods, and technics not just in manufacturing, but also in cooperation with suppliers and retailers. Hence, Mar-MaRF has to transmit accurate information about the

market requirements to develop the new product or adapt the current one to Know-MaRF, Res-MaRF and Net-MaRF, to coordinate the innovation processes. For example, to enhance the flavor of the cocoa beans required by the market, the suppliers in cooperation with Late Co. have developed a special box for the fermenting process and they also have improved the drying technique. Furthermore, this SME has developed some of its own roasting machines and processing machines increasing the capability to obtain new flavors as well as enhancing the shifting time from one production batch to another.

In addition to the manufacturing flexibility for designing new products, the interviewees recognized the importance of the flexibility of the workforce as a factor that prompts innovativeness. It is necessary that the staff performs various tasks and aligns its skills with new processes within the shortest time. Furthermore, developing new products in this industry demands a close and committed relationship with the market, entrepreneurial orientation inside the manufacturing firm and trustful relationship to joint efforts with the suppliers, as observed in the study of both SMEs. It takes one and a half year on average the time between the starting processes for developing a new product until its launch to the market. This process has stimulated the exchange of information (IMCs) and efforts among the partners (ILCs) to enhance the final product as well as the farming, production, and distribution processes. However, as the CEO of Choco Lt. stated, this requires a high degree of coordination among the involved counterparts, including the exchange of knowledge, networking capabilities, and resources to develop or adapt the products to be later positioned in the market.

Discussion

When defining the internationalization strategy, the firms need to cope with the degree of differentiation and adaptability required from the internationalizing product (Knight and Cavusgil 2004). It is also important to consider the degree of flexibility in the industry (Verdú-Jover et al. 2006), the right product's flexibility and innovativeness in accordance to the market (Fisher 1997; Felzensztein et al. 2015) as well as the SCF to develop new products (Petersen et al. 2005; Flynn et al. 2010; He et al. 2014). The capability to incorporate all these aspects is highly related to the market knowledge and commitment as well as the integration of the firm to its network (Johanson and Vahlne 2009; Omar et al. 2012). In line with He et al. (2014), the SMEs, of this study, have recognized the need to adapt their products and processes to what is required in foreign markets to be able to compete in those market. It is important for the firms to have a clear picture of competitive forces acting in the target market

(Porter 1998). By adopting an entrepreneurial orientation and network approach, the SMEs have the capability to enhance their adaptation and differentiation strategy. In accordance with He et al. (2014) and Mandal (2016), the integration of their logistics capabilities and the improvement of IMCs within the supply chain leads to continuous learning and creative processes to develop new products as well as improve the current ones. The integration of suppliers and the manufacturing SMEs for developing new processes and products have increased the capability of the firms to optimize the use of the raw materials and generate higher value in the sourcing and manufacturing processes. This has also promoted the generation of new knowledge and share resources to continuously improve the internal processes of each participant as well as the external functions among them. On the other side of the supply chain, the market knowledge gained through the integration with the customers and retailers provides the foundation to develop new products or adopt the existing ones. Furthermore, from the findings and in line with previous studies (Chu et al. 2011; He and Wei 2011; Ogulin et al. 2012; Felzensztein et al. 2014; He et al. 2014; Fantazy and Salem 2016), it is argued that trustful and committed relationships trigger the integration of logistics capabilities and SCF to enhance the innovativeness capabilities inside of each firm and promotes the interaction between the supply chain partners to develop new processes and products. The flexibility among the firms, to interact and propose new ideas, is prompted a committed and integrated relationship which increases the capability to provide an accurate response to the market when demanding innovative products, services or solutions. With these findings in view, it is argued that the management of the innovative processes of an internationalizing manufacturing SMEs requires a particular attention to obtain the desired outputs. Thus, it is necessary to combine the managerial aspects of market knowledge and commitment, the available resources as well as the network that is involved in the process. With these findings in view, it is argued that the management of the innovative processes of an internationalizing manufacturing SMEs requires a particular attention to obtain the desired outputs. Thus, it is necessary to combine the managerial aspects of market knowledge and commitment, the available resources as well as the network that is involved in the process. This managerial process of innovation requires a particular set of actions that differ from the regular marketing process, supporting the affirmations of ***S5*** and ***S6*** (Section 3.2.1.5). With respect to the system dynamic approach (Section 3.3.2), it is concluded that the implementation of a differentiation strategy and the increase of intensity in foreign markets through innovativeness depends on the degree of new products flexibility, which at the same time is related to coordinate the internationalization strategy, the knowledge of the market, the

networking of the supply chain and the resources available for this innovative process (Vahlne and Johanson 2013; He et al. 2014; Wu et al. 2014; Liao and Marsillac 2015).

4.3 Interpretive Structural Modeling (ISM)

Dealing with complex systems or issues involves various difficulties due to the several components and linkages among these components that are part of the system or issue. The presence of components that are directly or indirectly linked to the system complicates the structure of that system. Moreover, this structure might or might not be clearly articulated increasing the difficulties to handle such a system. With this in view, ISM emerges as a methodology that supports the recognition of a structure inside a system (Attri et al. 2013).

ISM is a methodology for analyzing the relationships among diverse components in a complex issue or system. It has been categorized in the soft operations research methodologies (Dev et al. 2014). It was first introduced by Warfield (1974) for examining the complexity of economic and social systems. It consists of an interactive learning process that assembly the related elements in a structured system accordingly to the nature of their relationships. ISM constitutes a methodology to scheme the course of action to solve complex problematics. To analyze any complex problem, a series of different variables need to be identified and associated with that problem. Indeed, the identification of direct and indirect linkages within the variables provides a more accurate description of the problem than considering each element in isolation. Hence, ISM provides the tools to translate this complex problem into a visual, well-defined model to have a collective understanding of the relationships between these variables (Sage 1977). In addition, compared with similar qualitative methodologies, such as analytic hierarchy process (AHP) (which only enable a pair-wise comparison among the components of the system and to rank them); ISM enables to identify mutual linkages among the variables (Kumar et al. 2008). In the present research, this methodology is implemented to understand the implementation of SCF strategies during the internationalization process of manufacturing SMEs.

Several researchers have used this methodology to analysis diverse issues related to the supply chain. A brief summary of the research conducted using this methodology is presented in Table 4-2.

Table 4-2 Summary of literature on ISM applications

Author	Area of application
Ravi and Shankar (2005)	Schemes the relationship of the variables for reverse logistics in the supply chain of computer hardware
Faisal et al. (2006)	Models the enabler to mitigate risks in the supply chain
Kumar et al. (2008)	Identifies the relationship among the enablers of flexibility in global supply chain
Kant and Singh (2009)	Models the variables for implementing knowledge management
Gorane and Kant (2013)	Schemes the enablers of supply chain management
Mathiyazhagan et al. (2013)	Examines the barriers to implement green supply chain initiatives in SMEs
Dev et al. (2014)	Models the reconfiguration of supply chain network
Mangla et al. (2014)	Analyzes the factors for sustainable supply chains und risk
Shibin et al. (2016)	Models the enablers and barriers of flexible green supply chain management

ISM is a method assisted by computing tools that provides hierarchical graphical representations of the structure and composition of a system. By using notions of Boolean algebra as well as graph theory, Warfield (1974) presented a methodology that is capable to communicate in a holistic fashion the components and relationships within a system. Attri et al. (2013) explained *"in this approach, a systematic application of some elementary notions of graph theory is used in such a way that theoretical, conceptual and computational leverage are exploited to explain the complex pattern of contextual relationship among a set of variables. ISM is intended for use when desired to utilize systematic and logical thinking to approach a complex issue under consideration"*. Thus, ISM involves various steps as shown in Figure 4-3.

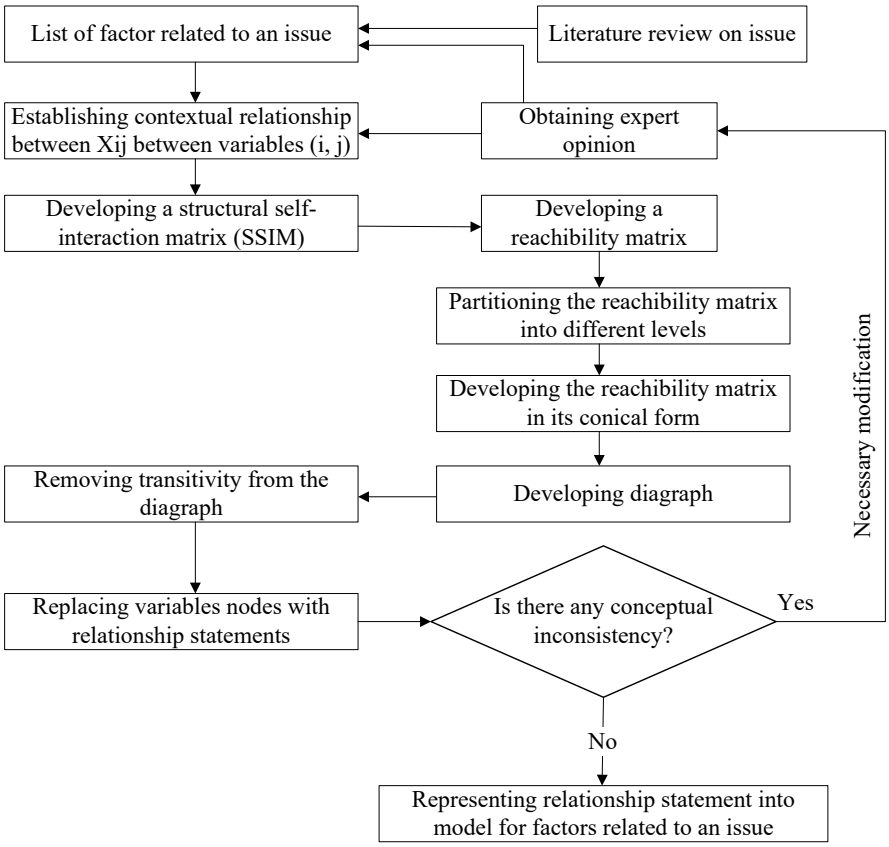

Figure 4-3 Flow diagram for preparing ISM model
Source: Mohammed et al. (2008)

The first step involves the identification of the key components that are relevant to the issue. This includes the literature review on the problem, as well as conducting survey, interviews with experts or group problem solving methods. On this basis, it is necessary to establish the contextual connections among the components that will serve as the ground to examine each pair of components. The second step involves the development of the structural self-interaction matrix (SSIM) of the components. This matrix presents the pair-wise connection between the system's components. The SSIM has to be checked for transitivity. Based on the SSIM, it is developed a reachability matrix. The reachability matrix is partitioned into various levels. Next, the reachability matrix is converted into conical form. The following step consists in removing the transitive links, and diagraph is drawn based on the connections established in the reachability matrix. The diagraph serves as a basis where the components nodes are substituted with statements to construct an ISM-based model. Finally, the model is reviewed to proof if there is any conceptual inconsistency to make the needed modifications. The section below provides a description of the ISM-model to implement SCF strategies for the internationalization process of manufacturing SMEs.

ISM-based model for SMEs internationalization with respecto to supply chain dynamic capabilities

To achieve the first step for developing the ISM-model, which consist in the elaboration of the list of factors or variables that are part of the issue, it is includes the literature review on the problem, as well as the interviews with experts from the case study. Hence, Table 4-3 presents the list of the main variables identified for each internationalization relational function based on the conceptual framework and in the light of the previous finding and discussion (Section 4.2.2). This includes the main barriers to internationalization, internationalization key dimension, and goals, resources, logistics capabilities, SCF dimensions and strategies as well as SMEs' intrinsic capabilities.

Table 4-3 Internationalization relational functions' variables

Internationalization Relation Functions	Variables
Know-MaRF	Market knowledge
Know-MaRF	Identify foreign opportunities
Know-MaRF	Strategic planning and integrative perspective (SP & IP)
Know-MaRF	International entrepreneurial orientation (IEO)
Know-MaRF	Information flexibility
Know-MaRF	Learning processes
Know-MaRF	Information-management capabilities (IMCs)
Know-MaRF	Economic and legal constraints
Know-MaRF	Strategic flexibility
Mar-MaRF	Geographical scope
Mar-MaRF	Speed
Mar-MaRF	Intensity
Mar-MaRF	Liability of foreignness (particularly the cultural barrier)
Mar-MaRF	Pricing and promotion in overseas markets
Mar-MaRF	Demand variations
Mar-MaRF	Market flexibility
Mar-MaRF	Demand-management capabilities (DMCs)
Mar-MaRF	Market commitment
Mar-MaRF	Responsiveness flexibility
Res-MaRF	Warehousing and inventory flexibility
Res-MaRF	Logistics flexibility
Res-MaRF	Sourcing flexibility
Res-MaRF	Supply-management capabilities (SMCs)
Res-MaRF	Resources flexibility
Res-MaRF	Volume flexibility
Res-MaRF	Mix flexibility
Net-MaRF	Inter-organizational relationship flexibility (IORF)
Net-MaRF	Integration logistics capabilities (ILCs)
Net-MaRF	Flexible supply agreement
Net-MaRF	Flexible distribution agreement
Net-MaRF	Supplier flexibility
Net-MaRF	Liability of outsidership
Net-MaRF	Organizational and configuration flexibility (OCF)
Net-MaRF	Networking capabilities and trust building
Inn-MaRF	Product features
Inn-MaRF	Manufacturing flexibility (including flexible manufacturing systems and processes)
Inn-MaRF	Product development flexibility (Product develop. flex.)

With respect to the Know-MaRF, among the main variables included are the learning processes and the capability to identify opportunities in foreign markets. This two are part of the market knowledge. The acquisition and generation of market knowledge are rooted in the information exchange and technologies (IMCs) as well as the flexibility of the information flow between the entities involved in the internationalization process. Other factors that are identified involve the IEO of the decision makers to interact with the business environment as well as the capability to adopt an integrative perspective for coordinating the strategic planning and flexibility. Among the variables included in the Mar-MaRF are the three internationalization goals of geographical scope, speed and intensity (Section 2.2.4) which also act as parameters for internationalization performance. The commitment to the market has been identified as the variable that prompts marketing aspects related to the pricing and promotion strategies overseas as well as with the SCF dimensions of market flexibility, responsiveness flexibility. In addition, the coordination and alignment of the internationalization strategy between the supply chain partners stimulate the development of demand-management capabilities (DMCs).

The variables recognized in Res-MaRF are the ones related to the allocation and flexibility of the available resources, including resource flexibility, volume flexibility, sourcing flexibility, logistics flexibility, among others. It is also included the supply-management capabilities (SMCs) as the capabilities to effectively manage the resources across the supply chain. With respect to the Net-MaRF, the variables included are the ones related to the networking capabilities and process. They involve the logistics capabilities to integrate the supply chain (ILCs) as well as the SCF dimensions of organizational and configuration flexibility, inter-organizational relationship flexibility among others. Finally, three are the main variables related to the Inn-MaRF, e.g. product feature, product development flexibility and the manufacturing flexibility which includes the flexibility of the systems and process for processing and transforming the raw materials into finished products. These variables embrace the fundamental aspects for generating and implementing of innovative strategies regarding the elaboration of new products or the adaptation of the current ones.

As it was observed from the findings and further discussed, there is a close relationship among the different variables of each relational function, as the variables for one relational function might drive the variables from other relational functions, and even it is possible that there is a closed loop among some of them. As all the variables are directly or indirectly

related to each other, it is possible to draw the driving path of these variables to achieve SCF strategies for SMEs internationalization. Additionally, based on Crick (2009) and the observations of this study, it is assumed that the three internationalization goals (i.e. geographical scope, speed, and intensity) will act as milestones to model this roadmap for the internationalization process of the manufacturing SME. The first step involves the definition of the geographic scope of the internationalization. The speed on which the firm reaches the scope depends on SMEs' capacities. Finally, once the scope is reached in a certain amount of time, the efforts of the firm will be focused on the intensity as well sustaining its internationalization process. ISM has been used as a methodology to analyze the driving forces of each variable and the relationship among them.

For the present work, the relationships among the 37 variables identified for manufacturing SMEs internationalization need to be structured in a carefully designed pattern. Hence, it is necessary to establish the contextual connections among the variables that will serve as the ground to examine each pair of them. Consulting with the experts from the industry provides the support to identify the direction of the relationships between the variables recognized from the literature review and the aforementioned technics. The direction of the contextual relationships is of two types, *'lead to'* or *'influenced by'*. Therefore, it is required to define which variable influences to another variable to develop the contextual relationship between all the included variables. Bearing in mind that it is required to develop the contextual relationship between every pair combination of the variables (*i* and *j*), the direction of the relationship needs to be questioned. Hence, four symbols have been used for denoting the direction of the contextual relationship between the variables identified in the implementation of SCF strategies for SMEs internationalization:

(1) *V*: variable *i* leads to variable *j*
(2) *A:* variable *i* is influenced by variable *j*
(3) *X:* variables *i* and *j* leads or influences to each other
(4) *O:* there is no relationship between variables *i* and *j*

On the basis of the contextual relationships, it is developed the structural self-interaction matrix (SSIM) of the variables. Appendix F-1 presents the pair-wise matrix of the connections between the system's variables.

Once the SSIM is finished, the next step consists in developing an initial reachability matrix (IRM) (Appendix F-2). The SSIM has been transformed into a binary matrix and checked for

transitivity. For this, the codes four symbols assigned in the matrix need to be changed in accordance to the following rules:

a) If the (*i,j*) entry in the SSIM corresponds to *V*, the (*i,j*) entry converts into 1 and the (*j,i*) converts into 0.
b) If the (*i,j*) entry in the SSIM corresponds to *A*, the (*i,j*) entry converts into 0 and the (*j,i*) converts into 1.
c) If the (*i,j*) entry in the SSIM corresponds to *X*, the (*i,j*) entry converts into 1 and the (*j,i*) converts into 1.
d) If the (*i,j*) entry in the SSIM corresponds to O, the (i,j) entry converts into 0 and the (*j,i*) converts into 0.

After obtaining IRM, it is required to check transitivity (i.e., if variable A is linked to variable B, and B is linked to C, then A is necessarily linked to C) by adding 1* entries to fill the gap when needed. Once the transitivity is completed, it is attained the final reachability matrix (FRM) (Appendix F-3). The FRM is partitioned into various levels. F For each element, the antecedent set and reachability set are determined (Appendix F-4). While the antecedent set incorporates the element itself and the elements that lead it, the reachability set includes the element itself and the elements that are influenced by it. Afterward, a third group is set with the intersections par-wise, i.e. when the element belongs to both the reachability set and the antecedent set. This process is repeated for each element. The elements are placed at the top-level in the ISM-model when the elements in the reachability set and intersection sets are the same. Thus, the element at the top-level is reached by the rest of the elements below its level in the model. As the element at the top-level is determined, it is no longer considered for modeling the levels below. Hence, this process continues until each element is allocated in a level (Appendix F-5).

Once the level partition of the factors is completed, a diagraph is constructed where the components nodes are substituted with statements obtaining the ISM-based model. Finally, the model is reviewed to proof if there is any conceptual inconsistency to make the needed modifications. The ISM model presented in this work has the aim to identify a path for reaching the three main dimensions of SMEs internationalization goals, i.e. geographic scope, speed, and intensity. To achieve these goals, it has been considered the implementation of SCF and the development of logistics capabilities as sources of a sustainable competitive advantage. The variables included were classified into one of the five relational functions identified previously. The driving power and dependencies of these variables were analyzed

regarding their impact on reaching SCF dimensions and strategies in accordance with the literature review and interviews with experts. From the ISM hierarchy, it is observed that most of Know-MaRF variables lie in the lower level, followed by Mar-MaRF and Net-MaRF driving Res-MaRF and Inn-MaRF. However, the top level corresponds to the variable of market flexibility related to Mar-MaRF. Figure 4-4 presents the final diagraph of the ISM-model of this research. It shows the flow of the contextual relationships between the 37 variables identified as the main elements that take part in the internationalization process of a manufacturing SME with respect to the dynamic capabilities and flexibilities of the supply chain.

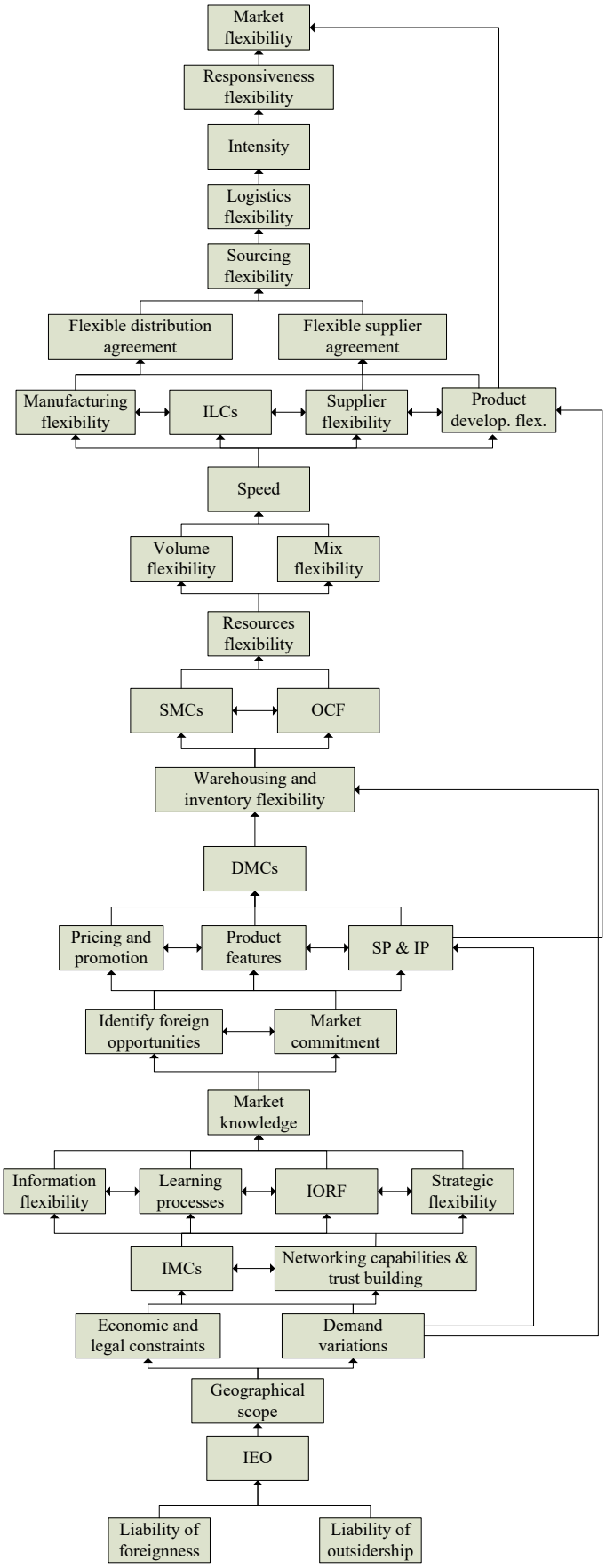

Figure 4-4 ISM-based model for SMEs internationalization with respect to supply chain dynamic capabilities

Before that any internationalization process takes place, the SME needs to evaluate its liability of foreignness (particularly the cultural barriers), as well as its liability outsidership on a set of possible target markets. On the bases of its international entrepreneurial orientation, the firm has to analyze the environmental constraints (mainly economic and political issues as tariff and non-tariff barriers) as well as the demand variations with respect to the target market. The proactive and risk-taking behavior of decision makers will drive the decision-making process to address the identified constraints. At this point, it is necessary to grasp information that provides valuable elements to support the decision-making process regarding the geographic scope, e.g. determine the cultural-distance, and identify the market trends and market size, the consumers' behavior, the geographical distance. The exchange of information (IMCs) is directly related to its networking capabilities, mainly trust, to have access to the sources of reliable information, e.g. access to the information and representatives of commerce chambers, trading groups, and brokers. These two elements are the groundwork for the learning process, which is at the same time related to the flexibility to distribute information, the strategic flexibility of the SME for generating new linkages with its business environment as well as the flexibility of the relationships among the entities involved in this process. The information gained, the learning processes, as well as the linkages among the business network, provide the ground for the developing market knowledge which in turn constitutes the bases for identifying opportunities in foreign markets. The identification of opportunities has a direct relationship to the market commitment as the former depends on the level of market commitment, and the level of market commitment will be impacted by the identification of opportunities. As the firm increases its commitment to the market, the search for opportunities in that market increases. On the other hand, the capability to identified opportunities stimulates the growth of the market commitment.

To coordinate the implementation of the strategic planning, and pricing and promotion policies as well as the development of the required product features, it is needed the development of DMCs. These capacities stimulate the alignment and development of customer-oriented strategies among the supply chain partners, e.g. generate differentiation strategies, and develop added-value activities. Furthermore, it is important to include the required level of flexibility to prevent demand uncertainty when designing strategies and policies for warehousing, inventory, and distribution which are part of the internationalization strategies. Hence, it is important the development of SMCs upstream to support the achievement of the required level of flexibility in the aforementioned dimensions. These capabilities support the collaborative efforts between the supplier and the manufacturer to

minimize the impact in the order cycle process, avoid the distortion of the order cycle process as well as reduce the waste of time and costs. It is also needed to define the organizational configuration inside the SME as well as among its supply chain partners. The configuration and the SMCs across the supply chain will determine the flexibility of the resources available in the network. On the basis of resources flexibility, it is possible to draw the volume flexibility and mix flexibility to respond to the demand variations of the target markets. The configuration of the aforementioned elements will determine the length of time required by the firm to reach a consistent volume of production and exportation for the international target market.

The volume and mix flexibility required by the target market drive the need to develop ILCs between the SME and its partners. The integration across the supply chain improves the flexibility required by the manufacturing system while levering the capabilities to develop new products as well as the required supplier flexibility. This integration is based on the information exchange and the flexibility to exchange such information to enhance the capability of the supply chain to coordinate the response to the fluctuations upstream or downstream. The coordination and integration need to be oriented to sustain the manufacturing system and incorporate the suppliers in the process of product development or modification. As the level of dependency increases among the firms involved in the supply chain, it will determine their commitment and need for controlling or supervising the fulfillment of their agreements, leading to establishing some formal contracts. Although this might limit the options to shift to other providers or retailers, they might build a more solid foundation to promote further collaborative efforts. The degree of flexibility among the agreements and the whole structure will determine the sourcing flexibility of the system. Furthermore, it is necessary to structure the logistics system to join the location of the sourcing and target markets in a cost-effective way. The structure of the logistics system implies a direct impact on the intensity of the internationalization, as it determines the export capacity, time and quality to serve international markets. Finally, to sustain the internationalization process of the firm requires appropriate responsiveness flexibility across the supply chain which further derivate market flexibility to respond to the particular requirements of the customer on each foreign market served by the firm.

From the analysis of the contextual relationship path exposed in the ISM-model, it is possible to design a roadmap for the internationalization of manufacturing SMEs through the development of SCF strategies as presented in Figure 4-5.

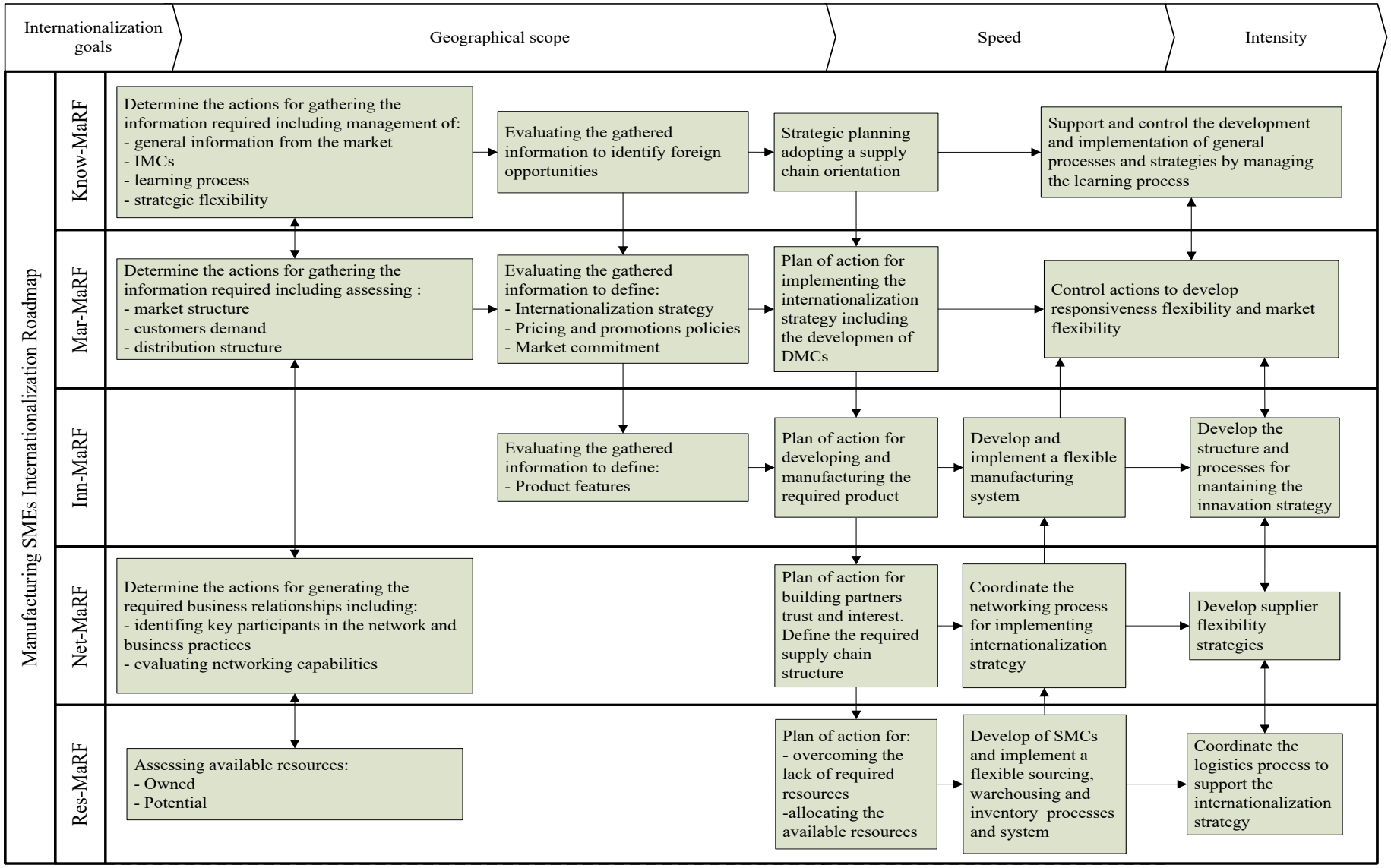

Figure 4-5 Roadmap for the internationalization of manufacturing SMEs with respect to SCF strategies

The present roadmap shows the actions required to be executed by each relational function during the internationalization process. The first task consists in gathering relevant information necessary to support the initial stage of internationalization. From the Know-MaRF is gather relevant information related to the economic, legal and political aspects as well as the logistics structure of the potential target market. In addition, it is important to identify the available processes and technologies to exchange information (IMCs), the needs for learning process and development of skills, and the available sources of strategic flexibility. The required information by the Mar-MaRF is related to structure of the potential target market(s), the behavior of the customers' demand and the culture of consumption in that market(s) as well as the distribution structure. In relation with the Net-MaRF, it is needed to identify the key participants in the network where the manufacturing SMEs are embedded as well as recognize the business practices in that environment. Moreover, the SME needs to evaluate its current networking capabilities and identify if there is any gap to be addressed. An assessment process needs to take place at the Res-MaRF to identify the currently available resources owned by the firm as well as recognizing the existing lacks and the potential sources to overcome them.

As the required information is collected, it is evaluated by the Know-MaRF to identify the opportunities in the potential markets including the stimulus and the threats. Based on this evaluation, it will be defined the strategic plan to support the internationalization process adopting a SCO. Furthermore, from the analysis of the gathered information, the Mar-MaRF will define the internationalization strategy and the plan of action to be followed. This strategy includes defining the main characteristics of the product to be manufactured and offered in the target market(s), the pricing and promotion policies to be developed, the distribution strategies as well as the level of market commitment regarding the level of risk that the manufacturing SMEs is willing to take. On the basis of the internationalization strategy, the innovation strategy is designed taking into consideration the required features of the product as well as the needed processes and means of sourcing and production. While designing the plan of action to implement the innovation strategy, the manufacturing SME needs to determine the degree of modularity of the product as well as the standardization of sourcing, manufacturing and distribution processes. This will determine the degree of SCF required to achieve according to the level of differentiation that the SME is willing to achieve. After defining the main internationalization strategy and innovation strategy, the manufacturing firm requires the alignment of the supply chain structure by defining a plan of action to build trustful relationships with its key partners (Net-MaRF) as well as the plan of

action to effective allocate the available resources in a flexible structure of warehousing and inventory to enhance the level of volume flexibility, mix flexibility and sourcing flexibility as well as overcoming the lack of resources (Res-MaRF).

Once the planning stage is finalized, the firm proceeds to the implementation of the plan of action of each relational function. At the Inn-MaRF, it is managed the collaborative effort to implement a flexible manufacturing system and achieve the required degree of product development flexibility. It is further developed the structure and process to update the innovation strategy. The Net-MaRF will coordinate the integration process among the manufacturing SME, its suppliers and retailers considering the achievement of the main internationalization strategy. This implies establishing the supply chain structure and its level of flexibility to be reconfigured. The management of the resource planning is implemented by the coordination of SMCs and the flexible dimensions of sourcing, warehousing and inventory within the supply chain. The management of these activities will determine the speed on which the firm reaches the aimed export volume. Furthermore, to increase the participation in the target markets, the manufacturing SME will develop a logistics system flexible enough to improve the responsiveness flexibility and market flexibility. Finally, the whole process for implementing the plan of action of each relation function is supported by the Know-MaRF to adjust the curse of action by managing the flow of information to ensure the achievement of the internationalization strategy. This function will also support the learning process across the supply chain to generate new knowledge and identify new opportunities.

4.4 A systematic approach for implementing SCF strategies for SMEs internationalization

Taking a step further, this section presents a systematic approach on which the SME and its supply chain partners will be able to manage the flow of the afore presented roadmap, and set the variables, levels and specific strategies for developing logistics capabilities and SCF strategies combining them in a valuable, rare and difficult to imitate way to gain a sustainable competitive advantage. Figure 4-6 depicts the processes and relationships among the components included in the proposed system, which is described in the rest of this section.

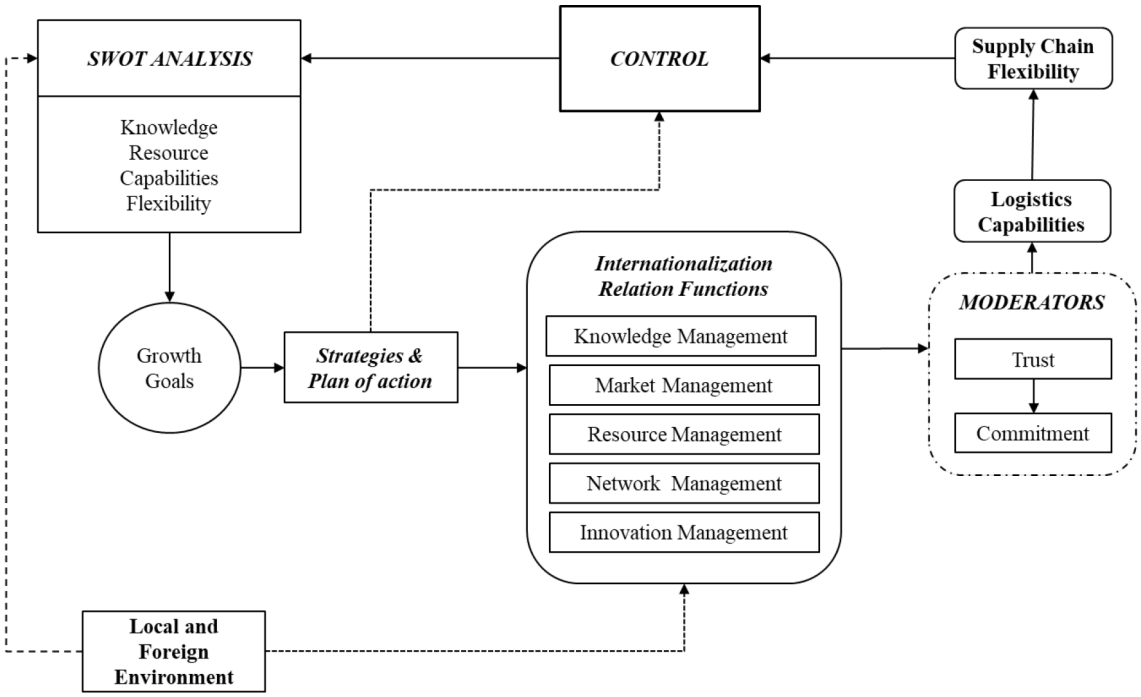

Figure 4-6 Systematic approach for implemeting SCF strategies for manufacturing SMEs internationalization

This process is based on the conceptual framework presented in Figure 3-2 and consists in four main stages, i.e. evaluation, planning, implementation, and control. The initial stage of evaluation takes place before any internationalization process begins. It is critical for the manufacturing SMEs to make a comprehensive analysis of the status quo. It is necessary to evaluate the current knowledge, the feature of the product to be offered, the network ties, the available resources and capabilities as well as the characteristics of the customer demand in target markets. The firms need to have a clear understanding of the opportunities and threats from the local and foreign network to develop the appropriate strategy for overcoming these threats and taking advantage of the identified opportunities. Hence, the manufacturing SME needs a systematic evaluation of all these aspects to further decide the strategies to be implemented and the related plan of action. The managerial analysis of the existing strengths, weakness of the organization as well as the opportunities and threats in the local and foreign environment (SWOT matrix) serves as a framework for this evaluation.

The SWOT analysis has been used as a tool to evaluate the current state and underline business strategies to follow in order to achieve the growth goals (Morash et al. 1996; Aragrande et al. 2005; Helms and Nixon 2010; Hill et al. 2014; Palomero and Chalmeta 2014). This managerial tool provides the starting point from where the firms can draw a clear

and explicit picture of the current state, the vision and mission they pursue and the strategies to reach them. Indeed, SWOT analysis constitutes an effective, simple, and accessible managerial tool for SMEs (Palomero and Chalmeta 2014). To star the SWOT analysis, it is necessary to collect the relevant information as was described in the roadmap (Figure 4-5). Each relational function needs to assess the situation to further develop the required actions for the internationalization process. This analysis includes market knowledge, product features, demand characteristics, the available structures, capacity and configuration for sourcing, production and distribution, main barriers for foreign trading as well as sources of opportunities Indeed, the evaluation of the threats as well as opportunities enables the recognition of adverse and positive aspects (correspondingly) of the industrial context that might or might not prevent the achievement of the pursued goals. From the resulting matrix of the evaluation, the firm will be able to define the internationalization goals, i.e. geographic scope, speed and intensity.

The planning stage takes place after the internationalization goals are defined. A plan of action is defined for each relational function to manage the internationalization process (i.e. Know-MaRF, Mar-MaRF, Inn-MaRF, Net-MaRF, and Res-MaRF) as described in the roadmap (Figure 4-5). On that basis, the organization will design the strategies and plan of action to achieve the pursued goals. When designing the strategies, a *'dynamic management of flexibility is need'* (Hua et al. 2009) where the firms take into account the alignment, adaptation, and degree of flexibility as well as the SCF dimensions required among the organization to respond to costumers' demand located in the foreign market that the firm is willing to reach.

After setting the strategies and plan of action, each relational function will manage the implementation of the plan of action (Section 3.2.1). This stage of implementation is moderated by the level of trust and commitment between the manufacturing SME and its supply chain partners (Figure 3-2). From the arguments presented in Section 3.2.2 as well as the discussions of Section 4.2.2, trust and commitment stimulates the development of logistics capabilities (inside the firm and across the supply chain network) (Johanson and Vahlne 2003; Sharma and Blomstermo 2003; Mandal 2016), although commitment moderates the decisions regarding dimensions of SCF (Johanson and Vahlne 2009; Stevenson and Spring 2009; Novillo Villegas and Haasis 2018). Through the exchange of information (IMCs), it is possible to coordinate and integrate the logistics capabilities among the firm and its supply

chain network. Furthermore, this will support the alignment and incorporation of the strategies and SCF dimension in line to those strategies (Section 3.2.4).

The final stage involves controlling the implementation process. It is needed to control and evaluate the effectiveness of the actions taken to implement the strategies. Hence, the achieved degree of SCF needs to be compared to the strategy and the plan of action (Kumar et al. 2006). It is also required to determine the impact of the current actions on internationalization performance, measured in terms of geographic scope, speed, and intensity (Section 0) estimated in the process of setting the strategies. Thus, it is possible to determine the degree of co-alignment (fit) between the planned SCF and internationalization strategies and the current degree of achievement of the pursued internationalization goals. Finally, the control of SCF fit triggers again the whole process to develop the next plan of actions in accordance to the new or modified requirements of the market, the needs of the SME and fluctuations in the supply chain on which the firm is engaged.

5 Conclusions

The internationalization of manufacturing SMEs is a complex process with involves several factors such as stakeholders, resources, capabilities, activities, processes and information that need to be strategically coordinated inside the firm as well as with its counterparts in its business network to sustain this process. Furthermore, as (Stank et al. 2005) stated *"creating and sustaining competitive advantage is an important part of the strategic planning process"*. As the firm grounds its main strategy regarding critical factors present in the external business environment, the strategy will lead the process to develop an effective operational and structural organization. *"Firms that have properly aligned strategy with structure are expected to perform better than competitors that lack the same degree of strategic fit"* (Stank et al. 2005). Thus, manufacturing SMEs need to define a strategy that allows them the effective use of their own resources, capabilities, the knowledge gained from the interactions with the environment, its network ties, processes and operation. In fact, it is necessary to adopt a network orientation to be able to cope with nowadays competitive, complex and dynamic international business scenario. The literature examined in this work presented a comprehensive state of the art of the three areas of interest, i.e. SME internationalization, SCF and logistics capabilities. From this examination, it is recognized, among other aspects, the positive impact of implementing SCM practices, particularly SCF to achieve a competitive advantage. The alignment of SMEs capabilities, specially its flexibility, to the capabilities of their supply chain partners will increase their mutual performance. This alignment depends on the development of coordination and integration of the logistics capabilities among the firms. The quality of the relationship between the supply chain partners moderates the degree of coordination and integration of the supply chain dynamic capabilities across the firms, determining the degree of competitiveness and effectiveness of their strategies.

Three major scientific contributions are presented in this work addressing the main research question: *how to sustain the internationalization process of manufacturing SMEs through the development of SCF to address the dynamics of foreign markets?* First, from the multidisciplinary literature review, this work *presents an integrative conceptual framework to describe the relationships among the areas of interest,* enlarging the body of knowledge related to these areas. It is among the first studies that integrate the areas of interest to describe the implementation of SCF as a source for a sustainable competitive advantage for manufacturing SMEs internationalization. From the literature review, it has been possible to

identified linking aspects and elements from each areas of interest where the concepts of trust and commitment, as social attributes, have emerged as the moderating elements not only in the internationalization process of the SME in general, but also on the development of logistics capabilities across the supply chain as well as its impact on the achievement of SCF strategies.

This *integrative conceptual framework* constitutes a conceptual mechanism for understanding the implementation of SCF strategies as a way to gain a sustainable competitive advantage for SMEs internationalization. This framework also addresses the issue of how to integrate the three areas of interest from a theoretical perspective. Five managerial areas are proposed where the development and implementation of logistics capabilities to further achieve SCF strategies is coordinated inside the manufacturing SME and within the supply chain partners through eh moderating effect of trust and commitment. First, the Know-MaRF manages the integration of the body of knowledge built upon the activities and experiences in foreign markets and by exchanging information with the supply chain partners. As function coordinates flow of information and the decision making processes inside the firm and within the supply chain, depends largely on the development of IMCs as well as the information flexibility within the firms. In addition, due to the accumulation of the knowledge among the supply chain partners, the firms are capable to identify opportunities abroad and coordinate their decision-making process to determinate the SCF dimensions as well as the degree of flexibility required among them enhancing their capability to cope with the challenges. From the Mar-MaRF, the SME together with its partners will design and coordinate the implementation of the internationalization strategy as well as set the internationalization goals according to the analysis of market requirements and the accumulated body of knowledge. The main goal is to provide an accurate and quick response to the demands' fluctuations, both in the quantity distributed and the modification or development of new products. Hence, the managerial task of this function is enhanced by the development of DMCs within the supply chain partners to generate added value activities for serving the customers in foreign markets. Moreover, it is necessary to define the degree of flexibility among the core SCF dimensions to achieve the required market flexibility to adopt, align and give an agile respond to the market. The Res-MaRF provides the support to leverage the limited resources of the SME by managing the use and allocation of its owned resources and coordinating the potential available resources on the network where it is operating. In addition, it is important to generate SMCs within the partners and across the supply chain to organize the effective flow of raw material, production, and distribution to provide the required market response avoiding

unnecessary costs and time. This managerial function includes the synchronization of the SCF dimensions related to the manufacturing process, warehousing and operational processes in accordance with the strategic planning and internationalization strategy.

As the market requires the modification of the product, the development of a new one or the identification by the supply chain network of a change in the processes or operations, it is necessary to coordinate the innovativeness processes. Thus, the Inn-MaRF manages the efforts to develop new and creative products, services and processes based on the coordination of previous relational functions. The integration of information among the firms is crucial and the development of logistics capabilities to optimize the innovative processes among the supply chain partners. Furthermore, the firms need to determine the degree of flexibility of their innovativeness processes required in accordance to the market demand. The achievement of the aforementioned managerial tasks depends on the capability of the manufacturing SMEs to integrate their supply chain partners in their internationalization process. The Net-MaRF coordinates the networking process among the supply chain and the SMEs as well as the collaboration and integration among them. Therefore, it is important to improve the ILCs to achieve the necessary supply chain structure and organization as well as to define the required inter-organizational flexibility. Finally, it is discussed the role of logistics capabilities and SCF strategies as dynamic capabilities of the supply chain which might constitute a source of sustainable competitive advantage (depending on their unique, inimitable and rare combination without strategic substitution) to generate add-value activities for SMEs internationalization.

The second major contribution corresponds to the *system dynamics approach* presented in Section 3.3 where it is analyzed the networking process for SMEs internationalization on the basis of the conceptual framework. This approach presents the networking process of the internationalization of SMEs and describes the dynamics of the relationship between the market knowledge, market commitment, innovativeness and available resources (as part of the relational functions introduced in the conceptual framework), logistics capabilities, SCF, as well as trust and commitment. From this approach it was recognized the enabler role played by the two social attributes in the networking process. A positive and iterative relationship was identified between trust building, the development of logistics capabilities and the achievement of SCF strategies. On the other hand, there is a moderating role of commitment over SCF network configuration. Furthermore, there is a balancing loop between the available resources and the relationship commitment. It was also observed the

iterative of the networking process. This understanding provides critical elements for developing the appropriate networking strategy to sustain the internationalization process of manufacturing SME from a supply chain perspective. The interaction among the components of the system and the dynamics of the relationship between logistics capabilities and SCF supports the respective statements in that sense discussed in the conceptual work. Hence, this system dynamics approach shows the importance of managing the networking process in such a way that enhances the potential combining logistics capabilities and SCF strategies to obtain a sustainable competitive advantage.

The third contribution corresponds to the ISM-model for SMEs-internationalization with respect to the implementation of SCF strategies. This work applied the ISM methodology to solve the issues referred to the variables involved in this implementation, how these variables are related to each other and how to implement SCF strategies for SMEs internationalization. To develop the ISM-model, first, a case study was conducted in two Ecuadorian chocolate manufacturer SMEs to provide a deeper understanding on how the relational functions, the logistics capabilities, and SCF dimension and strategies are related to each other. It is important to remark that the study of the three main disciplines included in this research has been conducted mainly in developed economies (Gelinas and Bigras 2004; Verdú-Jover et al. 2006; Omar et al. 2012; Felzensztein et al. 2014; Mellat-Parast and Spillan 2014; Zhang et al. 2014; Gonzalez-Perez et al. 2016). Thus, this paper also contributes to the body of literature on the areas of interest from developing economies, particularly from Latin America. The analysis of the case study contrasted with the conceptual framework and the system dynamics approach allowed the identification of 37 variables. These variables were modeled by using ISM methodology. The obtained model provides a structured path to trace the contextual relationships between the variables included. Based on the ISM-model, it is proposed a roadmap for SMEs internationalization by the implementation of SCF strategies and the development of logistics capabilities considering the combination of the variables in specifics steps to be followed by the SME. Finally, Finally, a systematic approach, consisting of four stages (i.e. evaluation, planning, implementation, and control), is presented to manage the implementation of the roadmap.

In conclusion, this work addressed the research question of how to sustain the internationalization process of manufacturing SMEs through the development of SCF strategies. The three main contributions, described previously, provide elements that show the positive effect of adopting an SCO by manufacturing SMEs and the positive role of

implementing SCF strategies and developing of logistics capabilities across the supply chain to sustain their internationalization process. The relationships between the key components identified along this work as involved in the development of SCF strategies and the dynamics of these relationships showed the path to sustain the internationalization process. Thus, this research presented theoretical and practical that affirms how the manufacturing SMEs are able to sustain their internationalization process by combining the identified SCF dimension and strategies through the development of logistics capabilities across the supply chain partner. This combination enables SMEs to cope with the dynamics of foreign markets. Finally, this combination constitutes a sustainable competitive advantage for the manufacturing SMEs as long as it is valuable, difficult to imitate, rare and without substitution.

Managerial relevance

This study has also managerial implications. Decision makers from manufacturing SMEs need to develop a sustainable competitive advantage to succeed in international markets. Furthermore, adopting a network perspective while defining the internationalization strategies constitutes an edge for the SME as it is able to leverage its capabilities and limitations through strategic relationships and planning across the supply chain on which they are involved. Nevertheless, there is a lack of awareness about the positive impact of integrating SCM practices as the development of logistics capabilities and SCF strategies on the internationalization process of a firm, particularly in the case of firms from developing economies (Araque and García 2015; Christopher 2016; Novillo and Haasis 2017). SMEs from these economies limit the scope of logistics capabilities to external infrastructure and operations that allow the distribution flow of materials. Further, the flexibility of the supply chain is not considered as part of the internationalization process in a strategic way. In the broadest sense, this study has identified the importance to develop logistics capabilities inside the manufacturing SMEs together with its partners to achieve SCF strategies in order to leverage SMEs flexibility and allow their entrance in highly competitive industries and foreign markets. By implementing SCF strategies the firms from the case study have gained a competitive advantage allowing them to sustain their internationalization process.

Limitations and further work

This research has some limitations. Although this study presents an extensive analysis of the literature related to the disciplines of interest; the qualitative approach adopted to propose the managerial tools for implementing SCF strategies in the internationalization process of

manufacturing SMEs constitutes its main limitation. Further, the limited number participants for this study restraints the generalization of the findings. Therefore, it is required additional research from different industries. Although, this study presented a general roadmap based in a ISM methodology to address the research questions of this work, more specified constructs and practices might be tested through different empirical methods. This would provide further elements for theory-building in the regards of the SMEs internationalization with respect to the dynamic capabilities of the supply chain. It will be also interesting to analyze the impact of these capabilities on the quantitative aspects of SMEs internationalization performance.

Appendix A

Summary of the thirty-one most used dimensions of SCF identified from the literature. The definitions for each flexibility dimension on each business area are traced regarding the functions and features of the supply chain (Fantazy et al. 2009; Manders et al. 2016).

An overview of flexibility dimensions

Business area	Flexibility dimension	Description	Source
Procurement	Procurement flexibility	The ability to respond to changing requirements regarding the sourcing, purchasing and supply of goods	Manders et al. (2016)
	Sourcing flexibility	The ability to modify sourcing decisions including the number of suppliers for each specific part, material, or service	Sánchez and Pérez Pérez (2005); Kumar et al. (2008); Fatemi (2010); Purvis et al. 2014)
	Supply flexibility	The ability to respond to changing requirements in terms of volume, location and/or delivery date	Based on Tachizawa and Thomsen (2007); Kumar et al. (2008)
	Purchasing flexibility	The ability to respond to changing needs in the ordering, delivery and receipt of supplied good	Manders et al. (2016)
Manufacturing	Manufacturing flexibility	The ability to reconfigure manufacturing resource and capacity to produce various products with consistent quality to meet customer expectations	Gerwin (1993); Nair (2005); Kumar et al. (2008); Gosling et al. (2010)
	Volume flexibility	The ability to adjust increase or decrease cost effectively output levels, supply chain production capacity, batch sizes and/or quantities in response to demand fluctuations	Based on Lummus et al. (2003); Martínez Sánchez and Pérez Pérez (2005); Stevenson and Spring (2007); Kumar et al. (2008); Gosling et al. (2010)
	Mix flexibility	The ability to change the variety or combination of produced or delivered products and/or performed activities	Based on Beamon (1999); Zhang et al. (2003)
	Operations flexibility	The range of alternative ways in which an activity can be perform by using alternative plans, procedures and available assets	Based on Sethi and Sethi (1990); Vokurka and O'Leary Kelly (2000)
	Process flexibility	The range of variety (types) of products or activities can be performed in a given situation	Based on Sánchez and Pérez (2005); Stevenson and Spring (2007); Hopp et al. (2010)
	Expansion flexibility	The ease with which a firm can increase for long-term the capacity and capabilities of the system	Sethi and Sethi (1990) and Stevenson and Spring (2007)
Marketing	Market flexibility	The ability to adjust to the fluctuations of the market environment and/or to customer requirements by building close relationships with them and customizing the products and services	Based on Vokurka and O'Leary-Kelly (2000); Lummus et al. 2003; Stevenson and Spring (2007)
	Launch flexibility	The ability to rapidly introduce new products and/or product varieties to the market	Vickery et al. (1999); Sánchez and Pérez Pérez (2005)
	Responsive & Robustness flexibility	The ability to cope and respond to market change with the existing supply chain configuration	Lummus et al. (2003); Stevenson and Spring (2007)

Product development	Product development flexibility	The ability to respond to changing customer needs with new products and modifications to existing products	Zhang et al. (2002b)
	New product design flexibility	Speed (and cost effectiveness) at which a new product can be designed and introduced by the firm	Stevenson and Spring (2007)
	Product modification flexibility	Ability to add or substitute new parts into the system to meet customer specification	Vickery et al. (1999); Lummus et al. (2003)
Logistics	Logistics flexibility	The ability to adapt, adjust, align and control the storage and flow of raw materials, finished products, and services, integrating the inbound and outbound processes as well as the information related to all the processes and operations from the origin to the final destination to meet the changing customers´ conditions	Swafford et al. (2000); Stevenson and Spring (2007); Kumar et al. (2008); Hock Soon and Mohamed Udin (2011)
	Inbound logistics flexibility	The ability to transport and produce products by different paths throughout the processing centers of the system	Based on Stevenson and Spring (2007)
	Routing /Re-routing flexibility	The ability to have a number of alternative routes a part or product can follow across the system to be completed safely. This includes the alternative paths to export or import a part or product in a safe way.	Koste and Malhotra (1999); Stevenson and Spring (2007); Kumar et al. (2008); More and Subash Babu (2008); Wang (2008); Hock Soon and Mohamed Udin (2011); Mohammed (2012)
	Material handling flexibility	The ability to move the different products between processing centers throughout the system using multiple paths	Koste and Malhotra (1999); Stevenson and Spring (2007)
	Physical distribution flexibility	The ability to adjust transport and inventory to allow a broad-spread access to products and address customers' demand	Lummus et al. (2003); Zhang et al. (2005); Singh et al. (2011)
	Delivery flexibility	The ability to respond to variations in the delivery requests regarding volume, location, delivery time and/or frequency	Slack (1983); Stevenson and Spring (2007); Gosling et al. (2010)
	Storage flexibility	The ability to adjust the storage capacity and/or move the stock between locations to transfer the goods/products in time	Based on Schütz and Tomasgard (2011); Sánchez and Pérez Pérez (2005)
Organization	Relationship flexibility	The ability to manage collaborative relationships, structures and controlling to respond to market change and develop new products	Based on Stevenson and Spring (2007)
	Organizational flexibility	The ability to align or adapt the organization skills and labor force to meet the current requirements of the whole supply chain including customer demand	Lummus et al. (2005); Stevenson and Spring (2007)
	Labor flexibility	The number of works that can be change as well as their ability to perform different task	Based on Stevenson and Spring (2007); Gong (2008)
	Worker flexibility	The ability of a worker to perform a number of different tasks with different responsibilities	Based on Stevenson and Spring (2007)
	Inter-organizational	The ability to build and maintain collaborative relationships up and/ or	Based on Stevenson and Spring (2007)

	relationship flexibility	downstream to adapt to changing circumstances	
	Configuration flexibility	The ability to shift the supply chain partners	Stevenson and Spring (2009)
Information	Information systems (IS) flexibility	Ability of organizational collective IS to support and adapt fluctuating requirements of the business functions e.g. product manufacturing, sourcing, logistics, product design, among other strategic goals	Kara et al. (2002); Lummus et al. (2005); Zhang (2005); More and Subash Babu (2008); Stevenson and Spring (2009); Singh and Acharya (2014); Tiwari et al. (2015)
	Spanning flexibility	The ability of the organizations to collect, store and disseminate information in horizontal connections across the supply chain to increase customers‘ value	Zhang et al. (2006); Nair (2005)

Source: Adapted from Manders et al. (2016)

Appendix B

List of the flexibility dimensions grouped in this domain and a brief description of each group.

Core SCF dimensions

No.	**Core SCF dimensions**	**Description**
1	Manufacturing/Production flexibility (e.g. machine flexibility, volume flexibility, process/mix flexibility, production flexibility, material and raw material flexibility, material handling flexibility, manufacturing postponement flexibility, process design flexibility, automation flexibility, routine flexibility, etc.)	Comprehend flexibility dimensions related to manufacturing/production processes, operations and activities that enable an organization to adjust its manufacturing strategy to environmental change. The dimensions under this domain act as levers to hedge against short-term order variation and long-term forecast uncertainty to enhance the responsiveness to the market
2	Product based flexibility (e.g. product modification flexibility, product concept flexibility, prototype flexibility, new design flexibility; new product flexibility, etc.)	It includes market- or customer-sensitive flexibility dimension as they are visible to the customer immediately by providing the right product at the right time. Thus it enhances the organization response to customer expectations or technological changes.
3	Sourcing/Procurement flexibility (e.g. supplier flexibility, delivery flexibility, physical supply flexibility, transshipment flexibility)	This refers to the supplier's ability to align with manufacturer's capability to enhance the response time to customers' demand. A high flexibility level can be achieved by selecting suppliers regarding not only on the cost basis but also with respect to their capability to adapt to the firm. This includes practices such as customer relationship management, relationship management, partner management, E-commerce and outsourcing services.
4	Logistics/Distribution flexibility (e.g. demand management flexibility, distribution or access flexibility, distribution system flexibility, physical distribution flexibility, logistics postponement flexibility, delivery flexibility, trans-routine flexibility, etc.)	The logistic function constitutes a competitive strategy for the firms which are delivery-time based. This function permits a firm to adapt its production- and delivery-schedule to unpredicted and constantly changing demand and offers the potential to gain competitive advantage.

5	Information technology (IT) flexibility (e.g. strategy development flexibility, information dissemination flexibility, spanning flexibility, partnering flexibility, computer system flexibility, etc.)	The information flow is a key aspect of the supply chain that plays the necessary role of linking partners or entities enabling the visibility up- and down-stream by sharing data in an accurate and timely fashion. Information and technology flexibility is attained by coordinating, synchronizing and integrating information across and within each functional area and organizational boundaries.
6	Organization flexibility (e.g. decision flexibility, strategic flexibility, tactical flexibility, operational flexibility, dynamic flexibility, time-based flexibility, adaptation flexibility, total system flexibility, organization structure flexibility.	These flexibility dimensions are related to the decision flow through all of the supply-chain stages and its later monitoring by decision makers between themselves and with other stakeholders. As a significant flow within the supply chain, the organizations should design or align their inter-organizational structure. This will allow to effective use of this structure and promote flexibility among the supply chain stages in order to enhance the decision making process to provide a rapid response to uncertainty. Along with the organizational structure, this flexibility can be reached by organization's dynamic capabilities, workforce its business practice regarding the structures and culture in which the workforce is operating.
7	Human resource (HR) flexibility (e.g. task flexibility, work group flexibility, numerical flexibility, employees-oriented change flexibility, decision flexibility, financial flexibility, management perception flexibility, functional flexibility and craft flexibility)	This group of flexibility dimensions is focused on diverse issues regarding human resources in the organizations. It is related to the human motivations, skills, and abilities. Moreover, this flexibility enhances the efficient allocation of resources from the begging to the end of the supply chain.

8	Market based flexibility (i.e. responsiveness flexibility, target market flexibility)	These flexibility dimensions play a key role to lead and serve in a competitive environment. There are several ways in which this flexibility might be increased which is visualized in the ease to adapt the manufacturing systems to a fluctuating market environment. This requires the ability for building close relationships with customers and mass customization; including new product design and the adaptation of the existing products. Further, this is the firms' ability to evaluate market opportunities and recognize market changes and trends within the limitations of their value chain. Additionally, it is the organization's capability to relocate itself in the market and to promote dramatic changes in customer-choice patterns in established markets as well as the capability for changing the marketing plan and the current market strategies. Last, it is related to market entry- and exit-barriers that might limit the effect of the marketing strategy.

Source: Based on More and Subash Babu (2008)

Appendix C

Classification of SCF enablers within supply-chain segments and sub-segments

Segments of SCF enablers	Sub-segments of SCF enablers	SCF enablers
Sourcing/ Procurement	Supplier development	Qualified suppliers; monitor and reward suppliers on time; supplier coaching; supplier certification
	Supplier base	Large supplier base; quick change of suppliers
	Cooperation or coordination	Coordination on quantity discount policies; close coordination of downstream activities; close relationship with supplier
	Collaboration or integration	Strategic partnership; supplier integrated manufacturing; network of partnership; VMI; flexible contracts; co-packing; integrated logistics
	Supply network or inbound logistics	Geographical proximity of the suppliers; effective transportation planning; multiple modes of transportation; large number of carriers and delivery modes; large number of delivery policies
	Sourcing practices or strategies	Co-location; JIT purchasing or supply; response buffer (capacity or time); large inventory; use in-transit inventory bean; pack product in transit; direct shipment; entrepreneurial focus; supplier market research
	IT	An electronic procurement system; EDI or internet; e-logistics; web services; centralized information system
Manufacturing	Manufacturing system	Storage and retrieval; material handling systems; automation; multi-purpose machines
	Layout	Flexible plant layout; cellular layout
	Inventory	Inventory buffer at focal company and inventory strategies
	Manufacturing practices and strategies	Holonic manufacturing; virtual batching; batch production; plant-within-plant; lean manufacturing tools; BPR; modular facilities; process reengineering
	Process design and development	Large number of process technologies for each products; modular processes; standardization of processes
	Product design and development	Rapid prototyping equipment/tools; simplifying the product structure; virtual product development; design for manufacturability; design global product; customer ready prototype; trough design over the wall practice; modular product design; component modularization; part and component standardization; co-design; integrated product and packaging design and development
	IT	MRP; ERP; PDM; PLM; CAD; CAPP; etc.

Classification of SCF enablers within supply-chain segments and sub-segments *(continue)*

Segments of SCF enablers	Sub-segments of SCF enablers	SCF enablers
Logistics/ Distribution	Alliances/ Collaboration/ Integration	Integrated logistics; coordinate multiple locations; collaboration with 3PL and SC partners; flexible contracts, etc.
	Logistics/Distribution practices, policies or/and strategies	Centralized warehouse; direct shipment; logistics postponement; inventory positioning; deign for commonality; cross docking; milk-run deliveries; merge-in-transit; Kanban; co-location; co-packing; time-based pricing; loose co-locations; formalized supplier parks; multiple local stock points; pack product in transit; retail consolidation; selective use of expedite freight
	Outbound network	Customized logistics network; centralized control structure; large number of products per delivery mode; large number of delivery policies; large number of delivery modes per products; large number of distributed channels; large number of warehouse
	IT	E-logistics; use of inventory management software; freight audit and payment automation Integrated
Organization	Management	Management initiatives and support; quick problem solving council
	Organizations' policies and strategies	Joint performance measurement; joint venture; modular flexible management cell
	Organization structure or design	Product focused structure; matrix structure; flat structure flexible structure; innovative network organizational structure; vertical coordination and control; executive information system
	Culture	Culture of change; learning culture or organization

Classification of SCF enablers within supply-chain segments and sub-segments *(continue)*

Segments of SCF enablers	Sub-segments of SCF enablers	SCF enablers
Across the SC	Inventory	Flexible stocking; safety stock Flexible
	SC network Inventory	Network substitution; strategic network design; shorter SC; fragmented manufacturing facilities; proximity to market; single level network structure; effective vendor network
	SC practices and strategies	Standardization; simplicity in processes; discipline in procedures; design for commonality; synchronization of processes; outsourcing; coordinated production and distributed scheduling; asset reusability; postponement; concurrent engineering; reducing ownership; project management skill; real time scheduling; value engineering and analysis; TQM; modular SC; mass customization; shifting demand across market; product and across time
	Planning and execution	Flexible planning system
	Collaboration or integration or alliances	Virtual factory or enterprise; point of sales data sharing; continuous and automatic replenishment; VMI, BPR within and inter/intra organisations relationships; B2B collaboration platform; virtual SC; Kanban (flow coordination); short term-long term flexible contracts; single point contact for each trading partners; strategic partnership; personal relationships; collaborative continuous improvement programme; willingness to approach win-win supply chain relationship by all partners; rapid partnership formulation; customer involvement
	IT	Integrated information system; synchronisation of hardware and software; DSS; e-Kanban; RFID; bar-coding; EDI and EDI based practices; web-services; ERP; MIS; e-commerce; centralised information system; global access to database; real-time communication

Classification of SCF enablers within supply-chain segments and sub-segments *(continue)*

Segments of SCF enablers	Sub-segments of SCF enablers	SCF enablers
HR	Workforce skill and training	Individual training; firm-wide integration of learning; SCM education across the senior management; training programs via workshops, seminars; encourage employees or team members to exchange ideas/opinion; continuous in-house training; shared learning; cross trained workforce
	HR practices or policies	Specialized flexible peoples; pay plans or educational benefits; workforce skill development; decentralized decision making; job rotation; job enrichments; transferability of workers; job sharing; localized and contingent wage system; objective based workers remuneration; strengthening inter-personal relationships; financial and no financial incentives; top management support; willingness of employees to change; workforce adjustment
	Team approach	Flexible team of people; concurrent team working; autonomous work group; cell based workers or work group arrangement; task-based multi-functional team; cross organizational team; empowering individual working in team; collaborative workforce or joint staffing

Source: More and Subash Babu (2008)

Appendix D

Three-tiered hierarchy enablers of flexibilities for global supply chain

Hierarchical level	Flexibility enablers	Description	Source
Performance level	Flexibility in global supply chain	Ability to respond rapidly to changes occurs in global supply chain due to variations in various global factors	Kumar et al. (2008)
	Logistics flexibility	The ability to adapt, adjust, align and control the storage and flow of raw materials, finished products, and services, integrating the inbound and outbound processes as well as the information related to all the processes and operations from the origin to the final destination to meet the changing customers´ conditions	Swafford et al. (2000); Stevenson and Spring (2007); Kumar et al. (2008); Hock Soon and Mohamed Udin (2011)
	Sourcing flexibility	The ability to modify sourcing decisions for each specific part, material, or service, e.g. JIT purchasing policy, number of suppliers per component. This has the aim to generate a rapid response to uncertainties.	Martínez Sánchez and Pérez Pérez (2005); Stevenson and Spring (2007); Gosling et al. (2010); Purvis et al. (2014)
	Manufacturing flexibility	The ability to reconfigure manufacturing resource and capacity to produce various products with consistent quality to meet customer expectations	Gerwin (1993); Nair (2005); Kumar et al. (2008); Gosling et al. (2010)
	Supplier flexibility	Suppliers' capability to address the modifications in the required volume on short notice. They have to be able to handle small size of production batches, at frequent intervals and to align if a change is required due to the design or launch of new products.	Kara et al. (2002); Swafford et al. (2006); Kumar et al. (2008); Gosling et al. (2010)
	Location flexibility	The willingness and ease for shifting the localities of the facilities of different business units globally	Kumar et al. (2008)

Three-tiered hierarchy enablers of flexibilities for global supply chain (continue)			
Hierarchical level	**Flexibility enablers**	**Description**	**Source**
Operational Level	Volume flexibility	The ability to adjust increase or decrease cost effectively output levels, supply chain production capacity, batch sizes and/or quantities in response to demand fluctuations	Based on Lummus et al. (2003); Martínez Sánchez and Pérez Pérez (2005); Stevenson and Spring (2007); Kumar et al. (2008); Gosling et al. (2010)
	Delivery flexibility	The ability to respond to variations in the delivery requests regarding volume, location, delivery time and/or frequency	Slack (1983); Stevenson and Spring (2007); Gosling et al. (2010)
	Cultural and linguistic compatibility	Ease to cope with linguistic differences and cultural distance between the related organizations	Kumar et al. (2008); More and Subash Babu (2008); Thomé et al. (2014)
	Alternative logistics arrangement	The ease to shift rapidly to an alternative transportation means	Tachizawa and Thomsen (2007); Kumar et al. (2008)
	IS flexibility	Ability of organizational collective IS to support and adapt fluctuating requirements of the business functions e.g. product manufacturing, sourcing, logistics, product design, among other strategic goals	Kara et al. (2002); Lummus et al. (2005); Zhang (2005); More and Subash Babu (2008); Stevenson and Spring (2009); Singh and Acharya (2014); Tiwari et al. (2015)
Strategic level	Rerouting flexibility	The ability to have a number of alternative routes a part or product can follow across the system to be completed safely. This includes the alternative paths to export or import a part or product in a safe way.	Koste and Malhotra (1999); Stevenson and Spring (2007); Kumar et al. (2008); More and Subash Babu (2008); Wang (2008); Hock Soon and Mohamed Udin (2011); Mohammed (2012)
	Warehousing and distribution flexibility	Distribution centers and warehouses location to meet customers' requirements	Kumar et al. (2008)

Three-tiered hierarchy enablers of flexibilities for global supply chain (continue)			
Hierarchical level	**Flexibility enablers**	**Description**	**Source**
	Delayed product differentiation	The capability to postpone the de-coupling point to extend the generic line of production as long as possible. The purpose is to customize the product according to the customer preferences in later stages.	Stevenson and Spring (2007), (2009); Kumar et al. (2008)
	Security	Physical security of goods	Leonidou (2004); Kumar et al. (2008); Kahiya and Dean (2016)
	Demand variation	Fluctuation in demand of products/services	Tachizawa and Thomsen (2007); Kumar et al. (2008); More and Subash Babu (2008)
	Stability of economy	Consistency in value of currency	Leonidou (2004); Kumar et al. (2008); Kahiya and Dean (2016); Thomé et al. (2014)

Source: Adapted from Kumar et al. (2008)

Appendix E

List of issues and aspects investigated in the case study and the related references

Issue	Reference
Market knowledge or experience in doing business internationally	(Leonidou 2004; Kahiya and Dean 2016)
Main strengths identified to internationalize your operations	(Leonidou 2004; Kahiya and Dean 2016)
Main external barriers identified to internationalize your operations	(Leonidou 2004; Kahiya and Dean 2016)
Main opportunities identified to internationalize your operations	(Leonidou 2004; Kahiya and Dean 2016)
Main internal barriers identified to internationalize your operations	(Leonidou 2004; Kahiya and Dean 2016)
International markets served by the firm	(Leonidou 2004; Kahiya and Dean 2016)
Intensity of exports	(Leonidou 2004; Kahiya and Dean 2016)
Grow of intensity	
Flexibility of manufacturing process	(Stevenson and Spring 2009; Gligor and Holcomb 2014a)
Internationalization strategy of the product: differentiation and adaptability strategies	(Knight and Cavusgil 2004; Pullen et al. 2009)
Average of the period of time within the design of new products and their introduction to the market	(Leonidou 2004; Kahiya and Dean 2016)
Average of new products and their introduction to the market within a year	
Distribution channels	
Pricing policies	(Leonidou 2004; Kahiya and Dean 2016)
Description of innovativeness processes	
Integration of partners in adapting or developing new products or processes	(Johanson and Vahlne 2009)
Identification of customer preferences and requirements in international markets	(Johanson and Vahlne 2009)
Process and managerial tools for strategic planning	(Wu et al. 2014)
Supply chain adaptability to respond to any change in the market / sourcing	(Stevenson and Spring 2009)
Supply chain alignment internationalization strategy to any change in the market /sourcing/ competitors	(Stevenson and Spring 2009)
Supply chain agility to respond to any change in the market /sourcing	(Stevenson and Spring 2009)
Manufacturing planning	(Stevenson and Spring 2009; Wu et al. 2014)
Sourcing planning	(Stevenson and Spring 2009; Wu et al. 2014)
Distribution planning	(Stevenson and Spring 2009; Wu et al. 2014)
Standardization and quality control	(Stevenson and Spring 2009; Wu et al. 2014)
Description of sourcing policies	(Stevenson and Spring 2009; Wu et al. 2014)
Inventory and resources allocation	(Johanson and Vahlne 2009; Stevenson and Spring 2009)
Ability to change suppliers to satisfy changing	(Stevenson and Spring 2009; Moon et al.

requirements	2012; Wu et al. 2014)
Ability to add or remove carriers or other distributors	(Moon et al. 2012)
Scope for changing delivery modes and schedules	(Moon et al. 2012)
Information sharing and use of information technologies across the supply chain	(Moon et al. 2012; Wu et al. 2014)
Inbound and outbound process coordination and integration	
Collaborative efforts to solve problems (upstream and downstream)	(Stevenson and Spring 2009; Wu et al. 2014)
Degree of formality in the relationships with the supply chain partners	(Gligor and Holcomb 2014b)
Supply chain partners collaborate in developing new market and customer response	(Gligor and Holcomb 2014b)
Willingness to continue the relationship with their suppliers and retailers	(Gligor and Holcomb 2014b)

Appendix F

1. Structural self-interaction matrix (SSIM)

	Variables	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2
1	Market knowledge	V	O	A	V	A	O	O	O	O	A	O	O	O	O	V	O	O	O	O	V	V	V	A	V	A	V	V	A	A	A	A	A	A	A	V	V
2	Identify foreign opportunities	O	V	A	V	A	V	V	V	O	A	O	O	O	V	O	O	O	V	O	X	O	O	A	V	A	V	V	A	A	O	A	A	A	A	V	
3	SP & IP	V	X	A	V	A	V	O	O	V	A	O	O	O	O	O	V	O	O	O	V	V	V	A	X	A	V	V	A	A	A	A	A	A	A		
4	IEO	O	V	V	V	A	O	V	V	O	V	O	O	O	O	V	O	O	O	O	V	V	O	O	O	A	V	V	V	V	O	V	V	V			
5	Information flexibility	V	O	A	V	O	O	O	O	V	X	V	V	V	O	V	O	V	O	V	O	V	V	O	O	O	V	O	O	V	O	A	V				
6	Learning processes	V	V	A	V	A	V	O	O	O	X	O	O	O	O	V	O	O	V	O	O	V	O	A	O	A	V	V	A	X	A	A					
7	IMLCs	V	O	X	V	A	O	O	O	V	V	V	V	V	O	V	O	V	V	V	V	V	O	A	O	A	V	V	A	V	A						
8	Economic and legal constraints	O	V	O	V	O	V	V	V	O	O	V	O	O	O	O	O	O	O	O	V	O	O	O	V	O	V	V	A	O							
9	Strategic flexibility	V	V	A	V	A	V	O	O	V	X	V	O	O	V	O	O	O	O	V	V	O	V	A	O	O	V	V	O								
10	Geographical scope	V	V	V	V	A	O	O	O	O	V	V	V	V	V	V	O	V	O	O	V	O	O	V	V	A	V	V									
11	Speed	V	A	A	A	A	V	V	V	O	A	V	A	A	A	A	O	V	V	A	A	A	V	A	A	A	V										
12	Intensity	A	A	A	A	A	A	A	A	A	A	V	A	A	A	A	A	A	A	A	A	A	V	A	A	A											
13	Liability of foreignness	O	V	V	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	V	V	O	O	O												
14	Pricing and promotion in overseas markets	V	X	A	V	A	O	V	V	O	O	V	V	V	V	V	O	V	O	V	A	V	V	A													
15	Demand variations	V	V	O	V	O	V	V	V	V	O	V	V	V	O	V	O	V	V	V	O	V	V														
16	Market flexibility	A	A	A	A	O	A	O	O	A	O	A	A	A	A	A	A	A	A	A	A	A															
17	DMLCs	V	A	A	V	O	O	O	O	V	A	V	V	V	V	V	O	V	V	V	A																
18	Market commitment	V	V	A	V	O	O	V	O	V	A	V	V	V	V	V	O	O	V	V																	
19	Warehousing and inventory flexibility	O	O	O	V	O	O	V	V	V	O	V	V	V	V	V	O	V	O																		
20	Manufacturing flexibility	X	A	O	A	O	X	V	V	X	O	V	A	A	A	A	O	V																			
21	Logistics flexibility	A	O	O	A	O	A	A	A	A	O	V	A	A	A	A	A																				
22	Sourcing flexibility	O	O	A	A	O	A	O	A	A	A	V	O	O	O	O																					
23	SMLCs	V	O	A	V	O	V	O	O	V	A	O	V	V	V																						
24	Resources flexibility	V	O	A	A	O	O	O	O	V	O	V	V	V																							
25	Volume flexibility	O	O	O	A	O	V	V	V	O	O	V	O																								
26	Mix flexibility	O	O	O	A	O	V	V	V	O	O	V																									
27	Responsiveness flexibility	A	O	O	A	O	A	O	O	A	O																										
28	IORF	O	O	A	X	A	O	V	V	V																											
29	ILCs	X	O	A	A	O	X	O	O																												
30	Flexible supply agreement	V	O	A	A	A	A	O																													
31	Flexible distribution agreement	O	O	A	A	A	A																														
32	Supplier flexibility	X	A	O	A	O																															
33	Liability of outsidership	O	O	V	V																																
34	Configuration flexibility	V	O	A																																	
35	Networking capabilities	V	O																																		
36	Product features	V																																			
37	Product development flexibility																																				

2. *Initial reachability matrix (IRM)*

	Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
1	Market knowledge	1	1	1	0	0	0	0	0	0	0	1	1	0	1	0	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1
2	Identify foreign opportunities	0	1	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	1	0	0	0	1	0	0	0	0	0	1	1	1	0	1	0	1	0
3	SP & IP	0	0	1	0	0	0	0	0	0	0	1	1	0	1	0	1	1	1	0	0	0	1	0	0	0	0	0	0	1	0	0	1	0	1	0	1	1
4	IEO	1	1	1	1	1	1	1	0	1	1	1	1	0	0	0	0	1	1	0	0	0	0	1	0	0	0	0	1	0	1	1	0	0	1	1	1	0
5	Information flexibility	1	1	1	0	1	1	0	0	1	0	0	1	0	0	0	1	1	0	1	0	1	0	1	0	1	1	1	1	1	0	0	0	0	1	0	0	1
6	Learning processes	1	1	1	0	0	1	0	0	1	0	1	1	0	0	0	0	1	0	0	1	0	0	1	0	0	0	0	1	0	0	0	1	0	1	0	1	1
7	IMLCs	1	1	1	0	1	1	1	0	1	0	1	1	0	0	0	0	1	1	1	1	1	0	1	0	1	1	1	1	1	0	0	0	0	1	1	0	1
8	Economic and legal constraints	1	0	1	0	0	1	1	1	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	1	1	0	1	0	1	0
9	Strategic flexibility	1	1	1	0	0	1	0	0	1	0	1	1	0	0	0	1	0	1	1	0	0	0	0	1	0	0	1	1	1	0	0	1	0	1	0	1	1
10	Geographical scope	1	1	1	0	0	1	1	1	0	1	1	1	0	1	1	0	0	1	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	1	1	1	1
11	Speed	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	1	1	0	0	0	0	0	1	0	0	1	1	1	0	0	0	0	1
12	Intensity	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
13	Liability of foreignness	1	1	1	1	0	1	1	0	0	1	1	1	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
14	Pricing and promotion in overseas markets	0	0	1	0	0	0	0	0	0	0	1	1	0	1	0	1	1	0	1	0	1	0	1	1	1	1	1	0	0	1	1	0	0	1	0	1	1
15	Demand variations	1	1	1	0	0	1	1	0	1	0	1	1	0	1	1	1	1	0	1	1	1	0	1	0	1	1	1	0	1	1	1	1	0	1	0	1	1
16	Market flexibility	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	DMLCs	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	1	1	1	0	1	1	1	1	1	0	1	0	0	0	0	1	0	0	1
18	Market commitment	0	1	0	0	0	0	0	0	0	0	1	1	0	1	0	1	1	1	1	1	0	0	1	1	1	1	1	0	1	0	1	0	0	1	0	1	1
19	Warehousing and inventory flexibility	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	1	0	1	0	1	1	1	1	1	0	1	1	1	0	0	1	0	0	0
20	Manufacturing flexibility	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	1	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	1
21	Logistics flexibility	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
22	Sourcing flexibility	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
23	SMLCs	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	1	1	0	1	1	1	1	0	0	1	0	0	1	0	1	0	0	1
24	Resources flexibility	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	1	1	0	0	1	1	1	1	0	1	0	0	0	0	0	0	0	1
25	Volume flexibility	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	1	1	0	0	0	1	0	1	0	0	1	1	1	0	0	0	0	0
26	Mix flexibility	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	1	1	0	0	0	0	1	1	0	0	1	1	1	0	0	0	0	0
27	Responsiveness flexibility	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
28	IORF	1	1	1	0	1	1	0	0	1	0	1	1	0	0	0	0	1	1	0	0	0	1	1	0	0	0	0	1	1	1	1	0	0	1	0	0	0
29	ILCs	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	1	1	0	0	0	0	1	0	1	0	0	1	0	0	0	0	1
30	Flexible supply agreement	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
31	Flexible distribution agreement	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
32	Supplier flexibility	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	1	1	0	0	0	0	1	0	1	1	1	1	0	0	0	0	1
33	Liability of outsidership	1	1	1	1	0	1	1	0	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1	1	1	0	0
34	Configuration flexibility	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	1	1	1	0	1	1	1	1	1	1	1	1	1	0	1	0	0	1
35	Networking capabilities	1	1	1	0	1	1	1	0	1	0	1	1	0	1	0	1	1	1	0	0	0	1	1	1	0	0	0	1	1	1	1	0	0	1	1	0	1
36	Product features	0	0	1	0	0	0	0	0	0	0	1	1	0	1	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
37	Product development flexibility	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	1	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	1

3. *Final reachability matrix (FRM)*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
1	1	1	1	0	0	0	0	0	0	0	1	1	0	1	0	1	1	1	1*	1*	1*	1*	1	1*	1*	1*	1*	0	1*	1*	1*	1*	0	1	0	1*	1
2	0	1	1	0	0	0	0	0	0	0	1	1	0	1	0	1*	1*	1	1*	1	1*	1*	1*	1	1*	1*	1	0	1*	1	1	1	0	1	0	1*	1*
3	0	0	1	0	0	0	0	0	0	0	1	1	0	1	0	1	1	1	1*	1*	1	1	1*	1*	1*	1*	1	0	1	1*	1*	1	0	1	0	1	1*
4	1	1	1	1	1	1	1	0	1	1	1	1	0	1*	0	1*	1	1	1*	1*	1*	1*	1	1*	1*	1*	1*	1	1*	1	1	1*	0	1	1	1*	0
5	1	1	1	0	1	1	0	0	1	0	1*	1	0	1*	0	1	1	1*	1	1*	1	1*	1	1*	1	1	1	1	1	1*	1*	1*	0	1	0	0	1
6	1	1	1	0	0	1	0	0	1	0	1	1	0	1*	0	1*	1	1*	1*	1	1*	1*	1	1*	1*	1*	1*	1	1*	1*	1*	1	0	1	0	1	1
7	1	1	1	0	1	1	1	0	1	0	1	1	0	1*	0	1*	1	1	1	1	1	1*	1	1*	1	1	1	1	1	1*	1*	1*	0	1	1	1*	1
8	1	1	1	0	1	1	1	1	1	0	1	1	0	1	0	1*	1*	1	1*	1*	1*	1*	1*	1*	1*	1*	1	1*	1*	1	1	1	0	1	1*	1	1*
9	1	1	1	0	0	1	0	0	1	0	1	1	0	1*	0	1	1*	1	1	1*	1	1*	1*	1	1*	1*	1	1*	1	1*	1*	1	0	1	0	1*	1
10	1	1	1	0	0	1	1	1	0	1	1	1	0	1	1	1*	1*	1	1*	1*	1	1*	1	1	1	1	1	1*	1*	1*	1*	1*	0	1	1	1	1
11	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	1	1	1*	0	0	0	0	1	0	1*	1	1	1	0	0	0	0	1
12	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
13	1	1	1	1	1*	1	1	0	1*	1	1	1	1	1*	1*	1*	1	1	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1	1	1*
14	0	0	1	0	0	0	0	0	0	0	1	1	0	1	0	1	1	0	1	0	1	0	1	1	1	1	1	0	0	1	1	0	0	1	0	1	1
15	1	1	1	0	0	1	1	0	1	0	1	1	0	1	1	1	1	0	1	1	1	0	1	0	1	1	1	0	1	1	1	1	0	1	0	1	1
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	1*	1	0	0	0	1	1	0	1	1	1	1*	1	1	1	1	1	0	1	1*	1*	1*	0	1	0	0	1
18	0	1	0	0	0	0	0	0	0	0	1	1	0	1	0	1	1	1	1	1	1*	1*	1	1	1	1	1	0	1	1*	1	1*	0	1	0	1	1
19	0	0	0	0	0	0	0	0	0	0	1*	1	0	0	0	1	0	0	1	1*	1	1*	1	1*	1*	1*	1	0	1	1	1	1*	0	1	0	0	1*
20	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	1	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	1
21	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	1*	1	0	0	0	1	0	0	0	1	1	1*	1	1	1	1	1*	0	1	1*	1*	1	0	1	0	0	1
24	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	1*	1*	1*	0	1	1	1	1	0	1	1*	1*	1*	0	0	0	0	1
25	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	1	1	1*	0	0	1	0	1	0	1*	1	1	1	0	0	0	0	1*
26	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	1	1	1*	0	0	0	1	1	0	1*	1	1	1	0	0	0	0	1*
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
28	1	1	1	0	1	1	0	0	1	0	1	1	0	1*	0	1*	1	1	1*	1*	1*	1	1	1*	1*	1*	1*	1	1	1	1	1*	0	1	0	1*	1*
29	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	1	1	0	0	0	0	1	0	1	0	0	1	0	0	0	0	1
30	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1*	0	0	0	0	1	1	0	0	0	0	1*	0	0	1	1*	0	0	0	0	0	1
31	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1*	0	0	0	0	1	1*	0	0	0	0	1*	0	0	0	1	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	1	1	0	0	0	0	1	0	1	1	1	1	0	0	0	0	1
33	1	1	1	1	1*	1	1	0	1	1	1	1	1*	1	0	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1	1*	1	1	1*	1	1	1	1*	1*
34	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	1	1	1	1*	1	1	1	1	1	1	1	1	1	0	1	0	0	1
35	1	1	1	0	1	1	1	0	1	0	1	1	0	1	1*	1	1	1	1*	1*	1*	1	1	1	1*	1*	1*	1	1	1	1	1*	0	1	1	1*	1
36	0	0	1	0	0	0	0	0	0	0	1	1	0	1	0	1	1	0	1*	1	1*	1*	1*	1*	1*	1*	1*	0	1*	1*	1*	1	0	1*	0	1	1
37	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	1	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	1

Note: * Indicate transitivity

4. *Partitioning of reachability matrix: First iteration*

Variable	Reachability set	Antecedent set	Intersection set	Level
1	1, 2, 3, 11, 12, 14, 16, 17, 18, 19, 20,21, 22, 23, 24, 25, 26, 27, 29, 30, 31, 32, 34, 36, 37	1, 4,5,6,7,8,9,1 13, 15, 28, 33, 35	1	
2	2, 3, 11, 12, 14, 16, 17, 18, 19, 20,21, 22, 23, 24, 25, 26, 27, 29, 30, 31, 32, 34, 36, 37	1,2, 4,5,6,7,8,9,1 13, 15, 18, 28, 33, 35	2,18	
3	3, 11, 12, 14, 16, 17, 18, 19, 20,21, 22, 23, 24, 25, 26, 27, 29, 30, 31, 32, 34, 36, 37	1,2,3,4,5,6,7,8,9,1 13,14,15, 28, 33, 35,36	3,14,36	
4	1, 2, 3, 4, 5, 6, 7, 9, 1 11, 12, 14, 16, 17, 18, 19, 20,21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 34, 35, 36	4, 13, 33	4	
5	1, 2, 3, 5, 6, 9, 11, 12, 14, 16, 17, 18, 19, 20,21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 34, 37	4,5, 7,8, 13, 28, 33, 35	5,28	
6	1, 2, 3, 6, 9, 11, 12, 14, 16, 17, 18, 19, 20,21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 34, 36, 37	4,5,6,7,8,9,1 13, 15, 28, 33, 35	6,9,28	
7	1, 2, 3, 5, 6, 7, 9, 11, 12, 14, 16, 17, 18, 19, 20,21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 34, 35, 36, 37	4, 7,8, 1 13, 15, 33, 35	7,35	
8	1, 2, 3, 5, 6, 7, 8, 9, 11, 12, 14, 16, 17, 18, 19, 20,21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 34, 35, 36, 37	8, 10	8	
9	1, 2, 3, 6, 9, 11, 12, 14, 16, 17, 18, 19, 20,21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 34, 36, 37	4,5,6,7,8,9, 13, 15, 28, 33, 35	6,9,28	
10	1, 2, 3, 6, 7, 8, 1 11, 12, 14, 15, 16, 17, 18, 19, 20,21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 34, 35, 36, 37	4, 1 13, 33	10	
11	11, 12, 16, 20,21, 22, 27, 29, 30, 31, 32, 37	1,2,3,4,5,6,7,8,9,1 11, 13,14,15, 17,18,19, 23,24,25,26, 28, 33,34,35,36	11	
12	12, 16, 27	1,2,3,4,5,6,7,8,9,1 11,12,13,14,15, 17,18,19, 20, 21,22,23,24,25,26, 28,29, 30, 31,32,33,34,35,36,37	12	
13	1, 2, 3, 4, 5, 6, 7, 9, 1 11, 12, 13, 14, 15, 16, 17, 18, 19, 20,21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37	13, 33	13,33	
14	3, 11, 12, 14, 16, 17, 19, 21, 23, 24, 25, 26, 27, 3 31, 34, 36, 37	1,2,3,4,5,6,7,8,9,1 13,14,15, 18, 28, 33, 35,36	3,14,36	
15	1, 2, 3, 6, 7, 9, 11, 12, 14, 15, 16, 17, 19, 20,21, 23, 25, 26, 27, 29, 30, 31, 32, 34, 36, 37	1 13, 15, 35	15	
16	16	1,2,3,4,5,6,7,8,9,1 11,12,13,14,15,16,17,18,19, 20, 21,22,23,24,25,26,27,28,29, 30, 31,32,33,34,35,36,37	16	I
17	11, 12, 16, 17, 19, 20,21, 22, 23, 24, 25, 26, 27, 29, 30, 31, 32, 34, 37	1,2,3,4,5,6,7,8,9,1 13,14,15, 17,18, 28, 33, 35,36	17	
18	2, 11, 12, 14, 16, 17, 18, 19, 20,21, 22, 23, 24, 25, 26, 27, 29, 30, 31, 32, 34, 36, 37	1,2,3,4,5,6,7,8,9,1 13, 18, 28, 33, 35	2,18	
19	11, 12, 16, 19, 20,21, 22, 23, 24, 25, 26, 27, 29, 30, 31, 32, 34, 37	1,2,3,4,5,6,7,8,9,1 13,14,15, 17,18,19, 28, 33, 35,36	19	
20	12, 16, 20,21, 27, 29, 30, 31, 32, 37	1,2,3,4,5,6,7,8,9,1 11, 13, 15, 17,18,19, 20, 23,24,25,26, 28,29, 32,33,34,35,36,37	20,29,32,37	
21	12, 16, 21, 27	1,2,3,4,5,6,7,8,9,1 11, 13,14,15, 17,18,19, 20, 21,22,23,24,25,26, 28,29, 30, 31,32,33,34,35,36,37	21	
22	12, 16, 21, 22, 27	1,2,3,4,5,6,7,8,9,1 11, 13, 17,18,19, 22,23,24,25,26, 28,29, 30, 31,32,33,34,35,36	22	
23	11, 12, 16, 20,21, 22, 23, 24, 25, 26, 27, 29, 30, 31, 32, 34, 37	1,2,3,4,5,6,7,8,9,1 13,14,15, 17,18,19, 23, 28, 33,34,35,36	23,34	
24	11, 12, 16, 20,21, 22, 24, 25, 26, 27, 29, 30, 31, 32, 37	1,2,3,4,5,6,7,8,9,1 13,14, 17,18,19, 23,24, 28, 33,34,35,36	24	
25	11, 12, 16, 20,21, 22, 25, 27, 29, 30, 31, 32, 37	1,2,3,4,5,6,7,8,9,1 13,14,15, 17,18,19, 23,24,25, 28, 33,34,35,36	25	
26	11, 12, 16, 20,21, 22, 26, 27, 29, 30, 31, 32, 37	1,2,3,4,5,6,7,8,9,1 13,14,15, 17,18,19, 23,24, 26, 28, 33,34,35,36	26	
27	16, 27	1,2,3,4,5,6,7,8,9,1 11,12,13,14,15, 17,18,19, 20, 21,22,23,24,25,26,27,28,29, 30, 31,32,33,34,35,36,37	27	
28	1, 2, 3, 5, 6, 9, 11, 12, 14, 16, 17, 18, 19, 20,21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 34, 36, 37	4,5,6,7,8,9,1 13, 28, 33,34,35	5,6,9,28,34	
29	12, 16, 20,21, 22, 27, 29, 32, 37	1,2,3,4,5,6,7,8,9,1 11, 13, 15, 17,18,19, 20, 23,24,25,26, 28,29, 32,33,34,35,36,37	20,29,32,37	
30	12, 16, 21, 22, 27, 30, 31, 37	1,2,3,4,5,6,7,8,9,1 11, 13,14,15, 17,18,19, 20, 23,24,25,26, 28, 30, 32,33,34,35,36	30	
31	12, 16, 21, 22, 27, 31	1,2,3,4,5,6,7,8,9,1 11, 13,14,15, 17,18,19, 20, 23,24,25,26, 28, 30, 31,32,33,34,35,36	31	
32	12, 16, 20,21, 22, 27, 29, 30, 31, 32, 37	1,2,3,4,5,6,7,8,9,1 11, 13, 15, 17,18,19, 20, 23,24,25,26, 28,29, 32,33,34,35,36,37	20,29,32,37	
33	1, 2, 3, 4, 5, 6, 7, 9, 1 11, 12, 13, 14, 16, 17, 18, 19, 20,21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37	13, 33	13,33	
34	11, 12, 16, 20,21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 34, 37	1,2,3,4,5,6,7,8,9,1 13,14,15, 17,18,19, 23, 28, 33,34,35,36	23,28,34	
35	1, 2, 3, 5, 6, 7, 9, 11, 12, 14, 15, 16, 17, 18, 19, 20,21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 34, 35, 36, 37	4, 7,8, 1 13, 33, 35	7,35	
36	3, 11, 12, 14, 16, 17, 19, 20,21, 22, 23, 24, 25, 26, 27, 29, 30, 31, 32, 34, 36, 37	1,2,3,4, 6,7,8,9,1 13,14,15, 18, 28, 33, 35,36	3,14,36	
37	12, 16, 20,21, 27, 29, 32, 37	1,2,3, 5,6,7,8,9,1 11, 13,14,15, 17,18,19, 20, 23,24,25,26, 28,29, 30, 32,33,34,35,36,37	20,29,32,37	

5. *Level partition of factors*

Variable	Reachability set	Antecedent set	Intersection set	Level
1	1, 2, 3, 11, 12, 14, 16, 17, 18, 19, 20,21, 22, 23, 24, 25, 26, 27, 29, 30, 31, 32, 34, 36, 37	1, 4,5,6,7,8,9,1 13, 15, 28, 33, 35	1	XVI
2	2, 3, 11, 12, 14, 16, 17, 18, 19, 20,21, 22, 23, 24, 25, 26, 27, 29, 30, 31, 32, 34, 36, 37	1,2, 4,5,6,7,8,9,1 13, 15, 18, 28, 33, 35	2,18	XV
3	3, 11, 12, 14, 16, 17, 18, 19, 20,21, 22, 23, 24, 25, 26, 27, 29, 30, 31, 32, 34, 36, 37	1,2,3,4,5,6,7,8,9,1 13,14,15, 28, 33, 35,36	3,14,36	XIV
4	1, 2, 3, 4, 5, 6, 7, 9, 1 11, 12, 14, 16, 17, 18, 19, 20,21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 34, 35, 36	4, 13, 33	4	XXI
5	1, 2, 3, 5, 6, 9, 11, 12, 14, 16, 17, 18, 19, 20,21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 34, 37	4,5, 7,8, 13, 28, 33, 35	5,28	XVII
6	1, 2, 3, 6, 9, 11, 12, 14, 16, 17, 18, 19, 20,21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 34, 36, 37	4,5,6,7,8,9,1 13, 15, 28, 33, 35	6,9,28	XVII
7	1, 2, 3, 5, 6, 7, 9, 11, 12, 14, 16, 17, 18, 19, 20,21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 34, 35, 36, 37	4, 7,8, 1 13, 15, 33, 35	7,35	XVIII
8	1, 2, 3, 5, 6, 7, 8, 9, 11, 12, 14, 16, 17, 18, 19, 20,21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 34, 35, 36, 37	8, 10	8	XIX
9	1, 2, 3, 6, 9, 11, 12, 14, 16, 17, 18, 19, 20,21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 34, 36, 37	4,5,6,7,8,9, 13, 15, 28, 33, 35	6,9,28	XVII
10	1, 2, 3, 6, 7, 8, 1 11, 12, 14, 15, 16, 17, 18, 19, 20,21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 34, 35, 36, 37	4, 1 13, 33	10	XX
11	11, 12, 16, 20,21, 22, 27, 29, 30, 31, 32, 37	1,2,3,4,5,6,7,8,9,1 11, 13,14,15, 17,18,19, 23,24,25,26, 28, 33,34,35,36	11	VIII
12	12, 16, 27	1,2,3,4,5,6,7,8,9,1 11,12,13,14,15, 17,18,19, 20, 21,22,23,24,25,26, 28,29, 30, 31,32,33,34,35,36,37	12	III
13	1, 2, 3, 4, 5, 6, 7, 9, 1 11, 12, 13, 14, 15, 16, 17, 18, 19, 20,21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37	13, 33	13,33	XXII
14	3, 11, 12, 14, 16, 17, 19, 21, 23, 24, 25, 26, 27, 3 31, 34, 36, 37	1,2,3,4,5,6,7,8,9,1 13,14,15, 18, 28, 33, 35,36	3,14,36	XIV
15	1, 2, 3, 6, 7, 9, 11, 12, 14, 15, 16, 17, 19, 20,21, 23, 25, 26, 27, 29, 30, 31, 32, 34, 36, 37	1 13, 15, 35	15	XIX
16	16	1,2,3,4,5,6,7,8,9,1 11,12,13,14,15,16,17,18,19, 20, 21,22,23,24,25,26,27,28,29, 30, 31,32,33,34,35,36,37	16	I
17	11, 12, 16, 17, 19, 20,21, 22, 23, 24, 25, 26, 27, 29, 30, 31, 32, 34, 37	1,2,3,4,5,6,7,8,9,1 13,14,15, 17,18, 28, 33, 35,36	17	XIII
18	2, 11, 12, 14, 16, 17, 18, 19, 20,21, 22, 23, 24, 25, 26, 27, 29, 30, 31, 32, 34, 36, 37	1,2,3,4,5,6,7,8,9,1 13, 18, 28, 33, 35	2,18	XV
19	11, 12, 16, 19, 20,21, 22, 23, 24, 25, 26, 27, 29, 30, 31, 32, 34, 37	1,2,3,4,5,6,7,8,9,1 13,14,15, 17,18,19, 28, 33, 35,36	19	XII
20	12, 16, 20,21, 27, 29, 30, 31, 32, 37	1,2,3,4,5,6,7,8,9,1 11, 13, 15, 17,18,19, 20, 23,24,25,26, 28,29, 32,33,34,35,36,37	20,29,32,37	VII
21	12, 16, 21, 27	1,2,3,4,5,6,7,8,9,1 11, 13,14,15, 17,18,19, 20, 21,22,23,24,25,26, 28,29, 30, 31,32,33,34,35,36,37	21	IV
22	12, 16, 21, 22, 27	1,2,3,4,5,6,7,8,9,1 11, 13, 17,18,19, 22,23,24,25,26, 28,29, 30, 31,32,33,34,35,36	22	V
23	11, 12, 16, 20,21, 22, 23, 24, 25, 26, 27, 29, 30, 31, 32, 34, 37	1,2,3,4,5,6,7,8,9,1 13,14,15, 17,18,19, 23, 28, 33,34,35,36	23,34	X1
24	11, 12, 16, 20,21, 22, 24, 25, 26, 27, 29, 30, 31, 32, 37	1,2,3,4,5,6,7,8,9,1 13,14, 17,18,19, 23,24, 28, 33,34,35,36	24	X
25	11, 12, 16, 20,21, 22, 25, 27, 29, 30, 31, 32, 37	1,2,3,4,5,6,7,8,9,1 13,14,15, 17,18,19, 23,24,25, 28, 33,34,35,36	25	IX
26	11, 12, 16, 20,21, 22, 26, 27, 29, 30, 31, 32, 37	1,2,3,4,5,6,7,8,9,1 13,14,15, 17,18,19, 23,24, 26, 28, 33,34,35,36	26	IX
27	16, 27	1,2,3,4,5,6,7,8,9,1 11,12,13,14,15, 17,18,19, 20, 21,22,23,24,25,26,27,28,29, 30, 31,32,33,34,35,36,37	27	II
28	1, 2, 3, 5, 6, 9, 11, 12, 14, 16, 17, 18, 19, 20,21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 34, 36, 37	4,5,6,7,8,9,1 13, 28, 33,34,35	5,6,9,28,34	XVII
29	12, 16, 20,21, 22, 27, 29, 32, 37	1,2,3,4,5,6,7,8,9,1 11, 13, 15, 17,18,19, 20, 23,24,25,26, 28,29, 32,33,34,35,36,37	20,29,32,37	VII
30	12, 16, 21, 22, 27, 30, 31, 37	1,2,3,4,5,6,7,8,9,1 11, 13,14,15, 17,18,19, 20, 23,24,25,26, 28, 30, 32,33,34,35,36	30	VI
31	12, 16, 21, 22, 27, 31	1,2,3,4,5,6,7,8,9,1 11, 13,14,15, 17,18,19, 20, 23,24,25,26, 28, 30, 31,32,33,34,35,36	31	VI
32	12, 16, 20,21, 22, 27, 29, 30, 31, 32, 37	1,2,3,4,5,6,7,8,9,1 11, 13, 15, 17,18,19, 20, 23,24,25,26, 28,29, 32,33,34,35,36,37	20,29,32,37	VII
33	1, 2, 3, 4, 5, 6, 7, 9, 1 11, 12, 13, 14, 16, 17, 18, 19, 20,21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37	13, 33	13,33	XXII
34	11, 12, 16, 20,21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 34, 37	1,2,3,4,5,6,7,8,9,1 13,14,15, 17,18,19, 23, 28, 33,34,35,36	23,28,34	X1
35	1, 2, 3, 5, 6, 7, 9, 11, 12, 14, 15, 16, 17, 18, 19, 20,21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 34, 35, 36, 37	4, 7,8, 1 13, 33, 35	7,35	XVIII
36	3, 11, 12, 14, 16, 17, 19, 20,21, 22, 23, 24, 25, 26, 27, 29, 30, 31, 32, 34, 36, 37	1,2,3,4, 6,7,8,9,1 13,14,15, 18, 28, 33, 35,36	3,14,36	XIV
37	12, 16, 20,21, 27, 29, 32, 37	1,2,3, 5,6,7,8,9,1 11, 13,14,15, 17,18,19, 20, 23,24,25,26, 28,29, 30, 32,33,34,35,36,37	20,29,32,37	VII

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