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Licenciado em Engenharia Química e Biológica – Ramo Química

Lean, Agile, Resilient and Green Supply Chain Management Interoperability Assessment Methodology

Dissertação para obtenção de grau de Mestre em Engenharia e Gestão
Industrial (MEGI)

Orientador: António Grilo, Professor Auxiliar, FCT - UNL

Júri:

Presidente: Professor Doutor Virgílio da Cruz Machado
Vogais: Professora Doutora Susana Maria Palavra
Garrido Azevedo
Professor Doutor António Carlos Bárbara Grilo



**FACULDADE DE
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Abstract

Supply Chain Management has become a tactic asset for the current global competition situation. Innovative strategies such as Lean, Agile, Resilient and Green emerged as a response, requiring high levels of cooperation and of great complexity. However, the strategic alignment of operations with partners in supply chains is affected by lack of interoperability. The present work provides a framework to enhance SC competitiveness and performance by assessing interoperable SCM Practices applied in automotive industry. Through a pragmatic interoperability approach, this methodology describes in detail the form of application using analytical hierarchical process (AHP) and Fuzzy sets as support decision making models, ensuring a systematic approach to the analysis of interoperability with appropriate criteria for assessment of situations that require high levels of collaboration between partners. Through a case study in a Portuguese automaker, it was possible to test the methodology and analyse which areas lack interoperability in the implementation of SCM practices.

Keywords: SCM, IS, LARG, AHP, Fuzzy Sets, Interoperability.

Resumo

A Gestão da Cadeia de Abastecimento tornou-se um recurso tático para a situação actual competição global. Estratégias inovadoras, tais como Lean, Agile, Resiliente e Green surgiram como uma resposta, exigindo altos níveis de cooperação e de grande complexidade. No entanto, o alinhamento estratégico das operações com os parceiros nas cadeias de abastecimento é afectado pela falta de interoperabilidade. O presente trabalho fornece uma estrutura para aumentar a competitividade e o desempenho SC avaliando Práticas interoperáveis SCM aplicados na indústria automóvel. Através de uma abordagem pragmática da interoperabilidade, a presente metodologia descreve detalhadamente a forma de aplicação utilizando modelos de apoio à tomada de decisão processo hierárquico analítico (AHP) e Fuzzy sets, que garantem uma abordagem sistemática à análise de interoperabilidade utilizando critérios adequados à avaliação de situações que requeiram níveis de colaboração entre parceiros. Através de um caso de estudo num fabricante automóvel português, foi possível testar a metodologia e verificar quais os pontos de falha de interoperabilidade na implementação de práticas SCM.

Palavras-chave: SCM, SI, LARG, AHP, Fuzzy Sets, Interoperabilidade.

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Acronyms

AHP	Analytical Hierarchy Process
ANP	Analytical Network Process
BIF	Business Interoperability Framework
BIP	Business Interoperability Parameter
BIQMM	Business Interoperability Quotient Measurement Model
CI	Consistency Index
CR	Consistency Ratio
CSCMP	Council of Supply Chain Management Professionals
DM	Decision-Maker
DoD	(U.S.) Department of Defence of
EAN	European Article Number
e-GIF	e-Government Interoperability Framework
EM	Eigenvector method
FF	Focal Firm (Manufacturer)
FMS	Flexible Manufacturing Systems
G	Good
GSCM	Green Supply Chain Management
H	High
ICT	Information and communications technology
IDEAS	Interoperable Delivery of European e-Government Services to public Administrations, Businesses and Citizens
IEEE	Institute for Electrical And Electronics Engineers
IPR	Intellectual Property Rights
IS	Information Systems
ISO	International Organisation for Standardization
IT	Information Technology
KPI	Key Performance Indicators
L	Low
LA	Lean and Agile
LARGeSCM	Lean, Agile, Resilient and Green Supply Chain Management
LM	Lean Management
M	Medium
MCDA	Multi-criteria decision analysis
MCDM	Multi-criteria decision-making
MDA	Model-driven architecture
PAID	Procedures, Applications, Infrastructure and Data
RI	Random Index
SC	Supply Chain

SCM	Supply Chain Management
SOA	Service-oriented architecture
TOPSIS	Technique for Order Preference by Similarity to Ideal Solution
UPC	Universal Product Code
VG	Fuzzy Sets linguistic variable “Very Good”
VH	Fuzzy Sets linguistic variable “Very High”
VL	Fuzzy Sets linguistic variable “Very Low”
VW	Fuzzy Sets linguistic variable “Very Weak”
VW	Volkswagen
W	Fuzzy Sets linguistic variable “Weak”

Symbols

A	AHP importance matrix	68
a_{ij}	AHP pairwise comparison rating between element i and element j (in AHP)	68
N	AHP number of pairwise comparisons	68
n	AHP number of criteria/sub-criteria/alternatives of importance matrix	68
s_i	AHP sum of pairwise comparisons of column i	68
W	AHP Eigenvector	69
λ_{max}	AHP Largest eigenvector of decision matrix	69
w_n	AHP Weight of criteria/alternative	69
CI	AHP Consistency index	70
CR	AHP Consistency ratio	70
RI	AHP Average CI of random matrices	70
G	Aggregated judgement of Group decision-making rule	71
n	TOPSIS alternatives	71
k	TOPSIS criteria	71
x_{ij}	TOPSIS raw measures	71
s_{ij}	TOPSIS standardized measures	71
w_k	TOPSIS weights	71
s^+	TOPSIS ideal alternative	71
s^-	TOPSIS nadir alternative	71
D^+	TOPSIS distance to ideal alternative	71
D^-	TOPSIS distance to nadir alternative	71
R	TOPSIS ratio	72
μ_F	Fuzzy Sets degree of membership	73
F	Fuzzy Set	73
\tilde{x}_{ij}	Fuzzy number	73
U	Fuzzy Sets universe of discourse	73
$\mu_F(u)$	Fuzzy Sets membership function	73
\tilde{R}	Fuzzy Sets aggregated decision matrix	77
\tilde{D}	Fuzzy Sets alternative decision matrix	77
\tilde{W}	Fuzzy Sets criteria decision matrix	77
S^*	Fuzzy positive ideal solution (FPIS)	78
S^-	Fuzzy positive negative solution (FNIS)	78
d_v	Fuzzy TOPSIS distance to FPIS and FNIS	78
CC_i	Fuzzy TOPSIS closeness coefficient	78
I	Ideal situation	88
A	Actual situation	88

1. Introduction

The creation of collaborative networks, such as Supply Chains, where suppliers, manufacturers, distributors, retailers and wholesalers operate in joint activities, sharing information in real-time to achieve global success, has been a key factor that prevailed since the end of 20th century until today.

To gain competitiveness towards the demands of the market, strategies as Lean, Agile, Resilient and Green have emerged as a response to enhance global competition. The integration of these four different methodologies on the same supply chain is a paradigm of great importance in the strategic point of view. If, on one hand, Lean argues that we should design products to minimize the waste increasing the added value for the customer, on the other hand, agile and resilient advocate that, in a generic way, we should be more responsive to customer (Agile) or be able to regenerate after abrupt changes (Resilient). Greenness leads with external outputs of SC that affect environment.

However, such complex networks are affected by problems of communication between partners, and through incoordination of activities, and some other kinds of disturbance. This kind of disturbance is being named as an interoperability issue. Every areas of joint activity need to be interoperable in order to work efficiently. The complexity of a supply chain network demands the correct information at the right time to make the right decision. The violation of this principle has consequences, reflected in the total cost to the client.

This work provides a methodology for analysis of interoperability, which is applied in a Fuzzy Sets Theory and Analytical Hierarchy Process decision models for assessing interoperability in the supply chain and see what implemented practices require interoperability. The scope of activity is centred in a pragmatic perspective of interoperability, focusing on enhancing strategic goals of SCM quality and customer services. This method aims at identifying implemented practices in SCM and, then, evaluates the interoperability drivers that rule B2B interactions to learn where improvements can be made. Focusing on two strategic perspectives “where are we?” and “where are we going?” it is proposed an analytical method to determine how far are we from optimal interoperability.

1.1. Scope

The main focus of the present dissertation is in the enhancement of competitiveness in LARG supply chain through improvement of interoperability in activities between supply chain partners.

In the perspective of SCM, the integration of material and information flows in a seamless manner results in the achievement of operational and strategic objectives by the implementation of practices that rule the mode actors interact with each other. However, facing the environment of high volatile markets and unpredictable conditions, supply chain strategies such as Lean, Agile, Resilient and Green emerge to offer solutions that provide a response to the many market and external conditions of SC. However, the strategies themselves do not provide all the solutions needed for every environment. Thus, hybrid solutions are now at the forefront in the struggle to achieve competitiveness and company's profit. In counterpart, the conception of hybrid strategy that combines Lean, Agile, Resilient and Green is, in one hand, innovative and, in other hand, paradigmatic. Market environment and external agents are not seen in the same manner by each SC strategy, requiring an in-depth

study of integrating contradictory practices and correspondent metrics and key performance indicators.

It is in the context of LARG that the present dissertation is developed. Every area of joint activity is affected by interoperability, in its business extent, namely where information, material and services are exchanged. Every activity between actors occurs according to the adopted SCM strategy and the correspondent practices. The alignment of these activities is a challenge for companies that deal with complex products such as automakers. Lack of interoperability in such integrated environments leads to reduced quality and service, resulting in costs for the final customer.

In this setting, many problem solving solutions are provided but none responds actually to the question of identifying the problem on the interaction between partners. Improving the capability of collaborating is important to achieve the key benefits of using LARG strategies. Thus, a more collaboration specific and interoperation detailed method is necessary in order to identified barriers in collaboration.

1.2. Objectives

The research question that arises in this work is: “how to achieve maximum competitiveness in LARG supply chains through improved interoperability activities between supply chain partners?”

The expected achievements for the present work involve the following stages:

1. Identify interoperable LARG SCM practices implemented between SC actors (Supplier-Manufacturer and Manufacturer-Distributor relationships);
2. Establish the adequate criteria to evaluate interoperability in LARG SCM context;
3. Develop an interoperability assessment methodology;
4. Develop mathematical decision-models to support the methodology;
5. Test the methodology in a dyadic perspective (Manufacturer-Supplier and/or Manufacturer-Distributor).

The results for the application of the methodology consist in validating all the previous steps, by applying it in an automotive SC. Then, the expected outcome is to present the analysis on the implementation of LARG practices identifying, systematically, the interoperability issues among SC collaboration. This methodology brings advantages to the business processes and managers. In the particular case of SCM, it is expected to have a more effective management and information sharing across departments and business partner's boundaries. Thus, the major benefits of this method are the following:

- Provide systematical information on the implementation of practices decomposed in strategic, external, internal and information sharing issues;
- Promote the accuracy and precise information in real time;
- Support in strategic decision making, permitting integrated decisions involving all the SC;
- Cost reducing in obtaining data (for e.g. demand forecasting, know partners inventories, etc.);
- Improved chain of value by reducing global costs;
- Competitiveness and stability – the access to the information will permit a rapid change in strategy in order to be able to change (requirement of Resilience and Agile strategies).

1.3. Methodology

This interoperability assessment is developed by achieving the stages identified in section 1.2. First, a theoretical study serves the first two stages in finding areas of SCM that can possibly be affected by lack of interoperability. In other hand, by researching on interoperability and business interoperability approaches in literature will make possible to determine which key drivers rule interactions among actors in SC.

Second, the obtained information on interoperability and LARG practices will be restructured as interoperability drivers for LARG SCM and, then, translated into a decision problem focusing on enhancing SC competitiveness to improve the interoperability of practices. This decision problem is modeled in mathematical multi-criteria decision making tools Fuzzy sets theory and Analytical Hierarchy Process. The main goal it is to maximize supply chain competitiveness through an efficient and effective implementation of supply chain management practices which are subject to lack of interoperability. In this matter, interoperability criteria will make a link between practices and SC competitiveness by assessing each individual criterion and the performance of each practice in each interoperability criterion perspective.

In order to apply the method in an automotive SCM, data input is previously modeled in form of questionnaire to provide the adequate interoperability evaluation terminology and the adequate scenarios of implementation of practices to determine how interoperable the actors are.

Finally, the information collected from the automotive supply chain will be analyzed and recommendations will be presented for the case study and to make modifications to the methodology.

The outcome of research has been peering reviewed of 5 papers in conferences. Namely:

1. Cabral, I., Espadinha-Cruz, P., Grilo, A., Puga-leal, R., & Cruz-Machado, V. (2011). Decision-making models for interoperable Lean, Agile, Resilient and Green Supply Chains. Supply Chain Management (p. 1-7). Naples, Italy: ISAHP 2011.
2. Maleki, M., Espadinha, P., Valente, R. P., & Machado, V. C. (2011). Supply Chain Integration Methodology: LARGe Supply Chain Supply Chain Integration. ENEGI 2011 (p. 1-9). Guimarães, Portugal: ENEGI 2011.
3. Espadinha-Cruz, P.; Grilo, A; Puga-Leal, R. & Cruz-Machado, V. (2011). A model for evaluating Lean, Agile, Resilient and Green practices interoperability in supply chains (p. 1-5). Singapore: IEEM 2011.
4. Espadinha-Cruz, P.; Grilo, A; Cruz-Machado, V. (2012). Fuzzy evaluation model to assess interoperability in LARG Supply Chains (pp. 1-5). Chongqing, China: FSKD 2012
5. Espadinha-Cruz, P., Cabral, I., Grilo, A., & Cruz-Machado, V. (2011). Information model for LARGeSCM interoperable practices (p.1-6). Croatia: ICITI 2012

Currently, two articles are being revised by peer reviewers in scientific journals.

1.4. Organisation of this dissertation

With the premises above, the thesis is organized in the following items:

- Chapters 2, 3 and 4 refer to the literature review of the topics interoperability, supply chain management and multi-criteria decision-making, respectively. The state of art for each issue will be addressed, to present in the methodology the last research on each matter.
- Chapter 5 describes the conception of the methodology for analysis of interoperability in SC. The summary of practices and interoperability criteria are presented in this section and

introduced on the assessment model. The detailed construction of each decision model is presented also in this section along with the modelling inputs.

- Chapter 6 refers to the case study developed on the Portuguese automaker VW Autoeuropa, where the application of the two models (Fuzzy sets and AHP) is described and the collected data is analysed.
- In chapter 7, the outcomes of this thesis are exposed, and the contributions of this work are presented.

2. Interoperability

Interoperability issues arise whenever systems or organisations need to exchange information and work together to achieve common goals. According to (Legner & Lebreton, 2007) in today's business reality, it is indubitable the existence of complex networked business models. The two main advantages are: the capability to offer innovative products and services to customer and the efficient business conduction. However, these strategic and operational advantages have many barriers to cross.

As the networked complexity increases, increases the number of business relationships and, therefore, the need to interact with each partner. Examples of problems in external collaborations are: the very complex individual and time-consuming negotiations; high data interchange rate; manual data interchange; lack of electronic data interface and storage.

In Automotive Supply Chains in particular, to achieve its goals, it is need to properly control the planning and execution processes as efficiently as possible. Therefore, Supply Chain Management is characterised by its large integration in the coordination of using an internal and external stable network. Business processes as well as IT infrastructure are optimized towards automation and standardization. However, even in a well-structured and integrated network, interoperability issues are always present. For instance, (Brunnermeier & Martin, 2002) approached the subject in an economical perspective, arguing that US Automotive spent 1 billion dollars by year in conversion of CAD and CAM formats (view Figure 2.1) that proved to be inadequate, as long as information is exchanged along the Supply Chain. As a result, this lack of interoperability affected the lead time and delayed the introduction of new models into market.

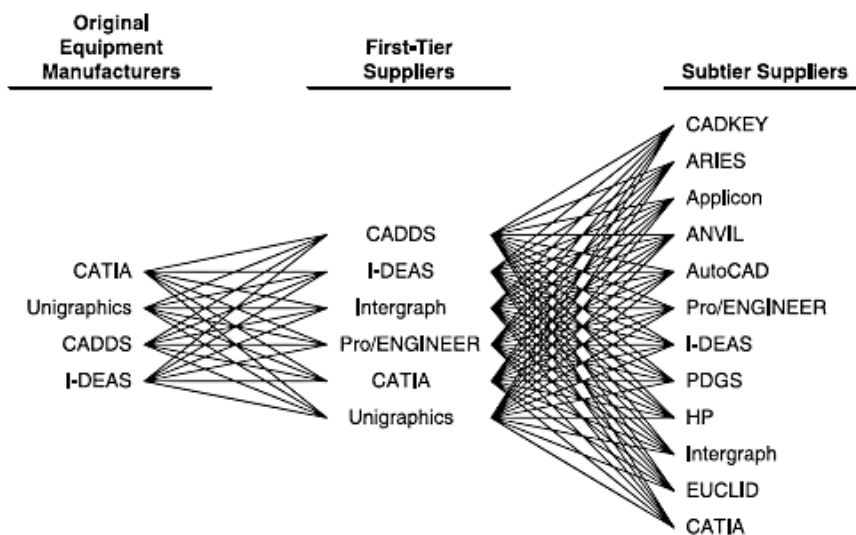


Figure 2.1. Multiple CAD/CAM systems used in the automobile supply chain (Brunnermeier & Martin, 2002).

Interoperability has been often discussed from a purely technical perspective, focusing on technical standards and IS architectures. During its research, (Legner & Lebreton, 2007) accomplished that there was a lack of a systematic analysis of strategic, organisational and operational issues associated with interoperability. Most of the existing research refers to technical standards and IS architectures. Nevertheless, many companies and institutions realized that the concept of

interoperability not only concerns IS architectures and standards, but also considers these to be the means to an end. Since the first references to “Business Interoperability” (Legner & Wende, 2006), the concept of interoperability has grown to a wider issue, embracing not only the traditional transactional of the information, but also the interaction with the subject that uses it: the person. Is to be noted, interoperability is not only concerned with interactions in and with the information systems. Most of the interactions involve corporations, institutions, groups of people and isolated persons working for a common goal, using, or not, an ICT for data exchange. So, today, the capability to interoperate involves, matters such as strategy and operations, making use of sociology, psychology, business strategy, operations management and relationships management.

In the following sections, it is exposed definitions of interoperability and business interoperability, existing approaches, the typology of approaches and, in each approaches section, the main contribution to this dissertation.

2.1. Definition of Interoperability

In literature, several definitions can be found for the concept of “interoperability”. The earliest reference is from (IEEE, 1990), which defines it as “the ability of two or more systems or components to exchange information and to use the information that has been exchanged”. In this definition, there are present two main remarks: the first, to be noted, is a technical perspective of the interoperability definition that has been most cited in most of technical and non-technical interoperability related articles; the second, is the definition of the concept as ability. Since this definition, the concept evolved from ability to concern. Hence, today is noted the discussion of the idea as lack of interoperability, rather than interoperability itself. (Naudet, Latour, Guedria, & Chen, 2010) argued that an interoperability problem appears when two or more incompatible systems are put in relation. Interoperability *per se* is the paradigm where an interoperability problem occurs, having proposed two problem-solving models (systemic and decisional model).

Another feature from the concept of interoperability is the evolutionary trend noted in literature. This concept has been constantly varying as the concern for the subject increases. Most enterprises extend this preoccupation to the business level. Starting at the IS Architectures level to the cooperation levels, involving business processes, organisational levels and business strategies.

In Table 2.1 are presented some of the definitions found in literature:

Table 2.1. Interoperability definitions.

Definition	Source
“The ability of two or more systems or components to exchange information and to use the information that has been exchanged”.	(IEEE, 1990)
“The capability to communicate, execute programs, or transfer data among various functional units in a manner that requires the user to have little or no knowledge of the unique characteristics of those units”.	(ISO, 1993)
“The ability of a system to communicate with peer systems and access their functionality”.	(Vernadat, 1996)

Definition	Source
"The ability of systems, units, or forces to provide services to and accept services from other systems, units, or forces, and to use the services so exchanged to enable them to operate effectively together".	LISI – Levels of Information Systems Interoperability (DoD, 1998)
"Ability of interaction between enterprise software applications".	IDEAS Interoperability Framework ((IDEAS, 2003) cited in (ATHENA, 2006; Daclin, 2005))
"Interoperability means the ability of information and communication technology (ICT) systems and of the business processes they support to exchange data and to enable sharing of information and knowledge".	EIF – European Interoperability Framework (IDABC, 2004)
"The organisational and operational ability of an enterprise to cooperate with its business partners and to efficiently establish, conduct and develop IT-supported business with the objective to create value".	(Legner & Wende, 2006)
"(1) The ability to share information and services. (2) The ability of two or more systems or components to exchange and use information. (3) The ability of systems to provide and receive services from other systems and to use the services so interchanged to enable them to operate effectively together".	TOGAF – The Open Group Architecture Framework (Open Group, 2009)

In the various presented definitions of interoperability one common trend is found: ability of two or more systems to exchange information and use this exchanged information. The novelty, in terms of definition, it is exposed by (DoD, 1998) and (Legner & Wende, 2006) including, for the first time, the human perspective on the definition. According to the first reference, interoperability become far more than IT: units and forces have been introduced as a part of collaboration with another systems, units or forces. This "units" and "forces", acting as a human military asset, where the first subjects to be considered humanly interoperable. What this means is that the "interoperability" perspective has grown more than systems and interaction with systems to electronic exchange information to the capability of interoperate with humans itself. These perspectives have been extended to business perspective by (Legner & Wende, 2006). Being the first to introduce and define the concept of Business Interoperability, the concept of Interoperability have been clubbed to the enterprise reality, enclosing IT structures, business processes, and business strategy.

2.2. Business Interoperability

The concept of business interoperability is part of an evolution in the contents studied in the various approaches. Strongly rooted in context of technical integration in platforms, syntactic and semantic data formats (Peristeras & Tarabanis, 2006) opened doors to operational/organisational approaches (ATHENA, 2006; DoD, 1998; IDABC, 2010; Open Group, 2009), whereas interactions inside business process have become the aim of study reflecting the collaboration within and without corporations.

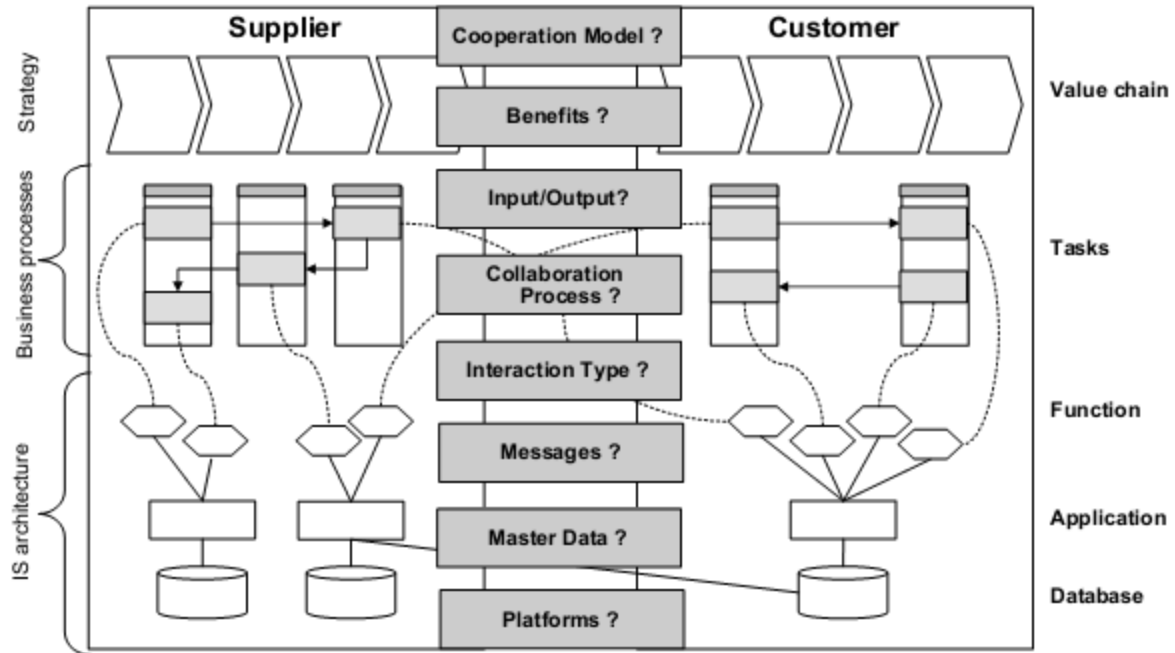


Figure 2.2. Different aspects of interoperability (Berre et al., 2007).

The increasing use of IT has led to various interoperability issues that had to be solved in order to achieve seamlessly integrated collaboration (Legner & Lebreton, 2007). This directed to various approaches to interoperability to pass through several stages: syntactic, semantic and pragmatic. In the first instance, the structuring of the information system was the first challenge in solving the problems of interoperability, so it would have a cohesive and homogeneous structure for the exchange of information. However, understanding of information exchanged between the various systems was another challenge. In this context, many authors stress the importance of aligning the semantics (Österle, Fleisch, & Alt, 2001) in order to have a unified understanding of concepts. Nevertheless, some authors like (J. Yang & Papazoglou, 2000) consider interoperability in a wider concept of value chain integration, relating activities such as business process compatibility, adaptability of business processes and other factors related to e-commerce and integrated value chains.

It is this growing understanding that the scope of interoperability has led to numerous frameworks addressing the concept as levels of interoperability. The levels of interoperability are present in many frameworks of the authors (ATHENA, 2006; DoD, 1998; IDABC, 2010; Open Group, 2009; Peristeras & Tarabanis, 2006). These relate to interoperability from the perspective of the hierarchy of priorities. It is possible to achieve an optimal level of interoperability, if the previous levels conditions are met. For example, an optimal level of interoperability at the semantic level presupposes a system that is

syntactically compatible, i.e., has a similar or appropriated structure of information to exchange information.

So, the top level of interoperability nowadays is Business interoperability. This level involves specific characteristics of the inter-organisational design of a company's external relationships. Having strong origins on the concept of networkability (Österle et al., 2001), business interoperability requires multi-layered collaboration with each level complementing the other for the smooth functioning of the overall collaboration. This idea is explored by ATHENA Integrated Project (view Figure 2.2), depicting the hierarchical nature of business interoperability constituted from technical levels at the bottom, passing by business processes (in the middle) and collaboration and referring business strategy at its highest level. Thus, business interoperability requires the multi-layered collaboration with each level complementing the other for the smooth functioning of the overall collaboration.

So, in conclusion, Business Interoperability aims to improve the effectiveness and ease of conduction of business between two or more business collaborators. Hence interoperability can be viewed as relying intensely on networkability at different levels. However collaborative scenarios can differ greatly from industry to industry and depend greatly on the objective of the collaboration.

2.3. Measurement of interoperability

The measurement of interoperability is part of the sensitive analysis of identification and improvement of problems of interoperability. In the context of business interoperability, (Legner & Lebreton, 2007) argue that research efforts must be spent in finding out which level of interoperability a company should struggle for. The first proposed step is to define where a firm currently is and where it should be. For this purpose, using the business interoperability related frameworks, such as (DoD, 1998; IDABC, 2010; Legner & Wende, 2006), interoperability parameters and suggested assessments can be applied in order to aim at higher levels of interoperability. However, the target level of interoperability still remains empirical.

For instance, in a strongly IT-supported automotive supply chain, interoperability level is expected to be high, in order to deal with the complexity of products. In other hand, in low integrated business like in tourism, the expected level of interoperability is considerably low.

This considerations leads to the introduction of the concept of optimal interoperability. Since it is not possible to assign a global target to optimal level of interoperability valid for all types of collaboration, this level should be established for each type of business. Nevertheless, most of the findings in research that will be approached in the next sections refer more to rules of assessment than the optimal level of interoperability itself.

Interoperability measurement is addressed in the literature by two different kinds of measurement: qualitative and quantitative. The first approach refers to model-driven approaches. The quantitative approach is addressed in most of the literature, whereas it is used indicators to estimate states of lack of interoperability.

2.4. Existing research on interoperability

2.4.1. Quantitative analysis

Although the first introduction to the subject has been done for more than twenty years ago, it was in the last decade that the great achievements were performed. (Legner & Lebreton, 2007) argued, during its interoperability research, that the limited but growing number of scientific publications indicates that a broader discussion related to interoperability is about to start. The authors found out that, since the year 2000 to 2007, a total of 170 academic articles (on Emerald and EBSCO) were published, and having been published 109 articles (64.5%) between 2004 and 2007.

To get a clear picture of the current research, it was made a quantitative analysis of published academic articles referring to “interoperability” or “interoperation” on the title or keywords. The results are the following (see Table 2.2).

Table 2.2. Academic publications until November 2011.

Total number of publications	839	Percentage
Year of publication		
1980-1992	35	4%
1993-1996	67	8%
1997-2000	101	12%
2001-2003	105	13%
2004-2007	266	32%
2008-2011	263	31%
Subject areas		
Computer Science	544	65%
Engineering	255	30%
Telecommunications	107	13%
Information Science Library Science	45	5%
Medical Informatics	40	5%
Automation Control Systems	25	3%
Health Care Sciences Services	23	3%
Instruments Instrumentation	19	2%
Operations Research Management Science	17	2%
Construction Building Technology	15	2%
Others (42 subject areas, generic sciences, public administration, sociology, transportation, etc.)	195	23%
Source: Web of Science academic articles which contained “interoperability” or “interoperation” or “business interoperability” in keywords or title.		

The majority of the articles on this area have been published since 2004, constituting 63% of existing publications since 1980. These data shows that there is a strong tendency to address the issue, as improvements were observed in the area of IT. However, this data reveals to be positive and negative in terms of contribution to the study of interoperability. Positive, in one hand, whereas many models,

architectures and methodologies were proposed to describe how to achieve higher levels of (IT) interoperability but, on the negative side, few describe how to achieve higher interoperability in an organisational cooperation perspective.

2.4.2. Qualitative analysis

Another aspect to have in consideration is the evolutionary streams to approach interoperability (view Figure 2.3). In earlier research, the subject of analysis mainly focused on the information structures and interfaces or the communication at the transport level. In recent work was introduced a broader perspective. According to (Legner & Lebreton, 2007), two streams can be distinguished: the first, addressing semantic aspects and the business process compatibility and adequacy; the second, addressing product interoperability.

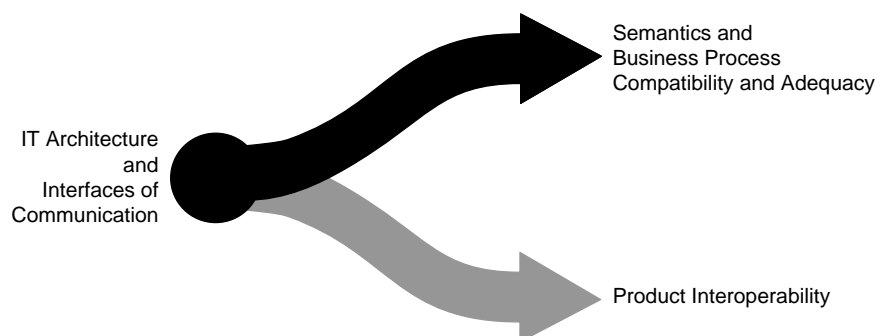


Figure 2.3. Evolutionary research streams of interoperability (adapted from (Legner & Lebreton, 2007)).

Regarding the nature of the approaches, there are two ways to classify the approaches: constructivist and exploratory (see Figure 2.4). The constructivist approach exposes new architectures, frameworks, models and methodologies to achieve higher levels of interoperability. Exploratory research stream relies on case studies or surveys in order to investigate the current state of interoperability in a specific industry segment or the use of interoperability solutions to improve the current state. However, is common to find publications simultaneously suggesting frameworks or IT architectures and, then, present a practical case study to support them.

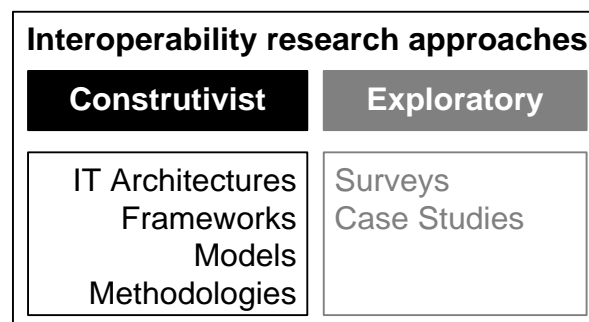


Figure 2.4. Interoperability research approaches (adapted from (Legner & Lebreton, 2007)).

Another trend noted in interoperability research is its closeness to standardization. The ultimate goal of standards is to ensure integration and interoperability of different systems. This complies with the overall purpose of interoperability. Addressing this perspective, there are few areas of industry that presented standards to its operations. Namely, public sector health care, manufacturing and

telecommunications are those which have published more articles related to interoperability and standards. Examples of those are presented in Table 2.3:

Table 2.3. Main publications in Public sector, health care, manufacturing and telecommunications.

Industry domain	Publications
Public sector	(Kaliontzoglou, Sklavos, Karantjias, & Polemi, 2005), (Roy, 2006), (Guijarro, 2007), (Otjacques, Hitzelberger, & Feltz, 2007)
Health care	(Egyhazy & Mukherji, 2004), (Eckman, Bennett, Kaufman, & Tenner, 2007)
Manufacturing	(H. K. Lin, Harding, & Shahbaz, 2004), (Brunnermeier & Martin, 2002)
Telecommunications	(Moseley, Randall, & Wiles, 2004), (Bose, 2006)

In spite of being a subject of great debate, the adoption rate of standards is low. To fill this gap, many publications focused on the lack of interoperability exposing wide-ranging perspectives revealing approaches that fit the following main trends:

- **Semantic and Ontological information mediation:**

Information mediation is used to detect and resolve semantic heterogeneity at the information level ((Kling et al., 1996) cited by (ATHENA, 2007)). It is based on the idea of specifying semantic aspects independently from their physical representation. Ontology-based information mediation builds on an ontology specifying the conceptualization of a domain and thus creating a shared vocabulary in a community of interest. During a semantic mapping process, an actor must define a mapping derived from its native conceptual model to the ontology and vice versa. Once the semantic mapping has been performed, the actor's data instances can be automatically translated into the representations of all the partners that have performed the same process.

- **Web services:**

According to (Legner & Lebreton, 2007), web services are self-contained, self-describing and modular, and they can be published, located and invoked across the web. They perform functions that can be anything from simple requests to complicated business processes. Since web services are based on open internet standards and enable flexible integration across heterogeneous technologies and platforms, their use is suggested in order to achieve cross-organisational coupling of business processes.

- **Model-driven architecture (MDA) approaches:**

Model-Driven Architecture is a software design approach, launched by the Object Management Group (OMG), which provides a set of guidelines for the structuring of specifications. It makes available an open approach to write specifications and develop applications, separating the application and business functionality from the platform technology.

Citing (Jardim-Gonçalves, Grilo, & Steiger-garção, 2006), MDA is constituted by three main layers: computation-independent model (CIM), platform-independent model (PIM) and platform-specific model (PSM). Figure 2.5 illustrates the structure of MDA. (CIM) is a stakeholders-oriented representation of a system from the computation-independent viewpoint. CIM focuses on the business and manufacturing environment in which a system will be used, abstracting from the technical details of the structure of the implementation system. PIM, and defines the conceptual model based on visual diagrams, use-case diagrams and metadata. The PSM is the bottom layer of the MDA. It differs from the PIM as it targets a specific implementation platform.

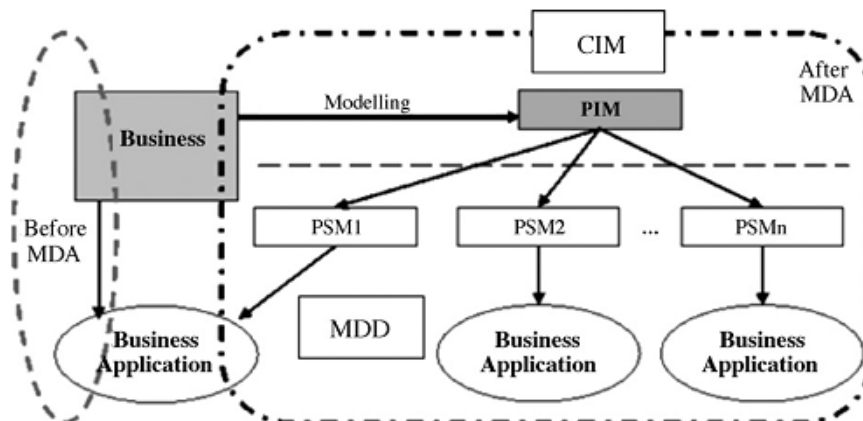


Figure 2.5. The model-driven architecture (Jardim-Gonçalves et al., 2006).

- **Service-oriented architecture (SOA) approaches:**

The service-oriented architecture establishes a software architectural concept that defines the use of services to support the requirements of software users, making them available as independent services accessible in a standardized way “a set of components which can be invoked, and whose interface descriptions can be published and discovered” ((W3C, 2007) cited by (Jardim-Gonçalves et al., 2006)).

The service-oriented architecture offers mechanisms of flexibility and interoperability that allow different technologies to be dynamically integrated, independently of the system’s platform in use (see Figure 2.6). This architecture promotes reusability, and it has reduced the time to put available and get access to new system’s functionalities, allowing enterprises to dynamically publish, discover and aggregate a range of Web services through the Internet.

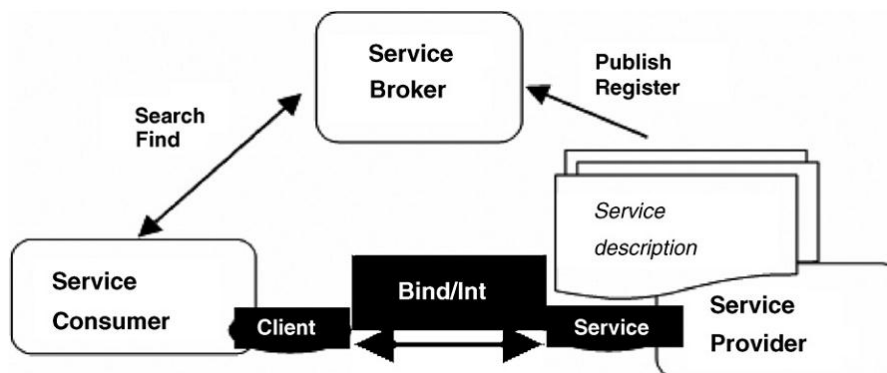


Figure 2.6. The service oriented architecture (Jardim-Gonçalves et al., 2006).

Beyond the closeness to the topic of standardization, another matter of great debate in literature is the number of initiatives that try to systemize and classify the different interoperability aspects into comprehensive interoperability frameworks. Frameworks like the e-Government Interoperability Framework (e-GIF), the Levels of Information Systems Interoperability framework (LISI) or the European Interoperability Framework (EIF) distinguish different layers of interoperability and describe artefacts or guidelines or standards for each of these layers. However, there is no general consensus in what is considered to be the optimal level of interoperability. The various frameworks referring to levels of interoperability establish the requirements and precedencies to assess and evaluate interoperability, but without providing information of the desired degree of interoperation.

2.5. Perspectives of Interoperability

Having completed the literature review, it's possible to conclude that the study of interoperability is divided into three principal phases: syntactic, semantic and pragmatic (view Figure 2.7).

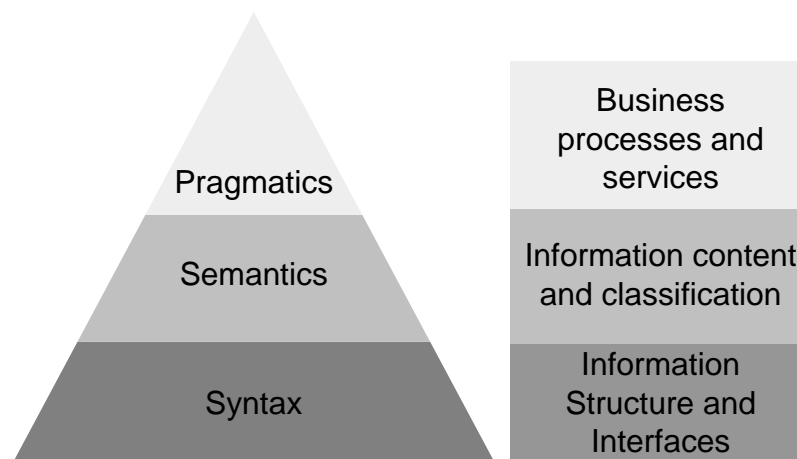


Figure 2.7. Perspectives of interoperability.

In the communications theory, the semiotics view defines it as a transmitting message from a sender to a receiver using a channel. This communication involves three levels (view Figure 2.8):

1. **Syntax** - studies the structure of the message.
2. **Semantics** - refers to the relation between signs and the objects to which they apply and enable the receiver of a message to understand it.
3. **Pragmatics** - adds an additional aspect to simple understanding.

These three constitute the relation of signs and interpreters, so that the message has a meaning for the receiver and therefore allows him to react with regards to the content of the message.

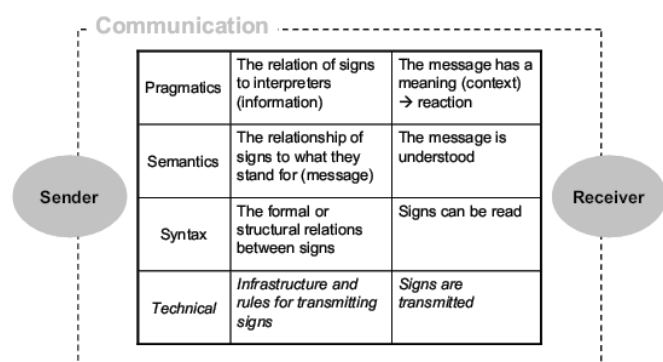


Figure 2.8. Semiotic aspects of communication (ATHENA, 2006).

Similarly, in business interoperability aspects of semantics and pragmatics are related to a message, whereas technical interoperability is more related to syntactical and infrastructure aspects. These three are the three main research and application trends of interoperability.

2.5.1. Syntactic Interoperability

Syntax is derived from an Ancient Greek word that means “arrangement”, “together” and “ordering”. By definition, is the “arrangement of words by which their connection and relation in a sentence are shown” or “the department of grammar which deals with the established usages of grammatical construction and the rules deducted therefrom”. (Veltman, 2001) refers to it as a “grammar to convey semantic and structure”.

In interoperability, the syntactic phase is noted when referring to the rules governing the behavior of systems, such as architectures or programming languages. In other words, this phase is characterized by describing various sets of rules and principles that describe the language and structure for the information. If two or more systems are capable of communicating and exchanging data, they exhibit syntactic interoperability. For instance, XML is seen as a markup idiom for structured data on the web. Hence, with syntax in the traditional sense, (Veltman, 2001) enunciated the challenges of syntactic interoperability:

- a) Identifying all the elements in various systems;
- b) Establishing rules for structuring these elements;
- c) Mapping, bridging, creating crosswalks between equivalent elements using schemes etc.;
- d) Agreeing on equivalent rules to bridge different cataloguing and registry systems.

Using these guidelines, syntactic interoperability is ensured when two or more systems follow the same technical specifications for processing data, being able to communicate and exchange information with each other.

However, syntactic interoperability may be a wide ranging discipline, making difficult to anticipate which resources are adequate for the systems. For example, when processing different barcode systems like EAN and UPC, in certain cases, there is no specified rule to directly incorporate one barcode system in the syntax of another system.

To ensure syntactic interoperability, collaborating systems should have a compatible way of structuring data during exchange (Asuncion & van Sinderen, 2010).

2.5.2. Semantic Interoperability

Semantics is most known to be the study of the meaning. It focuses on the relation between signifiers (in linguistics, words, phrases and symbols), and what they stand for, their denotation. Hereafter, semantic interoperability is “the ability of information systems to exchange information on the basis of shared, pre-established and negotiated meanings of terms and expressions,” (Veltman, 2001) and is needed in order to achieve other types of interoperability.

Beyond the technological perspective, in exact sciences, for instance, in chemistry, terms and words need to be negotiated with a domain specific semantics at international levels (as in case of ISO). Namely, the international definition for chemical compounds such as zinc, hydrogen, and other elements, must be the same for all the countries, in order to achieve a global understanding of the

subject, and to permit to exchange knowledge or information having the same definition between countries.

The role of semantic interoperability is to develop a deep understanding of the structure beyond the information. If the syntax, on the one hand, governs the structure of data (XML and SQL), on the other hand, the semantics should regulate the meaning of the terms in the expression, and make it compatible between systems. To achieve semantic interoperability, both sides must refer to a common information exchange reference model. The content of the information exchange requests are explicitly defined: what is sent is the same as what is understood. If there is any context sensitivity to the way terms are used, then the context must also be specified as part of the information using those terms. To ensure semantic interoperability, the meaning of the syntactic elements should be understood by collaborating systems (Asuncion & van Sinderen, 2010).

2.5.3. Pragmatic Interoperability

Pragmatism is a philosophical stream centered on the linking of practice and theory (Haack & Lane, 2006). It describes the process where theory is extracted from practice, and applied back to practice to form what is called intelligent practice.

Semiotics, like mentioned on section 2.5, is comprised of three basic components: syntactic, semantics, and pragmatics. In those, pragmatics refers to the effect of the sign on the interpreter which can be realized depending on the context where the sign is used. According to (Assche, 2006), pragmatic interoperability is achieved to the extent that users of interoperable services have compatible the intentions, responsibilities and consequences concerning the interoperable services and information exchange.

For (Asuncion & van Sinderen, 2010), to ensure pragmatic interoperability, message sent by a system causes the effect intended by that system. Therefore, pragmatic interoperability can only be achieved if systems are also syntactically and semantically interoperable.

As an example of the three perspectives of interoperability, (Asuncion, 2011) presents a case where a hospital sends a request for a lab test to a laboratory (view Figure 2.9).

After processing the request, the laboratory is expected to send back a lab report thereafter. To be syntactically interoperable, both use a compatible way of structuring their message (e.g., using XML to structure the message). To be semantically interoperable, both use standards (e.g., Health Level 7 or HL7) or ontologies to annotate the syntactic structure with meaning. To be pragmatically interoperable, the laboratory should have an understanding of the context in which the request for a lab test was made so that it can realize the intention of the hospital correctly.

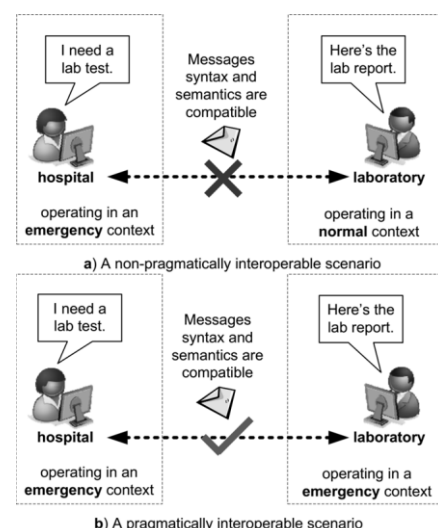


Figure 2.9. Illustration of pragmatically and non-pragmatically interoperable scenarios (Asuncion, 2011).

In Figure 2.9a, the hospital intends to receive the lab report as quickly as possible as it is in an emergency context. The laboratory, on the other hand, assumes that the request is made in the usual manner and thus performs the request like any other routine requests for a lab test. However, it may be the case that, the laboratory may use information and/or perform actions that vary between emergency and normal context (e.g., prioritizing lab tests that are immediately needed, implying also that payment information be asked later for emergency context). This could mean that the report will not be returned in due time as the hospital intends. Thus, the laboratory is not able to realize the intention of the hospital as the laboratory has a different understanding of the context that the hospital is operating in. In Figure 2.9b, the laboratory is able to realize the intention of the hospital as now both have the same understanding of the prevailing relevant context. In essence, pragmatics allows the meaning of the hospital's request to be specialized in the context where the request was made.

2.6. Networked organisations

The concept of networked organisations is implied in business interoperability, since we're dealing with the complexity of multi-layered collaboration between companies. In this matter, the dynamics of networked organisations is addressed and we need to have present two important notions on this segment: Business Networking and Networkability.

2.6.1. Business Networking

According to (Österle et al., 2001), the structure of Business Networking is based on the levels: business strategy, business process and information system (view Figure 2.10).

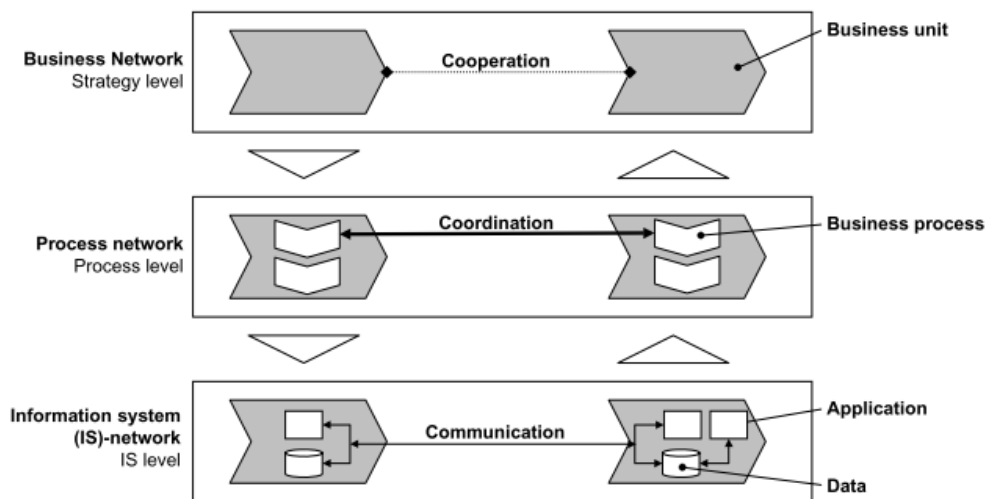


Figure 2.10. The Three Levels of Business Engineering Applied to Business Networking (Österle et al., 2001).

- **Strategic level** - includes business units and cooperation relationships between business units. A business unit has a business strategy, a series of business processes to implement that strategy, resources (such as personnel, information, capital) and relationships with internal and external business units. Cooperation between business units is based on formal and informal cooperation relationships. Outline agreements, mutual participating interests and supply chain interdependencies are examples of formal or 'hard' cooperation relationships.

Equally important for cooperations to function correctly are informal or 'soft' cooperation relationships. At the operative level they generate a coordinating effect.

- **Process level** - covers the process networks. A process network is an association of processes between business units, which implements a cooperation strategy at the operative level and provides outputs for customer processes. Coordination relationships between the processes ensure that the provision of outputs is coordinated. The granularity of a business unit would appear to be too coarse-grained for deriving concrete procedural instructions for the design and implementation of networks. Business units are usually active in several networks: They simultaneously participate in development and purchasing communities, enter strategic marketing partnerships and are involved in different value chains with different products and services. This differentiated view of networking required for the purpose of implementation can be more clearly visualized using the reference object business process than with the reference object business unit.
- **Information systems** – this level covers information system networks. These support process networks. Their nodes correspond to integrated information systems which can consist of people and machines. Their edges describe links for the purpose of system integration such as voice communication by telephone or the exchange of EDI messages.

2.6.2. Networkability

The concept of networkability builds on the Business Engineering Model (which has an enterprise-centric view) as well as the organisational ability to cooperate (Österle et al., 2001). To achieve business interoperability it is necessary to assume that we have a networked organisation, independently of the degree of inter-operation. It denotes the ability of two organisations to establish connections at different levels, however, does not assure that those connections would by themselves lead to efficient business processes.

Corresponding to the dimensions of business engineering, networkability has different aspects or design objects which create dependencies among the business partners (view Figure 2.11).

Design Object	Networkability of Design Object	Coordination Mechanism	Objectives of Networkability
Business Model	Flexible business models which enable participation in several different networks	Virtualisation	Internal networks
		Modularisation	Stable networks
		Distributed responsibilities	Dynamic networks
Products and Service	Rapid and inexpensive individualisation of products or services	Modularisation	Mass customisation
		Standardisation	Postponement
		Digitalisation	
Culture and Employees	Cooperation-promoting company culture and employees with the capacity for internal and external cooperation	Relative openness	Autonomy
		Identification and control of goalconflicts	Communicative competence
		Trust-creating measures	Information acquisition
Process	Rapid and flexible establishment and use of appropriately coordinated processes		Establishing and maintaining personal networks
		Process standardisation	Pragmatic integration
		Process integration	Real-time coordination
Information System	Rapid and inexpensive establishment of an individual communications link between information systems		Appropriate flexibility
		Communication standards and data standards	Semantic integration
		system integration	Making information externally available
			High data quality
			Real-time data processing

Figure 2.11. Approaches for Designing Networkability (adapted from (Österle et al., 2001) by (ATHENA, 2007)).

2.7. Interoperability frameworks

Many interoperability frameworks have emerged during the last two decades aligning technical aspects in specific contexts such as governmental and military environments of collaboration. Projects like IDEAS (IDEAS, 2003), EIF (IDABC, 2010), ECOLEAD (Consortium & others, 2006), ATHENA (ATHENA, 2007), e-GIF (UK Government Cabinet Office, 2005), LISI (DoD, 1998) and IC4F (Peristeras & Tarabanis, 2006) are examples of those who brought clues of how it is possible to approach interoperability in a multidisciplinary context and influenced this work. However, the following sections refer to the frameworks which strongly influenced the present work remarking: its scope, main elements and contributions.

2.7.1. IDEAS Interoperability Framework

The IDEAS Interoperability Framework ((IDEAS, 2003) cited in (ATHENA, 2006; Daclin, 2005)) is a project developed by IDEAS EU Project which identified the need for a structured approach for collecting, identifying, and representing interoperability challenges (ATHENA, 2006). It defined a framework for capturing and inter-relating this information from many perspectives called the "IDEAS interoperability framework". The interoperability is considered achieved if the interaction can, at least, take place at the three levels: data, application and business process with the semantics defined in a business context (ATHENA, 2006). The business level is decomposed in three sub levels: business

model, decisional model and business process (Daclin, 2005). The IDEAS Interoperability Framework defines four layers which are depicted in Figure 2.12.

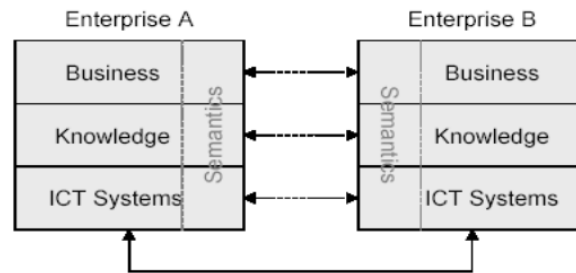


Figure 2.12. IDEAS interoperability framework (ATHENA, 2006; Daclin, 2005)).

To achieve meaningful interoperation between enterprises, interoperability must be achieved on all layers of an enterprise. This includes the business environment and business processes on the business layer, the organisational roles, skills and competencies of employees and knowledge assets on the knowledge layer, and applications, data and communication components on the ICT layer.

Like mentioned before, interoperability is achieved if interactions occur at three levels: data, application and business process with the semantics defined in a business context (ATHENA, 2006).

These three main dimensions of interoperability are involved in the following areas:

- Architecture & platform: application (solution management, workplace interaction, application logic, process logic), data (product data, process data, knowledge data, commerce data) and communication
- Semantic (business ontology, knowledge ontology, applications ontology, data ontology)
- Enterprise: business (decisional model, business model, business process) and knowledge (organisation roles, skills competencies, knowledge assets)

2.7.2. EIF – European Interoperability Framework

The European Interoperability Framework (EIF) was developed by IDABC (Interoperable Delivery of European e-Government Services to public Administrations, Businesses and Citizens) programme to the European Community. It defines a set of recommendations and guidelines for e-Government services and the development of national interoperability frameworks so that public administrations, enterprises and citizens can interact across borders in a pan-European context (ATHENA, 2006).

Driven by political motivations, the first version of the framework (see Figure 2.13) sets the current dependencies of the interaction of European citizens with European Union (EU) Institutions. Intends to address information content and recommend technical policies and specifications to help connect public administration information systems across the EU.

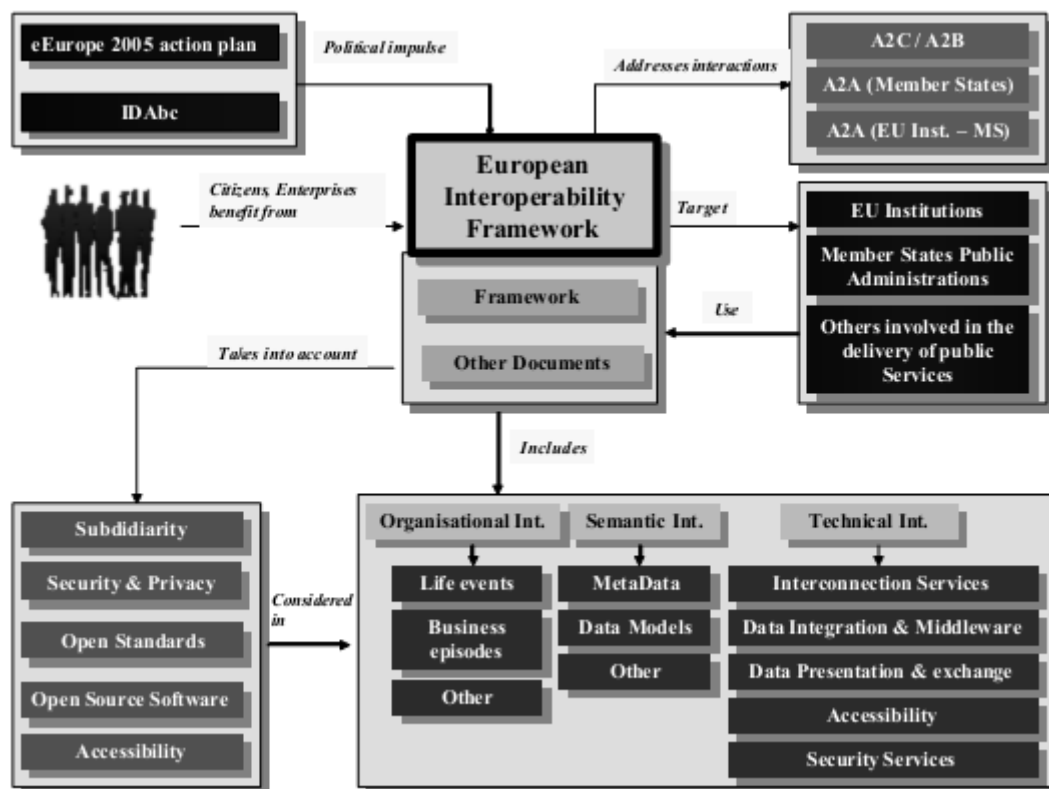


Figure 2.13. European Interoperability Framework version 1.0 (IDABC, 2004).

The EIF distinguishes three aspects of interoperability: technical, semantic and organisational interoperability:

- **Technical interoperability**

This aspect of interoperability covers the technical issues of linking up computer systems and services. Includes key aspects such as open interfaces, interconnection services, data integration and middleware, data presentation and exchange, accessibility and security services (IDABC, 2010). It covers also technical issues of linking computer systems and services (e.g. open interfaces, data integration, middleware, accessibility, and security services). EIF provides IDABC guidelines and standards; front office, back office and security recommendations; four sophistication levels of interaction types (ATHENA, 2006).

- **Semantic interoperability**

This aspect of interoperability is concerned with ensuring that the precise meaning of exchanged information is understandable by any other application not initially developed for this purpose. Semantic interoperability enables systems to combine received information with other information resources and to process it in a meaningful manner (IDABC, 2010). It refers to the possibility for the exchanged information to be precisely understandable and processable by any application. EIF recommends the use of open standards and the development of XML vocabularies (ATHENA, 2006).

- **Organisational interoperability**

This aspect of interoperability is concerned with defining business goals, modelling business processes and bringing about the collaboration of administrations that wish to exchange information, but that may have a different internal organisation and structure for their operations. Moreover,

organisational interoperability aims at addressing the requirements of the user community by making services available, findable, accessible and user-oriented (IDABC, 2010).

Furthermore, version 2.0 of EIF exposes the key recommendations to endorse standardisation in technology and harmonisation in legislation, focusing on the following levels of interoperability (see Figure 2.14):

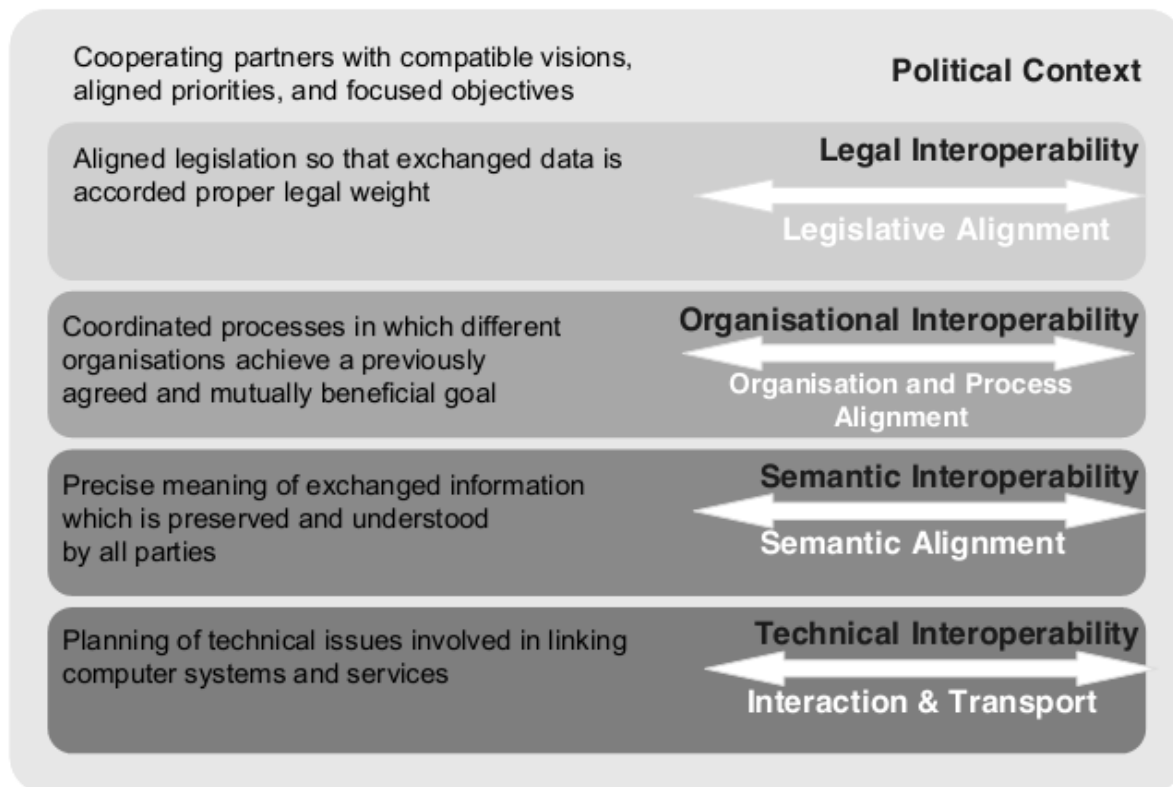


Figure 2.14. EIF Interoperability Levels (IDABC, 2010).

2.7.3. LSI – Levels of Information Systems Interoperability

U.S. Department of Defense (DoD) developed Levels of Information Systems Interoperability (LSI) framework (DoD, 1998) providing the basis for defining, evaluating, assessing, measuring and improving information systems interoperability across DoD in an even and incremental method.

2.7.3.1. LSI “Maturity Model”

The LSI Interoperability Maturity Model identifies the stages through which systems should logically progress, or “mature,” in order to improve their capabilities to interoperate. LSI considers five increasing levels of sophistication regarding system interaction and the ability of the system to exchange and share information and services. Each higher level represents a demonstrable increase in capabilities over the previous level of system-to-system interaction (DoD, 1998). This increase is expressed in terms of PAID — the procedures (i.e., policies and processes) imposed by information management, the capabilities of applications that act on that data, the type of infrastructure required, and the nature of data transferred. A general description of the nature of each level follows (see Figure 2.15).

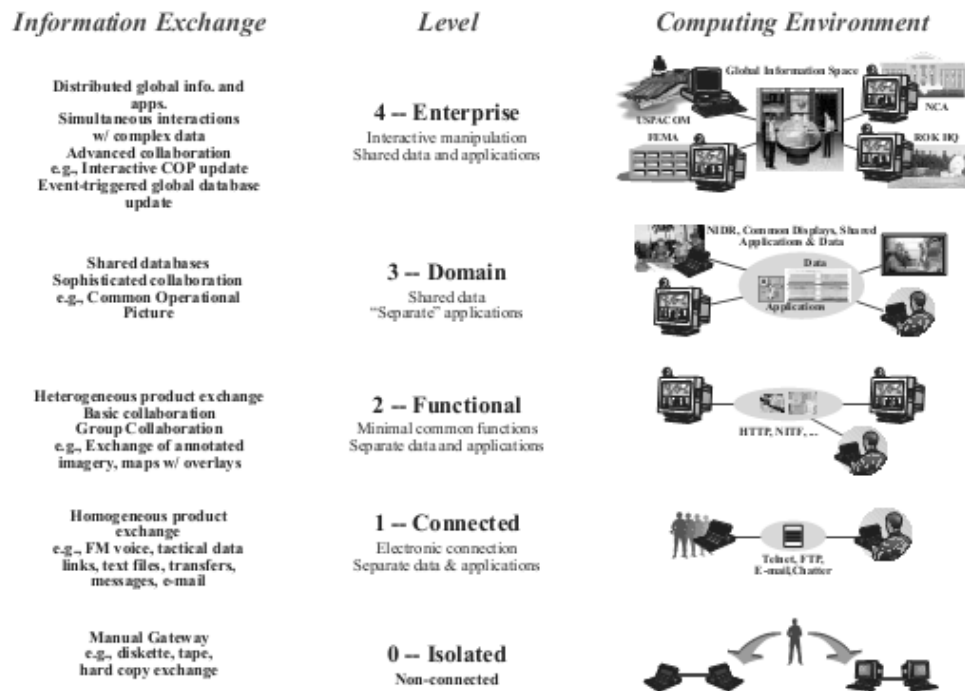


Figure 2.15. LISI Interoperability Maturity Model (DoD, 1998).

Levels of Interoperability (DoD, 1998):

Level 0. Isolated Interoperability

Level 0 encompasses the wide range of isolated or stand-alone systems. No direct electronic connection is allowed or is available, so the only interface between these systems is by manual re-keying or via extractable, common media. Fusion of information, if any, is done off-line by the individual decision-maker by other automated means.

Level 1. Connected Interoperability

Level 1 systems are capable of being linked electronically and providing some form of simple electronic exchanges. These systems have a limited capacity, generally passing homogeneous data types, such as voice, simple "text" e-mail, or fixed graphic files such as GIF or TIFF images between workstations. They allow decision-makers to exchange one-dimensional information but have little capability to fuse information together to support decision-making.

Level 2. Functional Interoperability

Level 2 systems reside on local networks that allow data sets to be passed from system to system. They provide for increasingly complex media exchanges. Formal data models (logical and physical) are present. Generally, however, only the logical data model is accepted across programs and each program defines its own physical data model. Data is generally heterogeneous and may contain information from many simple formats fused together, such as an image with an annotated overlay. Decision-makers are able to share fused information between systems or functions.

Level 3. Domain-Based Interoperability

Level 3 systems are capable of being connected via wide area networks (WANs) that allow multiple users to access data. Information at this level is shared between independent applications. A domain-based data model is present (logical and physical) that is understood, accepted, and

implemented across a functional area or group of organisations that comprises a domain. Using agreed-upon domain data models, systems must now be capable of implementing business rules and processes to facilitate direct database-to-data-base interactions, such as those required to support database replication servers. Individual applications at this level may share central or distributed data repositories. Systems at this level support group collaboration on fused information products. Decision-making is supported by fused information from a localized domain.

Level 4. Enterprise-Based Interoperability

Level 4 systems are capable of operating using a distributed global information space across multiple domains. Multiple users can access and interact with complex data simultaneously. Data and applications are fully shared and can be distributed throughout this space to support information fusion. Advanced forms of collaboration (the virtual office concept) are possible. Data has a common interpretation regardless of form, and applies across the entire enterprise. The need for redundant, functionally equivalent applications is diminished since applications can be shared as readily as data at this level. Decision-making takes place in the context of, and is facilitated by, enterprise-wide information found in this global information space.

2.7.3.2. LISI “Capabilities Model”

The LISI Capabilities Model provides the basis for assessing and comparing systems. Identifies for each level a common suite of capabilities across procedures (P), applications (A), infrastructure (I), and data (D) constituting the "attributes of interoperability" shortly abbreviated as PAID.

This model generates an “Interoperability Profile” for each assessed system or application. There are three metrics that are used to express the interoperability level of information systems: generic, expected, and specific. The generic level of interoperability is the highest level at which the full suite of capabilities is implemented in a given system across PAID. The expected level of interoperability is determined by comparing the generic levels of any two systems. The specific level of interoperability is determined by comparing each system’s specific implementation choices. The specific level may be lower, equal to, or higher than the expected level.

2.7.3.3. LISI “Implementations Options Tables”

These tables identifies for each capability specific technical implementations or products.

- Procedures Comparison Table - this table displays the conditions and state of conformance between any two systems;
- Applications Comparison Table - displays the set of implementation options that correspond to the functions and capabilities that comprise the applications attribute of PAID
- Infrastructure Comparison Table - displays the set of systems implementation choices that characterize the communications and services that comprise the infrastructure component of interoperability.
- Data Comparison Table - Information about data exchanges that is collected by LISI can be used to directly generate a Data Comparison Table.

2.7.3.4. LISI “Interoperability Assessment Process”

LSI “Interoperability Assessment Process” provides mechanisms and common metrics to assess current interoperability postures and to develop strategies for achieving higher states of interoperability maturity.

The LSI process includes the ability to access the interoperability profiles of other systems and to coordinate with other system developers to reach agreement on specific capability implementations that are compatible with each other. The LSI process includes a partnership with, and continuous feedback to, the various DoD standards bodies with respect to systems conformance issues and opportunities for revisions based on the emergence of new technology and the choices being exercised by system developers.

2.7.3.5. LSI “Reference Model”

The LSI Reference Model (see Figure 2.16) is the foundation for the LSI process. The rows of the LSI Reference Model are the five LSI interoperability levels, and the columns are the four PAID attributes. The level/attribute intersections provide the broad classifications for addressing what specific capabilities are needed. At a particular level, the referenced capabilities must be present for each attribute in order to achieve the degree of interoperability maturity defined by that level.

<i>Description</i>	<i>Computing Environment</i>	<i>Level</i>	P	A	I	D
Enterprise	Universal	4	Enterprise Level	Interactive	Multi-Dimensional Topologies	Enterprise Model
Domain	Integrated	3	Domain Level	Groupware	World-wide Network	Domain Model
Functional	Distributed	2	Program Level	Desktop Automation	Local Networks	Program Model
Connected	Peer-to-Peer	1	Local/Site Level	Standard System Drivers	Simple Connection	Local
Isolated	Manual	0	Access Control	N/A	Independant	Private

Figure 2.16. LSI Reference Model (DoD, 1998).

The five maturity levels – isolated, connected, functional, domain and enterprise – identify capabilities of a system on its way to improve its ability to interact with other systems. The levels are measured by using the Interoperability Maturity Model. In addition, the model can be used “as a guide to develop and improve a system’s general capability to interoperate with other systems without predefined or formal sets of requirements necessarily established between them” (DoD, 1998).

2.7.4. ATHENA Interoperability Framework (AIF) and Business Interoperability Framework (BIF)

The Advanced Technologies for Interoperability of Heterogeneous Enterprise Networks and their Applications (ATHENA) project was sponsored by European Commission to research on

interoperability. Inside this project, ATHENA proposed two frameworks: ATHENA Interoperability Framework and Business Interoperability Framework (BIF). Not only focusing on IT issues such as information, application, and platform interoperability, these two have in consideration business processes, seeking to establish an integrated set of research solutions, supplemented with through business and economic research.

While the IDEAS framework focused on structuring the interoperability issues (into business, knowledge, semantic, architecture and platform issues), the Athena Interoperability Framework (AIF) focused on the model-driven approaches. The solutions focused on modelling the interactions and information exchanges that occur in collaborations, both on a business level and a technical level.

The AIF provides a reference model in which the modelling solutions coming from different research areas can be related (view Figure 2.17). For each of these levels ATHENA prescribes a model-driven interoperability approach where models are used to formalise and exchange the provided and required artefacts that must be negotiated and agreed upon. ATHENA defines a set of metamodels and languages that can be supported by tools and methods to construct the models in question (ATHENA, 2007).

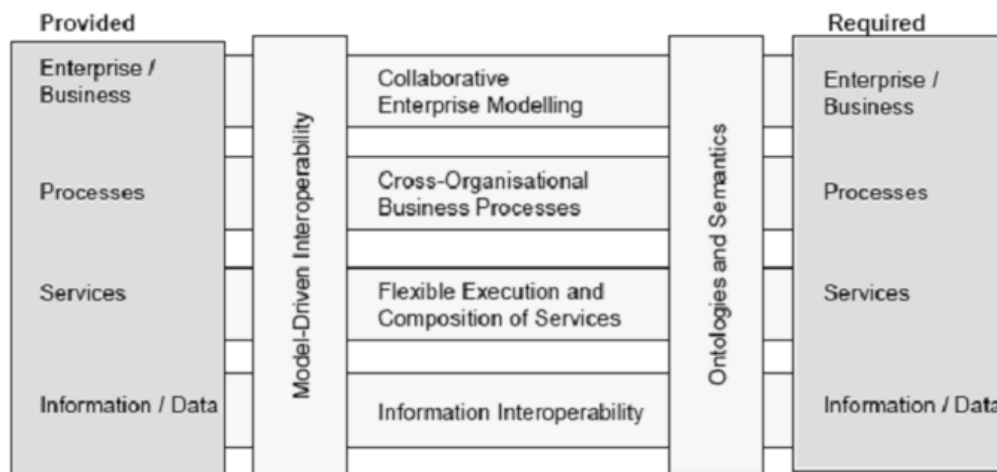


Figure 2.17. AIF conceptual Framework (Berre et al., 2007).

Thus, while this conceptual model aids in the modelling approach (or model-driven) to interoperability, further contributions from ATHENA's project provided information to the assessment of business interoperability. Business interoperability characterizes the business relationships of an enterprise and its external partners, such as customers, suppliers and service providers (ATHENA, 2007). The Business Interoperability Framework (BIF) describes the main constituents of business interoperability and to outline how an enterprise may assess and improve its business interoperability. To this purpose, the BIF proposes 4 categories focused on 4 perspectives (see Table 2.4):

Table 2.4. BIF Categories correspondence to perspectives.

Categories	Perspective
Management of External Relationships	Governance
Employees and Culture;	Behavioral
Collaborative Business Processes	Operational
Information Systems	Technical

Making use of the contingency theory, the proposed framework aims to enhance interoperability postulating internal and external factors that affect Business. The result of this project is a framework presented in Figure 2.18.

Business Interoperability (= organisational design of business relationships)		
<i>Category</i>	<i>Perspective</i>	<i>Description</i>
Management of External Relationships	"How do we manage and control business relationships?" (Governance Perspective)	Interoperable organisations manage and monitor their business relationships.
Employees & Culture	"How do we behave towards our business partners?" (Behavioural Perspective)	Interoperable organisations promote relationships with business partners at an individual, team-based and organisational level.
Collaborative Business Processes	"How do we collaborate with business partners?" (Operational Perspective)	Interoperable organisations can quickly and inexpensively establish and conduct electronic collaboration with business partners.
Information Systems	"How do we connect with business partners?" (Technical Perspective)	Interoperable ICT systems can be linked up to other ICT systems quickly and inexpensively and support the cooperation strategy of the organisation.
Contingencies (= factors which impact the organisational design)		
<i>Category</i>	<i>Perspective</i>	<i>Description</i>
Internal Contingencies	"What are the characteristics of the business relationship?"	Cooperation targets and transactional characteristics impact the optimum level of business interoperability.
External Contingencies	"Which environmental factors affect the business relationships?"	E-Business maturity, legislation and industry dynamics determine preconditions in the specific context.

Figure 2.18. Business Interoperability Framework (Categories and Contingencies) (ATHENA, 2007).

2.7.4.1. Levels of Business Interoperability

The authors from (ATHENA, 2007) arguing that the idea of interoperability of interoperability does not fit binary choices like "yes" or "no", but is multi-faceted, proposed a level based interoperability assessment that aims at maximum level of interoperability but not considering the upmost interoperability level that can be achieved (optimum level). It reflects the optimum vs. maximum condition of an enterprise named business interoperability levels (view Figure 2.19).

No.	Business Interoperability	Description
(1)	None	No awareness of external relationships; interaction with external partners is not planned or performed ad-hoc
(2)	Minimum	No provisions for interoperability; individual design of each external relationship
(3)	Moderate	Relevance of business interoperability is "understood"; Measures for improving interoperability have been taken, but substantial room for improvement remains
(4)	Qualified	External relationships are designed for improved business interoperability; only few factors missing on the way to full interoperability
(5)	Fully interoperable	Maximum level of business interoperability; external relationships can be established at no or few cost involved

Figure 2.19. Levels of Business Interoperability in BIF (ATHENA, 2007).

2.7.4.2. Business Interoperability Categories

2.7.4.2.1. Category “Management of External Relationships” (Governance Perspective)

This category relates to all the activities handled in the collaboration with business partners. It starts with planning and defining the cooperation by selecting partners and preparing cooperation contracts, accompanying the full life-cycle of collaboration, covering all aspects of realizing the relationship, such as managing conflicts and establishing communication channels with the external partners. So, (ATHENA, 2007) raises the question “How do we manage and control business relationships?”. To answer this question, the authors propose the following sub-categories:

- Cooperation model - The cooperation model represents the strategic dimension of managing external relationships. In order to realise a sustainable and viable collaboration with other organisations, an enterprise has to define its cooperation models and embed them as integral part into the company strategy.
- Cooperation targets - Cooperation targets reflect the economic dimension of the inter-firm relationships which covers benefits as well as measures for success. Ideally, business partners reconcile and monitor the plans and objectives that they pursue.
- Cooperation management - relates to the organisational aspects of managing external relationships. On the firm-level, an enterprise needs to manage the initiation, realisation, control and monitoring of a cooperation and take provisions for the management of risk and conflict. This includes roles as well as processes.

2.7.4.2.2. Category “Employees and Culture” (Behavioral Perspective)

This category relates to the behavioural aspects of inter-firm relationships. Interoperable enterprises promote inter-firm relationships at an individual, team-based and organisational level (ATHENA, 2007). According to ((Riemer & Klein, 2006) cited on (ATHENA, 2007)) at an organisational level, the participating firms are the institutional actors forming the collaborative relationship, but the employees carry out the actual work at an individual or team level. The actual reality is that inter-firms relationships are played by top managers and not by who develops the real purpose of each company. (ATHENA, 2007) acted on this motivation, highlighting the importance of informal relationships and trust between employees are key to make more intensive forms of collaboration work.

To assess this category (ATHENA, 2007) proposes the following sub-category:

- Trust - characterises behavioural aspects at the individual level. Ideally, the employees who are involved in the inter-firm relationship cooperate in a climate of trust and confidence.
- Visibility - Whereas trust arises from the informal relationships between employees, visibility represents the formal relationships and relates to the openness and information sharing at the firm level. Giving a certain visibility of the internal operations to external partners can be considered a prerequisite for aligning and optimizing the cross-organisational business processes.

2.7.4.2.3. Category “Collaborative Business Processes” (Operational Perspective)

Business dyadic relationships are, mostly, performed in a purpose-focused manner rather than integrating the full purpose of the network that it is inserted. This results in resource conflicts as well as coordination effort (ATHENA, 2007). To achieve successful joint-operations, it is needed to align collaboration business processes by means of agreements that set the arrangement of cross-organisational business processes that are relied on a common business vocabulary and terminology among the partners. With this focus, (ATHENA, 2007) proposes the following sub-categories:

- Public process - Public processes define the pragmatics of the business relationships. They describe how firms interact. They establish a joint understanding of the roles, the cross-organisational activity flow and the organisational interfaces. In the vision, this public process should not be subject to lengthy bilateral discussions, but be applicable in a broader context (m:n instead of bilateral agreements).
- Business semantics - Business semantics align the proprietary terminology of the different organisations and establish a common business vocabulary. They have to cover the transactional information flow (main business documents / messages) as well as the contextual information (in particular master data).

2.7.4.2.4. Category “Information Systems” (Technical Perspective)

Information systems bridges the business field and computer sciences, enabling the efficient and the effective flow and use of information between organisations with the goal to contribute to overall performance. However, until now, few public achievements have been obtained in technical interoperability. Namely, standardisation was part of a success, making its way by using common terminology (e.g. XML, core Web Service standards). However, this success only relates to syntactical interoperability, rather than semantic. To (ATHENA, 2007), service-oriented architectures could promote semantic integration by providing standardised interfaces which follow industry norms.

Other question raised by (ATHENA, 2007) in this category it is the matter of security and privacy on B2B relationships. Security & privacy issues have to be solved in order to conduct business transactions over an electronic channel. Security issues cover authentication and authorisation as well as the encryption of messages. Additional privacy and legal requirements have to be respected, since they deal with sensitive data and additionally need to comply with e-business legislation.

To assess the above reflections, (ATHENA, 2007) proposes the sub-categories:

- Type of interaction - The interaction type describes the coupling depth of the electronic interaction (human-human, human-machine or machine-machine).
- Connectivity - characterises scalability of the electronic connections. In particular, it reflects whether connections are formed as point-to-point (1:1) or multilateral (1:n or m:n) connections.
- Security & Privacy - relates to the ability to conduct transactions over Internet which meets business partner's privacy and security requirements as well as existing e-business legislation.

2.7.4.3. Contingencies

The proposed contingencies are the optimal levels achieved in business interoperability having in concern internal and external factors, named internal contingencies and external contingencies, respectively.

2.7.4.3.1. Internal Contingencies (“What are the characteristics of the business relationship?”)

The internal contingencies (see Figure 2.20) concern with the coordination area of business processes, focusing on cooperation targets and transactional characteristics that affect optimum level of business interoperability.

In this section, (ATHENA, 2007) considers the following criteria and sub-criteria:

Criteria	Sub-Criteria / Values
Coordination area and targets	Innovation: e.g. time to market, enhanced product / service offering ... Customer relationship management: e.g. customer retention / loyalty, access to new customers ... Supply chain management: e.g. efficient supply of products, reaction time, asset utilisation ... Infrastructure: e.g. costs of routine operations ...
Business Partners / Business Network	Partner type: e.g. customer, supplier, service provider, competitor Number and size of partners Industry Geographical coverage: national, regional, international
Cooperation dynamics	Stable – dynamic
Network governance	Hierarchic – heterarchic
Interdependence	Pooled interdependence – sequential interdependence – reciprocal interdependency
Specificity	Non-specific – mixed – idiosyncratic
Frequency	One-time – occasional – recurrent

Figure 2.20. Internal contingencies (ATHENA, 2007).

2.7.4.3.2. External Contingencies (“Which environmental factors affect the business relationships?”)

External environments affect the overall interoperability of each company. In this category (ATHENA, 2007) explores the external issues that affect the performance of each enterprise, drafting key issues to be addressed in this matter: legislation/regulation, degree of standardisation and e-maturity (view Figure 2.21). These external factors highly influence an enterprise’s internal decisions and strategies, and have an impact on its interoperability.

Criteria	Sub-Criteria / Values
Legislation and Regulation	Existence of national (including city, state, federal) and international legislation as well as industry-specific, national or international regulation and standards which impose interoperability on
Degree of Standardisation	Syntax – semantics (messages, identification, classification, ...) – Pragmatics (Process, business standards ...)
E-business maturity	Maturity of the industry, country and the size-band of the organisation with regards to e-business (low – moderate – high) Availability of platforms that provide m:n connectivity (e.g. SWIFT in the financial industry)

Figure 2.21. External contingencies (ATHENA, 2007).

2.7.5. Business Interoperability Quotient Measurement Model (BIQMM)

The Business Quotient Measurement Model (BIQMM), developed by (Zutshi, 2010), uses an interdisciplinary approach to capture the key elements responsible for collaboration performance. Through a quantification of the relevance of each element to the particular collaboration scenario in question, this model enables a quantitative analysis of Business Interoperability to get an overall score for interoperability to enhance performance measurements.

Strongly influenced by European initiatives, this measurement model compiles eight Business Interoperability parameters (BIP):

- Business Strategy
- Management of External Relationships
- Collaborative Business Processes
- Organisational Structures
- Employees and Work Culture
- IPR Management
- Business Semantics
- Information Systems

These parameters represent the different levels of business collaboration. In this model, they're used to measure and quantify the overall business interoperability between two organisations to get an Interoperability Index. Each parameter is constituted by a set of sub governing parameters, in turn, the main parameters. The interoperability assessment model is presented in Figure 2.22.

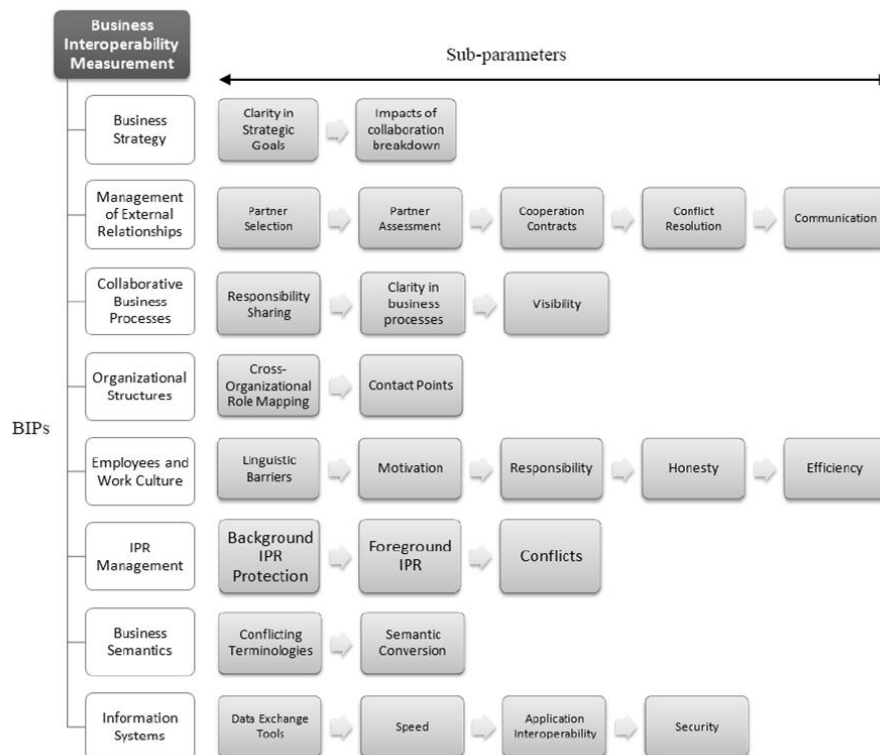


Figure 2.22. Interoperability Quotient Measurement Model (Zutshi, 2010).

This model describes the approach in the analysis of interoperability and focuses on the score of each parameter sub parameter to achieve optimal interoperability.

2.7.5.1. Interdisciplinarity of BIQMM

BIQMM combines multiple disciplinary fields into to each BIP, since the technical perspectives of business, such as networks and IT structures, to Business Strategy. In Table 2.5 are discriminated the disciplines involved in each of the parameters.

Table 2.5. Disciplines involved in BIQMM (Zutshi, 2010).

Business Parameters	Interoperability	Disciplines involved
Business Strategy		Strategic Management
Management of External Relationships		Management
Collaborative Business Processes		Business Process Management Information Management
Organisational Structures		Organisational Management Value Networks
Employees and Work Culture		Ethics Sociology Psychology Behavioural Science
IPR Management		Law Innovation Management
Business Semantics		Information Technology Language Semiotics
Information Systems		Information Technology IT Networking

The interdisciplinarity perspective of this model has an enormous advantage of allowing a comprehensive study of the various business perspectives. However, the same interdisciplinarity characteristic makes further difficult for analysis or application. Due to the immense disciplines, it is hardly difficult to analyse multiple field areas in one model without comprehending its relevance to interoperability. For instance, when assessing employees and work culture, we deal with four areas: ethics, sociology, psychology and behavioural science. In business context, it's rather difficult to have in hand enough knowledge to analyse our cooperation capabilities and internal and external interoperability. What motivates employees, the degree of honesty, culture and responsibility rule it's activity but we cannot hold the enough knowledge to jump in conclusion of which parameter was the more relevant to determine the interoperability capabilities of individuals in organisations.

2.7.5.2. Description of the Business Interoperability Parameters

- **Business Strategy:**

The business strategy reflects the highest level of interoperability between companies that collaborate. The clarity with which they are exposed and the strategic objectives of the cooperation are the basic parameters for decision making of companies that contribute, and it is on these that the analysis of business strategy focuses on this model. With these, the BIQMM to evaluate whether there is any conflict of interests in order to track which the mutual interests that must be identified and respected in collaboration.

To evaluate this parameter, the first BIQMM want to open an assessment of two sub parameters that governs through the issues presented in Table 2.6.

Table 2.6. Questions for assessing interoperability sub-parameters with respect to Business Strategy (Zutshi, 2010).

Clarity in Strategic Goals	Is there any conflict of interests in the collaboration? Has it been adequately resolved?
Impacts of collaboration breakdown	Has there been a formal commitment to the duration of collaboration? How detrimental would it be for the organisation in case of premature termination of the collaboration? Are sufficient safeguards to prevent this termination or backup plans in case it occurs?

- **Management of External Relationships:**

In this BIP it is translated the cooperation management from planning and definition of a collaboration agreement (partner selection and evaluation) to its effective management throughout the contract (conflict resolution and communication). This parameter reflects the management of the cooperation that is a recognized success factor in many companies. As mentioned earlier, today there is no doubt the existence of networks of collaboration to achieve real success of a company. The assessment of interoperability in this area reveals the various aspects of managing external relations.

For its evaluation, the author identifies the issues presented in Table 2.7.

Table 2.7. Questions for assessing interoperability sub-parameters with respect to Management of External Relationships (Zutshi, 2010).

Partner Selection	Is there any mechanism for identifying the best partners available? Are you certain that the collaboration partner is one of the best suited for your needs?
Partner Assessment	Do you have any mechanism for evaluation of the quality of selected partners and their appropriateness for your organisation? Do you have well developed guidelines for performance measurements and use it for gauging partner performances?
Cooperation Contracts	Do you have clear, well defined cooperation contracts with your partner which spells out conditions and liabilities and reduces chances of conflicts?
Conflict Resolution	Do you have frequent occurrences of conflicts? In case of conflicts, do you have mechanisms for quick resolution?
Communication	Do you have barriers to free inter-organisational communication?

- **Collaborative Business Processes:**

The collaborative business processes are addressed to all B2B relationships, most precisely to border situations. The correct definition of boundaries of responsibility, the transparency in business processes and visibility of the activities of the partner are the concerns of this BIP.

According to (Zutshi, 2010), in B2B relationships, partner responsibilities are often unclear and performed ad-hoc, which result in conflict of resources and coordination efforts. Responsibility sharing between partners must be well defined and well specified in cooperation contracts.

Another concern of this BIP is the visibility of information and business processes. Besides of needing a well-defined and aligned collaborative business process, most companies caress interoperability by not sharing the correct information or making its business processes visible to their partners.

To assess this BIP, (Zutshi, 2010) identifies the questions in Table 2.8.

Table 2.8. Questions for assessing interoperability sub-parameters with respect to Collaborative Business Processes (Zutshi, 2010).

Responsibility Sharing	Is there a clear division of responsibility between you and your partner?
Clarity in business processes	Are business processes for collaborative work well defined and responsibilities well allocated? Is there a smooth transition of information from one organisation to another?
Visibility	Is the status of processing within one organisation easily visible to the collaborating partner?

- **Organisational Structures:**

The organisational structure is an inherent characteristic of each company. In small companies it is common to find linear organisational structures, but in large corporations, these structures take complex proportions, finding most often hierarchical structures.

However, the concern of this issue is not the appropriate selection of the organisational structure for each type of company, but the interaction of companies and how its structure affects interoperability.

The B2B interaction is marked by the kind of collaboration that is set by the collaboration agreement. Inherent in the nature of this contract, it is always necessary to contact members of the business partner. The cross-organisational mapping is of great importance in this regard. The ease of finding the person responsible for a particular service or function becomes a critical parameter for this BIP.

The other critical factor for this activity is the number of contact points between companies. Sometimes the existence of too many contact points makes difficult and time-consuming to achieve any kind of collaboration. For instance, in supply chains, when it is made an order of a product, a supplier will need to be contacted by the logistics department of the OEM to receive the order and then send the invoice and the equipment. In this operation two different sectors will be affected: logistics and accounts. The lack of interoperability between these sectors inside the OEM will generate delays in payments to the supplier. In this case it is needed to coordinate efficiently the two sections of OEM, otherwise the supplier will need to contact the various sections in order to receive payment and dispatch the order.

For this BIP the author considers the following questions for evaluation presented in Table 2.9.

Table 2.9. Questions for assessing interoperability sub-parameters with respect to Organisational Structures (Zutshi, 2010).

Cross-Organisational Role Mapping	Is there clarity within the organisation for responsible person to contact from collaborating organisation for various different types of issues? Are there significant delays for obtaining information from collaborating organisation on account of uncertainty on whom to contact?
Contact Points	Are there sufficient contact points at different levels which would enable the different organisational structures to seamlessly collaborate?

- **Employees and work culture:**

Human work assumes importance in any business where we deal with cultural, sociological and psychological factors that positively and negatively affect the overall productivity of organisations. In

this BIP this concern is approached in order to assess the influence that these human factors have in collaborations.

For this BIP the author considers the following questions on Table 2.10.

Table 2.10 Questions for assessing interoperability sub-parameters with respect to Employees and work culture (Zutshi, 2010).

Linguistic Barriers	Does the collaborating partner's employees use a different language than yours? If yes, does it cause problems with normal communication of employees?
Motivation	Based on your experiences are your collaborator's employees as motivated about the work as are yours or vice versa? Are employees from both the organisations incentivised and encouraged to take leadership roles and initiatives for improving on going collaborative projects?
Responsibility	Do employees of both the organisations take responsibility for tasks or do you notice a "passing the buck" syndrome where there is a tendency to push responsibilities to the other organisation?
Honesty	Do you believe that employees of both the organisations share the same level of honesty and openness, especially when dealing with the other organisation?
Efficiency	Are your collaborator's employees as efficient as yours in terms of required training, performance, working speed?

- **Intellectual Property Right Management:**

Collaborations that involve the share of knowledge need an adequate mechanism to share Intellectual Property Rights. Due to legal, moral, ethical and classified obligations, it is admissible that information is shared in a seamless manner through partners to improve interoperability but, when it comes related to IPR, there must be a mechanism that should regulate the information and knowledge transit between partners.

To this case, (Zutshi, 2010) identifies three major parameters to assess: Background IPR protection, Foreground IPR protection and Conflicts. To assess them, uses the questions in Table 2.11.

Table 2.11 Questions for assessing interoperability sub-parameters with respect to Intellectual Property Right Management (Zutshi, 2010).

Background IPR Protection	For the collaborating scenario, does your collaboration agreement clearly spell out existing IPRs to be provided by each partner and its conditions of use? Is the compensation for the same clearly agreed upon?
Foreground IPR Protection	Has potential IPRs arriving out of this collaboration been identified and its use and sharing of rights been agreed upon?
Conflicts	Is there any conflicts related to IPR sharing or use within the collaboration?

- **Business Semantics:**

In the midst of various problems in aligning business processes, figure the problem of use of different terminology between organisations. As a prerequisite for any company, the ability to use and understand the information exchanged between companies is of great importance in the panorama of collaboration. In every organisation there must be mechanisms to model the information to correct conflicts and understand the information exchanged. According to this, the author identifies the following critical issues on Table 2.12.

Table 2.12 Questions for assessing interoperability sub-parameters with respect to Business Semantics (Zutshi, 2010).

Conflicting terminologies	Do you and your collaborator use different terminologies with regards to the business area that you both operate on?
Semantic Conversion	Do you have standardized tools or processes to undertake the process of semantic conversion so that differing terms in different organisations do not create operational difficulties?

- **Information Systems:**

Representing the main structure whereas information is mostly exchanged between partners, and the target of many interoperability approaches, the information systems are the most basic interoperability requirement since the information today is exchanged through electronic networks.

In B2B collaborations, information systems problems surge when the information is not exchanged effectively. The lack of standards between partners systems, and inefficient data exchange tools trace the path to failure. Most of systems are designed to be syntactically efficient but a few are semantically compatible. Hence, the author underlines the following questions on Table 2.13 to assess Information Systems' interoperability.

Table 2.13. Questions for assessing interoperability sub-parameters with respect to Information Systems (Zutshi, 2010).

Data Exchange Tools	Do you have suitable tools for ease of exchange of Data and files?
Speed	Is the information system that you rely on fast enough for quick communication?
Application Interoperability	Are there specific/standard translators or conversion applications that are used to access data between your organisations?
Security	Do users have the confidence to securely transmit confidential information and perform secure operations across the two organisations?

2.7.5.3. Application of BIQMM

To apply BIQMM in a set of two organisations that work together, (Zutshi, 2010) proposes that each company evaluates each parameter and sub-parameter, accordingly with its own experience. The procedure is to evaluate each BIP using the parameter relevance scale (see Table 2.14) for each BIP and sub-BIP it is needed to make two evaluations: the relevance value (r_i for BIP's and r_{ij} for sub-BIP's) and the sub-BIP score (v_{ij}).

Table 2.14. Scale for gauging relevance (Zutshi, 2010).

0	1	2	3	4	5	6	7	8	9	10
Irrelevant	Trivial	Preferable	Desirable	Beneficial	Substantial	Important	Significant	Crucial	Critical	Vital

To each parameter is calculated the final parameter score (V_i) using the following equation:

$$V_i = \sum r_{ij} v_{ij} / \sum r_{ij}$$

The overall interoperability score (I) is finally obtained computing the following equation:

$$I = \sum r_i v_i / \sum r_i$$

2.7.5.4. Summary of contributions to this dissertation

The literature review presented on interoperability demonstrates the action line of this work, and what in what parameters this study is inserted. First, this work is a pragmatic approach to interoperability measuring applied to operations research and supply chain management. From literature quantitative analysis, only 2% of publications are referent to operations research indicating that there is not many significant works applied to operations in SCM. Moreover, from the interoperability assessments found in constructivist and exploratory approaches, there is no general consensus of how business interoperability can be assessed and, actually, the concept of business interoperability is strongly linked to the original concept of technical interoperability, focusing mostly on information systems rather than human cooperation. In this matter, the proposed work focuses on raising the level of knowledge in the study of interoperability in B2B collaborations of supply chain management, from strategic, external and internal interactions and information sharing using information systems perspectives.

The contribution of IDEAS interoperability framework is the presentation of the dyadic views of enterprises. It considers that enterprises are interoperable if they satisfy three levels: data (ICT systems), application (knowledge) and business process (business). This perspective influenced the current work to study supply chain actors in dyadic perspectives and to systemize analysis in levels of interoperability.

EIF strongly influenced the current work by providing an organisational perspective on interoperability. The notion of organisational interoperability introduces concepts to interoperability such as business goals, business modelling and collaboration scenarios. It is in this context that the present work considers the influence of organisational systems when companies interact, the collaboration scenario of the internal and external business processes and business goals reflected in overall strategy.

Furthermore, EIF also contributed to other three levels of interoperability: technical, semantic and legal. While this framework describes in a detailed form what are the implications of technical interoperability, this dissertation focus on generic key aspects that permit a greater scope of analysis. In the case of semantics, the present work foresees the ability of converting and understanding exchanged information in terms of business interactions and in terms of IT.

Legal interoperability in the EIF interoperability surges has a harmonisation of information exchange with legislation in the terms of e-government. The same perspective is used in SCM but in terms of collaboration contracts and IPR that rule component and product specifications.

LISI military framework contributes in multiple levels for this dissertation. The LISI “Maturity Model” provides information about level of connectivity which is related to how IT integrated business partners is. This knowledge permits the adequate classification of IS connectivity among actors on SC.

LISI “Capabilities Model” stresses upon the creation of an “interoperability profile” through the identification of capabilities across PAID. The interoperability level of a corporation is expressed in three situations: generic, expected and specific. This model contributed in the assessment of the different situations of interoperability presented in section 5 as “ideal” and “actual”.

LISI “Interoperability Assessment Process” influenced the current work for the pragmatic perspective of interoperability to make a well structured and systematic study applied to B2B relationships.

AIF and BIF are two contributions of ATHENA project that influenced this work to a more expanded scope, applied to business perspective at the levels: Information/Data, Services, Processes and Enterprise/Business. The first framework AIF contributed by introduced this four dimensions on interoperability, and how they relate with the business perspectives. However, this first contribution is more focused in modelling approach and in data formats that are not currently applied on this thesis.

The second ATHENA’s framework presented has larger contributions to this dissertation. The first contribution is the constituents of business interoperability in more specific perspectives of business: management of external relationships, employees and culture, collaborative business processes and information systems. These four perspective correspond to the technical perspective of interoperability (information systems) combined with business perspectives of interactions, related in governance perspective of managing relations with partners, the operational perspective referred in joint operations and business processes and the human behavioural perspective reflected on employees and culture, which is the great novelty remarked on the business interoperability frameworks so far. The introduction of single human interaction is important, increasing the complexity of assessing interoperability.

Some terms introduced in BIF inside the four perspectives mentioned above were considered as individual parameter for analysing, interoperability and others considered as sub parameters of those perspectives. From management of external relationships, partner selection, cooperation contracts and conflict resolution were considered the main terms of evaluation of external relationships and the cooperation model was disaggregated as the strategic dimension “business strategy”.

Following, employees and culture, was considered the individual behavioural aspect trust, and in collaborative business processes, the business semantics was disaggregated and considered a discipline involved throughout various levels of interoperability.

Last, from information systems was considered the level of connectivity and security and privacy.

Other remark regarding BIF is the introduction of internal and external contingencies. Internal contingencies refer to internal business characteristics that define the position of each corporation in market and when faced with business partners. To the extent of this dissertation, internal contingencies are present in business strategy, political, economic, social, and technological characteristics and currency transactions which impact SC performance.

The external contingencies refer to environment of business. Legal obligations, contract executions and industry dynamics are present in this work as form of IPR, semantics and cooperation contracts.

The levels of business interoperability from BIF influenced in the creation of degrees of interoperability. The introduced deviation from ideal and actual interoperability in section 5 settles on the ATHENA's notion on non-existing definition of optimum level of interoperability, influenced in the creation of relative terms and relative measurement through fuzziness and AHP obtaining pairs (I and A evaluations) to gauge how interoperable companies are.

The last framework presented correspond to a constructivist research on interoperability, introducing a framework for evaluation of dyadic relationships through a set of parameters (BIP's) and a mathematical method to obtain an interoperability score. The novelty of this framework is on providing a multi-purpose method applicable to business and non-business institutions, such as governmental systems. Relatively to BIP's, these consist in an extent to the previous frameworks mentioned in terms of parameters to evaluate business interoperability. BIQMM considers the parameters presented in BIF, on a disaggregated manner but introducing new sub-parameters for consideration. The contribution of this work is the framework which contains BIP's and sub-BIP's to evaluate interoperability in business perspective.

In sum, in Table 2.15 are presented the main contributions from each framework for the used interoperability criteria.

Table 2.15. Summary of contributions to interoperability assessment parameters.

Proposed levels on this thesis	Interoperability Frameworks				
	IDEAS	EIF	LISI	ATHENA BIF	BIQMM
Business Strategy	-	-	-	From "internal contingencies": Business Strategy	Business Strategy <ul style="list-style-type: none"> • Clarity in strategic goals • Impacts of collaboration breakdown
B2B Relationships	Business	Process alignment: <ul style="list-style-type: none"> • Business modeling • Collaboration scenarios 	-	Management of external relationships <ul style="list-style-type: none"> • Partner Selection • Cooperation Contracts • Conflict resolution 	Management of external relationships Adds: <ul style="list-style-type: none"> • Partner Assessment • Communication
				Collaborative Business Processes	Collaborative Business Processes <ul style="list-style-type: none"> • Responsibility Sharing • Clarity in business processes • Visibility

Proposed levels on this thesis	Interoperability Frameworks				
	IDEAS	EIF	LISI	ATHENA BIF	BIQMM
Organisational	-	Organisational alignment: Organisational structures	-	Organisational structures	Organisational structures: • Contact Points Cross-organisational mapping
				Employees and culture Trust	Employees and Work Culture • Linguistic Barriers • Motivation • Responsibility • Honesty Efficiency
Information Exchange	Knowledge	Semantic alignment: conversion	-	From “collaborative business process”: Business Semantics	Business Semantics: • Conflicting Terminologies • Semantic Conversion
		Legal alignment		From “external contingencies”: legal obligations and IPR	IPR management: • Background IPR protection • Foreground IPR Conflicts
	ICT Systems	Technical interaction and transport	LISI “Maturity model” – levels of connectivity	Information Systems • Level of connectivity • Security and privacy	Information systems: • Data exchange tools • Speed • Application interoperability • Security

3. Supply Chain Management

In today's conjecture, companies are struggling with the challenge of meeting customers' expectations dealing with high volatile markets, and creating innovative ways to achieve overall competitiveness. In this context, Supply Chain Management (SCM) arose as the ultimate management strategy, guarantying a competitive advantage to companies in their markets. Supply Chains (SC) have become an undisputable reality in the race of companies that strive for competitiveness. The integration of various sectors and processes in a single chain was a recent approach to the way of looking at goods industry. In turn, a SC can be described as a chain that links various agents, from customer to the supplier, through manufacturing and services so that the flow of materials, money and information can be effectively managed to meet the business requirements. (Stevens, 1989) In other words, extends from the original supplier or source to the ultimate customer (Blanchard, 2010). Supply Chain Management (SCM) is based on the incorporation of all activities that add value to customers, since product design to delivery, integrating suppliers, manufacturers, warehouses, and stores, so that merchandise is produced and distributed at the right quantities, to the right locations, and at the right time, in order to minimize system wide cost while satisfying service level requirements (Simchi-Levi, Kaminsky, & Simchi-Levi, 2008). Businesses are highly dependable on their supply chains to provide them with what they need to live and succeed. Every business fits into one or more supply chains and has a role to play in each of them (Hugos, 2006).

3.1. Definition of Supply Chain and Supply Chain Management

In literature, there are present many definitions and conceptions of SCM. The following table (view Table 3.1) presents some of the examples.

Table 3.1 Definitions of SCM.

Definition	Source
"Supply Chain Management is the integration of key business processes from end user through original suppliers that provides products, services, and information that add value for customers and other stakeholders".	(Lambert, Cooper, & Pagh, 1998)
"Supply chain management is the systemic, strategic coordination of the traditional business within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole".	(Mentzer, Keebler, Nix, Smith, & Zacharia, 2001)
"SCM is based on the integration of all activities that add value to customers starting from product design to delivery".	(Gunasekaran, 2004)
"The coordination of production, inventory, location, and transportation among the participants in a supply chain to achieve the best mix of responsiveness and efficiency for the market being served".	(Hugos, 2006)

Definition	Source
"Supply chain management is a set of approaches utilized to efficiently integrate suppliers, manufacturers, warehouses, and stores, so that merchandise is produced and distributed at the right quantities, to right locations, and at the right time, in order to minimize system wide costs while satisfying the service level requirements".	(Simchi-Levi et al., 2008)
"Supply Chain Management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all Logistics Management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers, and customers. In essence, Supply Chain Management integrates supply and demand management within and across companies".	(Council of Supply Chain Management Professionals (CSCMP))

Amongst these definitions common topics arises such as strategic collaboration with suppliers and distributors, overall business process management and coordination, production and inventory management and value-added for final customer, having strong consequences to the value chain.

3.2. Supply Chain Management Strategies

Supply Chain Management has become a tactic asset for the current global competition situation. SCM strategies aim at the upmost competitiveness, translated in product quality and service level to customers, and optimal performance measured in operational, economic and environmentally (Espadinha-Cruz, Grilo, Puga-Leal, & Cruz-Machado, 2011). Lean, Agile, Resilient and Green are now at the forefront in management methods for supply chain management (Espadinha-Cruz et al., 2011). These strategies have emerged to gain competitiveness towards the demand of global markets. The ability to integrate these four different management approaches on the same supply chain is of great importance, in the strategic point of view, but rather challenging (Rao & Holt, 2005). The principal subject of these strategies is that lean supply chain search for simplification, reducing waste and increasing value added; agile supply chain has the capability to quick response to customers and markets demand; resilient have the ability to react to unexpected disruptions; and green supply chain pretend to minimize environmental impacts and integrating environmental thinking (Carvalho & Machado, 2009). The contradictions and agreements between these four strategies led to the creation of a set of principles (SCM Practices), which govern the Supply Chain (SC), to overlap. In effect, the proper management and decision making assumes a balance between these contradictions.

The following sections explore these strategies definitions and its contributions to SCM.

3.2.1. Lean Strategy

The lean management strategy was developed by (Ohno, 1988) of the Toyota Motor Corporation in Japan, during the years of 1948 and 1975, and formed the basis for the Toyota Production System (TPS) with two main pillars: 'autonomation' and 'just-in-time' (JIT) production. In the occidental world, this strategy was introduced by (Womack, Jones, & Roos, 1991) in the seminar book "The machine

that changed the world". The book chronicled the operations found in the automotive industry, capturing the dramatic differences in approach and ensuing performance found among the world's leading automakers. In particular, the book examined how the techniques employed by Japanese automakers, namely Toyota, outpaced the performance achieved by US and European competitors.

The core content of lean manufacturing lies in Just in Time (JIT), reducing the inner waste of resources with the smallest investment achieving the biggest output (H. M. Wu, 2009). According to Womack and Jones (1991), the lean strategy is an approach which provides a way to do more with less (less human effort, less equipment, less time and less space), while coming closer to customer requirements. (Motwani, 2003) argued that Lean Management (LM) is an enhancement of mass production. Reichhart and Holweg (Reichhart & Holweg, 2007) had extended the concept of lean production to the downstream or distribution level: "We define lean distribution as minimizing waste in the downstream SC, while making the right product available to the end customer at the right time and location".

In terms of contribution to supply chain, Lean Thinking key principles are: respect for people (Treville & Antonakis, 2006), quality management (Brown & Mitchell, 1991), pull production (Brown & Mitchell, 1991) and mistake-proofing (Stewart & Grout, 2001). These principles led to many techniques, such as kanban, 5S, visual control, takt-time, Poke-yoke and SMED (Melton, 2005). In addition to these techniques manufacturing practices, such as JIT, TPM (Total Productive Maintenance) and TQM (Total Quality Management) that are used to eliminate various types of waste (Melton, 2005).

3.2.2. Agile Strategy

The supply chain objective is to delivering the right product, in the right quantity, in the right condition, to the right place, at the right time, for the right cost. Since customer requirements are continuously changing, supply chains must be adaptable to future changes to respond appropriately to market requirements and changes (Azevedo & Carvalho, 2010). In this context, the concept of agile manufacturing was presented in 1991, by the Iacocca of Lehigh University, which focuses on the ability to respond rapidly and cost effectively to unpredictable changes in markets and increasing levels of environmental turbulence, both in terms of volume and variety (Agarwal, Shankar, & Tiwari, 2007; Christopher, 2008).

Leanness was one of the first approaches to an effective SCM, dealing with waste reduction and effective production tools that led to value-added products to customer. However, this management approach caresses in variety and make companies vulnerable to market fluctuations in demand. While leanness may be an element of agility in certain circumstances, by itself it will not enable the organisation to meet the precise needs of the customer more rapidly (Christopher, 2008). The origins of agility lie in flexibility, named Flexible Manufacturing Systems (FMS) (Christopher, 2008; Fan, Xu, & Gong, 2007). Agility is a business-wide capability that embraces organisational structures, information systems, logistics processes, and, in particular, mind-sets (Christopher, 2008).

In terms of contributions of agility to SCM, (Agarwal et al., 2007) have shown that the disposition of agile SCM strategy depends on the following variables: market sensitiveness, customer satisfaction, quality improvement, delivery speed, data accuracy, new product introduction, centralized and collaborative planning, process integration, use of IT tools, lead-time reduction, service level

improvement, cost minimization, customer satisfaction, minimizing uncertainty, quality improvement, trust development, and minimizing resistance to uncertainty.

Nevertheless, we can't consider a SCM strategy as a unique solution to a system. The field of application of agility may be open to hybrid solutions such as the concept of Leagility. (Naim & Naylor, 1999) used the decoupling point concept to divide the part of the supply chain that responds directly to the customer – agile - (demand is variable and high product variety) from the part of the supply chain that uses forward planning and a strategic stock to buffer against the demand variability – lean - (demand is smooth and products are standard).

3.2.3. Resilient Strategy

Environmental and external actions that affect SC become one of the concerns in SCM. Partial and total disruption of the SC is an indisputable reality, which inserts a new concept of management: resilience. Strongly related to the concept used in materials science and engineering, resilience is seen as the property of a material to absorb energy when it is deformed elastically and then, upon unloading to have this energy recovered. This concept was adapted to SCM perspective, defining it as the ability of a system to return to its original state or move to a new, more desirable state after being disturbed (Christopher & Peck, 2004).

In addition to the volatility introduced in the previous section, the concept of turbulence assumed importance in showing that SCM systems of production and inventory management have to be somewhat prepared to react or avoid disturbances. In this context, the terms mitigation and contingency are the key aspects to resilience. Generally, in a resilient SC, we need a mitigation plan that will help us in avoiding or attenuating the effects of disturbances and, in cases of severe disturbance, a contingency plan, such as an alternate production facility or transport, must be put in action to permit the flow of goods in SC. The ability to recover from a disturbance occurrence is related to development of responsiveness capabilities through flexibility and redundancy (Rice Jr. & Caniato, 2003).

In the past the principal objective in SC design was cost minimization or service optimization, the emphasis today has to be upon resilience (Tang, 2006). However, resilient supply chains may not be the lowest-cost supply chains but they are more capable of coping with the uncertain business environment (H. Carvalho & Machado, 2009). The goal of SC resilience analysis and management is to prevent the shifting to undesirable states, i.e., the ones where failure modes could occur. In SC systems, the purpose is to react efficiently to the negative effects of disturbances (which could be more or less severe) (Azevedo, Carvalho, & Cruz-Machado, 2011a).

The principles of application of resilience in SC are outlined by (Christopher & Peck, 2004): i) selecting SC strategies that keep several options open; ii) re-examining the 'efficiency vs. redundancy' trade off; iii) developing collaborative working across supply chains to help mitigating risk; iv) developing visibility to a clear view of upstream and downstream inventories, demand and supply conditions, and production and purchasing schedules; v) improving supply chain velocity through streamlined processes, reduced in-bound lead-times and non-value added time reduction.

Though, resilience is not always desirable if an organisation strategy is to be lean, where for reducing inventory cost, they must have a low inventory level, which makes it less resilient (Azevedo &

Carvalho, 2010). Like in Leagility, hybrid solutions that combine the previous strategies with resilience make difficult in the implementation to specific production scenarios.

3.2.4. Green Strategy

Like in the case of resilience, greenness becomes a subject of concern to SCM in the past decades, changing the way of thinking in industrial production. Environment is the main focus of green SCM but, instead of focusing on the way environmental agents affect SC, green concerns with the effects of SC's activity on environment (Rao & Holt, 2005). Environmental issues were addressed in the last decades, raising the question of how production affects environment. One of the most cited quotes "we do not inherit the earth from our ancestors, we borrow it from our children" (Native American proverb) retraces the shift of the subject, and led to a change of mentality, as in the case of SCM. For instance, (Venkat & Wakeland, 2006) in his article intitled "Is Lean Necessarily Green?" raises a question that prompts a rethink of how the supply chains were managed until then. Focusing on carbon dioxide emissions as key indicator, the authors investigated the environmental performance of lean, having concluded that lean is not necessarily green, i.e. leanness does not imply reduced carbon dioxide emissions.

The Manufacturing Research Association of Michigan State University raised, for the first time, the concept of Green Supply Chain Management (GSCM), stating that the thought of green manufacturing and environmental management based on the traditional SCM in order to intensify the utility rate of resource and energy and reduce the environmental influence which was produced by some product (Jia & Bai, 2009). This led to increased pressure from community and environmentally conscious consumers which triggered rigorous environmental regulations, such as the Waste Electrical and Electronic Equipment Directive in the European Union, forcing the manufacturers to effectively integrate environmental concerns into their management practices (Paulraj, 2009; Rao & Holt, 2005)

Although ecologically adopted legislative requirements, ecological responsiveness also led to sustained competitive advantage, improving their long-term profitability (Paulraj, 2009). GSCM has emerged as an organisational philosophy by which to achieve corporate profit and market-share objectives by environmental risks and impacts while improving the reducing ecological efficiency of such organisations and their partners (Rao & Holt, 2005; Sarkis, 2003).

According to (Srivastava, 2007), GSCM is an integrating environmental thinking into SCM, including product design, material sourcing and selection, manufacturing processes, delivery of the final product to the consumers as well as end-of-life management of the product after its useful life. He states that GSCM can reduce the ecological impact of industrial activity without sacrificing quality, cost, reliability, performance or energy utilization efficiency; meeting environmental regulations to not only minimize ecological damage but also to ensure overall economic profit.

In term, (Routroy, 2009) reinforces that the impact of the antecedents and drivers for a green SC may be diverse across different SC's with different manufacturing processes, with different raw materials, conversion processes, product characteristics, logistics/reverse logistics activities.

3.2.5. SCM strategies comparison

Lean, Agile, Resilient and Green are now at the forefront in management methods for SCM. The ability to integrate these four different management approaches on the same supply chain is of great importance, in the strategic point of view, but rather challenging (Rao & Holt, 2005). In one hand, lean argues that products should be designed to minimize the waste increasing the added value for the customer (Womack et al., 1991). In the other hand, Agile argues that the production should be more responsive to customer. Resilience and Green, instead of focusing directly on the customer and production issues, are more focused on the environment or external agents. Resilience refers to the impact of external agents in the SC and Green concerns with the effects of SC's activity on environment (Rao & Holt, 2005). However, in a SC contradictions occur between the disparate management approaches. For instance, Resilience is not always desirable if an organisation strategy is to be lean, where for reducing inventory cost, they must have a low inventory level, which makes it less resilient (Azevedo & Carvalho, 2010).

To accomplish an interoperable supply chain, it is necessary to develop a deep understanding of the tradeoffs between the Lean, Agile, Resilient and Green strategies, exploring and researching their contribute for the sustainable competitiveness of the overall production systems in the supply chain, to help companies and supply chains to become more efficient, streamlined, and sustainable. Table 3.2 resumes the contributions from each strategy to each driver.

Table 3.2. Lean, agile, resilient and green attribute comparison (Carvalho & Machado, 2009).

Driver	SCM Strategy			
	Lean	Agile	Resilient	Green
Purpose	Focus on cost reduction and flexibility, for already available products, through continuous elimination of waste or non-value added activities across the chain	Understands customer requirements by interfacing with customers and the market and being adaptable to future changes	System ability to return to its original state or to a new, more desirable one, after experiencing a disturbance, and avoiding the occurrence of failure modes	Focuses on sustainable development - the reduction of an ecological impact on industrial activity
Manufacturing focus	Maintains a high average utilization rate uses just in time practices, "pulling" the goods through the system based on demand	Has the ability to respond quickly to varying customer needs (mass customization); it deploys excess buffer capacity to respond to market requirements	The emphasis is on flexibility (minimal batch sizes and capacity redundancies); the schedule planning is based on shared information	Focuses on efficiency and waste reduction for environmental benefit and development of re-manufacturing capabilities to integrate reusable/remanufactured components
Alliances (with suppliers and customers)	May participate in traditional alliances such as partnerships and joint ventures at the operational level	Exploits a dynamic type of alliance known as a "virtual organisation" for product design	Supply chain partners join an alliance network to develop security practices and share knowledge	Inter-organisational collaboration involving transferring or/and disseminating green knowledge to partners customer cooperation
Organisational structure	Uses a static organisational structure with few levels in the hierarchy	Creates virtual organisations with partners that vary with different product offerings that change frequently	Creates a supply chain risk management culture	Creates an internal environmental management system and develops environmental criteria for risk-sharing
Approach to choosing suppliers	Supplier attributes involve low cost and high quality	Supplier attributes involve speed, flexibility, and quality	Flexible sourcing	Green purchasing

Driver	SCM Strategy			
	Lean	Agile	Resilient	Green
Inventory strategy	Generates high turns and minimizes inventory throughout the chain	Makes decisions in response to customer demands	Strategic emergency stock in potential critical points	Introduces reusable/remanufactured parts in the material inventory; Reduces replenishment frequencies to decrease carbon dioxide emissions; Reduces redundant materials.
Lead time focus	Shortens lead-time as long as it does not increase cost	Invests aggressively in ways to reduce lead times	Reduces lead time	Reduces transportation lead time as long it does not increase carbon dioxide emissions
Product design strategy	Maximizes performance and minimizes cost	Designs products to meet individual customer needs	Postponement	Eco-design and incorporation of complete material life cycle for evaluating ecological risks and impact
Product variety	Low	High	High	For a multiproduct analysis, environmental management decisions become increasingly complex
Market	Serves only the current market segments, with a predictable demand	Acquires new competencies, develops new product lines, and opens up new markets with a volatile demand	Have the capabilities to act on and anticipate changes in markets and overcome demand risk	Demands more environmentally-friendly practices

The contributions of the above table remark some of the approaches in each area of SC. For instance, in terms of product variety, agility and resilience is focused to produce a wide variety of products, while lean with a cost reduction policy. As concerns about the green variety is variable and subject to estimation taking into account the impact it may have on the environment. This example highlights one of the challenges of reconciling divergent strategies. New management strategies that attempt to combine two or more strategies need a thorough study and have well defined what its scope.

3.3. Challenges in a LARG Supply Chain Management

The hybrid conjunction of the four strategies, named Lean, Agile, Resilient and Green Supply Chain Management (LARGeSCM) deals with the difficulties of conciliate the divergences and synergies initially explored by (Carvalho & Machado, 2009; Cruz-Machado & Duarte, 2010) that clubbed the LARGeSCM project. Thus, the main key items to be defined to achieve this hybrid strategy are remarked in (Maleki, Espadinha-Cruz, Valente, & Cruz-Machado, 2011), named as the LARGe Path: characteristics, organisational systems, information systems, human and technology factors and performance measures.

3.3.1. Characteristics

As mentioned previously (Carvalho & Machado, 2009; Duarte, Carvalho, & Cruz-Machado, 2010) began addressing this definition by exploring synergies and contradictions of the strategies, designing frameworks in a cause-effect approach. For instance, a conceptual framework (Carvalho & Machado, 2009) was presented to evaluate how a particular attribute from each strategy has a positive or negative influence on the main performance indicators: Service Level, Lead Time and Cost. This conceptual contribution helps on the comprehension of the full and generic supply chain system.

The key areas of concern in this stage are the following:

- Mapping definitions and contradictions between strategies, searching for synergies;
- Framework design in cause-effect approach, studying effect of attributes on performance indicators.

3.3.2. Organisational Systems

The development of the organisational system is another subject of concern to achieve LARGeSCM. The complexity of a LARGe network, requires modelling the organisational dynamics and its environment, having in consideration diverse aspects as: multidimensionality, laterality, internal democracy, organisational learning, or knowledge management and performance. Thus, a new organisational model is to be developed that satisfies the SC paradigm shift to Lean, Agile, Resilient and Green. It is desirable to establish a model that concerns with cross-functionality, elimination of functional barriers and improved processes management.

The key areas of concern of organisational systems are to model organisational dynamics and its environment, considering:

- Multidimensionality;
- Laterality;
- Internal democracy;
- Organisational learning;
- Knowledge management performance.

3.3.3. Human and technology factors

The interface between human resources and technology involved in SC's activities requires a detailed methodology to model this interfaces, having in consideration: ergonomics and total productive maintenance. For this stage, two models are developed. One describes the ergonomic implications of LARGe in human labour. The second model, addresses to Total Productive Maintenance as a way to obtain optimal productivity of manufacturing equipment through a systematic approach.

In ergonomics, a field approach has been made to the application of human performance monitoring on Lean environments by (Natacha, Machado & Nunes, 2010), where it is mapped the influence of the Lean environment on subjects. This exemplifies one approach that there is desirable to obtain for each strategy, by plotting the effect of the SC's practices on humans.

Related to TPM, the goal of the approach will be to maximize the value added to products of LARGe SC's, by identifying TPM's contributions on manufacturing and administration. So, the model contemplates the manufacturing perspective, related to equipment and installations, and administration activities directly connected to supply chain and its management.

As methodology of development, the above mentioned contemplates the use of state-of-the-art tools, like CAD Simulation and Ergonomic Expert Systems, which support the analysis process. The combination of the use of an ergonomic analysis method supported by a DSS with an ergonomic CAD application helps on the identification of the ergonomic risk factors existent on a workplace.

Thus, the two critical areas for action are:

- 1) Ergonomic implications of LARGeSCM:
 - a) Mapping influence of LARG on human labor;

- b) Implement ergonomics and safety principles in LARG organisations.
- 2) Total productive maintenance:
 - a) Manufacturing (equipment and installations);
 - b) Administration.

3.3.4. Information systems

The information system is another stage to achieve the LARGeSCM. Any SC is supported on technology and connectivity, in order to share information downstream and upstream with business partners. Areas of concern on this sector involve: transactions, management control, decision analysis and strategic planning.

On the transaction level, information, monetary and material flows are the concern. The methodology applied to this level is through Business Process Modelling (BPM) designed by (Cabral, Grilo, Puga-Leal & Cruz-Machado, 2011a) focusing on the first tier of SC: Supplier, Focal Firm and Distributor. This procedure makes possible to standardise and map information, material and currency flows within and without LARG SC.

Linked to the business model, a conceptual database was developed by (Cabral, 2011; Cabral, Grilo, Leal, et al., 2011) to store information in each interchange point between a business process and the LARGeSCM information system. The interaction between user and LARGeSCM information system is another matter target of modelling. Using UML, the same work describes interactions in uses-cases diagram approach.

The final levels of decision analysis and strategic planning equate the relations between operational and strategic decisions on the supply chain. The first approach on this matter, concern more the strategic decisions than the operational, because operational issues are more related with working issues, such as vehicle routing and scheduling, inventory levels, network/facilities planning and vertical integration vs. outsourcing. By using decision models, it is intended to develop a set of tools that support strategic decisions, when establishing adequate performance measures, key performance indicators (KPI) and practices for the supply chain. Regarding this subject, work from (Cabral, Espadinha-Cruz, Grilo, Puga-leal, & Cruz-Machado, 2011; Cabral, Grilo, Puga-Leal, & Cruz-Machado, 2011) explains the use of decision tools for this purpose.

Parallel to all the mentioned levels, an assessment on SC's interoperability is developed to assist on the implementation of LARGeSCM information system. Its aim is to assist in the identification of interoperability issues on the SC, to enhance information flow, networkability and workability inside focal firm and upstream and downstream the supply chain. For this, decision models based on Analytical Hierarchy Process and Fuzzy Sets aid in the assessment of overall interoperability, adequate to the multiple purposes of the supply chain whether interoperability issues exist. Concerning this subject, the present work makes an exposition of how interoperability issues in LARGeSCM can be assessed, which will be exposed in the present work. However, previous work to this thesis was presented in (Cabral, Espadinha-Cruz, et al., 2011; Espadinha-Cruz et al., 2011; Espadinha-cruz, Grilo, & Cruz-Machado, 2012).

In sum, the areas of concern in LARG information systems are:

- Transactional (information, material and currency) – Business Process Modelling (BPM) and Database systems;
 - Management control
 - Decision analysis;
 - Strategic planning.
- AHP, ANP and Fuzzy Sets decision models to
establish performance measures, KPI's and
SCM Practices
- Interoperability

3.3.5. Performance measures

The last stage of the path has been first approached simultaneously with the definition of the characteristics and attributes of LARG. This first approach consisted on the driving-force for the path to LARGeSCM. First, it was conceived the conceptual idea for the path, exploring the relationships between strategies, through the understanding of how management characteristics influence the performance of SC. Through a conceptual framework of cause-effect between characteristics and performance measures, the study walks through a vast path of uncertainty to gain some objectivity tracing the route to the LARGe Supply Chain Management.

The performance evaluation is indispensable management tool that, in the last stage of the path, will validate the previous work of conciliate strategies with the multidisciplinary stages of LARGeSCM. Hence, performance measures are established to achieve goals and are provided with the intent to monitor, guide and improve across the different entities on the supply chain, and can encompass a variety of different metrics that should be identified.

Thus, the two critical areas of action are:

- Validate previous work for concealing the strategies with the multidisciplinary stages of LARGeSCM;
- Feedback mechanism to evaluate and enhance prior stages.

3.4. Supply Chain Management Practices

SCM performance is improved by implementation of a set of practices in the SC's entities and measure the impacts of these practices which can occur at the different entities. Previous works have explored the influence of Lean, Agile, Resilient and Green on the performance of a SC, exploring contradictions and synergies (Azevedo & Carvalho, 2010; Azevedo, Carvalho, & Cruz-Machado, 2011b, 2011c). According to (Azevedo, Carvalho, & Cruz-Machado, 2011b), all these practices contributes to a supply chain with less waste (non-value-added activities), more responsive to the customer requirements, able to overcome disruption conditions and also to reduce environmental impacts. There are some practices that can belong to one or more strategies, and have different impact on each strategy.

3.4.1. Lean SCM Practices

Table 3.3 shows a set of lean practices that are implemented at various levels of the SC to contribute to waste elimination and cost reduction.

Table 3.3. Lean practices in supply chain context.

SCM Practice			Source
First tier – Supplier	L ₁	Geographical concentration*	(Anand & Kodali, 2008; Gurumurthy & Kodali, 2009)
	L ₂	Just-in-time	(Anand & Kodali, 2008; Berry, Christiansen, Bruun, & Ward, 2003; Gurumurthy & Kodali, 2009; Mahidhar, 2005; Shah & Ward, 2003)
	L ₃	Outsourcing/indigenous production	(Anand & Kodali, 2008)
	L ₄	Procurement consolidation*	(Wilson & Roy, 2009)
	L ₅	Profit sharing*	(Anand & Kodali, 2008)
	L ₆	Single sourcing and lean purchasing	(Anand & Kodali, 2008; Gurumurthy & Kodali, 2009)
	L ₇	Supplier certification*	(Anand & Kodali, 2008; Gurumurthy & Kodali, 2009)
	L ₈	Supplier evaluation and rating*	(Anand & Kodali, 2008; Doolen, 2005)
	L ₉	Supplier involvement in product development*	(Anand & Kodali, 2008; Gurumurthy & Kodali, 2009)
	L ₁₀	Supplier relationships/long-term business relationships*	(Anand & Kodali, 2008; Berry et al., 2003; Gurumurthy & Kodali, 2009; Mahidhar, 2005; Shah & Ward, 2003)
	L ₁₁	Supplier training and development*	(Anand & Kodali, 2008; Gurumurthy & Kodali, 2009)
	L ₁₂	Supplier's in plant representative	(Anand & Kodali, 2008)
	L ₁₃	To deliver materials directly to the point of use*	(Anand & Kodali, 2008)
	L ₁₄	To used EDI to share information*	(Anand & Kodali, 2008; Gurumurthy & Kodali, 2009)
Focal Firm	L ₁₅	Built-in quality system	(Anand & Kodali, 2008; Gurumurthy & Kodali, 2009)
	L ₁₆	Cellular manufacturing	(Doolen, 2005; Gurumurthy & Kodali, 2009; Mahidhar, 2005; Shah & Ward, 2003)
	L ₁₇	Concurrent engineering*	(Doolen, 2005; Gurumurthy & Kodali, 2009)
	L ₁₈	Cycle/setup time reduction	(Doolen, 2005; Gurumurthy & Kodali, 2009; Mahidhar, 2005; Shah & Ward, 2003)
	L ₁₉	Design for manufacturability	(Anand & Kodali, 2008; Doolen, 2005; Gurumurthy & Kodali, 2009)
	L ₂₀	Frequent quick changeovers	(Anand & Kodali, 2008)
	L ₂₁	High-involvement work systems	(Doolen, 2005)
	L ₂₂	Innovative performance appraisal	(Doolen, 2005)
	L ₂₃	Just-in-time	(Anand & Kodali, 2008; Berry et al., 2003; Gurumurthy & Kodali, 2009; Mahidhar, 2005; Shah & Ward, 2003)
* Interoperable Lean SCM Practices			

SCM Practice			Source
Focal Firm	L ₂₄	Lot-size reduction	(Doolen, 2005; Gurumurthy & Kodali, 2009; Shah & Ward, 2003)
	L ₂₅	Mass customisation	(Anand & Kodali, 2008)
	L ₂₆	Multifunctional workforce	(Anand & Kodali, 2008; Doolen, 2005; Gurumurthy & Kodali, 2009)
	L ₂₇	Parts/work standardization	(Anand & Kodali, 2008; Gurumurthy & Kodali, 2009)
	L ₂₈	Postponement*	(Anand & Kodali, 2008)
	L ₂₉	Product modularity	(Anand & Kodali, 2008)
	L ₃₀	Production scheduling improvement	(Doolen, 2005)
	L ₃₁	Pull flow control	(Anand & Kodali, 2008; Doolen, 2005; Gurumurthy & Kodali, 2009; Mahidhar, 2005; Shah & Ward, 2003)
	L ₃₂	To level production and scheduling	(Anand & Kodali, 2008; Gurumurthy & Kodali, 2009)
	L ₃₃	To use common parts	(Anand & Kodali, 2008)
	L ₃₄	To use bar coding and radio frequency identification (RFID)	(Anand & Kodali, 2008)
	L ₃₅	To used production planning and control technology (ERP)	(Anand & Kodali, 2008; Berry et al., 2003; Shah & Ward, 2003)
	L ₃₆	Total productive maintenance	(Berry et al., 2003; Doolen, 2005; Gurumurthy & Kodali, 2009; Shah & Ward, 2003)
	L ₃₇	Total quality management	(Berry et al., 2003; Doolen, 2005; Gurumurthy & Kodali, 2009; Mahidhar, 2005; Shah & Ward, 2003)
	L ₃₈	Use of standard or bar coded containers	(Anand & Kodali, 2008; Gurumurthy & Kodali, 2009)
	L ₃₉	WIP reduction	(Gurumurthy & Kodali, 2009)
First tier-Distributor/Customer	L ₄₀	Cross-docking or compound delivery approach for great distances	(Anand & Kodali, 2008)
	L ₄₁	Customer relationships*	(Anand & Kodali, 2008; Berry et al., 2003; Doolen, 2005)
	L ₄₂	Delivery performance improvement	(Doolen, 2005)
	L ₄₃	Demand stabilization	(Doolen, 2005)
	L ₄₄	Just-in-time	(Anand & Kodali, 2008; Berry et al., 2003; Mahidhar, 2005; Shah & Ward, 2003)
	L ₄₅	Milk run or circuit delivery for smaller distances	(Anand & Kodali, 2008)
	L ₄₆	Order/shipment tracking/notice	(Anand & Kodali, 2008)
	L ₄₇	To capture the demand of the customers in real time (POS)*	(Anand & Kodali, 2008)
	L ₄₈	To use third-party logistics for transportations	(Anand & Kodali, 2008)
	L ₄₉	Vendor-managed inventory (VMI)*	(Anand & Kodali, 2008)

* Interoperable Lean SCM Practices

3.4.2. Agile SCM Practices

Agile practices stress at the ability to respond quickly to demand changes. The following practices (see Table 3.4) are an example of those which can be implemented to achieve these SC goals.

Table 3.4. Agile practices in supply chain context.

SCM Practice			Source
First tier – Supplier	A ₁	Ability to change delivery times of supplier's order*	(Swafford, Ghosh, & Murthy, 2008)
	A ₂	Ability to change quantity of supplier's order*	(Swafford et al., 2008)
	A ₃	First choice partner	(C. Lin, Chiu, & Chu, 2006)
	A ₄	Speed in reducing development cycle time	(Swafford et al., 2008)
	A ₅	Use of IT to coordinate/integrate activities in design and development*	(Agarwal et al., 2007; Swafford et al., 2008)
	A ₆	Use of IT to coordinate/integrate activities in procurement*	(Swafford et al., 2008)
	A ₇	Use of IT to coordinate/integrate activities in manufacturing*	(Agarwal et al., 2007; C. Lin et al., 2006; Swafford et al., 2008)
Focal firm	A ₈	Centralized and collaborative planning*	(Agarwal et al., 2007)
	A ₉	Facilitate rapid decision making	(C. Lin et al., 2006)
	A ₁₀	Integrated supply chain/value stream/virtual corporation	(Ben Naylor, Naim, & Berry, 1999)
	A ₁₁	Organized along functional lines	(C. Lin et al., 2006)
	A ₁₂	Rapidly reconfigure the production process	(Ben Naylor et al., 1999)
	A ₁₃	To accommodate changes in production mix	(Swafford et al., 2008)
	A ₁₄	To minimize setups times and product changeovers	(Goldsby, Griffis, & Roath, 2006)
	A ₁₅	To produce in large or small batches	(Goldsby et al., 2006)
	A ₁₆	To reduce development cycle times	(Swafford et al., 2008)
	A ₁₇	To reduce manufacturing throughout times to satisfy customer delivery	(Swafford et al., 2008)
	A ₁₈	Use of It to coordinate/integrated activities in logistics and distribution*	(Swafford et al., 2008)
	A ₁₉	To alter deliver schedules to meet customer requirement*	(Swafford et al., 2008)
First tier – Distributor/Customer	A ₂₀	Products with substantial added value for customers*	(C. Lin et al., 2006)
	A ₂₁	Retain and grow customer relationships*	(C. Lin et al., 2006)
	A ₂₂	Speed in adjusting delivery capability	(Swafford et al., 2008)
	A ₂₃	Speed in improving customer service	(Agarwal et al., 2007; Swafford et al., 2008)
	A ₂₄	Speed in improving delivery reliability	(Swafford et al., 2008)
	A ₂₅	Speed in improving responsiveness to changing market needs	(Swafford et al., 2008)
	A ₂₆	Speed in increasing levels of product customisation	(Swafford et al., 2008)
	A ₂₇	To capture demand information immediately	(C. Lin et al., 2006)
	A ₂₈	To increase frequencies of new product introductions	(Agarwal et al., 2007; C. Lin et al., 2006; Swafford et al., 2008)
* Interoperable Agile SCM Practices			

3.4.3. Resilient SCM Practices

Resilient practices are a set of practices that reflect the entity ability to cope with unexpected disturbances. Some of the resilient practices that can be implemented in different level in the chain are presented in Table 3.5.

Table 3.5. Resilient practices in supply chain context.

SCM Practice			Source
First tier – Supplier	R ₁	Committing to contracts for material supply (buying capacity whether it is used or not)*	(Rice Jr. & Caniato, 2003)
	R ₂	Developing visibility to a clear view of upstream inventories and supply conditions*	(Christopher & Peck, 2004)
	R ₃	Flexible supply base/flexible sourcing*	(Tang, 2006)
	R ₄	Sourcing strategies to allow switching of suppliers*	(Rice Jr. & Caniato, 2003)
Focal firm	R ₅	Creating total supply chain visibility*	(Iakovou, Vlachos, & Xanthopoulos, 2007)
	R ₆	Designing production systems that can accommodate multiple products and real-time changes	(Rice Jr. & Caniato, 2003)
	R ₇	Developing collaborative working across supply chains to help mitigating risk*	(Christopher & Peck, 2004)
	R ₈	Developing visibility to a clear view production and purchasing schedules*	(Christopher & Peck, 2004)
	R ₉	Excess of capacity requirements	(Rice Jr. & Caniato, 2003)
	R ₁₀	Lead time reduction*	(Christopher & Peck, 2004; Tang, 2006)
	R ₁₁	Make-and-buy trade-off	(Tang, 2006)
	R ₁₂	Minimal batch sizes	(Christopher & Peck, 2004)
	R ₁₃	Multi-skilled workforce	(Rice Jr. & Caniato, 2003)
	R ₁₄	Postponement*	(Tang, 2006)
	R ₁₅	Process and knowledge back-up	(Iakovou et al., 2007)
	R ₁₆	Strategic disposition of additional capacity and/or inventory at potential ‘pitch-points’	(Christopher & Peck, 2004)
	R ₁₇	Strategic stock	(Christopher & Peck, 2004; Iakovou et al., 2007; Tang, 2006)
	R ₁₈	Supply chain risk management culture*	(Christopher & Peck, 2004)
First Tier – Distributor/Customer	R ₁₉	Demand-based management	(Iakovou et al., 2007)
	R ₂₀	Developing visibility to a clear view of downstream inventories and demand conditions*	(Christopher & Peck, 2004)
	R ₂₁	Flexible transportation*	(Tang, 2006)
	R ₂₂	Maintaining a dedicated transit fleet	(Rice Jr. & Caniato, 2003)
	R ₂₃	Silent product rollover	(Tang, 2006)

* Interoperable Resilient SCM Practices

3.4.4. Green SCM Practices

The GSCM practices should aim at the reduction of environment impact. Table 3.6 shows some green SCM practices.

Table 3.6. Green practices in supply chain context.

SCM Practice			Source
First tier - Supplier	G ₁	Certification of suppliers' environmental management systems	(Paulraj, 2009; Vachon, 2007; Q. Zhu, Sarkis, & Lai, 2007, 2008a)
	G ₂	Conducting joint planning to anticipate and resolve environment-related problems*	(Vachon, 2007)
	G ₃	Environmental collaboration with suppliers*	(Holt & Ghobadian, 2009; Hu & Hsu, 2010; Lippmann, 1999; Vachon, 2007; Q. Zhu et al., 2007; Q. Zhu, Sarkis, & Lai, 2008a, 2008b)
	G ₄	Environmental monitoring upon suppliers*	(Holt & Ghobadian, 2009; Hu & Hsu, 2010; Paulraj, 2009; Vachon, 2007; Q. Zhu, Sarkis, & Lai, 2008a)
	G ₅	Green procurement/sourcing	(Holt & Ghobadian, 2009; Routroy, 2009)
	G ₆	Prequalification of suppliers	(Hu & Hsu, 2010; Paulraj, 2009)
	G ₇	Providing design specification to suppliers that include environmental requirements for purchased item*	(Q. Zhu, Sarkis, & Lai, 2008b)
	G ₈	Source materials from environmentally/ethically sources	(Holt & Ghobadian, 2009; Paulraj, 2009)
	G ₉	Suppliers' ISO14000 certification	(Q. Zhu, Sarkis, & Lai, 2008a, 2008b)
	G ₁₀	To communicate to suppliers environmental and/or ethical criteria for goods and services*	(Holt & Ghobadian, 2009; Hu & Hsu, 2010; Q. Zhu, Sarkis, & Lai, 2008a)
	G ₁₁	Second-tier supplier environmentally friendly practice evaluation	(Q. Zhu, Sarkis, & Lai, 2008b)
	G ₁₂	To encourage suppliers to take back packaging	(Holt & Ghobadian, 2009; Rao & Holt, 2005)
	G ₁₃	To use green purchasing or logistics guideline	(Holt & Ghobadian, 2009; Hu & Hsu, 2010)
	G ₁₄	To use recyclable pallet to delivery materials	(Holt & Ghobadian, 2009)
* Interoperable Green SCM Practices			

SCM Practice			Source
Focal firm	G ₁₅	To work with product designers and suppliers to reduce and eliminate product environmental impacts*	(Holt & Ghobadian, 2009; Lippmann, 1999; Paulraj, 2009; Q. Zhu et al., 2007)
	G ₁₆	Working with industry peers to standardize requirements (for suppliers and purchasing items)	(Hu & Hsu, 2010)
	G ₁₇	Applying life cycle assessment to conduct eco-reports	(Hu & Hsu, 2010)
	G ₁₈	Better use of natural resources	(Rao & Holt, 2005)
	G ₁₉	Collaboration on products recycling with industry peers*	(Hu & Hsu, 2010)
	G ₂₀	Cross-functional cooperation for environmental improvements*	(Hu & Hsu, 2010; Q. Zhu, Sarkis, & Lai, 2008a, 2008b)
	G ₂₁	Commitment of GSCM from senior managers	(Q. Zhu, Sarkis, & Lai, 2008b)
	G ₂₂	Design of products for reduced consumption of material and energy	(Q. Zhu, Sarkis, & Lai, 2008a, 2008b)
	G ₂₃	Design of products to avoid or reduce use of hazardous of products and/or their manufacturing process	(Q. Zhu, Sarkis, & Lai, 2008a)
	G ₂₄	Energy efficiency measures for lighting and heating	(Holt & Ghobadian, 2009)
	G ₂₅	Environmental Management System (EMS)	(Routroy, 2009; Q. Zhu, Sarkis, & Lai, 2008a, 2008b)
	G ₂₆	Environmentally friendly raw materials	(González, Sarkis, & Adenso-Díaz, 2008; Holt & Ghobadian, 2009; Rao & Holt, 2005)
	G ₂₇	Filters and controls for emissions and discharges	(González et al., 2008)
	G ₂₈	Green design (eco-design)	(Hu & Hsu, 2010; Routroy, 2009; Q. Zhu et al., 2007; Q. Zhu, Sarkis, & Lai, 2008a)
	G ₂₉	Green innovation	(Routroy, 2009)
	G ₃₀	Green operations	(Rao & Holt, 2005; Routroy, 2009)
	G ₃₁	Internal recycling of materials within the production phase	(Vachon, 2007)
	G ₃₂	ISO 14001 certification	(Holt & Ghobadian, 2009; Hu & Hsu, 2010; Rao & Holt, 2005; Vachon, 2007; Q. Zhu et al., 2007; Q. Zhu, Sarkis, & Lai, 2008a, 2008b)
	G ₃₃	Investment recovery (sale) of excess inventories/materials	(Q. Zhu, Sarkis, & Lai, 2008b)
	G ₃₄	Joining local recycling organisations	(Hu & Hsu, 2010)
	G ₃₅	Recycling workplace materials (toners, paper, packing wastes, water, solid wastes)	(González et al., 2008)
* Interoperable Green SCM Practices			

SCM Practice			Source
Focal firm	G ₃₆	Reduction in raw material (i.e. the use of recycled material) for product manufacturing	(González et al., 2008)
	G ₃₇	Risk prevention systems to cover possible environmental accidents and emergencies	(González et al., 2008; Hu & Hsu, 2010)
	G ₃₈	Support for GSCM from mid-level managers	(Q. Zhu, Sarkis, & Lai, 2008b)
	G ₃₉	Sale of scrap and used materials	(Q. Zhu, Sarkis, & Lai, 2008b)
	G ₄₀	To decrease inventory levels	(Paulraj, 2009; Q. Zhu et al., 2007; Q. Zhu, Sarkis, & Lai, 2008a)
	G ₄₁	To decrease the consumption of hazardous/toxic materials	(Vachon, 2007; Q. Zhu et al., 2007)
	G ₄₂	To design products for disassembly	(González et al., 2008; Holt & Ghobadian, 2009; Q. Zhu, Sarkis, & Lai, 2008a)
	G ₄₃	To enhance environmental performance	(Rao & Holt, 2005; Vachon, 2007)
	G ₄₄	To integrate total quality environmental management (TQEM) into planning and operation processes	(Rao & Holt, 2005; Q. Zhu et al., 2007; Q. Zhu, Sarkis, & Lai, 2008a)
	G ₄₅	To minimize waste	(Paulraj, 2009; Rao & Holt, 2005)
	G ₄₆	To reduce energy consumption	(González et al., 2008; Holt & Ghobadian, 2009; Paulraj, 2009; Rao & Holt, 2005)
	G ₄₇	To reuse/recycling materials and packaging	(Holt & Ghobadian, 2009; Paulraj, 2009; Rao & Holt, 2005; Vachon, 2007)
	G ₄₈	To use life cycle assessment to reduce the products environmental burden	(Holt & Ghobadian, 2009)
	G ₄₉	To use life cycle assessment for product design	(González et al., 2008; Holt & Ghobadian, 2009)
	G ₅₀	To use of standardized components to facilitate their reuse	(González et al., 2008)
	G ₅₁	Total quality environmental management	(Q. Zhu, Sarkis, & Lai, 2008b)
* Interoperable Green SCM Practices			

SCM Practice			Source
First tier – Distributor/Customer	G ₅₂	Cooperation with customer for eco-design*	(Q. Zhu, Sarkis, & Lai, 2008a, 2008b)
	G ₅₃	Cooperation with customers for cleaner production*	(Q. Zhu, Sarkis, & Lai, 2008a, 2008b)
	G ₅₄	Customers return our original packaging or pallet systems*	(González et al., 2008; Holt & Ghobadian, 2009)
	G ₅₅	Discuss changes in current packaging with the customers	(Q. Zhu et al., 2007)
	G ₅₆	Eco-labeling	(Rao & Holt, 2005)
	G ₅₇	Environmental collaboration with the customer*	(Holt & Ghobadian, 2009; Vachon, 2007; Q. Zhu et al., 2007; Q. Zhu, Sarkis, & Lai, 2008a)
	G ₅₈	Environmental monitoring by the customer*	(Vachon, 2007; Q. Zhu et al., 2007)
	G ₅₉	Environmentally friendly packaging (green packaging)	(Rao & Holt, 2005; Routroy, 2009; Q. Zhu, Sarkis, & Lai, 2008a, 2008b)
	G ₆₀	Formal policy on green logistics/transport	(Holt & Ghobadian, 2009)
	G ₆₁	Reverse logistics*	(Hu & Hsu, 2010; Lippmann, 1999; Rao & Holt, 2005; Routroy, 2009; Vachon, 2007; Q. Zhu et al., 2007)
	G ₆₂	To plan the vehicles routes to reduce environmental impacts	(Holt & Ghobadian, 2009; Paulraj, 2009; Q. Zhu, Sarkis, & Lai, 2008a)
	G ₆₃	To use of environmentally-friendly transportation	(Holt & Ghobadian, 2009; Rao & Holt, 2005)
	G ₆₄	To work with customers to change product specifications*	(Lippmann, 1999)
* Interoperable Green SCM Practices			

3.5. SC Performance

According to (Wong 2009), performance measurement is crucial to better supply chain management. It can makes possible the inter-understanding and integration among the supply chain partners, while revealing the effects of strategies and potential opportunities in supply chain management (Azevedo & Carvalho, 2010). Research contributions from (Azevedo, Carvalho, & Cruz-Machado, 2011b) provide a set of performance measures classified in: operational, economic and environmental (see Table 3.7).

Table 3.7. Supply chain performance measures (Azevedo, Carvalho, & Cruz-Machado, 2011b).

Measures		Metrics
Operational performance	Quality	Customer reject rate
		In plant defect fallow rate
		Increment products quality
	Customer satisfaction	After-sales service efficiency
		Rates of customer complaints
		Out-of-stock ratio
	Delivery	On time delivery
		Delivery reliability
		Responsiveness to urgent deliveries
	Time	Lead time
		Cycle times
		Delivery lead time
	Inventory levels	Finished goods equivalent units
		Level of safety stocks
		Order-to-ship
Economic performance	Cost	New product flexibility
		Manufacturing cost
		Cost per operating hour
	Efficiency	Overhead expense
		Operating expenses
	Environmental revenues	Revenues from 'green' products
		Recycling revenues
		Cost avoidance from environmental action
	Environmental costs	Cost of scrap/rework
		Fines and penalties
		Costs for purchasing environmentally friendly materials
		Disposal costs
		Recycling cost = transport + storage costs
		R & D expenses ratio

Measures		Metrics
Environmental performance	Green image	Number of fairs/symposiums related to environmentally conscious manufacturing the organisation participate
	Business wastage	Total flow quantity of scrap
		Percentage of materials remanufactured
		Percentage of materials recycled /re-used
		Hazardous and toxic material output
		Solid and liquid wastes
	Emissions	Energy consumption
		Greenhouse gas emissions
		Air emission

According to this research contributions, operational performance focuses on measuring quality, customer service, delivery, time and inventory levels; Economic performance focus on costs, efficiency environmental revenues and environmental costs; and environmental performance, which focus on green image, business wastage and emissions.

3.6. SC Competitiveness

SC competitiveness stresses upon the concepts behind competitive strategy and competitive advantage, which correlates individual corporate strategy to the extension of business strategy or SC competitiveness. Business strategy refers to aggregated strategies of single business firms who work together for mutual advantages. Parallel, SC competitiveness is seen as an extent of business strategy, whereas the objective is to create sustainable competitive advantages and to position the firm opposite the competition (Schnetzler, Sennheiser, & Schonsleben, 2007). According to (Porter, 1998), competitive advantage is the extent to which an organisation is able to create a defensible position over its competitors.

(Schnetzler et al., 2007) extend the organisation strategy domain to the supply chain level: the strategic priorities of an organisation should be translated into supply chain management objectives and implemented in operations management.

In the research developed in (Carvalho, Azevedo, & Cruz-Machado, 2012) and (Li, Ragunathan, Ragunathan, & Subbarao, 2006), various dimensions of SC competitiveness where identified, namely: competitive pricing, value-to-customer quality, dependable delivery, production innovation, customer service and time-to-market.

According to ((Sila, Ebrahimpour, & Birkholz, 2006) cited by (Carvalho et al., 2012)), quality is not only a product characteristic; it also means customer satisfaction. ((Y. Zhu, You, Alard, Schonsleben, & Schönsleben, 2009) cited by (Carvalho et al., 2012)) reinforces that if design does not reflect the market requirements, the product cannot meet the demands of market even though manufacturing

conforms to the design completely, and if manufacturing does not conform to the design specifications, the finished product has poor quality and cannot satisfy customers' needs.

(Li et al., 2006) evaluate customer service in terms of delivery dependability, the extent to which an organisation is capable of providing, on time, the type and volume of product required by customers. ((Sanchez & Perez, 2004) cited by (Carvalho et al., 2012)) distinguish six major dimensions of customer service: product availability, order cycle time, distribution system flexibility, distribution system information, distribution system malfunction and post-sale support.

3.7. Summary of contributions to this thesis

This revision chapter provides the setting where interoperability assessment acts. The efficient and effective management of supply chain is achieved through implementation of strategies such as the exposed Lean, Agile, Resilient and Green which, in turn, provide the adequate practices that help to achieve SC competitiveness and performance. The main contribution of this chapter is to provide, from the extensive research on LARG, the adequate LARG SCM practices which refer to joint-operations between SC actors. It is in these practices that lack of interoperability may be present and it is where the methodology will assess and act to achieve best competitiveness and performance results.

On the SC performance, the main research contributions are the key performance measures: operational, economic and environmental. This metrics are exposed, relating to the applied measures for each, but not used in the current dissertation. They make part of the conceptual framework (addressed in section 5.1) to apply in future research work.

SC competitiveness objectives are addressed, remarking the focus on costumer in terms of service and in terms of quality. Further strategic objectives are not considered, because it is assumed that the interoperability case scenario is applied to a steady state SC, not focusing on aspects like price/cost, time-to-market and product innovation. These aspects refer to SC capabilities that require a deeper study. In a normal performance of the activities in the SC we'll assume that the assessed actors are in the middle of a cooperation contract where they provide parts to manufacturer that already have been designed.

4. Multi-Criteria Decision Making (MCDM) and Multi-Criteria Decision Analysis (MCDA)

In professional and personal life, decision-making assumes great importance when we're dealing with multiple options and, in a few cases, with multiple criteria to evaluate the goal itself. However, most of the time, logical thinking is used instead of systematic reasoning in decision-making. In this context, multiple-criteria decision-making (MCDM) or multiple-criteria decision analysis (MCDA) is a management tool that support decision makers in understanding his preferences (through criteria) and expand the set of alternatives.

MCDM encompasses various methods, such as the following examples:

- Aggregated Indices Randomization Method (AIRM)
- Analytic hierarchy process (AHP) (Saaty, 1980)
- Analytic network process (ANP) (Saaty, 2004, 2008a; Saaty & Vargas, 2006)
- Data envelopment analysis
- Disaggregation – Aggregation Approaches (UTA*, UTAIL, UTADIS)
- Dominance-based rough set approach (DRSA)
- ELECTRE (Outranking)
- Fuzzy AHP (Demirel, Demirel, & Kahraman, 2008)
- Fuzzy ANP
- Fuzzy Sets (Zadeh, 1965)
- Goal programming
- Grey relational analysis (GRA)
- Inner product of vectors (IPV)
- Measuring Attractiveness by a categorical Based Evaluation Technique (MACBETH)
- Multi-Attribute Analysis
- Multi-Attribute Global Inference of Quality (MAGIQ)
- Multi-attribute utility theory (MAUT)
- Multi-attribute value theory (MAVT)
- New Approach to Appraisal (NATA)
- Nonstructural Fuzzy Decision Support System (NSFDSS)
- Potentially all pairwise rankings of all possible alternatives (PAPRIKA)
- PROMETHEE (Outranking)
- Risk analysis
- Superiority and inferiority ranking method (SIR method)
- The evidential reasoning approach (ER)
- The VIKOR method
- TOPSIS Method
- Value analysis (VA)
- Value engineering (VE)
- Weighted product model (WPM)
- Weighted sum model (WSM)

MCDM and MCDA methods make part of the major discipline Operations Research that uses advanced analytical methods to help in decision-making that aid structuring complex problems to provide enough information to take decisions. However, in operations research in most of the times objectivity is preferable than dealing with subjective information. The ability to measure factors, such as profit, taxes, etc. makes easier to get to a mathematically correct solution that, supposedly, will answer the question to a typical decision problem. Though, according to the Behavioural science, we perceive the world through senses (Buchanan & Henig, 1998), and this generates our first personal experience of the world. This influences the way that decisions are taken. According to an example of (Buchanan & Henig, 1998), statically air traffic accidents are unlikely to happen, reinforcing the idea that is safe way of travelling. However, people choose ground transportation because of a fear of flying. Reciprocally, when people use public ground transportation such as bus, although they are fitted with seat belts, they do not use them, because they have the sense of security of being on the ground.

Decision makers face many problems with incomplete and vague information in MCDM problems since the characteristics of these problems often require this kind of information (Kahraman, 2008). Thus, many decision-making and problem-solving tasks are too complex to be understood quantitatively; however, people succeed by using knowledge that is imprecise rather than precise (Kahraman, 2004). This becomes a research trend that inspired decision models such as Analytical Hierarchy Process (AHP) and Fuzzy Sets. These two models translate human reasoning inaccuracy in mathematical data that helps visualizing our decisions according to a set of criteria.

Fuzzy Sets is a theory that deals with human reasoning to evaluate situations with not well-defined boundaries. It translates these concepts into fuzzy functions, which correspond to a set of dispersed numbers in which fit an approximate linguistic parameter. However, this method results in direct measurements. In other hand, AHP is another comprehensive method that deals with uncertainty. Instead of focusing on direct observations, it makes pairwise judgments of criteria and objectives, giving a consistent and comprehensive analysis on the weights of all factors (Z. Yang, Chen, & Sze, 2003).

4.1. Analytic Hierarchy Process

The Analytic Hierarchy Process (AHP) is a methodology for structuring, measurement and synthesis (Forman & Gass, 2001) introduced by (Saaty, 1980), which is a general theory of measurement and one of the widely used approaches to handle such a multi-criteria decision-making problem (Saaty & Vargas, 2006). It is based on the well-defined mathematical structure of consistent matrices and their associated right-eigenvector's ability to generate true or approximate weights (Saaty, 1980). AHP is easy to understand and it can effectively handle both qualitative and quantitative data (Kahraman, 2004).

According to (Forman & Gass, 2001), the best way we can describe AHP is more than just a methodology for choice situations. It serves to describe its three basic functions: structuring complexity; measuring on a ratio scale; and synthesizing. Applied to choice problems in a multi-criteria environment, this methodology computes comparisons of objectives and alternatives in a pairwise mode. Thus, this method converts individual judgments into gauged weights that are combined into linear additive weights for each alternative that help decision makers (DM) in making choices or

forecasting. The AHP converts individual preferences into ratio-scale weights that are combined into linear additive weights for the associated alternatives.

4.1.1. Application of the method

It consists in three parts, namely, making the hierarchy structure of the decision problem, evaluating the weights of the answers by pairwise comparison and calculating global weights. To make a decision in an organised way to generate priorities we need to decompose the decision into the following principles (Saaty, 2008b).

1. Define the problem and determine the kind of knowledge sought.
2. Structure the decision hierarchy from the top with the goal of the decision, then the objectives from a broad perspective, through the intermediate levels (criteria on which subsequent elements depend) to the lowest level (which usually is a set of the alternatives).
3. Construct a set of pairwise comparison matrices. Each element in an upper level is used to compare the elements in the level immediately below with respect to it.
4. Use the priorities obtained from the comparisons to weigh the priorities in the level immediately below. Do this for every element. Then for each element in the level below add its weighed values and obtain its overall or global priority. Continue this process of weighing and adding until the final priorities of the alternatives in the bottom most level are obtained.

Thus, the application of the method encompasses the following steps:

- 1) Define the problem and establish it in a hierarchical structure, having on the top the goal, and the alternatives at the bottom. For example, Figure 4.1 shows an AHP model for evaluation of the level of satisfaction at a school (goal at the top of hierarchy). The middle layer contains the adequate criteria to evaluate each of alternatives (at the bottom).

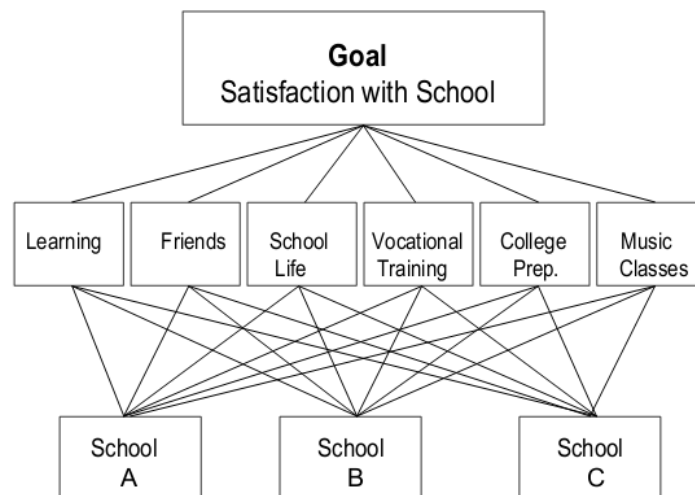


Figure 4.1. Example of Choice hierarchy (Saaty, 2008a).

- 2) To evaluate each criteria, sub-criteria and alternative, is used the fundamental scale (see Figure 4.2) This scale is a way to gauge parameters by telling if they're equally important or if one criterion is extremely more important than another.

Intensity of importance on an absolute scale	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective
3	Moderate importance of one over another	Experience and judgment strongly favor one activity over another
5	Essential or strong importance	Experience and judgement strongly favor one activity over another
7	Very strong importance	An activity is strongly favored and its dominance demonstrated in practice
9	Extreme importance	The evidence favoring one activity over another is of the highest possible order of affirmation
2, 4, 6, 8	Intermediate values between the two adjacent judgments	When compromise is needed
Reciprocals	If activity i has one of the above numbers assigned to it when compared with activity j , then j has the reciprocal value when compared with i	
Rationals	Ratios arising from the scale	If consistency were to be forced by obtaining n numerical values to span the matrix

Figure 4.2. The fundamental scale (Saaty, 1990).

The pairwise comparisons are made according the following importance matrix:

$$A = \begin{bmatrix} 1 & a_{12} & \cdots & a_{1n} \\ a_{12} & 1 & & a_{2n} \\ \vdots & & \ddots & \vdots \\ a_{1n} & a_{2n} & \cdots & 1 \end{bmatrix}$$

Where a_{ij} represents the pairwise comparison rating between the element i and element j of a level with respect to the upper level and, for any i , with $j = 1, \dots, n$. In turn, a_{ij} have the following properties:

$$a_{ij} > 0$$

$$a_{ij} = \frac{1}{a_{ji}}$$

$$a_{ii} = 1$$

To determine the number of comparisons that are need to be done, we calculate:

$$N = \frac{n(n-1)}{2} \quad \text{Eq. 4.1}$$

- 3) In case of more than one decision-maker, each pairwise judgment must be aggregated into one single value. The aggregation criterion is exposed in section 4.1.3.
- 4) In order to prioritize each of the judgments, we need to aggregate all the values into one single value.

First of all, we need to calculate the sum of each column of the reciprocal matrix, in order to, afterwards, obtain the normalized value, i.e., the values of each comparison, assuming the same gauge.

$$A = \begin{bmatrix} 1 & a_{12} & \cdots & a_{1n} \\ a_{12} & 1 & & a_{2n} \\ \vdots & & \ddots & \vdots \\ a_{1n} & a_{2n} & \cdots & 1 \end{bmatrix}$$

$$Sum = [s_1 \quad s_2 \quad \cdots \quad s_n]$$

The normalized decision-matrix is obtained by:

$$A = \begin{bmatrix} 1 & \frac{a_{12}}{s_1} & \dots & \frac{a_{1n}}{s_1} \\ \frac{a_{12}}{s_1} & 1 & \dots & \frac{a_{1n}}{s_1} \\ \vdots & \vdots & \ddots & \vdots \\ \frac{a_{1n}}{s_1} & \frac{a_{1n}}{s_1} & \dots & 1 \end{bmatrix}$$

The aggregation is a crucial step to prioritize and rank alternatives. However, there are a few methods to aggregate weights for pairwise judgments in AHP. In Table 4.1 are present the various methods:

Table 4.1. Weighting methods for pairwise judgments in AHP.

Method	Source
Eigenvector method, EM	(Saaty, 1980)
Least squares method, LSM	(Chu, Kalaba, & Spingarn, 1979)
Chi squares method, χ^2 M	(Jensen, 1984)
Singular value decomposition method, SVDM	(Gass & Rapcsák, 2004)
Logarithmic least squares method, LLSM	(Crawford & Williams, 1985)

The eigenvector method (EM) was the first approach presented by (Saaty, 1980) when introducing the AHP method. For the purpose of the current work, this approach is the one used for further calculation.

The computation of priority vectors is done obtaining the normalized Eigen vector, W . It is obtained by calculating the average of each row of the normalized decision-matrix, A . Mathematically, this step is made estimating:

$$AW = \lambda_{max} W \quad \text{Eq. 4.2}$$

When the vector W is normalized, it becomes the vector of priorities of elements of one level with respect to upper level. λ_{max} is the largest eigenvalue of the matrix A .

The priorities of the elements can be estimated by finding the principal eigenvector W of the matrix A , that is calculated as follows:

$$W = \frac{1}{n} \begin{bmatrix} \frac{1}{s_1} + \frac{a_{12}}{s_2} + \frac{a_{1n}}{s_n} \\ \frac{a_{12}}{s_1} + \frac{1}{s_2} + \frac{a_{1n}}{s_n} \\ \vdots \\ \frac{a_{1n}}{s_1} + \frac{a_{1n}}{s_2} + \frac{1}{s_n} \end{bmatrix} = \begin{bmatrix} w_1 \\ w_2 \\ \vdots \\ w_n \end{bmatrix}$$

Whereas, λ_{max} is determined by:

$$\lambda_{max} = \sum_{i=0}^n s_n \times w_n = s_1 \times w_1 + \dots + s_n \times w_n \quad \text{Eq. 4.3}$$

4.1.2. Inconsistency problem

In the most cases, decision matrixes are inconsistent. In these situations, (Saaty, 1980) has introduced a Consistency Index (CI) to measure the consistency of pairwise comparison. In a complete consistent situation, λ_{max} is equal to the number of terms in the matrix ($\lambda_{max} = n$). Hence, in a non-consistent situation the more the λ_{max} value is ($\lambda_{max} \geq n$), the more inconsistent it is the matrix. So, (Saaty, 1980) established that the CI is estimated by:

$$CI = \frac{\lambda_{max} - n}{n - 1} \quad \text{Eq. 4.4}$$

In order to use this index, (Saaty, 1980) proposes a consistency ratio (CR) between this index and the Random Index (RI). The RI is obtained by randomly generating reciprocal matrixes, using the fundamental scale of 17 values (from 1/9 to 9) and calculating the average CI for 50,000 random matrixes. According (Saaty, 2008c) article on “Relative Measurement and Its Generalization in Decision Making for the Measurement of Intangible Factors”, the random consistency index for 50.000 randomly generated matrixes is the following:

The CR of the judgmental matrix can be determined by calculating:

$$CR = \frac{CI}{RI} \quad \text{Eq. 4.5}$$

Using the average consistencies (RI values) of randomly generated matrices by (Saaty, 1980, 2008c) (view Table 4.2).

Table 4.2. The average CI of random matrices (RI) (Saaty, 1980, 2008c).

Size	1	2	3	4	5	6	7	8	9	10
RI	0.00	0.00	0.52	0.89	1.11	1.25	1.35	1.40	1.45	1.49

This ratio establishes a rule for considering (or not) an inconsistent matrix. Depending on the magnitude of the ratio, we should accept the judgment as unequivocal. If the change or perturbation in value is of the order of a percent or less, it would be so small and would be considered negligible. However if this perturbation is a decimal we are likely to pay attention to modify the original value by this decimal without losing the significance and identity of the original number as we first understood it to be. So, (Saaty, 1980) proposes a rule based on the maximum value of 0,10 (10 per cent). The main explanation for that is the fact that we can consider small changes in the value, because it is according to our understanding. However, when changes are dramatic, it is not reasonable to assume that the matrix is consistent with the human reasoning.

However, in the cases that CR is larger than desired, there are three main options:

1. Find the most inconsistent judgment in the matrix;
2. Determine the range of values to which that judgment can be changed corresponding to which the inconsistency would be improved;
3. Ask the judge to consider, if he can, change his judgment to a plausible value in that range.

Other issue remarked by (Saaty, 1995), is the dimension of matrix. Since it is rather difficult to deal with inconsistency in pairwise comparisons matrixes with dimension more than 9, the number of the

alternatives should not be more than this number. The method provides two options depending on the number of alternatives:

- Less than nine alternatives - In this case the number of the evaluation matrices for the alternatives equals the number of the sub-criteria of the level just above the alternatives. In our example seventeen matrices are formed. Each matrix requires thirty six weights, i.e. values of indicators, to be supplemented by the decision maker.
- More than nine alternatives - In this case alternatives are evaluated using a rating scale for each sub-criterion, that is, a qualitative rating scale is assigned to each sub-criterion related to every alternative. Then priorities are determined with respect to the intensity scoring assigned to each alternative. This evaluation procedure also necessitates judgments from the decision makers.

4.1.3. Group decision-making

The Group Decision-making rule used for this methodology is based on (Saaty & Peniwati, 2008), where group judgments are combined by the geometric mean, G . According to (Saaty, 2008b), as regards group decision making, AHP considers two important issues in group decision making: aggregation of individual judgements in a group into a single representative judgement for the entire group and the aggregation of individual priorities. Judgements must be combined so that the reciprocal of the synthesised judgements is equal to the syntheses of the reciprocals of these judgements. It has been proved that the geometric mean, not the frequently used arithmetic mean, is the only way to do that. If the individuals have different priorities of importance, their judgements (final outcomes) are raised to the power of their priorities and then the geometric mean is formed.

Thus, the applied rule to aggregate individual judgements is:

$$G = \left(\prod_{i=1}^n a_i \right)^{\frac{1}{n}} = \sqrt[n]{a_1 a_2 \dots a_n} \quad \text{Eq. 4.6}$$

4.2. TOPSIS Method

The Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) was initially presented by ((Hwang & Yoon, 1981) cited by (Olson, 2004)), ((Lai, Liu, & Hwang, 1994) cited by (Olson, 2004)) and ((Yoon & Hwang, 1995) cited by (Olson, 2004)). According to (Olson, 2004), TOPSIS is attractive in that limited subjective input is needed from decision makers. The only subjective input needed is weights.

Generically, the application of TOPSIS can be expressed in the following steps (Olson, 2004):

- 1) Obtain performance data for n alternatives over k criteria. Raw measurements are usually standardized, converting raw measures x_{ij} into standardized measures s_{ij} ;
- 2) Develop a set of importance weights w_k , for each of the criteria. The basis for these weights can be anything, but, usually, is ad-hoc reflective of relative importance. Scale is not an issue if standardizing was accomplished in Step 1;
- 3) Identify the ideal alternative (extreme performance on each criterion) s^+ ;
- 4) Identify the nadir alternative (reverse extreme performance on each criterion) s^- ;
- 5) Develop a distance measure over each criterion to both ideal (D^+) and nadir (D^-);

- 6) For each alternative, determine a ratio R equal to the distance to the nadir divided by the sum of the distance to the nadir and the distance to the ideal;

$$R = \frac{D}{D^- + D^+} \quad \text{Eq. 4.7}$$

- 7) Rank order alternatives by maximizing the ratio in Step 6.

TOPSIS minimizes the distance to the ideal alternative while maximizing the distance to the nadir (Olson, 2004). A relative advantage of TOPSIS is the ability to identify the best alternative quickly. TOPSIS was found to perform almost as well as multiplicative additive weights and better than analytic hierarchy process in matching a base prediction model.

The TOPSIS role on this work is to be applied as an extension of Fuzzy Sets model to compute evaluation on criteria and alternatives. This is explained in next section.

4.3. Fuzzy Set

To deal with the vagueness of human thought, fuzzy set theory was introduced by (Zadeh, 1965) who, motivated by the difficulty that human reasoning has to utilize concepts and knowledge that don't have well-defined boundaries, developed a theory in which information can be evaluated and mathematically used for innumerable purposes. The approximate reasoning of fuzzy set theory can properly be represented by linguistic terms (Zadeh, 1975). Fuzzy set theory encompasses: fuzzy logic, fuzzy arithmetic, fuzzy mathematical programming, fuzzy topology, fuzzy graph theory, and fuzzy data analysis, though the term fuzzy logic is often used to describe all of these (Kahraman, 2004).

Unlike Boolean and Set theories, fuzzy logic is multi-valued, stating that a set of numbers has a not well-defined boundary. Instead of belonging to one group or another (0 or 1 in Boolean, and a greater set of numbers in Sets theory), a fuzzy number may belong to a function with a certain membership degree.

Mathematically, according to (Cantor, 1883) in Sets theory, an item from a given universe is either qualified as a member or not from a set. There are two ways to describe a set: explicitly in a list (for example, $A = \{0,1,2,3\}$) or implicitly with a predicate (for example, $x > 10$). For instance, in Figure 4.3a, a person is classified, according to he's height, as low, if he has less than 1.70 meters, or high, if he has a height above this value.

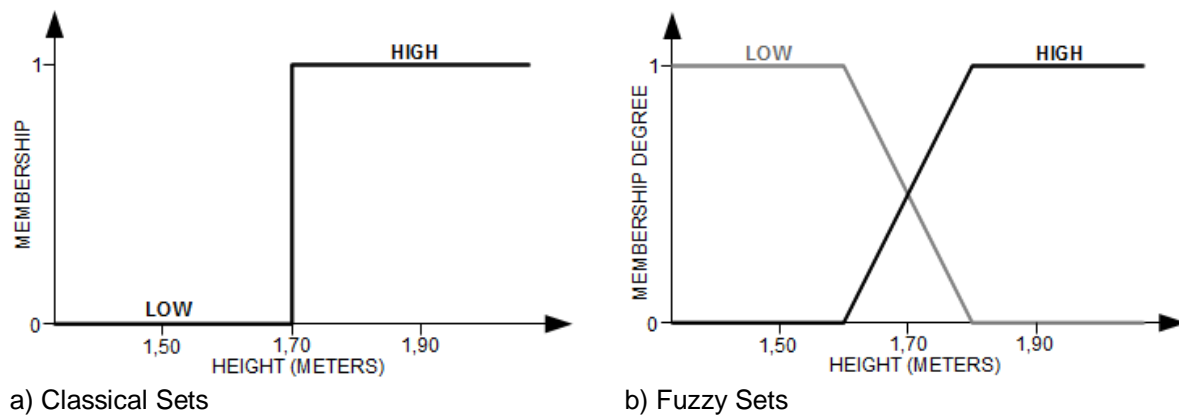


Figure 4.3. Distinction between Classical Sets and Fuzzy Sets.

In contrast, a fuzzy set is a particular kind of set of elements that simultaneously can belong to different sets with some degree of membership, μ_F . A particular element can belong to different sets, having a different degree of membership depending on where it fits most. In the previous example,

Figure 4.3b represents the membership functions of being considered low or high or both, with a degree of membership of, approximately, 0.5 for both of the sets, meaning that it fits equally in each set.

4.3.1. Universe of discourse, membership function and linguistic variables

A fuzzy set F is evaluated in a universe of discourse, U , whereas is characterized by a membership function of μ_F that takes necessarily the values in the interval $[0,1]$, i.e.:

$$\mu_F: U \rightarrow [0, 1]$$

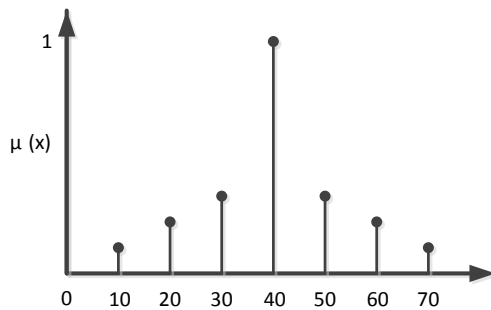
Hence, the fuzzy set F in U can be represented as a set of ordered pairs of a generic element u and its degree of membership as:

$$F = \{(u, \mu_F(u)), u \in U\}$$

The probability that u belongs to F is the membership function $\mu_F(u)$. The membership function can be represented in two ways: discrete or continuous.

4.3.2. Discrete membership functions

Discrete membership function and a discrete universe of discourse are represented using finite number of values, also called as a vector. An example of this type of membership function can be represented as (see Figure 4.4):



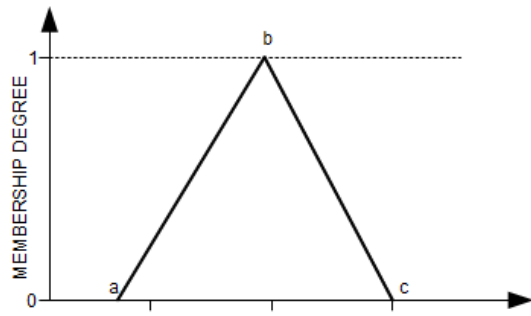
$$u = \{0, 10, 20, 30, 40, 50, 60, 70\}$$

$$F = \frac{0.05}{10} + \frac{0.1}{20} + \frac{0.2}{30} + \frac{1}{40} + \frac{0.2}{50} + \frac{0.1}{60} + \frac{0.05}{70}$$

Figure 4.4. Discrete membership function.

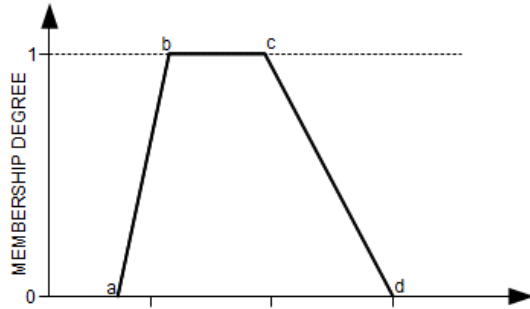
4.3.3. Continuous membership functions

In the continuous form, the membership function is a mathematical function. Continuous memberships functions can have the shapes of: triangular, trapezoidal, Gaussian, bell-shaped or sigmoidal. From Figure 4.5 to Figure 4.9 is exemplified each one of these functions.



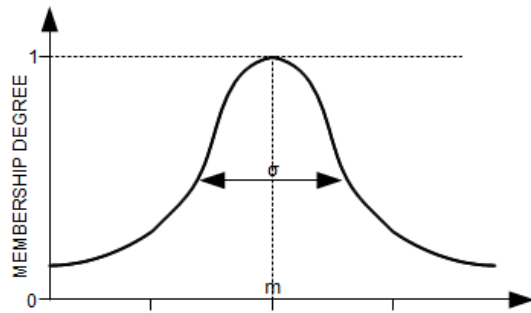
$$\text{triangle}(x: a, b, c) = \begin{cases} 0 & x < a \\ (x - a)/(b - a) & a \leq x \leq b \\ (c - x)/(c - b) & b \leq x \leq c \\ 0 & x > c \end{cases}$$

Figure 4.5. Triangular membership function.



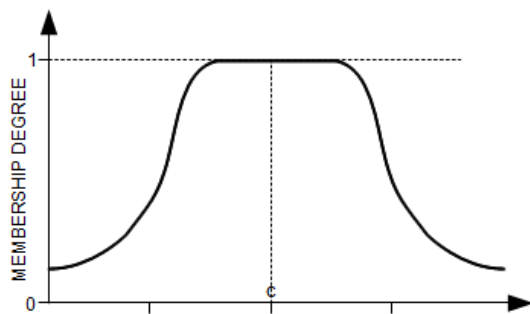
$$\begin{aligned} \text{trapezoidal}(x: a, b, c, d) \\ = \begin{cases} 0 & x < a \\ (x - a)/(b - a) & a \leq x \leq b \\ 1 & b \leq x \leq c \\ (d - x)/(d - c) & c \leq x \leq d \\ 0 & x > d \end{cases} \end{aligned}$$

Figure 4.6. Trapezoidal membership function.



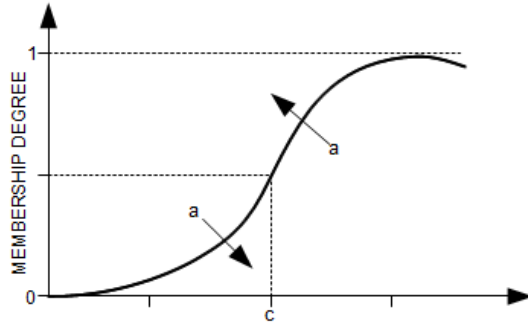
$$\text{gaussian}(x: m, \sigma) = \exp \left\{ -\frac{(x - m)^2}{\sigma^2} \right\}$$

Figure 4.7. Gaussian membership function.



$$\text{bell}(x: a, b, c) = \frac{1}{1 + \left| \frac{x - c}{a} \right|^{2b}}$$

Figure 4.8. Bell-shaped membership function.



$$\text{Sigmoidal}(x: a, c) = \frac{1}{1 + e^{-a(x-c)}}$$

Figure 4.9. Sigmoidal membership function.

4.3.4. Linguistic variables

Like an algebraic variable takes numbers as values, a linguistic variable takes words or sentences as values (Zimmermann, 2010). The set of values that it can take is called term set. Each value in the term set is a fuzzy variable defined over a base variable. The base variable defines the universe of discourse for all the fuzzy variables in the term set. The Figure 4.10 refers to an example of an importance scale, rating between very low to very high.

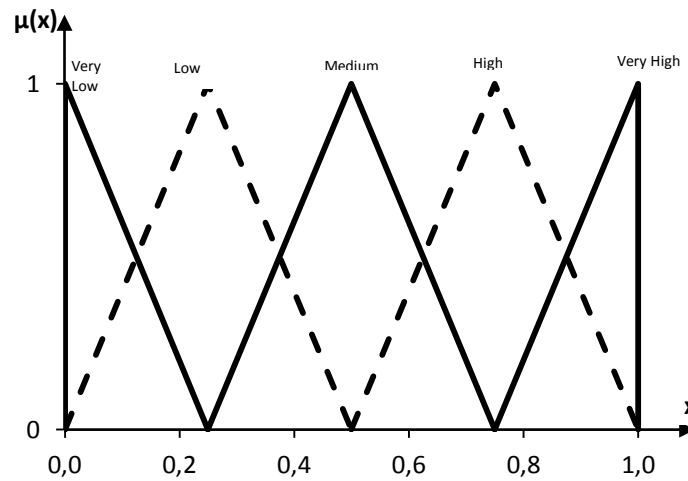


Figure 4.10. Linguistic variables for importance scale.

Mathematically, the linguistic variable “Medium” is expressed in the following membership function:

$$\mu_{\text{Medium}}(x) = \begin{cases} 0, & x < 0,25 \\ \frac{x - 0,25}{0,50 - 0,25} & 0,25 \leq x \leq 0,50 \\ \frac{0,75 - x}{0,75 - 0,50} & 0,50 \leq x \leq 0,75 \\ 0, & x > 0,75 \end{cases}$$

4.3.5. Operations with fuzzy numbers

Assuming \tilde{m} and \tilde{n} to be two triangular fuzzy numbers given by $\tilde{m} = (m_1, m_2, m_3)$ and $\tilde{n} = (n_1, n_2, n_3)$, respectively, then the basic arithmetic expressions are (Sreekumar & Mahapatra, 2009):

$$\tilde{m} \oplus \tilde{n} = (m_1 + n_1, m_2 + n_2, m_3 + n_3) \quad (\text{Additive property})$$

$$\tilde{m} \ominus \tilde{n} = (m_1 - n_1, m_2 - n_2, m_3 - n_3) \quad (\text{Subtractive property})$$

$$\tilde{m} \otimes \tilde{n} = (m_1 \times n_1, m_2 \times n_2, m_3 \times n_3) \quad (\text{Multiplicative property})$$

According to (Sreekumar & Mahapatra, 2009), it is noted here that fuzzy addition and subtraction of two triangular fuzzy numbers is a triangular fuzzy number whereas multiplication of two triangular fuzzy numbers is only approximately triangular fuzzy number.

4.3.6. Application of fuzzy sets in MCDM

There are few applications of Fuzzy Sets theory in MCDM. Some of the approaches consider a well-structured decision problem, represented in hierarchy. In literature, examples of these applications can be found in Table 4.3.

Table 4.3. Examples of application of fuzzy sets in MCDM.

Fuzzy Sets Approach	Applications	Source
Modified Fuzzy TOPSIS Method	Employees selection	(Chen, 2000)
	Supplier evaluation in SCM	(Chen, Lin, & Huang, 2006)
		(Sreekumar & Mahapatra, 2009)
Fuzzy AHP	Business Strategy (Enterprise R&D roadmap)	(Chiou, Wan, & Tzeng, 2005)
	Catering service selection	(Kahraman, 2004)
	Success factors evaluation of e-commerce	(Kong, 2005)
	Geographic Information System (GIS)	(Vahidnia, Alesheikh, & Alimohammadi, 2008)
Fuzzy ANP	Business Strategy (competition level)	(Dağdeviren & Yüksel, 2010)
	Shipyard location selection	(Güneri, Cengiz, & Seker, 2009)

4.3.6.1. Modified Fuzzy TOPSIS Method

The modified Fuzzy TOPSIS Method is based on TOPSIS (view section 4.2), based upon the concept that the chosen alternative should have the shortest distance from the positive ideal solution (PIS) and the farthest from the negative ideal solution (NIS). Parallel, in a fuzzy environment, it is defined the fuzzy positive ideal solution (FPIS) and fuzzy negative ideal solution (FNIS). The method to determine the distance to these two solutions is the vertex method (Chen, 2000; Chen et al., 2006; Kahraman, 2008; Sreekumar & Mahapatra, 2009) that permits calculate the distance between two triangular fuzzy ratings. According to (Chen, 2000) a closeness coefficient of each alternative is determined to regulate the ranking order of all alternatives. The higher value of closeness coefficient indicates that an alternative is closer to FPIS and farther from FNIS simultaneously.

Thus, the application of this method is according the following steps (Saghafian & Hejazi, 2005):

- 1) Form a committee of decision-makers, and then identify the evaluation criteria.
- 2) Choose the appropriate linguistic variables for the importance weight of the criteria and the linguistic ratings for alternatives with respect to criteria.
- 3) Convert linguistic evaluation into triangular fuzzy numbers and construct the fuzzy decision making matrix.

- 4) Aggregate the weight of criteria to get the aggregated fuzzy weight \tilde{w}_j of criterion C_j , and pool the decision makers' opinions to get the aggregated fuzzy rating \tilde{x}_{ij} of alternative A_i under criterion C_j ;

- Decision matrix method of aggregation, \tilde{R} :

$$\tilde{R} = (a, b, c), \quad k = 1, 2, \dots, K \quad \text{Eq. 4.8}$$

Where,

$$\begin{aligned} a &= \min_k \{a_k\} \\ b &= \frac{1}{K} \sum_{k=1}^K b_k \\ c &= \max_k \{c_k\} \end{aligned}$$

- Alternative matrix method of aggregation, \tilde{D} :

$$\tilde{x}_{ij} = (a_{ij}, b_{ij}, c_{ij}) \quad \text{Eq. 4.9}$$

Where,

$$\begin{aligned} a_{ij} &= \min_k \{a_{ijk}\} \\ b_{ij} &= \frac{1}{K} \sum_{k=1}^K b_{ijk} \\ c_{ij} &= \max_k \{c_{ijk}\} \end{aligned}$$

- Weight of criteria method of aggregation, \tilde{W} :

$$\tilde{w}_j = (w_{j1}, w_{j2}, w_{j3}) \quad \text{Eq. 4.10}$$

Where,

$$\begin{aligned} w_{j1} &= \min_k \{w_{jk1}\} \\ w_{j2} &= \frac{1}{K} \sum_{k=1}^K w_{jk2} \\ w_{j3} &= \max_k \{w_{jk3}\} \end{aligned}$$

- 5) Construct the decision matrixes for criteria, sub criteria and alternatives

$$\tilde{D} = \begin{bmatrix} \tilde{x}_{11} & \tilde{x}_{12} & \cdots & \tilde{x}_{1n} \\ \tilde{x}_{21} & \tilde{x}_{22} & \cdots & \tilde{x}_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ \tilde{x}_{m1} & \tilde{x}_{m1} & \cdots & \tilde{x}_{mn} \end{bmatrix}$$

$$\tilde{W} = \begin{bmatrix} \tilde{w}_1 \\ \tilde{w}_2 \\ \vdots \\ \tilde{w}_n \end{bmatrix}$$

- 6) Construct the normalized fuzzy decision matrix. To normalize each matrix, use the rule:

$$\tilde{r}_{ij} = \left(\frac{a_{ij}}{d_j^*}, \frac{b_{ij}}{d_j^*}, \frac{c_{ij}}{d_j^*} \right) \quad \text{Eq. 4.11}$$

Where,

$$d_j^* = \max_k (d_{ij})$$

Thus, the normalized weighted fuzzy decision matrix is obtained in the product of:

$$\tilde{R} = \tilde{D} \times \tilde{W}$$

Eq. 4.12

Matricially,

$$\tilde{R} = \begin{bmatrix} \tilde{x}_{11} & \tilde{x}_{12} & \cdots & \tilde{x}_{1n} \\ \tilde{x}_{21} & \tilde{x}_{22} & \cdots & \tilde{x}_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ \tilde{x}_{m1} & \tilde{x}_{m1} & \cdots & \tilde{x}_{mn} \end{bmatrix} \times \begin{bmatrix} \tilde{w}_1 \\ \tilde{w}_2 \\ \vdots \\ \tilde{w}_n \end{bmatrix} = \begin{bmatrix} \tilde{x}_{11} \times \tilde{w}_1 & \tilde{x}_{12} \times \tilde{w}_2 & \cdots & \tilde{x}_{1n} \times \tilde{w}_n \\ \tilde{x}_{21} \times \tilde{w}_1 & \tilde{x}_{22} \times \tilde{w}_2 & \cdots & \tilde{x}_{2n} \times \tilde{w}_n \\ \tilde{x}_{31} \times \tilde{w}_1 & \tilde{x}_{32} \times \tilde{w}_2 & \cdots & \tilde{x}_{mn} \times \tilde{w}_n \end{bmatrix}$$

7) Determine FPIS (S^*) and FNIS (S^-).

$$S^* = \{v_1^*, \dots, v_n^*\}, \text{ where } v_i^* = \max_i(v_{ij3})$$

$$S^- = \{v_1^-, \dots, v_n^-\}, \text{ where } v_i^- = \max_i(v_{ij1})$$

8) Calculate the distance (d_v) of each alternative from FPIS and FNIS, respectively using:

$$d_v(\tilde{m}, \tilde{n}) = \sqrt{\frac{1}{3}[(m_1 - n_1)^2 + (m_2 - n_2)^2 + (m_3 - n_3)^2]}$$

Eq. 4.13

Where,

$$d_i^* = \sum_{j=1}^n d_v(\tilde{v}_{ij}, v_j^*), i = 1, 2, \dots, n$$

$$d_i^- = \sum_{j=1}^n d_v(\tilde{v}_{ij}, v_j^-), i = 1, 2, \dots, n$$

9) Calculate the closeness coefficient of each alternative, using:

$$CC_i = \frac{d_i^-}{d_i^* + d_i^-}$$

Eq. 4.14

10) According to the closeness coefficient, determine the ranking order of all alternatives.

4.4. Summary of contributions to this thesis

The contribution of this chapter is to provide the adequate model to deal with interoperability terms which are difficult to assess by conventional models of operations research. These models are dichotomous, deterministic and precise in character, but to evaluate real situations it is needed to apply decision-models that deal with uncertainty or vagueness. Fuzzy Sets and AHP decision-models are two approaches that deal with immeasurable terms in two separate forms. Fuzzy deals with the vagueness and imprecision of human reasoning by translating linguistic terms, evaluated in an absolute scale, into fuzzy numbers, which have a certain degree of membership, that makes possible to affirm that one specific item can simultaneously belong to one set and/or another, depending on its degree of membership. The ability of dealing with vagueness and imprecision fits with the interoperability parameters characteristics, making possible to decision-makers evaluate through their events perception.

In other hand, AHP is another method to deal with vagueness. It uses a methodic computation to transform pairwise comparisons into mathematical scores. It differs from fuzzy approach in the relative scale used. Instead of absolute scale evaluation, it makes pairwise comparisons making possible for decision-makers establish a relationship between criteria or alternatives leading to the assignment of weights.

In sum, these two models fit the decision problem and are applied in the present methodology due to each characteristic. Fuzzy is a direct approach making use of a relative scale which depends on fewer

inputs and, also, makes possible to establish classes to evaluate the output. AHP, in turn, is a more sensitive and systematic approach that deals adequately with imprecise information, by making comparisons.

5. Methodology for interoperability analysis

5.1. Problem definition and scope of activity

The ultimate SCM results in an effective and efficient integration of information, material and transactional flows seamlessly across the supply chain as an effective competitive asset. Thus, this is reflected in SC overall competitiveness which, indirectly, affects the individual organisation performance and, consequently, the performance of whole supply chain. The present work follows the conceptual framework proposed in Figure 5.1.

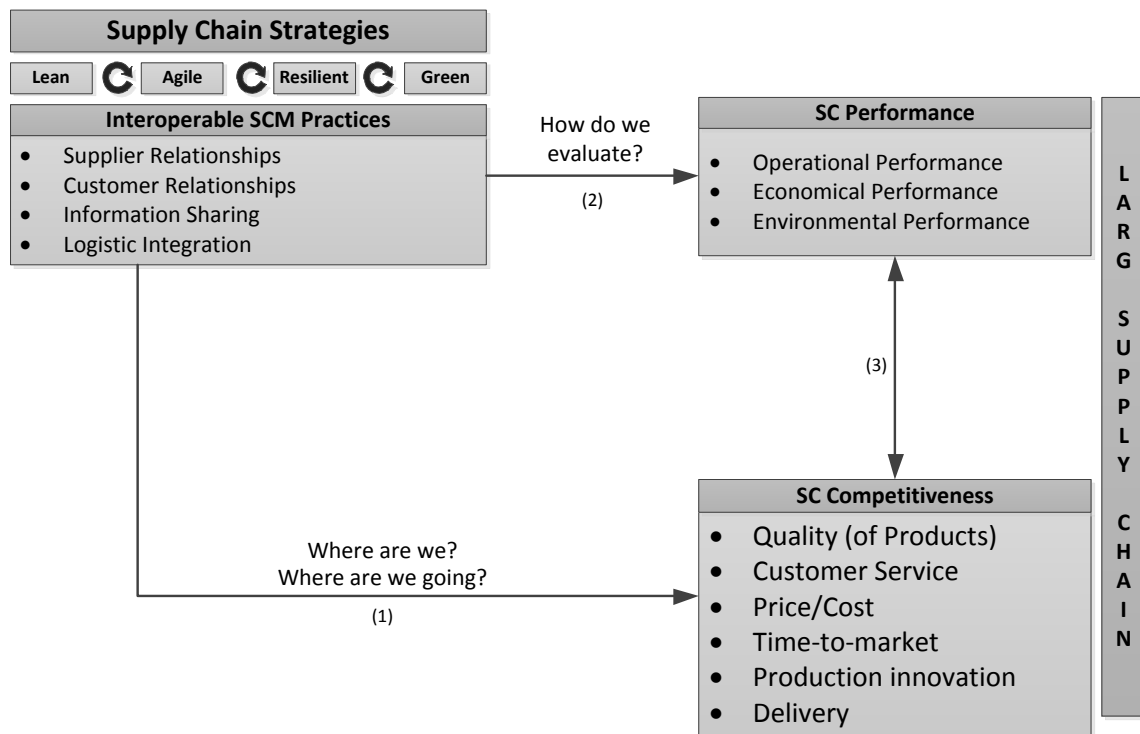


Figure 5.1. Conceptual framework proposed.

Lean, Agile, Resilient and Green SCM strategies aim at the upmost competitiveness, translated in the correct integration between supply chain strategy and corporate strategy which creates sustainable competitive advantages against competition. Supply Chain Competitiveness (featured in branch (1) of Figure 5.1) aims at various objectives, which marks SC position in global market when facing competitors supply chains. Customer is the main focus of the supply chain. The ability to respond to customer needs quantities and in the adequate price, the requirement for innovation and quality are the main requirements of the any supply chain to strive against business competition. In SC competitiveness section of Figure 5.1 are featured Quality, customer service, price/cost, time-to-market, product innovation and delivery as key strategic goals to position SC against competitors. They resume the requirements of any SC to answer all the main challenges to respond to customer needs and to face competing SC's.

For the purpose of the present work only customer service and quality are addressed. It is focused only activities that add value to customer in terms of products and services. These activities relate with companies capability to provide the goods with the adequate requirements for customer. I.e., they depend directly on the alignment of business processes and logistics activities between SC actors.

Time-to-market, product innovation and price or cost is not directly relevant to the assessment of interoperability among SC partners. They depend on a deeper study to evaluate the how practices interoperability can affect the ability to develop new products. However, the capability to introduce and develop new products is not easily measurable in short term and price/cost and delivery capabilities are not approached in this model because of their complexity and they depend on specific details of each company, which don't fit the purpose of the current work.

The current work intends to be suitable for a generic automotive supply chain with the appropriate characteristics to develop goods (automobiles) to customer with quality in the appropriate volume and in the correct time. The capability to introduce new models (time-to-market) is not addressed, because it is intended to consider a steady-state production scenario and not the development capabilities. It is considered only the collaboration scenario that can contribute to demand capture in terms of volume and in terms market needs.

The management of supply chains is achieved by means of SCM practices that are defined as a set of activities undertaken by organisations to promote effective management of its supply chain. The practices of SCM are proposed to be a multi-dimensional concept, including the downstream and upstream sides of the supply chain. The framework proposes that SCM practices will have an impact on overall supply chain competitiveness which influences directly and indirectly the supply chain performance. From section 3.4.1 to section 3.4.4 various LARG practices are presented that aim at the ultimate LARG SCM. Those are the focus of this methodology.

The activities between actors in supply chains are affected by interoperability. The coordination of strategic goals, operational activities, collaboration scenarios and homogeneous exchange of information are the key objectives to achieve the interoperable LARG supply chain. In this context, it is considered that interoperable LARG SCM practices have four dimensions (see Figure 5.2): supplier relationships, customer relationships, information sharing and logistics integration.

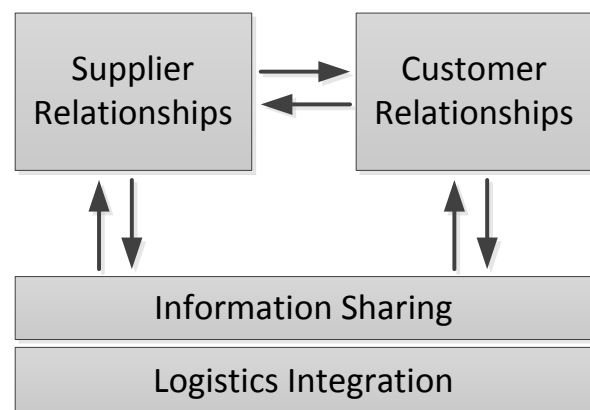


Figure 5.2. Dimensions of interoperable LARG SCM Practices.

These dimensions encompass the upstream (supplier relationships) and downstream (customer relationships) perspectives of supply chain, and the flow of information (information sharing) and material (logistics integration) between actors.

These supply chain perspectives are aligned with the business interoperability drivers (BIP's). The BIP's presented in section 2.7.5.4 rule the interaction of organisations from transactional levels to top strategy levels of the supply chain.

Hence, the research question that arises in this work is: "how to achieve maximum competitiveness in LARG supply chains through improved interoperability activities between supply chain partners?"

5.2. Interoperability assessment methodology

The present methodology follows the first branch presented in the framework in Figure 5.1. This consists in the first approach of assessing interoperability. The suggested model answers the research question, proposing a subjective information analysis model that helps to assess and distinguish two situations: ideal (I) and actual (A). Representing this situations as “Where are we going?” and “Where are we?”, respectively, represents the upmost ideals of what is desired and how good are we in terms of competitiveness in supply chain. With those situations, it is intended to put in scale how do LARG supply chains are managed, and what is it’s correlation with the expectation for the future.

The other branch of the framework is not addressed in the present methodology. These fields of research are explored in future work (see section 7.2).

Thus, the proposed interoperability assessment is done having in consideration two strategic questions “Where are we going?” and “Where are we?”, whereas managers and decision-makers can gauge between the present situation and the desirable situation for SCM. Like mentioned before, the effective management of supply chain is achieved by terms of practices. The current implementation of supply chains determines how LARG strategies are applied, and how competitive SC it is. Thus, the position of practices in supply chain is the means to achieve competitive and high performance of SC. However, the problem within it is interoperability between supply chain actors. The interoperability parameters are the driver of all the activities, known in SCM as practices, where cooperation is taken place in B2B perspective, using IT to support transactions. In sum, from the contributions remarked on 2.7.5.4, we can generalize the drivers of interaction between actors as it is represented in Figure 5.3.

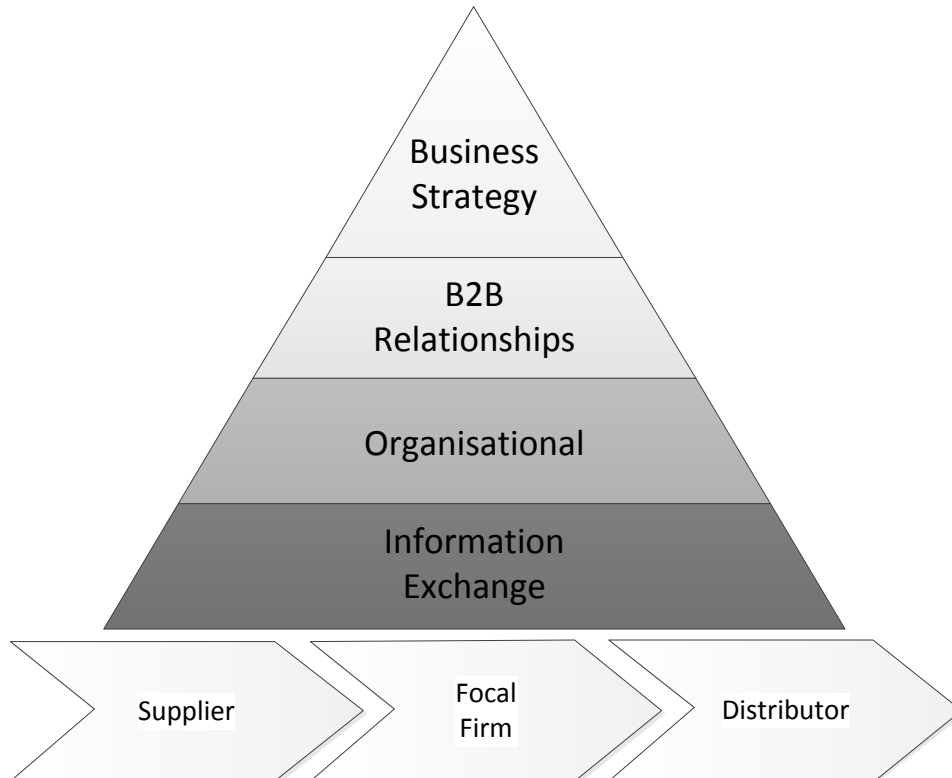


Figure 5.3. Interoperability SCM drivers.

The four main levels of interoperability rule supply chain interactions:

Level 1. Information Exchange:

Information exchange is remarked in every activity between actors. Independently from the kind of ICT that supports business transactions, information must be exchanged to achieve goals. For instance, when an order is placed, logistics departments are put in contact, to know about inventory, production schedules, component details and delivery time. To this purpose, three main areas are affected: Information Systems (IS), Business Semantics (BSe) and Intellectual Property Rights management (IPRm). In Information Systems, independently of its complexity, is the support for information. It constitutes the basic structure for information exchange (syntactic interoperability). The key items to deal in this area are the data exchange tools (IS₁), speed (IS₂), application interoperability (IS₃) and security (IS₄). These areas aggregate the multiple options in terms of communication and information support, thus, speed, security and ability to interact with other systems (in case of IT supported communications and engineering applications).

In terms of Business Semantics, information exchanged between actors must be comprehensive, and trade in the same terminology, independently of the internal terminology applied for each business activities. In cases of lack of business semantic interoperability, occur terminologies in conflict (conflicting terminologies - BSe₁) and the need to convert terms (semantic conversion – BSe₂).

Parallel to structural and semantic characteristics of information exchange, legal issues and Intellectual property rights regulate the kind of information exchanged. Thus, the IPR management deals with legal regulations and imposed information disclosure from partners, by acting in: background IPR protection (IPRm₁), foreground IPR (IPRm₂) and conflicts (IPRm₃).

Level 2. Organisational:

The level 2 of interoperability in SCM is the pillar for the organisation. Organisational structures (OS) and employees and work culture (EWC) are considered both the architecture and the players of the roles inside companies. In the structural perspective, OS describes the way activities are taken place inside the company. However, independently of the structure, is the interaction between organisations is affected by how easy is to follow up information, activities, material and currency between departments (cross-organisational mapping – OS₁) and which person to contact for each matter (contact points – OS₂).

In other hand, employees and its work culture are the most fundamental piece in each organisation. Independently of the complexity and the level of technology of business, every business is achieved by employees. Thus, in this matter it is need to deal with cultural issues, such as language (linguistic barriers – EWC₁) and particular and inherent characteristics of individuals, like motivation (EWC₂), responsibility (EWC₃) and honesty (EWC₄).

Level 3. B2B Relationships:

Business interaction between peers in supply chain is a fundamental aspect to SCM, since its activities have high integration depth to keep information and material flows. Thus, the management of relationships (MER) and the design and establishment of collaborative business processes (CBP) are the two main areas of concern. The partner selection and evaluation (MER₁), the formalisation of cooperation contracts (MER₂), the communication (MER₃) and conflict resolution (MER₄) during

cooperation are the main fields of action during the management of a relationship. In other hand, during cooperation, the collaborative business process marks the activities itself. They depend on a contract that regulates the responsibility roles of each actor (CBP₁) and the visibility of business processes (CBP₂) taken by each actor.

Level 4. Business Strategy:

The top level, Business Strategy (BS), is considered the ultimate aspect of interoperability in terms business. Strategy reflects both vision and mission of what defines a companies' business and what overall objective is for future. Despite the strategic goal of each company, supply chain strategy must be at top level of any company activity. Therefore, there must be a clear understanding of strategic goals (BS₁) throughout partners and must have in count the influence of strategy in cooperation breakdown (BS₂).

5.2.1. SCM Practices selection method

The four above mentioned levels of interoperability are the drivers that help to assess LARG SCM practices. The next step to model is to define which practices can be assessed in the present methodology. In Figure 5.2 are presented the main focus of interoperable SCM practices. In order to make an assessment in SC Interoperability, it is needed to establish which practices depend on collaboration between actors. Thus, the practices mentioned on sections 3.2.1, 3.2.2, 3.2.3 and 3.2.4 were first classified according to the four dimensions of interoperable practices in Table 5.1.

Table 5.1. LARG Practices classification according to interoperability dimension.

Dimension of interoperable LARG SCM Practices	SCM Practices			
	Lean	Agile	Resilient	Green
Supplier Relationships	L ₁ , L ₅ , L ₇ , L ₈ , L ₉ , L ₁₀ , L ₁₁ , L ₁₃ , L ₁₇ , L ₂₈ , L ₄₉	A ₁ , A ₂ , A ₈	R ₁ , R ₂ , R ₃ , R ₄ , R ₅ , R ₇ , R ₈ , R ₁₀ , R ₁₄ , R ₁₈ , R ₂₀ , R ₂₁	G ₂ , G ₃ , G ₄ , G ₇ , G ₁₀ , G ₁₅ , G ₁₉ , G ₂₀ , G ₆₁
Customer Relationships	L ₅ , L ₄₁ , L ₄₁ , L ₄₇	A ₁₉ , A ₂₁	R ₂ , R ₅ , R ₁₀ , R ₁₈ , R ₂₁	G ₂ , G ₂₀ , G ₅₂ , G ₅₃ , G ₅₄ , G ₅₇ , G ₅₈ , G ₆₁ , G ₆₄
Information Sharing	L ₁₃ , L ₁₄ , L ₁₇	A ₅ , A ₆ , A ₇ , A ₁₈	R ₂ , R ₅ , R ₈ , R ₁₈ , R ₂₀	G ₃ , G ₄ , G ₆₁ , G ₆₄
Logistics Integration	L ₁ , L ₄ , L ₂₈	A ₁ , A ₂ , A ₆ , A ₁₉	R ₅ , R ₈ , R ₁₀ , R ₁₄ , R ₂₁	G ₁₉ , G ₆₁

Amongst LARG practices from literature revision were identified 52 practices that involve interaction between peers. For these practices, the current model is applicable to determine the level of interoperability and in each parameter they have best performance. However, in SCM is common to apply a multitude of practices applied simultaneously. That makes hard to make such intensive study of interoperability, and we need to reduce significantly the assessment to practices that have a more important paper in supply chain. The suggested form to do it passes from checking the practices

according to degree of implementation and, then, applies Pareto's Law to reduce the spectrum of practices according importance. The first step of selection is to classify practices according to degree of implementation for each SC actor in eight degrees of implementation. They intend to represent the value of practices to current business activities. Pareto's law is applicable for selection, thus it can classify practices according to its value according to implementation degree, selecting twenty per cent of the practices that represent the highest degree of implementation (eighty per cent). However, there are few limitations to application of Pareto's law. For instance, if there are many practices classified as "completely implemented", the rule will select a lot of practices. This restrings the simplification. The solution may be to input other criteria of selection or apply a more refined decision-model like AHP or Fuzzy Sets.

5.2.2. Definition of the decision-model

With the previous considerations, to make the interoperability assessment is needed to construct a decision model that aims at upmost supply chain competitiveness, through interoperable SCM practices. Thus, the end is SC competitiveness, achieved by SCM practices which are driven by interoperability among actors. So, interoperability parameters are considered the criteria in which we can evaluate the practices performance when management supply chain. As a result, was built the model presented in Figure 5.4.

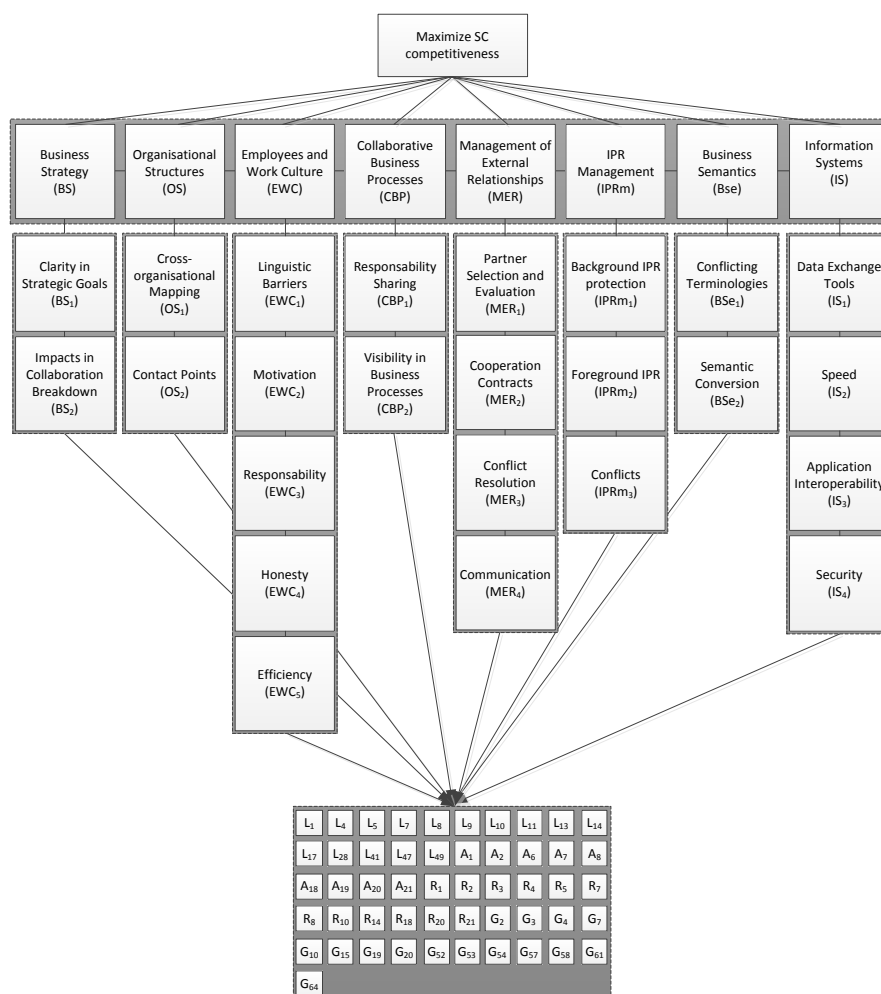


Figure 5.4. SCM Practices interoperability assessment model.

In top level it is the main objective of SCM: maximize SC competitiveness. The objects of study, the practices, are the focus of the model which is assessed according to interoperability criteria. To make this assessment it is intended to obtain two perspectives: the ideal and the actual interoperability level. The expected result is to obtain both analyses for how interoperable actors are and how interoperable they should be. Output have form of ranking, disposing most interoperable to less interoperable allowing managers and actors to view, criteria by criteria, the performance of practices.

5.2.3. Definition of the target

The target of study is the basic unit of every supply chain: first tier actors (see Figure 5.5). Due to complexity of supply chain, the first approach to SCM interoperability should focus on dyadic perspectives. Thus, the application of the model focuses on 1st tier suppliers, the manufacturer and 1st tier distributor. Due to the closeness of peers in the 1st tiers, it's easier to track information and material flows in dyadic perspectives. Many articles published in SCM area address upwards and downward streams in 1st tier. However, a more extensive approach is currently lacking, and there is a limitation to the study because it is not easy to map information and material in all the supply chain, since raw material providers until the hands of final customer. In terms of interoperability, it is rather challenging to conceive a model that equates this streams using all entities of supply chain, and to understand how (lack of) interoperability affects each business transaction, information exchange, material flow and how far are we from our goals when previous tiers lack interoperability. Consequently, the present methodology focuses on dyadic relationships, addressing supply chain professionals from supplier, focal firm and distributor as the decision-makers to assess interoperability.

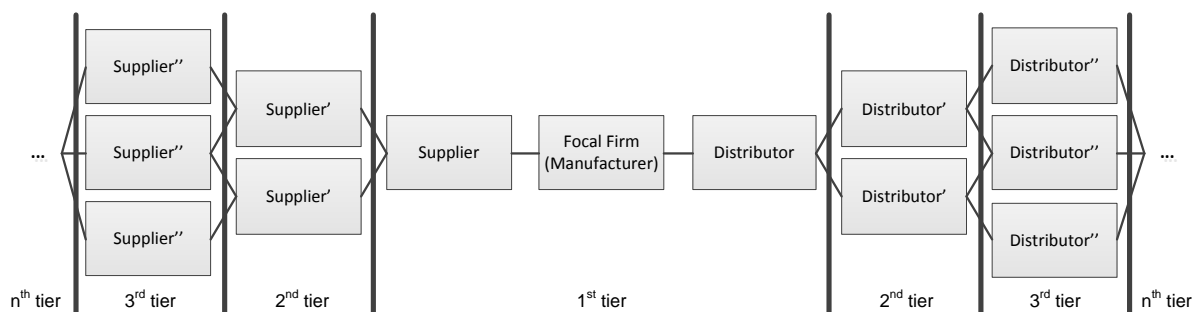


Figure 5.5. SC structure by tier.

In sum, the proposed steps for this methodology are:

1. Establish a decision group formed by members of the target supply chain;
2. Classify SCM practices by degree of implementation;
3. Select most implemented practices using Pareto's law;
4. Evaluate interoperability parameters according to desired performance to achieve SC competitiveness (I) and to actual level of interoperability (A);
5. Evaluate the practices implementation, having in consideration their performance in terms of each interoperability parameter in I and A perspectives;
6. Compute data according to decision-models to obtain rankings;
7. Analyse results having in consideration: each decision-maker (SC actor), each interoperability parameter and overall scores;

8. Act on practices that caress interoperability.

Inherent to the indicated steps, is crucial to construct the decision-model that will support the methodology. The critical steps in modelling are the mathematical support, which is presented in subjective information models in Fuzzy Sets and AHP, and the data input modelling, through form of questionnaire. The reason for choosing subjective information decision-models is that the assessment is based in professionals' opinions about their perception of interoperability in supply chain. Sections 5.2.4 and 3 address the subjective information modelling from the construction of the mathematical model to the conversion of judgments into crisp data and, then, the computation to obtain objective data. Thus, fuzzy environments and pairwise comparisons are one way to convert subjectivity in objective data that allows be analysing and converting in practical conclusions.

Data input of subjective information is another key stage to this methodology definition. It is necessary to convert interoperability criteria into form of question, applicable to write questionnaires with the adequate terminology to judge practices implementation. The challenge in this step is the creation of the proper terminology so that, simultaneously, recognize the criteria and who interoperability environment that governs the practice guideline evaluation. More challenging is the creation of AHP model that compares the application of practices taking into account certain criteria for interoperability. Here, we play with different environment and with the same guidelines, making it difficult to put a single question one way to evaluate and compare the same guideline in different actions. Section 3 describes detailed information how criteria and practices where modelled in form of questionnaires.

5.2.4. Proposed Fuzzy Sets model

The first proposed approach to assess interoperability is achieved by the application of a fuzzy sets model, using an extension of the TOPSIS applied to fuzzy environments. The adequacy of this decision-model to interoperability is motivated by the difficulty of judging practical situations, such as the implementation of SCM practices, which are due to professionals' opinions when managing the supply chain.

In section 5.2 is described the application to a generic decision situation. In the present section will be described the critical steps that characterize the fuzzy decision problem: identification of decision makers, provided linguistic variables to assess interoperability criteria and SCM practices, how to evaluate computed data in practical judgments and how to calculate the percentage of deviation of A to I situations.

5.2.4.1. Identification of Decision-makers, individual judgments and aggregated judgments

The desired decision-makers for the methodology would be the actors of the 1st tier of SC. Thus, each actor representative should be coded as D_x , where x is the number of the decision-maker. With the data from each decision-maker it is intended to make two assessments: individual judgments perspectives and group perspective.

The aggregation of individual judgments is crucial to obtain an overall assessment. Step 4) of section 4.3.6.1 provides the adequate equations to mix decision-makers opinions into one group decision.

5.2.4.2. Linguistic variables to assess interoperability criteria and SCM practices

To assess each interoperability situation I and A , it is suggested to use two different scales. The first scale to evaluate I situation is presented in Figure 5.6. It is intended to rate interoperability from very low (VL) to very high (VH) interoperability for the ideal situation.

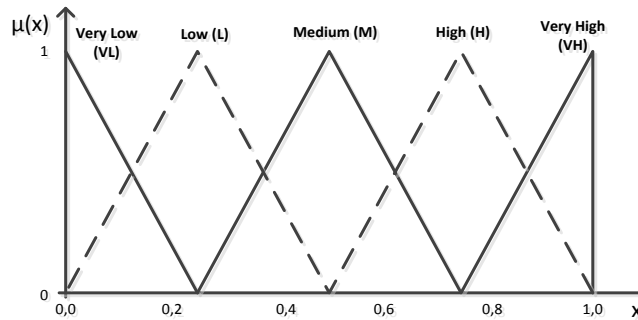


Figure 5.6. Linguistic variables for ideal interoperability (I) of criteria and SCM practices.

For the actual situation (A), it is intended to assess the current performance of practices, classifying since very weak (VW) to very good (VG) interoperability (see Figure 5.7).

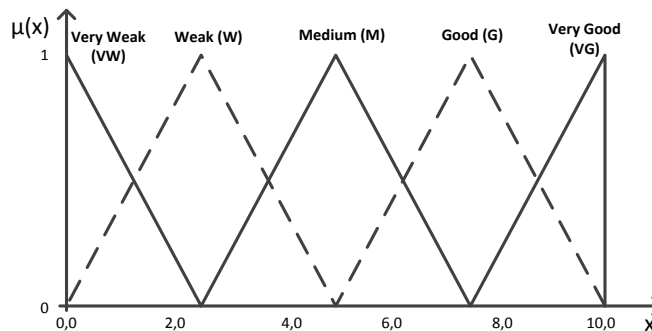


Figure 5.7. Linguistic variables for actual interoperability (A) of criteria and SCM practices.

5.2.4.3. Interoperability degree for computed data evaluation

After ranking the SCM practices using the fuzzy sets model, the interoperability of each practice is classified according to the degrees presented in Table 5.2.

Table 5.2. Interoperability degree classification.

Class	Range of CC_t	Interoperability degree
I	[0,0; 0,2]	Null
II	[0,2; 0,4]	Low
III	[0,4; 0,6]	Average
IV	[0,6; 0,8]	High
V	[0,8; 1,0]	Very high

Depending on the decision-makers judgments, each practice is classified from I to V, indicating that the level of interactions between peers is null to very high.

5.2.4.4. Deviation percentage

The suggested form to compare between situations I and A is through Eq. 5.1. In this equation, independently of the degree of interoperability for the current situation, it is put in scale how far we are from the desired degree of interaction.

$$\%Deviation = \frac{I - A}{I} \quad \text{Eq. 5.1}$$

5.2.5. Proposed AHP model

Analytical Hierarchy Process (AHP) is another decision-making model that fits the purpose of the current methodology. To deal with subjective information, pairwise comparisons make possible to judge criteria and alternatives through a relative scale of importance. Using the same structure of the presented model (Figure 5.4), the objective of the AHP model is to make pairwise comparisons between interoperability criteria, sub-criteria and SCM practices in order to establish the final ranking of practices according to their interoperability degree. To this purpose, the critical steps noted in the construction are:

1. Identification of decision-makers - similarly to Fuzzy Sets model, decision-makers are identified among SC actors;
2. Aggregation of group decision - group decision criteria is used according to Eq. 4.6 on section 4.1.3;
3. Criteria, sub-criteria and practices modeling and computation of decision matrixes – made according to 2) in section 4.1.1;
4. Determination of inconsistency problems – calculated according the description in 4.1.2.
5. Obtain ranks for the practices, according to decision-maker, group decision and, for each, analysis for each criteria and sub-criteria – To establish rankings, it is applied the Eigenvector method (see step 4) in section 4.1.1);
6. Compute I and A situations results according to Eq. 5.1.

5.3. Comparison of decision methods

The reason for presenting two alternatives for the assessment model is the question of quickness versus complexity in the application of models to practical situations. In one hand, fuzzy sets model is simpler and quicker to apply, because it depends on absolute scale evaluation resulting in less inputs than AHP which, in other hand, depends on comparison of terms, which can be more accurate, but harder to apply.

In terms of inputs, considering the full model implementation (without excluding criteria, sub-criteria and practices), the amount of data needed is presented in

Table 5.3.

Table 5.3. Inputs comparison between fuzzy sets and AHP models.

Stage of evaluation	Number of terms	Fuzzy sets	AHP
Criteria	8	8	28
Sub-criteria	23	23	253
SCM Practices	51	51	1275
Total	82	82	1556

From the data presented, it is notorious the great complexity of the model application form in AHP. Even for the number of inputs fuzzy model leads to the need to refine the number of input data. To this end, the suggestion is in two paths:

1. Refine number of criteria and sub-criteria according to purposes of the target. For instance, decision models or Pareto's law are feasible to reduce criteria to the number of most relevant interoperability criteria to SC objectives and, then, apply one or both decision models.
2. Apply first fuzzy sets, due to its simplicity and reduced number of inputs and, then, with the analysis of the most relevant interoperability criteria (i.e., the ones that are more affected by lack of interoperability), apply the AHP model for those of the more interoperable criteria and practices to obtain more refined results.
3. In sum, the application of the methodology follows the diagram presented in Figure 5.8. This diagram starts with the purpose of assessing interoperability in LARG SCM, and describes if one or both models are applied, and how to refine criteria and results.

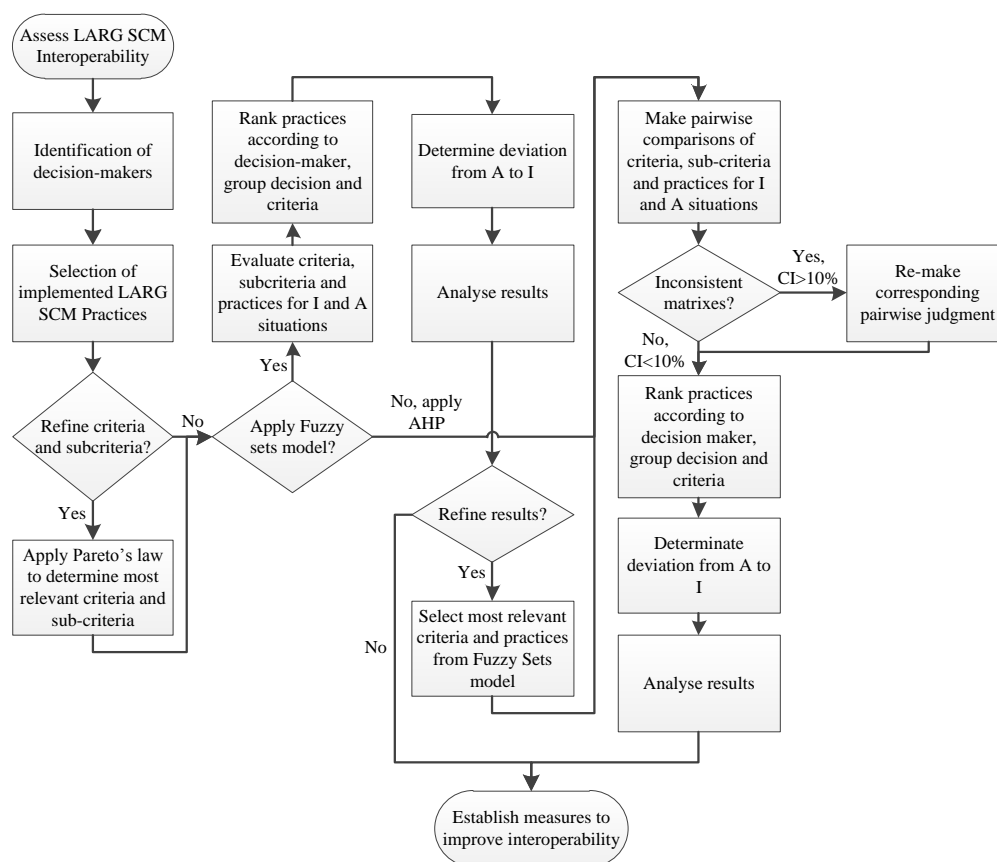


Figure 5.8. LARG SCM interoperability assessment methodology application diagram.

5.4. Data input – design and modeling of questionnaires

To make the assessment, data is required to feed decision-models with adequate inputs. As has been mentioned before, the kind of input is subjective information. Judgments of managers about the implementation of SCM practices and interoperability drivers (criteria) that rule them are the main input for the two models. However, there is quite a challenge in modeling questions for the purpose of SCM. It is needed to know how practices are implemented, and how interoperability drivers are present in each practice. Thus, the development of input forms was taken in several stages, generating various versions that led to the ultimate automotive SCM dedicated questionnaire applied in the case study (chapter 6). The present section addresses the design and development of questionnaires appropriate to each model, referring to the various stages of versions of questionnaires, in annexes 1, 2,3 and 4, and the main considerations for each input to model: identification of decision-makers, practices selection, fuzzy sets and AHP models.

5.4.1. Identification of decision-makers

To identify respondents when obtaining data is crucial to capture the positioning of his opinion in the overall SC, when put in relation with the focal firm. The perspectives of the interoperability scenario are relevant to map business interoperation problems along SC. Thus, for the purposes of the applicability of the methodology, was considered a radio group diagram to sign with the position of the inquiry (see Figure 5.9).

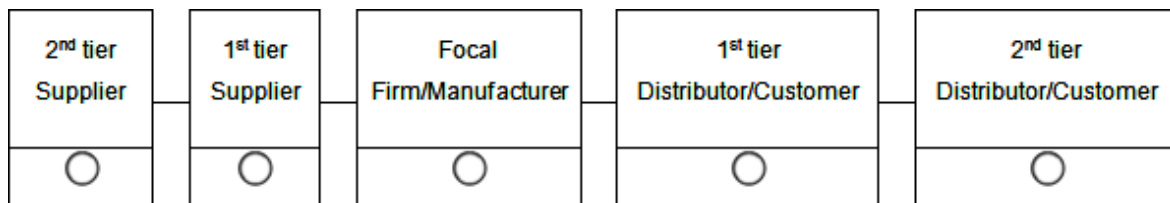


Figure 5.9. Placement of the company in the supply chain.

Further data collected provide the information needed to characterize the company and its supply chain. For this purpose, it is suggested to collect: company's name, country, activity area, main products and title of the inquired person (see field A in annexes 1, 2, 3 and 4).

5.4.2. Practices selection questionnaire

In section 5.2.1 was addressed the method to select implemented SCM practices. To serve this method, was created the questionnaire named "Practices selection" (see annex 1) which applies the following scale format to gauge the implementation degree (see Figure 5.10).

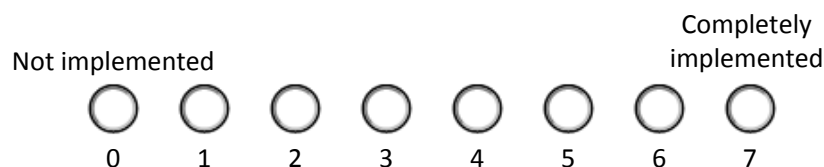


Figure 5.10. Degree of implementation of SCM practices.

5.4.3. Fuzzy Sets LARG SCM interoperability assessment questionnaires

To apply fuzzy sets model, the main input are the evaluations of criteria, sub-criteria and practices in an absolute scale. The scales used correspond to the linguistic variables designed for ideal and actual situations, gauged in the scale presented in Figure 5.11.

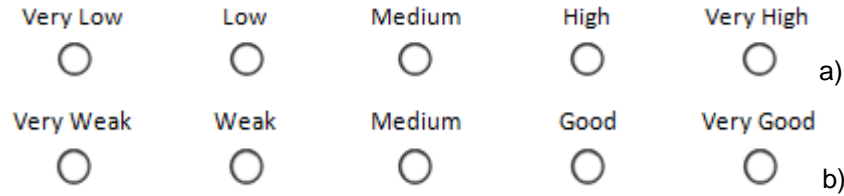


Figure 5.11. Fuzzy Sets scales to evaluate ideal (a) and actual (b) interoperability.

In terms of questions dedicated to practices and interoperability criteria where followed two questionnaire approaches. The first questionnaire approach extensively described each term in its application perspective. For instance, to assess ideal situation of the collaborative business processes (CBP) was elaborated a question (see section B of annex 2) that addresses interoperability terminology by referring the situation whereas CBP aspects occur. Further, in accessing practices, was provided the sub-criteria as consideration items to assess overall CBP criteria, which state the conditions we have to consider in the implementation of practices.

Second questionnaire approach resulted in a more simplified view of the application of practices in the supply chain. The same question of the previous example was condensed, and the terminology was simplified to “joint business processes” (see section B and D in annex 4).

5.4.4. AHP LARG SCM interoperability assessment questionnaires

AHP input data was the most challenging input to model. Due to the complexity of the subject, and the pairwise comparison resulting in 17 degrees of importance, many design approaches to questions where tested and applied to obtain a simpler and more condensed form.

Similarly to fuzzy sets, the first approach consisted in a full description of the interoperability perspectives in business context and their vision of the SCM practices. As a result, first version of questionnaire was developed, following the structure of Figure 5.12.

B. Avaliação de parâmetros de interoperabilidade:

B.1. Importância dos Processos de Negócio Colaborativos face aos Sistemas de Informação para aumento da competitividade da cadeia de abastecimento:

1 B.1.1. Numa situação ideal, qual o critério que considera mais relevante para o aumento da competitividade da cadeia de abastecimento?

2 ☐ Processos de negócio colaborativos ☐ Sistemas de Informação

3 Avalie o grau de importância do critério escolhido, face ao critério não escolhido, tendo em vista o seu contributo para **aumentar a competitividade da cadeia de abastecimento**. Utilize, para o efeito, a escala fornecida abaixo.

4 Igual 1 2 3 4 5 6 7 8 9 Extrema

Tenha em mente que:

- Em relação aos **Processos de Negócio Colaborativos**, na maioria das empresas, os processos de negócio comuns aos parceiros têm de ser alinhados de forma a conciliar objectivos e tarefas. Inerentes a estes processos, estão a dificuldade de definir quais as **fronteiras de responsabilidade**, a **transparência da informação** e a **clareza com que são explicados os processos**.

- Os **Sistemas de**

Description:

1 – Question addressing situation, referring to objective (AHP goal where criteria are compared or interoperability criteria where practices are compared).

2 – Criteria/practices to compare.

3 – Description of situation where interoperability criteria is present.

4 – Importance scale from 1 to 9.

5 – Additional information to Explain the interoperability parameter in question.

Figure 5.12. Example of question for AHP interoperability assessment (see Annex 3).

The main concern of having full description of each environment whereas BIP's are present is the dimension of the questions. This version of AHP question was applied in the focal firm from the case study (chapter 6), in which remarked the output of being too much extensive and it was adequate a more simplified and condensed questionnaire. Thus, the following approximations to the questionnaire tried to simplify either terminology, aggregating descriptions of interoperability into fewer terms, and design. The two design approaches are presented in Figure 5.13 and Figure 5.14.

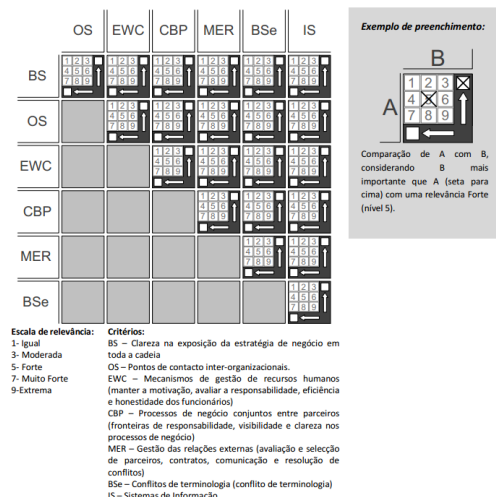


Figure 5.13. Example of comparisons for AHP interoperability assessment.

In second version of AHP compact information of matrixes in a major matrix. For instance, for criteria comparison (see Figure 5.13), when comparing BS with OS, is marked which one is more relevant in the arrows and, then, is marked how relevant is it over the other in the scale 1 to 9. Additional information, at the side and bottom, describe the use of diagram and the meaning of acronyms. To test this design, the questionnaire was presented to academic researchers to validate it. Therefore, this design was considered confusing and professional in SCM would have difficulty to understand.

The outcome of the previous considerations led to change in terminology applied, and to a more visible form to make pairwise comparisons. The suggested form is presented in Figure 5.14, where items are compared side by side and, using importance scale represented in a chromatic scale, is marked the relevance of an item over another.

	Extrema	Muito Forte	Forte	Moderada	Igual	Moderada	Forte	Muito Forte	Extrema	
Pontos de contacto interorganizacionais	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Motivação, Honestidade e Responsabilidade dos RH
Pontos de contacto interorganizacionais	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Processos de Negócio Colaborativos com o parceiro
Pontos de contacto interorganizacionais	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Gestão das Relações Externas
Pontos de contacto interorganizacionais	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Conflitos de Terminologia
Pontos de contacto interorganizacionais	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Adequação dos Sistemas de Informação
Gestão das Relações Externas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Conflitos de Terminologia
Gestão das Relações Externas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Adequação dos Sistemas de Informação

Figure 5.14. Example of comparisons for AHP interoperability assessment (see Annex 4).

6. Case study

The present case study was developed on the automotive supply chain whereas Volkswagen Autoeuropa is the manufacturer of Volkswagen group models Sharan, Scirocco and Eos. The objective of the application of this methodology in this SC is either to test decision models in order to improve it and scale up to a higher model and to assess interoperability in order to get to practical solutions that could be applied in business environment.

6.1. Volkswagen Autoeuropa SC characterization

Volkswagen Autoeuropa (Focal Firm – FF) is a Portuguese manufacturer which belongs to Volkswagen group responsible for building family class automobiles. Located in Palmela, Portugal, VW Autoeuropa started their activity in 1991, with the joint ventures of VW Sharan, SEAT Alhambra and Ford Galaxy, however it was only in 1995 that their effective production has taken place. The main products along history are presented in Figure 6.1.

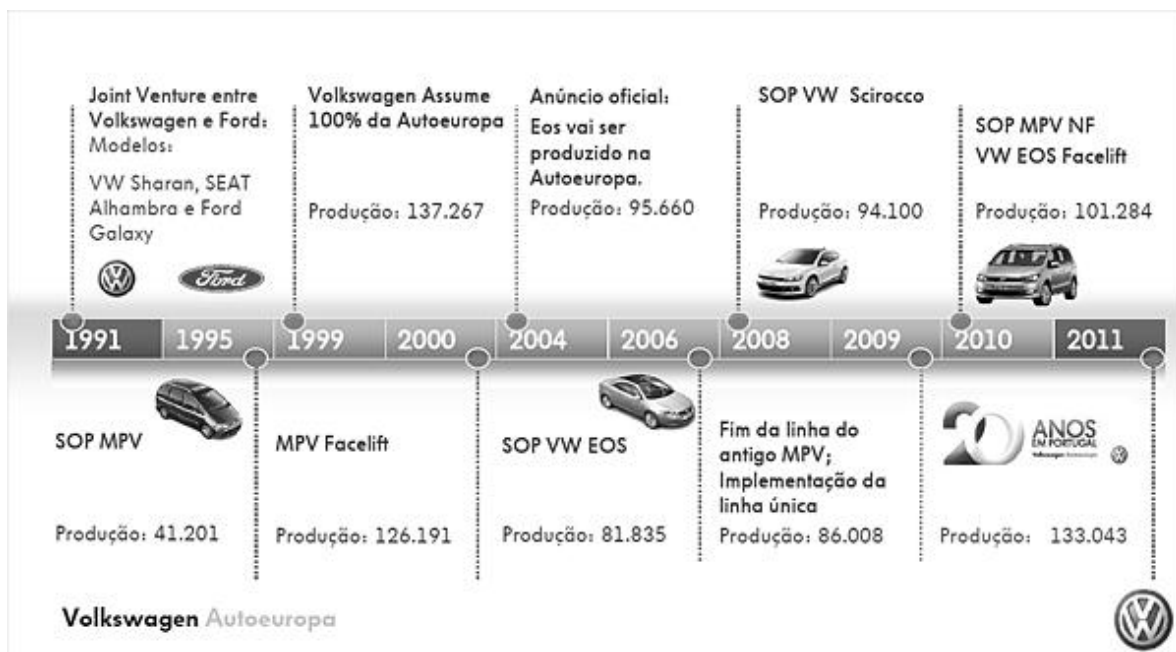


Figure 6.1. Production history of Volkswagen Autoeuropa (Volkswagen Autoeuropa, 2012).

Currently employing 3,603 people (400 more than 2010, with average age of 38), this company was responsible to produce 133,100 automobiles in 2011, representing a recipe of 2,246 million of euros with a 98.9% of exportations. The role of VW Autoeuropa on Portuguese economy oscillates around 1% of the Gross National Product (GNP).

Regarding the supply chain of this focal firm, the company has 671 suppliers, of which 660 are European, following the geographical distribution: Portugal – 12; rest of Europe – 581; rest of the world – 78. Distribution and vehicle sales are done by SIVA (for models VW Sharan and VW Eos) and Seat Portugal (for SEAT Alhambra). VW Scirocco is an exclusive model produced only by this company but not sold by directly by Portuguese companies.

For the purpose of this case study, the intention was to focus on dyads between focal firm and suppliers located in Industrial Park of Palmela. However, due to unavailability of the suppliers to attend

to interviews and respond to questionnaires in time, the present case was applied only in the VW Autoeuropa focusing on its vision above and below the SC.

6.2. LARG SCM practices selection

The LARG SCM practices selection is an outcome of the work developed in LARGeSCM project. Previous field work developed by (Carvalho, 2011) on the presented automaker made possible to verify what practices are currently applied by suppliers and manufacturer. Thus, this work contributed to establish main practices to assess in the current methodology. However, few changes occurred in terminology from the proposed practices in 3.2.1, 3.2.2, 3.2.3 and 3.2.4. For the purpose of the VW Autoeuropa, some practices were grouped in one common definition that encompasses hybrid combinations of LARG. Table 6.1 refers to the selected practices and the used hybrid definitions.

Table 6.1. Practices correspondence between LARG SCM Practices and hybrid practices applied in VW Autoeuropa.

Previous designation (symbols)	Used in VW Autoeuropa	Symbol	SCM Strategy
G ₄	Environmental collaboration with business partners	P ₁	Green
G ₆₁	Reverse logistics	P ₂	Green
L ₉	Supplier involvement in conception and design of products	P ₃	Lean
L ₁₄ , A ₅ , A ₆ , A ₇ , A ₁₈	Use of compatible IT between actors	P ₄	LA ¹
R ₂ , R ₅ , R ₂₀	Use of IT to develop visibility to a clear view of upstream and downstream inventories	P ₅	Resilient
R ₇ , R ₁₈	Development of security initiatives (to mitigate risk and contingency plans)	P ₆	Resilient
R ₁₀	Lead time reduction	P ₇	Resilient
R ₂₁	Flexible transportation	P ₈	Resilient

The procedure for the selection of practices was performed according to the degree of implementation in the work obtained by (Carvalho, 2011). From the results obtained, were selected the most implemented practices that involve interaction between partners in a scale of 1 to 5, having selected the practices above 4.3 degree of implementation.

¹ LA = Lean + Agile

6.3. Applied model

Having selected the interoperable practices applied, the current applied model is presented in Figure 6.2.

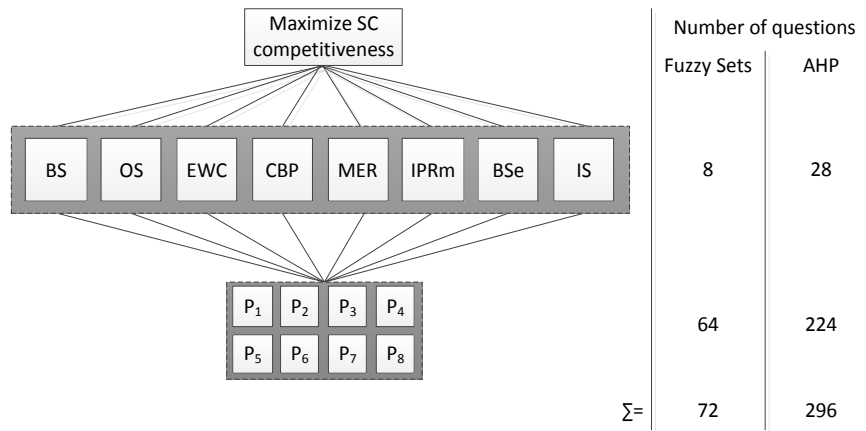


Figure 6.2. Applied decision model with number of questions in fuzzy and AHP.

The interoperability criteria applied are the macros of the criteria presented previously. Sub-criteria are presented in questionnaires as terms of consideration instead of terms for direct evaluation. Along the application of methodology this terms are adapted to the business scenario of FF (questionnaire 1, 2 and 3).

6.4. Application of Fuzzy Sets model

6.4.1. Results

To assess each criteria and each management practice it was made a questionnaire to the supply chain supervisor of the FF. The results are presented in Table 6.2.

Table 6.2. Criteria and practices evaluation.

Criteria	Perspective	Global	LARG SCM Practices							
			P ₁	P ₂	P ₃	P ₄	P ₅	P ₆	P ₇	P ₈
BS	Ideal	VH	VH	VH	H	VH	VH	VH	VH	VH
	Actual	VG	VG	W	W	VG	VG	G	G	G
OS	Ideal	VH	VL	VH	VL	VH	VH	VH	VH	VH
	Actual	G	VW	VG	VW	VG	VG	VG	VG	VG
EWC	Ideal	H	VL	VH	H	H	VH	VH	H	VH
	Actual	M	VW	G	W	M	VG	G	M	G
CBP	Ideal	H	VH	VH	VH	VH	VH	VH	H	VH
	Actual	M	G	M	W	VG	G	G	M	G
MER	Ideal	VH	VH	VH	H	VH	VH	VH	H	VH
	Actual	G	G	M	W	G	G	G	M	G
BSe	Ideal	VH	VW	H	H	VH	VH	H	VH	VH
	Actual	VG	VW	M	W	VG	VG	G	VG	G
IS	Ideal	VH	VH	VH	H	VH	VH	VH	H	VH
	Actual	VG	M	M	W	VG	G	G	G	G

Although were foreseen 8 interoperability criteria, was excluded IPRm since information exchange between actors is not subject to this type of rule, and inherent to each collaboration contract is

foreseen what information can be and must be exchanged between actors. However, this data is not subject to IPR, but the parameters of confidential non-disclosure due to contractual reasons and/or legal.

- **Important remarks at the completion of the questionnaire:**

During questionnaire, some observations were made regarding the nature of criteria and practice in Autoeuropa's perspective. The main remarks are presented in Table 6.3 and Table 6.3.

Table 6.3. Important remarks from SCM supervisor referring to criteria.

Criteria	Observations
BS	The business strategy is clear for the whole chain. Autoeuropa undertakes to explain the objectives to partners, and all are directed in the same direction. There are only a few modifications that Autoeuropa want to redefine in long term. They want to have a greater customer focus and have reciprocity in collaboration with partners. Increasingly find it necessary to rely on the cooperation of suppliers to achieve the objectives of the chain.
OS	Autoeuropa does not have any problems with the internal organisational structure and even in contact with other entities in the chain. As regards the internal organisational structure, this is well defined by corporate headquarters, and under functional point of view has to emphasize points of failure. When we speak of interaction between organisations, identifying those responsible for each section of the entity also does not have any type of defect. The identification of the contact points is performed easily and, even if the structural differences occur, such as change of the charge section, all the entities are reported previously.
EWC	With regard to employees and the organisation's culture, there are no types of barriers to language level. The official language spoken in more internally Autoeuropa is Portuguese, with recurrence of a second language - English - which employees must be able to speak. In contact with external entities, is spoken mostly in English and in German.
CBP	The collaborative business processes are not of great concern to Autoeuropa. Establishment of cooperation agreements and clarification of well-defined processes that Autoeuropa has proven to be a key to success, so that conflicts do not occur in the collaboration by each pair of entities. However, the definition of the boundaries of responsibility generates operational gaps which makes difficult of which actor is responsible for the problem.
MER	As regards relations between Autoeuropa and external agents, the selection is not performed directly by Autoeuropa, but by the corporate headquarters in Germany. The role of Autoeuropa is only to conduct periodic assessments on providers (performance, fulfilment of supplies, environmental parameters, etc.), provision of adequate information before establishing a cooperation agreement, conflict resolution (such as the already mentioned on the boundary of responsibility) and constant communication.
BSe	The BSe does not raise issues of great importance. Before a formal contract is provided to the partner information necessary to suit the needs of Autoeuropa, being these in terms of terminology as in terms of information.
IS	The IS of Autoeuropa are well defined a priori, with no obvious flaws or domestically or in contact with external entities. The main reason is that, in addition to the internal well defined architecture of Autoeuropa, before performing a contract of co-operation with another entity in the chain (such as a supplier), the specification has described what software and formats that must be exchanged information. Parameter such as safety and compatibility application isn't subject of concern because of interoperability specification is contractual. Moreover, the speed of the transmission information is the subject of considerable concern to Autoeuropa, trying to get information updated every 75 seconds.

Table 6.4. Important remarks from SCM supervisor referring to practices.

Practices	Observations
P ₁	The environmental goals are met through two measures imposed by Autoeuropa: common field evaluation of suppliers and sharing the same WWTP throughout the industrial park, managed by Autoeuropa.
P ₂ [*]	With regard to collaborative business processes, management of external relations, information systems and business strategy, the Reverse Logistics was ranked between “Poor” and “Good”, but with the remark of wanting improvements for the future. From the point of view of the importance of interoperability criteria for the implementation of practices, P2 was checked again as expected to improve in the future, with regard to the BSe. This refers to the objective course of Autoeuropa to highlight this practice as a reality to be understood between the contracting SC.
P ₃	Increasingly Autoeuropa is interested in getting the participation of suppliers in the design and development. Currently we do not rely heavily on the participation in these activities, but recognize the importance and strategic factor and that such a relationship can bring to SC.
P ₄ [*] , P ₅ [*]	These practices are of great relevance to Autoeuropa. According to the respondent, at present these practices meet expectations due to well-structured information systems, as already indicated previously.
P ₆	In the sense of what is expected for the strategic objectives of supply chain practice P6 was reported by the respondent and which can be improved with regard to the Semantic Business. The importance of this factor has to do with further clarification of what is a safety initiative as a contingency plan and a mitigation plan between the entities in the chain.
P ₇ [*]	No remarks.
P ₈ [*]	At present, Autoeuropa has a project underway to use alternative transportation, according to the practice P8. It was noted that this effect is thought to rehabilitate the rail line to make deliveries directly to the Autoeuropa. The role of interoperability in this regard is that at present the Autoeuropa is dependent on Palmetal, to receive orders arriving by train. The main reason is that Autoeuropa has no loading dock for the purpose. This observation was made during the evaluation from the point of view of the criteria for CBP and BS, which govern the collaboration between the entities (Autoeuropa supplier and receiver of orders aimed at Autoeuropa) and the strategic objectives of optimizing the implementation of practices.
*Most relevant practices signed by SCM supervisor.	

6.4.2. Data analysis

6.4.2.1. Computing ideal situation

With the results from evaluation of practices and criteria, first it were converted into numerical judgements (Table 6.5) and then obtained the normalized decision matrix (Table 6.6) using Eq. 4.12.

Table 6.5. Fuzzy weights for criteria and practices according to criteria in ideal situation.

Decision Matrix	BS	OS	EWC	CBP	MER	BSe	IS
P ₁	(0.75, 1.00, 1.00)	(0.00, 0.00, 0.25)	(0.00, 0.00, 0.25)	(0.75, 1.00, 1.00)	(0.75, 1.00, 1.00)	(0.00, 0.00, 0.25)	(0.75, 1.00, 1.00)
P ₂	(0.75, 1.00, 1.00)	(0.75, 1.00, 1.00)	(0.75, 1.00, 1.00)	(0.75, 1.00, 1.00)	(0.75, 1.00, 1.00)	(0.50, 0.75, 1.00)	(0.75, 1.00, 1.00)
P ₃	(0.50, 0.75, 1.00)	(0.00, 0.00, 0.25)	(0.50, 0.75, 1.00)	(0.75, 1.00, 1.00)	(0.50, 0.75, 1.00)	(0.50, 0.75, 1.00)	(0.50, 0.75, 1.00)
P ₄	(0.75, 1.00, 1.00)	(0.75, 1.00, 1.00)	(0.50, 0.75, 1.00)	(0.75, 1.00, 1.00)	(0.75, 1.00, 1.00)	(0.75, 1.00, 1.00)	(0.75, 1.00, 1.00)
P ₅	(0.75, 1.00, 1.00)	(0.75, 1.00, 1.00)	(0.75, 1.00, 1.00)	(0.75, 1.00, 1.00)	(0.75, 1.00, 1.00)	(0.75, 1.00, 1.00)	(0.75, 1.00, 1.00)
P ₆	(0.75, 1.00, 1.00)	(0.75, 1.00, 1.00)	(0.75, 1.00, 1.00)	(0.75, 1.00, 1.00)	(0.75, 1.00, 1.00)	(0.50, 0.75, 1.00)	(0.75, 1.00, 1.00)
P ₇	(0.75, 1.00, 1.00)	(0.75, 1.00, 1.00)	(0.50, 0.75, 1.00)	(0.50, 0.75, 1.00)	(0.50, 0.75, 1.00)	(0.75, 1.00, 1.00)	(0.50, 0.75, 1.00)
P ₈	(0.75, 1.00, 1.00)	(0.75, 1.00, 1.00)	(0.75, 1.00, 1.00)	(0.75, 1.00, 1.00)	(0.75, 1.00, 1.00)	(0.75, 1.00, 1.00)	(0.75, 1.00, 1.00)
\tilde{w}_j	(0.75, 1.00, 1.00)	(0.75, 1.00, 1.00)	(0.50, 0.75, 1.00)	(0.50, 0.75, 1.00)	(0.75, 1.00, 1.00)	(0.75, 1.00, 1.00)	(0.75, 1.00, 1.00)

Table 6.6. Weighted normalised decision matrix in ideal situation.

Decision Matrix	BS	OS	EWC	CBP	MER	BSe	IS
P ₁	(0.56, 1.00, 1.00)	(0.00, 0.00, 0.25)	(0.00, 0.00, 0.25)	(0.38, 0.75, 1.00)	(0.56, 1.00, 1.00)	(0.00, 0.00, 0.25)	(0.56, 1.00, 1.00)
P ₂	(0.56, 1.00, 1.00)	(0.56, 1.00, 1.00)	(0.38, 0.75, 1.00)	(0.38, 0.75, 1.00)	(0.56, 1.00, 1.00)	(0.38, 0.75, 1.00)	(0.56, 1.00, 1.00)
P ₃	(0.38, 0.75, 1.00)	(0.00, 0.00, 0.25)	(0.25, 0.56, 1.00)	(0.38, 0.75, 1.00)	(0.38, 0.75, 1.00)	(0.38, 0.75, 1.00)	(0.38, 0.75, 1.00)
P ₄	(0.56, 1.00, 1.00)	(0.56, 1.00, 1.00)	(0.25, 0.56, 1.00)	(0.38, 0.75, 1.00)	(0.56, 1.00, 1.00)	(0.56, 1.00, 1.00)	(0.56, 1.00, 1.00)
P ₅	(0.56, 1.00, 1.00)	(0.56, 1.00, 1.00)	(0.38, 0.75, 1.00)	(0.38, 0.75, 1.00)	(0.56, 1.00, 1.00)	(0.56, 1.00, 1.00)	(0.56, 1.00, 1.00)
P ₆	(0.56, 1.00, 1.00)	(0.56, 1.00, 1.00)	(0.38, 0.75, 1.00)	(0.38, 0.75, 1.00)	(0.56, 1.00, 1.00)	(0.38, 0.75, 1.00)	(0.56, 1.00, 1.00)
P ₇	(0.56, 1.00, 1.00)	(0.56, 1.00, 1.00)	(0.25, 0.56, 1.00)	(0.25, 0.56, 1.00)	(0.38, 0.75, 1.00)	(0.56, 1.00, 1.00)	(0.38, 0.75, 1.00)
P ₈	(0.56, 1.00, 1.00)	(0.56, 1.00, 1.00)	(0.38, 0.75, 1.00)	(0.38, 0.75, 1.00)	(0.56, 1.00, 1.00)	(0.56, 1.00, 1.00)	(0.56, 1.00, 1.00)

FPIS and FNIS are determined using S^* and S^- from section 4.3.6.1. Therefore, ideal solutions are:

$$S^* = [(1,1,1), (1,1,1), (1,1,1), (1,1,1), (1,1,1), (1,1,1), (1,1,1)]$$

$$S^- = [(0,0,0), (0,0,0), (0,0,0), (0,0,0), (0,0,0), (0,0,0), (0,0,0)]$$

Using Eq. 4.13, the distance between FPIS of practice P2 in the criteria BS is given by:

$$d_v(P_1, S^*) = \sqrt{\frac{1}{3}[(0.56 - 1)^2 + (1.00 - 1)^2 + (1.00 - 1)^2]} = 0.144$$

Thus, to calculate d_i^* it used step 8) from section 4.3.6.1. For the previous example, it is calculated:

$$d_i^* = 0.144 + 0.924 + 0.924 + 0.144 + 0.144 + 0.924 + 0.144 = 3.350$$

So, for each value, the results are presented in Table 6.7 and Table 6.8.

Table 6.7. Distance of decision vectors to FPIS in I .

Distances	BS	OS	EWC	CBP	MER	BSe	IS	d_i^*
$d_v(P_1, S^*)$	0.144	0.924	0.924	0.144	0.144	0.924	0.144	3.350
$d_v(P_2, S^*)$	0.144	0.144	0.144	0.144	0.144	0.323	0.144	1.189
$d_v(P_3, S^*)$	0.323	0.924	0.323	0.144	0.323	0.323	0.323	2.682
$d_v(P_4, S^*)$	0.144	0.144	0.323	0.144	0.144	0.144	0.144	1.189
$d_v(P_5, S^*)$	0.144	0.144	0.144	0.144	0.144	0.144	0.144	1.010
$d_v(P_6, S^*)$	0.144	0.144	0.144	0.144	0.144	0.323	0.144	1.189
$d_v(P_7, S^*)$	0.144	0.144	0.323	0.323	0.323	0.144	0.323	1.724
$d_v(P_8, S^*)$	0.144	0.144	0.144	0.144	0.144	0.144	0.144	1.010

Table 6.8. Distance of decision vectors to FNIS in I .

Distances	BS	OS	EWC	CBP	MER	BSe	IS	d_i^-
$d_v(P_1, S^-)$	0.554	0.144	0.144	0.677	0.554	0.144	0.554	2.773
$d_v(P_2, S^-)$	0.554	0.924	0.924	0.677	0.554	0.777	0.554	4.966
$d_v(P_3, S^-)$	0.427	0.144	0.777	0.677	0.427	0.777	0.427	3.657
$d_v(P_4, S^-)$	0.554	0.924	0.777	0.677	0.554	0.924	0.554	4.966
$d_v(P_5, S^-)$	0.554	0.924	0.924	0.677	0.554	0.924	0.554	5.113
$d_v(P_6, S^-)$	0.554	0.924	0.924	0.677	0.554	0.777	0.554	4.966
$d_v(P_7, S^-)$	0.554	0.924	0.777	0.540	0.427	0.924	0.427	4.574
$d_v(P_8, S^-)$	0.554	0.924	0.924	0.677	0.554	0.924	0.554	5.113

The closeness coefficient is given by Eq. 4.14. For instance, for practice P_1 , it is calculated:

$$CC_{P_1} = \frac{2.773}{3.350 + 2.773} = 0.453$$

Applying the same calculation for the rest of the practices is obtained the results presented in Table 6.9.

Table 6.9. Resume of distances and respective closeness coefficients to each solution and final ranking for ideal situation.

Practice	d_i^*	d_i^-	$d_i^* + d_i^-$	CC_i	Ranking
P ₁	3.350	2.773	6.123	0.453	8
P ₂	1.189	4.966	6.154	0.807	3
P ₃	2.682	3.657	6.339	0.577	7
P ₄	1.189	4.966	6.154	0.807	3
P ₅	1.010	5.113	6.123	0.835	1
P ₆	1.189	4.966	6.154	0.807	3
P ₇	1.724	4.574	6.298	0.726	6
P ₈	1.010	5.113	6.123	0.835	1

In order to analyse practices interoperability, individual closeness coefficients can be estimated in order to obtain rankings inside each criterion. For practice P₁, according to criterion BS, it's calculated:

$$CC_{P_1,BS} = \frac{0.554}{0.144 + 0.554} = 0.793$$

Applying the same computation to the rest of data, is obtained the data on Table 6.10.

Table 6.10. SCM Practices closeness coefficients for each criterion in I.

i	$CC_{i,BS}$	$CC_{i,OS}$	$CC_{i,EWC}$	$CC_{i,CBP}$	$CC_{i,MER}$	$CC_{i,BSe}$	$CC_{i,IS}$
P ₁	0.793 1	0.135 7	0.135 8	0.824 1	0.793 1	0.135 8	0.793 1
P ₂	0.793 1	0.865 1	0.865 1	0.824 1	0.793 1	0.707 5	0.793 1
P ₃	0.569 8	0.135 7	0.707 5	0.824 1	0.569 7	0.707 5	0.569 7
P ₄	0.793 1	0.865 1	0.707 5	0.824 1	0.793 1	0.865 1	0.793 1
P ₅	0.793 1	0.865 1	0.865 1	0.824 1	0.793 1	0.865 1	0.793 1
P ₆	0.793 1	0.865 1	0.865 1	0.824 1	0.793 1	0.707 5	0.793 1
P ₇	0.793 1	0.865 1	0.707 5	0.626 8	0.569 7	0.865 1	0.569 7
P ₈	0.793 1	0.865 1	0.865 1	0.824 1	0.793 1	0.865 1	0.793 1

6.4.2.2. Computing actual situation

Similarly to the previous procedure, the conversion of linguistic evaluation into fuzzy sets is presented in Table 6.11 for the actual situation.

Table 6.11. Fuzzy weights for criteria and practices according to criteria in actual situation.

Decision Matrix	BS	OS	EWC	CBP	MER	BSe	IS
P ₁	(7.50, 10.00, 10.00)	(0.00, 0.00, 2.50)	(0.00, 0.00, 2.50)	(5.00, 7.50, 10.00)	(5.00, 7.50, 10.00)	(0.00, 0.00, 2.50)	(2.50, 5.00, 7.50)
P ₂	(0.00, 2.50, 5.00)	(7.50, 10.00, 10.00)	(5.00, 7.50, 10.00)	(2.50, 5.00, 7.50)	(2.50, 5.00, 7.50)	(2.50, 5.00, 7.50)	(2.50, 5.00, 7.50)
P ₃	(0.00, 2.50, 5.00)	(0.00, 0.00, 2.50)	(0.00, 2.50, 5.00)	(0.00, 2.50, 5.00)	(0.00, 2.50, 5.00)	(0.00, 2.50, 5.00)	(0.00, 2.50, 5.00)
P ₄	(7.50, 10.00, 10.00)	(7.50, 10.00, 10.00)	(2.50, 5.00, 7.50)	(7.50, 10.00, 10.00)	(5.00, 7.50, 10.00)	(7.50, 10.00, 10.00)	(7.50, 1.00, 10.00)
P ₅	(7.50, 10.00, 10.00)	(7.50, 10.00, 10.00)	(7.50, 10.00, 10.00)	(5.00, 7.50, 10.00)	(5.00, 7.50, 10.00)	(7.50, 10.00, 10.00)	(5.00, 7.50, 10.00)
P ₆	(5.00, 7.50, 10.00)	(7.50, 10.00, 10.00)	(5.00, 7.50, 10.00)	(5.00, 7.50, 10.00)	(5.00, 7.50, 10.00)	(5.00, 7.50, 10.00)	(5.00, 7.50, 10.00)
P ₇	(5.00, 7.50, 10.00)	(7.50, 10.00, 10.00)	(2.50, 5.00, 7.50)	(2.50, 5.00, 7.50)	(2.50, 5.00, 7.50)	(7.50, 10.00, 10.00)	(5.00, 7.50, 10.00)
P ₈	(5.00, 7.50, 10.00)	(7.50, 10.00, 10.00)	(5.00, 7.50, 10.00)	(5.00, 7.50, 10.00)	(5.00, 7.50, 10.00)	(5.00, 7.50, 10.00)	(5.00, 7.50, 10.00)
Weights	(7.50, 10.00, 10.00)	(5.00, 7.50, 10.00)	(2.50, 5.00, 7.50)	(2.50, 5.00, 7.50)	(5.00, 7.50, 10.00)	(7.50, 10.00, 10.00)	(7.50, 10.00, 10.00)

To normalise matrix, each term is divided by the maximum number present in the sets, like in Eq. 4.11 and presented in Table 6.12.

Table 6.12. Normalized decision matrix and criteria weights matrix in A.

Decision Matrix	BS	OS	EWC	CBP	MER	BSe	IS
P ₁	(0.75, 1.00, 1.00)	(0.00, 0.00, 0.25)	(0.00, 0.00, 0.25)	(0.50, 0.75, 1.00)	(0.50, 0.75, 1.00)	(0.00, 0.00, 0.25)	(0.25, 0.50, 0.75)
P ₂	(0.00, 0.25, 0.50)	(0.75, 1.00, 1.00)	(0.50, 0.75, 1.00)	(0.25, 0.50, 0.75)	(0.25, 0.50, 0.75)	(0.25, 0.50, 0.75)	(0.25, 0.50, 0.75)
P ₃	(0.00, 0.25, 0.50)	(0.00, 0.00, 0.25)	(0.00, 0.25, 0.50)	(0.00, 0.25, 0.50)	(0.00, 0.25, 0.50)	(0.00, 0.25, 0.50)	(0.00, 0.25, 0.50)
P ₄	(0.75, 1.00, 1.00)	(0.75, 1.00, 1.00)	(0.25, 0.50, 0.75)	(0.75, 1.00, 1.00)	(0.50, 0.75, 1.00)	(0.75, 1.00, 1.00)	(0.75, 1.00, 1.00)
P ₅	(0.75, 1.00, 1.00)	(0.75, 1.00, 1.00)	(0.75, 1.00, 1.00)	(0.50, 0.75, 1.00)	(0.50, 0.75, 1.00)	(0.75, 1.00, 1.00)	(0.50, 0.75, 1.00)
P ₆	(0.50, 0.75, 1.00)	(0.75, 1.00, 1.00)	(0.50, 0.75, 1.00)	(0.50, 0.75, 1.00)	(0.50, 0.75, 1.00)	(0.50, 0.75, 1.00)	(0.50, 0.75, 1.00)
P ₇	(0.50, 0.75, 1.00)	(0.75, 1.00, 1.00)	(0.25, 0.50, 0.75)	(0.25, 0.50, 0.75)	(0.25, 0.50, 0.75)	(0.75, 1.00, 1.00)	(0.50, 0.75, 1.00)
P ₈	(0.50, 0.75, 1.00)	(0.75, 1.00, 1.00)	(0.50, 0.75, 1.00)	(0.50, 0.75, 1.00)	(0.50, 0.75, 1.00)	(0.50, 0.75, 1.00)	(0.50, 0.75, 1.00)
Weights	(0.75, 1.00, 1.00)	(0.50, 0.75, 1.00)	(0.25, 0.50, 0.75)	(0.25, 0.50, 0.75)	(0.50, 0.75, 1.00)	(0.75, 1.00, 1.00)	(0.75, 1.00, 1.00)

Using Eq. 4.12, \tilde{R} is obtained in Table 6.13.

Table 6.13. Weighted normalised decision matrix in actual situation.

Decision Matrix	BS	OS	EWC	CBP	MER	Bse	IS
P ₁	(0.56, 1.00, 1.00)	(0.00, 0.00, 0.25)	(0.00, 0.00, 0.19)	(0.13, 0.38, 0.75)	(0.25, 0.56, 1.00)	(0.00, 0.00, 0.25)	(0.19, 0.50, 0.75)
P ₂	(0.00, 0.25, 0.50)	(0.38, 0.75, 1.00)	(0.13, 0.38, 0.75)	(0.06, 0.25, 0.56)	(0.13, 0.38, 0.75)	(0.19, 0.50, 0.75)	(0.19, 0.50, 0.75)
P ₃	(0.00, 0.25, 0.50)	(0.00, 0.00, 0.25)	(0.00, 0.13, 0.38)	(0.00, 0.13, 0.38)	(0.00, 0.19, 0.50)	(0.00, 0.25, 0.50)	(0.00, 0.25, 0.50)
P ₄	(0.56, 1.00, 1.00)	(0.38, 0.75, 1.00)	(0.06, 0.25, 0.56)	(0.19, 0.50, 0.75)	(0.25, 0.56, 1.00)	(0.56, 1.00, 1.00)	(0.56, 1.00, 1.00)
P ₅	(0.56, 1.00, 1.00)	(0.38, 0.75, 1.00)	(0.19, 0.50, 0.75)	(0.13, 0.38, 0.75)	(0.25, 0.56, 1.00)	(0.56, 1.00, 1.00)	(0.38, 0.75, 1.00)
P ₆	(0.38, 0.75, 1.00)	(0.38, 0.75, 1.00)	(0.13, 0.38, 0.75)	(0.13, 0.38, 0.75)	(0.25, 0.56, 1.00)	(0.38, 0.75, 1.00)	(0.38, 0.75, 1.00)
P ₇	(0.38, 0.75, 1.00)	(0.38, 0.75, 1.00)	(0.06, 0.25, 0.56)	(0.06, 0.25, 0.56)	(0.13, 0.38, 0.75)	(0.56, 1.00, 1.00)	(0.38, 0.75, 1.00)
P ₈	(0.38, 0.75, 1.00)	(0.38, 0.75, 1.00)	(0.13, 0.38, 0.75)	(0.13, 0.38, 0.75)	(0.25, 0.56, 1.00)	(0.38, 0.75, 1.00)	(0.38, 0.75, 1.00)

To actual situation, FPIS and FNIS are:

$$S^+ = [(1,1,1), (1,1,1), (0.75,0.75,0.75), (0.75,0.75,0.75), (1,1,1), (1,1,1), (1,1,1)]$$

$$S^- = [(0,0,0), (0,0,0), (0,0,0), (0,0,0), (0,0,0), (0,0,0), (0,0,0)]$$

The correspondent distance is present in Table 6.14 and Table 6.15.

Table 6.14. Distance of decision vectors to FPIS in A.

Distances	BS	OS	EWC	CBP	MER	BSe	IS	d_i^*
$d_v(P_1, S^+)$	0.253	0.924	0.693	0.421	0.501	0.924	0.569	4.286
$d_v(P_2, S^+)$	0.777	0.389	0.421	0.503	0.637	0.569	0.569	3.866
$d_v(P_3, S^+)$	0.777	0.924	0.604	0.604	0.798	0.777	0.777	5.262
$d_v(P_4, S^+)$	0.253	0.389	0.503	0.355	0.501	0.253	0.253	2.506
$d_v(P_5, S^+)$	0.253	0.389	0.355	0.421	0.501	0.253	0.389	2.560
$d_v(P_6, S^+)$	0.389	0.389	0.421	0.421	0.501	0.389	0.389	2.897
$d_v(P_7, S^+)$	0.389	0.389	0.503	0.503	0.637	0.253	0.389	3.061
$d_v(P_8, S^+)$	0.389	0.389	0.421	0.421	0.501	0.389	0.389	2.897

Table 6.15. Distance of decision vectors to FNIS in A.

Distances	BS	OS	EWC	CBP	MER	BSe	IS	d_i^-
$d_v(P_1, S^-)$	0.879	0.144	0.108	0.489	0.678	0.144	0.532	2.975
$d_v(P_2, S^-)$	0.323	0.753	0.489	0.357	0.489	0.532	0.532	3.475
$d_v(P_3, S^-)$	0.323	0.144	0.228	0.228	0.308	0.323	0.323	1.877
$d_v(P_4, S^-)$	0.879	0.753	0.357	0.532	0.678	0.879	0.879	4.956
$d_v(P_5, S^-)$	0.879	0.753	0.532	0.489	0.678	0.879	0.753	4.963
$d_v(P_6, S^-)$	0.753	0.753	0.489	0.489	0.678	0.753	0.753	4.671
$d_v(P_7, S^-)$	0.753	0.753	0.357	0.357	0.489	0.879	0.753	4.343
$d_v(P_8, S^-)$	0.753	0.753	0.489	0.489	0.678	0.753	0.753	4.671

Overall closeness coefficient is presented in Table 6.16.

Table 6.16. Distances and respective closeness coefficients to each solution and final ranking for actual situation.

Practices	d_i^*	d_i^-	$d_i^* + d_i^-$	CC_i	Ranking
P ₁	4.286	2.975	7.260	0.410	7
P ₂	3.866	3.475	7.341	0.473	6
P ₃	5.262	1.877	7.139	0.263	8
P ₄	2.506	4.956	7.462	0.664	1
P ₅	2.560	4.963	7.523	0.660	2
P ₆	2.897	4.671	7.568	0.617	3
P ₇	3.061	4.343	7.404	0.587	5
P ₈	2.897	4.671	7.568	0.617	3

The individual closeness coefficients for each criterion are in Table 6.17.

Table 6.17. SCM Practices closeness coefficients for each criterion in A.

<i>i</i>	$CC_{i,BS}$		$CC_{i,OS}$		$CC_{i,EWC}$		$CC_{i,CBP}$		$CC_{i,MER}$		$CC_{i,BSe}$		$CC_{i,IS}$	
P ₁	0.777	1	0.135	7	0.135	8	0.538	2	0.575	1	0.135	8	0.483	6
P ₂	0.293	7	0.660	1	0.538	2	0.415	6	0.434	6	0.483	6	0.483	6
P ₃	0.293	7	0.135	7	0.274	7	0.274	8	0.279	8	0.293	7	0.293	8
P ₄	0.777	1	0.660	1	0.415	5	0.599	1	0.575	1	0.777	1	0.777	1
P ₅	0.777	1	0.660	1	0.599	1	0.538	2	0.575	1	0.777	1	0.660	2
P ₆	0.660	4	0.660	1	0.538	2	0.538	2	0.575	1	0.660	4	0.660	2
P ₇	0.660	4	0.660	1	0.415	5	0.415	6	0.434	6	0.777	1	0.660	2
P ₈	0.660	4	0.660	1	0.538	2	0.538	2	0.575	1	0.660	4	0.660	2

6.4.3. Determination of deviation percentage

The deviation percentage is calculated using Eq. 5.1. In this equation figures the closeness coefficient calculated in each situation. For instance, for the overall score of practice P₁ is given by:

$$\%Deviation = \frac{0.453 - 0.410}{0.453} \times 100 = 10\%$$

Applying this rule to global and each criterion, it is obtained the data present in Table 6.18.

Table 6.18. Deviation percentage from A to I for each practice, considering global and criteria perspectives.

$\%Deviation$	P ₁	P ₂	P ₃	P ₄	P ₅	P ₆	P ₇	P ₈	Average
Global	10	41	54	18	21	24	19	26	28

BS	2	63	48	2	2	17	17	17	21
OS	0	24	0	24	24	24	24	24	18
EWC	0	38	61	41	31	38	41	38	36
CBP	35	50	67	27	35	35	34	35	40
MER	28	45	51	28	28	28	24	28	33
BSe	0	32	58	10	10	7	10	24	19
IS	39	39	48	2	17	17	-16	17	20
Average	23	41	55	19	21	24	19	26	-

6.4.4. Perspective analysis

6.4.4.1. Global

In first analysis (see Figure 6.3), the expected level of interoperability (I) is between the middle (III) to very high (V) interoperability (from the classes on Table 5.2), fitting the practices P_2 , P_4 , P_5 , P_6 and P_8 in this last in the class. However, at present, the performance of these practices lies low to high interoperability. This shows that the current SCM lacks significantly in interoperability.

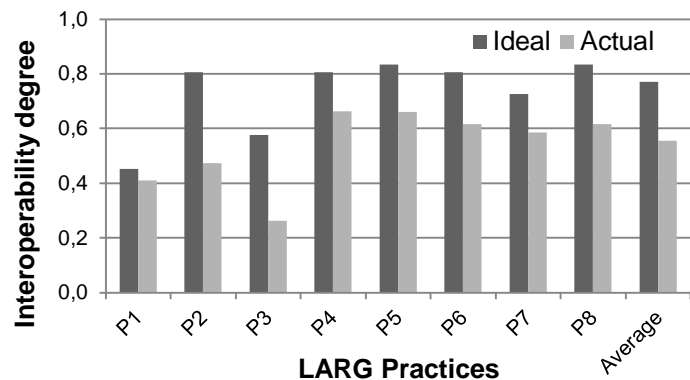


Figure 6.3. Interoperability degree of each practice considering I and A.

Lack of interoperability is evidenced by the diversion of interoperability. The graph in Figure 6.4 illustrates how far away the practices are of what it is expected.

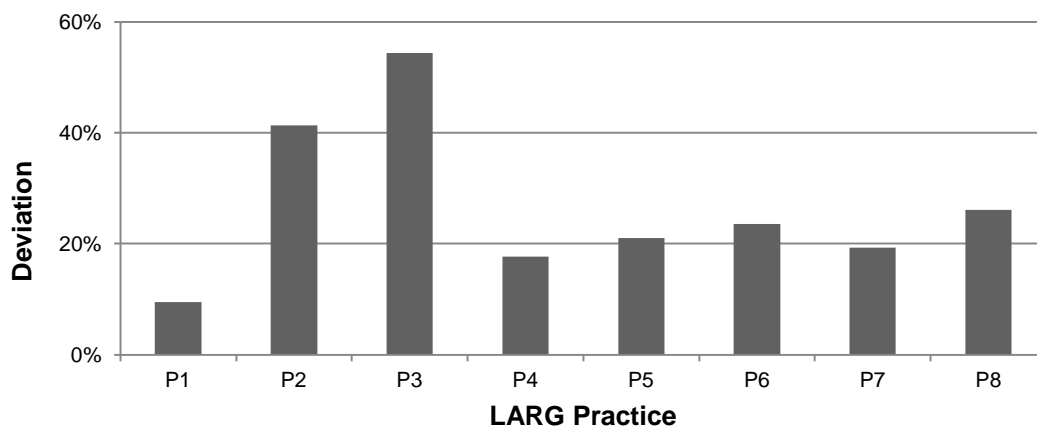


Figure 6.4. Deviation of practices implementation to expected interoperability.

From the calculation of deviation percentage, two SCM practices are identified with interoperability problems: P_2 and P_3 . Having a degree of deviation in the range of 40 to 50 %, both practices should receive attention and require detailed analysis to identify which points of failure interoperability.

P_5 , P_6 and P_8 are the subsequent in terms of the requirement for interoperability, with a distance between 21-26 %. These don't represent the greater issue for analysis, but are part of interoperability problem.

Finally, P_1 , P_4 and P_7 are those having less problem of interoperability with values ranging from 10 to 19 %.

Analysing overall interoperability in terms of BIP's, it is possible to previously denote in what matter interoperability fails. By computing average of the CC_i 's in Table 6.10 and Table 6.17 by criteria, is obtained the data of Table 6.19.

Table 6.19. Average of closeness coefficient by criteria and correspondent deviation.

Scenario	$\overline{CC}_{i,BS}$	$\overline{CC}_{i,OS}$	$\overline{CC}_{i,EWC}$	$\overline{CC}_{i,CBP}$	$\overline{CC}_{i,MER}$	$\overline{CC}_{i,BSe}$	$\overline{CC}_{i,IS}$
<i>I</i>	0.765	0.682	0.714	0.799	0.737	0.714	0.737
<i>A</i>	0.612	0.529	0.432	0.482	0.503	0.570	0.584
%Deviation	20	23	40	40	32	20	21

Graphically (see Figure 6.5), the drivers of interoperability have high interoperability requirement. However, with the exception of BS, the rest of the interoperability enablers have currently average interoperable degree.

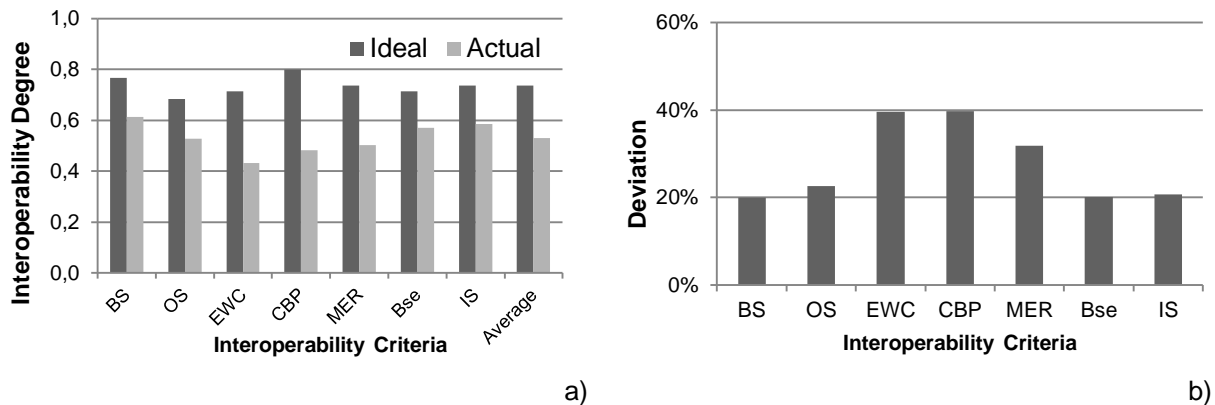


Figure 6.5. Graphic representation of criteria in terms of: a) Interoperability degree and b) deviation.

In terms of deviation, EWC, CBP and MER are the main concern for this organisation. The expectancy for workers to fulfil their activities is to accomplish goals without compromising company's objectives. However, it is hardly difficult to keep track of motivation, honesty and responsibility. To keep employees motivated, for instance, Autoeuropa develops many group activities and founded recently the workout morning, whereas employees can join and exercise.

In terms of joint collaborations between actors, the occurrence of conflicts and difficulty on dealing with responsibility frontiers (CBP₁) are noted as one remark in Table 6.3. The "pass the buck" phenomenon among material delivery from suppliers to manufacturer is one of the concerns of not well-defined responsibility barriers. Thus, generates conflicts that affect delivery and production schedules and, consequently, SC's goals.

Related to the previous collaboration scenario, MER is other matter of concern lacking interoperability (deviation between 20 and 40%). In Table 6.3 was reinforced the concern of dealing with conflicts (MER₃).

6.4.4.2. P₁ – Environmental collaboration with business partners

P₁ includes all the environmental activities performed by supply chain partners and internal security initiatives in the chain. The position of the manufacturer on this practice is to assume an internal responsibility to monitor carefully the effects on the environment, both internally as externally, through audits and field assessments of each partner. The panorama of interoperability for this practice is presented in the chart of Figure 6.6.

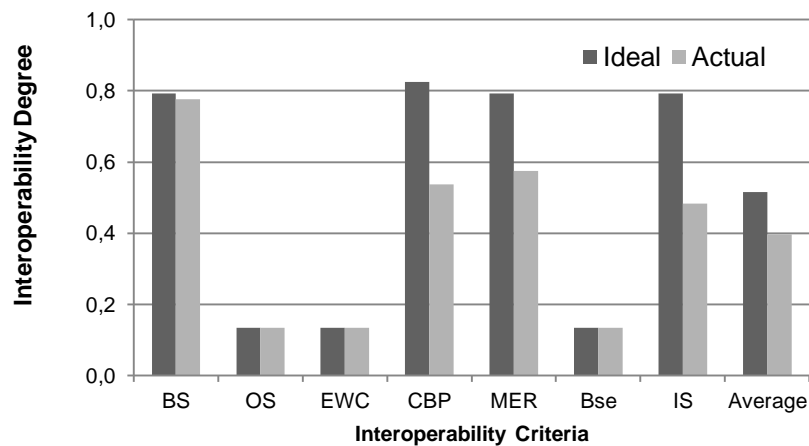


Figure 6.6. Interoperability degree of P_1 considering I and A by criteria.

In first analysis, the criteria BS, CBP, MER and IS are the denoted driving force of this practice. Analysing, in the ideal situation, it is expected a degree of interoperability from high (BS, IS and MER) to very high (CBP) levels of interoperability to implement this practice. Moreover, the criteria OS, EWC and BSe constitute levels of interoperability with low requirement for carrying out this activity. Performing a comparative analysis between the degrees of interoperability required and the current level of interaction by calculating the deviation percentage, is represented in Figure 6.7.

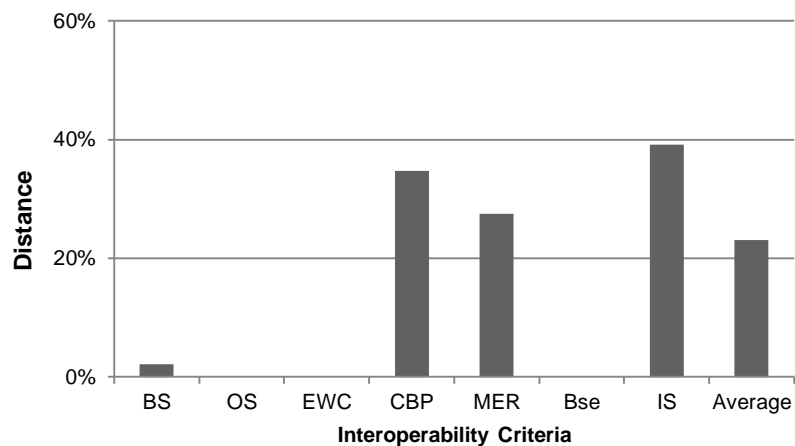


Figure 6.7. Deviation of P_1 implementation to expected interoperability by criteria.

The less relevant criteria OS, EWC and BSe to practice P_1 , have a deviation percentage of 0, corresponding to the level of interoperability requirement null, not requiring improvements in this sector.

With regard to the BS, P_1 requires a high level of interoperability and, facing the ideal situation, the deviation is 2 %, not requiring a great improvement. From the perspective of manufacturer, there is a clear understanding of the strategic objectives of the internal structure of the company and suppliers. The roles of each entity are clearly defined. Both Autoeuropa and suppliers carry out their tasks of monitoring and adaptation to environmental legal requirements. However, Autoeuropa has a dual task in this regard. As part of the MER and the CBP, providers have the responsibility to fulfil in accordance with requirements and, in turn, Autoeuropa audits on the suppliers installations. These two activities

are reflected in the great need for interoperability in these two criteria (MER and CBP). The MER criterion was evaluated with a high level of interoperability desirable for operations. However, the current situation reflects an average interoperability; there is a gap of 28 % over the expected. The communication, collaboration contracts and evaluation of the partner are the source of the problem from the standpoint of Autoeuropa. The visibility of the tasks of environmental monitoring, sharing of responsibility and clarity in the processes involved in this activity are a source of concern, especially the suppliers assessment has great importance in this operation.

In turn, in accordance with the CBP, the degree of interoperability requirement has been reported as high, and contrary to what one would expect, the present state of Autoeuropa evaluation criterion was medium having a gap of 35%. In this measurement is reflected inadequate division of responsibility for performing environmental monitoring. Although there are well-defined responsibilities for each partner, in border situations there isn't a clear understanding of who will be the entity responsible to act in a certain activity monitoring and environmental control.

Still in the context of CBP, the visibility of processes can be undermined, since the environment monitoring is of concern to the Autoeuropa, rather than of the actors. That is, although it is of interest to both parties, Autoeuropa performs internal and external monitoring of environmental parameters, being responsible for having an internal and external vision of the environmental impact of production activities. Autoeuropa is thus responsible for: internally monitor all activities that may affect the environment (noise, solid waste, effluent and air) and perform the wastewater treatment through the WWTP², which receives disposed effluents from Autoeuropa and suppliers of the Industrial Park.

Finally, the IS are measured with a degree of interoperability requirement High (0.793) and, secondly, at the present, the level of interoperability is Medium, with a deviation of 39 %. Internally, Autoeuropa has mechanisms to monitor the environment and make the information visible within the company. However, in relation to suppliers, there is no obvious mechanism by electronic means to monitor environment in real time. It is necessary to take measurements in the field. The improvement and/or creation of an information system in this regard would be an asset to make environmental information visible not only to the relation Autoeuropa - Suppliers, but also between the various suppliers.

6.4.4.3. P₂ – Reverse Logistics

In the current scenario, one of the problems mentioned in the survey was the problem of the pallets used to transport components not being returned to the suppliers. At present, there is no clear mechanism that is responsible for returning the pallets to suppliers. A truck is responsible for carrying these pallets back, but without any adaptation to the needs of transportation of components to Autoeuropa.

This example reports one of several situations in which the reverse logistics interoperability failure may appear. This becomes visible in the analysis of data presented in Figure 6.8.

² WWTP – Wastewater treatment plant

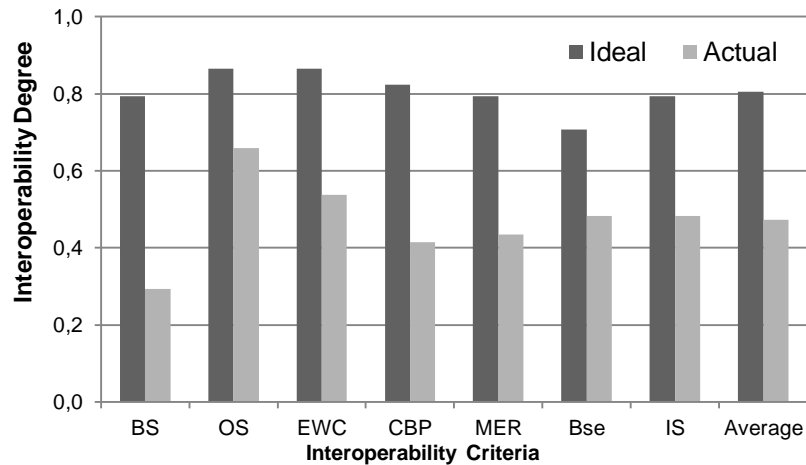


Figure 6.8. Interoperability degree of P_2 considering I and A by criteria.

In the first analysis, it is verified that the degree of interoperability requirement for the implementation of this practice is around very high level. This shows that this practice is important for the functioning of the supply chain in which it operates and requires a strong collaboration between entities. However, actual performance against the criteria of this practice is situated around the middle and lower levels. Holistically, there is a substantial deviation from the requirements of interoperability required to perform the reverse logistics. This discrepancy is shown graphically (see Figure 6.9) in which is denoted a distance between 20 to 60 %.

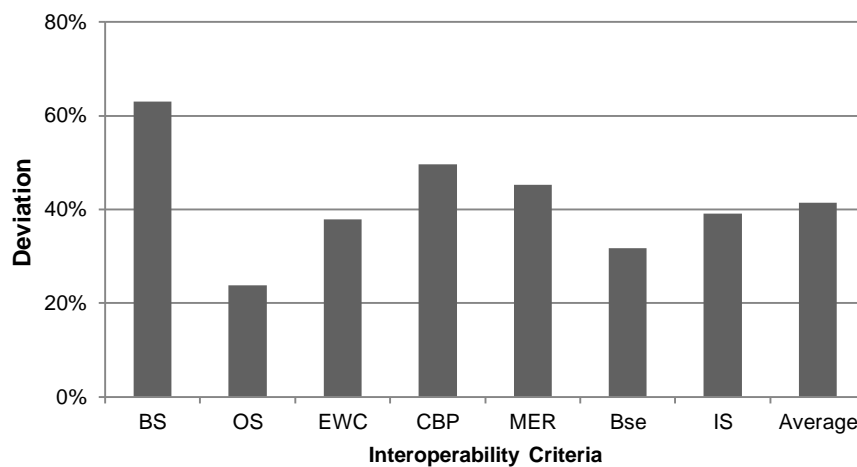


Figure 6.9. Deviation of P_2 implementation to expected interoperability by criteria.

The obvious parameter in need for improvement is BS and classified as high level of interoperability required, facing the actual low level. This may be interpreted by the lack of clarification of the strategic importance of having a system that enables the implementation of reverse logistics in the SC, such as the definition of the points on which this decision affects the collaborations and to whom each task is assigned. Graphic representation of deviation percentage in Figure 6.9 stresses the evidence that P_2 does not fit in strategic priorities of focal firm neither the SC.

In terms of OS, the implementation of P_2 has an appropriate organisational system, since it is evaluated in the current situation with a high level of interoperability. The internal system of

Autoeuropa allows companies to clearly identify what is the point of contact (section or professional responsible) from which you can make requests, for example, to perform the reprocessing of defective components.

The two problems more pronounced, with deviation of more than 40 %, are mainly focused on CBP and MER. The lack of a clear process to enable inventory return to suppliers is the foundation of this lack of interoperability of these two criteria. If, on one hand, there is a clear process that affects the visibility of the problem and the definition of who is responsible for the return of components and/or pallets, on the other hand, there is no prior definition of collaborative contracts that stipulate this requirement to carry out production activities. This factor means that suppliers often run out of pallets for shipment of components, because there is no clear responsibility on the part of Autoeuropa as on the suppliers.

The absence of the reverse logistics in the definition of strategic and, in turn, the lack of a mechanism to ensure the implementation of this practice, means that other functional areas of companies are affected. In terms of the EWC, there is a deviation of 38%. In this criterion the factors that most influence this problem are responsibility and efficiency of workers. In the absence of a process of return of stock, we cannot assign responsibility to any member of the entities, and will not be possible to evaluate how efficient the same member will be in the process.

Another interoperability area of denoted remarks is BSe. The absence of clarity in the implementation of this practice leads to lack of proper terminology, and information sharing that exists today in the chain is not transmitted seamlessly. For example, if there is a defective part arriving on the assembly line and cannot be fixed in place, it must return to the supplier. To this end, a contact is made between logistics department seeking a new part and inform the defective part to be sent for reprocessing. However, even with this contact, there is accumulation of non-conforming parts that are never reprocessed. Only when these parts reach a considerable level of stock, the corporate headquarters of Volkswagen takes the decision to take action on this inventory. As a solution, a mechanism that allows adequate logistical tracking of components and accessories transportation along the chain, and a flow of information through an IS should allow parts already manufactured but not conforming to return to production at the supplier.

The IS is another point to remark in implementing this practice. As in the previous situation, no mechanism that rules reverse logistics, it is known that the information needs of the process. Thus, it would be desirable information system with a high level of interoperability, where information on stock to return to the supplier and transit was visible throughout the chain, equipped with tools for rapid data exchange and secure flow, allowing decision making and the reverse flow of the stock.

6.4.4.4. P₃ – Suppliers involvement in design and conception of products

The design and product development is a task that is not carried out directly by Autoeuropa. Volkswagen's corporate headquarters is responsible for performing the design of new products and routes to Volkswagen production plants in Europe. In the specific case of Autoeuropa, they have no decisions on the developmental aspects of the vehicles produced.

From the perspective of Lean, implementation of this practice would become essential to achieve a production with the lowest possible cost. The purpose of engaging a vendor for a product design is

intended to remove all process steps and components that do not add value to the final product. This is evidenced by the objective assessment of Autoeuropa to this practice in terms of interoperability. In fact, this practice is not currently being implemented but it is recognised its importance. Through analysis of data (see Figure 6.10), it appears that on a global basis, the level of interoperability required would be desirable to have high level of interoperability of 0.583. However, with a deviation of 55%, the current situation reflects low level of interoperability, nearly zero (0.263).

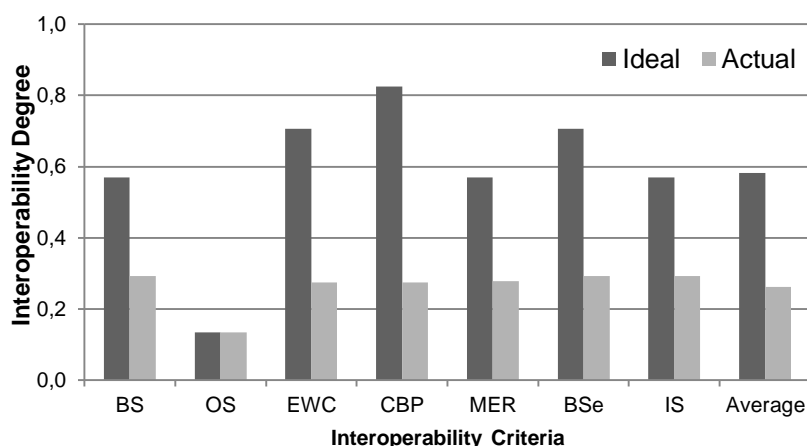


Figure 6.10. Interoperability degree of P_3 considering I and A by criteria.

With the exception of OS, the standards for interoperability have a remaining need expected around medium and higher levels of interoperability. Autoeuropa recognizes the importance that this practice has at strategic level, and in long term would have enormous benefits, leading Autoeuropa to indicate the intention to implement this practice. However, the current scenery reflects a low cooperation in this regard. At all levels of interoperability, except OS, the interoperability level is low in the implementation of P_3 . Through the calculation of deviation is possible to evidence which points to improve and which affects the interoperability problem (see Figure 6.11).

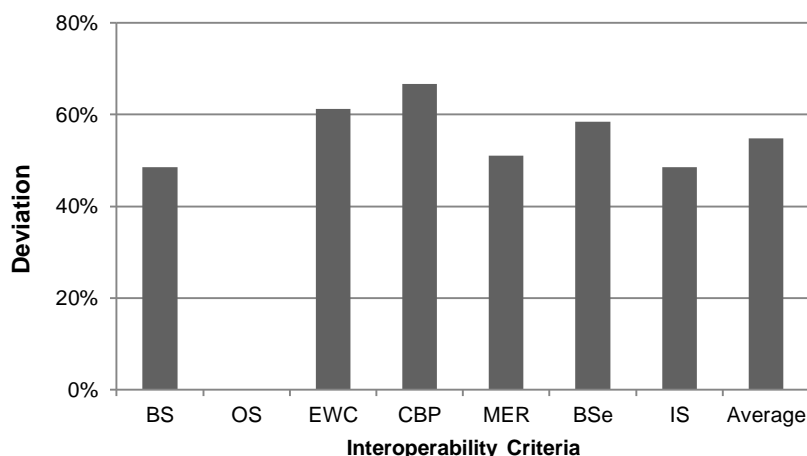


Figure 6.11. Deviation of P_3 implementation to expected interoperability by criteria.

OS is one matter that does not caress interoperability. For now, Autoeuropa has the adequate structure to implement P_3 . In other hand, at the top, level BS is caressing interoperability in about 48%, requiring a level of average interoperability between peers in an ideal situation. In contraire, P_3 doesn't

make part of strategic goals of Autoeuropa. However, the inquired reinforced the idea that in future it is desirable to start to design and develop proper models. Also remarked in this matter, Autoeuropa has the adequate OS (engineering department) that make possible the creation of new models. However, in counterpart, the opinion about the suppliers is that most of them do not possess the adequate staff and sections to achieve this possibility. That is remarked in EWC, CBP and MER, which have a deviation between 51 to 67%. Lack of strategic goals in P_3 implies that neither employees neither collaborative processes are prepared to design and development.

BSe and IS are a consequence of the above exposition. If company doesn't apply P_3 , there isn't an interoperable system that permit exchange information to this purpose, and no agreed terminology (semantics) make part of collaboration contracts.

6.4.4.5. P_4 – Use of compatible IT between actors

Compatibility of IS isn't an issue remarked as few interoperable by SCM's supervisor. Autoeuropa has a well-defined IS that fits all work expectations. That is remarked in BS, BSe and IS values (see Figure 6.12 and Figure 6.13). In strategy there is a clear view of the relevance of having systems compatible among peers. Furthermore, considering the internal IS, when Autoeuropa celebrates a new cooperation contract, it provides the software specification and what information must be provided almost in real-time. Without this condition, the contract is not established.

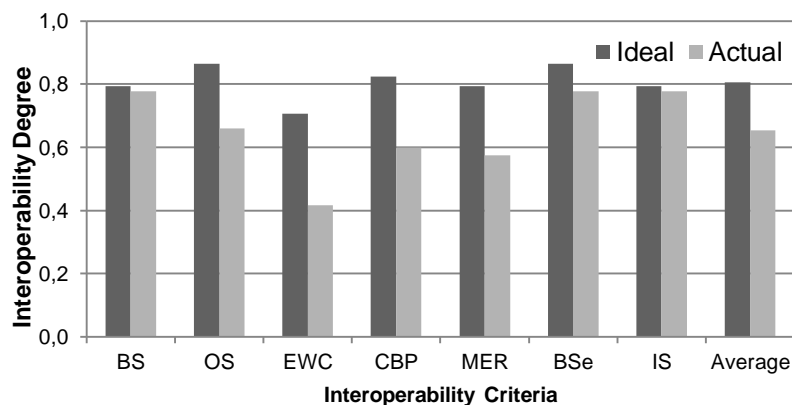


Figure 6.12. Interoperability degree of P_4 considering I and A by criteria.

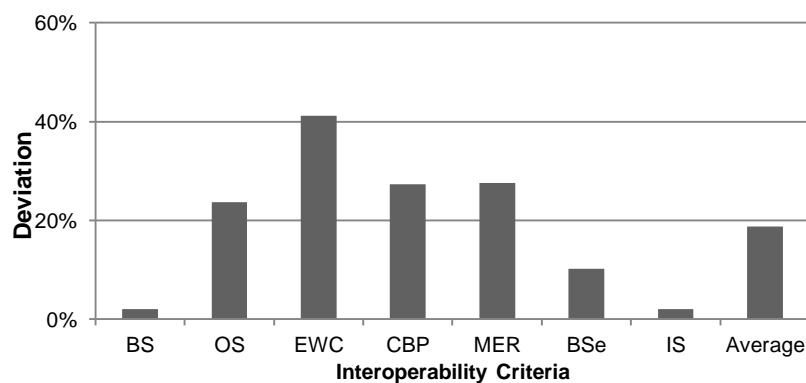


Figure 6.13. Deviation of P_4 implementation to expected interoperability by criteria.

In other hand, the ideal scenario of application of P_4 is faced with lack of interoperability in OS, EWC, CBP and MER. The interviewed highlights collaboration and human tasks in this matter. In perspective of collaboration (CBP and MER), even having a compatible system, the responsibility is not clearly defined for some situations. Even with compatible systems, problems seem to surge. There is some difficulty in understanding how information is exchanged, and which is responsible for what in frontier conditions.

From human perspective, in EWC responsibility and honesty are one great concern. Avoiding communicating a problem, for instance, in a delivery leads to erroneous information on the system leading to delays in production and, if this kind of matter is reported earlier there is a possibility that both parts can aid in finding a solution earlier.

6.4.4.6. P_5 - Use of IT to develop visibility to a clear view of upstream and downstream inventories

Visibility features among the less interoperable practices from global perspective analysis (section 6.4.4.1). Visibility is a key practice making possible to monitor inventory upstream and downstream the SC. From analysis of data (see Figure 6.14), it is possible to see that the level of interoperability expected stands around 0,8 (high to very high interoperability frontier). However, analysing the deviation percentage, there is an average deviation about 20% to the expectable interoperability level.

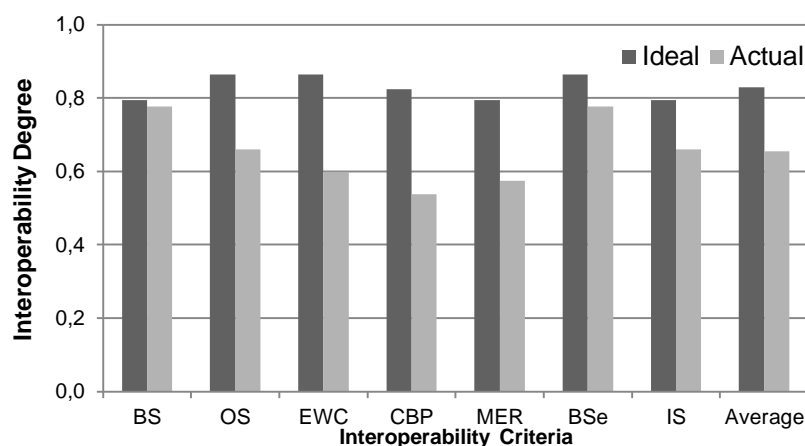


Figure 6.14. Interoperability degree of P_5 considering I and A by criteria.

BS remarks with less interoperability problems (2% deviation), reinforcing the idea of the contribution of P_5 to strategic goals. That position stands in the effectiveness and efficiency of IT, presented in IS and BSe with deviations of 17% and 10% respectively. Nevertheless, the prospects for collaboration and human are, again, the biggest problem in information sharing. Remarkd with deviation above 20%, reinforces the position exposed in the analysis of P_4 : the human tasks are inherent to lack transparency and lack of responsibility and honesty in the information shared.

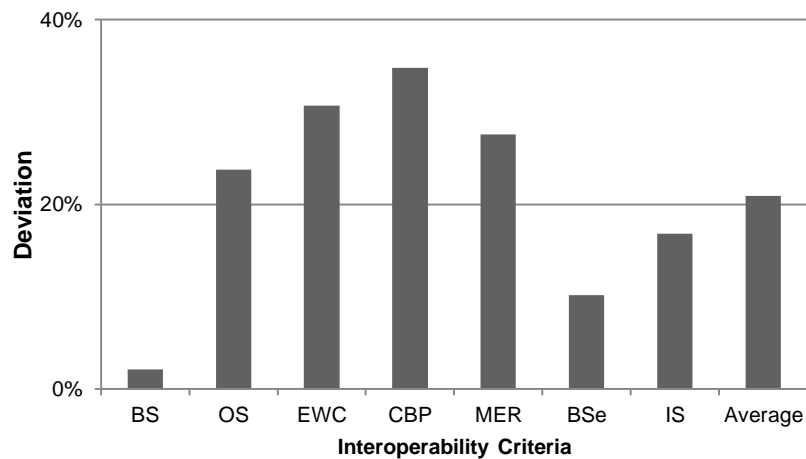


Figure 6.15. Deviation of P_5 implementation to expected interoperability by criteria.

6.4.4.7. P_6 - Development of security initiatives (to mitigate risk and contingency plans)

Facing the remarks from the interviewed in Table 6.16, the expected level of interoperability stands between high and very high interoperability and presently, it is between average and high. SCM's supervisor from FF remarked the relevance of needing to clarify semantically the terms inherent to mitigation and contingency plans. However, this matter is the most interoperable of this practice (see Figure 6.16 and Figure 6.17) with a deviation of 7% both manufacturer and suppliers understand the terms used for this activity.

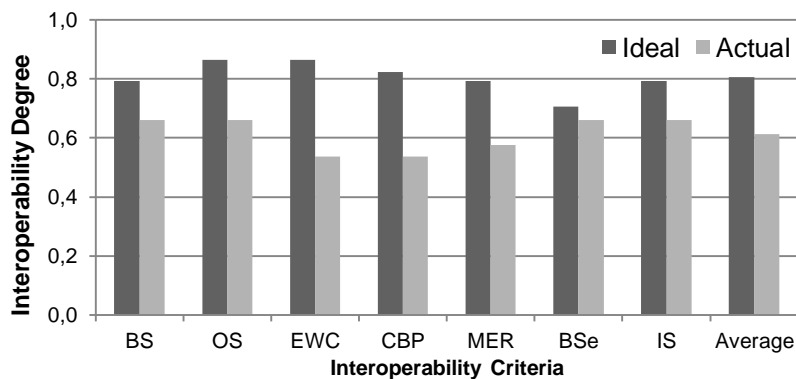


Figure 6.16. Interoperability degree of P_6 considering I and A by criteria.

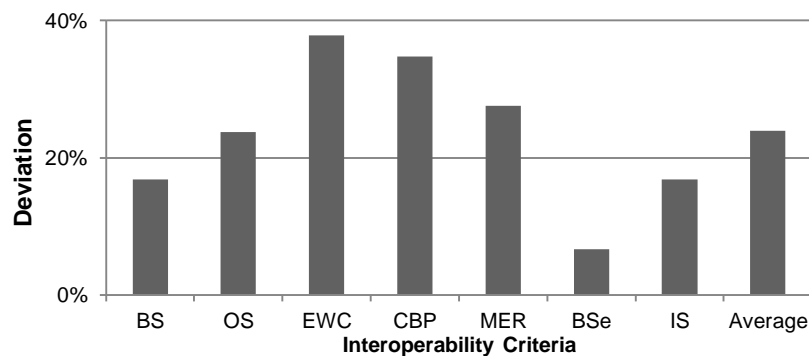


Figure 6.17. Deviation of P_6 implementation to expected interoperability by criteria.

With 17% deviation, BS and IS stand in the expected level of interoperability (high), satisfying the needs to P₆. However, there seems to be some issues regarding EWC and CBP which are the less interoperable (35 and 38% of deviation).

6.4.4.8. P₇ - Lead time reduction

P₇ doesn't have any remarks by the interviewed. The activity is very clear to watch in practice, and Autoeuropa, being a company that works in JIT³, recognises the strategic and operational importance of this practice as highly relevant. As a fact, analysing data in Figure 6.18 and Figure 6.19, BS is classified as high interoperable both in ideal and actual situations.

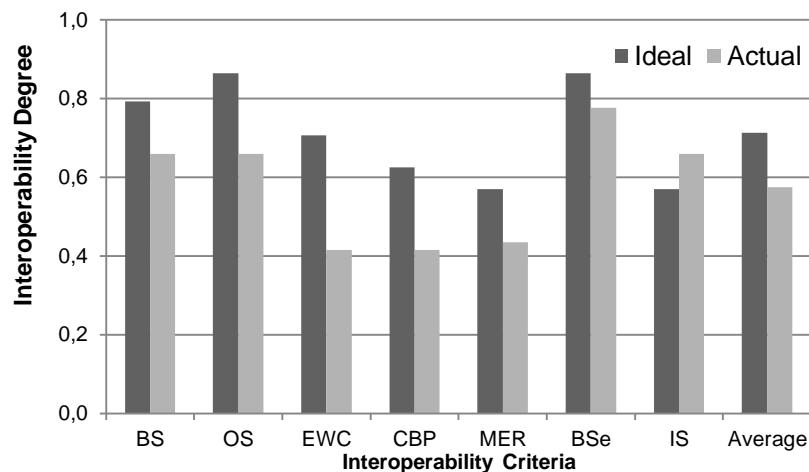


Figure 6.18. Interoperability degree of P₇ considering I and A by criteria.

The more interoperable drivers of P₇ are BSe and IS. BSe stands in very high interoperability expected (I) faced by high interoperable in the actual situation. Therefore, reveals a deep understanding in the logistic terminology in exchanging information relative to logistics. From IS perspective, the current systems seem to be more than adequate to perform P₇. The deviation is -17%.

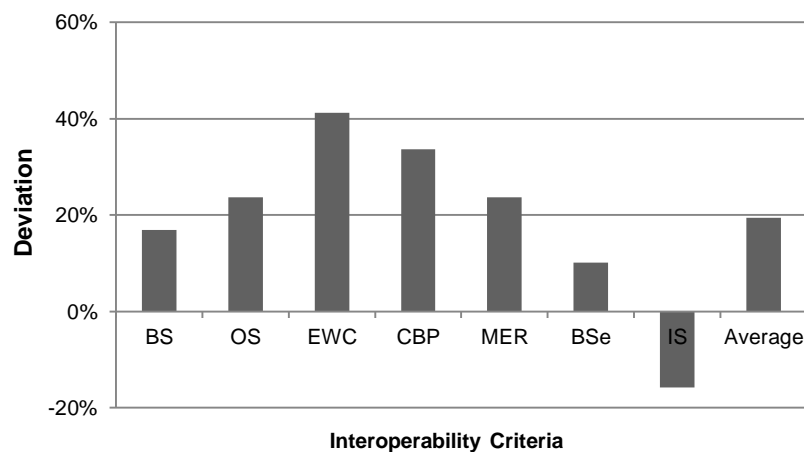


Figure 6.19. Deviation of P₇ implementation to expected interoperability by criteria.

³ JIT-Just in time

Once over, human and collaboration factors are the main concern in another logistic activity. Less interoperable aspect is EWC, followed by CBP, MER and OS with 41, 34, 24 and 24% deviation respectively.

6.4.4.9. P₈ – Flexible transportation

P₈ is a practice that Autoeuropa applies and is looking for improvement. Actually, all the deliveries to manufacturer are made by truck combined with rail delivery. However, these two forms of transport are not used in the perspective of alternatives but in joint operation. The absence of a dock rail inside manufacturer facilities led to the alternative solution of receiving material through a supplier and through an external intermediary.

At top level, BS assessment reveals expected and actual high interoperability but, in the operational aspects interoperability has a deviation between 24 and 38%. Graphic representations in Figure 6.20 and Figure 6.21 reveal that, generally, internal aspects as OS and EWC must be very high (class V) interoperable and, actually, are average to high interoperable and, in terms of collaboration, it was expected high and very high interoperation and, in contraire, in the current situation the interoperability is rated as average. Any disturbances that occur in the suppliers that receive and deliver materials to Autoeuropa, will lead to lack of interoperability and disturbances in logistics and production schedule. Thus, this practice must be enhanced in order to keep the input material flow in a steady state.

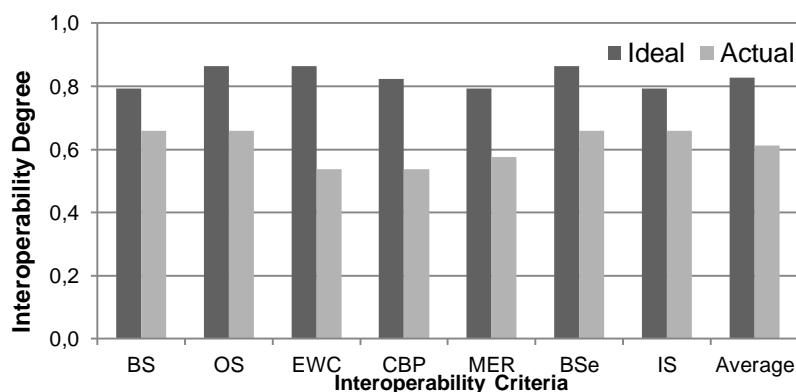


Figure 6.20. Interoperability degree of P₈ considering *I* and *A* by criteria.

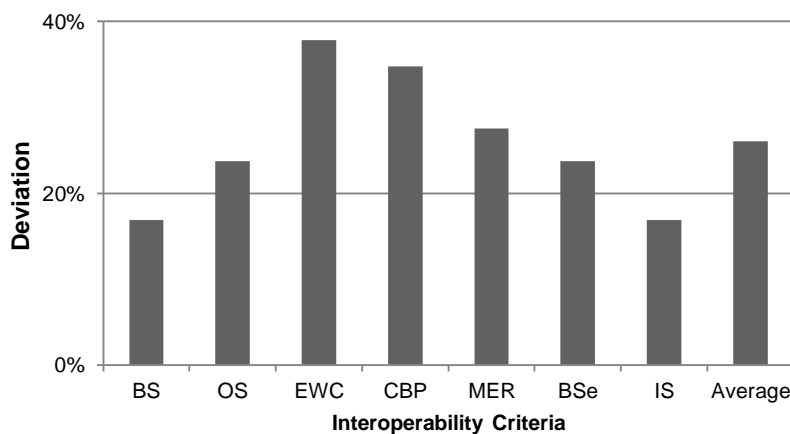


Figure 6.21. Deviation of P₈ implementation to expected interoperability by criteria.

6.5. Application of AHP model

The AHP model suffered some changes due to results from fuzzy sets model. Namely, in the practices assessed and in terminology used. Relatively to practices, were selected the following: P_2 , P_3 , P_5 , P_7 and P_8 .

P_2 and P_3 are the less interoperable practices assessed, thus the interest to assess these two in prior investigation. Followed by previous practices, P_8 is the third with less interoperability performance, thus was selected to evaluate in AHP.

Since P_4 and P_5 are slightly correlated, was selected the less interoperable (P_5) to assess in the AHP model.

Although P_6 is also less interoperable, the interviewed didn't remarked as a relevant practice to assess (view Table 6.4).

6.5.1. Results

6.5.1.1. Relevance - I

The evaluation of interoperability proceeded in a systematic way through two phases: criteria and practices evaluation. The results of criteria evaluation for I situation is presented in Eq. 6.1.

$$CI = \begin{matrix} & \begin{matrix} BS & OS & EWC & CBP & MER & BSe & IS \end{matrix} \\ \begin{matrix} BS \\ OS \\ EWC \\ CBP \\ MER \\ BSe \\ IS \end{matrix} & \begin{bmatrix} 1 & 1 & 3 & 1 & 1 & 1 & 1 \\ 1 & 1 & 3 & 1 & 1 & 1 & 1 \\ 1/3 & 1/3 & 1 & 1/3 & 1/3 & 1/3 & 1/3 \\ 1 & 1 & 3 & 1 & 1 & 1 & 1 \\ 1 & 1 & 3 & 1 & 1 & 1 & 1 \\ 1 & 1 & 3 & 1 & 1 & 1 & 1 \\ 1 & 1 & 3 & 1 & 1 & 1 & 1 \end{bmatrix} \end{matrix} \quad \text{Eq. 6.1}$$

Practices evaluation for the same situation is presented in Eq. 6.2 to Eq. 6.8.

$$p^{BS} = \begin{matrix} & \begin{matrix} P_2 & P_3 & P_5 & P_7 & P_8 \end{matrix} \\ \begin{matrix} P_2 \\ P_3 \\ P_5 \\ P_7 \\ P_8 \end{matrix} & \begin{bmatrix} 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \end{bmatrix} \end{matrix} \quad \text{Eq. 6.2}$$

$$p^{OS} = \begin{matrix} & \begin{matrix} P_2 & P_3 & P_5 & P_7 & P_8 \end{matrix} \\ \begin{matrix} P_2 \\ P_3 \\ P_5 \\ P_7 \\ P_8 \end{matrix} & \begin{bmatrix} 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \end{bmatrix} \end{matrix} \quad \text{Eq. 6.3}$$

$$p^{EWC} = \begin{matrix} & \begin{matrix} P_2 & P_3 & P_5 & P_7 & P_8 \end{matrix} \\ \begin{matrix} P_2 \\ P_3 \\ P_5 \\ P_7 \\ P_8 \end{matrix} & \begin{bmatrix} 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \end{bmatrix} \end{matrix} \quad \text{Eq. 6.4}$$

$$p^{CBP} = \begin{matrix} & \begin{matrix} P_2 & P_3 & P_5 & P_7 & P_8 \end{matrix} \\ \begin{matrix} P_2 \\ P_3 \\ P_5 \\ P_7 \\ P_8 \end{matrix} & \begin{bmatrix} 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \end{bmatrix} \end{matrix} \quad \text{Eq. 6.5}$$

$$p^{MER} = \begin{matrix} & \begin{matrix} P_2 & P_3 & P_5 & P_7 & P_8 \end{matrix} \\ \begin{matrix} P_2 \\ P_3 \\ P_5 \\ P_7 \\ P_8 \end{matrix} & \begin{bmatrix} 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \end{bmatrix} \end{matrix} \quad \text{Eq. 6.6}$$

$$p^{BSe} = \begin{matrix} & \begin{matrix} P_2 & P_3 & P_5 & P_7 & P_8 \end{matrix} \\ \begin{matrix} P_2 \\ P_3 \\ P_5 \\ P_7 \\ P_8 \end{matrix} & \begin{bmatrix} 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \end{bmatrix} \end{matrix} \quad \text{Eq. 6.7}$$

$$p^{IS} = \begin{matrix} & P_2 & P_3 & P_5 & P_7 & P_8 \\ \begin{matrix} P_2 \\ P_3 \\ P_5 \\ P_7 \\ P_8 \end{matrix} & \begin{bmatrix} 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \end{bmatrix} \end{matrix} \quad \text{Eq. 6.8}$$

6.5.1.2. Actual state - A

Relatively to actual state, the evaluations of criteria are present in Eq. 6.9.

$$CA = \begin{matrix} & BS & OS & EWC & CBP & MER & BSe & IS \\ \begin{matrix} BS \\ OS \\ EWC \\ CBP \\ MER \\ BSe \\ IS \end{matrix} & \begin{bmatrix} 1 & 1 & 3 & 1 & 1 & 1 & 1 \\ 1 & 1 & 3 & 1 & 1 & 1 & 1 \\ 1/3 & 1/3 & 1 & 1/3 & 1/3 & 1/3 & 1/3 \\ 1 & 1 & 3 & 1 & 1 & 1 & 1 \\ 1 & 1 & 3 & 1 & 1 & 1 & 1 \\ 1 & 1 & 3 & 1 & 1 & 1 & 1 \\ 1 & 1 & 3 & 1 & 1 & 1 & 1 \end{bmatrix} \end{matrix} \quad \text{Eq. 6.9}$$

Practices evaluation is presented in matrixes Eq. 6.10 to Eq. 6.14.

$$p^{BS} = \begin{matrix} & P_2 & P_3 & P_5 & P_7 & P_8 \\ \begin{matrix} P_2 \\ P_3 \\ P_5 \\ P_7 \\ P_8 \end{matrix} & \begin{bmatrix} 1 & 3 & 1 & 1 & 1 \\ 1/3 & 1 & 1/3 & 1/3 & 1/3 \\ 1 & 3 & 1 & 1 & 1 \\ 1 & 3 & 1 & 1 & 1 \\ 1 & 3 & 1 & 1 & 1 \end{bmatrix} \end{matrix} \quad \text{Eq. 6.10}$$

$$p^{OS} = \begin{matrix} & P_2 & P_3 & P_5 & P_7 & P_8 \\ \begin{matrix} P_2 \\ P_3 \\ P_5 \\ P_7 \\ P_8 \end{matrix} & \begin{bmatrix} 1 & 3 & 1 & 1 & 1 \\ 1/3 & 1 & 1/3 & 1/3 & 1/3 \\ 1 & 3 & 1 & 1 & 1 \\ 1 & 3 & 1 & 1 & 1 \\ 1 & 3 & 1 & 1 & 1 \end{bmatrix} \end{matrix} \quad \text{Eq. 6.11}$$

$$p^{EWC} = \begin{matrix} & P_2 & P_3 & P_5 & P_7 & P_8 \\ \begin{matrix} P_2 \\ P_3 \\ P_5 \\ P_7 \\ P_8 \end{matrix} & \begin{bmatrix} 1 & 3 & 1 & 1 & 1 \\ 1/3 & 1 & 1/3 & 1/3 & 1/3 \\ 1 & 3 & 1 & 1 & 1 \\ 1 & 3 & 1 & 1 & 1 \\ 1 & 3 & 1 & 1 & 1 \end{bmatrix} \end{matrix} \quad \text{Eq. 6.12}$$

$$p^{CBP} = \begin{matrix} & P_2 & P_3 & P_5 & P_7 & P_8 \\ \begin{matrix} P_2 \\ P_3 \\ P_5 \\ P_7 \\ P_8 \end{matrix} & \begin{bmatrix} 1 & 1/3 & 1/3 & 1/3 & 1/3 \\ 3 & 1 & 1/3 & 1/3 & 1 \\ 3 & 3 & 1 & 1/3 & 1 \\ 3 & 3 & 3 & 1 & 1 \\ 3 & 1 & 1 & 1 & 1 \end{bmatrix} \end{matrix} \quad \text{Eq. 6.13}$$

$$p^{MER} = \begin{matrix} & P_2 & P_3 & P_5 & P_7 & P_8 \\ \begin{matrix} P_2 \\ P_3 \\ P_5 \\ P_7 \\ P_8 \end{matrix} & \begin{bmatrix} 1 & 2 & 1/3 & 1/3 & 1/3 \\ 1/2 & 1 & 1/3 & 1/3 & 1/3 \\ 3 & 3 & 1 & 1/3 & 1/3 \\ 3 & 3 & 3 & 1 & 1 \\ 3 & 3 & 3 & 1 & 1 \end{bmatrix} \end{matrix} \quad \text{Eq. 6.14}$$

$$p^{BSe} = \begin{matrix} & P_2 & P_3 & P_5 & P_7 & P_8 \\ \begin{matrix} P_2 \\ P_3 \\ P_5 \\ P_7 \\ P_8 \end{matrix} & \begin{bmatrix} 1 & 3 & 1 & 1 & 1 \\ 1/3 & 1 & 1/3 & 1/3 & 1/3 \\ 1 & 3 & 1 & 1 & 1 \\ 1 & 3 & 1 & 1 & 1 \\ 1 & 3 & 1 & 1 & 1 \end{bmatrix} \end{matrix} \quad \text{Eq. 6.15}$$

$$p^{IS} = \begin{matrix} & P_2 & P_3 & P_5 & P_7 & P_8 \\ \begin{matrix} P_2 \\ P_3 \\ P_5 \\ P_7 \\ P_8 \end{matrix} & \begin{bmatrix} 1 & 2 & 1/3 & 1/3 & 1/3 \\ 1/2 & 1 & 1/3 & 1/3 & 1/3 \\ 3 & 3 & 1 & 1/3 & 1/3 \\ 3 & 3 & 3 & 1 & 1 \\ 3 & 3 & 3 & 1 & 1 \end{bmatrix} \end{matrix} \quad \text{Eq. 6.16}$$

6.5.2. Data analysis

6.5.2.1. Relevance – I

After evaluation of criteria and practices, decision matrixes must be computed and determine the priorities for each term. To effect, first, each matrix is normalised and then it is determined the priority for each term. For instance, considering the matrix Eq. 6.1, the normalisation is done as follows:

$$CI = \begin{matrix} & \begin{matrix} BS & OS & EWC & CBP & MER & BSe & IS \end{matrix} \\ \begin{matrix} BS \\ OS \\ EWC \\ CBP \\ MER \\ BSe \\ IS \end{matrix} & \begin{bmatrix} 1 & 1 & 3 & 1 & 1 & 1 & 1 \\ 1 & 1 & 3 & 1 & 1 & 1 & 1 \\ 1/3 & 1/3 & 1 & 1/3 & 1/3 & 1/3 & 1/3 \\ 1 & 1 & 3 & 1 & 1 & 1 & 1 \\ 1 & 1 & 3 & 1 & 1 & 1 & 1 \\ 1 & 1 & 3 & 1 & 1 & 1 & 1 \\ 1 & 1 & 3 & 1 & 1 & 1 & 1 \end{bmatrix} \end{matrix} = \begin{bmatrix} 0.16 & 0.16 & 0.16 & 0.16 & 0.16 & 0.16 & 0.16 \\ 0.16 & 0.16 & 0.16 & 0.16 & 0.16 & 0.16 & 0.16 \\ 0.05 & 0.05 & 0.05 & 0.05 & 0.05 & 0.05 & 0.05 \\ 0.16 & 0.16 & 0.16 & 0.16 & 0.16 & 0.16 & 0.16 \\ 0.16 & 0.16 & 0.16 & 0.16 & 0.16 & 0.16 & 0.16 \\ 0.16 & 0.16 & 0.16 & 0.16 & 0.16 & 0.16 & 0.16 \\ 0.16 & 0.16 & 0.16 & 0.16 & 0.16 & 0.16 & 0.16 \end{bmatrix}$$

Thus, using Eq. 4.2, the attainment of priority for BS corresponds to:

$$w_{BS} = \frac{1}{7}(0.16 + 0.16 + 0.16 + 0.16 + 0.16 + 0.16 + 0.16) = 0.16$$

To determine the maximum priority of BS in I, it is used Eq. 4.3 as follows:

$$\lambda_{max} = (1 + 1 + 1/3 + 1 + 1 + 1 + 1) \times 0.16 + \dots + \left(1 + 1 + \frac{1}{3} + 1 + 1 + 1 + 1\right) \times 0.16 = 7$$

Consistency is verified if CI is less than 10. Thus, considering the criteria evaluation matrix Consistency is verified if CI is less than 10. Thus, considering the criteria evaluation matrix Eq. 6.1 and using Eq. 4.4, is calculated:

$$CI = \frac{\lambda_{max} - n}{n - 1} = \frac{7 - 7}{7 - 1} = 0$$

For this situation, it is concluded that, since CI is 0, then the matrix is consistent. Therefore, CR is 0.

To compute the rest of data, it is applied the previous calculations having in consideration that, for practices, all values must be multiplied by the subjacent criteria weight. The results for criteria and practices are presented in Table 6.20 and Table 6.21 respectively.

Table 6.20. Computed criteria priorities for I situation, with rank, eigenvector and consistency.

Criteria (i)	w_i	Rank	λ_{max}	CI	CR
BS	0.158	1	7	0%	0%
OS	0.158	1			
EWC	0.053	7			
CBP	0.158	1			
MER	0.158	1			
BSe	0.158	1			
IS	0.158	1			

Table 6.21. Computed practices priorities for I situation, with rank, eigenvector and consistency.

Criteria	w_i	Practices (j)	$w_{i,j}$	Rank	λ_{\max}	CI	CR	$w_i \times w_{i,j}$	Overall Rank
BS	0.158	P ₂	0.200	1	5	0%	0%	0.0316	1
		P ₃	0.200	1				0.0316	1
		P ₅	0.200	1				0.0316	1
		P ₇	0.200	1				0.0316	1
		P ₈	0.200	1				0.0316	1
OS	0.158	P ₂	0.200	1	5	0%	0%	0.0316	1
		P ₃	0.200	1				0.0316	1
		P ₅	0.200	1				0.0316	1
		P ₇	0.200	1				0.0316	1
		P ₈	0.200	1				0.0316	1
EWC	0.053	P ₂	0.200	1	5	0%	0%	0.0105	1
		P ₃	0.200	1				0.0105	1
		P ₅	0.200	1				0.0105	1
		P ₇	0.200	1				0.0105	1
		P ₈	0.200	1				0.0105	1
CBP	0.158	P ₂	0.200	1	5	0%	0%	0.0316	1
		P ₃	0.200	1				0.0316	1
		P ₅	0.200	1				0.0316	1
		P ₇	0.200	1				0.0316	1
		P ₈	0.200	1				0.0316	1
MER	0.158	P ₂	0.200	1	5	0%	0%	0.0316	1
		P ₃	0.200	1				0.0316	1
		P ₅	0.200	1				0.0316	1
		P ₇	0.200	1				0.0316	1
		P ₈	0.200	1				0.0316	1
BSe	0.158	P ₂	0.200	1	5	0%	0%	0.0316	1
		P ₃	0.200	1				0.0316	1
		P ₅	0.200	1				0.0316	1
		P ₇	0.200	1				0.0316	1
		P ₈	0.200	1				0.0316	1
IS	0.158	P ₂	0.200	1	5	0%	0%	0.0316	1
		P ₃	0.200	1				0.0316	1
		P ₅	0.200	1				0.0316	1
		P ₇	0.200	1				0.0316	1
		P ₈	0.200	1				0.0316	1

To determine final weights for practices, the composite weights are summed. The final weights are presented in Table 6.22.

Table 6.22. Practices weights considering each criterion and global perspectives in ideal situation.

Practices	BS	OS	EWC	CBP	MER	BSe	IS	Global	Rank
P ₂	0.032	0.032	0.011	0.032	0.032	0.032	0.032	0.200	1
P ₃	0.032	0.032	0.011	0.032	0.032	0.032	0.032	0.200	1
P ₅	0.032	0.032	0.011	0.032	0.032	0.032	0.032	0.200	1
P ₇	0.032	0.032	0.011	0.032	0.032	0.032	0.032	0.200	1
P ₈	0.032	0.032	0.011	0.032	0.032	0.032	0.032	0.200	1

6.5.2.1. Actual state - A

For actual situation, were applied the same computations obtaining Table 6.23, Table 6.24 and Table 6.25.

Table 6.23. Computed criteria priorities for A situation, with rank, eigenvector and consistency.

Criteria	Normalized Eigenvector	Rank	λ_{max}	CI	CR
BS	0.158	1	7	0%	0%
OS	0.158	1			
EWC	0.053	7			
CBP	0.158	1			
MER	0.158	1			
BSe	0.158	1			
IS	0.158	1			

Table 6.24. Computed practices priorities for A situation, with rank, eigenvector and consistency.

Criteria	w_i	Practices (j)	w_{ij}	Rank	λ_{max}	CI	CR	$w_i \times w_{ij}$	Overall Rank
BS	0.158	P ₂	0.231	1	5	0%	0%	0.0364	6
		P ₃	0.077	5				0.0121	27
		P ₅	0.231	1				0.0364	6
		P ₇	0.231	1				0.0364	6
		P ₈	0.231	1				0.0364	6
OS	0.158	P ₂	0.231	1	5	0%	0%	0.0364	6
		P ₃	0.077	5				0.0121	27
		P ₅	0.231	1				0.0364	6
		P ₇	0.231	1				0.0364	6
		P ₈	0.231	1				0.0364	6
EWC	0.053	P ₂	0.231	1	5	0%	0%	0.0121	27
		P ₃	0.077	5				0.0040	35
		P ₅	0.231	1				0.0121	27
		P ₇	0.231	1				0.0121	27
		P ₈	0.231	1				0.0121	27
CBP	0.158	P ₂	0.073	5	5.41	10%	9%	0.0115	34
		P ₃	0.150	4				0.0237	22
		P ₅	0.222	2				0.0350	18
		P ₇	0.337	1				0.0532	1
		P ₈	0.218	3				0.0345	19
MER	0.158	P ₂	0.106	4	5.33	8%	7%	0.0167	23
		P ₃	0.079	5				0.0125	25
		P ₅	0.178	3				0.0281	20
		P ₇	0.319	1				0.0503	2
		P ₈	0.319	1				0.0503	2
BSe	0.158	P ₂	0.231	1	5	0%	0%	0.0364	6
		P ₃	0.077	5				0.0121	27
		P ₅	0.231	1				0.0364	6
		P ₇	0.231	1				0.0364	6
		P ₈	0.231	1				0.0364	6
IS	0.158	P ₂	0.106	4	5.33	8%	7%	0.0167	23
		P ₃	0.079	5				0.0125	25
		P ₅	0.178	3				0.0281	20
		P ₇	0.319	1				0.0503	2
		P ₈	0.319	1				0.0503	2

Table 6.25. Practices weights considering each criterion and global perspectives in ideal situation.

Practices	BS	OS	EWC	CBP	MER	BSe	IS	Score	Rank
P ₂	0.036	0.036	0.012	0.011	0.017	0.036	0.017	0.166	4
P ₃	0.012	0.012	0.004	0.024	0.013	0.012	0.013	0.089	5
P ₅	0.036	0.036	0.012	0.035	0.028	0.036	0.028	0.213	3
P ₇	0.036	0.036	0.012	0.053	0.050	0.036	0.050	0.275	1
P ₈	0.036	0.036	0.012	0.034	0.050	0.036	0.050	0.257	2

6.5.3. Perspective analysis

6.5.3.1. Overall

From the point of view of the interviewed, having made a first assessment in how relevant are the interoperability parameters to implement practices once (in fuzzy sets, section 6.4), makes no sense repeat it again. Further, considered that in idealistic perspective, all the parameters have equal importance to SCM objectives. Thus, the evaluation of *I* situation was excluded because all values of pairwise comparisons are 1, except EWC that was signed 1/3 less relevant than the rest of criteria.

For instance, in the global perspective, analysing data from both *I* and *A* situations, it is obtained the graphic of Figure 6.22. Having considered equal importance for all the criteria and practices, the objective of scaling evaluations between *I* and *A* is not accomplished. In practice P₇, for example, the actual performance would mean that its implementation occurs beyond expected. In counterpart, from fuzzy model data it is possible to know that P₇ is 19% far from what is projected as the level of interoperability. Thus, all the evaluation of *I* situation is rejected, and only the actual performance is addressed in this section.

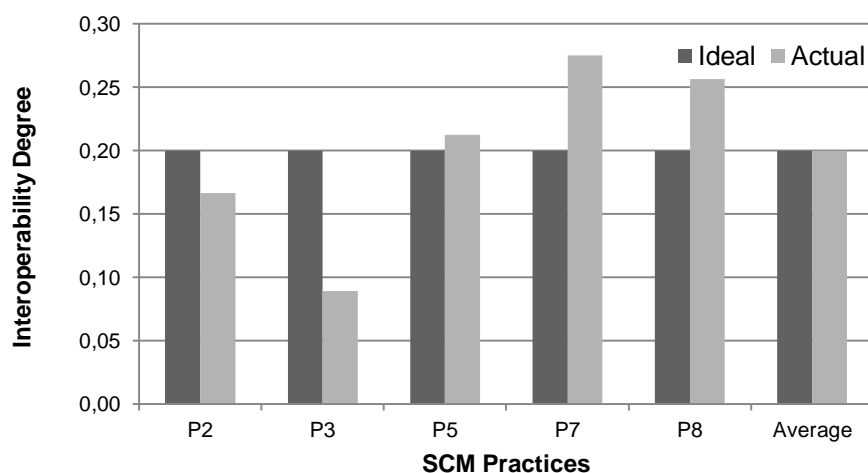


Figure 6.22. Interoperability degree of each practice considering I and A.

6.5.3.2. P₂ – Reverse logistics

Considering the actual performance of P₂ implementation (see Figure 6.23), and according to AHP model, it presents highest level of interoperability in strategic issues (BS), organisational interoperability (OS and EWC) and information exchange (IS). Strategically, P₂ requires an elevated degree of interoperability by clarifying the importance of reuse, re-work and recycle materials to the

objectives of SC. Internally, this practice requires and presents high level of interoperability in the OS and EWC. The interviewed argued that Autoeuropa has the adequate OS and employee formation and no difficulty in locating the responsible from each organisation to deal with this subject. However, the difficulty is in the mechanism that governs the reverse flow of material. That is revealed in the low interoperability on collaborative sectors CBP and MER. Like previously mentioned, due to inexistent business process that rule how material is returned to suppliers (from 1st to nth tiers), no meaningful interactions occur leading to the accumulation of pallets in focal firm. These pallets serve to the predicted flow of material along the supply chain. The accumulation of these, means that empty pallets and full pallets with non-conform components are retained in manufacturer.

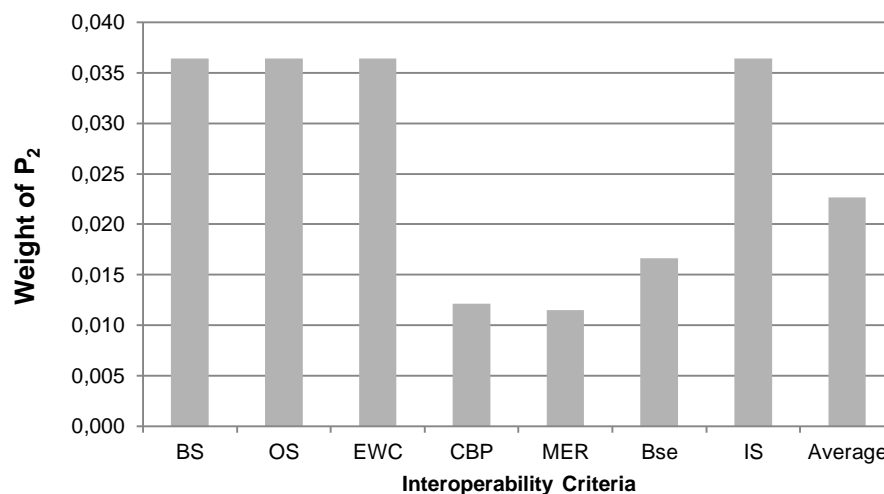


Figure 6.23. Weights of P₂ of each interoperability criterion.

6.5.3.3. P₃ – Suppliers involvement in design and conception of products

The suppliers' involvement in conception and design is remarked by low interoperability in comparison with the rest of practices, indicating that presently is not fully implemented as SC managers would desire. Except to MER and CBP, all the rest of criteria places in average interoperability (see Figure 6.24). SCM supervisor indicates that presently Autoeuropa does not conceive local conception and development, explaining the low level of interoperability in BS, OS, EWC, BSe and IS. However, the interviewed remarks the intention of implementing this practice in future with Portuguese suppliers instead of foreign suppliers which cooperate with VW headquarters. That is expressed in the high level of interoperability in MER. In this topic, it is commented by the interviewed the relevance of assess partners. It is argued that some of local suppliers have the enough conditions to cooperate in design of components. In counterpart, lack of implementation of this practice generates a low cooperation scenario revealed in CBP.

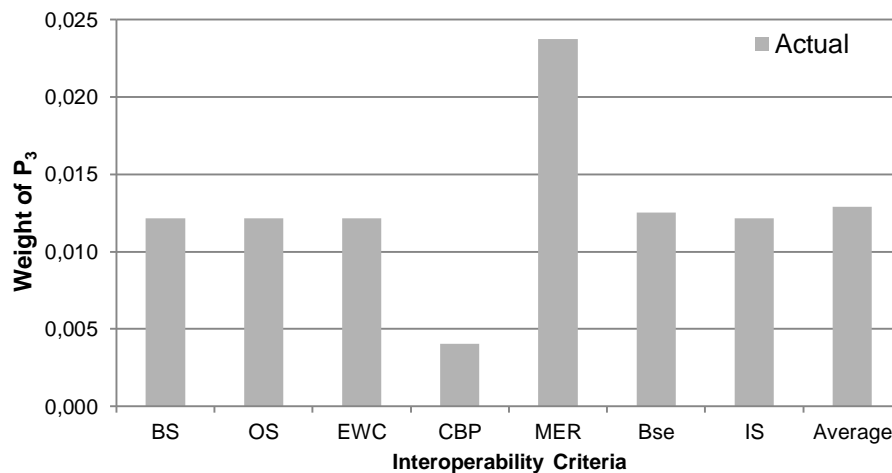


Figure 6.24. Weights of P_3 of each interoperability criterion.

6.5.3.4. P_5 – Use of IT to develop visibility to a clear view of upstream and downstream inventories

Like mentioned before, visibility is a key practice for SCM. The levels of interoperability stand at maximum for every criterion, except CBP (see Figure 6.25). Collaborative scenario shows that low interoperability occurs between focal firm and suppliers. Inventory levels are not equally shared between actors, not leading to a well implemented scenario.

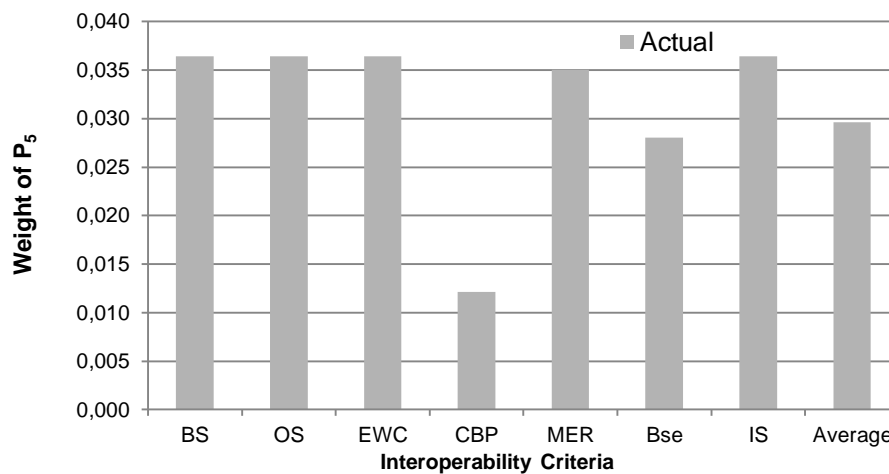


Figure 6.25. Weights of P_5 of each interoperability criterion.

6.5.3.5. P_7 - Lead time reduction

Reduction of lead-time figures among logistic integration of SC actors, requiring high depth of aligned business processes. Comparing with other criteria, P_7 is classified as having highest level of interoperability.

MER and BSe represent the highest interoperability scenario for P_7 (see Figure 6.26). In other hand, CBP performance display the lowest interoperation weight of P_7 revealing that collaboration is the main concern of logistics activities.

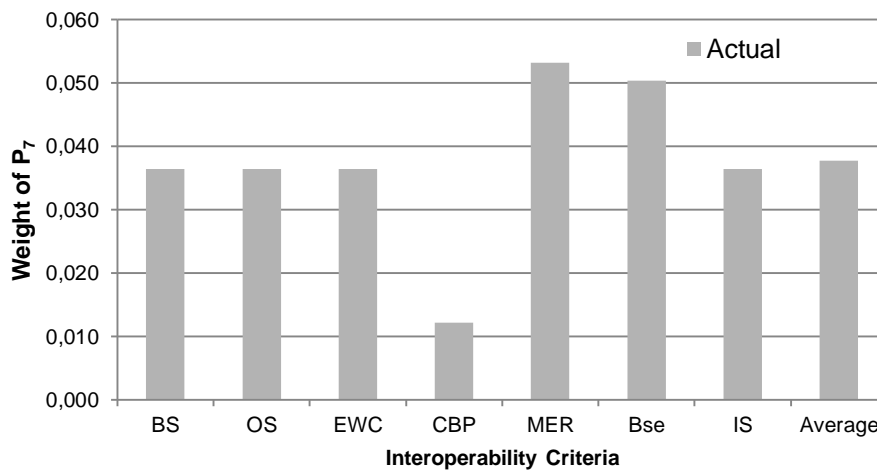


Figure 6.26. Weights of P_7 of each interoperability criterion.

6.5.3.6. P_8 – Flexible transportation

In the implementation of P_8 , the highest level of interoperability occurs in semantics (see Figure 6.27). The understanding of exchanged information figures among the key issues in the communication involved on transportation.

Low interoperability is present in CBP perspective. The ability of exchanging between alternative transportation affects general SC performance, by the reasons exposed in 6.4.4.9.

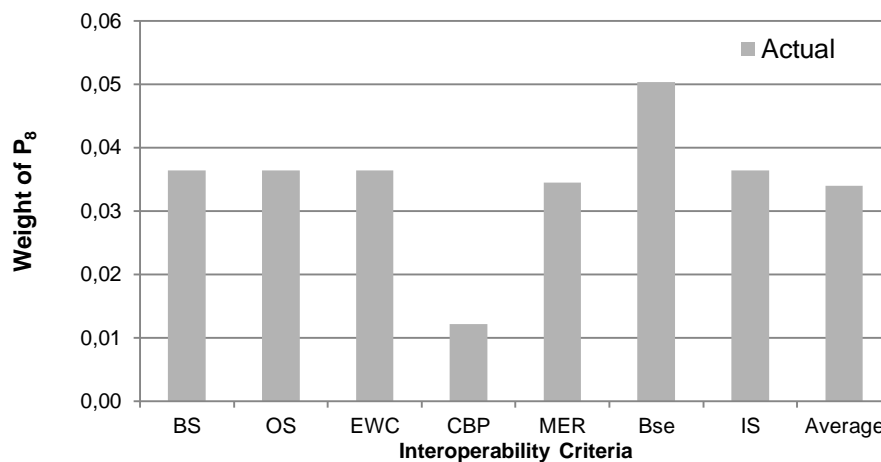


Figure 6.27. Weights of P_8 of each interoperability criterion.

6.5.4. Comparison with fuzzy sets model

From an overall perspective, data from models are concordant, with a slightly difference in practices P_5 and P_7 which are revealed in fuzzy sets having P_5 more interoperable than P_7 (see Table 6.26). In counterpart, in AHP model this sequence is reversed. The main reason for this matter is the degree of detail of each model. Fuzzy sets uses a 5 degree scale to assess both I and A . This scale limits sensibility when faced with 17 degree scale of importance from AHP. However, the source of the problem is not the scale but the interviewed. Previous research work done in Autoeuropa uses AHP and ANP models and the interviewed, being familiar with those models, tried to keep answers consistent. That limited the spectrum of pairwise comparisons to relevance between 3 and 1/3, i.e., reducing significantly the scale to 5 degrees of evaluation instead of 17 degrees of the full model.

In Table 6.26 are presented the rankings of practices, in terms of more interoperable, by criteria and the overall rank.

Table 6.26. Comparison of interoperability level ranking for AHP and Fuzzy models, from more interoperable to less.

Practices	Rank															
	BS		OS		EWC		CBP		MER		BSe		IS		Overall	
	AHP	Fuzzy	AHP	Fuzzy	AHP	Fuzzy	AHP	Fuzzy	AHP	Fuzzy	AHP	Fuzzy	AHP	Fuzzy	AHP	Fuzzy
P ₂	1 st	3 rd	1 st	1 st	1 st	2 nd	5 th	3 rd	4 th	3 rd	1 st	4 th	4 th	4 th	4 th	4 th
P ₃	5 th	3 rd	5 th	5 th	5 th	5 th	4 th	5 th	5 th	5 th	5 th	5 th	5 th	5 th	5 th	5 th
P ₅	1 st	1 st	1 st	1 st	1 st	1 st	2 nd	1 st	3 rd	1 st	1 st	1 st	3 rd	1 st	3 rd	1 st
P ₇	1 st	2 nd	1 st	1 st	1 st	4 th	1 st	3 rd	1 st	3 rd	1 st	1 st	1 st	1 st	1 st	3 rd
P ₈	1 st	2 nd	1 st	1 st	1 st	2 nd	3 rd	1 st	1 st	1 st	1 st	3 rd	1 st	1 st	2 nd	2 nd

Analysing data, is find some partial correspondences between models. In terms of BS, the practice that presents highest interoperability level is P₅, being concordant in the two models. Nonetheless, the lack of sensibility in AHP led to a tie in terms of most interoperable. P₂, P₇ and P₈ are also the most interoperable on BS. The less interoperable for AHP is P₃ and for fuzzy model P₃ and P₅.

Comparing the level of interoperability in actual situation for P₅, some discrepancies are emphasized (see Figure 6.28). The graph shape should be similar for the two models. Instead, there are remarkable differences in terms of EWC and CBP.

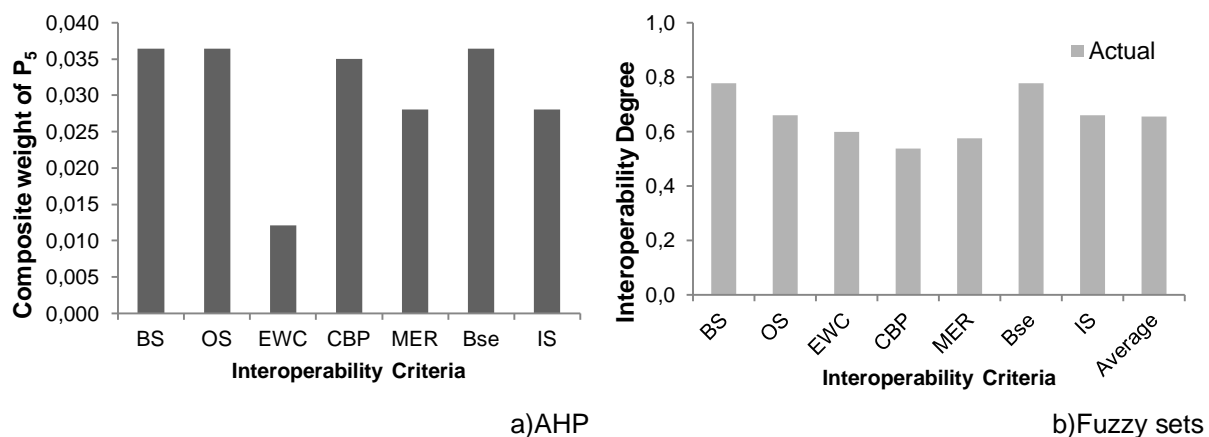


Figure 6.28. Comparison of results from models for P₅.

Considering only the individual weights of P₅, it is possible to represent the evaluations of P₅ regarding each criterion (see Figure 6.29).

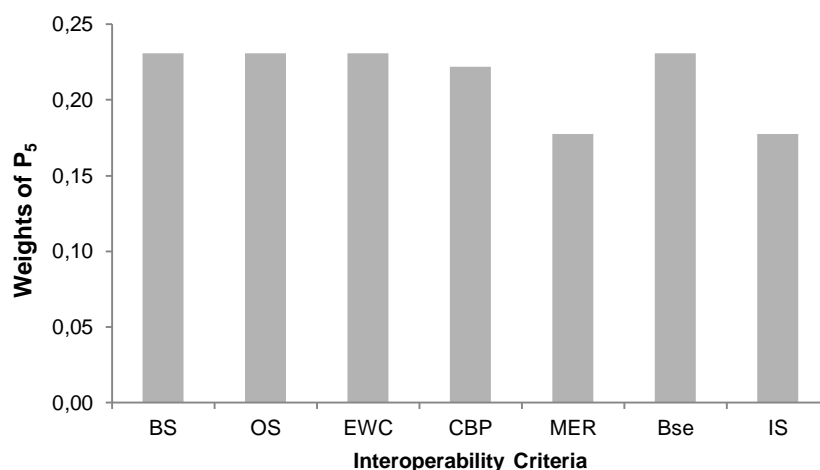


Figure 6.29. Individual weights of P_5 for each criterion.

Comparing with the representation of fuzzy data, it is possible to establish a resemblance between graphic shapes. The main explanation is found in the evaluation of criteria. Having considered that only EWC is 1/3 less relevant than other criteria influenced the subsequent evaluations, neglected the possibility of considering that each interoperability driver has different contributions to achieve SC competitiveness. That does not correspond to results in Fuzzy model. In Figure 6.5 is visible that each criterion has different degrees of interaction, not matching the evaluation of criteria in *A* using AHP.

7. Conclusions and Future Work

7.1. Conclusions

The present dissertation contributes to a pragmatic approach in interoperability assessment, making use of the latest developments in business interoperability applied to innovative Lean, Agile, Resilient and Green Supply Chain Management strategies. With the completion of this dissertation, it is possible to say that the intended objectives were achieved almost entirely.

From the research on interoperability and business interoperability it was possible to gather relevant literature that studies interoperability impact and what key areas of information sharing, business and organisational are affected by interoperability. Evolutionary perspective was addressed, referring to the contributions of governmental and military frameworks to the definition of the issue, and to application range of frameworks and assessments methodologies.

Also, was made a quantitative and qualitative literature research from 1980 to November 2011 (see Table 2.2), revealing that most of publications in this sector were made in the last 10 years (76% of publications from 2001 until 2011). Categorically, most of the literature is focused in IT, and only 30% and 2% fits in areas of generic Engineering and Operations research respectively, areas where the current work fits.

Further, were presented the contributions of IDEAS, EIF, LISI ATHENA and BIQMM to this thesis. In sum, these frameworks strongly influenced in: providing adequate criteria to evaluate business dyads; describing levels of interoperability (and business interoperability) accomplished as the degree of interaction increases; and providing approaches to assess interoperability which influenced the current work on the pragmatic perspective of interoperability.

Complex networked collaboration environments are addressed in this work and contextualized to SCM perspective. Interactions among SC actors and the strategic alignment of goals and operations are addressed as an issue affected by interoperability. To use the ultimate setting to assess interoperability, the present work follows the main developments on SCM strategies Lean, Agile, Resilient and Green.

Through analysis of the contradictions of paradigmatic strategies, were explored in literature the synergies and the trade-offs among LARG, and were identified the main focus of business interoperability: business activities where is most likely to have problems of interoperability. Focusing on dyadic interactions between SC actors, the present work aims at SCM practices as the key to achieve SC competitiveness and performance. Lack of interoperability in SC's activities is reflected in the effectiveness and efficiency of the implementation of practices. Thus, were identified the practices that involve interaction among peers in the categories: supplier relationships, customer relationships, and information sharing and logistics integration.

From analysis of the thematic of interoperability and the nature of the practices implementation, was developed a conceptual framework (see Figure 5.1) considering two research approaches: the focus on SC competitiveness items of quality and customer service; the focus on SC Performance considering operational, economic and environmental performance. These two branches refer to strategic and operational alignments of practices to manage supply chain. The present work followed

the first branch (branch (1) in Figure 5.1), focusing on aligning practices to SC competitiveness through interoperability improvement. Answering the questions “Where are we?” (actual situation, *A*) and “Where are we going?” (ideal situation, *I*) was intended to demonstrate the lack of interoperability revealed in practices implementation.

Thus, was developed a methodology to analyse the *I* and *A* situations based on a set of steps to be applied by managers. To support this methodology, in chapter 4 various decision models were discussed and were described the three that fit the nature of interoperability study in SC.

In the definition and development of the interoperability assessment methodology two critical steps were addressed: the practices selection and the selection of criteria. Recurring to Pareto’s law and/or combining Fuzzy Sets and AHP models these steps are carried considering the degree of implementation of practices by each actor and what drivers of interoperability must be addressed.

Additionally, it was modelled the data to feed each model applied in the methodology in the form of questionnaire dedicated to Automotive SC.

A case study was developed in a Portuguese automaker, VW Autoeuropa, which influenced the structure of the methodology and the adaptation of the terminology dedicated to automotive SC.

To apply the methodology, first were selected the most implemented practices in Autoeuropa and its correspondent suppliers. Then, were aggregated the interoperability criteria to cover business strategy, B2B relationships, organisational and information sharing interoperation areas, in order to demonstrate the application of the model and its interdisciplinary perspectives.

From application of fuzzy sets model, was concluded that the level of expectations and the current level of interoperability (*I* and *A*) do not match, indicating that exist interoperability issues on the evaluated SC. By calculating the deviation percentage, the global perspective analysis (see section 6.4.4.1) shows that SC lacks interoperability between 10 to 54%. These values refer to the implementation of practices, being the environmental cooperation with business partners (P_1) the most interoperable, and suppliers’ involvement in conception and design (P_3) the less interoperable.

The decomposition of the analysis allowed identifying in which interoperability criterion the implementation of practices is lacking. The overall assessment in fuzzy sets, revealed that employees and work culture (EWC) and collaborative business processes (CBP) have the lowest performance (40% deviation) and business strategy (BS) and business semantics (BSe) present the best performances, standing 20% close to the level of interoperability expected.

Further, were analysed the practices individually, exploring the interoperability gaps according to criterion, and was provided the interpretations for each scenario of the practices implementation. For instance, the implementation of reverse logistics (P_2) caress in interoperability by 41%. The main reasons for this discrepancy are the business strategy (BS) and B2B aspects of collaborative business processes (CBP) and management of external relationships (MER). In the BS, was identified that Autoeuropa strategically doesn’t comprise business goals that involve a well-defined mechanism for returning inventory (exemplified in the pallets case). Thus, it is reflected on collaborations. Without a well-defined logistics planning for inventory return, the business model doesn’t include this action.

AHP analysis was made in second, having the considerations of the previous model related to the practices that caress interoperability combined with the most relevant practices for Autoeuropa’ SCM

supervisor. The second step of methodology was applied with five practices, using adapted terms from previous experience.

The complexity and dimension of AHP questionnaire was one of the main problems remarked in this decision-model application. The interviewed from Autoeuropa, familiar to AHP and ANP methodologies from previous research integrated in LARGeSCM project, found very hard to establish comparisons between terms and, simultaneously, keeping the consistency of every comparison. That position influenced responses to a “safer” scale of evaluation. All the evaluations were between 1/3 and 3 of the relative scale of importance. That reduced significantly the degree of detail of the decision-model. Additionally, the interviewed found that, in ideal perspective, all the criteria and practices have the same relevance to SC competitiveness, giving evaluation 1 (equal) to each. That affected the methodology, limiting it in the comparison of *I* and *A* situations. Thus, was only evaluated the actual situations.

In the analysis of the practices P_2 , P_3 , P_5 , P_7 and P_8 (see Table 6.1 for description), was concluded that P_3 presents the lowest and P_7 the highest interoperability levels. The analysis of each criterion permitted to monitor where interoperability occurs.

In last, a comparison of models was addressed getting to almost concordant practices ranking in terms of interoperability degree. According to fuzzy model, the order of practices, from lowest to highest interoperability is P_3 , P_2 , P_7 , P_8 and P_5 and, in AHP model, the order is P_3 , P_2 , P_5 , P_8 and P_7 . This leads to the conclusion that both models are applicable but, however, due to the limited range in the evaluations of the interviewed on the AHP model, led to less detailed information than fuzzy sets model. Using AHP's full scale (1 to 9 in pairwise comparison leading to 17 levels) provides a more detailed view on the data assessed.

Facing the expected objectives, one task was not completely fulfilled. It was intended to study this methodology in a dyadic perspective, collecting data from Autoeuropa's suppliers belonging to the Industrial Park in Palmela. However, due to unavailability of the contacted professionals, wasn't possible to obtain responses to the questionnaires at the appropriate time.

From the application and analysis of the case study was possible to demonstrate the utility of this methodology, revealing a form to express the implementation of practices into cooperative parameters classified in classes (fuzzy sets) and weights (AHP). This provides vital information for academic researchers and SCM professionals to assess interoperability on practices implementation by using subjective information. However, this methodology requires a deep knowledge on the evaluated SC and a compromise of the respondents to the adoption of the methodology.

For the specific case of Autoeuropa, this methodology proves to be adequate in the systematic identification of interaction problems with its suppliers. For instance, in the weekly meetings with suppliers the application of this method will be able to provide an insight of the perspectives of each SC actor, getting an image of the interoperability level of activities (practices) carried on with each supplier, and in the analysis of the 1st tier of the supply chain. This method demonstrates how to analyse each actor perspective, each practice and each interoperability driver. Additionally, the mathematic aggregation techniques of multiple opinions makes possible to obtain overall perspective on the scenario.

In terms of limitations of this study, the current model was applied and analysed in automotive perspective of SCM. Further applications to other SC's require deep study namely in the selection of practices or, even, in the selection of B2B activities to assess.

Is noteworthy that to make an assessment in interoperability it is required a deep knowledge in this subject from the manager (or academic researcher) and from the professionals interviewed. The present work presents the literature that help in the comprehension of the subject, since its origins to the concept of business interoperability by remarking the most relevant constructivist and exploratory works which provide guidelines and results to assess interoperability.

7.2. Future Research Work

In terms of contribution of this study, the research question focus on the strategic perspective of supply chain management, by enhancing practices interoperability. The methodology makes a practical exposition of how to assess interoperability in practices using subjective information. Further study will address the second branch of the conceptual framework proposed (see Figure 5.1). In this branch, the question of "How do we evaluate?" is answered by establishing a relation between practices and SC performance, through performance measures and key performance indicators that help monitor practices implementation. In this subject, it is intended to establish a link between the metrics and operational and technical aspects of interoperability. The combination of the present methodology and future work may provide a complementary and seamless manner to monitor interoperability throughout SC. Operational, economic and environmental performances are featured because LARG strategies imply activities with effect in these main areas of management. In terms of operational metrics, examples of performance measures are inventory levels, quality, customer satisfaction and time. From an economic perspective the measures suggested are cost, environmental cost and cash-to-cash cycle. And finally, from an environmental perspective the measure is business wastage. However, this suggested metrics are not portrayed for the current study. This study aims at supply chain strategies and their influence on supply chain competitiveness.

The first approach may address the mapping of performance measures and its connection to LARG strategies and the establishment of practice-metrics and practice-KPI's relationships in order to design real-time decision support systems (DSS) to monitor SC. The suggested form is to examine measures related to previous LARG developments, referred in section 3.5, and connect to the presented interoperable practices marked in sections 3.4.1 to 3.4.4. Second stage of development will address interoperability evaluation. To this purpose interoperability KPI's should establish cooperation scenarios in which interoperability may be lacking. Business process modeling should establish a link between activities and possible collaboration scenarios affected by interoperability. These business processes in a first stage of application can be demonstrated by simulation, whereas performance measures can be obtained and correlated to information and material flows. This procedure will allow developing decision models that permit to conclude about interoperability in dyadic perspectives of SC. Second, the designed DSS could be applied in a real business environment to validate and establish the link between practical situations and interoperability scenarios.

Future work could also concentrate in the information database and architecture to support the implementation of the current methodology and the real-time monitor of SC performance. This

database should support the information needed to implement SCM practices and the performance metrics associated to them. DSS should also be present in this database, to assist managers in operational decision making.

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9. Annexes

9.1. Annex 1

LARGeSCM

Gestão da Cadeia de Abastecimento Lean, Ágil, Resiliente e Verde

Avaliação do grau de implementação de práticas de gestão da cadeia de abastecimento

O presente questionário tem como objectivo apoiar uma investigação que pretende avaliar e estudar a influência do nível de interoperabilidade na gestão da cadeia de abastecimento *Lean, Ágil, Resiliente e Verde*.

A gestão da cadeia de abastecimento pode ser definida como uma rede de organizações (fornecedores, produtores, distribuidores, etc.) que estão envolvidas intrinsecamente, através de ligações a jusante e a montante, em diversos processos e actividades que produzem valor em forma de produtos e serviços nas mãos do cliente final. Sob este contexto, os fluxos de material, de informação e de transacções assumem grande importância desempenhando um papel fundamental para atingir os objectivos da cadeia de abastecimento.

Contudo, problemas que afectam o fluxo de informação e material ao longo da cadeia exigem grande atenção, e necessitam ser analisados. O presente questionário incide sobre um método de análise de aspectos intra e inter-organizacionais que dificultam a passagem de informação e fluxo de material ao longo da cadeia.

Como tal, a sua colaboração para este estudo desempenha um papel chave. Por favor, aceite colaborar com esta investigação através do preenchimento deste questionário.

A. Enquadramento da empresa:

- A.1. Nome da empresa: _____
 A.2. País: _____ A.3. Número de funcionários: _____
 A.4. Sector de actividade: _____
 A.5. Produto principal produzido pela empresa: _____
 A.6. Cargo da pessoa que preenche o questionário: _____
 A.7. Nome da pessoa que preenche o questionário (Facultativo): _____
 A.8. Contacto (e-mail): _____
 A.9. Qual o posicionamento da sua empresa na cadeia de abastecimento automóvel?



B. Avaliação de parâmetros de interoperabilidade:

Avalie as seguintes práticas tendo em conta o grau de implementação na sua empresa.

P ₁	Colaboração ambiental com parceiros de negócios	Não implementada <input type="radio"/> 0 <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 Completamente implementada
P ₂	Logística Inversa	Não implementada <input type="radio"/> 0 <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 Completamente implementada
P ₃	Envolvimento dos fornecedores na concepção de produtos	Não implementada <input type="radio"/> 0 <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 Completamente implementada
P ₄	Utilização de sistemas de informação compatíveis entre parceiros	Não implementada <input type="radio"/> 0 <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 Completamente implementada
P ₅	Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	Não implementada <input type="radio"/> 0 <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 Completamente implementada
P ₆	Desenvolvimento de iniciativas de segurança	Não implementada <input type="radio"/> 0 <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 Completamente implementada
P ₇	Redução do tempo de resposta a pedidos urgentes	Não implementada <input type="radio"/> 0 <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 Completamente implementada
P ₈	Utilização de modos de transporte flexíveis	Não implementada <input type="radio"/> 0 <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 Completamente implementada

9.2. Annex 2

LARGeSCM

Gestão da Cadeia de Abastecimento Lean, Ágil, Resiliente e Verde

Questionário 1 – Avaliação de interoperabilidade

O presente questionário tem como objectivo apoiar uma investigação que pretende avaliar e estudar a influência do nível de interoperabilidade na gestão da cadeia de abastecimento Lean, Ágil, Resiliente e Verde.

A gestão da cadeia de abastecimento pode ser definida como uma rede de organizações (fornecedores, produtores, distribuidores, etc.) que estão envolvidas intrinsecamente, através de ligações a jusante e a montante, em diversos processos e actividades que produzem valor em forma de produtos e serviços nas mãos do cliente final. Sob este contexto, os fluxos de material, de informação e de transacções assumem grande importância desempenhando um papel fundamental para atingir os objectivos da cadeia de abastecimento.

Contudo, problemas que afectam o fluxo de informação e material ao longo da cadeia exigem grande atenção, e necessitam ser analisados. O presente questionário incide sobre um método de análise de aspectos intra e inter-organizacionais que dificultam a passagem de informação e fluxo de material ao longo da cadeia.

Como tal, a sua colaboração para este estudo desempenha um papel chave. Por favor, aceite colaborar com esta investigação através do preenchimento deste questionário.

A. Enquadramento da empresa:

- A.1. Nome da empresa: _____
 A.2. País: _____ A.3. Número de funcionários: _____
 A.4. Sector de actividade: _____
 A.5. Produto principal produzido pela empresa: _____
 A.6. Cargo da pessoa que preenche o questionário: _____
 A.7. Nome da pessoa que preenche o questionário (Facultativo): _____
 A.8. Contacto (e-mail): _____
 A.9. Qual o posicionamento da sua empresa na cadeia de abastecimento automóvel?



B. Avaliação de parâmetros de interoperabilidade:

B.1. Processos de Negócio Colaborativos (CBP – Collaborative Business Processes):

Na maioria das empresas, os processos de negócio comuns aos parceiros têm de ser alinhados de forma a conciliar objectivos e tarefas. Inerentes a estes processos, estão a dificuldade de definir quais as **fronteiras de responsabilidade**, a **transparência da informação** e a **clareza com que são explicados os processos**.

- B.1.1. Neste contexto, qual a relevância que atribui à melhoria dos **processos de negócio colaborativos** para aumentar a **competitividade da cadeia de abastecimento**?

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- B.1.2. Na situação actual da sua empresa, como avalia o nível os processos de negócio colaborativos?

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B.2. Sistemas de Informação (IS – Information Systems):

Os Sistemas de Informação são na actualidade o veículo para a transmissão de dados por via electrónica. É desejável que estes sistemas actuem de forma eficaz e transparente, garantindo a informação correcta imediatamente. Factores fundamentais que regem estes sistemas são as **ferramentas de troca de dados**, a **rapidez das aplicações**, a **compatibilidade** e a **segurança dos dados trocados electronicamente**.

- B.2.1. Sob este contexto, como avalia a melhoria dos **sistemas de informação** entre si e os seus parceiros de negócios como contributo para maximizar a **competitividade da cadeia de abastecimento**?

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- B.2.2. Na situação actual, como avalia os sistemas de informação utilizados entre si e os seus parceiros de negócio? Tenha em consideração factores como as **ferramentas de troca de dados** utilizadas, a **rapidez dos sistemas de informação**, a **compatibilidade de dados** e a **segurança das aplicações**.

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B.3. Gestão das relações externas (MER – Management of External Relationships):

As relações os parceiros de uma cadeia de abastecimento envolvem interacções de forma a conciliar as actividades de produção e serviços com os objectivos individuais e globais da cadeia. A gestão destas relações passa pela adequada **selecção de um parceiro** (por exemplo, um fornecedor) que envolve **avaliação** antes e durante o contrato de colaboração, o **estabelecimento de contratos de colaboração**, a **comunicação** e a **resolução de conflitos** entre parceiros.

B.3.1. Neste sentido, sendo a **Gestão das Relações Externas** um factor fundamental para desempenhar a sua actividade e para atingir os objectivos da sua empresa, de que forma acha que este parâmetro contribui para maximizar a **competitividade da cadeia de abastecimento**?

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B.3.2. Na situação actual, como avalia Gestão das Relações Externas face à competitividade global da cadeia de abastecimento em que se insere?

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B.4. Funcionários e Cultura Organizacional (*EWC – Employees and Work Culture*):

Inerente a qualquer actividade de uma organização, existe o trabalho humano. Para atingir o sucesso de uma organização e de toda a cadeia de abastecimento, esta condição tem relevância sempre que discutimos os factores: culturais (das empresas e do próprio funcionário) tais como a **cultura** em que se insere e a língua; factores de identidade como a **honestidade** e **eficiência** pessoal; e factores psicológicos, demonstrados pela **motivação** e **responsabilidade** no **desempenho** de actividades na organização.

B.4.1. Neste sentido, qual a relevância deste factor para maximizar a **competitividade da cadeia de abastecimento**?

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B.4.2. Na situação actual da sua empresa, como avalia os **funcionários e a cultura organizacional** em que se inserem face à **competitividade da cadeia de abastecimento**?

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B.5. Semântica de negócio (*BSe – Business Semantics*):

No desempenho da actividade de uma empresa, é comum a troca de dados e, independentemente do meio de comunicação (verbalmente ou por escrito, pessoalmente ou electronicamente) é comum surgirem, entre parceiros da cadeia, a utilização terminologias diferentes. A **semântica de negócio** e a sua gestão oferece uma resposta a este tipo de falhas, na medida em que lida com a **conversão de terminologias** diferentes e com os **conflitos** que possam existir entre termos utilizados entre parceiros da cadeia.

B.5.1. Nesse sentido, como avalia a relevância que a **Semântica de Negócio** e a sua gestão para maximizar a **competitividade da cadeia de abastecimento**?

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B.5.2. Na sua empresa, como avalia a gestão da **semântica de negócio** face à **competitividade da cadeia de abastecimento**?

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B.6. Sistemas Organizacionais (*OS – Organizational Systems*):

Os sistemas organizacionais constituem a estrutura interna de qualquer organização, independentemente do eventual contacto entre entidades exteriores. No entanto, a estas estruturas condicionam as relações entre parceiros. Nomeadamente quando estamos em presença de estruturas organizacionais complexas, torna-se difícil identificar quais os **pontos de contacto** e qual o **papel desempenhado por cada membro na organização**.

B.6.1. Como avalia a importância dos **sistemas organizacionais** para maximizar a **competitividade da cadeia de abastecimento**?

Muito Baixa Baixa Média Alta Muito Alta
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B.6.2. Na sua empresa, como avalia os **sistemas organizacionais** face à **competitividade da cadeia de abastecimento**, tendo em conta possíveis dificuldades que tenha na identificação de pontos de contacto entre membros de diferentes parceiros e identificar membros responsáveis por determinada área?

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B.7. Gestão dos Direitos de Propriedade Intelectual (*IPRM – Intellectual Property Rights management*):

A troca de informação entre parceiros está condicionada a **Direitos de Propriedade Intelectual**, que exigem um elevado grau de confiança entre parceiros. Na situação da cadeia de abastecimento automóvel, este tipo de direitos está envolvido na concepção e design de um novo modelo de automóvel ou acessório e sempre que são fornecidas especificações para um produto solicitado a um fornecedor. Para o efeito, é necessária a existência de um mecanismo que regule estes direitos e um elevado grau de confiança que permita a cedência de dados.

B.7.1. Tendo em conta estes factores, como avalia a importância da Gestão dos Direitos de Propriedade Intelectual para maximizar a competitividade da cadeia de abastecimento?

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B.7.2. Na sua empresa, como avalia os mecanismos de gestão dos Direitos de Propriedade Intelectual, face à competitividade da cadeia de abastecimento?

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B.8. Estratégia de Negócio (BS – Business Strategy):

As colaborações numa cadeia de abastecimento passam pela partilha dos mesmos objectivos estratégicos ao longo da cadeia. Estes objectivos devem estar centrados no benefício mútuo e não resultar em conflitos de interesse entre os parceiros. Desta forma, como parâmetros a ter em conta na definição da estratégia de negócio são: a **clareza na exposição dos objectivos estratégicos** e qual o **impacte dos objectivos nos processos individuais** de cada parceiro.

B.8.1. Neste sentido, qual a relevância que atribui à definição de uma **estratégia de negócio** para o aumento da **competitividade da cadeia de abastecimento**?

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B.8.2. Na sua empresa, como avalia este aspecto face à competitividade da cadeia? Isto é, de que forma considera que os objectivos estratégicos são claros para a sua empresa e seus parceiros?

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C. Avaliação de Práticas de Gestão da Cadeia de Abastecimento:

As práticas de gestão da cadeia de abastecimento promovem o funcionamento eficaz e eficiente dos processos internos e externos aos agentes da cadeia. A melhoria destes processos tem efeito sob os objectivos estratégicos da cadeia de abastecimento e na sua performance global. Nomeadamente, quando se tratam de práticas comuns entre parceiros da cadeia (interacções), a sua melhoria permite-nos alcançar objectivos estratégicos da cadeia, tais como o nível de serviço e a qualidade do produto, e melhorar a performance global.

Focando na competitividade da cadeia (aspectos como nível de serviço e qualidade dos produtos), avalie as práticas listadas nas secções seguintes, face aos critérios de cada secção.

C.1. Processos de Negócio Colaborativos (CBP – Collaborative Business Processes):

Na maioria das empresas, os **processos de negócio** comuns aos parceiros têm de ser alinhados de forma a conciliar objectivos e tarefas. Inerentes a estes processos, estão a dificuldade de definir quais as **fronteiras de responsabilidade**, a **transparência da informação** e a **clareza com que são explicados os processos**.

C.1.1. Qual a importância dos **processos de negócio colaborativos** para a implementação das práticas listadas a baixo?

Tenha em consideração:

- Qual a importância de ter fronteiras de responsabilidade bem definidas;
- Grau de exigência de transparência de informação;
- Com que clareza devem ser bem definidos e explicados os processos de negócio comuns.

C.1.1.1. Constituição estratégica de stock

Muito Baixa	Baixa	Média	Alta	Muito Alta
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C.1.1.2. Redução do tempo de resposta a pedidos urgentes

Muito Baixa	Baixa	Média	Alta	Muito Alta
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C.1.1.3. Criação de sistemas de comunicação e informação compatíveis com os parceiros de negócios

Muito Baixa	Baixa	Média	Alta	Muito Alta
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.1.1.4. Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos

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C.1.1.5. Coordenação das actividades com os parceiros de negócios

Muito Baixa	Baixa	Média	Alta	Muito Alta
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C.1.1.6. Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

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C.1.1.7. Logística inversa

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C.1.1.8. Utilização de modos de transportes flexíveis

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C.1.1.9. Desenvolvimento de iniciativas de segurança

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C.1.1.10. Colaboração ambiental com parceiros de negócios

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C.1.2. Na sua empresa, como a avalia a aplicação das práticas listadas, em termos de **processos de negócio colaborativos**? Isto é, existe algum problema na aplicação das práticas, quando falamos: na definição de fronteiras de responsabilidade; na transparência da informação cedida pelo parceiro; e/ou na clareza dos processos comuns.

C.1.2.1. Constituição estratégica de stock

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C.1.2.2. Redução do tempo de resposta a pedidos urgentes

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C.1.2.3. Criação de sistemas de comunicação e informação compatíveis com os parceiros de negócios

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C.1.2.4. Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos

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C.1.2.5. Coordenação das actividades com os parceiros de negócios

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C.1.2.6. Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

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C.1.2.7. Logística inversa

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C.1.2.8. Utilização de modos de transportes flexíveis

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C.1.2.9. Desenvolvimento de iniciativas de segurança

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C.1.2.10. Colaboração ambiental com parceiros de negócios

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C.2. Sistemas de Informação (IS – Information Systems):

Os Sistemas de Informação são na actualidade o veículo para a transmissão de dados por via electrónica. É desejável que estes sistemas actuem de forma eficaz e transparente, garantindo

a informação correcta imediatamente. Factores fundamentais que regem estes sistemas são as **ferramentas de troca de dados**, a **rapidez das aplicações**, a **compatibilidade** e a **segurança dos dados trocados electronicamente**.

C.2.1. Qual a importância dos **sistemas de informação** para a implementação das práticas listadas abaixo?

Tenha em consideração:

- A importância do uso de **ferramentas de troca de dados** para a aplicação da prática;
- Até que ponto é determinante ter aplicações rápidas para o desempenho da prática nas organizações envolvidas na cadeia;
- Se a **compatibilidade das aplicações** informáticas e dados é relevante;
- Se é uma condição necessária existir **segurança na troca de dados**.

C.2.1.1. Constituição estratégica de stock

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C.2.1.2. Redução do tempo de resposta a pedidos urgentes

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C.2.1.3. Criação de sistemas de comunicação e informação compatíveis com os parceiros de negócios

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C.2.1.4. Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos

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C.2.1.5. Coordenação das actividades com os parceiros de negócios

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C.2.1.6. Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

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C.2.1.7. Logística inversa

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C.2.1.8. Utilização de modos de transportes flexíveis

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C.2.1.9. Desenvolvimento de iniciativas de segurança

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C.2.1.10. Colaboração ambiental com parceiros de negócios

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C.2.2. Na situação actual da sua empresa, como avalia o desempenho da aplicação das práticas listadas abaixo face aos **sistemas de informação** utilizados entre si e os seus parceiros da cadeia? Considere: as **ferramentas de troca de dados** utilizadas (se forem utilizadas); a **rapidez das aplicações**; a **compatibilidade** e **segurança das aplicações** usadas para as operações inerentes a cada prática.

C.2.2.1. Constituição estratégica de stock

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C.2.2.2. Redução do tempo de resposta a pedidos urgentes

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C.2.2.3. Criação de sistemas de comunicação e informação compatíveis com os parceiros de negócios

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C.2.2.4. Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos

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C.2.2.5. Coordenação das actividades com os parceiros de negócios

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C.2.2.6. Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

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C.2.2.7. Logística inversa

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C.2.2.8. Utilização de modos de transportes flexíveis

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C.2.2.9. Desenvolvimento de iniciativas de segurança

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C.2.2.10. Colaboração ambiental com parceiros de negócios

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C.3. Gestão das relações externas (MER – Management of External Relationships):

As relações os parceiros de uma cadeia de abastecimento envolvem interações de forma a conciliar as actividades de produção e serviços com os objectivos individuais e globais da cadeia. A gestão destas relações passa pela adequada **selecção de um parceiro** (por exemplo, um fornecedor) que envolve avaliação antes e durante o contrato de colaboração, o

estabelecimento de **contratos de colaboração**, a inerente **comunicação** e a **resolução de conflitos** entre parceiros.

C.3.1. Qual a importância da **Gestão das Relações Externas** para a aplicação das práticas listadas abaixo?

Tenha em consideração:

- A importância que os mecanismos de **selecção de parceiros** têm para a implementação da prática, como por exemplo a escolha e a avaliação de um fornecedor;
- A importância e definir **contractos de colaboração** correctamente de forma a não gerar conflitos aquando a realização de actividades entre parceiros;
- Qual a importância de identificar e ultrapassar barreiras de **comunicação** entre parceiros;
- De que forma é importante ter mecanismos para a resolução rápida de **conflitos**.

C.3.1.1. Constituição estratégica de stock

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C.3.1.2. Redução do tempo de resposta a pedidos urgentes

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C.3.1.3. Criação de sistemas de comunicação e informação compatíveis com os parceiros de negócios

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C.3.1.4. Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos

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C.3.1.5. Coordenação das actividades com os parceiros de negócios

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C.3.1.6. Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

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C.3.1.7. Logística inversa

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C.3.1.8. Utilização de modos de transportes flexíveis

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C.3.1.9. Desenvolvimento de iniciativas de segurança

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C.3.1.10. Colaboração ambiental com parceiros de negócios

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C.3.2. Na sua empresa, como avalia o desempenho da aplicação das práticas listadas no que respeita à **gestão das relações externas**? Tenha em consideração se existem:

- Problemas nos mecanismos de **avaliação e selecção de parceiros**, como por exemplo, quando um fornecedor não é adequado às necessidades do negócio;
- Conflitos de interesses ou no desempenho de actividades devido à **celebração de contractos** que não definem correctamente quais as competências e responsabilidades;
- Barreiras de **comunicação** entre organizações.

C.3.2.1. Constituição estratégica de stock

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C.3.2.2. Redução do tempo de resposta a pedidos urgentes

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C.3.2.3. Criação de sistemas de comunicação e informação compatíveis com os parceiros de negócios

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C.3.2.4. Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos

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C.3.2.5. Coordenação das actividades com os parceiros de negócios

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C.3.2.6. Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

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C.3.2.7. Logística inversa

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C.3.2.8. Utilização de modos de transportes flexíveis

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C.3.2.9. Desenvolvimento de iniciativas de segurança

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C.3.2.10. Colaboração ambiental com parceiros de negócios

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C.4. Funcionários e Cultura Organizacional (EWC – Employees and Work Culture):

Inerente a qualquer actividade de uma organização, existe o trabalho humano. Para atingir o sucesso de uma organização e de toda a cadeia de abastecimento, esta condição tem relevância sempre que discutimos os factores: culturais (das empresas e do próprio funcionário) tais como a **cultura** em que se insere e a língua; factores de identidade como a **honestidade** e **eficiência** pessoal; e factores psicológicos, demonstrados pela **motivação** e **responsabilidade** no desempenho de actividades na organização.

C.4.1. Quão relevante avalia a **cultura organizacional e os funcionários** para a aplicação das práticas?

Tenha em conta:

- Qual a importância dos funcionários entre organizações **falar na mesma língua**;
- A importância de uma selecção eficaz de funcionários que permita obter mão-de-obra **eficiente e responsável**;
- A necessidade de avaliar e fomentar a **motivação** e a **honestidade** de funcionários.

C.4.1.1. Constituição estratégica de stock

Muito Baixa	Baixa	Media	Alta	Muito Alta
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C.4.1.2. Redução do tempo de resposta a pedidos urgentes

Muito Baixa	Baixa	Media	Alta	Muito Alta
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C.4.1.3. Criação de sistemas de comunicação e informação compatíveis com os parceiros de negócios

Muito Baixa	Baixa	Media	Alta	Muito Alta
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C.4.1.4. Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos

Muito Baixa	Baixa	Media	Alta	Muito Alta
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C.4.1.5. Coordenação das actividades com os parceiros de negócios

Muito Baixa	Baixa	Media	Alta	Muito Alta
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C.4.1.6. Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Muito Baixa	Baixa	Media	Alta	Muito Alta
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C.4.1.7. Logística inversa

Muito Baixa	Baixa	Media	Alta	Muito Alta
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C.4.1.8. Utilização de modos de transportes flexíveis

Muito Baixa	Baixa	Media	Alta	Muito Alta
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C.4.1.9. Desenvolvimento de iniciativas de segurança

Muito Baixa	Baixa	Media	Alta	Muito Alta
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C.4.1.10. Colaboração ambiental com parceiros de negócios

Muito Baixa	Baixa	Media	Alta	Muito Alta
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C.4.2. Na situação actual da sua empresa, como avalia o desempenho da aplicação das práticas listadas abaixo face à **cultura organizacional e funcionários**? Tenha em consideração possíveis problemas:

- **Linguísticos** entre parceiros;
- Relativos a situações em que a **honestidade** e **responsabilidade** não tenham sido bem avaliadas;
- A forma como a falta de **motivação** de funcionários pode afectar os processos;
- A ausência de mecanismos para manter os funcionários **motivados**.

Muito Fraco	Fraco	Médio	Bom	Muito Bom
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.4.2.1. Constituição estratégica de stock

Muito Fraco	Fraco	Médio	Bom	Muito Bom
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.4.2.2. Redução do tempo de resposta a pedidos urgentes

Muito Fraco	Fraco	Médio	Bom	Muito Bom
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.4.2.3. Criação de sistemas de comunicação e informação compatíveis com os parceiros de negócios

Muito Fraco	Fraco	Médio	Bom	Muito Bom
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.4.2.4. Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos

Muito Fraco	Fraco	Médio	Bom	Muito Bom
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.4.2.5. Coordenação das actividades com os parceiros de negócios

Muito Fraco	Fraco	Médio	Bom	Muito Bom
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.4.2.6. Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Muito Fraco	Fraco	Médio	Bom	Muito Bom
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.4.2.7. Logística inversa

Muito Fraco	Fraco	Médio	Bom	Muito Bom
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.4.2.8. Utilização de modos de transportes flexíveis

Muito Fraco	Fraco	Médio	Bom	Muito Bom
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.4.2.9. Desenvolvimento de iniciativas de segurança

Muito Fraco	Fraco	Médio	Bom	Muito Bom
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.4.2.10. Colaboração ambiental com parceiros de negócios

Muito Fraco	Fraco	Médio	Bom	Muito Bom
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.5. Semântica de negócio (BSe – Business Semantics):

No desempenho da actividade de uma empresa, é comum a troca de dados e, independentemente do meio de comunicação (verbalmente ou por escrito, pessoalmente ou electronicamente) é comum surgirem, entre parceiros da cadeia, a utilização terminologias diferentes. A **semântica de negócio** e a sua gestão oferece uma resposta a este tipo de falhas, na medida em que lida com a **conversão de terminologias** diferentes e com os **conflitos** que possam existir entre termos utilizados entre parceiros da cadeia.

C.5.1. Qual a importância dos mecanismos de gestão da **semântica de negócio** para a aplicação das práticas?

Tenha em consideração:

- A importância de resolver **conflitos de terminologias** usadas entre parceiros;
- A existência de mecanismos para converter termos diferentes de forma a não afectar as operações.

C.5.1.1. Constituição estratégica de stock

Muito Baixa	Baixa	Média	Alta	Muito Alta
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.5.1.2. Redução do tempo de resposta a pedidos urgentes

Muito Baixa	Baixa	Média	Alta	Muito Alta
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C.5.1.3. Criação de sistemas de comunicação e informação compatíveis com os parceiros de negócios

Muito Baixa	Baixa	Média	Alta	Muito Alta
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C.5.1.4. Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos

Muito Baixa	Baixa	Média	Alta	Muito Alta
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C.5.1.5. Coordenação das actividades com os parceiros de negócios

Muito Baixa	Baixa	Média	Alta	Muito Alta
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C.5.1.6. Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Muito Baixa Baixa Média Alta Muito Alta
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C.5.1.7. Logística inversa

Muito Baixa Baixa Média Alta Muito Alta
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C.5.1.8. Utilização de modos de transportes flexíveis

Muito Baixa Baixa Média Alta Muito Alta
☐ ☐ ☐ ☐ ☐

C.5.1.9. Desenvolvimento de iniciativas de segurança

Muito Baixa Baixa Média Alta Muito Alta
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C.5.1.10. Colaboração ambiental com parceiros de negócios

Muito Baixa Baixa Média Alta Muito Alta
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C.5.2. Na situação actual da sua empresa, como avalia o desempenho da aplicação das práticas listadas no que respeita aos mecanismos de **conversão semântica**? Considere os problemas relativos:

- À utilização de terminologia diferente entre parceiros;
- À ineficácia dos mecanismos de conversão semântica face as operações levadas a cabo entre parceiros.

Muito Fraco Fraco Médio Bom Muito Bom
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C.5.2.1. Constituição estratégica de stock

Muito Fraco Fraco Médio Bom Muito Bom
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C.5.2.2. Redução do tempo de resposta a pedidos urgentes

Muito Fraco Fraco Médio Bom Muito Bom
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C.5.2.3. Criação de sistemas de comunicação e informação compatíveis com os parceiros de negócios

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C.5.2.4. Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos

Muito Fraco Fraco Médio Bom Muito Bom
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C.5.2.5. Coordenação das actividades com os parceiros de negócios

Muito Fraco Fraco Médio Bom Muito Bom
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C.5.2.6. Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Muito Fraco Fraco Médio Bom Muito Bom
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C.5.2.7. Logística inversa

Muito Fraco Fraco Médio Bom Muito Bom
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C.5.2.8. Utilização de modos de transportes flexíveis

Muito Fraco Fraco Médio Bom Muito Bom
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C.5.2.9. Desenvolvimento de iniciativas de segurança

Muito Fraco Fraco Médio Bom Muito Bom
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C.5.2.10. Colaboração ambiental com parceiros de negócios

Muito Fraco Fraco Médio Bom Muito Bom

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C.6. Sistemas Organizacionais (OS – *Organizational Systems*):

Os sistemas organizacionais constituem a estrutura interna de qualquer organização, independentemente do eventual contacto entre entidades exteriores. No entanto, a estas estruturas condicionam as relações entre parceiros. Nomeadamente quando estamos em presença de estruturas organizacionais complexas, torna-se difícil identificar quais os **pontos de contacto** e qual o **papel desempenhado por cada membro na organização**.

C.6.1. Qual a importância que os **sistemas organizacionais** assumem para a aplicação das práticas?

Tenha em consideração:

- A importância de estabelecer **pontos de contacto**, para facilitar a comunicações interorganizacionais entre os vários sectores e hierarquias da empresa;
- A relevância ter sistemas organizacionais bem definidos e claros, entre empresas, de forma a **identificar quem é o responsável por cada sector**.

C.6.1.1. Constituição estratégica de stock

Muito Baixa Baixa Media Alta Muito Alta
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C.6.1.2. Redução do tempo de resposta a pedidos urgentes

Muito Baixa Baixa Media Alta Muito Alta
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C.6.1.3. Criação de sistemas de comunicação e informação compatíveis com os parceiros de negócios

Muito Baixa Baixa Media Alta Muito Alta
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C.6.1.4. Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos

Muito Baixa Baixa Media Alta Muito Alta
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C.6.1.5. Coordenação das actividades com os parceiros de negócios

Muito Baixa Baixa Media Alta Muito Alta

☐ ☐ ☐ ☐ ☐

C.6.1.6. Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Muito Baixa Baixa Media Alta Muito Alta
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C.6.1.7. Logística inversa

Muito Baixa Baixa Media Alta Muito Alta
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C.6.1.8. Utilização de modos de transportes flexíveis

Muito Baixa Baixa Media Alta Muito Alta
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C.6.1.9. Desenvolvimento de iniciativas de segurança

Muito Baixa Baixa Media Alta Muito Alta
☐ ☐ ☐ ☐ ☐

C.6.1.10. Colaboração ambiental com parceiros de negócios

Muito Baixa Baixa Media Alta Muito Alta
☐ ☐ ☐ ☐ ☐

C.6.2. Na situação actual da sua empresa, como avalia o desempenho da aplicação das práticas listadas no que respeita aos sistemas organizacionais? Tenha em consideração problemas:

- Que possam existir quando necessita identificar qual o membro responsável por determinada secção.

Muito Fraco Fraco Médio Bom Muito Bom
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C.6.2.1. Constituição estratégica de stock

Muito Fraco Fraco Médio Bom Muito Bom
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C.6.2.2. Redução do tempo de resposta a pedidos urgentes

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C.6.2.3. Criação de sistemas de comunicação e informação compatíveis com os parceiros de negócios

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C.6.2.4. Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos

Muito Fraco	Fraco	Médio	Bom	Muito Bom
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C.6.2.5. Coordenação das actividades com os parceiros de negócios

Muito Fraco	Fraco	Médio	Bom	Muito Bom
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C.6.2.6. Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Muito Fraco	Fraco	Médio	Bom	Muito Bom
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C.6.2.7. Logística inversa

Muito Fraco	Fraco	Médio	Bom	Muito Bom
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C.6.2.8. Utilização de modos de transportes flexíveis

Muito Fraco	Fraco	Médio	Bom	Muito Bom
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C.6.2.9. Desenvolvimento de iniciativas de segurança

Muito Fraco	Fraco	Médio	Bom	Muito Bom
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C.6.2.10. Colaboração ambiental com parceiros de negócios

Muito Fraco	Fraco	Médio	Bom	Muito Bom
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C.7. Gestão dos Direitos de Propriedade Intelectual (IPRM – Intellectual Property Rights management):

A troca de informação entre parceiros está condicionada a **Direitos de Propriedade Intelectual**, que exigem um elevado grau de confiança entre parceiros. Na situação da cadeia de abastecimento automóvel, este tipo de direitos está envolvido na concepção e design de um novo modelo de automóvel ou acessório e sempre que são fornecidas especificações para um produto solicitado a um fornecedor. Para o efeito, é necessária a existência de um mecanismo que regule estes direitos e um elevado grau de confiança que permita a cedência de dados.

C.7.1. Qual a importância que a **gestão dos direitos de propriedade intelectual** assume na aplicação das práticas em baixo?

Tenha em consideração:

- A importância da resolução de conflitos de partilha de informação protegida;
- A importância de existirem mecanismos de protecção de dados que gerem as condições de uso de informação entre parceiros.

C.7.1.1. Constituição estratégica de stock

Muito Baixa	Baixa	Média	Alta	Muito Alta
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.1.2. Redução do tempo de resposta a pedidos urgentes

Muito Baixa	Baixa	Média	Alta	Muito Alta
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.1.3. Criação de sistemas de comunicação e informação compatíveis com os parceiros de negócios

Muito Baixa	Baixa	Média	Alta	Muito Alta
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.1.4. Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos

Muito Baixa	Baixa	Média	Alta	Muito Alta
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.1.5. Coordenação das actividades com os parceiros de negócios

Muito Baixa	Baixa	Media	Alta	Muito Alta
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.1.6. Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Muito Baixa	Baixa	Media	Alta	Muito Alta
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.1.7. Logística inversa

Muito Baixa	Baixa	Media	Alta	Muito Alta
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.1.8. Utilização de modos de transportes flexíveis

Muito Baixa	Baixa	Media	Alta	Muito Alta
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.1.9. Desenvolvimento de iniciativas de segurança

Muito Baixa	Baixa	Media	Alta	Muito Alta
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.1.10. Colaboração ambiental com parceiros de negócios

Muito Baixa	Baixa	Media	Alta	Muito Alta
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.2. Na situação actual da sua empresa, como avalia o desempenho da aplicação das práticas listadas abaixo face à gestão dos direitos de propriedade intelectual?

Muito Fraco	Fraco	Médio	Bom	Muito Bom
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.2.1. Constituição estratégica de stock

Muito Fraco	Fraco	Médio	Bom	Muito Bom
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.2.2. Redução do tempo de resposta a pedidos urgentes

Muito Fraco	Fraco	Médio	Bom	Muito Bom
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.2.3. Criação de sistemas de comunicação e informação compatíveis com os parceiros de negócios

Muito Fraco	Fraco	Médio	Bom	Muito Bom
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.2.4. Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos

Muito Fraco	Fraco	Médio	Bom	Muito Bom
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.2.5. Coordenação das actividades com os parceiros de negócios

Muito Fraco	Fraco	Médio	Bom	Muito Bom
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.2.6. Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Muito Fraco	Fraco	Médio	Bom	Muito Bom
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C.7.2.7. Logística inversa

Muito Fraco	Fraco	Médio	Bom	Muito Bom
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.2.8. Utilização de modos de transportes flexíveis

Muito Fraco	Fraco	Médio	Bom	Muito Bom
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.2.9. Desenvolvimento de iniciativas de segurança

Muito Fraco	Fraco	Médio	Bom	Muito Bom
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.2.10. Colaboração ambiental com parceiros de negócios

Muito Fraco	Fraco	Médio	Bom	Muito Bom
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.8. Estratégia de Negócio (BS – Business Strategy):

As colaborações numa cadeia de abastecimento passam pela partilha dos mesmos objectivos estratégicos ao longo da cadeia. Estes objectivos devem estar centrados no benefício mútuo e não resultar em conflitos de interesse entre os parceiros. Desta forma, como parâmetros a ter em conta na definição da estratégia de negócio são: a **clareza na exposição dos objectivos estratégicos** e qual o **impacte dos objectivos estratégicos nos processos individuais de cada parceiro**.

C.8.1. Qual a importância que a estratégia de negócio assume na aplicação das práticas listadas?

Tenha em consideração:

- A importância de **expor os objectivos estratégicos com clareza**, de forma a evitar conflitos de interesse;
- A importância de antecipar qual a **influência da estratégia ao longo da cadeia**, de forma a evitar conflitos.

C.8.1.1. Constituição estratégica de stock

Muito Baixa	Baixa	Media	Alta	Muito Alta
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.8.1.2. Redução do tempo de resposta a pedidos urgentes

Muito Baixa	Baixa	Media	Alta	Muito Alta
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C.8.1.3. Criação de sistemas de comunicação e informação compatíveis com os parceiros de negócios

Muito Baixa	Baixa	Media	Alta	Muito Alta
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C.8.1.4. Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos

Muito Baixa	Baixa	Media	Alta	Muito Alta
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C.8.1.5. Coordenação das actividades com os parceiros de negócios

Muito Baixa	Baixa	Media	Alta	Muito Alta
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C.8.1.6. Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Muito Baixa	Baixa	Media	Alta	Muito Alta
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C.8.1.7. Logística inversa

Muito Baixa	Baixa	Media	Alta	Muito Alta
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.8.1.8. Utilização de modos de transportes flexíveis

Muito Baixa	Baixa	Media	Alta	Muito Alta
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C.8.1.9. Desenvolvimento de iniciativas de segurança

Muito Baixa	Baixa	Media	Alta	Muito Alta
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C.8.1.10. Colaboração ambiental com parceiros de negócios

Muito Baixa	Baixa	Media	Alta	Muito Alta
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C.8.2. Na situação actual da sua empresa, como avalia o desempenho da aplicação das práticas listadas abaixo face à definição da **estratégia de negócio**?

Atente para problemas quando:

- Não são apresentados os objectivos de forma clara a todos os parceiros;
- Os parceiros não partilham os mesmos objectivos;
- O conflito de interesses leva ao término antecipado de contracto.

Muito Fraco	Fraco	Médio	Bom	Muito Bom
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C.8.2.1. Constituição estratégica de stock

Muito Fraco	Fraco	Médio	Bom	Muito Bom
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C.8.2.2. Redução do tempo de resposta a pedidos urgentes

Muito Fraco	Fraco	Médio	Bom	Muito Bom
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C.8.2.3. Criação de sistemas de comunicação e informação compatíveis com os parceiros de negócios

Muito Fraco	Fraco	Médio	Bom	Muito Bom
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.8.2.4. Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos

Muito Fraco	Fraco	Médio	Bom	Muito Bom
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.8.2.5. Coordenação das actividades com os parceiros de negócios

Muito Fraco	Fraco	Médio	Bom	Muito Bom
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.8.2.6. Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Muito Fraco	Fraco	Médio	Bom	Muito Bom
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.8.2.7. Logística inversa

Muito Fraco	Fraco	Médio	Bom	Muito Bom
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.8.2.8. Utilização de modos de transportes flexíveis

Muito Fraco	Fraco	Médio	Bom	Muito Bom
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.8.2.9. Desenvolvimento de iniciativas de segurança

Muito Fraco	Fraco	Médio	Bom	Muito Bom
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.8.2.10. Colaboração ambiental com parceiros de negócios

Muito Fraco	Fraco	Médio	Bom	Muito Bom
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

9.3. Annex 3

LARGE SCM

Gestão da Cadeia de Abastecimento Lean, Ágil, Resiliente e Verde

Questionário 2 – Avaliação de Interoperabilidade

O presente questionário tem como objectivo apoiar uma investigação que pretende avaliar e estudar a influência do nível de interoperabilidade na gestão da cadeia de abastecimento *Lean, Ágil, Resiliente e Verde*.

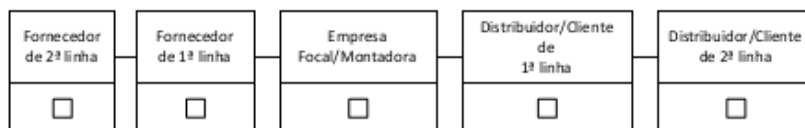
A gestão da cadeia de abastecimento pode ser definida como uma rede de organizações (fornecedores, produtores, distribuidores, etc.) que estão envolvidas intrinsecamente, através de ligações a jusante e a montante, em diversos processos e actividades que produzem valor em forma de produtos e serviços nas mãos do cliente final. Sob este contexto, os fluxos de material, de informação e de transacções assumem grande importância desempenhando um papel fundamental para atingir os objectivos da cadeia de abastecimento.

Contudo, problemas que afectam o fluxo de informação e material ao longo da cadeia exigem grande atenção, e necessitam ser analisados. O presente questionário incide sobre um método de análise de aspectos intra e inter-organizacionais que dificultam a passagem de informação e fluxo de material ao longo da cadeia.

Como tal, a sua colaboração para este estudo desempenha um papel chave. Por favor, aceite colaborar com esta investigação através do preenchimento deste questionário.

A. Enquadramento da empresa:

- A.1. Nome da empresa: _____
 A.2. País: _____ A.3. Número de funcionários: _____
 A.4. Sector de actividade: _____
 A.5. Produto principal produzido pela empresa: _____
 A.6. Cargo da pessoa que preenche o questionário: _____
 A.7. Nome da pessoa que preenche o questionário (Facultativo): _____
 A.8. Contacto (e-mail): _____
 A.9. Qual o posicionamento da sua empresa na cadeia de abastecimento automóvel?



B. Avaliação de parâmetros de interoperabilidade:

B.1. Importância dos Processos de Negócio Colaborativos face aos Sistemas de Informação para aumento da competitividade da cadeia de abastecimento:

B.1.1. Numa **situação ideal**, qual o critério que considera mais relevante para o aumento da competitividade da cadeia de abastecimento?

- ☐ Processos de negócio colaborativos
☐ Sistemas de Informação

Avalie o grau de importância do critério escolhido, face ao critério não escolhido, tendo em vista o seu contributo para **aumentar a competitividade da cadeia de abastecimento**. Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.1.2. Na **situação actual** da sua empresa, qual o critério que considera ter uma melhor performance e contribuição para o aumento da competitividade da cadeia de abastecimento?

- ☐ Processos de negócio colaborativos
☐ Sistemas de Informação

Avalie a performance do critério escolhido, face ao critério não escolhido, tendo em consideração possíveis problemas que possam existir na sua empresa aquando a utilização de **Sistemas de Informação** (por exemplo, **ferramentas de troca de informação**) para desempenhar tarefas e sempre que existem falhas nos **processos de negócio colaborativos** (como por exemplo a **falta de transparência de informação** e/ou má definição de **fronteiras de responsabilidade**). Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Tenha em mente que:

- Em relação aos **Processos de Negócio Colaborativos**, na maioria das empresas, os processos de negócio comuns aos parceiros têm de ser alinhados de forma a conciliar objectivos e tarefas. Inerentes a estes processos, estão a dificuldade de definir quais as **fronteiras de responsabilidade**, a **transparência da informação** e a **clareza com que são explicados os processos**.

- Os **Sistemas de Informação** são, na actualidade, o veículo para a transmissão de dados por via electrónica. É desejável que estes sistemas actuem de forma eficaz e transparente, garantindo a informação correcta imediatamente. Factores fundamentais que regem estes sistemas são as **ferramentas de troca de dados**, a **rapidez das aplicações**, a **compatibilidade** e a **segurança dos dados trocados electronicamente**.

B.2. Importância da Gestão das Relações Externas face aos Processos de Negócio Colaborativos para aumento da competitividade da cadeia de abastecimento:

B.2.1. Numa **situação ideal**, qual o critério que considera mais relevante para o aumento da competitividade da cadeia de abastecimento?

- ☐ Gestão das Relações Externas
- ☐ Processos de Negócio Colaborativos

Avalie o grau de importância do critério escolhido, face ao critério não escolhido, tendo em vista o seu contributo para **aumentar a competitividade da cadeia de abastecimento**. Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.2.2. Na **situação actual** da sua empresa, qual o critério que considera ter uma melhor performance e contribuição para o aumento da competitividade da cadeia de abastecimento?

- ☐ Gestão das Relações Externas
- ☐ Processos de Negócio Colaborativos

Avalie a performance do critério escolhido, face ao critério não escolhido, tendo em consideração possíveis problemas que possam existir na sua empresa aquando falhas nos **processos de negócio colaborativos** (como por exemplo a **falta de transparência de informação** e/ou má definição de **fronteiras de responsabilidade**) para desempenhar tarefas e sempre que existem falhas na **gestão das relações externas** (como por exemplo, falha na **avaliação e selecção** de um fornecedor ou **falhas de comunicação** entre parceiros). Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Tenha em mente que:

- Em termos de **Gestão das Relações Externas**, as relações os parceiros de uma cadeia de abastecimento envolvem interações de forma a conciliar as actividades de produção e serviços com os objectivos individuais e globais da cadeia. A gestão destas relações passa pela adequada **selecção de um parceiro** (por exemplo, um fornecedor) que envolve **avaliação** antes e durante o contrato de colaboração, o **estabelecimento de contratos de colaboração**, a inerente **comunicação** e a **resolução de conflitos** entre parceiros.

B.3. Importância da Gestão das Relações Externas face aos Sistemas de Informação para aumento da competitividade da cadeia de abastecimento:

B.3.1. Numa **situação ideal**, qual o critério que considera mais relevante para o aumento da competitividade da cadeia de abastecimento?

- ☐ Gestão das Relações Externas
- ☐ Sistemas de Informação

Avalie o grau de importância do critério escolhido, face ao critério não escolhido, tendo em vista o seu contributo para **aumentar a competitividade da cadeia de abastecimento**. Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.3.2. Na **situação actual** da sua empresa, qual o critério que considera ter uma melhor performance e contribuição para o aumento da competitividade da cadeia de abastecimento?

- ☐ Gestão das Relações Externas
- ☐ Sistemas de Informação

Avalie a performance do critério escolhido, face ao critério não escolhido, tendo em consideração possíveis problemas que possam existir na sua empresa aquando a utilização de **Sistemas de Informação** (por exemplo, **ferramentas de troca de informação**) para desempenhar tarefas e sempre que existem falhas na **gestão das relações externas** (como por exemplo, falha na **avaliação e selecção** de um fornecedor ou **falhas de comunicação** entre parceiros). Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.4. Importância dos Funcionários e Cultura Organizacional face aos Processos de Negócio Colaborativos para aumento da competitividade da cadeia de abastecimento:

B.4.1. Numa **situação ideal**, qual o critério que considera mais relevante para o aumento da competitividade da cadeia de abastecimento?

- ☐ Funcionários e Cultura Organizacional
- ☐ Processos de Negócio Colaborativos

Avalie o grau de importância do critério escolhido, face ao critério não escolhido, tendo em vista o seu contributo para **aumentar a competitividade da cadeia de abastecimento**. Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte	Muito Forte		Extrema		
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.4.2. Na **situação actual** da sua empresa, qual o critério que considera ter uma melhor performance e contribuição para o aumento da competitividade da cadeia de abastecimento?

- ☐ Funcionários e Cultura Organizacional
- ☐ Processos de Negócio Colaborativos

Avalie a performance do critério escolhido, face ao critério não escolhido, tendo em consideração possíveis problemas que possam existir na sua empresa aquando falhas nos **processos de negócio colaborativos** (como por exemplo a **falta de transparência de informação** e/ou má definição de **fronteiras de responsabilidade**) e problemas inerentes à **cultura organizacional** e aos **funcionários** (como por exemplo: **diferenças linguísticas**, ausência de mecanismos que mantenham **funcionários motivados** e situações de falta de **honestidade** e **responsabilidade** dos funcionários). Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte	Muito Forte		Extrema		
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Tenha em mente que:

- Em relação aos **Funcionários e Cultura Organizacional**, a utilização do trabalho humano para atingir os objectivos organizacionais e de toda a cadeia de abastecimento, é regida por factores: culturais (das empresas e do próprio funcionário) tais como a **cultura** em que se insere e a língua; factores de identidade como a **honestidade** e **eficiência** pessoal; e factores psicológicos, demonstrados pela **motivação** e **responsabilidade** no **desempenho** de actividades na organização.

B.5. Importância da Funcionários e Cultura Organizacional face aos Sistemas de Informação para aumento da competitividade da cadeia de abastecimento:

B.5.1. Numa **situação ideal**, qual o critério que considera mais relevante para o aumento da competitividade da cadeia de abastecimento?

- ☐ Funcionários e Cultura Organizacional
- ☐ Sistemas de Informação

Avalie o grau de importância do critério escolhido, face ao critério não escolhido, tendo em vista o seu contributo para **aumentar a competitividade da cadeia de abastecimento**. Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte	Muito Forte		Extrema		
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.5.2. Na **situação actual** da sua empresa, qual o critério que considera ter uma melhor performance e contribuição para o aumento da competitividade da cadeia de abastecimento?

- ☐ Funcionários e Cultura Organizacional
- ☐ Sistemas de Informação

Avalie a performance do critério escolhido, face ao critério não escolhido, tendo em consideração possíveis problemas que possam existir na sua empresa aquando a utilização de **Sistemas de Informação** (por exemplo, **ferramentas de troca de informação**) e problemas inerentes à **cultura organizacional** e aos **funcionários** (como por exemplo: **diferenças linguísticas**, ausência de mecanismos que mantenham **funcionários motivados** e situações de falta de **honestidade** e **responsabilidade** dos funcionários). Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte	Muito Forte		Extrema		
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.6. Importância da Funcionários e Cultura Organizacional face à Gestão das Relações Externas para aumento da competitividade da cadeia de abastecimento:

B.6.1. Numa **situação ideal**, qual o critério que considera mais relevante para o aumento da competitividade da cadeia de abastecimento?

- ☐ Funcionários e Cultura Organizacional
- ☐ Gestão das Relações Externas

Avalie o grau de importância do critério escolhido, face ao critério não escolhido, tendo em vista o seu contributo para **aumentar a competitividade da cadeia de abastecimento**. Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte	Muito Forte		Extrema		
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.6.2. Na **situação actual** da sua empresa, qual o critério que considera ter uma melhor performance e contribuição para o aumento da competitividade da cadeia de abastecimento?

- ☐ Funcionários e Cultura Organizacional
- ☐ Gestão das Relações Externas

Avalie a performance do critério escolhido, face ao critério não escolhido, tendo em consideração possíveis problemas que possam existir na sua empresa aquando a **gestão das relações externas** (como por exemplo, falha na **avaliação** e **selecção** de um fornecedor ou **falhas de comunicação** entre parceiros) e problemas inerentes à **cultura organizacional** e **aos funcionários** (como por exemplo: **diferenças linguísticas**, ausência de mecanismos que mantenham **funcionários motivados** e situações de falta de **honestidade** e **responsabilidade** dos funcionários). Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte	Muito Forte		Extrema		
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.7. Importância da Semântica de Negócio face aos Processos de Negócio Colaborativos para aumento da competitividade da cadeia de abastecimento:

B.7.1. Numa **situação ideal**, qual o critério que considera mais relevante para o aumento da competitividade da cadeia de abastecimento?

- ☐ Semântica de Negócio
- ☐ Processos de Negócio Colaborativos

Avalie o grau de importância do critério escolhido, face ao critério não escolhido, tendo em vista o seu contributo para **aumentar a competitividade da cadeia de abastecimento**. Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte	Muito Forte		Extrema		
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.7.2. Na **situação actual** da sua empresa, qual o critério que considera ter uma melhor performance e contribuição para o aumento da competitividade da cadeia de abastecimento?

- ☐ Semântica de Negócio
- ☐ Processos de Negócio Colaborativos

Avalie a performance do critério escolhido, face ao critério não escolhido, tendo em consideração possíveis problemas que possam existir na sua empresa aquando falhas nos **processos de negócio colaborativos** (como por exemplo a **falta de transparência de informação** e/ou má definição de **fronteiras de responsabilidade**) e falhas na **semântica de negócio** (como por exemplo: utilização de **terminologia diferente** entre parceiros). Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte	Muito Forte		Extrema		
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Tenha em mente que:

- No desempenho da actividade de uma empresa, é comum a troca de dados e, independentemente do meio de comunicação (verbalmente ou por escrito, pessoalmente ou electronicamente) é comum surgirem, entre parceiros da cadeia, a utilização terminologias diferentes. A **semântica de negócio** e a sua gestão oferece uma resposta a este tipo de falhas, na medida em que lida com a **conversão de terminologias** diferentes e com os **conflitos** que possam existir entre termos utilizados entre parceiros da cadeia.

B.8. Importância da Semântica de Negócio face aos Sistemas de Informação para aumento da competitividade da cadeia de abastecimento:

B.8.1. Numa **situação ideal**, qual o critério que considera mais relevante para o aumento da competitividade da cadeia de abastecimento?

- ☐ Semântica de Negócio
- ☐ Sistemas de Informação

Avalie o grau de importância do critério escolhido, face ao critério não escolhido, tendo em vista o seu contributo para **aumentar a competitividade da cadeia de abastecimento**. Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.8.2. Na **situação actual** da sua empresa, qual o critério que considera ter uma melhor performance e contribuição para o aumento da competitividade da cadeia de abastecimento?

- ☐ Semântica de Negócio
- ☐ Sistemas de Informação

Avalie a performance do critério escolhido, face ao critério não escolhido, tendo em consideração possíveis problemas que possam existir na sua empresa aquando a utilização de **Sistemas de Informação** (por exemplo, **ferramentas de troca de informação**) e falhas na **semântica de negócio** (como por exemplo: utilização de **terminologia diferente** entre parceiros). Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.9. Importância da Semântica de Negócio face à Gestão das Relações Externas para aumento da competitividade da cadeia de abastecimento:

B.9.1. Numa **situação ideal**, qual o critério que considera mais relevante para o aumento da competitividade da cadeia de abastecimento?

- ☐ Semântica de Negócio
- ☐ Gestão das Relações Externas

Avalie o grau de importância do critério escolhido, face ao critério não escolhido, tendo em vista o seu contributo para **aumentar a competitividade da cadeia de abastecimento**. Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.9.2. Na **situação actual** da sua empresa, qual o critério que considera ter uma melhor performance e contribuição para o aumento da competitividade da cadeia de abastecimento?

- ☐ Semântica de Negócio
- ☐ Gestão das Relações Externas

Avalie a performance do critério escolhido, face ao critério não escolhido, tendo em consideração possíveis problemas que possam existir na sua empresa aquando a **gestão das relações externas** (como por exemplo, falha na **avaliação** e **selecção** de um fornecedor ou **falhas de comunicação** entre parceiros) e falhas na **semântica de negócio** (como por exemplo: utilização de **terminologia diferente** entre parceiros). Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.10. Importância da Semântica de Negócio face aos Funcionários e Cultura Organizacional para aumento da competitividade da cadeia de abastecimento:

B.10.1. Numa **situação ideal**, qual o critério que considera mais relevante para o aumento da competitividade da cadeia de abastecimento?

- ☐ Semântica de Negócio
- ☐ Funcionários e Cultura Organizacional

Avalie o grau de importância do critério escolhido, face ao critério não escolhido, tendo em vista o seu contributo para **aumentar a competitividade da cadeia de abastecimento**. Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.10.2. Na **situação actual** da sua empresa, qual o critério que considera ter uma melhor performance e contribuição para o aumento da competitividade da cadeia de abastecimento?

- ☐ Semântica de Negócio
- ☐ Funcionários e Cultura Organizacional

Avalie a performance do critério escolhido, face ao critério não escolhido, tendo em consideração possíveis problemas que possam existir na sua empresa aquando a **cultura organizacional e aos funcionários** (como por exemplo: **diferenças linguísticas**, ausência de mecanismos que mantenham **funcionários motivados** e situações de falta de **honestidade e responsabilidade** dos funcionários) e falhas na **semântica de negócio** (como por exemplo: utilização de **terminologia diferente** entre parceiros). Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.11. Importância dos Sistemas Organizacionais face aos Processos de Negócio Colaborativos para aumento da competitividade da cadeia de abastecimento:

B.11.1. Numa **situação ideal**, qual o critério que considera mais relevante para o aumento da competitividade da cadeia de abastecimento?

- ☐ Sistemas Organizacionais
- ☐ Processos de Negócio Colaborativos

Avalie o grau de importância do critério escolhido, face ao critério não escolhido, tendo em vista o seu contributo para **aumentar a competitividade da cadeia de abastecimento**. Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.11.2. Na **situação actual** da sua empresa, qual o critério que considera ter uma melhor performance e contribuição para o aumento da competitividade da cadeia de abastecimento?

- ☐ Sistemas Organizacionais
- ☐ Processos de Negócio Colaborativos

Avalie a performance do critério escolhido, face ao critério não escolhido, tendo em consideração possíveis problemas que possam existir na sua empresa aquando falhas nos **processos de negócio colaborativos** (como por exemplo a **falta de transparência de informação** e/ou má definição de **fronteiras de responsabilidade**) e conflitos devido aos **sistemas organizacionais** (como por exemplo: **dificuldades na identificação de responsáveis por determinada secção** de uma empresa e quais os **pontos de contacto**). Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Tenha em mente que:

- Os **sistemas organizacionais** constituem a estrutura interna de qualquer organização, independentemente do eventual contacto entre entidades exteriores. No entanto, a estas estruturas condicionam as relações entre parceiros. Nomeadamente quando estamos em presença de estruturas organizacionais complexas, torna-se difícil identificar quais os **pontos de contacto** e qual o **papel desempenhado por cada membro na organização**.

B.12. Importância dos Sistemas Organizacionais face aos Sistemas de Informação para aumento da competitividade da cadeia de abastecimento:

B.12.1. Numa **situação ideal**, qual o critério que considera mais relevante para o aumento da competitividade da cadeia de abastecimento?

☐ Sistemas Organizacionais

☐ Sistemas de Informação

Avalie o grau de importância do critério escolhido, face ao critério não escolhido, tendo em vista o seu contributo para **aumentar a competitividade da cadeia de abastecimento**. Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.12.2. Na **situação actual** da sua empresa, qual o critério que considera ter uma melhor performance e contribuição para o aumento da competitividade da cadeia de abastecimento?

☐ Sistemas Organizacionais

☐ Sistemas de Informação

Avalie a performance do critério escolhido, face ao critério não escolhido, tendo em consideração possíveis problemas que possam existir na sua empresa aquando a **gestão das relações externas** (como por exemplo, falha na **avaliação e selecção** de um fornecedor ou **falhas de comunicação** entre parceiros) e conflitos devido aos **sistemas organizacionais** (como por exemplo: **dificuldades na identificação de responsáveis por determinada secção** de uma empresa e quais os **pontos de contacto**). Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.13. Importância dos Sistemas Organizacionais face à Gestão das Relações Externas para aumento da competitividade da cadeia de abastecimento:

B.13.1. Numa **situação ideal**, qual o critério que considera mais relevante para o aumento da competitividade da cadeia de abastecimento?

☐ Sistemas Organizacionais

☐ Gestão das Relações Externas

Avalie o grau de importância do critério escolhido, face ao critério não escolhido, tendo em vista o seu contributo para **aumentar a competitividade da cadeia de abastecimento**. Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.13.2. Na **situação actual** da sua empresa, qual o critério que considera ter uma melhor performance e contribuição para o aumento da competitividade da cadeia de abastecimento?

☐ Sistemas Organizacionais

☐ Gestão das Relações Externas

Avalie a performance do critério escolhido, face ao critério não escolhido, tendo em consideração possíveis problemas que possam existir na sua empresa aquando utilização de **Sistemas de Informação** (por exemplo, **ferramentas de troca de informação**) e conflitos devido aos **sistemas organizacionais** (como por exemplo: **dificuldades na identificação de responsáveis por determinada secção** de uma empresa e quais os **pontos de contacto**). Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.14. Importância dos Sistemas Organizacionais face aos Funcionários e Cultura Organizacional para aumento da competitividade da cadeia de abastecimento:

B.14.1. Numa **situação ideal**, qual o critério que considera mais relevante para o aumento da competitividade da cadeia de abastecimento?

- ☐ Sistemas Organizacionais
- ☐ Funcionários e Cultura Organizacional

Avalie o grau de importância do critério escolhido, face ao critério não escolhido, tendo em vista o seu contributo para **aumentar a competitividade da cadeia de abastecimento**. Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.14.2. Na **situação actual** da sua empresa, qual o critério que considera ter uma melhor performance e contribuição para o aumento da competitividade da cadeia de abastecimento?

- ☐ Sistemas Organizacionais
- ☐ Funcionários e Cultura Organizacional

Avalie a performance do critério escolhido, face ao critério não escolhido, tendo em consideração possíveis problemas que possam existir na sua empresa aquando a **cultura organizacional e aos funcionários** (como por exemplo: **diferenças linguísticas**, ausência de mecanismos que mantenham **funcionários motivados** e situações de falta de **honestidade e responsabilidade** dos funcionários) e conflitos devido aos **sistemas organizacionais** (como por exemplo: **dificuldades na identificação de responsáveis por determinada secção** de uma empresa e quais os **pontos de contacto**). Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.15. Importância dos Sistemas Organizacionais face à Semântica de Negócio para aumento da competitividade da cadeia de abastecimento:

B.15.1. Numa **situação ideal**, qual o critério que considera mais relevante para o aumento da competitividade da cadeia de abastecimento?

- ☐ Sistemas Organizacionais
- ☐ Semântica de Negócio

Avalie o grau de importância do critério escolhido, face ao critério não escolhido, tendo em vista o seu contributo para **aumentar a competitividade da cadeia de abastecimento**. Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.15.2. Na **situação actual** da sua empresa, qual o critério que considera ter uma melhor performance e contribuição para o aumento da competitividade da cadeia de abastecimento?

- ☐ Sistemas Organizacionais
- ☐ Semântica de Negócio

Avalie a performance do critério escolhido, face ao critério não escolhido, tendo em consideração possíveis problemas que possam existir na sua empresa aquando falhas na **semântica de negócio** (como por exemplo: utilização de **terminologia diferente** entre parceiros) e conflitos devido aos **sistemas organizacionais** (como por exemplo: **dificuldades na identificação de responsáveis por determinada secção** de uma empresa e quais os **pontos de contacto**). Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.16. Importância da Estratégia de Negócio face aos Processos de Negócio Colaborativos para aumento da competitividade da cadeia de abastecimento:

B.16.1. Numa **situação ideal**, qual o critério que considera mais relevante para o aumento da competitividade da cadeia de abastecimento?

- ☐ Estratégia de Negócio
- ☐ Processos de Negócio Colaborativos

Avalie o grau de importância do critério escolhido, face ao critério não escolhido, tendo em vista o seu contributo para **aumentar a competitividade da cadeia de abastecimento**. Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.16.2. Na **situação actual** da sua empresa, qual o critério que considera ter uma melhor performance e contribuição para o aumento da competitividade da cadeia de abastecimento?

- ☐ Estratégia de Negócio
- ☐ Processos de Negócio Colaborativos

Avalie a performance do critério escolhido, face ao critério não escolhido, tendo em consideração possíveis problemas que possam existir na sua empresa aquando falhas nos **processos de negócio colaborativos** (como por exemplo a **falta de transparência de informação** e/ou má definição de **fronteiras de responsabilidade**) e problemas na **estratégia de negócio** (por exemplo: quando **não são apresentados os objectivos estratégicos de forma clara**). Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Tenha em mente que:

- As colaborações numa cadeia de abastecimento passam pela partilha dos mesmos objectivos estratégicos ao longo da cadeia. Por este motivo, a Estratégia de Negócio deve estar centrada no benefício mútuo e não resultar em conflitos de interesse entre os parceiros. Desta forma, como parâmetros a ter em conta na definição da estratégia de negócio são: a **dareza na exposição dos objectivos estratégicos** e qual o **impacte dos objectivos nos processos individuais** de cada parceiro.

B.17. Importância da Estratégia de Negócio face aos Sistemas de Informação para aumento da competitividade da cadeia de abastecimento:

B.17.1. Numa **situação ideal**, qual o critério que considera mais relevante para o aumento da competitividade da cadeia de abastecimento?

- ☐ Estratégia de Negócio
- ☐ Sistemas de Informação

Avalie o grau de importância do critério escolhido, face ao critério não escolhido, tendo em vista o seu contributo para **aumentar a competitividade da cadeia de abastecimento**. Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.17.2. Na **situação actual** da sua empresa, qual o critério que considera ter uma melhor performance e contribuição para o aumento da competitividade da cadeia de abastecimento?

- ☐ Estratégia de Negócio
- ☐ Sistemas de Informação

Avalie a performance do critério escolhido, face ao critério não escolhido, tendo em consideração possíveis problemas que possam existir na sua empresa aquando a utilização de **Sistemas de Informação** (por exemplo, **ferramentas de troca de informação**) e problemas na **estratégia de negócio** (por exemplo: quando **não são apresentados os objectivos estratégicos de forma clara**). Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.18. Importância da Estratégia de Negócio face à Gestão das Relações Externas para aumento da competitividade da cadeia de abastecimento:

B.18.1. Numa **situação ideal**, qual o critério que considera mais relevante para o aumento da competitividade da cadeia de abastecimento?

- ☐ Estratégia de Negócio
- ☐ Gestão das Relações Externas

Avalie o grau de importância do critério escolhido, face ao critério não escolhido, tendo em vista o seu contributo para **aumentar a competitividade da cadeia de abastecimento**. Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.18.2. Na **situação actual** da sua empresa, qual o critério que considera ter uma melhor performance e contribuição para o aumento da competitividade da cadeia de abastecimento?

- ☐ Estratégia de Negócio
- ☐ Gestão das Relações Externas

Avalie a performance do critério escolhido, face ao critério não escolhido, tendo em consideração possíveis problemas que possam existir na sua empresa aquando a **gestão das relações externas** (como por exemplo, falha na **avaliação** e **selecção** de um fornecedor ou **falhas de comunicação** entre parceiros) e problemas na **estratégia de negócio** (por exemplo: quando **não são apresentados os objectivos estratégicos de forma clara**). Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.19. Importância da Estratégia de Negócio face à Gestão das Relações Externas para aumento da competitividade da cadeia de abastecimento:

B.19.1. Numa **situação ideal**, qual o critério que considera mais relevante para o aumento da competitividade da cadeia de abastecimento?

- ☐ Estratégia de Negócio
- ☐ Funcionários e Cultura Organizacional

Avalie o grau de importância do critério escolhido, face ao critério não escolhido, tendo em vista o seu contributo para **aumentar a competitividade da cadeia de abastecimento**. Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.19.2. Na **situação actual** da sua empresa, qual o critério que considera ter uma melhor performance e contribuição para o aumento da competitividade da cadeia de abastecimento?

- ☐ Estratégia de Negócio
- ☐ Funcionários e Cultura Organizacional

Avalie a performance do critério escolhido, face ao critério não escolhido, tendo em consideração possíveis problemas que possam existir na sua empresa aquando a **cultura organizacional e aos funcionários** (como por exemplo: **diferenças linguísticas**, ausência de mecanismos que mantenham **funcionários motivados** e situações de falta de **honestidade e responsabilidade** dos funcionários) e problemas na **estratégia de negócio** (por exemplo: quando **não são apresentados os objectivos estratégicos de forma clara**). Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.20. Importância da Estratégia de Negócio face à Semântica de Negócio para aumento da competitividade da cadeia de abastecimento:

B.20.1. Numa **situação ideal**, qual o critério que considera mais relevante para o aumento da competitividade da cadeia de abastecimento?

☐ Estratégia de Negócio

☐ Semântica de Negócio

Avalie o grau de importância do critério escolhido, face ao critério não escolhido, tendo em vista o seu contributo para **aumentar a competitividade da cadeia de abastecimento**. Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.20.2. Na **situação actual** da sua empresa, qual o critério que considera ter uma melhor performance e contribuição para o aumento da competitividade da cadeia de abastecimento?

☐ Estratégia de Negócio

☐ Semântica de Negócio

Avalie a performance do critério escolhido, face ao critério não escolhido, tendo em consideração possíveis problemas que possam existir na sua empresa aquando falhas na **semântica de negócio** (como por exemplo: utilização de **terminologia diferente** entre parceiros) e problemas na **estratégia de negócio** (por exemplo: quando **não são apresentados os objectivos estratégicos de forma clara**). Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.21. Importância da Estratégia de Negócio face aos Sistemas Organizacionais para aumento da competitividade da cadeia de abastecimento:

B.21.1. Numa **situação ideal**, qual o critério que considera mais relevante para o aumento da competitividade da cadeia de abastecimento?

☐ Estratégia de Negócio

☐ Sistemas Organizacionais

Avalie o grau de importância do critério escolhido, face ao critério não escolhido, tendo em vista o seu contributo para **aumentar a competitividade da cadeia de abastecimento**. Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.21.2. Na **situação actual** da sua empresa, qual o critério que considera ter uma melhor performance e contribuição para o aumento da competitividade da cadeia de abastecimento?

☐ Estratégia de Negócio

☐ Sistemas Organizacionais

Avalie a performance do critério escolhido, face ao critério não escolhido, tendo em consideração possíveis problemas que possam existir na sua empresa aquando conflitos devido aos **sistemas organizacionais** (como por exemplo: **dificuldades na identificação de responsáveis por determinada secção** de uma empresa e quais os **pontos de contacto**) e problemas na **estratégia de negócio** (por exemplo: quando **não são apresentados os objectivos estratégicos de forma clara**). Utilize, para o efeito, a escala fornecida abaixo.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C. Avaliação de Práticas de Gestão da Cadeia de Abastecimento:

As práticas de gestão da cadeia de abastecimento promovem o funcionamento eficaz e eficiente dos processos internos e externos aos agentes da cadeia. A melhoria destes processos tem efeito sob os objectivos estratégicos da cadeia de abastecimento e no seu desempenho global. Nomeadamente, quando se tratam de práticas comuns entre parceiros da cadeia (interacções), a sua melhoria permite-nos alcançar objectivos estratégicos da cadeia, tais como o nível de serviço e a qualidade do produto, e melhorar o desempenho global.

Focando na **competitividade da cadeia** (aspectos como **nível de serviço** e **qualidade dos produtos**), avalie as práticas listadas nas secções seguintes, face aos critérios de cada secção.

C.1. Processos de Negócio Colaborativos (CBP – Collaborative Business Processes):

Os **Processos de Negócio Colaborativos**, na maioria das empresas, têm de ser alinhados de forma a conciliar objectivos e tarefas. Inerentes a estes processos, estão a dificuldade de definir quais as **fronteiras de responsabilidade**, a **transparência da informação** e a **clareza com que são explicados os processos**.

C.1.1. Os **processos de negócio colaborativos** são mais importantes para a implementação de qual das duas práticas listadas abaixo?

Tenha em consideração:

- Qual a importância de ter **fronteiras de responsabilidade bem definidas**;
- Grau de exigência de **transparência de informação**;
- **Com que clareza devem ser bem definidos e explicados os processos de negócio** comuns.

C.1.1.1. Comparação 1 – P6 vs P9:

- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o grau de importância dos **processos de negócio colaborativos** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.1.1.2. Comparação 2 – P3 vs P6:

- ☐ P3 Logística Inversa
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o grau de importância dos **processos de negócio colaborativos** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.1.1.3. Comparação 3 – P3 vs P9:

- ☐ P3 Logística Inversa
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o grau de importância dos **processos de negócio colaborativos** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.1.1.4. Comparação 4 – P8 vs P6:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o grau de importância dos **processos de negócio colaborativos** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.1.1.5. Comparação 4 – P8 vs P9:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o grau de importância dos **processos de negócio colaborativos** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.1.1.6. Comparação 6 – P8 vs P3:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P3 Logística Inversa

Avalie o grau de importância dos **processos de negócio colaborativos** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.1.1.7. Comparação 7 – P4 vs P6:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o grau de importância dos **processos de negócio colaborativos** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.1.1.8. Comparação 8 – P4 vs P9:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o grau de importância dos **processos de negócio colaborativos** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.1.1.9. Comparação 9 – P4 vs P3:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P3 Logística inversa

Avalie o grau de importância dos **processos de negócio colaborativos** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.1.1.10. Comparação 10 – P4 vs P8:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P8 Redução do tempo de resposta a pedidos urgentes

Avalie o grau de importância dos **processos de negócio colaborativos** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.1.2. Na **situação actual** da sua empresa, qual a prática que considera ter um **melhor desempenho** e contribuição para o **aumento da competitividade da cadeia de abastecimento**, tendo em conta os **processos de negócio colaborativos**?

Considere possíveis problemas quando falamos:

- Na definição de **fronteiras de responsabilidade**;
- Na **transparência da informação** cedida pelo parceiro;
- Na **clareza dos processos comuns**.

C.1.2.1. Comparação 1 – P6 vs P9:

- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o desempenho dos **processos de negócio colaborativos** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.1.2.2. Comparação 2 – P3 vs P6:

- ☐ P3 Logística Inversa
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o desempenho dos **processos de negócio colaborativos** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.1.2.3. Comparação 3 – P3 vs P9:

- ☐ P3 Logística Inversa
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o desempenho dos **processos de negócio colaborativos** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.1.2.4. Comparação 4 – P8 vs P6:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o desempenho dos **processos de negócio colaborativos** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.1.2.5. Comparação 4 – P8 vs P9:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o desempenho dos **processos de negócio colaborativos** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.1.2.6. Comparação 6 – P8 vs P3:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P3 Logística Inversa

Avalie o desempenho dos **processos de negócio colaborativos** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.1.2.7. Comparação 7 – P4 vs P6:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o desempenho dos **processos de negócio colaborativos** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.1.2.8. Comparação 8 – P4 vs P9:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o desempenho dos **processos de negócio colaborativos** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.1.2.9. Comparação 9 – P4 vs P3:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P3 Logística inversa

Avalie o desempenho dos **processos de negócio colaborativos** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.1.2.10. Comparação 10 – P4 vs P8:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P8 Redução do tempo de resposta a pedidos urgentes

Avalie o desempenho dos **processos de negócio colaborativos** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.2. Sistemas de Informação (IS – Information Systems):

Os **Sistemas de Informação** são, na actualidade, o veículo para a transmissão de dados por via electrónica. É desejável que estes sistemas actuem de forma eficaz e transparente, garantindo a informação correcta imediatamente. Factores fundamentais que regem estes sistemas são as **ferramentas de troca de dados**, a **rapidez das aplicações**, a **compatibilidade** e a **segurança dos dados trocados electronicamente**.

C.2.1. Os **sistemas de informação** são mais importantes para a implementação de qual das duas práticas listadas abaixo?

Tenha em consideração:

- A importância do uso de **ferramentas de troca de informação**;
- **Rapidez** de aplicações;
- **Compatibilidade** de aplicações.

C.2.1.1. Comparação 1 – P6 vs P9:

- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o grau de importância dos **sistemas de informação** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.2.1.2. Comparação 2 – P3 vs P6:

- ☐ P3 Logística Inversa
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o grau de importância dos **sistemas de informação** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.2.1.3. Comparação 3 – P3 vs P9:

- ☐ P3 Logística Inversa
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o grau de importância dos **sistemas de informação** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.2.1.4. Comparação 4 – P8 vs P6:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o grau de importância dos **sistemas de informação** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.2.1.5. Comparação 4 – P8 vs P9:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o grau de importância dos **sistemas de informação** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.2.1.6. Comparação 6 – P8 vs P3:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P3 Logística Inversa

Avalie o grau de importância dos **sistemas de informação** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.2.1.7. Comparação 7 – P4 vs P6:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o grau de importância dos **sistemas de informação** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.2.1.8. Comparação 8 – P4 vs P9:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o grau de importância dos **sistemas de informação** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.2.1.9. Comparação 9 – P4 vs P3:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P3 Logística inversa

Avalie o grau de importância dos **sistemas de informação** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.2.1.10. Comparação 10 – P4 vs P8:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P8 Redução do tempo de resposta a pedidos urgentes

Avalie o grau de importância dos **sistemas de informação** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.2.2. Na **situação actual** da sua empresa, qual a prática que considera ter um **melhor desempenho** e contribuição para o **aumento da competitividade da cadeia de abastecimento**, tendo em conta os **sistemas de informação**?

Considere possíveis problemas quando falamos de:

- **Ferramentas de troca de informação** ineficientes;
- Baixa **rapidez** das aplicações;
- **Incompatibilidade** das aplicações.

C.2.2.1. Comparação 1 – P6 vs P9:

- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o desempenho dos **sistemas de informação** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.2.2.2. Comparação 2 – P3 vs P6:

- ☐ P3 Logística Inversa
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o desempenho dos **sistemas de informação** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.2.2.3. Comparação 3 – P3 vs P9:

- ☐ P3 Logística Inversa
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o desempenho dos **sistemas de informação** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.2.2.4. Comparação 4 – P8 vs P6:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o desempenho dos **sistemas de informação** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.2.2.5. Comparação 4 – P8 vs P9:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o desempenho dos **sistemas de informação** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.2.2.6. Comparação 6 – P8 vs P3:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P3 Logística Inversa

Avalie o desempenho dos **sistemas de informação** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.2.2.7. Comparação 7 – P4 vs P6:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o desempenho dos **sistemas de informação** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.2.2.8. Comparação 8 – P4 vs P9:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o desempenho dos **sistemas de informação** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.2.2.9. Comparação 9 – P4 vs P3:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P3 Logística inversa

Avalie o desempenho dos **sistemas de informação** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.2.2.10. Comparação 10 – P4 vs P8:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P8 Redução do tempo de resposta a pedidos urgentes

Avalie o desempenho dos **sistemas de informação** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.3. Gestão das Relações Externas (MER – Management of External Relationships):

As relações os parceiros de uma cadeia de abastecimento envolvem interações de forma a conciliar as actividades de produção e serviços com os objectivos individuais e globais da cadeia. A gestão destas relações passa pela adequada **selecção de um parceiro** (por exemplo, um fornecedor) que envolve avaliação antes e durante o contrato de colaboração, o estabelecimento de **contratos de colaboração**, a inerente **comunicação** e a **resolução de conflitos** entre parceiros.

C.3.1. A **Gestão das Relações Externas** é mais importante para a implementação de qual das duas práticas listadas abaixo?

Tenha em consideração:

- A importância que os mecanismos de **selecção de parceiros** têm para a implementação da prática, como por exemplo a escolha e a avaliação de um fornecedor;
- A importância de definir **contractos de colaboração** correctamente de forma a não gerar conflitos aquando a realização de actividades entre parceiros;
- Qual a importância de identificar e ultrapassar barreiras de **comunicação** entre parceiros;
- De que forma é importante ter mecanismos para a resolução rápida de **conflitos**.

C.3.1.1. Comparação 1 – P6 vs P9:

- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o grau de importância da **Gestão das Relações Externas** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.3.1.2. Comparação 2 – P3 vs P6:

- ☐ P3 Logística Inversa
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o grau de importância da **Gestão das Relações Externas** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.3.1.3. Comparação 3 – P3 vs P9:

- ☐ P3 Logística Inversa
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o grau de importância da **Gestão das Relações Externas** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.3.1.4. Comparação 4 – P8 vs P6:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o grau de importância da **Gestão das Relações Externas** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.3.1.5. Comparação 4 – P8 vs P9:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o grau de importância da **Gestão das Relações Externas** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.3.1.6. Comparação 6 – P8 vs P3:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P3 Logística Inversa

Avalie o grau de importância da **Gestão das Relações Externas** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.3.1.7. Comparação 7 – P4 vs P6:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o grau de importância da **Gestão das Relações Externas** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.3.1.8. Comparação 8 – P4 vs P9:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o grau de importância da **Gestão das Relações Externas** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.3.1.9. Comparação 9 – P4 vs P3:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P3 Logística inversa

Avalie o grau de importância da **Gestão das Relações Externas** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.3.1.10. Comparação 10 – P4 vs P8:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P8 Redução do tempo de resposta a pedidos urgentes

Avalie o grau de importância da **Gestão das Relações Externas** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.3.2. Na **situação actual** da sua empresa, qual a prática que considera ter um **melhor desempenho** e contribuição para o **aumento da competitividade da cadeia de abastecimento**, tendo em conta a **gestão das relações externas**?

Considere possíveis problemas quando falamos de:

- Problemas nos mecanismos de **avaliação e selecção de parceiros**;
- Conflitos de interesse ou no desempenho de actividades devido à **celebração de contractos** que não definem correctamente quais as competências e responsabilidades;
- Barreiras de **comunicação** entre organizações.

C.3.2.1. Comparação 1 – P6 vs P9:

- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o desempenho da **Gestão das Relações Externas** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.3.2.2. Comparação 2 – P3 vs P6:

- ☐ P3 Logística Inversa
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o desempenho da **Gestão das Relações Externas** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.3.2.3. Comparação 3 – P3 vs P9:

- ☐ P3 Logística Inversa
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o desempenho da **Gestão das Relações Externas** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.3.2.4. Comparação 4 – P8 vs P6:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o desempenho da **Gestão das Relações Externas** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.3.2.5. Comparação 4 – P8 vs P9:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o desempenho da **Gestão das Relações Externas** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.3.2.6. Comparação 6 – P8 vs P3:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P3 Logística Inversa

Avalie o desempenho da **Gestão das Relações Externas** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.3.2.7. Comparação 7 – P4 vs P6:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o desempenho da **Gestão das Relações Externas** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.3.2.8. Comparação 8 – P4 vs P9:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o desempenho da **Gestão das Relações Externas** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.3.2.9. Comparação 9 – P4 vs P3:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P3 Logística inversa

Avalie o desempenho da **Gestão das Relações Externas** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.3.2.10. Comparação 10 – P4 vs P8:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P8 Redução do tempo de resposta a pedidos urgentes

Avalie o desempenho da **Gestão das Relações Externas** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.4. Funcionários e Cultura Organizacional (EWC – Employees and Work Culture):

Em relação aos **Funcionários e Cultura Organizacional**, a utilização do trabalho humano para atingir os objectivos organizacionais e de toda a cadeia de abastecimento, é regida por factores: culturais (das empresas e do próprio funcionário) tais como a **cultura** em que se insere e a **língua**; factores de identidade como a **honestidade** e **eficiência** pessoal; e factores psicológicos, demonstrados pela **motivação** e **responsabilidade** no **desempenho** de actividades na organização.

C.4.1. A **Cultura Organizacional e os funcionários** é um factor mais importante para a implementação de qual das duas práticas listadas abaixo?

Tenha em consideração:

- Qual a importância dos funcionários entre organizações **falar na mesma língua**;
- A importância de uma selecção eficaz de funcionários que permita obter mão-de-obra **eficiente e responsável**;
- A necessidade de avaliar e fomentar a **motivação** e a **honestidade** de funcionários.

C.4.1.1. Comparação 1 – P6 vs P9:

- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o grau de importância da **Cultura Organizacional e os funcionários** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.4.1.2. Comparação 2 – P3 vs P6:

- ☐ P3 Logística Inversa
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o grau de importância da **Cultura Organizacional e os funcionários** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.4.1.3. Comparação 3 – P3 vs P9:

- ☐ P3 Logística Inversa
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o grau de importância da **Cultura Organizacional e os funcionários** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.4.1.4. Comparação 4 – P8 vs P6:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o grau de importância da **Cultura Organizacional e os funcionários** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.4.1.5. Comparação 4 – P8 vs P9:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o grau de importância da **Cultura Organizacional e os funcionários** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.4.1.6. Comparação 6 – P8 vs P3:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P3 Logística Inversa

Avalie o grau de importância da **Cultura Organizacional** e os funcionários para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte	Muito Forte		Extrema		
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.4.1.7. Comparação 7 – P4 vs P6:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o grau de importância da **Cultura Organizacional** e os funcionários para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte	Muito Forte		Extrema		
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.4.1.8. Comparação 8 – P4 vs P9:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o grau de importância da **Cultura Organizacional** e os funcionários para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte	Muito Forte		Extrema		
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.4.1.9. Comparação 9 – P4 vs P3:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P3 Logística inversa

Avalie o grau de importância da **Cultura Organizacional** e os funcionários para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte	Muito Forte		Extrema		
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.4.1.10. Comparação 10 – P4 vs P8:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P8 Redução do tempo de resposta a pedidos urgentes

Avalie o grau de importância da **Cultura Organizacional** e os funcionários para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte	Muito Forte		Extrema		
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.4.2. Na **situação actual** da sua empresa, qual a prática que considera ter um **melhor desempenho** e contribuição para o **aumento da competitividade da cadeia de abastecimento**, tendo em conta a **Cultura Organizacional e os funcionários**?

Considere possíveis problemas quando falamos de:

- Problemas **linguísticos** entre parceiros;
- Relativos a situações em que a **honestidade e responsabilidade** não tenham sido bem avaliadas;
- A forma como a falta de **motivação** de funcionários pode afectar os processos;
- A ausência de mecanismos para manter os funcionários **motivados**

C.4.2.1. Comparação 1 – P6 vs P9:

- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o desempenho da **Cultura Organizacional e os funcionários** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.4.2.2. Comparação 2 – P3 vs P6:

- ☐ P3 Logística Inversa
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o desempenho da **Cultura Organizacional e os funcionários** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.4.2.3. Comparação 3 – P3 vs P9:

- ☐ P3 Logística Inversa
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o desempenho da **Cultura Organizacional e os funcionários** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.4.2.4. Comparação 4 – P8 vs P6:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o desempenho da **Cultura Organizacional e os funcionários** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.4.2.5. Comparação 4 – P8 vs P9:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o desempenho da **Cultura Organizacional e os funcionários** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.4.2.6. Comparação 6 – P8 vs P3:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P3 Logística Inversa

Avalie o desempenho da **Cultura Organizacional e os funcionários** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.4.2.7. Comparação 7 – P4 vs P6:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o desempenho da **Cultura Organizacional e os funcionários** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.4.2.8. Comparação 8 – P4 vs P9:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o desempenho da **Cultura Organizacional e os funcionários** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.4.2.9. Comparação 9 – P4 vs P3:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P3 Logística inversa

Avalie o desempenho da **Cultura Organizacional e os funcionários** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.4.2.10. Comparação 10 – P4 vs P8:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P8 Redução do tempo de resposta a pedidos urgentes

Avalie o desempenho da **Cultura Organizacional e os funcionários** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.5. Semântica de Negócio (BSe – Business Semantics):

No desempenho da actividade de uma empresa, é comum a troca de dados e, independentemente do meio de comunicação (verbalmente ou por escrito, pessoalmente ou electronicamente) é comum surgirem, entre parceiros da cadeia, a utilização terminologias diferentes. A **semântica de negócio** e a sua gestão oferece uma resposta a este tipo de falhas, na medida em que lida com a **conversão de terminologias** diferentes e com os **conflitos** que possam existir entre termos utilizados entre parceiros da cadeia.

C.5.1. A **Semântica de Negócio** é um factor mais importante para a implementação de qual das duas práticas listadas abaixo?

Tenha em consideração:

- A importância de resolver **conflitos de terminologias** usadas entre parceiros;
- A existência de mecanismos para converter termos diferentes de forma a não afectar as operações.

C.5.1.1. Comparação 1 – P6 vs P9:

- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o grau de importância da **Semântica de Negócio** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.5.1.2. Comparação 2 – P3 vs P6:

- ☐ P3 Logística Inversa
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o grau de importância da **Semântica de Negócio** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.5.1.3. Comparação 3 – P3 vs P9:

- ☐ P3 Logística Inversa
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o grau de importância da **Semântica de Negócio** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.5.1.4. Comparação 4 – P8 vs P6:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o grau de importância da **Semântica de Negócio** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.5.1.5. Comparação 4 – P8 vs P9:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o grau de importância da **Semântica de Negócio** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.5.1.6. Comparação 6 – P8 vs P3:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P3 Logística Inversa

Avalie o grau de importância da **Semântica de Negócio** para a prática escolhida, com vista o aumento a competitividade da cadeia de abastecimento.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.5.1.7. Comparação 7 – P4 vs P6:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o grau de importância da **Semântica de Negócio** para a prática escolhida, com vista o aumento a competitividade da cadeia de abastecimento.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.5.1.8. Comparação 8 – P4 vs P9:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o grau de importância da **Semântica de Negócio** para a prática escolhida, com vista o aumento a competitividade da cadeia de abastecimento.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.5.1.9. Comparação 9 – P4 vs P3:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P3 Logística inversa

Avalie o grau de importância da **Semântica de Negócio** para a prática escolhida, com vista o aumento a competitividade da cadeia de abastecimento.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.5.1.10. Comparação 10 – P4 vs P8:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P8 Redução do tempo de resposta a pedidos urgentes

Avalie o grau de importância da **Semântica de Negócio** para a prática escolhida, com vista o aumento a competitividade da cadeia de abastecimento.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.5.2. Na **situação actual** da sua empresa, qual a prática que considera ter um **melhor desempenho** e contribuição para o **aumento da competitividade da cadeia de abastecimento**, tendo em conta a **Semântica de Negócio**?

Considere possíveis problemas quando falamos de:

- À utilização de terminologia diferente entre parceiros;
- À ineficácia dos mecanismos de conversão semântica face as operações levadas a cabo entre parceiros.

C.5.2.1. Comparação 1 – P6 vs P9:

- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o desempenho da **Semântica de Negócio** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.5.2.2. Comparação 2 – P3 vs P6:

- ☐ P3 Logística Inversa
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o desempenho da **Semântica de Negócio** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.5.2.3. Comparação 3 – P3 vs P9:

- ☐ P3 Logística Inversa
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o desempenho da **Semântica de Negócio** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.5.2.4. Comparação 4 – P8 vs P6:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o desempenho da **Semântica de Negócio** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.5.2.5. Comparação 4 – P8 vs P9:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o desempenho da **Semântica de Negócio** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.5.2.6. Comparação 6 – P8 vs P3:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P3 Logística Inversa

Avalie o desempenho da **Semântica de Negócio** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.5.2.7. Comparação 7 – P4 vs P6:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o desempenho da **Semântica de Negócio** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.5.2.8. Comparação 8 – P4 vs P9:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o desempenho da **Semântica de Negócio** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.5.2.9. Comparação 9 – P4 vs P3:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P3 Logística inversa

Avalie o desempenho da **Semântica de Negócio** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.5.2.10. Comparação 10 – P4 vs P8:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P8 Redução do tempo de resposta a pedidos urgentes

Avalie o desempenho da **Semântica de Negócio** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.6. Sistemas Organizacionais (OS – Organizational Systems):

Os **sistemas organizacionais** constituem a estrutura interna de qualquer organização, independentemente do eventual contacto entre entidades exteriores. No entanto, a estas estruturas condicionam as relações entre parceiros. Nomeadamente quando estamos em presença de estruturas organizacionais complexas, torna-se difícil identificar quais os **pontos de contacto** e qual o **papel desempenhado por cada membro na organização**.

C.6.1. Os **Sistemas Organizacionais** são mais importantes para a implementação de qual das duas práticas listadas abaixo?

Tenha em consideração:

- A importância de estabelecer **pontos de contacto**, para facilitar a comunicações interorganizacionais entre os vários sectores e hierarquias da empresa;
- A relevância ter sistemas organizacionais bem definidos e claros, entre empresas, de forma a **identificar quem é o responsável por cada sector**.

C.6.1.1. Comparação 1 – P6 vs P9:

- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o grau de importância dos **Sistemas Organizacionais** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.6.1.2. Comparação 2 – P3 vs P6:

- ☐ P3 Logística Inversa
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o grau de importância dos **Sistemas Organizacionais** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.6.1.3. Comparação 3 – P3 vs P9:

☐ P3 Logística Inversa

☐ P9 Utilização de modos de transporte flexíveis

Avalie o grau de importância dos **Sistemas Organizacionais** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.6.1.4. Comparação 4 – P8 vs P6:

☐ P8 Redução do tempo de resposta a pedidos urgentes

☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o grau de importância dos **Sistemas Organizacionais** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.6.1.5. Comparação 4 – P8 vs P9:

☐ P8 Redução do tempo de resposta a pedidos urgentes

☐ P9 Utilização de modos de transporte flexíveis

Avalie o grau de importância dos **Sistemas Organizacionais** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.6.1.6. Comparação 6 – P8 vs P3:

☐ P8 Redução do tempo de resposta a pedidos urgentes

☐ P3 Logística Inversa

Avalie o grau de importância dos **Sistemas Organizacionais** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.6.1.7. Comparação 7 – P4 vs P6:

☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos

☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o grau de importância dos **Sistemas Organizacionais** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.6.1.8. Comparação 8 – P4 vs P9:

☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos

☐ P9 Utilização de modos de transporte flexíveis

Avalie o grau de importância dos **Sistemas Organizacionais** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.6.1.9. Comparação 9 – P4 vs P3:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P3 Logística inversa

Avalie o grau de importância dos **Sistemas Organizacionais** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.6.1.10. Comparação 10 – P4 vs P8:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P8 Redução do tempo de resposta a pedidos urgentes

Avalie o grau de importância dos **Sistemas Organizacionais** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.6.2. Na **situação actual** da sua empresa, qual a prática que considera ter um **melhor desempenho** e contribuição para o **aumento da competitividade da cadeia de abastecimento**, tendo em conta os **Sistemas Organizacionais**?

Considere possíveis problemas quando falamos de:

- Que possam existir quando necessita identificar qual o membro responsável por determinada secção de um parceiro da cadeia.

C.6.2.1. Comparação 1 – P6 vs P9:

- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o desempenho dos **Sistemas Organizacionais** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.6.2.2. Comparação 2 – P3 vs P6:

- ☐ P3 Logística Inversa
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o desempenho dos **Sistemas Organizacionais** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.6.2.3. Comparação 3 – P3 vs P9:

- ☐ P3 Logística Inversa
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o desempenho dos **Sistemas Organizacionais** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.6.2.4. Comparação 4 – P8 vs P6:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o desempenho dos **Sistemas Organizacionais** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.6.2.5. Comparação 4 – P8 vs P9:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o desempenho dos **Sistemas Organizacionais** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.6.2.6. Comparação 6 – P8 vs P3:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P3 Logística Inversa

Avalie o desempenho dos **Sistemas Organizacionais** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.6.2.7. Comparação 7 – P4 vs P6:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o desempenho dos **Sistemas Organizacionais** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.6.2.8. Comparação 8 – P4 vs P9:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o desempenho dos **Sistemas Organizacionais** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.6.2.9. Comparação 9 – P4 vs P3:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P3 Logística inversa

Avalie o desempenho dos **Sistemas Organizacionais** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.6.2.10. Comparação 10 – P4 vs P8:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P8 Redução do tempo de resposta a pedidos urgentes

Avalie o desempenho dos **Sistemas Organizacionais** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7. Estratégia de Negócio (BS – Business Strategy):

As colaborações numa cadeia de abastecimento passam pela partilha dos mesmos objectivos estratégicos ao longo da cadeia. Estes objectivos devem estar centrados no benefício mútuo e não resultar em conflitos de interesse entre os parceiros. Desta forma, como parâmetros a ter em conta na definição da **estratégia de negócio** são: a **clareza na exposição dos objectivos estratégicos** e qual o **impacte dos objectivos estratégicos nos processos individuais de cada parceiro**.

C.7.1. A **Estratégia de Negócio** é mais importante para a implementação de qual das duas práticas listadas abaixo?

Tenha em consideração:

- A importância de **expor os objectivos estratégicos com clareza**, de forma a evitar conflitos de interesse;
- A importância de antecipar qual a **influência da estratégia ao longo da cadeia**, de forma a evitar conflitos.

C.7.1.1. Comparação 1 – P6 vs P9:

- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
- ☐ P9 Utilização de modos de transporte flexíveis

Avalie o grau de importância da **Sistemas Organizacionais** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.1.2. Comparação 2 – P3 vs P6:

- ☐ P3 Logística Inversa
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o grau de importância da **Estratégia de Negócio** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.1.3. Comparação 3 – P3 vs P9:

- ☐ P3 Logística Inversa
- ☐ P9 Utilização de moda de transporte flexíveis

Avalie o grau de importância da **Estratégia de Negócio** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.1.4. Comparação 4 – P8 vs P6:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o grau de importância da **Estratégia de Negócio** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.1.5. Comparação 4 – P8 vs P9:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P9 Utilização de moda de transporte flexíveis

Avalie o grau de importância da **Estratégia de Negócio** para a prática escolhida, com vista o **aumento a competitividade da cadeia de abastecimento**.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.1.6. Comparação 6 – P8 vs P3:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P3 Logística Inversa

Avalie o grau de importância da **Estratégia de Negócio** para a prática escolhida, com vista o aumento a competitividade da cadeia de abastecimento.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.1.7. Comparação 7 – P4 vs P6:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o grau de importância da **Estratégia de Negócio** para a prática escolhida, com vista o aumento a competitividade da cadeia de abastecimento.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.1.8. Comparação 8 – P4 vs P9:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P9 Utilização de moda de transporte flexíveis

Avalie o grau de importância da **Estratégia de Negócio** para a prática escolhida, com vista o aumento a competitividade da cadeia de abastecimento.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.1.9. Comparação 9 – P4 vs P3:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P3 Logística inversa

Avalie o grau de importância da **Estratégia de Negócio** para a prática escolhida, com vista o aumento a competitividade da cadeia de abastecimento.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.1.10. Comparação 10 – P4 vs P8:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P8 Redução do tempo de resposta a pedidos urgentes

Avalie o grau de importância da **Estratégia de Negócio** para a prática escolhida, com vista o aumento a competitividade da cadeia de abastecimento.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.2. Na **situação actual** da sua empresa, qual a prática que considera ter um **melhor desempenho** e contribuição para o **aumento da competitividade da cadeia de abastecimento**, tendo em conta os **Estratégia de Negócio**?

Considere possíveis problemas quando falamos de:

- Problemas que possam existir quando necessita identificar qual o membro responsável por determinada secção de outra entidade da cadeia.

C.7.2.1. Comparação 1 – P6 vs P9:

- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
- ☐ P9 Utilização de moda de transporte flexíveis

Avalie o desempenho da **Estratégia de Negócio** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.2.2. Comparação 2 – P3 vs P6:

- ☐ P3 Logística Inversa
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o desempenho da **Estratégia de Negócio** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.2.3. Comparação 3 – P3 vs P9:

- ☐ P3 Logística Inversa
- ☐ P9 Utilização de moda de transporte flexíveis

Avalie o desempenho da **Estratégia de Negócio** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.2.4. Comparação 4 – P8 vs P6:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o desempenho da **Estratégia de Negócio** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.2.5. Comparação 4 – P8 vs P9:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P9 Utilização de moda de transporte flexíveis

Avalie o desempenho da **Estratégia de Negócio** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.2.6. Comparação 6 – P8 vs P3:

- ☐ P8 Redução do tempo de resposta a pedidos urgentes
- ☐ P3 Logística Inversa

Avalie o desempenho da **Estratégia de Negócio** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.2.7. Comparação 7 – P4 vs P6:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento da produtos
- ☐ P6 Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia

Avalie o desempenho da **Estratégia de Negócio** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.2.8. Comparação 8 – P4 vs P9:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P9 Utilização de moda de transporte flexíveis

Avalie o desempenho da **Estratégia de Negócio** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.2.9. Comparação 9 – P4 vs P3:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P3 Logística inversa

Avalie o desempenho da **Estratégia de Negócio** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C.7.2.10. Comparação 10 – P4 vs P8:

- ☐ P4 Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
- ☐ P8 Redução do tempo de resposta a pedidos urgentes

Avalie o desempenho da **Estratégia de Negócio** para a prática escolhida.

Igual	Moderada		Forte		Muito Forte		Extrema	
1	2	3	4	5	6	7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

9.4. Annex 4

LARGEscM

Gestão da Cadeia de Abastecimento Lean, Ágil, Resiliente e Verde

Avaliação de fluxo de informação e da cooperação de entidades na cadeia de abastecimento

O presente questionário tem como objectivo apoiar uma investigação que pretende avaliar e estudar a influência do nível de interoperabilidade na gestão da cadeia de abastecimento *Lean*, *Ágil*, *Resiliente* e *Verde*.

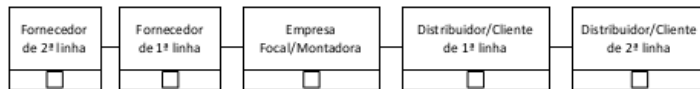
A gestão da cadeia de abastecimento pode ser definida como uma rede de organizações (fornecedores, produtores, distribuidores, etc.) que estão envolvidas intrinsecamente, através de ligações a jusante e a montante, em diversos processos e actividades que produzem valor em forma de produtos e serviços nas mãos do cliente final. Sob este contexto, os fluxos de material, de informação e de transacções assumem grande importância desempenhando um papel fundamental para atingir os objectivos da cadeia de abastecimento.

Contudo, problemas que afectam o fluxo de informação e material ao longo da cadeia exigem grande atenção, e necessitam ser analisados. O presente questionário incide sobre um método de análise de aspectos intra e interorganizacionais que dificultam a passagem de informação e fluxo de material ao longo da cadeia.

Como tal, a sua colaboração para este estudo desempenha um papel chave. Por favor, aceite colaborar com esta investigação através do preenchimento deste questionário.

A. Enquadramento da empresa:

- A.1. Nome da empresa: _____
 A.2. País: _____ A.3. Número de funcionários: _____
 A.4. Sector de actividade: _____
 A.5. Produto principal produzido pela empresa: _____
 A.6. Cargo da pessoa que preenche o questionário: _____
 A.7. Nome da pessoa que preenche o questionário (Facultativo): _____
 A.8. Contacto (e-mail): _____
 A.9. Qual o posicionamento da sua empresa na cadeia de abastecimento automóvel?



B. Avaliação de critérios de fluxo de informação e de capacidade cooperação entre entidades da cadeia de abastecimento:

B.1. Clareza na exposição da estratégia de negócio (BS – Business Strategy):

As colaborações existentes entre a sua empresa e os seus colaboradores da cadeia exigem uma exposição clara dos objectivos estratégicos. Estes objectivos devem estar centrados no benefício mútuo e não resultar em conflitos de interesse entre os parceiros.

B.1.1. Qual a **importância** de possuir uma **estratégia de negócio clara em toda a cadeia** para aumentar a competitividade da cadeia de abastecimento?

Muito Baixa Baixa Média Alta Muito Alta
☐ ☐ ☐ ☐ ☐

B.1.2. Na sua empresa, os objectivos estratégicos são claros para si e os seus parceiros?

Muito Fraco Fraco Médio Bom Muito Bom
☐ ☐ ☐ ☐ ☐

B.2. Pontos de contacto inter-organizacionais (OS – Organizational Systems):

Os **sistemas organizacionais** constituem a estrutura interna de qualquer organização. No entanto, estas estruturas condicionam as relações entre parceiros. Quando estamos em presença de estruturas organizacionais complexas, torna-se difícil identificar qual o **papel desempenhado por cada membro na organização**.

B.2.1. Qual a **importância** de obter um sistema organizacional bem definido que permita **identificar com facilidade o responsável de secção** das suas empresas parceiras, como contributo para a **maximização da competitividade da cadeia de abastecimento**?

Muito Baixa Baixa Média Alta Muito Alta
☐ ☐ ☐ ☐ ☐

B.2.2. Na cadeia de abastecimento em que se insere, como avalia os **sistemas organizacionais** dos seus parceiros, tendo em consideração **dificuldades na identificação responsáveis de secção**? (Por exemplo: quando mudam o responsável de um departamento de logística, é rapidamente informado de qual o novo membro a contactar? Alguma vez essas mudanças afectaram a sua empresa?)

Muito Fraco Fraco Médio Bom Muito Bom
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B.3. Motivação, Honestidade e Responsabilidade dos Recursos Humanos (EWC – Employees and Work Culture):

O trabalho humano assume relevo em qualquer empresa, sempre que lidamos com factores **culturais**, **sociológicos** e **psicológicos** que afectam positiva e negativamente a produtividade global da cadeia de abastecimento.

B.3.1. Sob o ponto de vista do **aumento da competitividade da sua cadeia de abastecimento**, qual a **importância** de possuir mecanismos que permitam lidar com os recursos humanos, de forma a não ocorrerem problemas relacionados com a **motivação, responsabilidade, eficiência e honestidade**?

Muito Baixa Baixa Média Alta Muito Alta
☐ ☐ ☐ ☐ ☐

B.3.2. Na situação actual da sua empresa, como avalia a influência das falhas humanas sempre que realiza uma actividade conjunta com o seu parceiro? Por exemplo: o não cumprimento de um prazo de entrega devido a erro de um funcionário da empresa parceira.

Muito Fraco Fraco Médio Bom Muito Bom
☐ ☐ ☐ ☐ ☐

B.4. Processos de negócio em conjunto com os seus parceiros (CBP – Collaborative Business Processes):

Os **processos de negócio conjuntos** entre parceiros da cadeia devem estar alinhados, de forma a conciliar objectivos e tarefas. Para esse efeito, é necessário definir correctamente as **fronteiras de responsabilidade**, promover a **transparência da informação** e **explicar os processos com clareza**.

B.4.1. Neste contexto, qual a **importância** de possuir processos de negócio bem definidos e claros entre si e o seu parceiro de forma a contribuir para o **aumento da competitividade da cadeia de abastecimento**?

Muito Baixa Baixa Média Alta Muito Alta
☐ ☐ ☐ ☐ ☐

B.4.2. Na situação actual da sua empresa, como avalia o desempenho dos **processos de negócio conjuntos** que realiza entre si e os seus parceiros de negócios? Tenha em consideração se existem **fronteiras de responsabilidade** claras nas actividades de cada entidade e se existe **transparência da informação** cedida pelos seus parceiros.

Muito Fraco Fraco Médio Bom Muito Bom
☐ ☐ ☐ ☐ ☐

B.5. Gestão das relações externas (MER – Management of External Relationships):

As relações entre parceiros de uma cadeia de abastecimento envolvem interacções de forma a conciliar as actividades de produção e serviços com os objectivos individuais e globais da cadeia. A gestão destas relações passa pela adequada **selecção de um parceiro** (por exemplo,

um fornecedor) que envolve **avaliação** antes e durante o contrato de colaboração, o **estabelecimento de contratos de colaboração**, a inerente **comunicação** e a **resolução de conflitos** entre parceiros.

B.5.1. Neste sentido, qual a **importância** de possuir uma **gestão das relações externas** eficiente para maximizar a **competitividade da cadeia de abastecimento**?

Muito Baixa Baixa Média Alta Muito Alta
☐ ☐ ☐ ☐ ☐

B.5.2. Na **situação actual**, como avalia **gestão das relações externas** da sua empresa.

Muito Fraco Fraco Médio Bom Muito Bom
☐ ☐ ☐ ☐ ☐

B.6. Conflitos de terminologia (BSe – Business Semantics):

No desempenho da actividade de uma empresa, é comum a troca de dados e, independentemente do meio de comunicação (verbalmente ou por escrito, pessoalmente ou electronicamente) é comum surgirem, entre parceiros da cadeia, a utilização de terminologias diferentes. A **semântica de negócio** e a sua gestão oferece uma resposta a este tipo de falhas, na medida em que lida com a **conversão de terminologias** diferentes e com os **conflitos** que possam existir entre termos utilizados entre parceiros da cadeia.

B.6.1. Nesse sentido, qual o **nível de exigência** de mecanismos que lidem com **conflitos de terminologia** para maximizar a **competitividade da cadeia de abastecimento**?

Muito Baixa Baixa Média Alta Muito Alta
☐ ☐ ☐ ☐ ☐

B.6.2. Na sua empresa, como avalia a gestão dos **conflitos de terminologia** face à **competitividade da cadeia de abastecimento**? Tenha em conta situações de incompatibilidade de informação e conflitos gerados por utilização de terminologia diferente.

Muito Fraco Fraco Médio Bom Muito Bom
☐ ☐ ☐ ☐ ☐

B.7. Adequação dos Sistemas de Informação (IS – Information Systems):

Os **Sistemas de Informação** são na actualidade o veículo para a transmissão de dados por via electrónica. É desejável que estes sistemas actuem de forma eficaz e transparente, garantindo

a informação correcta imediatamente. Factores fundamentais que regem estes sistemas são as **ferramentas de troca de dados**, a **rapidez das aplicações**, a **compatibilidade** e a **segurança dos dados trocados electronicamente**.

B.7.1. Sob este contexto, qual a **importância** de possuir **sistemas de informação adequados** e eficientes para maximizar a **competitividade da cadeia de abastecimento**?

Muito Baixa	Baixa	Media	Alta	Muito Alta
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B.7.2. Na situação actual, como avalia os sistemas de informação utilizados entre si e os seus parceiros de negócio? Tenha em consideração as **ferramentas de troca de dados** utilizadas (por exemplo, telefone, EDI, Fax, e-mail, etc.) e se são adequadas às actividades que realiza com os seus parceiros.

Muito Fraco	Fraco	Médio	Bom	Muito Bom
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

C. Comparação de critérios de fluxo de informação e de capacidade de cooperação entre entidades da cadeia de abastecimento:

C.1.1. Comparação da importância dos critérios para aumentar a competitividade da cadeia de abastecimento:

Compare os critérios avaliados anteriormente tendo em conta a **importância** da sua optimização para **aumentar a competitividade da cadeia de abastecimento**.

	Extrema	Muito Forte	Forte	Moderada	Igual	Moderada	Forte	Muito Forte	Extrema	
Clareza na Estratégia de negócio	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Pontos de contacto interorganizacionais
Clareza na Estratégia de negócio	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Motivação, Honestidade e Responsabilidade dos RH
Clareza na Estratégia de negócio	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Processos de Negócio Colaborativos com o parceiro
Clareza na Estratégia de negócio	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Gestão das Relações Externas
Clareza na Estratégia de negócio	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Conflitos de Terminologia
Clareza na Estratégia de negócio	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Adequação dos Sistemas de Informação
Conflitos de Terminologia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Adequação dos Sistemas de Informação

Forma de preenchimento: se considerar o critério da esquerda mais importante, assinala a sua importância do lado esquerdo a partir de "Igual" a "Extrema". Na situação inversa assinala nas quadriculas do lado direito. Se considerar que tanto um critério como outro são igualmente importantes assinala no meio em "Igual".

	Extrema	Muito Forte	Forte	Moderada	Igual	Moderada	Forte	Muito Forte	Extrema	
Pontos de contacto interorganizacionais	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Motivação, Honestidade e Responsabilidade dos RH
Pontos de contacto interorganizacionais	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Processos de Negócio Colaborativos com o parceiro
Pontos de contacto interorganizacionais	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Gestão das Relações Externas
Pontos de contacto interorganizacionais	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Conflitos de Terminologia
Pontos de contacto interorganizacionais	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Adequação dos Sistemas de Informação
Gestão das Relações Externas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Conflitos de Terminologia
Gestão das Relações Externas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Adequação dos Sistemas de Informação

	Extrema	Muito Forte	Forte	Moderada	Igual	Moderada	Forte	Muito Forte	Extrema	
Motivação, Honestidade e Responsabilidade dos RH	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Processos de Negócio Colaborativos com o parceiro
Motivação, Honestidade e Responsabilidade dos RH	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Gestão das Relações Externas
Motivação, Honestidade e Responsabilidade dos RH	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Conflitos de Terminologia
Motivação, Honestidade e Responsabilidade dos RH	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Adequação dos Sistemas de Informação
Processos de Negócio Colaborativos com o parceiro	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Gestão das Relações Externas
Processos de Negócio Colaborativos com o parceiro	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Conflitos de Terminologia
Processos de Negócio Colaborativos com o parceiro	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Adequação dos Sistemas de Informação

C.1.2. Comparação do **desempenho actual** dos critérios na sua empresa.

Compare os critérios avaliados anteriormente tendo em conta o **desempenho actual** de cada critério na sua empresa.

	Extrema	Muito Forte	Forte	Moderada	Igual	Moderada	Forte	Muito Forte	Extrema	
Clareza na Estratégia de negócio	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Pontos de contacto interorganizacionais
Clareza na Estratégia de negócio	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Motivação, Honestidade e Responsabilidade dos RH
Clareza na Estratégia de negócio	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Processos de Negócio Colaborativos com o parceiro
Clareza na Estratégia de negócio	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Gestão das Relações Externas
Clareza na Estratégia de negócio	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Conflitos de Terminologia
Clareza na Estratégia de negócio	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Adequação dos Sistemas de Informação
Conflitos de Terminologia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Adequação dos Sistemas de Informação
Pontos de contacto interorganizacionais	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Motivação, Honestidade e Responsabilidade dos RH
Pontos de contacto interorganizacionais	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Processos de Negócio Colaborativos com o parceiro
Pontos de contacto interorganizacionais	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Gestão das Relações Externas
Pontos de contacto interorganizacionais	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Conflitos de Terminologia
Pontos de contacto interorganizacionais	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Adequação dos Sistemas de Informação
Gestão das Relações Externas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Conflitos de Terminologia
Gestão das Relações Externas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Adequação dos Sistemas de Informação

	Extrema	Muito Forte	Forte	Moderada	Igual	Moderada	Forte	Muito Forte	Extrema	
Motivação, Honestidade e Responsabilidade dos RH	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Processos de Negócio Colaborativos com o parceiro
Motivação, Honestidade e Responsabilidade dos RH	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Gestão das Relações Externas
Motivação, Honestidade e Responsabilidade dos RH	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Conflitos de Terminologia
Motivação, Honestidade e Responsabilidade dos RH	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Adequação dos Sistemas de Informação
Processos de Negócio Colaborativos com o parceiro	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Gestão das Relações Externas
Processos de Negócio Colaborativos com o parceiro	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Conflitos de Terminologia
Processos de Negócio Colaborativos com o parceiro	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Adequação dos Sistemas de Informação

D. Avaliação de práticas da cadeia de abastecimento:

D.1. Clareza na estratégia de negócio:

D.1.1. Qual a **importância** de possuir uma **estratégia de negócio clara** para implementar as seguintes práticas:

Logística Inversa	Muito Baixa <input type="checkbox"/>	Baixa <input type="checkbox"/>	Media <input type="checkbox"/>	Alta <input type="checkbox"/>	Muito Alta <input type="checkbox"/>
Envolvimento dos fornecedores na concepção e desenvolvimento de produtos	Muito Baixa <input type="checkbox"/>	Baixa <input type="checkbox"/>	Media <input type="checkbox"/>	Alta <input type="checkbox"/>	Muito Alta <input type="checkbox"/>
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	Muito Baixa <input type="checkbox"/>	Baixa <input type="checkbox"/>	Media <input type="checkbox"/>	Alta <input type="checkbox"/>	Muito Alta <input type="checkbox"/>
Redução do tempo de resposta a pedidos urgentes	Muito Baixa <input type="checkbox"/>	Baixa <input type="checkbox"/>	Media <input type="checkbox"/>	Alta <input type="checkbox"/>	Muito Alta <input type="checkbox"/>
Utilização de modos de transporte flexíveis	Muito Baixa <input type="checkbox"/>	Baixa <input type="checkbox"/>	Media <input type="checkbox"/>	Alta <input type="checkbox"/>	Muito Alta <input type="checkbox"/>

D.1.2. Na sua empresa, de que forma os **objectivos estratégicos são claros** entre si e os seus fornecedores quando implementa cada uma das práticas? Avalie prática-a-prática.

Logística Inversa	Muito Fraco <input type="checkbox"/>	Fraco <input type="checkbox"/>	Médio <input type="checkbox"/>	Bom <input type="checkbox"/>	Muito Bom <input type="checkbox"/>
Envolvimento dos fornecedores na concepção e desenvolvimento de produtos	Muito Fraco <input type="checkbox"/>	Fraco <input type="checkbox"/>	Médio <input type="checkbox"/>	Bom <input type="checkbox"/>	Muito Bom <input type="checkbox"/>
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	Muito Fraco <input type="checkbox"/>	Fraco <input type="checkbox"/>	Médio <input type="checkbox"/>	Bom <input type="checkbox"/>	Muito Bom <input type="checkbox"/>
Redução do tempo de resposta a pedidos urgentes	Muito Fraco <input type="checkbox"/>	Fraco <input type="checkbox"/>	Médio <input type="checkbox"/>	Bom <input type="checkbox"/>	Muito Bom <input type="checkbox"/>
Utilização de modos de transporte flexíveis	Muito Fraco <input type="checkbox"/>	Fraco <input type="checkbox"/>	Médio <input type="checkbox"/>	Bom <input type="checkbox"/>	Muito Bom <input type="checkbox"/>

D.2. Pontos de contacto interorganizacionais:

D.2.1. Qual a importância de possuir sistemas organizacionais bem estruturados para implementar as seguintes práticas? Tenha em conta a facilidade de identificar o responsável de secção de um parceiro.

Logística Inversa	Muito Baixa <input type="checkbox"/>	Baixa <input type="checkbox"/>	Media <input type="checkbox"/>	Alta <input type="checkbox"/>	Muito Alta <input type="checkbox"/>
Envolvimento dos fornecedores na concepção e desenvolvimento de produtos	Muito Baixa <input type="checkbox"/>	Baixa <input type="checkbox"/>	Media <input type="checkbox"/>	Alta <input type="checkbox"/>	Muito Alta <input type="checkbox"/>
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	Muito Baixa <input type="checkbox"/>	Baixa <input type="checkbox"/>	Media <input type="checkbox"/>	Alta <input type="checkbox"/>	Muito Alta <input type="checkbox"/>
Redução do tempo de resposta a pedidos urgentes	Muito Baixa <input type="checkbox"/>	Baixa <input type="checkbox"/>	Media <input type="checkbox"/>	Alta <input type="checkbox"/>	Muito Alta <input type="checkbox"/>
Utilização de modos de transporte flexíveis	Muito Baixa <input type="checkbox"/>	Baixa <input type="checkbox"/>	Media <input type="checkbox"/>	Alta <input type="checkbox"/>	Muito Alta <input type="checkbox"/>

D.2.2. Na sua empresa, como avalia a estrutura organizacional dos seus parceiros para implementar as práticas seguintes?

Logística Inversa	Muito Fraco <input type="checkbox"/>	Fraco <input type="checkbox"/>	Médio <input type="checkbox"/>	Bom <input type="checkbox"/>	Muito Bom <input type="checkbox"/>
Envolvimento dos fornecedores na concepção e desenvolvimento de produtos	Muito Fraco <input type="checkbox"/>	Fraco <input type="checkbox"/>	Médio <input type="checkbox"/>	Bom <input type="checkbox"/>	Muito Bom <input type="checkbox"/>
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	Muito Fraco <input type="checkbox"/>	Fraco <input type="checkbox"/>	Médio <input type="checkbox"/>	Bom <input type="checkbox"/>	Muito Bom <input type="checkbox"/>
Redução do tempo de resposta a pedidos urgentes	Muito Fraco <input type="checkbox"/>	Fraco <input type="checkbox"/>	Médio <input type="checkbox"/>	Bom <input type="checkbox"/>	Muito Bom <input type="checkbox"/>
Utilização de modos de transporte flexíveis	Muito Fraco <input type="checkbox"/>	Fraco <input type="checkbox"/>	Médio <input type="checkbox"/>	Bom <input type="checkbox"/>	Muito Bom <input type="checkbox"/>

D.3. Motivação, Honestidade e Responsabilidade dos Recursos Humanos:

D.3.1. Qual a **importância** de possuir **recursos humanos** motivados, eficientes e responsáveis para implementar cada uma das práticas seguintes?

Logística Inversa	Muito Baixa <input type="checkbox"/>	Baixa <input type="checkbox"/>	Media <input type="checkbox"/>	Alta <input type="checkbox"/>	Muito Alta <input type="checkbox"/>
Envolvimento dos fornecedores na concepção e desenvolvimento de produtos	Muito Baixa <input type="checkbox"/>	Baixa <input type="checkbox"/>	Media <input type="checkbox"/>	Alta <input type="checkbox"/>	Muito Alta <input type="checkbox"/>
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	Muito Baixa <input type="checkbox"/>	Baixa <input type="checkbox"/>	Media <input type="checkbox"/>	Alta <input type="checkbox"/>	Muito Alta <input type="checkbox"/>
Redução do tempo de resposta a pedidos urgentes	Muito Baixa <input type="checkbox"/>	Baixa <input type="checkbox"/>	Media <input type="checkbox"/>	Alta <input type="checkbox"/>	Muito Alta <input type="checkbox"/>
Utilização de modos de transporte flexíveis	Muito Baixa <input type="checkbox"/>	Baixa <input type="checkbox"/>	Media <input type="checkbox"/>	Alta <input type="checkbox"/>	Muito Alta <input type="checkbox"/>

D.3.2. Na sua empresa, como avalia a **gestão de recursos humanos**, no sentido de manter motivados e avaliar a eficiência e responsabilidade para a implementação das práticas abaixo?

Logística Inversa	Muito Fraco <input type="checkbox"/>	Fraco <input type="checkbox"/>	Médio <input type="checkbox"/>	Bom <input type="checkbox"/>	Muito Bom <input type="checkbox"/>
Envolvimento dos fornecedores na concepção e desenvolvimento de produtos	Muito Fraco <input type="checkbox"/>	Fraco <input type="checkbox"/>	Médio <input type="checkbox"/>	Bom <input type="checkbox"/>	Muito Bom <input type="checkbox"/>
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	Muito Fraco <input type="checkbox"/>	Fraco <input type="checkbox"/>	Médio <input type="checkbox"/>	Bom <input type="checkbox"/>	Muito Bom <input type="checkbox"/>
Redução do tempo de resposta a pedidos urgentes	Muito Fraco <input type="checkbox"/>	Fraco <input type="checkbox"/>	Médio <input type="checkbox"/>	Bom <input type="checkbox"/>	Muito Bom <input type="checkbox"/>
Utilização de modos de transporte flexíveis	Muito Fraco <input type="checkbox"/>	Fraco <input type="checkbox"/>	Médio <input type="checkbox"/>	Bom <input type="checkbox"/>	Muito Bom <input type="checkbox"/>

D.4. Processos de negócio conjuntos:

D.4.1. Qual a **importância** de possuir **processos de negócio** bem definidos, visando uma **dareza nos processos, divisão de responsabilidade e visibilidade** dos processos para implementar as práticas.

Logística Inversa	Muito Baixa <input type="checkbox"/>	Baixa <input type="checkbox"/>	Media <input type="checkbox"/>	Alta <input type="checkbox"/>	Muito Alta <input type="checkbox"/>
Envolvimento dos fornecedores na concepção e desenvolvimento de produtos	Muito Baixa <input type="checkbox"/>	Baixa <input type="checkbox"/>	Media <input type="checkbox"/>	Alta <input type="checkbox"/>	Muito Alta <input type="checkbox"/>
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	Muito Baixa <input type="checkbox"/>	Baixa <input type="checkbox"/>	Media <input type="checkbox"/>	Alta <input type="checkbox"/>	Muito Alta <input type="checkbox"/>
Redução do tempo de resposta a pedidos urgentes	Muito Baixa <input type="checkbox"/>	Baixa <input type="checkbox"/>	Media <input type="checkbox"/>	Alta <input type="checkbox"/>	Muito Alta <input type="checkbox"/>
Utilização de modos de transporte flexíveis	Muito Baixa <input type="checkbox"/>	Baixa <input type="checkbox"/>	Media <input type="checkbox"/>	Alta <input type="checkbox"/>	Muito Alta <input type="checkbox"/>

D.4.2. Na sua empresa, quão bem definidos estão os **processos de negócio** que permitem assegurar a implementação das práticas.

Logística Inversa	Muito Fraco <input type="checkbox"/>	Fraco <input type="checkbox"/>	Médio <input type="checkbox"/>	Bom <input type="checkbox"/>	Muito Bom <input type="checkbox"/>
Envolvimento dos fornecedores na concepção e desenvolvimento de produtos	Muito Fraco <input type="checkbox"/>	Fraco <input type="checkbox"/>	Médio <input type="checkbox"/>	Bom <input type="checkbox"/>	Muito Bom <input type="checkbox"/>
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	Muito Fraco <input type="checkbox"/>	Fraco <input type="checkbox"/>	Médio <input type="checkbox"/>	Bom <input type="checkbox"/>	Muito Bom <input type="checkbox"/>
Redução do tempo de resposta a pedidos urgentes	Muito Fraco <input type="checkbox"/>	Fraco <input type="checkbox"/>	Médio <input type="checkbox"/>	Bom <input type="checkbox"/>	Muito Bom <input type="checkbox"/>
Utilização de modos de transporte flexíveis	Muito Fraco <input type="checkbox"/>	Fraco <input type="checkbox"/>	Médio <input type="checkbox"/>	Bom <input type="checkbox"/>	Muito Bom <input type="checkbox"/>

D.5. Gestão das relações externas:

D.5.1. Qual a **importância** de possuir uma **gestão das relações externas** eficiente para implementar cada uma das práticas? Tenha em conta o papel que a avaliação e selecção de parceiros e a definição de contratos de colaboração têm para a implementação de cada prática.

	Muito Baixa	Baixa	Media	Alta	Muito Alta
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Envolvimento dos fornecedores na concepção e desenvolvimento de produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Redução do tempo de resposta a pedidos urgentes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Utilização de modos de transporte flexíveis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

D.5.2. Na sua empresa, como avalia a **gestão das relações externas** na aplicação de cada prática.

	Muito Fraco	Fraco	Médio	Bom	Muito Bom
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Envolvimento dos fornecedores na concepção e desenvolvimento de produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Redução do tempo de resposta a pedidos urgentes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Utilização de modos de transporte flexíveis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

D.6. **Conflitos de terminologia:**

D.6.1. Avalie a **importância** de possuir mecanismos que lidem com **conflitos de terminologia** e **compatibilidade de informação** para aplicar as seguintes práticas.

Logística Inversa	Muito Baixa <input type="checkbox"/>	Baixa <input type="checkbox"/>	Media <input type="checkbox"/>	Alta <input type="checkbox"/>	Muito Alta <input type="checkbox"/>
Envolvimento dos fornecedores na concepção e desenvolvimento de produtos	Muito Baixa <input type="checkbox"/>	Baixa <input type="checkbox"/>	Media <input type="checkbox"/>	Alta <input type="checkbox"/>	Muito Alta <input type="checkbox"/>
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	Muito Baixa <input type="checkbox"/>	Baixa <input type="checkbox"/>	Media <input type="checkbox"/>	Alta <input type="checkbox"/>	Muito Alta <input type="checkbox"/>
Redução do tempo de resposta a pedidos urgentes	Muito Baixa <input type="checkbox"/>	Baixa <input type="checkbox"/>	Media <input type="checkbox"/>	Alta <input type="checkbox"/>	Muito Alta <input type="checkbox"/>
Utilização de modos de transporte flexíveis	Muito Baixa <input type="checkbox"/>	Baixa <input type="checkbox"/>	Media <input type="checkbox"/>	Alta <input type="checkbox"/>	Muito Alta <input type="checkbox"/>

D.6.2. Na sua empresa, como avalia os mecanismos que lidam com **conflitos de terminologia** para aplicar as práticas?

Logística Inversa	Muito Fraco <input type="checkbox"/>	Fraco <input type="checkbox"/>	Médio <input type="checkbox"/>	Bom <input type="checkbox"/>	Muito Bom <input type="checkbox"/>
Envolvimento dos fornecedores na concepção e desenvolvimento de produtos	Muito Fraco <input type="checkbox"/>	Fraco <input type="checkbox"/>	Médio <input type="checkbox"/>	Bom <input type="checkbox"/>	Muito Bom <input type="checkbox"/>
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	Muito Fraco <input type="checkbox"/>	Fraco <input type="checkbox"/>	Médio <input type="checkbox"/>	Bom <input type="checkbox"/>	Muito Bom <input type="checkbox"/>
Redução do tempo de resposta a pedidos urgentes	Muito Fraco <input type="checkbox"/>	Fraco <input type="checkbox"/>	Médio <input type="checkbox"/>	Bom <input type="checkbox"/>	Muito Bom <input type="checkbox"/>
Utilização de modos de transporte flexíveis	Muito Fraco <input type="checkbox"/>	Fraco <input type="checkbox"/>	Médio <input type="checkbox"/>	Bom <input type="checkbox"/>	Muito Bom <input type="checkbox"/>

D.7. Adequação dos Sistemas de Informação:

D.7.1. Qual a importância de possuir sistemas de informação adequados para aplicar as práticas?

Logística Inversa	Muito Baixa <input type="checkbox"/>	Baixa <input type="checkbox"/>	Media <input type="checkbox"/>	Alta <input type="checkbox"/>	Muito Alta <input type="checkbox"/>
Envolvimento dos fornecedores na concepção e desenvolvimento de produtos	Muito Baixa <input type="checkbox"/>	Baixa <input type="checkbox"/>	Media <input type="checkbox"/>	Alta <input type="checkbox"/>	Muito Alta <input type="checkbox"/>
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	Muito Baixa <input type="checkbox"/>	Baixa <input type="checkbox"/>	Media <input type="checkbox"/>	Alta <input type="checkbox"/>	Muito Alta <input type="checkbox"/>
Redução do tempo de resposta a pedidos urgentes	Muito Baixa <input type="checkbox"/>	Baixa <input type="checkbox"/>	Media <input type="checkbox"/>	Alta <input type="checkbox"/>	Muito Alta <input type="checkbox"/>
Utilização de modos de transporte flexíveis	Muito Baixa <input type="checkbox"/>	Baixa <input type="checkbox"/>	Media <input type="checkbox"/>	Alta <input type="checkbox"/>	Muito Alta <input type="checkbox"/>

D.7.2. Na sua empresa, como avalia a adequação dos sistemas de informação utilizados entre si e o seu parceiro para aplicar cada uma das práticas?

Logística Inversa	Muito Fraco <input type="checkbox"/>	Fraco <input type="checkbox"/>	Médio <input type="checkbox"/>	Bom <input type="checkbox"/>	Muito Bom <input type="checkbox"/>
Envolvimento dos fornecedores na concepção e desenvolvimento de produtos	Muito Fraco <input type="checkbox"/>	Fraco <input type="checkbox"/>	Médio <input type="checkbox"/>	Bom <input type="checkbox"/>	Muito Bom <input type="checkbox"/>
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	Muito Fraco <input type="checkbox"/>	Fraco <input type="checkbox"/>	Médio <input type="checkbox"/>	Bom <input type="checkbox"/>	Muito Bom <input type="checkbox"/>
Redução do tempo de resposta a pedidos urgentes	Muito Fraco <input type="checkbox"/>	Fraco <input type="checkbox"/>	Médio <input type="checkbox"/>	Bom <input type="checkbox"/>	Muito Bom <input type="checkbox"/>
Utilização de modos de transporte flexíveis	Muito Fraco <input type="checkbox"/>	Fraco <input type="checkbox"/>	Médio <input type="checkbox"/>	Bom <input type="checkbox"/>	Muito Bom <input type="checkbox"/>

E. Comparação de práticas de gestão da cadeia de abastecimento:

E.1. Clareza na estratégia de negócio:

E.1.1. Compare a **importância** de realizar uma **exposição clara dos objectivos estratégicos** na comparação da implementação de cada par de práticas. Avalie a importância deste critério para implementar cada prática quando comparada com outra.

	Extrema	Muito Forte	Forte	Moderada	Igual	Moderada	Forte	Muito Forte	Extrema	
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis
Redução do tempo de resposta a pedidos urgentes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis

	Extrema	Muito Forte	Forte	Moderada	Igual	Moderada	Forte	Muito Forte	Extrema	
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis

E.1.2. Na sua empresa, como avalia a **clareza de como os objectivos estratégicos** são expostos a si e aos parceiros da cadeia, quando implementa as práticas.

	Extrema	Muito Forte	Forte	Moderada	Igual	Moderada	Forte	Muito Forte	Extrema	
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis
Redução do tempo de resposta a pedidos urgentes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis

	Extrema	Muito Forte	Forte	Moderada	Igual	Moderada	Forte	Muito Forte	Extrema	
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis

E.2. Pontos de contacto interorganizacionais

E.2.1. Compare a importância de possuir **pontos de contacto interorganizacionais** bem definidos na implementação das práticas abaixo. Tenha em consideração a facilidade de identificar responsáveis de secção do seu parceiro e conseguir rastrear o procedimento ao longo da hierarquia da empresa.

	Extrema	Muito Forte	Forte	Moderada	Igual	Moderada	Forte	Muito Forte	Extrema	
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis
Redução do tempo de resposta a pedidos urgentes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis

	Extrema	Muito Forte	Forte	Moderada	Igual	Moderada	Forte	Muito Forte	Extrema	
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis

E.2.2. Na sua empresa, compare o desempenho da interação com a **estrutura organizacional** dos seus parceiros quando implementa as práticas listadas.

	Extrema	Muito Forte	Forte	Moderada	Igual	Moderada	Forte	Muito Forte	Extrema	
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis
Redução do tempo de resposta a pedidos urgentes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis

	Extrema	Muito Forte	Forte	Moderada	Igual	Moderada	Forte	Muito Forte	Extrema	
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis

E.3. Motivação, Honestidade e Responsabilidade dos Recursos Humanos:

E.3.1. Compare a **importância** de possuir **recursos humanos** motivados, eficientes e responsáveis para utilizar as práticas abaixo.

	Extrema	Muito Forte	Forte	Moderada	Igual	Moderada	Forte	Muito Forte	Extrema	
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis
Redução do tempo de resposta a pedidos urgentes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis

	Extrema	Muito Forte	Forte	Moderada	Igual	Moderada	Forte	Muito Forte	Extrema	
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis

E.3.2. Na sua empresa, como avalia, comparativamente, o desempenho da actual **gestão de recursos humanos** no sentido de implementar as práticas.

	Extrema	Muito Forte	Forte	Moderada	Igual	Moderada	Forte	Muito Forte	Extrema	
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis
Redução do tempo de resposta a pedidos urgentes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis

	Extrema	Muito Forte	Forte	Moderada	Igual	Moderada	Forte	Muito Forte	Extrema	
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis

E.4. Processos de negócio conjuntos:

E.4.1. Compare a **importância** de possuir **processos de negócio bem definidos** na implementação das práticas.

	Extrema	Muito Forte	Forte	Moderada	Igual	Moderada	Forte	Muito Forte	Extrema	
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis
Redução do tempo de resposta a pedidos urgentes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis

	Extrema	Muito Forte	Forte	Moderada	Igual	Moderada	Forte	Muito Forte	Extrema	
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis

E.4.2. Na sua empresa, compare o quão bem definidos estão os **processos de negócio** que permitem assegurar a implementação das práticas listadas.

	Extrema	Muito Forte	Forte	Moderada	Igual	Moderada	Forte	Muito Forte	Extrema	
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis
Redução do tempo de resposta a pedidos urgentes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis

	Extrema	Muito Forte	Forte	Moderada	Igual	Moderada	Forte	Muito Forte	Extrema	
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis

E.5. Gestão das relações externas:

E.5.1. Compare a importância de possuir uma **gestão das relações externas** eficiente para aplicar as práticas de gestão da cadeia.

	Extrema	Muito Forte	Forte	Moderada	Igual	Moderada	Forte	Muito Forte	Extrema	
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis
Redução do tempo de resposta a pedidos urgentes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis

	Extrema	Muito Forte	Forte	Moderada	Igual	Moderada	Forte	Muito Forte	Extrema	
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis

E.5.2. Na sua empresa, como avalia a **gestão das relações externas** comparativamente em relação a cada prática.

	Extrema	Muito Forte	Forte	Moderada	Igual	Moderada	Forte	Muito Forte	Extrema	
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis
Redução do tempo de resposta a pedidos urgentes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis

	Extrema	Muito Forte	Forte	Moderada	Igual	Moderada	Forte	Muito Forte	Extrema	
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis

E.6. Conflitos de terminologia:

E.6.1. Compare a **importância** de possuir mecanismos que lidem com **conflitos de terminologia** e **compatibilidade de informação** para aplicar cada uma das práticas.

	Extrema	Muito Forte	Forte	Moderada	Igual	Moderada	Forte	Muito Forte	Extrema	
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis
Redução do tempo de resposta a pedidos urgentes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis

	Extrema	Muito Forte	Forte	Moderada	Igual	Moderada	Forte	Muito Forte	Extrema	
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis

E.6.2. Na sua empresa, como avalia os mecanismos que lidam com **conflitos de terminologia**, comparativamente, para a utilização das práticas.

	Extrema	Muito Forte	Forte	Moderada	Igual	Moderada	Forte	Muito Forte	Extrema	
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis
Redução do tempo de resposta a pedidos urgentes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis

	Extrema	Muito Forte	Forte	Moderada	Igual	Moderada	Forte	Muito Forte	Extrema	
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis

E.7. Adequação dos Sistemas de Informação:

E.7.1. Compare a importância de possuir sistemas de informação adequados entre os parceiros para implementar as práticas.

	Extrema	Muito Forte	Forte	Moderada	Igual	Moderada	Forte	Muito Forte	Extrema	
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis
Redução do tempo de resposta a pedidos urgentes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis

	Extrema	Muito Forte	Forte	Moderada	Igual	Moderada	Forte	Muito Forte	Extrema	
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis

E.7.2. Na sua empresa, como avalia, comparativamente, a adequação dos sistemas de informação utilizados entre si e o seu parceiro para a utilização das práticas.

	Extrema	Muito Forte	Forte	Moderada	Igual	Moderada	Forte	Muito Forte	Extrema	
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Logística Inversa	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis
Redução do tempo de resposta a pedidos urgentes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis

	Extrema	Muito Forte	Forte	Moderada	Igual	Moderada	Forte	Muito Forte	Extrema	
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Envolvimento dos fornecedores na concepção e desenvolvimento dos produtos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Redução do tempo de resposta a pedidos urgentes
Implementação de sistemas de informação para aumentar a visibilidade ao longo da cadeia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilização de modos de transportes flexíveis