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Collaborative Relationships in Supply Chains

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ABSTRACT

This thesis is about developing a better understanding of an emergent practice to tackle the issue of competitiveness, that is, **collaboration and efficient relationships between organisations in a supply chain.** It provides a model for optimising relationships between companies and defines the operational practices that these companies should adopt in order to efficiently develop desirable relationships.

This research project starts with the definition of the gap in knowledge identified through an exploratory process. The findings of the review of the literature in supply chain management and collaboration together with an empirical study carried out in 10 organisations suggest that further research is required to:

(1) analyse the nature and characteristics of different relationship types between organisations,

(2) study the operational implications of these relationship types,

(3) analyse the factors that influence these relationships, and

(4) make more desirable the relationships between companies depending on their characteristics.

This study falls into the *applied research* category. As a result, specific research strategies and methods were rigorously selected to study a current industrial problem and provide a suitable solution.

This thesis makes a novel contribution to existing knowledge through deduction from theory and empirical evidence from five case studies. The key contribution is as follows:

1. There are five relationship types between organisations.
2. Each of these relationship types has a set of strategic, tactical and operational, 'hard' and 'soft' characteristics.
3. 'Value' and 'risk' factors define what relationships a company **should** develop.
4. There are 12 critical factors that define what relationships a company **can** develop.
5. The proposed model facilitates the definition of desirable organisational relationship at a process level, including a set of operational practices for implementation.

This thesis also defines the criteria required for ensuring the quality and validity of the research process and its output. These criteria are considered throughout all the different stages of this study. The thesis ends outlining the main conclusions and the validity of the research project.

GENERAL CONTENTS OF THE THESIS

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1. INTRODUCTION

"The flow of goods through the supply chain is the life-blood of the modern world" (New, 1997).

This statement made by Stephen J. New was one of the key citations that led this researcher to accomplish this study. This researcher wanted to investigate the theory behind this transcendent statement due to the impact that 'the flow of goods' apparently had over the economy of the world.

His professional experience in organisations such as Danobat Group and Domusa Calefaccion S.Coop. also highlighted the relevance and influence that an efficient performance of the whole supply chain of a product has on the effective response to customers' requirements. This researcher learned that an inaccurate service of a tiny organisation supplying 'C' type products was enough to alter the rhythmic performance of a network of more than 100 organisations.

The motivation of this researcher to analyse this effect and the theoretical reasons behind it led this researcher to review the work of some main authors in this research field. The initial findings from this literature review strongly motivated this researcher to deal with the research project described in this Thesis.

This first chapter starts presenting the background of this research, that is, the starting point of this study. Secondly, it copes with the general aims and objectives defined by the author. This chapter continues defining the scope of the research and then it describes the structure of this Thesis. This first chapter will finish with some conclusions.

1.1 Background of the research

Globalisation of the markets has dramatically raised competition between organisations all over the world for decades. This fact, the development of new communication technologies and the raw material crisis (Manders and Brenner, 1995), specially the non-stopping increase of oil-price, have forced companies to pursue new strategic decisions in order to survive.

Supply chain management, especially collaboration, can be seen as a relatively new practice that leads organisations toward success within this challenging industrial environment. It is not enough anymore to focus exclusively on internal efficiency and effectiveness: implementation of practices such as JIT, TOC or TQM can not achieve all the benefits that they could; new advantages on performance that TIC's could provide are wasted; knowledge acquisition in new areas is restricted. In summary, internally orientated organisations might find more difficulties in satisfying customers' expectations. Openness to external collaboration is the key to survive and succeed.

Several authors have asserted that competition in the future will no longer be between single companies as has been happening for many years, it will be between global value chains (Porter, 1985; Christopher and Towill, 2001; Cox, 1999; Rich and Hines, 2000; Weber, 2002; Bititci and Carrie, 1998; Browne *et al.*, 1999). This way, close ties between organisations are getting gradually accomplished, joint-performance is becoming common within organisations, resource sharing for mutual profit based on trust and commitment is no longer taboo, and companies start decentralising their activities focusing just on their core-competences.

These trends lead organisations to a new scenario: Smaller companies will create networks where business processes will be extended along all the members; customer orientation will be shared through the development of common objectives and strategy; investments and benefits will be the responsibility of all partners; and individual capabilities, knowledge and experiences will be exchanged. These networks will become a single competitive entity in the market (Harland et al., 1999; Zineldin et al., 2003).

This study is based on the problems and challenges described in the latter scenario. Therefore, this scenario will be the framework of this study. The point of departure of this study was the need of competitiveness of organisations operating in such a global environment. To this end, supply chain management practice was selected for this study as an emergent strategic choice to gain competitiveness and best practice that would need further research. Authors such as Yin (2003), Stake (1995) and Miles and Huberman (1994)

highlight that every research project should start with the statement of the problems and issues to be studied. This case, the problems detected during the initial review in the literature were basically related to a lack of understanding of:

- The operational side of supply chain management.
- The configuration of relationships between organisations.
- Collaboration practice as a concept.

This research will deal with these general issues. However, specific research questions will have to be defined in order to focus the scope of the research. In order to make clear the concepts of both supply chain management and collaboration, it is necessary to provide a brief definition of them. Supply chain management is defined as the co-ordination of the flow of material, knowledge, information and other tangible/intangible resources between organisations. Collaboration is the act of two or more organisations of working together to achieve a common goal. Many authors consider that collaboration is the future trend of supply chain management. As a consequence this study will consider collaboration as an emergent co-ordination level within supply chain management practice, that is, collaboration will be one strategic choice of organisations for managing their supply chains.

The next section will present the initial objectives defined for this study.

1.2 Research aims and objectives

The aims and the objectives were defined following the recommendations from the authors previously mentioned. This way, the aim of this study was to gain a better understanding of supply chain management practice, focusing especially on collaboration among organisations.

This generic aim was divided into specific objectives:

- To analyse the nature and characteristics of different relationship types between organisations.
- To study the operational implications of the relationships between organisations within a supply chain.
- To analyse the factors that influence collaborative relationships.
- To make more desirable relationships between organisations depending on their characteristics and performance.

The contribution to knowledge of this study relied on the fulfilment of these four generic objectives. These objectives served as a guideline for the general literature review of this study. As a consequence, the research questions extracted from this literature review would be supported by this set of general objectives. The review of the literature should also provide evidence to guarantee the novelty of the objectives and the contribution to knowledge of this project.

The next section will deal with the scope of this thesis. To this end, the sources of literature used during the development of this research project will be presented.

1.3 Scope of the thesis

Before starting with the research, it is important to define the boundaries of the research. This task will focus the research process on the previously selected issues.

This study falls into the *applied research* category (Easterby-Smith et al., 2002). It departs from an industrial problem and the objective is to solve this problem through rigorous research. This requires collaboration between the researcher and the industrial organisations.

This thesis will deal with five main areas; the review of literature; the selection of an appropriate research methodology for the research; a theory building stage; a theory testing process; and finally, the description of the findings and conclusions extracted from the research process.

All these areas will deal with supply chain management concept from a business process point of view, especially focusing on the nature and implications of the relationships between the members of supply chains. The supply chain management concept will be analysed using both theoretical and practical sources of data.

Journals, books and the Internet will be used for reviewing the theory behind this practice. More than the 90% of all the references consulted are published after the 1980s, although there are some sources from the 1960s and 1970s. The main reason of considering almost all the data sources from after the 1980s is that supply chain management concept as it is described in this research was mostly developed and enhanced after 1980s decade. The references before this date had an orientation to purchasing practice, rather than to the value exchange along the chain. Regarding the origin of these references, it can be said that they are from all over the world.

As it will be seen in the following chapters industrial organisations will be used as practical data sources during different stages of the research. This constant relationship with organisations has been already justified at the beginning of this section.

The next section will deal with the structure of this thesis. The different chapters of it will be described and also their main outcome.

1.4 Structure of the thesis

As was mentioned before, this thesis is composed of five main. These five research phases are distributed in 8 chapters preceded by this first chapter. Thus, this thesis has a total of 9 chapters. This section aims to describe the content and the objective of each of these chapters. Figure 1.1 shows the general structure of the thesis and a brief description of the content of each chapter.

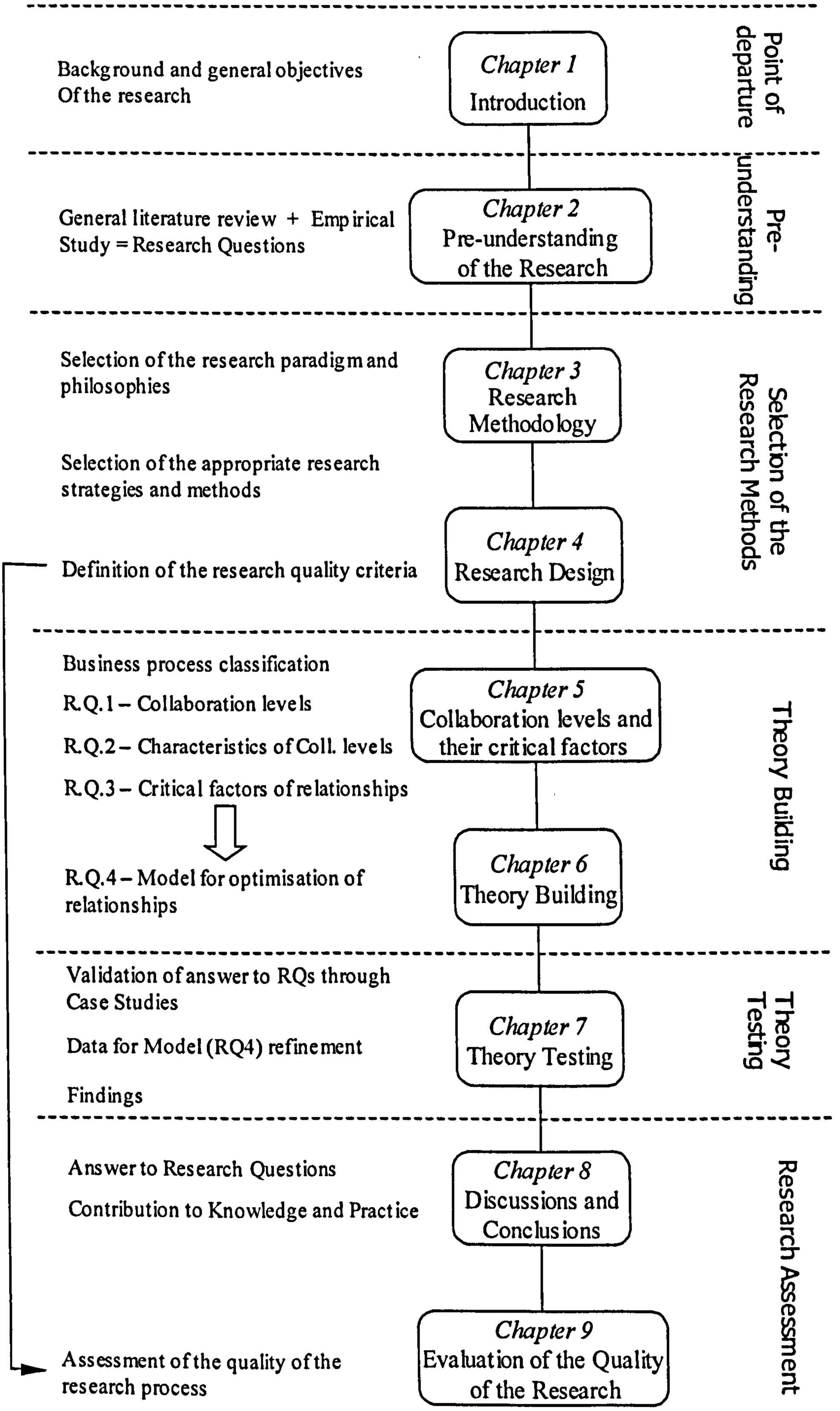

Figure 1.1: Structure of the thesis

This thesis starts with the description of the background which the research is based on. Then, it deals with the general objectives defined for the research project and the scope of the research. All these issues are presented in chapter 1, which aims to function as the introduction to this thesis. This first chapter copes with the structure and content of all chapters and finishes with conclusions.

Once the general characteristics of the research topic are presented, chapter 2 presents the pre-understanding stage carried out at the beginning of the study. This chapter has three main sections: The first section plays a key role in the definition of the research problem and the gaps in knowledge. It deals with the review of the main literature related to the research topic, i.e. supply chain management. The findings and conclusions extracted from this phase are contrasted in the second section of the chapter through an empirical study carried out in 10 organisations. Both theoretical and empirical data gathered throughout these two sections are combined for the definition of the research questions of the study. A total of four research questions are presented in the third section of the chapter. Thus, finding an accurate answer to these research questions will be the key objective of this study; they will be a guideline for the research.

Having identified the research questions, chapter 3 copes with the analysis and selection of the appropriate research paradigm and philosophies that will best meet the features defined by the research questions. Theory behind management research and its implications will also be studied. The third chapter reviews research strategies available and it decides what strategies will be used throughout the entire research project.

Chapter 4 continues specifying the research methods and tools required for putting into practice the research paradigms, philosophies and strategies selected in the previous chapter. The main methods and tools are reviewed and the most suitable are selected according to the features and requirements defined by the four research questions.

Chapter 4 also provides some criteria for the assessment of the quality of the research project. These criteria will be used to evaluate the validity of the research and its outcome at the end of the project, chapter 9.

Theory Building stage starts in chapter 5 and it follows in chapter 6. This relevant stage is split into two chapters because the first three research questions require an answer based on exploratory, whereas the fourth research question implicates a more constructive approach. As a consequence, it was decided to distinguish two chapters and implement different research processes and strategies in each of them.

Chapter 5 has four main sections. The scope of the thesis previously defined highlighted that the concept of supply chain management was going to be analysed from a business process perspective. As a consequence, the first section of chapter 5 proposes a generic classification of business processes extracted from the work of different authors.

The second section of chapter 5 copes with the first research question, i.e. the different collaboration levels that two organisations may develop. Sections 3 and 4 do the same with the other two research questions, the characteristics of these collaboration levels and the critical factors that influence the organisational relationships respectively. It ends with a brief section dedicated to the conclusions of the chapter.

Chapter 6 deals exclusively with the answer to the fourth research question. This research question relies on constructive research strategy, as it requires the development of a model. The main input of the construct has already been developed in the previous chapter. Therefore, it can be concluded that the first three research questions feed the fourth.

Chapter 6 presents a model for the optimisation of organisational relationships based on the critical factors proposed in the third research question. However, two different approaches will be provided, the second developed as a consequence of the data gathered in a pilot case study.

Theory testing stage is accomplished in chapter 7. Based on 5 case studies this chapter aims to validate the answers provided to the research questions in the previous two chapters. The data gathered in these organisations is also highly valuable for the selection and refinement of the most accurate approach between the two models proposed in chapter 6. To this end, two main stages will be distinguished, the data collection process and the data analysis process. This chapter will finish with the presentation of the main findings of the case studies.

Chapter 8 deals with the discussion and conclusions derived from the research process. After summarising the different stages of the thesis, it provides a definitive answer to the four research questions. It then analyses the theoretical and practical contribution made by this research project and it also states the limitations associated to the research. Chapter 8 outlines some recommendations of the author for further research and the personal experience and opinion of the research journey.

Finally, chapter 9 contrasts the research questions with the quality criteria defined in chapter 4. Issues such as construct validity, external validity and the reliability of the research are assessed. This chapter evaluates whether this research project meets the basic characteristics

of any valid research. Chapter 9 ends summarising the key details of this thesis and the research project.

1.5 Conclusions of the chapter

This chapter has presented the point of departure for this thesis. It has reviewed the background of the research topic (i.e. supply chain management). An initial review of the literature has enabled defining the general objectives of the research as follows:

- To analyse the nature of different relationships between organisations
- To study the operational implications of supply chain management
- To analyse the theory behind the characteristics of collaboration practice

This chapter has also described the scope of the thesis. This research has been identified as *applied research*, thus, collaboration with organisations will be required. The nature of the sources of data has been analysed. This chapter has also outlined the structure and the content of the thesis and its nine chapters.

Next chapter will deal with the pre-understanding stage of the research. In this chapter, the general literature review and an empirical study will be presented. The findings and conclusions obtained from these two phases will allow defining the research questions of this study.

2. PRE-UNDERSTANDING STAGE OF THE RESEARCH

Before the 1970's the unlimited demand of the world markets generated a sharp increase of new ventures and business opportunities (Manders and Brenner, 1995; McIvor, Humphreys et al., 1997). Therefore, the number of similar organisations performing in the same industrial sector and sharing common potential market opportunities was high.

This proliferation and the 1973-1974 oil crisis and raw materials recession (McIvor, Humphreys et al., 1997) turned the sellers' unlimited demand market into a buyers' market (Manders and Brenner, 1995) where customers had the chance to demand exactly what they required. More recently, globalisation of the economy, opening of economic boundaries and the development of new IT sources have arisen, so there is even more competition between organisations.

Considering this situation organisations need to be highly competitive in order to continue being successful and guarantee their survival in this challenging environment

Small and large organisations are looking for more innovative ways of creating competitive advantage (Womack *et al.*, 1990). There is an emergent practice that is changing traditional organisational structures in the race to gaining a competitive edge – that is supply chain management and collaboration (or external integration) among organisations (Alpander *et al.*, 1995; Gordon *et al.*, 2001; Lopez, Bititci et al., 2004).

This chapter aims to increase the understanding of both supply chain management and collaboration practice. It will first review the general literature of these two fields. This stage will highlight some findings and potential gaps of knowledge. In order to corroborate and extend these findings this chapter will present an empirical study carried out in 10 organisations. The results of this fieldwork will also provide new findings. Finally, the combination of the conclusions of both the general literature review and the empirical study will address the research questions and the objectives of this study.

2.1 General literature review

The pre-understanding stage of this study started with a review of the general literature related to some key research areas. This scope of the literature will be described in the first section of this stage. Once the boundaries of the study are established the key references of the field will be reviewed. This general literature review will finish with the discussion of the main findings and conclusions.

2.1.1 Scope of the literature review

It is necessary to define the boundaries of the literature review before starting with this stage. Both chapter 1 and the introduction of this second chapter highlighted the characteristics of collaboration practice as a strategic decision to increase competitiveness at the present time. Collaboration being an emergent practice, it still requires much research to become a well-understood research field by researchers and practitioners from all over the world.

The core research area of this study will be collaboration practice, as it is shown in figure 2.1.

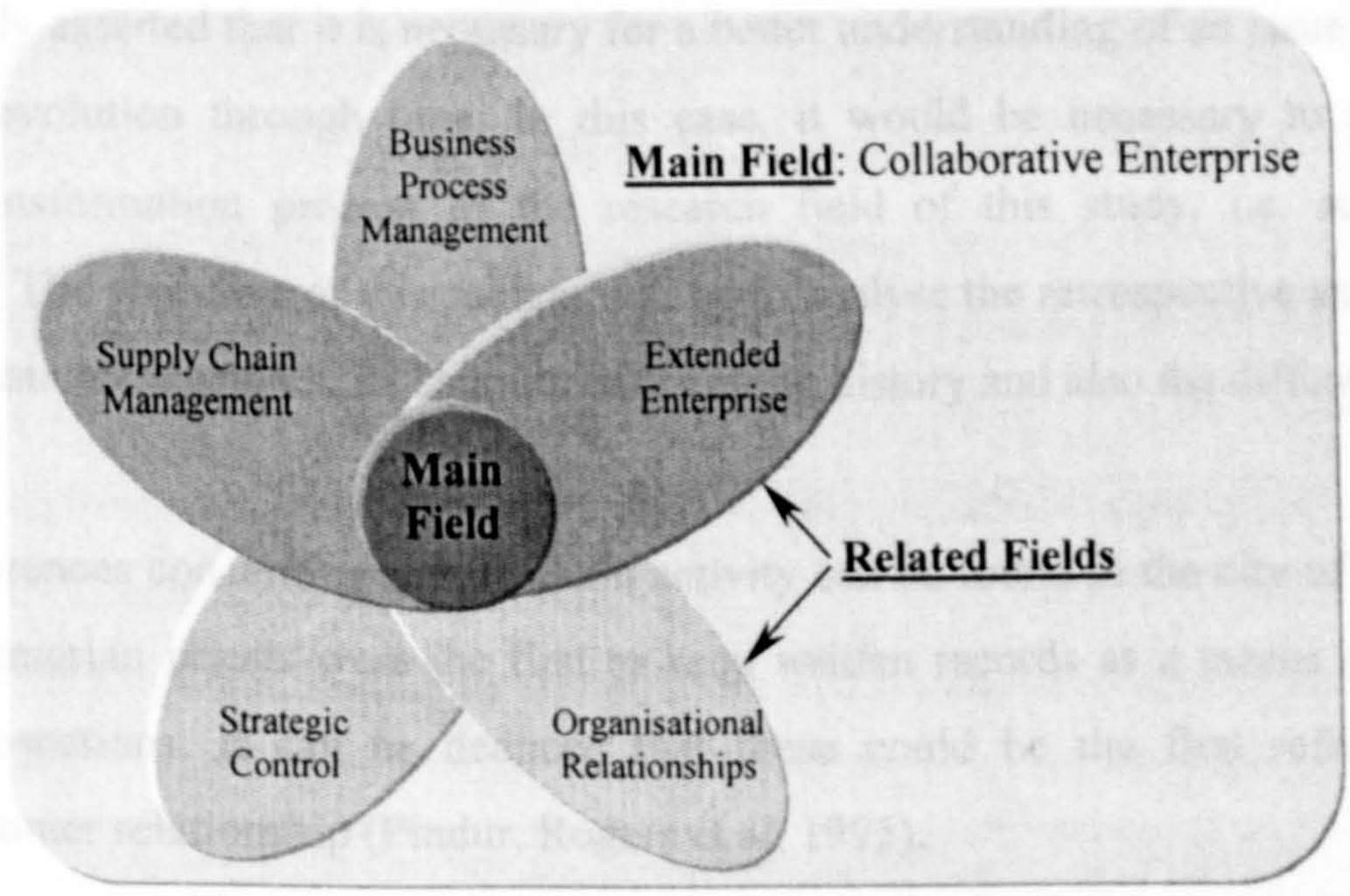

Figure 2.1: Scope of the literature review of this study

Throughout this study different research fields will be reviewed due to the interaction that they have with the main field. The general literature review will deal with supply chain management, extended enterprise and collaboration areas.

The rest of the fields presented in figure 2.1, i.e. business process management, organisational relationships and strategic control, will be reviewed in following chapters and sections of this thesis. It will be important to cope with this five research topics because a

good understanding of them will enable the researcher to gain an optimum understanding of the main field of this study, i.e. collaboration practice.

This general literature review section will first deal with the historical evolution of supply chain management. Then, supply chain management research topic will be analysed from its origins to the latest innovations and trends, i.e., collaboration practice.

2.1.2 Supply chain management practice

Today's competitive pressures force business managers to constantly search for new sources of sustainable advantage to survive. Competitive advantage in the 21st century no longer resides with a company's own capabilities, but rather with the external relationships and linkages that a firm can arrange with other organisations (Lewis, 1990). This concept is the base of supply chain management, which aims to manage the relationships between these external entities for an efficient and competitive performance of the organisations (Quinn, 1998).

2.1.2.1. Evolution of supply chain management

It is commonly asserted that it is necessary for a better understanding of an issue to know its origins and evolution through time. In this case, it would be necessary to analyse the historical transformation process of the research field of this study, i.e. supply chain management. The objective of this section will be to analyse the retrospective and origins of the supply chain management, its characteristics along history and also the different stages of this practice.

The first references concerning supply chain activity can be found in the city of Ur (Iraq) in 3000 BC. Sumerian priests were the first to keep written records as a means of recording business transactions. It can be deduced that these could be the first references of a supplier/customer relationship (Pindur, Rogers et al. 1995).

Similar records were found in Egypt (1300 BC) with references to the importance of organisation, administration and external transactions in bureaucratic states. Other records were found in ancient China also stating the great importance of similar issues in this culture (Morden, 1995; Pindur, Rogers et al., 1995).

Supply chain practice was also common in the Middle Ages through buying/selling handicraft goods. Logistics played a key role due to the localisation of specific raw materials and other goods in particular countries and regions.

The Classical Management movement arisen between 1885 and 1940 provided a rational and scientific basis for the development of supply chain management as it is at the present time. The Industrial Revolution gave birth to factories where people were brought together to work. As a result, this new trend made companies interact among themselves in order to exchange goods for money (Pindur, Rogers et al. 1995).

Another movement which arose at this time was the General Administrative Management theory. This theory aimed to develop a broader sight of the total management organisation. Related to this school of thought, Henri Fayol (1888-1915) created the Systematic Management Theory. According to Fayol, among six basic functions of any manager, commercial activities concerning supply-exchange tasks were highlighted as an essential function (Morden, 1995; Pindur, Rogers et al., 1995).

Some years later, Scientific Management school of thought and two of its greatest defenders as Mary Parket Follet (1940s) and Chester Barnard (1930s) presented the concepts of 'interconnectedness' and 'co-operative' for the first time (Post, Preston et al., 2002). Mary Parket Follet discussed the central contribution of 'interconnectedness' among different enablers to business success, whereas Chester Barnard later defined the business firm as a 'co-operative' organisation based on rational principles (Post, Preston et al., 2002; Pindur, Rogers et al., 1995).

Japan is considered to be one of the countries where supply chain management practice was first developed. The development of industrial groups, i.e. *keiretsu*, was accomplished between 1900 and 1920. In the mid-1930s, Toyota, dissatisfied with the quality and reliability of purchased components began to group suppliers into a cohesive set of external resources (suppliers' associations) (Lamming, 2000). In 1943 a policy document was published after Toyota's contribution:

> "The Ministry of Commerce and Industry positively plans to make 'child' factories, dedicated to 'parent' firms, and 'grandchild' factories to 'child' firms. 'Child' and 'grandchild' factories must stop manufacturing finished products and must manufacture components primarily for their parent factories. 'Parents' and 'children' must share labour management, materials, and capital".

This statement clearly shows the concept of supply chain management, although it was not known by this name yet.

The notion that close inter-firm linkages grew from the need to re-industrialise the countries involved in the Second World War is supported by many authors. According to New (1997), the idea of supply chain management is directly related to the emergence in the 1950s of

systems theory. This theory states that the analysis of a complex system cannot be fulfilled through the study of its individual constituent parts.

The 1960s was a highly relevant milestone in the supply chain management concept evolution process. It was then when the configuration of a supply chain and its behaviour was first thoroughly understood. Researchers at the Massachusetts Institute of Technology (MIT) developed the Beer Game, a logistics simulation problem that deals with the bullwhip effect. The Beer Game became famous and it is still very well known today. According to authors such as Busi and Dreyer (2005) and Lamming (1996), it can be concluded that the identification of this effect was the starting point of supply chain management practice, as it is currently known.

In the 1970s, the recommendation given by researchers was to look outside the organisation and develop long-range plans. This suggestion was orientated to open the boundaries of the organisation, externalise operations and relate with other external entities (Pindur, Rogers et al., 1995; Morden, 1995). These authors also highlighted the figure of Mintzberg (late 1970s) as the researcher that first defined strategy as a mediating force between an organisation and its environment. The isolated role of organisations lacked support and companies started relating more friendly with stakeholders.

It was in the 1980s, exactly in 1984, when Houlihan introduced the term 'supply chain management' to refer to the management of material beyond the boundaries of an organisation including "upstream" production chains and "downstream" distribution channels (Womack and Jones, 1996; Christopher, 1992; Lamming, Johnsen et al., 2000).

The worldwide recession of the late 1980s and early 1990s forced organisations to analyse the value generated by themselves and their participation in different value chains (Harland, Lamming et al., 1999). Dyadic linkages evolved to supply and value as a chain or pipeline in the late 1980s (Cousins and Spekman, 2003).

After this period, theory related to supply chain management has been constantly evolving and adapting to new market and customer requirements. Factors such as globalisation of the markets, high cost competition or radical time-to-market reduction have forced both researchers and practitioners to search for new solutions to deal with these issues. These last two decades have witnessed many changes and new configurations of supply chains, and also many different concepts and terms associated with inter-organisational relationships.

Table 2.4 shows four different stages that supply chain management practice has had since the early 1980s. It can be seen that the characteristics of each of these four stages are very different among them due to the factors mentioned before.

Table 2.4: Evolution of supply chain management practice between the 1980s and the 1990s (adopted from Christopher and Towill, 2001)

SC evolution phase	**I**	**II**	**III**	**IV**
SC time marker	Early 1980s	Late 1980s	Early 1990s	Late 1990s
SC philosophy	Product driven	Market orientated	Market driven	Customer driven
SC type	Lean functional silos	Lean supply chain	Leagile supply chain	Customised leagile supply chain
Market winner	Quality	Cost	Availability	Lead time
Market qualifiers	(a) Cost (b) Availability (c) Lead time	(a) Availability (b) Lead time (c) Quality	(a) Lead time (b) Quality (c) Cost	(a) Quality (b) Cost (c) Availability
Performance metrics	(a) Stock turns (b) Production cost	(a) Throughput time (b) Physical cost	(a) Market share (b) Total cost	(a) Customer satisfaction (b) Value added

Collaboration, strategic alliances and partnering among organisations were other new steps toward global competitiveness proposed in the mid-90s by researchers and practitioners (Barratt, 2004). As it was also foreseen by Harland, Lamming et al. (1999) in the previous section, collaboration between firms will be the future of organisations, moreover, an essential requirement for survival. Many authors such as Christopher and Towill (2001), Cox (1999), Rich and Hines (2000), Weber (2002), Bititci and Carrie (1998) and Browne and Zhang (1999) claimed that competition in the future will no longer be between single companies as it has been happening, it will be between global value chains and collaborative networks. Figure 2.6 summarises the chronological evolution and the different stages of supply chain management practice presented throughout this section.

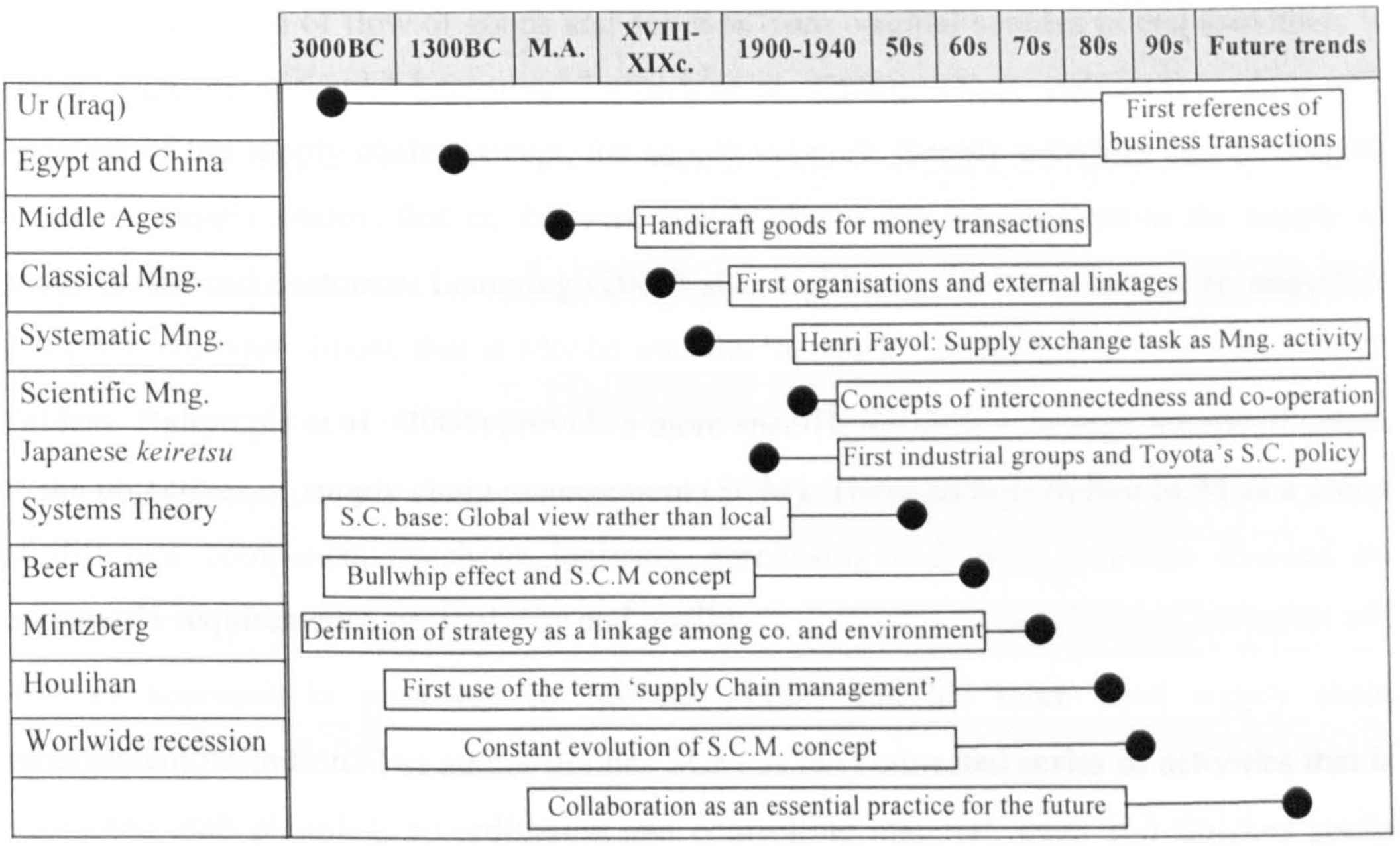

Figure 2.6: Origins and key dates of supply chain management

2.1.2.2. What is supply chain management?

Many uses of the concept 'supply chain management' show a considerable ambiguity as to what exactly is meant by the term. It is often stated that many researchers and practitioners deal with this concept to refer to several meanings. However, it is also clear that these meanings do connect one with another and in some cases overlap. The difficulty of definition of the supply chain management practice arises from a possible tight definition that would artificially close off productive avenues of development. On the other hand, a too loose definition would allow researchers and practitioners to cope with the study of everything (New, 1997).

As a consequence, many definitions referring to different approaches are available in literature. One of the simplest definitions is provided by Christopher (1992). The author defines supply chain management as a process of strategically managing the procurement, movement and storage of materials, parts and finished inventory (and the related information flows) through the organisation and other external entities. Thus, the flow of material and information is the basis of this approach proposed by Christopher (1992).

Jagdev and Browne (1998) also propose a similar definition. According to these authors, supply chain management is the management of physical flow of materials and information among the nodes of a supply chain. This definition is supported by Jain, Aparicio IV et al. (1999) and Agarwal and Shankar (2002) as well.

The same approach of flow of goods and services from original sources to end customers is found in the definition of Lamming, Johnsen et al. (2000). These authors provide a new variation of the supply chain concept, the supply network. Supply networks can be defined as sets of supply chains, that is, different supply chains are inter-related to the supply of goods to the end customer. Lamming (2000) also highlights that the chain is an imperfect metaphor and rarely linear, that is why he uses the 'network' concept.

Caldera, Dalrymple et al. (2004) provide a more specific definition through the specification of the objectives of supply chain management (SCM). These authors define SCM as a group of different components such as logistics, purchasing and sales activities focused on customer's requirements, profitability and quality.

Another approach is presented by Stevens (1989) and his three level supply chain management definition. The author defines SCM as the connected series of activities that is concerned with planning, co-ordinating and controlling material, parts and finished goods from suppliers to the customer. Two flows are also outlined by Stevens (1989): The flow of material and information.

The new income proposed by Stevens relies on three perspectives that have to be considered when managing the material flow. Operational, tactical and strategic levels will determine the specific requirements of the supply chain in terms of use of facilities, people, finance and systems.

The strategic level will define the objectives and policies for the supply chain. These objectives and policies should express what the supply chain has to do well to support the need of the organisation. Same way, the strategic level will specify the shape of the supply chain, the facilities required and their locations, and also the structure of the single organisation to bridge functional barriers and operate an integrated supply chain effectively (Stevens, 1989).

The second level, i.e. tactical level, should define how these strategic goals are going to be fulfilled. To this end, these general objectives and policies are translated into complementary objectives and policies for each function. Issues such as the inventory level of the organisation, capacity, service and tools (MRP II, JIT, and so on) are determined.

Finally, the operational perspective will be focused on the efficiency of the supply chain from a perspective of operations. Detailed systems and procedures will be implemented, and controls and performance measures will be developed. Decisions concerning inventory investment, service level and cost will be made (Stevens, 1989).

This vertical linkage of these three elements of a supply chain is essential for the effective organisation of the supply chain. It will be hard for a supply chain to separate or operate without any of these three elements.

All the authors reviewed so far share a similar approach, although each of them adds his/her own ideas. The material and information flow is the core of the definitions provided by these authors, i.e., simply a transaction of goods for money, which requires information for operating.

There is a second approach proposed by some other authors, which has a more global view of the value chain. Rather than focusing exclusively on the supply of goods between suppliers and customers, this second approach encompasses other services, activities and competences as linkages between organisations of the chain.

A first definition of SCM that considers more activities than just the transaction of material can be found in Spekman, Kamauff et al. (1998). These authors define SCM as a process for designing, developing, optimising and managing the internal and external components of the supply system, including material supply and also transforming materials and distributing finished products or services to customers. It is noticed that design, development and managing activities are included for the first time in this definition by Spekman, Kamauff et al. (1998).

Clear evidence of the difference between these two SCM approaches is provided by Franks (2000). The author describes the term SCM as the sequence of processes and activities involved in the complete manufacturing and distribution cycle, including everything from product design through materials and component ordering through manufacturing and assembly and onto warehousing and distribution until the finished product is in the possession of the final owner.

Similarly, Lemke, Goffin et al. (2003) incorporate the concept of value in their definition of the SCM. Rather than the transaction of just material or goods, these authors propose that there is an exchange of "value-packages" within the supply chain. Lemke, Goffin et al. (2003) consider this "value-package" as the combination of products, services, knowledge, mutual goals, trust, monetary compensation, long-term relationship and share of business.

This definition has introduced new and revolutionary concepts such as mutual goals, trust, long-term relationships and share of business. This second SCM approach aims to build closer relationships between the nodes of the supply chain, not just limiting to inter-change goods but also strengthening the commitment amongst them. This closer vision of the SCM

is defended by Yu, Yan et al. (2001), Mason-Jones and Towill (1997) and van der Vorst and Beulens (2002) when they say that SCM creates a win-win situation for all members.

Figure 2.2 shows the structure of a generic supply chain according to this second approach of SCM.

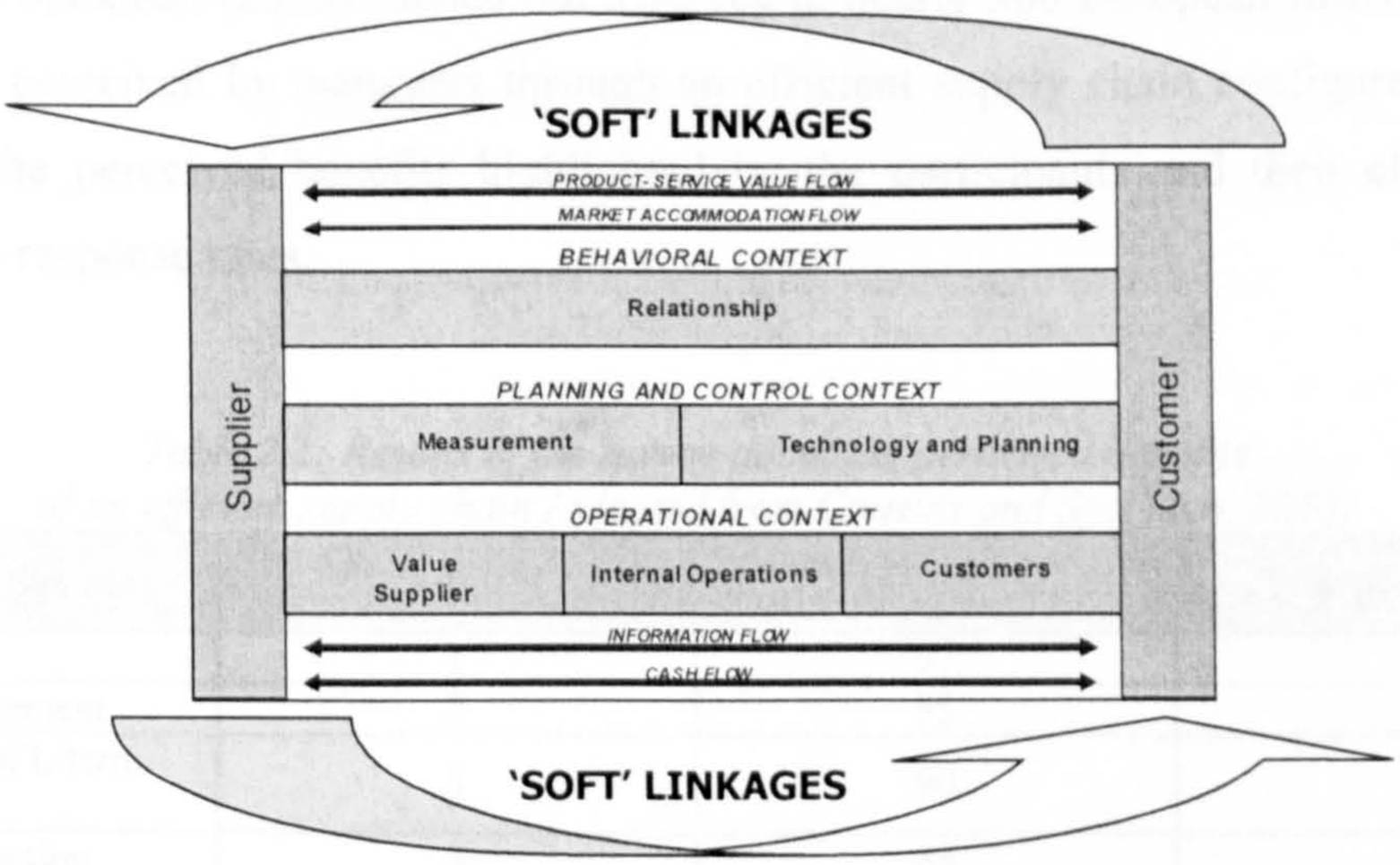

Figure 2.2: Structure of a generic supply chain (modified from Busi and Dreyer, 2005)

After reviewing all these definitions of several authors, two main approaches can be distinguished: A basic approach where SCM is focused on the management of material and information flow; and a second approach where a close relationship is involved between the organisations and there is a value transaction, understanding value as material, information, service, knowledge, commitment, trust, long-term relationship and so on.

For the effects of this study, this second approach will be used. Based on the literature the author considers that nowadays organisations are starting to offer and demand integral service, not just limiting to a procurement relationship. Operations such as R&D, product design or after sales service are frequently outsourced, thus, transactions within the supply chain are moving from a purely material flow towards a value flow.

2.1.2.3. Advantages of supply chain management

Many advantages are associated with SCM practice by researchers and practitioners. Although the characteristics and the configuration of each particular supply chain will influence the advantages achieved, there are some benefits common to all supply chains.

Franks (2000) highlighted the ability to source globally, and the availability of online, real-time information networked around the organisation giving full supply chain visibility. Customer response times are improved through SCM according to Franks, inventories are lower, and 'time to market' for the development of new products is considerably shorter. Finally, the author states that 'local' products can be globally offered thanks to supply chain management.

Cousins and Spekman (2003) carried out a survey in nearly 300 European firms concerning the benefits perceived by managers through an efficient supply chain configuration. Table 2.1 shows the perceived benefits highlighted by the participants and their classification according to response rates.

Table 2.1: Results of the survey about the perceived benefits of an efficient supply chain (adopted from Cousins and Spekman, 2003)

Perceived Benefit	Rank	Medium to high priority (%)	Low priority (%)
Cost reduction	1	97	3
Quality improvement	2	95	5
Development of L/term relationships	3	90	10
Lead-time reduction	4	88	12
Supply base reduction	5	82	18
Increasing profile of purchasing	6	78	22
Improved time-to-market	7	68	32
Outsourcing	8	63	37
Supply base delegation (tiering)	9	51	49
Co-design	10	42	58

The importance of cost reduction, quality improvement and development of long-term relationships between firms is highlighted by the responses to the survey. The results of the survey surprisingly showed that benefits such as improved time-to-market, outsourcing and co-design were secondary for the organisations. According to these authors this table would indicate that the main advantage gained from the effective management of a supply chain is to achieve cost benefit.

According to Sahay (2003) cost savings and efficiency improvements across business processes can also be created through enhanced SCM capabilities. The author proposes other benefits, including classic supply chain function as inventory control, purchasing and order fulfilment.

Drago (1997) assesses the benefits of SCM from the perspective of the uncertainty of both the supply chain and the single organisation. As a consequence, he states that SCM can

reduce the environmental uncertainty of an organisation. The uncertainty associated to both demand and competitiveness can also be decreased, as well as the organisational and operational uncertainty. Drago refers to the access to scarce resources as another potential benefit for organisations of SCM.

2.1.2.4. Potential sources for failure

Some authors such as Zineldin and Bredenlöw (2003) state that the reasons for relationship failure within a supply chain are not well understood yet. These authors highlight the lack of stability of relationships. However, much of the literature in the field limits the potential sources for failure and pitfalls of SCM to a relatively narrow set of reasons.

One of the most common problems found in a generic supply chain is known as the "bullwhip effect". This effect was first found by logistics executives at Procter & Gamble in the 60's. Basically, it is a phenomenon where the variability of an upstream organisation's demand is greater than that of the downstream organisation. As a consequence, it is highly complicated to maintain an optimum service through an accurate inventory level due to the high variability (Mason-Jones and Towill, 1997; Yu, Yan et al., 2001).

Information sharing between members of the supply chain, visibility of the whole supply chain and a centralised supply chain operation should be implemented to eliminate this effect. The members of a supply chain should optimise the overall performance of the supply chain rather than optimising their own local performance (Mason-Jones and Towill, 1997; Yu, Yan et al., 2001). This "bullwhip effect" will be further discussed in section 2.1.2.5.1.

Another pitfall associated to a supply chain is generated by the lack of involvement of the top managers of the organisations of the supply chain (Gomes-Casseres, 1994; Drago, 1997; Zineldin and Bredenlöw, 2003). Real co-ordination of activities often needs more time and effort of different managers, thus, these managers have to be convinced to effectively carry out global managerial tasks. It will require special networking skills and eventually also investments for the configuration of the supply chain.

In the same way, the more organisations involved in a supply chain, the more complex the supply chain becomes and the more difficult it will become to effectively be managed from a global perspective (Gomes-Casseres, 1994; Drago, 1997; Zineldin and Bredenlöw, 2003). The effort and the resources such as time and skill required by a complex supply chain will increase proportionally with the number of organisations participating in the supply chain.

It was said when presenting the "bullwhip effect" that organisations should optimise the global performance of the supply chains rather than individually maximise their local

performance. Another potential source of failure of a supply chain comes from the lack of own control that organisations suffer as a consequence of this global performance optimisation (Gomes-Casseres, 1994; Drago, 1997). Organisations lose performance independence because key information has to be shared. Also individual decisions are no longer possible all the time, thus, operational flexibility is reduced. Any organisation getting involved in a new supply chain should be ready to cope with these sacrifices.

Related to this potential problem, it is often found in a supply chain that all the members do not share the same objectives, that is, there is a goal incongruence (Drago, 1997; Johansson, 1997; Zineldin and Bredenlöw, 2003). Organisations usually do not give up fulfilling their own individual objectives. As a consequence, each organisation defends its own interests and the supply chain does not operate as a unique business unit. Organisations of a supply chain should seamlessly work together sharing the same vision for the whole supply chain (Drago, 1997).

One of the main characteristics of the economy and the global markets is that they are highly variable. Therefore, supply chains are operating in a changeable environment that forces them to constantly adapt to new requirements and challenges. According to Drago (1997), difficulties for a supply chain arise when it is not able to change and adapt to this new environment. Success of a supply chain will be measured in terms of capacity for agile evolution, among other indicators.

Other two inter-related potential sources for failure are highlighted by several authors. Difference of cultures among the organisations of a supply chain might provoke many problems and misunderstandings (Daniels and Radebaugh, 2001; Zineldin and Bredenlöw, 2003). This factor will gain more importance when the supply chain is composed by international organisations.

Factors such as this lack of cultural affinity make difficult to establish a trustful relationship between the organisations of a supply chain. According to Johansson (1997), Ohmae (1992), Daniels and Radebaugh (2001) and Zineldin and Bredenlöw (2003) this lack of trust does not allow sharing information or resources, investing together and so on.

2.1.2.5. General characteristics of supply chain management

There are some key characteristics that determine the nature and configuration of a supply chain. The objective of this section is to describe these characteristics and their effect over the general performance of the supply chain.

Three main issues will be reviewed: Firstly, the relevance of the information flow within the supply chain will be studied. Secondly, the importance of the culture, the traditions and the habits of the organisations when building and sustaining a supply chain will be analysed. Finally, this section will present other types of common characteristics of a supply chain, such as the organisation of a supply chain.

2.1.2.5.1. Supply chain management as a flow of information

The previous section concerning the potential sources of failure stated that the lack of information could jeopardise the optimum performance of a supply chain. The main limitation to enriching a supply chain with market sales data is the common attitude that information is power. The traditional culture and traditions of the organisations will distort order information to hide their intent not only to competitors but also to their own suppliers and customers (Mason-Jones and Towill, 1997; Christopher, 2000); Yu, Yan et al., 2001).

The retailer, i.e. the entity dealing with the final customer, is the only member of the supply chain who has direct sight of consumer demand in a traditional supply chain (Mason-Jones and Towill, 1997). All the other members only have the information of the orders from their immediate customer. As a consequence, the market information is distorted first by the retailer and further by each successive link in the chain (Christopher, 2000; Yu, Yan et al., 2001). This effect was first labelled by Forrester (1960) as "the bullwhip effect" (Mason-Jones and Towill, 1997).

On the other hand, in an information enriched supply chain each member receives the marketplace data directly from the customer. Hence, rather making an order decision based on the internal chain order data, each member can now operate more efficiently and adjust accurately the inventory levels based on real market demand (Mason-Jones and Towill, 1997; Christopher, 2000; Yu, Yan et al., 2001).

The point at which the information of real demand penetrates upstream in a supply chain is commonly named *the de-coupling point* (Christopher, 2000). Depending on the situation of the de-coupling point, the nature of the stock will be totally different: If the de-coupling point is at the beginning of the supply chain, inventory will be held in the form of raw-material and components. On the other hand, if the de-coupling point is at the end of the supply chain, the inventory will be based on finished products. As a consequence inventory levels will be higher, and both the complexity and costs will also be higher (Christopher, 2000).

To eliminate the bullwhip effect, information sharing between members should be enhanced to reduce uncertainty. Increasing vertical information sharing using Electronic Data Interchange (EDI) technology can improve the performance of the supply chain (Mason-Jones and Towill, 1997; Yu, Yan et al., 2001). With efficient supply chain management, the impact of the bullwhip effect can be reduced or eliminated because it can help the members share more information. Above anything, trust within the supply chain will be a key issue to increase the flow of information.

2.1.2.5.2. The role of culture affinity

The influence of the organisational culture was already presented as a potential source for failure in the previous section. Culture affinity between organisations is considered to be one of the most critical determinants for success in a supply chain. Culture affinity has been defined as the degree to which customs and communication related to language, business, cultural environment and legal environment look like the usual way of doing business in the home culture (Caldera, Dalrymple et al., 2004).

Lack of foreign language skills, cultural understanding or working habits can lead to a "them-and-us" confrontational mentality. The higher the cultural distance, the greater the difficulty to develop a collaborative relationship and also the higher the informational cost and complexity in business relationships. Culture affinity is considered to be an effective communication tool (Caldera, Dalrymple et al., 2004).

The analysis of the influence of cultural issues on business relationships would require studying research fields such as sociology, psychology, anthropology, and so on. The effects of these research areas are out of the boundaries defined by the scope of this study. Although the author considers that cultural affinity plays a critical role in organisational relationships, this research will exclusively focus on 'hard' issues such as the operational characteristics of the relationships.

2.1.2.5.3. Other characteristics for success

Authors such as Spekman, Kamauff et al. (1999) and Kanter (1994) propose some characteristics to make more efficient and effective a supply chain. These characteristics often include the optimisation of resources, organisational structures or costs globally for all the supply chain, rather than focusing on local optimisation (Spekman, Kamauff et al., 1999).

Integration of suppliers into the supply chain is highlighted as a key feature of an efficient supply chain. Basically, it means integrating suppliers by implementing specific practices and incorporating key sourcing dimensions in strategy, systems or processes and operations concurrently with the supply base (Spekman, Kamauff et al., 1999).

Effective organisation of the supply chain to achieve alignment between the members is another measure proposed by several authors. Supply chain management requires multi-disciplinary actions that cope with cross-functional areas. It is not uncommon to find a weak link in a supply chain. This weak member usually does not share the objectives and the perceptions of the supply chain. A single organisation cannot approach supply chain management as though it was the only benefactor (Spekman, Kamauff et al., 1999; Gomes-Casseres, 1994).

According to Spekman, Kamauff et al. (1999) supply chains should focus on total costs to be more effective. Underlying the premise of delivering value through sourcing is the notion of total systems based costing. Rather than focusing exclusively on the initial purchasing price, a supply chain should consider the relationship between cost drivers and value. Total costs consider the quality, price, delivery and service levels of the transaction. As a consequence, it is not enough to deal with suppliers that offer the lowest price.

Another characteristic highlighted for the efficient configuration of a supply chain is based on the effective distribution of activities within the supply chain (Spekman, Kamauff et al., 1999; Gomes-Casseres, 1994). Each member of the supply chain should be focused on its core-competences whereas the rest of the activities required should be transferred elsewhere in the supply chain. This measure will allow reducing costs and resources, and also gaining expertise and specialisation on core-activities.

Rationalisation of the supply base is also proposed as a characteristic for the efficiency and effectiveness in a supply chain (Spekman, Kamauff et al., 1999). The rationalisation process begins by simplifying business processes and searching for methods to reduce or eliminate waste and redundancy in the supply chain. In the same way, each member analyses the configuration of its relationships within the supply chain, and estimates how each linkage contributes to the value perceived by end-use customers.

Gomes-Casseres (1994) briefly presents other characteristics for an optimum configuration of a supply chain:

- Groups are only as strong as the alliances within them, manage individual relationships carefully.

- Effective groups are worth more than the sum of the alliance within them; manage the group as a whole.
- The strategic position of an organisation within a supply chain will determine what it gets.
- Every member of a supply chain should make sure that the network strategy is sustainable for its own interests.

The next section will deal with an internationally well-known supply chain reference model. This reference model will be used later on in this study.

2.1.2.6. SCOR model

The supply chain operations reference (SCOR) model is considered to be one of the most popular. It is a construction built by a council, which groups many researchers and practitioners from all over the world.

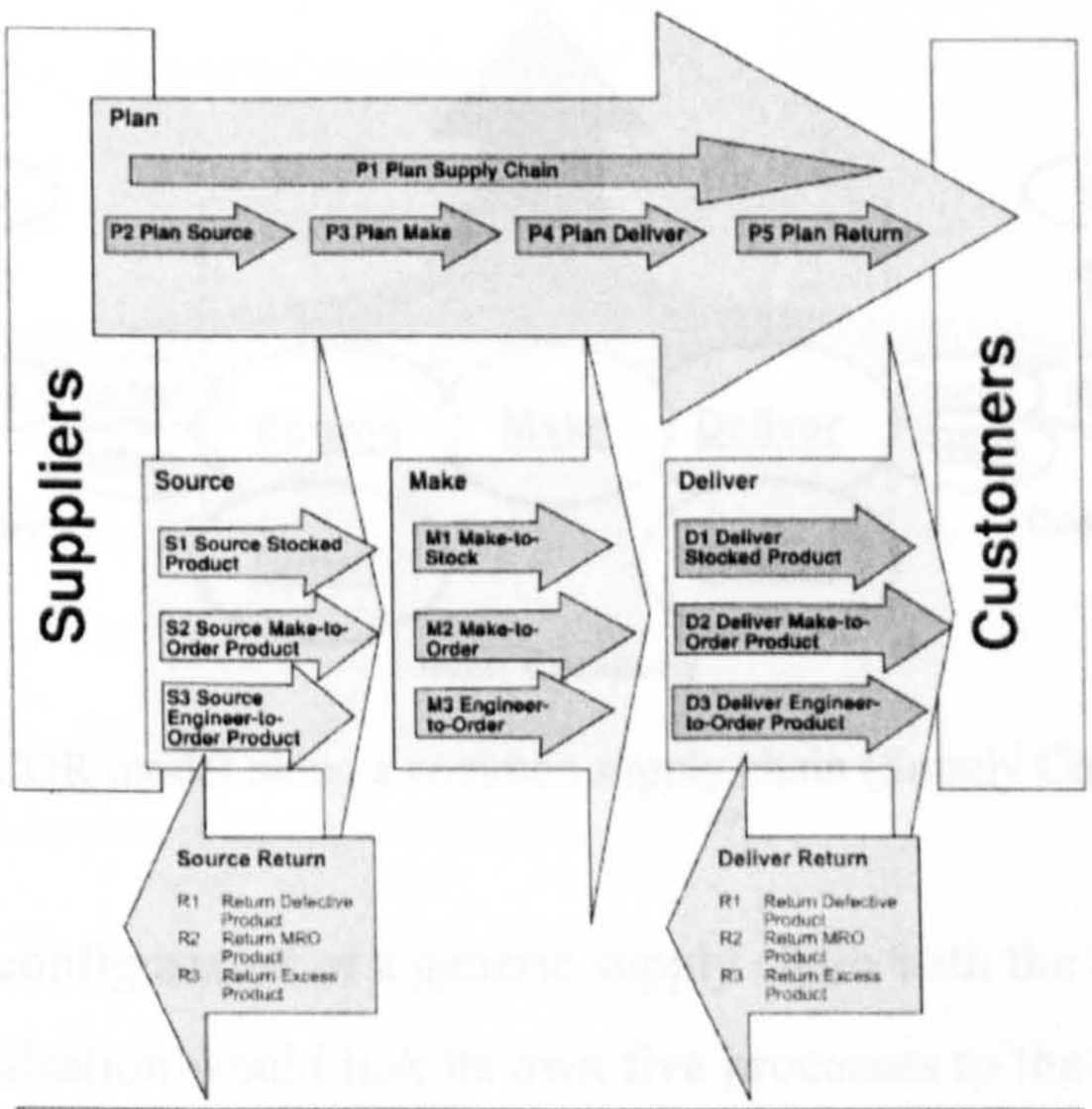

Figure 2.3: Architecture of the SCOR model (Supply Chain Council, 2001)

SCOR model links process elements, best practice and the features associated with the execution of a supply chain in a unique format. This model describes processes rather than

functions, that is, it focuses on the activity involved not the person or resource that carries out the activity.

Figure 2.3 shows the basic architecture of the SCOR model. Five main processes are distinguished in this model: Plan, source, make, deliver and return. Each of these processes is split into a set of activities, and these activities into tasks. Finally, each organisation will have to tailor these tasks according to its own characteristics and requirements. This is the information that SCOR model provides for each task defined:

- Standard name of the process/activity/task.
- Notation for the process/activity/task element.
- Supply chain council's standard definition for the process element.
- Performance attributes that are associated with the process element.
- Metrics.
- Best practices.

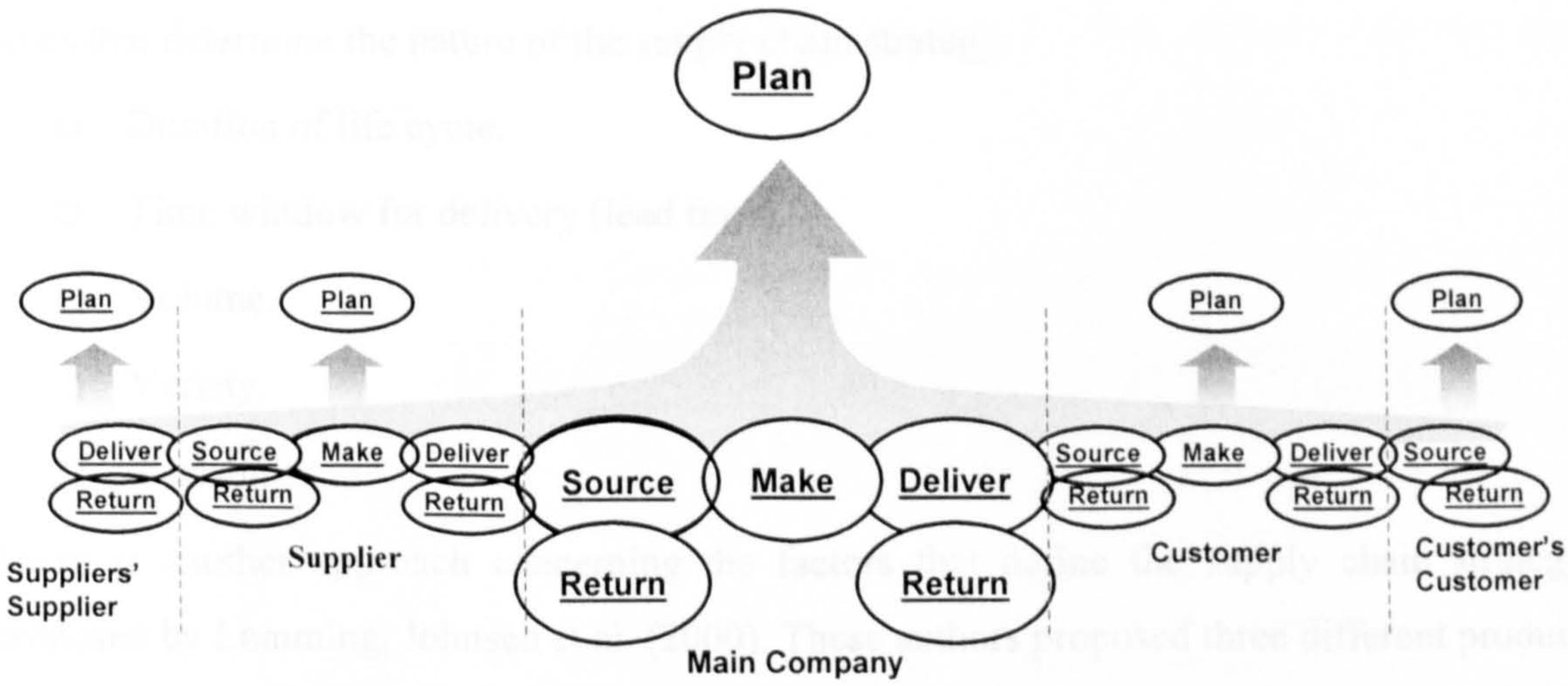

Figure 2.4: The SCOR model along a common supply chain (Supply Chain Council, 2001)

Figure 2.4 shows the configuration of a generic supply chain with the SCOR model. It shows how each single organisation would link its own five processes to the rest of the members of the supply chain.

The SCOR model provides a good approach in the co-ordination level of the actors in the supply chain. It spans all customer interactions (order entry through paid invoice), all physical material transactions (supplier's supplier to customer's customer, including equipment, supplies, spare parts, bulk product, software, and so on) and all market interactions (from the understanding of aggregate demand to the fulfilment of each order) (Supply Chain Council, 2001).

2.1.2.7. Product approach in the supply chain

There are different supply chain strategies available for organisations. One of the most important decision criteria for selecting an appropriate supply chain strategy is the product type of the organisation (Towill, 1997; Fisher, 1997). According to Towill (1997), supply chain must be tailored to meet product characteristics and customer requirements. This section will deal with the influence that product type has over the strategy, configuration and management style of a supply chain.

Customer requirements substantially change depending on the life cycle of the products. As a consequence, supply chain strategies have to be dynamically adapted to increase competitiveness (Towill, 1997; Aitken, Childerhouse et al., 2003). In the real world, there is a wide range of products with an extended spectrum of functional and fashionable characteristics. At a generic level there is no single supply chain strategy that meets the characteristics of all product types (Aitken, Childerhouse et al., 2003).

According to Aitken, Childerhouse et al. (2003) there are five main factors related to product types that determine the nature of the supply chain strategy:

- Duration of life cycle.
- Time window for delivery (lead time).
- Volume.
- Variety.
- Variability.

There is another approach concerning the factors that define the supply chain strategy proposed by Lamming, Johnsen et al. (2000). These authors proposed three different product characteristics as key drivers for the definition of an appropriate strategy: Product innovation, product uniqueness and product complexity.

A more generic classification of products encompasses with both classifications presented above. Many authors distinguish between predictable functional standard products and innovative fashionable customised products (Fisher, 1997; Franks, 2000; Radnor, 1991; Li and O'Brien, 2001). Functional standard products will have long life cycles, relatively short lead-time, high volume and low variety and variability. These products will have low innovative level, uniqueness and complexity. On the other hand, innovative products will normally have short life cycles, long lead-time, low volume, and high variety and variability. According to the criteria proposed by Lamming, Johnsen et al. (2000), innovative products will involve high innovation, uniqueness and also complexity.

Two main supply chain strategies are highlighted to match the characteristics and requirements of these two product types: Lean supply chain and agile supply chain (Fisher, 1997; Franks, 2000; Jagdev and Browne, 1998; Radnor, 1991; Li and O'Brien, 2001; Lamming, 1996; McCullen and Towill, 2001; Christopher, 2000; Christopher and Towill, 2001).

Leanness is defined as the development of a value stream to eliminate all waste including time, and to enable a level schedule. On the other hand, agility means using market knowledge and a virtual corporation to exploit profitable opportunities in a volatile marketplace (Christopher and Towill, 2001). Consequently, lean supply chain is defined by Jagdev and Browne (1998) and Lamming (1996) as the minimisation of the slack in all value (and cost) adding activities across the whole chain within the manufacturing plant, and, indeed, right through the chain of co-operating enterprises. Similarly, agile supply chain is defined as the configuration of flexible operations across the whole chain that allows offering customised products according to the marketplace information.

Table 2.2 shows the main characteristics of each supply chain strategy and also the differences between them.

Table 2.2: Comparison of efficient and agile supply chains (adopted from McCullen and Towill, 2001)

	Efficient Supply Chain	**Agile Supply Chain**
Primary goal	Supply demand at the lowest cost	Respond quickly to demand
Product design strategy	Maximise performance at a minimum product cost	Create *modularity* to allow postponement of product differentiation
Pricing strategy	Lower margins because price is a prime customer driver	Higher margins, as price is not a prime customer driver
Manufacturing strategy	Lower costs through high utilisation	Maintain capacity flexibility to meet unexpected demand
Inventory strategy	Minimise inventory to lower cost	Maintain *buffer inventory* to meet unexpected demand
Lead time strategy	Reduce but not at the expense of costs	Aggressively reduce even if the costs are significant
Supplier strategy	Select based on cost and quality	Select based on speed, flexibility, and quality
Transportation strategy	Greater reliance on low cost modes	Greater reliance on responsive modes

Christopher and Towill (2001) also propose this comparison between both supply chain strategies shown in table 2.3.

Table 2.3: Lean supply vs. agile supply chain comparison (adopted from Christopher and Towill, 2001)

Distinguishing attributes	**Lean Supply**	**Agile Supply**
Typical products	Commodities	Fashion goods
Marketplace demand	Predictable	Volatile
Product variety	Low	High
Product life cycle	Long	Short
Customer drivers	Cost	Availability
Profit margin	Low	High
Dominant costs	Physical costs	Marketability costs
Stockout penalties	Long-term contractual	Immediate and volatile
Purchasing Policy	Buy materials	Assign capacity
Information enrichment	Highly desirable	Obligatory
Forecasting mechanism	Algorithmic	Consultative

A highly efficient supply chain network would exploit economies of scale, JIT purchasing, economic batch sizes, strategic inventories, and so on. These features would be based on a highly predictable demand pattern resulting in a firm manufacturing and distribution schedule. On the other hand, products with unpredictable demand would require a supply chain capable of responding to this demand quickly (Franks, 2000). A similar approach states that manufacturing processes in a lean supply chain would be based on *'make and sell'*. The manufacturer would define the efficient manufacturing parameters, using long production runs, to create an inventory from which wholesalers and retailers could be satisfied. Agile supply chain would be based on *'sense and respond'*, where the manufacturer must have detailed information on current, real demand so that products can be built to order. Figure 2.5 shows the attributes of both lean and agile supply chains for market qualifiers and order winners organisations.

	Market Qualifiers	**Order Winners**
Agile Supply	1. **Quality** 2. **Cost** 3. **Lead Time**	1. **Service Level**
Lean Supply	1. **Quality** 2. **Lead Time** 3. **Service Level**	1. **Cost**

Figure 2.5: Comparison of efficient and agile Supply Chains, market qualifiers/order winners' perspective (adopted from Christopher and Towill, 2001)

As a conclusion, it was stated that lean supply chain would be more suitable when the cost is the main driver. Long product life cycles, high production volume, and low product variety and variability would be best dealt through lean supply chain strategy.

At the other extreme of the range, agile supply chain strategy would be appropriate when the key driver is the service level. Similarly, innovative products with short life cycles, low production batches (or unitary manufacturing), and high reference variety and variability would be suitable characteristics for selecting agile supply chain strategy (Christopher, 2000; Christopher and Towill, 2001; Lamming, Johnsen et al., 2000; Backhouse and Burns, 1999; McCullen and Towill, 2001).

Although these two supply chain strategies are substantially different, there are some techniques to maintain hybrid strategies (Christopher and Towill, 2001). These hybrid strategies are suitable for organisations that offer both types of product. This way, Christopher and Towill propose three methods for implementing hybrid strategies, that is, strategies mixing the characteristics of both lean and agile strategies:

- The Pareto curve approach: It is based on using lean methods for 20% of the products that is generated by 80% of the demand, and the rest of the production is fulfilled through agile methods.
- The 'de-coupling' point approach: The de-coupling point was defined before in this chapter as the point at which the information of real demand penetrates upstream in a supply chain. Christopher and Towill propose to be lean up to de-coupling point and agile beyond it, when real information is available. This strategy is also known as 'postponement' strategy.
- Separation of 'base' and 'surge' demand: There will be a percentage of the demand that is predictable, and the rest will be variable. This method relies on managing the forecastable demand using lean principles, and using agile principles for the less predictable demand (Christopher and Towill, 2001).

2.1.2.8. Future trends in supply chain management

Harland, Lamming et al. (1999) carried out a study to project ahead 20 years into the future and analyse visions of the new scenario of supply chain management, the evolution suffered by this practice and the implications for supply strategy, structures and infrastructures.

Globalisation of the economy was predicted to continue, generating two main features such as knowledge-related barriers to entry and economies of scale. Development of the Internet enabled efficient and effective interaction and data exchange between organisations. Global offerings and even global brands might become less important than meeting local needs with culturally specific goods and services. The size of these global organisations might considerably reduce.

Supply chains might evolve into long-term partnering networks, based on secondary activities sharing while internalising key core-competences. Development of the Internet would allow SMEs participating in these networks: They would pick up available work, add value for a period of time and fee, then leave the network, enabling others to continue.

Organisations would become more dynamic, frequently changing their sets of competencies and knowledge rather than maintaining all over their existence the same functional structures. Senior managers of the organisations would be responsible for facilitating relationships between different stakeholders of the supply chain.

Some supply chains would be very innovative with each member of the chain adding substantial value. The upstream side of the supply chain would provide the technological/innovative advantage based on lean performance, whereas the downstream members would enable the customisation of the products/services through agile performance. Management of this flow of value would need to be flexible and adaptation to both the local and global requirements should be guaranteed.

The challenge for organisations over the next 20 years is to become integrated members of agile and dynamic supply chain networks. To meet this challenge it will be necessary to develop a supply strategy for both the single organisation and the global supply chain. The growth of the strategic alliances and close relationships will continue into this century (Zineldin and Bredenlöw, 2003).

The next section will deal with the theory behind this emerging practice, i.e. collaboration. Different definitions of collaboration will be reviewed, the advantages and pitfalls of this practice, and also some key characteristics.

2.1.3 Collaboration as a bridge for the future

This chapter started presenting the scope of the literature review for the study. Five main areas were presented, two of them for the specific literature review and three for the general literature review for this chapter. The first section has already dealt with one of the three research topics, i.e. supply chain management. This section will cope with the other two research fields, that is, collaboration and extended enterprise.

This section will first present different definitions of collaboration concept and the extended enterprise. Both the advantages and the potential sources for failure of collaboration will be reviewed. Some key characteristics and the importance of this practice for organisations will

also be analysed, and finally, the process of building a collaborative relationship will be briefly described.

2.1.3.1. What is collaboration?

A generic and basic definition of collaboration concept can be found in different dictionaries. This way, Oxford Advanced Gentle Dictionary defines collaboration as *'the act of working with another group of people to create or produce'*.

Similarly, Webster's Encyclopaedic provides another definition when stating that to collaborate means to cooperate together in work and that collaboration is the act or the process of collaborating.

It can be seen that these two references propose wide definitions of collaboration. These same definitions could be used for referring to collaboration between two countries, two aid associations or even two people. However, for the purpose of this study specific definitions of collaboration concerning industrial/service organisations are required.

Moonen, Zwegers et al. (2003) define collaboration as "the process of working together toward a common purpose or goal in which the participants are committed and interdependent, with individual and collective accountability for the results of the collaboration, and each of the participants shares a common benefit".

According to Sriram, Krapfel et al. (1992), collaboration relationship means developing a long-term co-operative effort and common orientation toward meeting their individual and mutual goals. The authors also highlight the interdependence among partners, information sharing and common future planning.

Interdependence feature is also outlined by the definition proposed by Post, Preston et al. (2002). These authors state that interdependence between the stakeholders involved in the collaborative effort gains importance. As a consequence of this mutual dependence, these stakeholders achieve increased reciprocity, efficiency and stability among themselves.

From the 'value' perspective, collaboration is defined as the exchange of some 'value-package' such as products, services, knowledge, mutual goals and trust, from one organisation to another firm that compensates through another 'value-package' such as monetary compensation, long-term relationship and share of business (Lemke, Goffin et al., 2003). Hence, these authors highlight the flow of value between partners as a basis for collaboration.

Finally, Cagliano et al. (2002) in Coughlan, Coghlan et al. (2003) describe inter-firm collaboration as a purposeful inter-company interactive process that focuses on continuous incremental innovation.

Analysing the definitions of collaboration presented above, some conclusions can be extracted concerning the key ingredients of collaboration practice. Interdependence and working together is basically the main requirement for collaborating. There has to be an exchange of value based on trust, commitment and mutual benefit/risk. According to the authors reviewed, collaboration is usually a long-term win-to-win relationship.

Varadajaran and Rajaratnam (1996) in Zineldin and Bredenlöw (2003) state that many inter-organisational structures and agreements have collaboration concept as the basis for their development. This way, business structures such as extended enterprise, virtual enterprises, joint ventures and partnering need collaboration between their members in order to maintain a healthy agreement.

An extended enterprise is often considered by many researchers as the most collaborative inter-organisational structure. It is an emergent business agreement developed in the mid-90s by Chrysler Corporation where it was used to shape information exchange and cost reduction practices within the supply chain (Post, Preston et al., 2002). Many different meanings and definitions have been associated to the extended enterprise concept by researchers and practitioners since then.

Bititci et al. (2004) defined the extended enterprise as 'a knowledge-based organisation that uses the distributed capabilities, competencies and intellectual strengths of its members to gain competitive advantage to maximise the performance of the overall extended enterprise'. This definition was also supported by O'Neill and Sackett (1994) and Childe (1998), amongst others. The concept of extended enterprise arises from the needs of organisations situated at dispersed locations to arrange formal relationships to achieve a competitive advantage (Jagdev and Browne, 1998). One of the aims of this practice is to embrace external resources and services without owning them. The extended enterprise extends beyond the limits of a single organisation to deal with the whole product life cycle, from product development to recycling activities (Jagdev and Browne, 1998).

Szegheo and Petersen (2000) also described the extended enterprise as a source for achieving competitive advantages by forming formal linkages and maintaining distributed co-operation throughout the network. These authors highlighted the concept of core competence and secondary activities: The collaborating enterprises are encouraged to focus on activities in

which they have special competence. Szegheo and Petersen (2000) also referred to ICT use within the extended enterprise as a recommended decision.

The rest of the business structures mentioned above that rely on collaboration differs in some characteristics from these definitions of extended enterprise. A virtual enterprise varies from an extended enterprise in the length of time that it is operating. Thus, it may be set up with the objective of making one particular project and then dissolve (Martinez, Fouletier et al., 2001; Browne and Zhang, 1999).

According to the definitions of partnering provided by Lemke, Goffin et al. (2003) and Lamming, Johnsen et al. (2000), this practice differs from an extended enterprise in the degree of integration of the members of the agreement. On the other hand, a joint venture is defined by the United Nations as:

> *"The joining of forces between two or more enterprises, of the same or different countries, for the purposes of carrying out a specific operation (industrial or commercial, investment, production or trade). This includes consortia, export consortia, export marketing groups, joint export marketing groups".*

Normally a joint venture requires developing a new organisation or business unit by the enterprises involved in the joint venture.

These are some of the multinational organisations that have developed collaborative relationships (Manders and Brenner, 1995):

In aero-engines,

- General Electric and Rolls Royce,
- Pratt and Whitney-Kawasaki-Rolls Royce.

In motor vehicles (components and assembly),

- GM and Toyota,
- Chrysler and Mitsubishi,
- Volkswagen and Nissan,
- Volvo and Renault,
- Rover and Honda.

In consumer electronics,

- Matsushita and Kodak,
- JVC, Telefunken and Thorn,
- Philips and Sony.

In computers,

- Hitachi and Hewlett-Packard,
- Fujitsu, Amdahl, Siemens and ICL,
- IBM and Matsushita.

Next section will deal with the advantages of collaborating between organisations.

2.1.3.2. Advantages of collaboration practice

Many advantages are believed to gain through collaboration practice. The deeper the collaboration, the more relevant the profits achieved through the relationship. These are the most important advantages highlighted by the main authors of this research field:

- *Achieve best practice and quality standards* (Manders and Brenner, 1995; Jagdev and Browne, 1998): Collaboration allows single organisations achieving highly efficient and effective operations through the optimisation of the value chain. This way, core-competences are internalised while the rest of activities are outsourced to other members, which have expertise on these activities.
- *Cut lead times and increase flexibility in market response* (Jagdev and Browne, 1998; Parker, 2000; Jayaram, Vickery et al., 1999; Martinez, Fouletier et al., 2001): Sharing key information enables the collaborative members to improve productivity and working together. Sharing the same goal and orientating performance to the same customer reduces lead times and makes possible to response more agile to new customer requirements.
- *Plan more effectively through long-term information sharing* (Jagdev and Browne, 1998): Information sharing also allows all the members planning more accurately, avoiding the above explaining bullwhip effect.
- *Reduce time-to-market* (Huxham, 1996; Jagdev and Browne, 1998; Parker, 2000; Jayaram, Vickery et al., 1999): Concurrent engineering is one of the substantial advantages of collaboration within the value chain. Developing together new products reduces considerably the time required to commercialise them, moreover, quality is increased and costs are reduced.
- *Increase innovation capability* (Huxham, 1996): Concurrent engineering increases innovation capability as well. As each member dedicates all the efforts to its core-competences, innovation capability for this process/activity will be concentrated on it, resulting in a higher capability.

- *Access to a wide range of specialised resources* (Huxham, 1996; O'Neill and Sackett, 1994; Browne and Zhang, 1999; Martinez, Fouletier et al., 2001; Harland, Lamming et al., 1999): Rather than externally obtaining specialised resources, collaboration between organisations allows sharing all type of resources (e.g. special machinery, HHRR, knowledge, and so on) among the members. It reduces the costs and synergies are found between collaborating companies.
- *Minimise risk associated to new investments* (Huxham, 1996; Manders and Brenner, 1995; O'Neill and Sackett, 1994): Rather than accomplishing highly innovative and risky projects alone, collaboration enables organisations sharing risks and investments to carry them out. Profits gained through these projects will be equitably shared among collaborating companies.
- *Exploitation of economies of scale* (Manders and Brenner, 1995; Harland, Lamming et al., 1999; Browne and Zhang, 1999; Martinez, Fouletier et al., 2001): Competition is held between collaborating value chains rather than single organisations. Each member gains negotiating power and purchasing activity can be jointly carried out by all the nodes, improving substantially procurement costs.

2.1.3.3. Potential sources for failure

Much effort has been dedicated to analysing why so many relationships based on collaboration fail. According to Lambert and Knemeyer (2004), alliances often fail because they should not have existed in the first place. These are some of the main pitfalls that allied organisations find in their collaborating journey:

- *Misalignment between collaborating organisations* (Bruner and Spekman, 1998): Collaboration requires objective sharing between the organisations involved in the alliance. Lack of agreed objectives and strategy will lead the alliance to fail. All the members should focus on the same vision.
- *High performance dependency* (Bruner and Spekman, 1998; Drago, 1997; Parker, 2000): Collaborating organisations will not be independent any more, they will depend on the rest of the members of the alliance. This way, local flexibility will be reduced, as decisions will be made jointly.

Privacy will also be lost. As a consequence, confidential information might be shared and specific know-how transmitted to all the members. There is often a leakage of organisations' skills, experience and knowledge.

- *Lack of leadership, difficult to manage* (Bruner and Spekman, 1998; Martinez, Fouletier et al., 2001; Drago, 1997; Parker, 2000): The skills required for effective collaboration management include listening and responding, negotiating, environmental scanning, issue forecasting, and measuring and reporting on both issues and impacts; all within an atmosphere of openness and transparency. It is usually very difficult to manage due to the complexity of co-ordinating several organisations. Managing collaboration also requires aligning organisations toward the same objectives and sharing the profits equitably.
- *Cultural differences among partners* (Bruner and Spekman, 1998; Drago, 1997): Globalisation of markets has lead organisations to search for alliances and partnerships all over the world. It is common for organisations from different cultures to build together a collaborative relationship. This cultural difference usually generates misunderstandings and disparity of habits and traditions among the members in the relationship, which leads collaboration to fail.
- *Large resources required for building collaboration* (Bruner and Spekman, 1998; Martinez, Fouletier et al., 2001; Spekman, Isabella et al., 1996; Drago, 1997; Parker, 2000): Close relationships based on collaboration required large amounts of resources, such as human resources in charge of the alliance, time and ICT equipment for linking organisations. According to Bruner and Spekman (1998) collaboration often requires three to four years before the alliance is settled.

2.1.3.4. General characteristics of collaboration

Collaboration relationship has some typical characteristics essential for the survival of the alliance. The quality of the collaboration will directly depend on the implementation level of this set of characteristics.

Co-operation between partners is highlighted as a key feature for collaboration by Fontenot and Wilson (1997). Co-operation allows each partner to have individual and common goals, and a certain degree of autonomy is given up in favour of a mutual success. Rather than local approach, organisations will aim at maximising global performance.

Related to this co-operation concept, Kanter (1994), Fontenot and Wilson (1997) and Zineldin and Bredenlöw (2003) propose *interdependence* as another characteristic of collaboration. This characteristic represents a company's acceptance to be part of a mutually beneficial exchange relationship. As a consequence, decisions will be jointly made and performance will also be commonly planned.

It could be stated that *trust* might be the most essential characteristic of a collaborative relationship (Fontenot and Wilson, 1997; Kanter, 1994; Browne and Zhang, 1999; Levy, Bessant et al., 1995; Barratt, 2004). The outcome of trust is a firm's belief that their counterpart in the relationship will perform actions resulting in positive outcomes. Trust will be essential for information, system and benefit/risk sharing.

Commitment is also very important and it is built from trust (Barratt, 2004; Fontenot and Wilson, 1997; Harland, Zheng et al., 2004). Long-term agreements will be possible depending on the commitment among collaborating organisations. This commitment will especially be important from the top management of the partnership.

Related to trust and commitment, *communication* between collaborating organisations plays an important role. *Information exchange* through ICT systems provides collaboration many advantages such as lead-time reduction, bullwhip effect mitigation and time-to-market reduction. The better the communication systems between collaborating organisations, the more effective collaboration relationships will be (Fontenot and Wilson, 1997; Kanter, 1994; Barratt, 2004; Szegheo and Petersen, 2000; Browne and Zhang, 1999).

Conflict is inevitable in most relationships. Therefore, procedures for *conflict resolution* will help addressing potential problems and misunderstandings (Harland, Zheng et al., 2004). According to Fontenot and Wilson (1997), self-regulation has been found to be key in many successful alliances.

Shared values are defined as the extent to which partners have common beliefs as to the importance and appropriateness of certain behaviours, goals, and policies (Fontenot and Wilson, 1997; Szegheo and Petersen, 2000). Alignment of the collaborating organisations facilitates sharing similar values that will allow organisations to culturally integrate, avoiding any initial conflict.

There should be an outcome generated by the collaboration relationship for all the members involved in this relationship. For a healthy collaboration there should be an explicit *profit-sharing arrangement* between organisations. This arrangement should depend on the *contribution* made by each member and also the *investment* and *risk* played by these organisations (Fontenot and Wilson, 1997; Busby and Fan, 1993). According to Harland, Zheng et al. (2004), reaching a fair and balanced division of both risk and benefits derived from joint effort will be highly important. There must be a *win-win* relationship for a successful collaboration.

Table 2.5 shows the differences between the characteristics of a typical organisation and a partner of a collaborative relationship. Although collaboration requires focusing globally rather than on a local basis, organisations have to adapt their internal structure in order to successfully meet the features of collaboration.

Table 2.5: Differences between the characteristics of typical and collaborative organisations (adopted from Harland, Lamming et al., 1999)

Dimension	Typical organisation	Collaborative organisation
Critical tasks	Physical	Mental
Relationships	Hierarchical	Peer-to-peer
Levels	Many	Few
Structures	Functional	Multi-disciplinary teams
Boundaries	Fixed	Permeable
Competitive thrust	Vertical integration	Outsourcing and alliances
Management style	Autocratic	Participative
Culture	Compliance and tradition	Commitment and results
People	Homogeneous	Diverse
Strategic focus	Efficiency	Innovation

It is often enquired by researchers and practitioners whether a traditional organisation that did not adopt any characteristic shown on the right column of table 2.5 could develop a collaborative relationship or not. According to some researchers the answer probably would be positive. However, they make emphasis on the lack of effectiveness that this external relationship would have. In other words, one might collaborate externally with another organisation but probably the former could not take all the advantages and benefits out of the relationship due to the lack of internal preparation. Authors such as Bititci et al. (2005) propose a collaboration readiness self-assessment tool for analysing whether an organisation is ready for collaboration or not. These authors recommend that any organisation should first internally evolve in order to deal with an external relationship based on collaboration.

2.1.4 Findings and problem definition

The general literature review carried out in this study presented the current practice of supply chain management, its historical evolution and also one of its future trends, i.e. collaboration. Different relationships based on collaboration were defined, such as the extended enterprise, the virtual enterprise or a joint venture. However, several problems and gaps in knowledge were stated after analysing the work of different authors.

According to Spina and Zotteri (2001) contingencies around customer-supplier partnerships are not fully investigated. These authors also state that the domain of applicability of such

practices is not clearly defined. Lemke, Goffin et al. (2003) highlight that the concept of partnership is poorly understood. As a consequence, it can be concluded that the nature and configuration of close relationships require further investigation.

Spekman, Kamauff et al. (1998) state that organisations have not yet fully operationalised the concept of supply chain management. The authors say that supply chain management practice is only well understood at a theoretical and strategic level, but not at the operational stage. There is a missing link between the strategic and operational implications of supply chain management.

Similarly, Lamming, Johnsen et al. (2000) highlight that current relationship classifications offer limited operational assistance for companies trying to manage their supply chains effectively. This operationalisation problem of the supply chain and its relationships was also noticed by Lemke, Goffin et al. (2003). These statements lead the author to deduce that current relationship classifications might not be offering an accurate operational guidance to both researchers and specifically to practitioners.

Related to this problem, Cox (1999) states that there is no optimum procedure to manage a supply chain. The author proposes that the success of any supply chain relies on recognising the types of supply chains that exist, aligning strategy and operational practice with the specific properties of the supply chain that the company is positioned within.

van der Vorst and Beulens (2002) present two key reflections based on the operational perspective of the relationships within the supply chain. Firstly, these authors state that there is a gap in knowledge concerning how organisations should decide which business process to link with other entities. Associated to this gap, van der Vorst and Beulens (2002) also say that there should be some decision criteria for assessing how to develop this linkage.

According to Spina and Zotteri (2001), any further research in the supply chain management area would require a clear distinction between the 'levels of collaboration' between the members of the supply chain. This way it leads the author to think that there is a substantial gap about relationship levels, i.e. collaboration levels, within any supply chain. This deduction is strengthen by Fontenot and Wilson (1997) when they highlight that future research should explore constructs of relationships closer to collaboration.

Another important finding of this general literature review was that there was not only a gap in knowledge concerning the relationship levels within a supply chain, but there was no procedure for selecting the relationship level that any organisation should select. This conclusion was stated by several authors.

Lamming, Johnsen et al. (2000) highlight that there is little guidance for organisations addressing specific supply chain-related problems such as choosing the type of supply network appropriate for particular circumstances.

According to Barratt (2004) a supply chain should be designed to meet the specific requirements of the various supplier/customer segments. The author proposes that one supply chain design could be optimum for a more arms's-length approach (i.e. no formal relationship), whereas another could be most appropriate for a collaborative approach. This statement leads the author to deduce that the relationship will vary according to the characteristics of the suppliers and customers.

This deduction is supported by Spekman, Kamauff et al. (1999). These authors say that not all suppliers are treated equally as some relationships are best managed through an 'open-market' exchange, while others require collaboration and networking. Other authors such as Lambert and Knemeyer (2004) and Horwath (2001) also support the idea that every scenario needs a different relationship level.

Lambert and Knemeyer (2004) and Barratt (2004) pose an interesting question about whether every organisation can and has to collaborate or not. They both provide a negative answer to this enquiry; however, further research might be necessary to confirm this assumption.

A negative answer to this question would open a new gate for further research (Porter, 1985). Porter mentions that it would be worth attempting to identify some of the most important factors that determine whether collaboration is a right choice or not under certain circumstances.

These problems were considered for the definition of the research questions of this study. The author decided to carry out an empirical study in order to contrast these findings with real data gathered from a set of organisations. It was considered that this empirical study would be highly valuable for the definition of the research questions, as it would strengthen the conclusions extracted from the literature review with practical data. As a consequence, research questions would be both theoretically and practically supported.

This empirical study also aimed to support another assumption stated by some authors. Most of the researchers reviewed during this pre-understanding stage talked about collaboration as a mutual relationship between two or more organisations. However, most of the they did not specify how this relationship takes place, that is, the relationship is only held between managers, it is between functional departments or the whole organisation is collaborating. Based on the research by van der Vorst and Beulens (2002) and Bititci et al. (2004), the

author hypothesises that any relationship, also collaboration, is carried out at a business process level. This way, this empirical study will also try to clear whether organisational relationships are held at a business process level or not.

2.2 Empirical study

Most authors consider that relationship between companies is developed at an organisational level, i.e., between companies. However, from an operational perspective it is not clear enough how these relationships are held.

One case study carried out by Bititci et al. (2004) stated that collaboration takes place at a business process level. This study was developed in a clothing company that had two main business units and was part of an extended enterprise.

After carrying out some semi-structured interviews and workshops with different managers, one of the conclusions obtained was that operating processes were extended across the enterprises within the extended enterprise. As a result, the relationship between the companies took place at a process level of each business unit, and not at the organisational level.

Despite this finding, the research team stated that their research had one main limitation: The evidence presented was based on a single case and further cases needed to be studied to confirm the findings achieved during the research

An empirical study presented below was designed and developed in order to ascertain the latter conclusion.

2.2.1 Fieldwork

Studies were conducted in top ten companies of the Basque Country, a region in the north of Spain. The Basque Country is characterised by its wide spread industrial roots, achieving highest economic ratios in Spain and with a GDP per capita similar to UK and Singapore (Porter, 2002). The companies represented different industrial sectors, such as automotive, household goods, steel making, machine tools, construction and distribution, thus improving the reliability and generalisability of the conclusions.

Using a questionnaire managers at each company were interviewed on the nature of the collaboration their companies were involved in. This included discussions on nature and the level of inter-company integration as well as discussions on the nature of business processes between their organisation and their collaborators. These were other additional objectives of this field study:

- ❑ To gain a better knowledge of collaboration practices.
- ❑ To compare the findings from the literature and the characteristics of industrial cases.
- ❑ To gain the experiences of practitioners of the field.
- ❑ To analyse the impact and importance of the gap in knowledge found in the literature.
- ❑ To assess the validity of the research problems stated in the general literature review and if necessary, redefine them.

As business processes were going to be analysed, a total of 7 generic processes were initially defined (Lopez, Bititci et al., 2004):

- ✓ Logistics
- ✓ Quality assurance
- ✓ IT Services
- ✓ Product Development
- ✓ Product Support
- ✓ Meta-managing process
- ✓ Strategic-decisions taking process

It can be argued whether this list of processes is representative for all the organisations or not. However, the objective of this empirical study was not to assess how the organisations perform in detail each of these processes, but to state that organisations had different collaboration strategies for each process.

For this purpose, two main data requirements were identified:

- ❑ The external integration level that the company interviewed has within its environment for each process.
- ❑ The efforts that the company is planning to do strategically to improve the external integration level in medium/long term.

The first question is oriented to evaluate whether there is any chance to achieve a certain relationship between companies of the value chain in each process, and the success achieved developing it at the present time.

The second question is focused on the medium to long-term timescale; it evaluates the perception of the company about the possibility of improvement of the integration levels of the processes. In the same way, it focuses on whether the organisation is going to make any effort to achieve this improvement or not.

After defining the questions, a standard system of punctuation was designed, basically in order to be able the researcher to compare objectively all the results of the different interviews

Ten companies were selected randomly for carrying out this study. All these companies perform in highly competitive sectors such as automotive or household goods markets. The main characteristics of the organisations are summarised in table 2.6.

Table 2.6: Characteristics of the organisations

Organisation		Sector	Product	Position in Value Chain
A	*Recyde*	Automotive/Household goods	Bar work on multi-spindle lathes	1st Tier
B	*ULMA Packaging*	Packaging Machinery	Packaging Machinery	OEM
C	*Danobat*	Machine Tools	Lathes, Saws, Grinding Machines.	OEM
D	*Maier*	Automotive, Household goods & Consumer Electronics	Injected plastic parts	1st Tier
E	*URSSA*	Steel Construction	Public Construction	OEM
F	*Metagra*	Automotive	Special cold stamped screws	2nd-3rd Tier
G	*ULMA Forging*	Oil and Energy sector	Flanges and fittings	OEM
H	*Fagor Electrodomesticos*	Household goods	Fridges, washing-machines, ovens, etc.	OEM
I	*Exel*	Transportation and integral logistics	Logistic services	1st Tier
J	*Marcial Ucin*	Steel	Steel profiles	OEM

2.2.2 Results of the empirical study

All the data obtained from the interviews was processed and analysed. Different charts were built with this data, and the two most relevant (figures 2 and 3) are presented here.

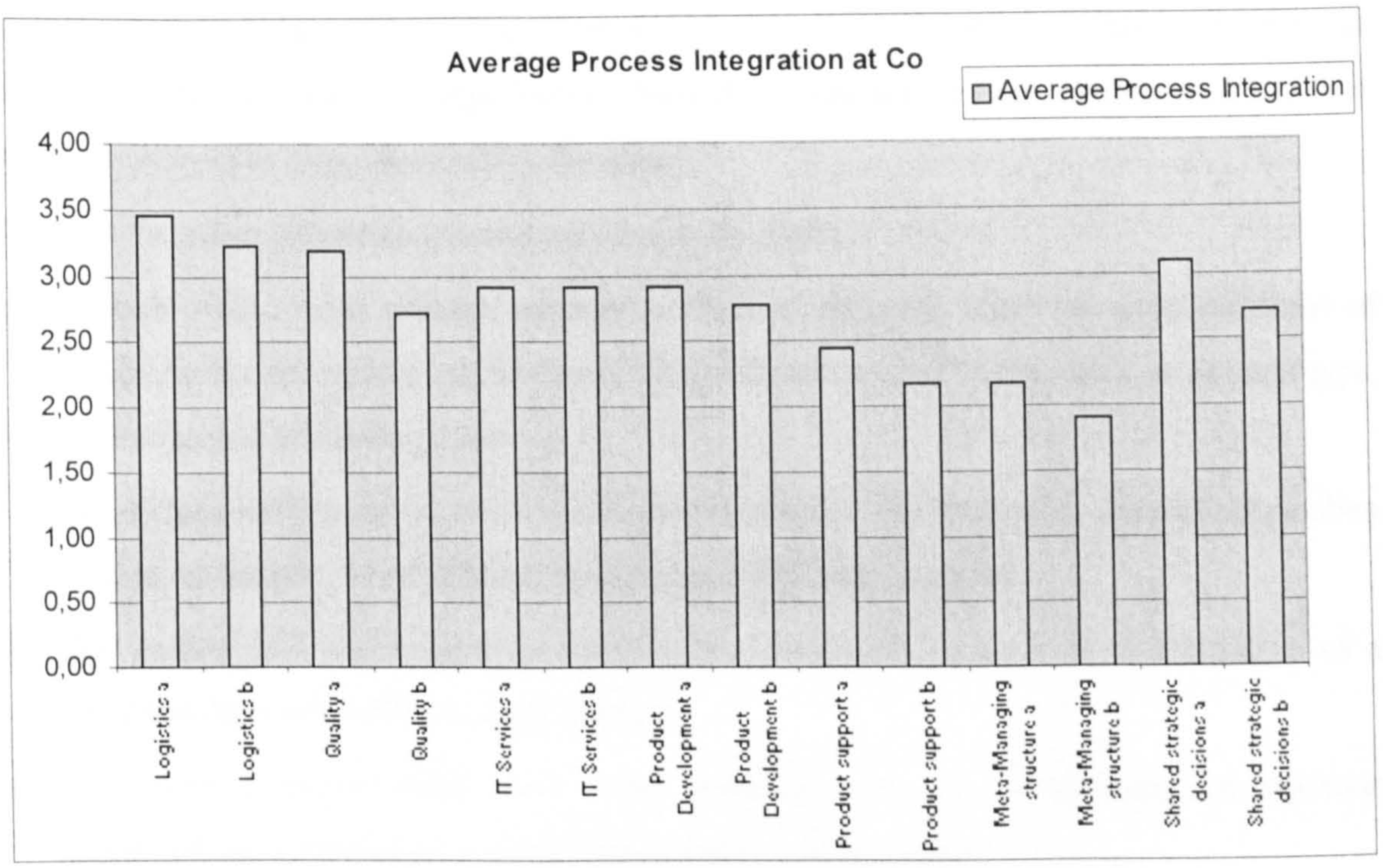

Figure 2.7: Average integration of the processes of all the companies

In figure 2.7 the average integration level of the processes defined is presented; the scored achieved by each process in all the companies is considered and the average value is depicted. A scale from 1 to 4 is used to assess the integration level (1= Low, 4= High). At the same time, both (a) the current integration level and (b) the effort planned to dedicate improving this relationship are presented in the chart.

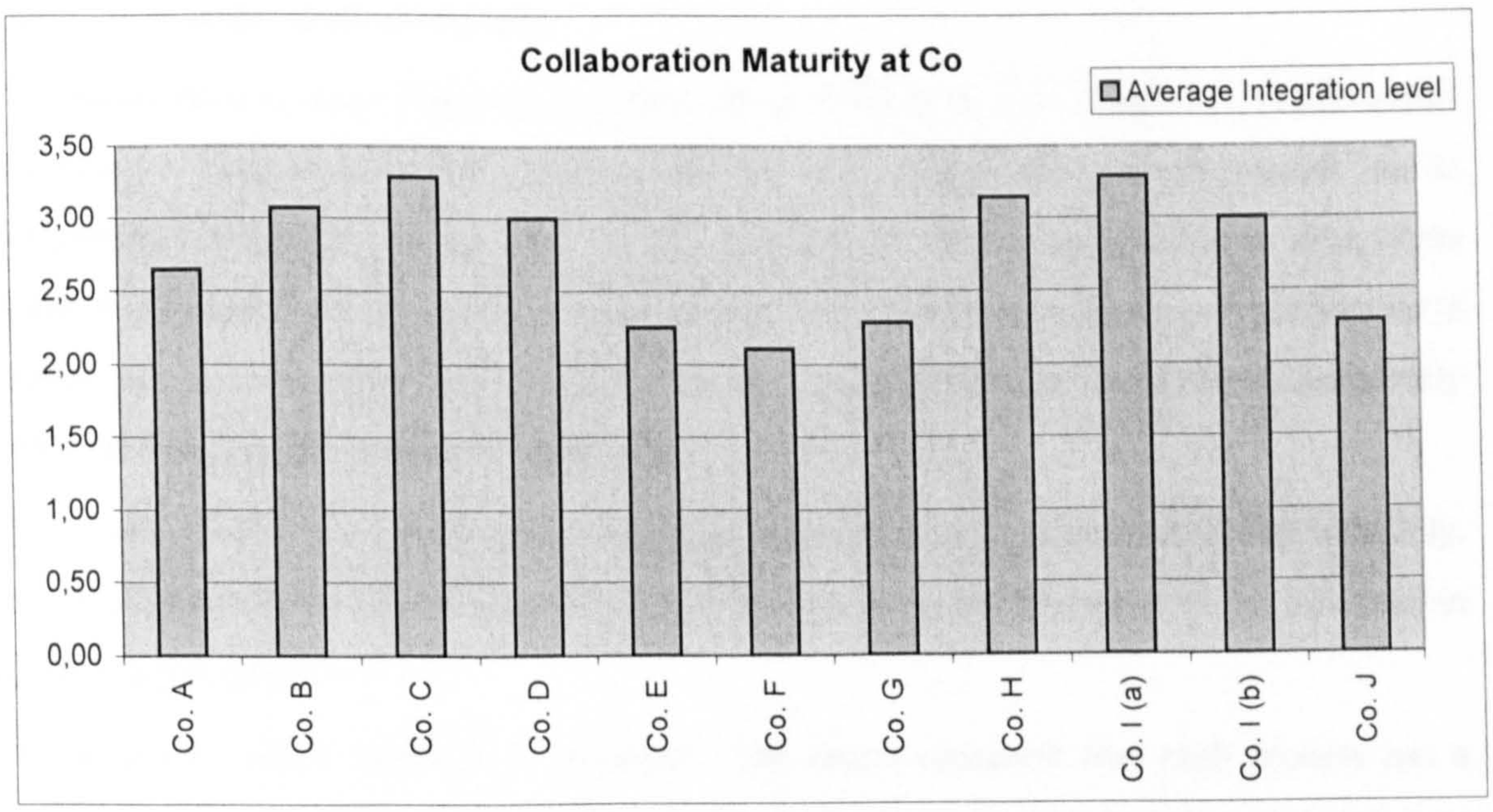

Figure 2.8: Collaboration Maturity profile of the organisations

Figure 2.8 shows the average integration-practice of each organisation, that is, the average score of all the processes by organisation. Note that there are two sets of data for Co. I (a & b) as two managers were involved in the study.

These is the main information extracted from both charts:

- In each study, each process appears to have a different level (or sophistication) of collaboration depending on the nature of collaboration and factors such as product type, market/sector, technology, etc.
- The average collaboration level is different from one organisation to another, depending on critical factors. These critical factors require further research.
- The profile (i.e. the integration level of the processes studied) of collaboration of a company does not follow a single pattern.
- The most common trend with these companies is the maintenance of rigorous collaboration with respect to their supply chain requirements.
- Companies find it very difficult to operate a common meta-management structure.
- Sharing of strategic decisions with customers and suppliers seems to be a common practice among all the companies studied but co-ordination is deficient because of the latter statement.

According to figure 2.8, automotive and household appliances sectors demonstrate the most demanding requirements with respect to collaboration practices.

2.2.3 Discussion and conclusions

The results seem to show that each company has developed its own integration requirements according to some factors that influence the nature of collaboration. Each process has its independent integration level, and all the companies have their particular integration maturity. From this statement it can be concluded that collaboration between organisations is carried out at a business process level, being this collaboration requirement completely different from one company to another one.

The values given by the managers during the interviews have to be understood relatively, that is, the perception of integration value-difference between processes is the information desired in this study.

At this point, further research is proposed: The charts represent that each process has a certain integration level. On the other hand, each company has its own integration or

collaboration profile. Thus, it is not clear why each company has different collaboration needs.

The possible answer to these questions is that there have to be some critical factors common to all organisations that determine all the relationships of a company within its environment. This deduction was also stated by Porter (1985) as it was presented in the findings and problems identified in the general literature review. It might be that depending on the product type of one organisation (standard, modular, customised) it should collaborate in its product development process with its customers and suppliers, whereas it might require to establish a co-ordination relationship with other suppliers in order fulfilment process.

As stated in the results of the empirical study, collaboration profile was changeable depending on the sector where the organisation under study was performing. Automotive or household goods sector might require closer relationships within customer/supplier than other sectors less exigent. So, sector type could be another Critical Factor that impacts over the collaboration requirements.

It is suggested that more research is needed to identify and study the impact of these Critical Factors (e.g. Product type) over the relationships of organisations. It is believed that having under control these factors it could be possible to improve relationships within organisations. According to Barratt (2004), some relationships may be more desirable in some cases. An arm's-length purely cost based type of relationship might be more suitable under some circumstances as collaboration would not create any obvious benefit. After identifying the characteristics of the Critical Factors of a company it might be viable to design a portfolio of desirable relationships within its environment in all its processes, and thus, achieve efficiency and competitiveness in the links of this company with its customers, suppliers and so on.

Both the general literature review and the empirical study provided a detailed sight of the state of the art of supply chain management and collaboration research fields. Complementary findings of these two stages allowed the author to state some gaps in knowledge and define a set of research questions for this study. The objective of the following section will be to define these research questions and to assess whether they are valid for this study or not.

2.3 Research questions of the study

The findings of the literature review showed that there was a lack of understanding concerning the differences between potential organisational relationships. Authors such as Spina and Zotteri (2001) and Fontenot and Wilson (1997) highlighted that further researcher should be carried out to clear the concept of 'levels of collaboration'. The empirical study also supported this recommendation. The organisations interviewed did not understand accurately the different relationship levels that they were holding with other companies. This feature justifies the decision of the author to assess the integration level (i.e. relationship type) of the firms through a 'Likert scale' (scoring system from '1' to '4'), rather than using other more theoretical concepts.

As a conclusion, both the literature review and the empirical study stated that there is a gap in knowledge concerning the different collaboration levels between organisations. As a result the following is the first research question of this study:

R.Q.1 – What are the levels of collaboration?

This first research question gave birth to the second research question. Once that a classification of organisational relationships was proposed, it would be necessary to investigate the implications of each of these levels. In other words, it would be necessary to identify the characteristics of each relationship type in order to settle boundaries between the different collaboration levels. This way, researchers and practitioners would increase their understanding about the properties of each collaboration level. Also the first steps toward operationalisation of the supply chain management and collaboration concepts would be made (Spekman, Kamauff et al., 1998; Lamming, Johnsen et al., 2000; Lemke, Goffin et al., 2003).

The empirical study also showed that managers were not able to distinguish between different relationship types because they did not know which were the implications and properties of each type. Thus, the theory reviewed and the findings of the empirical study lead the author to define the second research question as follows:

R.Q.2 – What are the characteristics of each level?

The interviews carried out during the empirical study highlighted that the need for collaboration in each of the organisations was different. This way, some of the companies had implemented close relationship with some of the suppliers, whereas other firms had not done the same. As a conclusion, it was stated that collaboration requirement differs from firm to firm, and also from business process to business process. The third research questions aims to investigate the factors that determine the relationship levels of any organisation. The

literature review also showed that it would be worth attempting to identify some of the most relevant factors that define whether collaboration is a right choice or not under some certain circumstances (Porter, 1985). Hence, the third research question supported by both the empirical study and the literature review will be:

R.Q.3 – What are the critical factors of a company that determine its collaborative profile?

Authors such as Lamming, Johnsen et al. (2000) stated that there is little guidance for organisations addressing specific supply chain-related problems such as choosing the type of supply network appropriate for particular circumstances. In other words, there is not any procedure for selecting the desirable relationship level for each organisation according to its characteristics.

The previous research questions would provide a portfolio of collaboration levels, their characteristics and the critical factors of an organisation that influence the relationships. Thus, combining this information provided by these questions, the fourth research question aims to assess whether it would be possible to develop a construct that would define the desirable relationship levels for organisations depending on their critical factors. If the answer would be positive, the objective of this research question would be to develop this construct. This is the fourth research question defined for this study:

R.Q.4 - Can we create a standard profile that corresponds to a desirable collaborating footprint?

Related to both this research question and the statement made by Lamming, Johnsen et al. (2000), it was considered that a change-agenda for organisations to migrate from their current relationships to the desirable proposed by the fourth research question would be necessary. To this end, this change-agenda proposed by the fifth research question would define the operational steps required. Finally, another gap in knowledge was detected concerning the impact that this migration would generate on the performance of organisations. The last research question would aim to assess the impact of the change-agenda on the organisation.

These are the fifth and the sixth research questions proposed for this research question:

R.Q.5 - Can we create a change-agenda for organisations to migrate from one relationship to the desirable?

R.Q.6 – How does the change-agenda impact on the performance of the company?

A total of six research questions were defined for this study supported by both theory and practice. However, according to the criteria defined by Stake (1995) to assess the validity and viability of research questions, it was noticed that the last two research questions did not meet the characteristics defined by the author.

One of Stake's criteria pointed that valid research questions should be accomplished in a logical and relatively affordable period of time. As this research is carried out towards the degree of PhD, it was deduced that it would not be viable to analyse the impact of a change-agenda on a firm due to the extend period of time that any organisation would require to move from a current relationship to the desirable one.

Same way, another criterion defined by Stake (1995) was focused on the resources required by research questions. Resources necessary to answer these research questions would be considerably, as accessibility to different migrating organisations during a long period would be required.

As a conclusion, these are the final research questions that meets the characteristics defined by Stake (1995) and selected for this study:

R.Q.1 – What are the levels of collaboration?

R.Q.2 – What are the characteristics of each level?

R.Q.3 – What are the critical factors of a company that determine its collaborative profile?

R.Q.4 - Can we create a standard profile that corresponds to a desirable collaborating footprint?

It is important to highlight that even though two of the research questions are not selected, they are still completely valid for future research studies. The definition of these two research questions is *per se* a contribution of this thesis.

2.4 Conclusions of the chapter

This chapter has dealt with the review of the research fields defined in the 'scope of the research' of this study. Thus, supply chain management and collaboration areas has been analysed. To this end, issues such as the definitions, advantages, pitfalls and characteristics of both fields have been described. The historical evolution of supply chain management was also presented, starting from the origins to the future trends of this practice, that is,

collaboration. The general literature review ended presenting a set of findings and problems identified.

This chapter has also coped with an empirical study carried out in 10 organisations. A semi-structured interview was held to collect data that supported all the findings and conclusions extracted from the literature review. This empirical study was also highly valuable to state that collaboration between organisations is held at a business process level.

The conclusions achieved from both stages, i.e. literature review and empirical study, played a key role during the definition of the research questions. A set of six research questions were defined and supported by these two sources. However, according to the research question validity criteria proposed by Stake (1995), four of these six research questions were only selected for this study.

This chapter ended presenting the list of four research questions that this study will aim to address.

Next section will cope with the research paradigms, philosophies and strategies appropriate for addressing the research questions defined in this chapter. The research methodology will present the basis for the definition of the specific research design that will aim to provide an accurate answer to this research.

3. RESEARCH METHODOLOGY

The following chapter deals with the methods, techniques and instruments that make every research reliable and feasible: Research methodology. It plays an essential role also in this research as key decisions are made during research methodology definition for achieving research quality and accuracy.

The research questions defined in the previous chapter were considered to be the core of this (and every) research. The objective of all research processes should be to find an answer to questions. This way, once the research questions have been stated and validated, the aim of this study will be to address a possible answer to the research questions through an accurate research process. However, how can the researcher ensure that the right research process will be carried out? The answer is defining an appropriate research methodology.

There is much knowledge generated around research methodology. Many authors have coped with different research streams for the last decades, generating lots of possible approaches to be adopted in a research project. The primary objective of this chapter is to analyse these research methodology approaches, and to demonstrate that a suitable research methodology was used to deal with the objectives and research questions of this study.

Firstly, this chapter will start clarifying the concepts of research and methodology. It will present the definitions of different authors and some common generic steps for a research process identified by them. Other important concepts that will be continuously used along this entire chapter will be presented. The objective of this first part is to make clear the complex vocabulary and terminology of the research methodology.

Secondly, the implications and requirements of management research will be presented. There are several potential research fields and each of them has its particular features. As this study tackles managerial issues, it will be necessary to analyse the main characteristics

of this particular research field. These features and requirements will be considered in the definition of the research methodology.

In the third section, this chapter describes the content of this study. To this end, the research objectives and the related research questions are analysed. This section aims to identify the boundaries of this research and also to highlight the nature of the research problems that the research methodology will have to tackle.

The fourth section will deal with different research philosophical paradigms that can be associated to scientific research. A brief description of each paradigm and the research strategies related to them will lead this chapter to present and discuss the specific paradigm and strategy adopted for this study.

3.1 What is understood by 'research' 'methodology'?

The aim of this section is to clarify all the terminology that surrounds the research methodology issue. To this end, the research and research methodology concepts are defined, and also some other essential concepts that will be useful for a better understanding of this particular chapter and for all the study.

3.1.1 Concept of 'Research'

The word 'research' is one of the most commonly used concepts between practitioners and academics. However, is it always used with the right meaning?

Ghauri and Gronhaug (2002:8) describe research as the systematic process to critically analyse issues/facts before believing in them or making any decision upon them. These authors highlight the importance of gathering information and analysing it to make a judgement about the nature of the solution of the problem or question defined initially.

Additionally, doing research requires other specific implications to fulfil according to Clough et al. (2002):

- It has to find out some inter-linked **methods** for
- the generation of **knowledge** to
  - ✓ solve a problem,
  - ✓ answer a question, or
  - ✓ better describe or understand something;
- all this with varying levels of **generalisability, complexity** and **detail.**

Without research it would not be possible to find an appropriate answer to any question or problem in life. Even more, it would not be possible to predict many future events implementing theories that have been tested throughout research (Ghauri and Gronhaug, 2002:9).

Based on the features described above, figure 3.1 presents some generic steps that every researcher fulfils in order to find an answer to a question or problem identified during a research process.

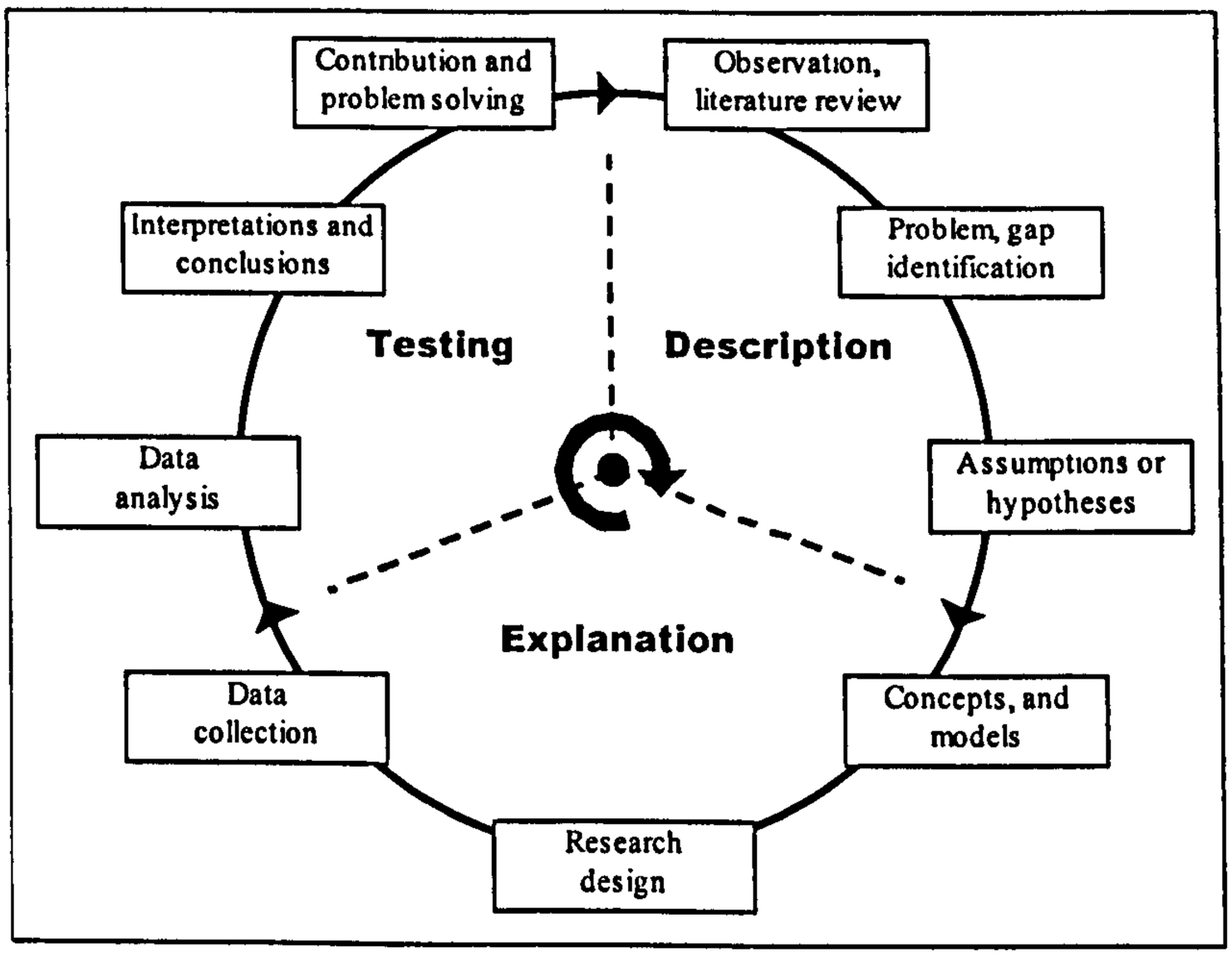

Figure 3.1: The wheel of research (modified from Ghauri and Gronhaug, 2002; Gill & Johnson, 2002; Meredith et al. 1989)

The figure depicted above presents the basic stages that a common research process might encompass. Some authors highlight that this process is not a well-delimited sequence of steps, but a continuum interaction between different stages (Gill & Johnson, 2002). Each of these stages requires a thorough analysis as it has been done in chapter 2 with the first two tasks: Observation, literature review; and Problem, gap identification. In next sections, the rest of these stages will be analysed.

Figure 3.2 shows the detailed research wheel, as denominated by Ghauri and Gronhaug (2002), used in this study. It aims to describe thoroughly the roadmap used to link research questions identified at the starting point and the final conclusions and contribution of this research, and different tasks and resources used for this end.

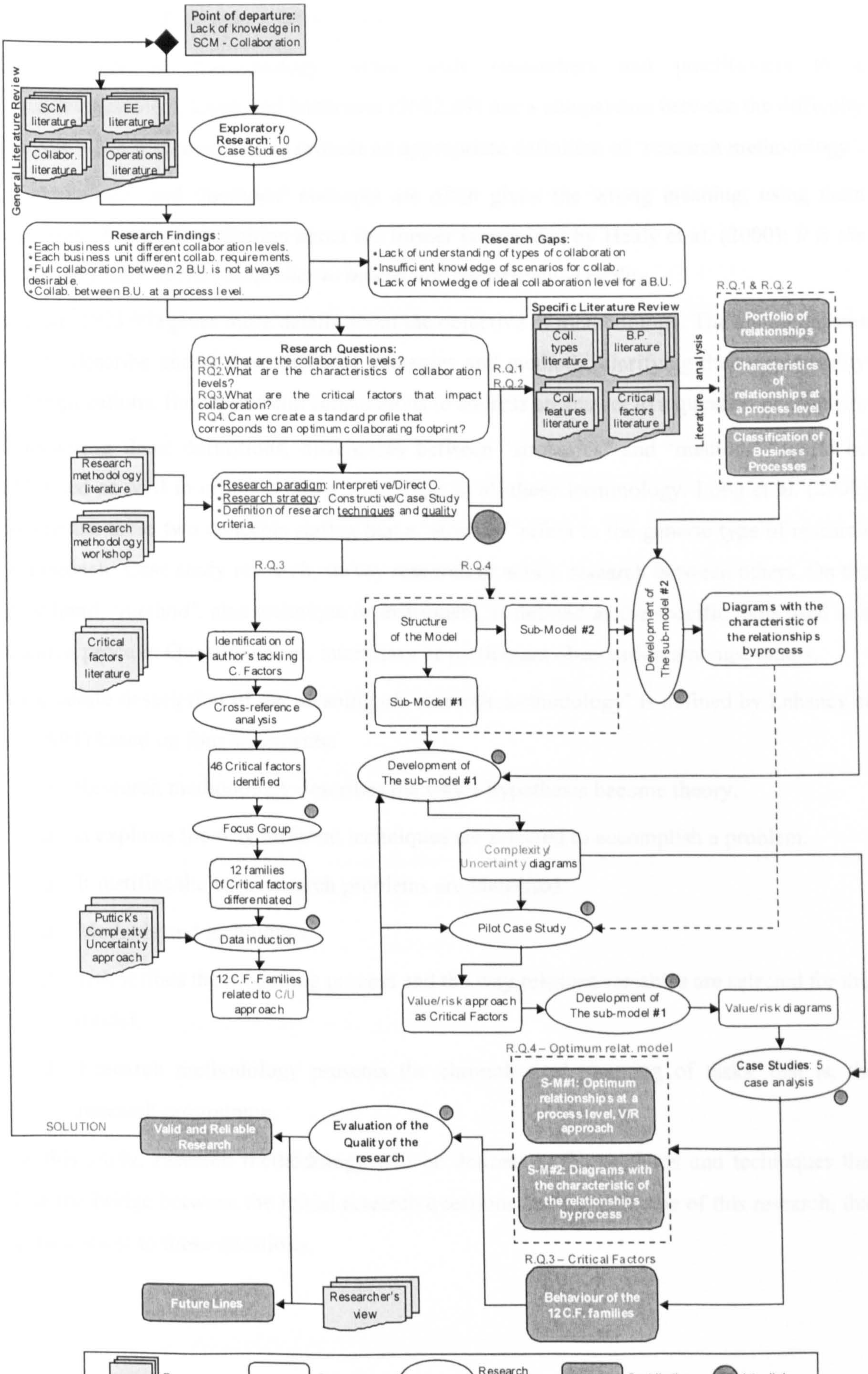

Figure 3.2: Research wheel of this study

3.1.2 Concept of 'Research Methodology'

The concept of 'methodology' often leads researchers and practitioners to a misunderstanding. Clough and Nutbrown (2002:29) use a comparison between the difficulty to catch water with a net and to provide an appropriate definition of 'research methodology'.

'Methodology' and 'methods' concepts are often given the wrong meaning, using them randomly. A generic definition about the former is provided by Healy et al. (2000): *It is the techniques used by the researcher to investigate the perceived reality.*

Kaplan (1973:93) gives more details about the objective of methodology. The author defines it as to describe and analyse different strategies and methods, clarifying their applicability and implications, limitations and suppositions to address an answer to a question or problem.

Considering these definitions, differences between 'strategies' and 'methods' should be addressed as well in order to throw some light to all these terminology. Long et al. (2000) distinguish these two concepts stating that a 'strategy' refers to the generic type of research or approach: Case study research, survey research or action research between others. On the other hand, 'method', also technique or instrument, is defined as the specific tools used in a research process: Questionnaires, interviews or participant observation amongst others.

An accurate description of the meaning of 'research methodology' is defined by Lehaney et al. (1994) based on four statements:

- Research methodology describes the way a hypothesis become theory.
- It explains the way different techniques are selected to accomplish a problem.
- It justifies the way research problems are identified.
- Methods and techniques.
- It describes the modelling process and the way relevant variables are selected for this model.
- Research methodology presents the chronological planning of tasks, that is, the research programme.

For this study, research methodology will be defined as the methods and techniques that close the bridge between the initial research questions and the outcome of this research, that is, the answer to these questions.

3.2 Implications of management research

Traditionally, the way of doing management research has followed a common pattern of characteristics. This research field has been treated by the researcher as one more scientific research. It was thought that the interaction of some specific and isolated variables generated some controllable effects. However, it is currently accepted that managerial activity is not just a mathematical equation, but a complex and chaotic activity where soft and hard issues of different disciplines such as sociology, technology or anthropology among others, are inter-related (Gill & Johnson, 2002; Meredith et al., 1989; Meredith, 1998; Easterby-Smith et al., 2002; Barnes, 2001).

Research projects carried out in the management field over the last 40 years (Meredith, 1998) have been focused on analysing what happens and how through research strategies and techniques that often required inaccurate assumptions. Rather than building a new theory that would help explain why facts happened, this rational approach was focused on validating or refusing hypotheses (Long et al., 2000). The goal of these validated hypotheses would be to enable researchers to predict some effects or assess how some certain variables impacted over management (Meredith, 1998; Barnes, 2001).

It has been stated by practitioners that the outcome of this research approach might not always be applicable on a real scenario. Easterby-Smith et al. (2002:8) suggests that management research should seek for both a theoretical contribution and a potential action for practitioners.

This potentiality for action of the research would be obtained from a close relationship with the real managerial environment. However, another implication stated by Easterby-Smith et al. (2002:8) highlights the limitation of accessibility that a researcher might have to carry out fieldwork. High cost of managers' time and their saturation might become a constrain for collecting and analysing in depth real information.

This study will cope with all the characteristics and implications that surround management research. It will describe the properties of the research strategy selected to avoid partial knowledge, that is isolation of just some variables, of the cases under study. Similarly this study will analyse the procedure followed to gain access to organisations to gather real data and the use made out of it.

3.3 Content of this study: The research questions

This section will cope with the importance that research questions have during the research methodology definition. Clough and Nutbrown (2002:32) highlight the key role that these

research questions play in every research project. This study does not differ from this observation, therefore, it is worth starting research methodology description process analysing the nature of the research questions defined in the previous chapter.

According to Clough and Nutbrown (2002:33), the research questions are responsible for setting the boundaries of the study, also for making clear the content of the study. They are appreciated for their potential contribution to theoretical and empirical issues. Yin (2003:21) enhances the importance of research questions stating that the nature of the research questions ('what?', 'how?', 'why?') will determine the requirements that the research methodology will have to fulfil.

These are the research questions and the propositions (Yin, 2003:22) that this study aims to answer:

- RQ1: *What are the levels of collaboration?*

The proposition of this initial research question **(Prop.1)** is to agree a portfolio of generic inter-organisational relationships which will encompass all the work done by the authors identified in the general literature review. This research question was defined from both the literature review and the initial empirical study carried out in 10 companies, as there was a considerable lack of understanding in this area.

This first research question addressed the researcher to the definition of the second question:

- RQ2: *What are the characteristics of each level?*

Once that the levels of collaboration are known, the proposition of this research question **(Prop.2)** will be to define the characteristics which make each collaboration level different. This list of characteristics will enable researchers and practitioners to set the boundaries between the different collaboration levels. This way, a common pattern will be provided for referring to relationship styles among business units.

The answer to these two research questions leads the researcher to think about the scenarios where each relationship level should be implemented. That is, both in the literature and in practice it was noticed that there are some factors which impact over the collaboration levels. The research question which aims to cope with this issue is stated below:

- RQ3: *What are the critical factors of a company that determine its collaborative profile?*

The proposition of this third research question **(Prop.3)** involves identifying the critical factors which make it possible to develop one certain collaboration level (i.e. organisational relationship). The goal of this question is not limited to present a list of factors, but to assess how these factors influence organisational relationship and also why.

It was considered enriching to gather the outcome of the three questions in a fourth research question. On one hand, there were the collaboration levels with their characteristics identified in the first and second research questions. On the other hand, a classification of critical factors influencing these collaboration levels was defined and also their behaviour. As a conclusion, the viability of defining desirable collaboration levels depending on the nature of these critical factors was quoted:

RQ4: *Can we create a standard profile that corresponds to a desirable collaborating footprint?*

The complexity of this research question suggested some minor propositions:

- **(Prop.4.1)** To analyse the features of business processes in a collaborative environment.
- **(Prop.4.2)** To design the desirable relationships depending on the critical factors.
- **(Prop.4.3)** To build a model that graphically represents the desirable relationships and their characteristics.

The philosophical research paradigm and the research strategy selected for addressing an appropriate answer to these research questions are described in the following sections. A review of different approaches can be found in the literature will lead the researcher to define the adopted choice.

3.4 Addressing the research questions: From philosophical paradigms to research strategies

The objective of this section is to describe the decisions and assumptions that researchers must make in order to address an appropriate answer to the research questions. This set of decisions and assumptions form what has been described before as research methodology: 'The strategies and methods that close the bridge between the initial research questions and the outcome of this research, that is, the answer to these questions.'

Figure 3.3 shows the content of a generic research methodology, and the most important decisions to make in a hierarchical distribution.

This chapter will exclusively cope with the coloured levels depicted in figure 3.3, that is, firstly it will describe the nature of this study. A thorough review of the philosophical research paradigms and their particular assumptions will be done. Thirdly, this chapter will present the most common research strategies for each philosophical paradigm, and it will

finish describing the specific decision that this researcher made about these three ingredients of the research methodology for this study.

Key methodological issues such as the research design, its techniques and the quality criteria will be tackled in the following chapter.

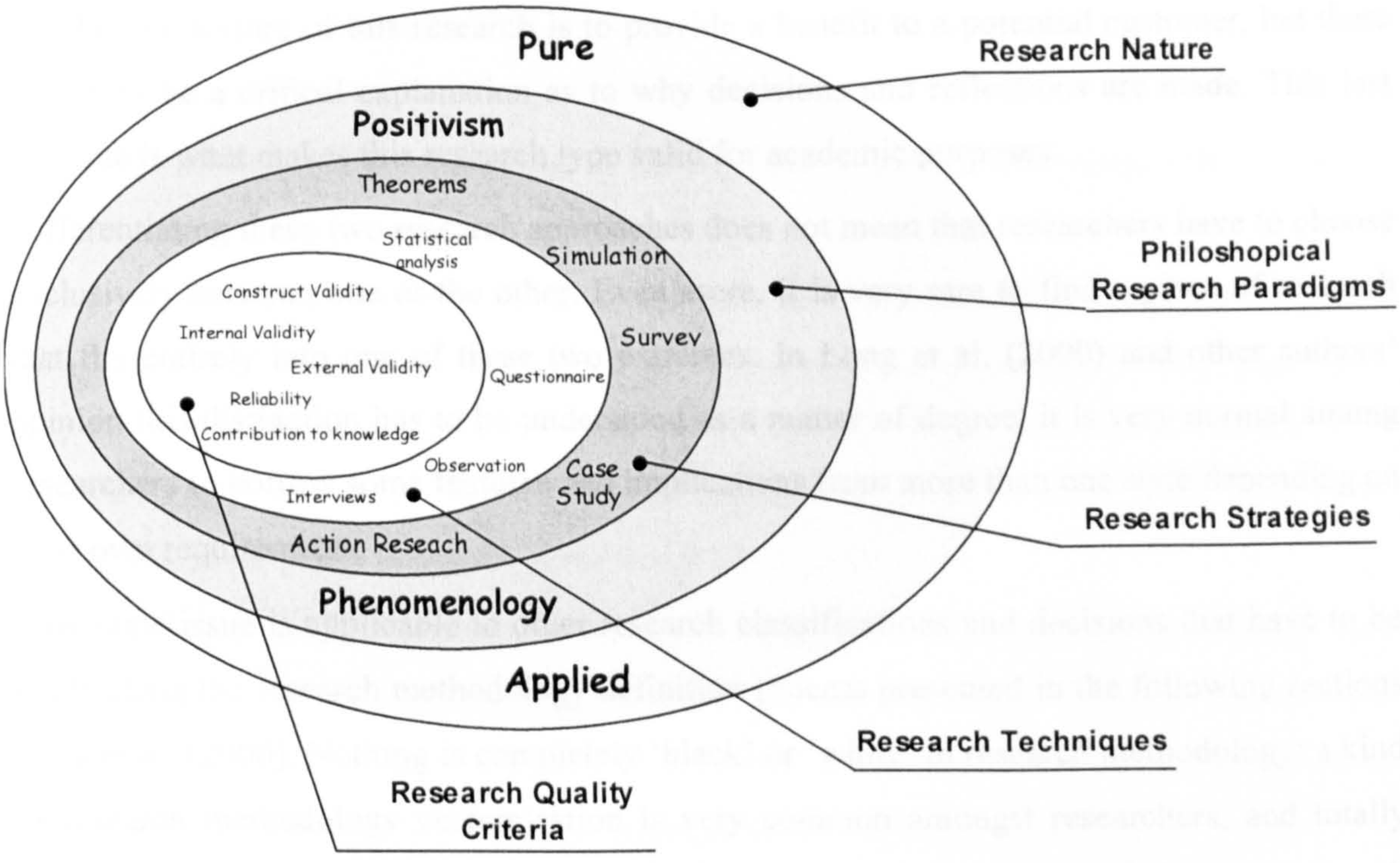

Figure 3.3: Research Methodology content (Modified from Saunder et al., 2000)

3.4.1 Research Nature

The nature of the research refers to the first important decision that researchers must consider: *Pure* or *applied research.*

This initial classification is focused on distinguishing the outcome that any research project is supposed to generate (Easterby-Smith et al., 2002:8; Kasanen et al., 1993).

- *Pure Research:* The characteristic of this research type is that it aims to contribute through theoretical development, that is, it may or may not have a practical implementation. Basically, there are three different pure research approaches according to the nature of this theoretical development (Easterby-Smith et al., 2002:9):
  - Discovery: A brand new idea or explanation is achieved through empirical research.
  - Invention: A brand new solution is given to a specific problem.
  - Reflection: An existing knowledge is re-examined using different variables.

Mainly the outcome of this research is orientated to academia. These results may frequently be found in books, articles and academic journals.

- *Applied Research:* This second research style leads the researcher to give a practical solution to a certain problem, always covered by a theoretical contribution.

  The key feature of this research is to provide a benefit to a potential customer, but there has to be a critical explanation as to why decisions and reflections are made. This last issue is what makes this research type valid for academic purposes.

Differentiating these two research approaches does not mean that researchers have to choose exclusively between one or the other. Even more, it is very rare to find a piece of research that fits entirely into one of these two extremes. In Long et al. (2000) and other authors' opinion this distinction has to be understood as a matter of degree, it is very normal among researchers to borrow some features and implications from more than one style depending on their own requirements.

This same issue is applicable to other research classifications and decisions that have to be made along the research methodology definition process presented in the following sections Long et al. (2000). Nothing is completely 'black' or 'white' in research methodology: a kind of research methodology customisation is very common amongst researchers, and totally necessary to adapt all of these concepts to the specific requirements of different research questions.

3.4.2 Philosophical Research Paradigms

All action carried out by any human being is based on some philosophical perspectives (Amaratunga et al., 2001). These philosophical perspectives are defined by Burrell et al. (1979) and Morgan (1979) as 'the basic beliefs about the world'.

This concept has been labelled with the term 'paradigm' as well. A more specific definition about this terminology is provided by Deshpande (1983:101) in Healy et al. (2000): 'A set of linked assumptions about the world which is shared by a community of scientists investigating the world'. A similar definition for paradigm is also stated by Meredith (1989).

The impact of these philosophical issues over research in management science is considered highly relevant (Amaratunga et al., 2001; Easterby-Smith et al., 2002; Mendibil, 2003). A lack of consideration of the philosophical nature of the research/researcher might seriously affect the quality of the outcome of the research. The way the researcher understands and interprets the reality of the world will influence the procedure followed for carrying out the research project and, in consequence, the results of it. Hence, the philosophical assumptions

will help the researcher to choose the right research strategies and techniques. There are some benefits highlighted by Easterby-Smith et al. (2002:27):

- Design process of the research is clearer.
- Understanding the characteristics of the different philosophical paradigms may help the researcher to foresee which research design may work and which may not.
- It may help the researcher to identify and create research designs that might be unknown to him/her.

Before analysing the nature of the different philosophical paradigms of scientific management research, it is necessary to describe the elements of content of these paradigms in order to better understand the differences among them: Ontological assumption; epistemological assumption; and methodological assumption (Healy et al., 2000; Long et al., 2000; Easterby-Smith et al., 2002; Amaratunga et al., 2001).

Ontology refers to 'the perception of the nature of social reality', that is, 'the "reality" that researchers investigate'. Epistemology considers the way knowledge is transmitted to other people. Finally, methodology, as described in former sections, refers to 'the methods used by the researcher to investigate the reality' (Long et al., 2000; Healy et al., 2000).

There are a number of dimensions on which research paradigms can be classified (Meredith, 1989). The methods used for collecting data may be one criterion; the techniques used for analysing the data may be another procedure; or just another example, the nature of the units of analysis. This researcher is going to present a framework for the classification of paradigms based on the work carried out by Meredith (1989). At the same time, propositions made by Kasanen et al. (1993) and Wacker (1998) will be considered and discussed.

Meredith (1989) highlights two dimensions as key criteria for philosophical modelling of the management research. The first is *rational/existential* dimension, which defines whether there is just one reality, independent to the researcher, or this reality is subjective and socially constructed.

There are many authors that classify the research paradigms using this latter approach (Easterby-Smith et al., 2002; Healy et al., 2000; Amaratunga et al., 2001; Long et al., 2000; Clough and Nutbrown, 2002; Saunders et al., 2003; Gummesson, 2000; Gill & Johnson, 2002). However, the terminology used for describing the same concept is very wide, so, this researcher decided to unify this terminology and use the more repeated ones: Positivist approach (rational) and phenomenological approach (existential). This new terminology will be used in advance.

The second dimension, *natural/artificial*, refers to the type of information and source used in the research.

Figure 3.4 represents the two dimensions explained above with their respective generic perspectives: Axiomatic, logical positivist/empiricist, critical theory, and interpretive for *Positivist/Phenomenological* approach; direct observation, perceptions and artificial reconstruction for *Natural/Artificial*. Also, the main measures for assessing each dimension and perspective are presented in the same figure.

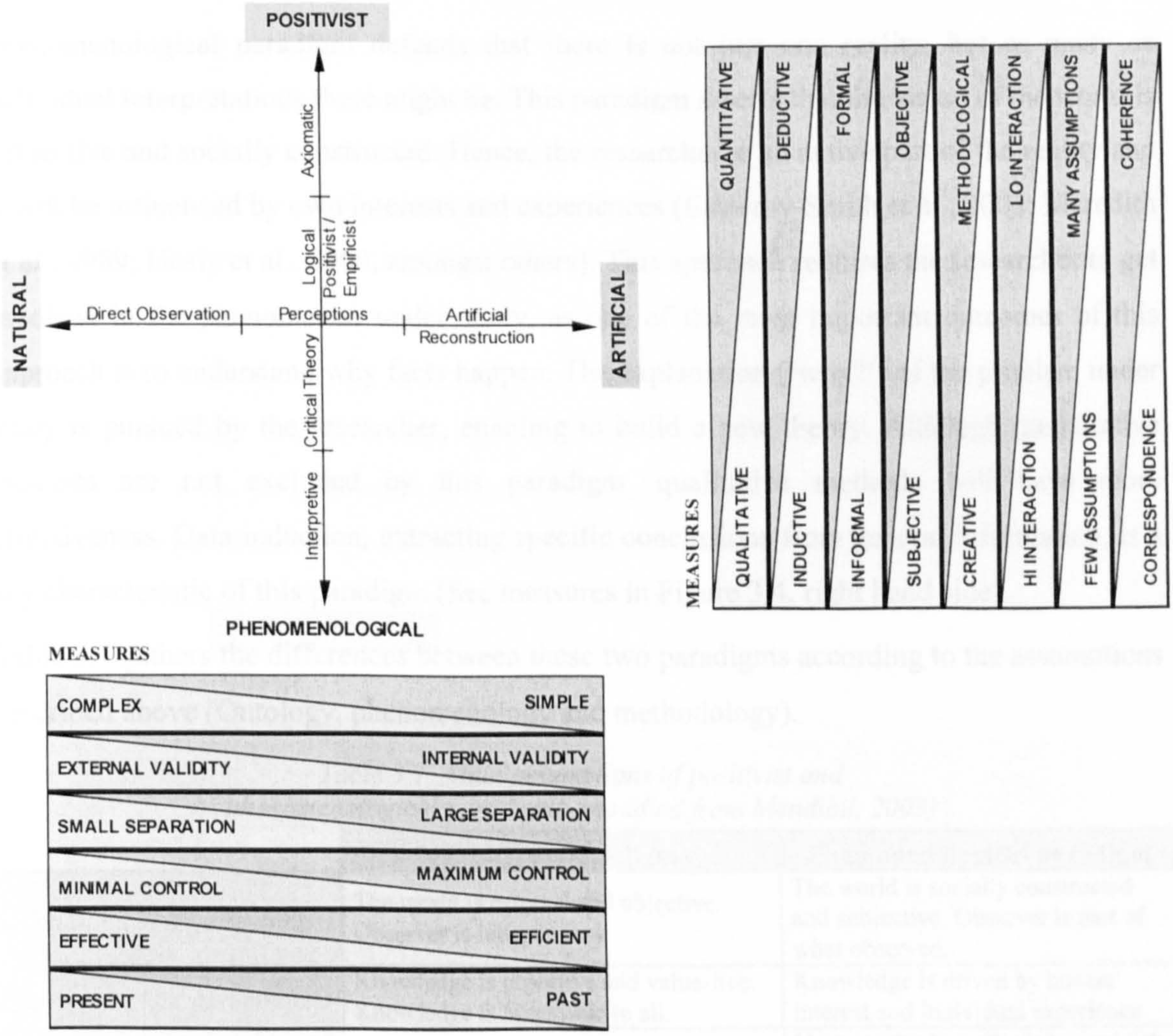

Figure 3.4: Framework for research paradigms (Modified from Meredith et al., 1989)

This section will analyse the content of each dimension, the generic perspectives of them, and also will review other approaches and classification proposed by the literature. It will be observed that although the terminology used by different authors lead researchers to think that there are many approaches, the concept does not differ.

3.4.2.1. Positivist/Phenomenological dimension

In the positivist approach, it is believed that there is just one reality. It is considered that this reality is objective, external to the individual, and cannot be interpreted, only understood. It uses formal structure and pure logic for measuring the truth. This positivist paradigm requires the researcher to be independent to the phenomenon under study. Rather than building a theory, it aims to test hypotheses derived from the interaction of a set of variables under study (Easterby-Smith et al., 2002; Meredith et al., 1989; Healy et al., 2000, amongst others). To this end, quantitative methods for ensuring objectiveness will be used, as well as a deduction process for hypotheses testing (See measures in Figure 3.4, right hand side).

Phenomenological paradigm defends that there is not just one reality, but as many as individual interpretations there might be. This paradigm asserts that the vision of the world is subjective and socially constructed. Hence, the researcher is an active part of the reality and it will be influenced by own interests and experiences (Easterby-Smith et al., 2002; Meredith et al., 1989; Healy et al., 2000, amongst others). This approach requires the researcher to get involved in the phenomenon under study, as one of the most important outcomes of this approach is to understand why facts happen. The explanation ('why?') of the problem under study is pursued by the researcher, enabling to build a new theory. Although quantitative methods are not excluded by this paradigm, qualitative methods will have more effectiveness. Data induction, extracting specific conclusions from general information, is a key characteristic of this paradigm (See measures in Figure 3.4, right hand side).

Table 3.1 gathers the differences between these two paradigms according to the assumptions described above (Ontology, phenomenology and methodology).

Table 3.1: Main assumptions of positivist and phenomenological paradigms (modified from Mendibil, 2003)

	Positivist paradigm	**Phenomenological paradigm**
Ontological assumptions	The world is external and objective. Observer is independent.	The world is socially constructed and subjective. Observer is part of what observed.
Epistemological assumptions	Knowledge is objective and value-free. Knowledge is accessible to all.	Knowledge is driven by human interest and individual experience
Methodological assumptions	Operationalising concepts so that they can be measured taking large samples. Quantitative methods.	Using multiple methods to establish different views of phenomenon. Small samples investigated in depth or over time. Qualitative methods.
Other features	Researchers should focus on facts, look for causality and fundamental laws, reduce phenomenon to simplest elements, and formulate hypotheses and then test them.	Researchers should focus on meaning, try to understand what is happening, look at the totality of each situation (i.e. historical-contextual-characteristics), and develop ideas through induction from data.

This positivist/phenomenological dimension has a number of measures illustrated in figure 3.4. These measures help in clarifying the difference between these two extremes. Although some of them have already been presented in table 3.1, these are measures inherent to each research paradigm (Meredith et al., 1989):

At the positivist extreme, the research process is often deductive, it makes general conclusions from specific facts. It is well-structured, with a high degree of objectivity, and it is methodologically prescribed. This research process aims to avoid researchers' biases in the findings. It requires an initial assumption concerning primary constructs, and compares the 'truth' of the findings with the 'truth' of other statements or 'laws'.

On the other hand, research processes carried out under the phenomenological paradigm tend to be more inductive, i.e., particular conclusions from an extended number of facts or cases. It is less structured, subjective and the environment plays a much more important role. The process of theory building requires 'detective work' and a 'creative leap'. The researcher seeks for coherence between the findings and the real world, rather than with existing theories or 'laws'.

As stated before in this chapter, it is unusual to find a research project that fits just in one of these two extremes (Long et al., 2000). In order to extend this range of paradigm classification, some authors present more intermediate approaches between positivist and phenomenological sides (see Table 3.2). These intermediate approaches are not anything else but a mix of characteristics of the two extremes presented above.

Table 3.2: Classification of paradigms in the literature

Meredith (1989)	**Easterby-Smith (2002)**	**Healy et al. (2000)**	**Denzin et al. (2000)**
Axiomatic	Positivist	Positivist	Positivist/Postpositivist
Logical positivist/empiricist	Relativist	Critical Theory	Constructivist
Critical Theory	Social Constructionist	Constructionist	Feminist
Interpretive		Realist	Ethnic
			Marxist
			Cultural studies
			Queer theory

The work of Meredith et al. (1989) was taken as a basis for this study. One of the reasons for doing it was that the author presents a wide spectrum of paradigms in the positivist/phenomenological range (see table 3.2). At the same time, the author presents this

classification in a very simplistic way, with a great level of detail. These two characteristics were much considered for the definition of the research methodology for this study.

Table 3.3 describes the main assumptions (ontology, phenomenology and methodology) for each of the four paradigms defined by Meredith et al. (1989), as it was done in table 3.1 with the positivist/phenomenological extremes. A thorough analysis of the implications of each paradigm will be essential for defining the paradigm for the study.

Table 3.3: Main assumptions of the spectrum of paradigms adopted for this study (modified from Healy et al., 2000)

Assumption	Axiomatic	Logical positivist/ Empiricist	Critical Theory	Interpretive
Ontology	Reality is real and apprehensible.	Reality is "real" but only imperfectly and probabilistically apprehensible.	"Virtual" reality shaped by social, economic, ethnic, political, cultural, and gender values, crystallised over time.	Multiple local and specific "constructed" realities.
Epistemology	Objectivist: findings true..	Modified objectivist: findings probably true	Subjectivist: value mediated findings.	Subjectivist: created findings.
Methodology	Experiments/surveys: verification of hypotheses, chiefly quantitative methods.	Survey research	Structured interviews questionnaires, , and other quantitative methods	Case studies/convergent interviewing: triangulation, interpretation of research issues by qualitative methods.

According to the work developed by Mendibil (2003), there are two main drivers that influence the definition of the features of the research paradigm, and consequently which paradigm adopt for one particular study:

1.- The nature of the phenomena (i.e. research problem) under study.

2.- Personal preferences and philosophical assumptions of the researcher.

These two variables will have to be considered during the research paradigm definition process. However, Clough and Nutbrown (2002) considers that positioning the study within a certain paradigm is not such a transcendental issue, but how to distinguish between the implications of different research designs of the paradigms that best address the answer to the research questions.

3.4.2.2. Natural/Artificial dimension

This second dimension (see figure 3.4) tackles the nature of the information used in the research, as well as the source of this information.

At the natural pole is empiricism, explanation is made from real on-site information of the problem under study. On the other hand, at the artificial end is subjectivism, which extracts the findings from information collected in an artificial reconstruction of the reality (Meredith et al., 1989).

The mechanisms used to study the phenomenon will determine the researcher's perception of the reality. The framework presented by the author encompasses three categories of mechanisms (Figure 3.4): Direct observation of object reality; people's perceptions of object reality; and artificial reconstruction of object reality.

- *Direct observation of object reality:* The researcher directly observes and analyses the phenomenon under study. The key feature of this mechanism is to gain accessibility to study the real case. This observation may be carried out through either formal structured analysis (positivist) or interpretive (phenomenological) approach.
- *People's perceptions of object reality:* Research under this mechanism is conducted 'through somebody else's eyes' (Meredith et al., 1989), as happens in surveys or interviews. Hence, the key feature of this approach is to focus on the perception that an individual in direct contact to the phenomenon has of the reality. This is known as second source methods for data collection.
- *Artificial reconstruction of object reality:* It aims to identify the key variables of the phenomenon under study, and then analyse the behaviour and interaction between these variables in a controlled artificial environment. Research process is more focused on hypotheses testing rather than knowledge building due to the lack of explanation that the researcher has about the finding. Experimentation, analytical modelling or computer simulation fit into this mechanism.

As it was described with the positivist/phenomenological dimension, this natural/artificial dimension also has a set of measures (see Figure 3.4) that helps clarifying the spectrum between these two poles.

At the artificial pole, the models used by the researcher are highly abstract and simple, with reliability and internal validity as key characteristics of the conclusions. The researcher and the phenomenon are separated, and it is completely controlled as the researcher uses primary constructs to define the information to be collected. This research process is highly efficient, and it usually covers matters of the past.

On the other extreme of the spectrum, research projects carried out with a natural approach need the researcher to be in direct contact to the real phenomenon. Although reliability is not so crucial, external validity is highly considered, closer to reality, more difficult to control

and less efficient. Information collected from current phenomena is the goal of this natural approach.

This section has defined and classified research paradigms according to two dimensions: Positivist/phenomenological dimension, and natural/artificial dimension. The following section will tackle the next ingredient for research methodology definition: Research strategy. The nature of the research strategy adopted for the study emerges from the philosophical paradigm chosen by the researcher. The next section will present the portfolio of research strategies available for the paradigms described in the last section.

3.4.3 Research Strategies

Yin (2003:3) defines a research strategy as 'a different way of collecting and analysing empirical evidence, following its own logic'. Each research strategy has advantages and disadvantages. It is essential to know these characteristics before selecting a particular strategy to get the most out of it during the research process.

One of the aims of this chapter is to select and justify an appropriate research strategy to address an answer to the research questions. The objective, as stated by Mendibil (2003), 'is not to champion any particular strategy, but to ensure that the researcher does not ignore those strategies that offer more advantages for that specific situation'.

Many authors justify that research strategies should be hierarchically disposed. These authors defend this statement asserting that there are some strategies exclusively valid for the description (Meredith et al., 1989) stage, that are not extensible to exploration or explanation stages.

Yin (2003:3) questions this belief arguing that generally all the research strategies might be of common use at different stages. Rather than classifying the strategies according to this kind of hierarchy, Yin (2003:5) proposes some criteria (see table 3.4) for distinguishing between them.

Table 3.4: Relevant situations for different research strategies

Strategy	Form of research question	Requires control of behavioural events?	Focuses on contemporary events?
Experiment	how, why?	Yes	Yes
Survey	who, what, where, how many, how much?	No	Yes
Archival analysis	who, what, where, how many, how much?	No	Yes / No
History	how, why?	No	No
Case Study	how, why?	No	Yes

NATURAL ⟷ ARTIFICIAL

Deductive - Theory Testing

Normative (Kasanen, 1993)

Descriptive (Kasanen, 1993)

POSITIVIST

PHENOMENOL.

Quantitative Approach

	Direct Observation of Object Reality	People's Perceptions of Object Reality	Artificial Reconstruction of Object Reality
Axiomatic			• Reason/Logic/Theorems • Normative Modelling • Descriptive Modelling
Logical Positivist / Empiricist	• Field Studies • Field Experiments	• Structured Interviewing • Survey Research	• Prototyping • Physical Modelling • Laboratory Experimentation • Simulation
Critical Theory		• Introspective Reflection	
Interpretive	• Action Research • Case Studies • Constructive Research • Grounded Research	• Historical Analysis • Delphi • Intensive Interviewing • Expert Panels • Futures/Scenarios	• Conceptual Modelling • Hermeneutics

Inductive - Theory Building

Qualitative Approach

Deductive - Theory Testing

Empirical (Wacker, 1998; Kasanen, 1993)

Analytical (Wacker, 1998)

Theoretical (Kasanen, 1993)

Table 3.5: Framework for Research Strategies (Modified from Meredith et al., 1989)

Thus, this researcher will consider the nature of the phenomena and the personal preferences as it was stated in the previous section (Mendibil, 2003); and also these criteria presented by Yin (2003:5) in table 3.4 for selecting an appropriate research strategy.

Next, a portfolio of research strategies will be presented. To this end, the research paradigm framework (Figure 3.4) shown in the previous section will be used to classify the research strategies according to positivist/phenomenological and natural/artificial dimensions. Table 3.5 gathers an extended classification of research strategies. As happened in previous classifications in other sections, there are as many classifications and different terminology as researchers. Hence, the classification presented above aims to be a representative portfolio of all the research strategies that can be found in the literature.

On the left hand side of the table, the four perspectives of the positivist/phenomenological dimensions are disposed. At the top of the table, the three mechanisms of natural/artificial dimension are located. A total of twelve boxes are generated through the combination of these two dimensions. All the research strategies analysed by the author are classified according to these twelve cells (Meredith et al., 1989).

As can be seen in the table, two main measures described in the previous section and highlighted by many authors are incorporated as well: Deduction/Induction and Qualitative/Quantitative.

- The closer the selected paradigm is to the positivist and the artificial poles, the more deductive the research strategies will tend to be, and vice versa. Deduction was defined as the process to extract general conclusions from particular facts. Theory testing process is associated to this approach.
- Same way, the closer the selected paradigm is to the positivist and the artificial poles, the more quantitative the research strategies will generally tend to be, and vice versa. Quantitative methods require numerical and statistical data collection and analysis for achieving objectiveness and reliability in the findings (Long et al., 2000; Easterby-Smith et al., 2002; Yin, 2003).

Also, other authors' classifications have been considered in the table (Kasanen et al., 1993; Wacker, 1998). Kasanen et al. (1993) propos a framework with two dimensions: Normative/descriptive and empirical/theoretical. The first dimension may be compared to the positivist/phenomenological approach proposed by the author, whereas the empirical/theoretical dimension plays the same role as natural/artificial dimension.

Table 3.6: Analysis of research strategies (Meredith et al., 1989)

Positivist/ Phenom. Dimension	Natural/Artificial dimension	Research Strategy	Description
Axiomatic	Artificial reconstruction	*Reason/Logical deduc./ Theorems*	These strategies involve rigorous, logical analysis that can be followed and replicated by other researchers. Hypotheses testing.
		Normative Modelling	It uses closed-form mathematical representations. The model is used to produce a prescriptive result. Linear programming is often used.
		Descriptive Modelling	Unlike normative mod., this method is used to just describe, by mathematical emulation, the actual workings of a real system
Logical positivist / Empiricist	Artificial reconstruction	*Prototyping*	It involves the construction of a working model of a system. The prototype is used for testing and evaluating the system being constructed.
		Physical Modelling	The model is a physical representation of the real setting such as is done by engineers when evaluating a new layout for an organisation.
		Laboratory Experim.	The intervening variables are carefully controlled while the independent variables are manipulated systematically to determine their effects on the dependent variables.
		Simulation	It includes both a conceptual model of what is happening, through equations, plus an element of reality through the values set for the parameters in the equations.
Logical positivist / Empiricist	People's perceptions	*Structured Interviews*	Observation is limited to the interview process and transcripts. Questions are always the same following a fixed format, so, answers are constrained.
		Survey Research	It allows statistical analysis. Once properly designed, it can be sent to a large number of people. Generally poor responses, answers may be of little value. No way to alter the questions. Normally what and not how or why.
Logical positivist / Empiricist	Direct observation	*Field Studies*	A carefully selected set of field sites is used to evaluate one or more factors. The factors are controlled through the judicious selection of sites rather than by attempting to manipulate the factors within the sites at the time of observation or analysis.
		Field Experiments	The field site variables (the important ones) are under the control of the researcher. The independent variables are manipulated while the intervening variables are controlled to determine the resulting dependent variables.
Critical Theory	People's perceptions	*Introspective Reflection*	It is the most existential of the methods involving people's perceptions of reality. It allows the integration of both positivist and phenomenological approaches to attain a higher level of understanding. The researcher reflects his/her own experience.
Interpretive	Artificial reconstruction	*Conceptual Modelling*	A mental model of the suspected relationships is posited which may then be evaluated by means of a framework that captures the essence of the study under investigation.
		Hermeneutics	It is directly concerned with the interpretation of what is being observed. The observer interprets and documents the object reality directly.
Interpretive	People's perceptions	*Historical Analysis*	It examines historical documents, make comparisons, note apparent contradictions, see similarities and analyse a situation from a particular perspective. No manipulation of variables is possible, the researcher can just select particular evidences.
		Delphi	It is a type of expert panel (see below). Defined methods are used to obtain and consolidate expert opinion.
		Intensive Interviewing	People are interviewed using open-ended questions. Good for descriptive and exploratory research stages. The issues are framed by the participants. Every interview may be different, so, they are difficult to compare. Lack of reliability and generalisability.
		Expert Panels	It can be conducted from a distance. A set of experts is polled for their opinions and beliefs. Commonalities and differences among the experts are noted and statistically analyses of their responses may be conducted.
		Futures / Scenarios	What is involved here is postulating different future situations and evaluating the results by means of a conceptual, pictorial, or abstract model. If the effect appears reasonable, then the model's validity is better established.
Interpretive	Direct observation	*Action Research*	It requires the researcher to become involved with the phenomenon under study. The researcher attempts to influence the situation in a positive direction while collecting data. Factorial design is not attempted.
		Case Study	It investigates a specific phenomenon through an in-depth, limited-scope study. Operations can be studied in natural setting and theory is generated directly from data. How and why questions. Applicable all over the research process (early stages as well).
		Constructive Research	It aims to produce solutions to explicit problems and it is closely related to the concept of innovative constructivism. An essential component is the generation of new learning and knowledge in the process of constructing the solution.
		Grounded Research	Large amounts of non-standard qualitative data has to be systematically analysed to draw out themes, patterns and categories. Theory is directly built from the phenomenon under study, without any previous assumption, model or concept.

On the other hand, Wacker (1998) does the same with the nature of the source and the kind of information necessary for the research (natural/artificial). He names this dimension as empirical/analytical.

Table 3.6 shows the characteristics of each research strategy. A total of 23 research strategies are briefly described. The objective of this table is to provide a general orientation of these strategies, not specific procedures and details. The justification for this is that the implications of all the strategies will have to be considered before selecting the strategy that best addresses an answer to the research questions. Also, the preferences of the author will assess the content of these strategies in order to choose the one that best fulfils his assumptions.

After presenting all the research types, paradigms and strategies proposed by several authors in the research methodology literature, next section will describe and analysis the decision made for defining the particular research methodology for this study. Basically, there will be three types of decisions to make:

- *Nature of the research*: Applied or Pure.
- *Philosophical research paradigm*: The author will have to choose one of the twelve boxes of table Y.
- *Research strategy*: Based on the previous decision, the author will have to choose a specific strategy situated inside this particular "research paradigm box".

These decisions will lead the author to carry out the research design process where data collection and analysis requirements will be described. Next chapter will tackle this latter issue.

3.5 Research methodology adopted for this study

When the implications of management research were described, many authors highlighted the necessity for practical implications of management and operations research (Meredith, 1998; Easterby-Smith et al., 2002:8). Even more, Meredith et al. (1989) present the results of a survey where only 5% of the articles published in four journals in the years 1977 and 1987 are demonstrated to be interpretive and carried out through direct observation. According to the same author, this result means that rather than seeking for a solution to real problems in management and operations areas, researchers are developing theoretical outcomes out of their research programmes. His conclusions also outline that this trend should inversely change and try to focus more on research projects that accomplish questions closer to practical environments.

Supply chain management and collaboration fields are without any doubt of high practical implication. Dealing with these two fields would not be possible if real cases and problems were not considered. Hence, the conclusions highlighted above and the practical nature of the field of this study lead the author to state that this research will meet the characteristics of *applied research.*

This research will involve working as close as possible with companies, trying to give a practical approach to the answer of theoretical research questions. Despite this practical implication, the main objective of this study will be to make a contribution to knowledge.

Ontological, epistemological and methodological assumptions of the author lead him to give a *phenomenological* approach to this study. The author believes that reality is not objective and unique, but subjective and particular for each individual. He defends the idea that knowledge is nowhere but in each individual.

Apart from the researcher's own beliefs and preferences, the nature of the field and research questions suggest orientating this study towards the same paradigm. This study aims to analyse the different collaboration levels, the possible relationships that two organisations may establish at a process level. At the same time, it seeks to find some generic characteristics that fulfil these relationships in order to identify more easily the relationship types between business units.

All this information will enable the researcher to identify some critical factors that influence the development of a certain relationship type rather than others. Finally, based on previous findings, this study will propose a set of desirable relationships between business units.

The content of the study clearly shows that it is not possible to find just one reality about relationships and their practice, as each company will have its own reality and casuistic. As a conclusion, the nature of content of the study also confirms the validity of the phenomenological paradigm.

As described in previous chapters, there are four perspectives for positivist/ phenomenological dimension. *Interpretive* approach will be selected, as it is the one closest to phenomenological pole in the spectrum.

The proposition of the research questions described above does not suggest using artificial data, but real information gathered directly from the source of the questions, the organisations. At the same time, it is planned to study the cases as a whole rather than analysing just some variables. These two reasons will lead the author to orientate this study towards *natural* source of data.

As it was done with the positivist/phenomenological dimension, the natural/artificial dimension proposes three perspectives. *Direct observation of object reality* will be selected as it is the closest approach to the natural pole. The implications of this election will lead the author to contact a number of organisations to gather on-site data and study real cases.

The two decisions made concerning the philosophical research paradigm automatically choose a box out of the twelve presented in table 3.6. The combination of interpretive and direct observation approaches proposes four research strategies (see table 3.7): Action research, case study research, constructive research, and grounded research.

Table 3.7: Strategies for the selected philosophical research paradigm

Positivist/ Phenomenological dimension	Natural/ Artificial dimension	*Research Strategy*	Description
Interpretive	Direct observation	*Action Research*	It requires the researcher to become involved with the phenomenon under study. The researcher attempts to influence the situation in a positive direction while collecting data. Factorial design is not attempted.
		Case Study	It investigates a specific phenomenon through an in-depth, limited-scope study. Operations can be studied in natural setting and theory is generated directly from data. How and why questions. Applicable all over the research process (early stages as well).
		Constructive Research	It aims to produce solutions to explicit problems and it is closely related to the concept of innovative constructivism. An essential component is the generation of new learning and knowledge in the process of constructing the solution.
		Grounded Research	Large amounts of non-standard qualitative data has to be systematically analysed to draw out themes, patterns and categories. Theory is directly built from the phenomenon under study, without any previous assumption, model or concept.

Once that the decisions concerning the nature of the research (applied) and the philosophical research paradigm (interpretive/direct observation) have been made, one last decision is still remaining: The research strategy. These four strategies presented above have to be analysed, and the most appropriate strategy/strategies will have to be chosen. It is important to note that they are not opposite, two or more strategies can be used in the study.

The table below aims to clarify the implications of these four research strategies. The main characteristics and differences between them are described.

Table 3.8: Main characteristics of the research strategies (modified from Mendibil, 2003)

General characteristics	When to use?	Ensuring and judging the quality of the research
Action Research		
• Research in action • Researcher actively participates in the change process • Two aims: solve a problem and contribute to science • Seeks for situation-specific knowledge rather than universal knowledge • Holistic and contextual understanding of the phenomena • Requires and understanding of the ethical framework • Both qualitative and quantitative data collection methods used • Continuous cooperation between researcher and client personnel • Incremental theory building • Generalisation though conceptualisation of the particular experience and linking to theory	• When change is required to investigate about a contemporary phenomena in its real-life context • When describing an unfolding series of actions over time in an organisation • To understand as a member of a group 'how' and 'why' action can change or improve aspects of the system • To understand the process of change to learn from it • To build and test theory	•Systematic use of action research cycle •Rigorous and orderly data exploration process •Illustrate inferences with relative directly observable data •Combine advocacy with enquiry – subject assumptions to public testing •Make explicit sustainable change as a result of action research •Make explicit significance of work
Case Study Research		
•Descriptive or normative in nature •Both quantitative and qualitative methods used •Hard to separate analysis and interpretation from data gathering •Analysing and interpreting subjective procedures •Knowledge is rather constructed than discovered or found • Generalising on the basis of very limited number of cases • Generalising is not making statistical inferences from the sample but to generalise through deep understanding of the phenomena • Interviews adapt to the changing situations and requirements • Captures the core meaning and feelings of the informant	• When a contemporary phenomenon within its real-life context needs investigation to gain a better understanding of complex phenomena • When a 'what', 'how' or 'why' question is being asked about a set of events, over which the investigator has little or no control • To build a theory and test it • To produce a description	• The use of triangulation • Proper research design • Rigorous and accurate representation of empirical data • Finding rival explanations • Do pattern matching • Use a case study protocol • Develop a case study database • Use replication logic in multiple case studies • The reader is offered a chance independently to judge the merits, the validity, and the reliability of the analysis • Significant research outcome
Constructive Research		
•Normative in nature •Typically includes case studies •Both quantitative and qualitative methods used •Produces an innovative and theoretically grounded solution for a relevant problem •Uses a limited number of research objects	•When there is a need for an innovative and theoretically grounded solution for a relevant problem •When there is a concern about "how things ought to be in order to attain goals" – not "how things are"	The research outcome: •Relevant, simple, and easy to use •Practical relevance •Practical utility •Proved to be useful •Theoretical novelty •Link to theory •Also applicable in other environments.
Grounded Research		
• The structure used has to be derived from data • Qualitative methods are used • Produces a practically grounded solution or theory • Data analysis process is highly important • The researcher has to identify the concepts and variables, which are important understanding what is going on. • Research and analysis in qualitative data is about feel and honesty of the researcher	• When there is not an initial framework, model or concept supporting the findings • To build a theory	• Do pattern matching • Rigorous data analysis process • Rigorous and accurate representation of empirical data • Do conceptualisation of data

From the table above the first conclusion highlights the non-appropriateness of action research strategy for this study. The nature of this research does not allow carrying out any change process in an organisation, this study is not going to re-structure the inter-organisational relationships of an organisation. Time, accessibility and other types of resources make unviable such a considerable action plan.

On the other hand, application of grounded theory is not considered to be entirely suitable for this study. This research strategy leads the researcher to develop the framework and theory out of the data analysis process, new theory development arises from the data collected. The structure of this study is rather orientated to initially develop a theoretical model based on theoretical assumptions and then to refine it through data collection and analysis processes.

This last statement leads the author to choose either constructive research, case study research, or both.

As described before, the fourth research question of this study is focused on developing desirable relationships for organisations at a process level, based on the critical factors identified in the previous research questions. The nature of this outcome has a clear orientation towards describing 'how things ought to be in order to attain goals', that is, how relationships ought to be between organisations to achieve efficiency and competitiveness. This normative outcome would produce an innovative and theoretically grounded solution for a relevant problem'. It is foreseen that the outcome would be 'relevant, simple, and easy to use', it would have 'practical implications' and clear 'theoretical links'.

The characteristics of the content of the study, and the preferences of the author conclude selecting constructive research as the research strategy to carry out during this study. However, one of the characteristics of this strategy highlights the utility of case studies, so, it is decided to use both *constructive research* and *case study research* as combined research strategies for this study.

This second strategy will guarantee an appropriate answer to 'what', 'how', and 'why' type of research questions. Real scenarios will be analysed as a whole, adapting the data collection process to the nature of the case. A deep understanding of the phenomenon will enable to generalise the findings through a qualitative induction process.

The next step will have to design and describe the techniques used to carry out this constructive research through case study research. Specific procedures will have to be defined in order to ensure the reliability and generalisability of the conclusions and guarantee the general quality of the research.

3.6 Conclusions of the chapter

The objective of this chapter was to clarify the concept of research methodology and its implications in this study. To this end, the characteristics of a generic research methodology were described. The content and the proposition of the research question were analysed in order to define the methodological requirements of this study.

The next section coped with the classification of research types, the philosophical research paradigms and their assumptions that surround all research projects. It also described the specific research strategies which could be adopted for dealing with research questions.

This chapter concluded asserting that this study meets the characteristics of the *applied research*. It highlighted *interpretive* and *direct observation* approaches as philosophical research paradigms, and finally it selected the *constructive research* strategy through *case study research*.

The following chapter deals with research design issues as well as data collection and analysis techniques (i.e. methods, instruments) used during this study. This chapter will also describe the criteria used for ensuring the quality of the research and its conclusions.

4. RESEARCH DESIGN

This chapter copes with the research design developed for this study. To this end, the first section of this chapter will present the main theory concerning the research design. Then, it will analyse the design implications of the research strategies adopted for this study, i.e. constructive research and case study research.

The third section of this chapter will present the most common research methods grouped in three main families: Theory building methods, data collection methods, and data analysis methods. Another important outcome of this chapter will be the review of the quality criterion defined by some authors of the field.

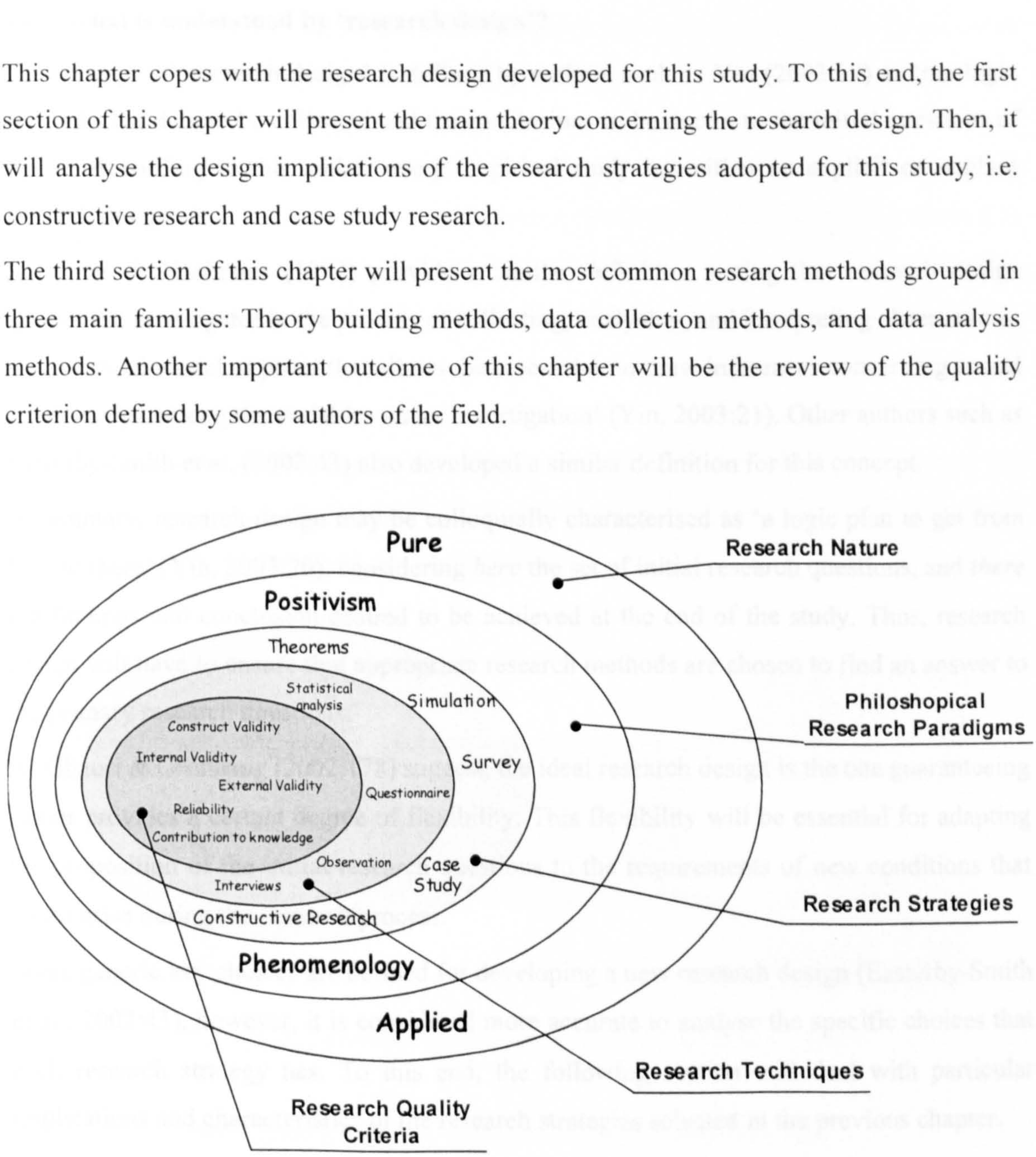

Figure 4.1: Research Methodology content (Modified from Saunders et al., 2000)

Finally, both the research methods and quality criterion adopted for this particular study will be presented. To this end, the main stages of this study will be identified and the methodological implications of each of these stages will be tackled.

The same figure (figure 4.1) that was used in Chapter 3 is shown to represent the fields of study for this chapter. It will tackle the areas in bright colours.

The importance of this chapter is highlighted by many authors in the research methodology field. As it will depict the detailed roadmap for linking the research questions to the final conclusions, it requires much attention for ensuring an accurate research process.

4.1 What is understood by 'research design'?

The concept of 'research design' is defined by authors such as Yin (2003:19) as 'the logic that links the data to be collected and the conclusions to be drawn to the initial questions of study'. According to this author every empirical study has either an explicit or implicit research design.

Nachmias & Nachmias (1992) provide a similar definition stating that research design 'guides the investigator in the process of collecting, analysing, and interpreting observations. It is a logical model of proof that allows the researcher to draw inferences concerning casual relationships among the variables under investigation' (Yin, 2003:21). Other authors such as Easterby-Smith et al. (2002:43) also developed a similar definition for this concept.

In summary, research design may be colloquially characterised as 'a logic plan to get from here to there' (Yin, 2003:20), considering *here* the set of initial research questions, and *there* the findings and conclusion desired to be achieved at the end of the study. Thus, research design will have to ensure that appropriate research methods are chosen to find an answer to the primary research questions.

As Ghauri & Gronhaug (2002:178) suggest, the ideal research design is the one guaranteeing rigour provides a certain degree of flexibility. This flexibility will be essential for adapting the proposition of the initial research questions to the requirements of new conditions that might arise during the research process.

Some generic key choices are defined for developing a new research design (Easterby-Smith et al., 2002:43), however, it is considered more accurate to analyse the specific choices that each research strategy has. To this end, the following section will deal with particular implications and characteristics of the research strategies selected in the previous chapter.

4.2 Implications of the research strategies of this study

Chapter 3 concluded highlighting constructive research and case study research as appropriate research strategies for this study. To this end, it analysed the nature of the study and the philosophical research paradigm that best meet the author's assumptions and beliefs.

The next section will analyse the features of these two research strategies. These features will influence the design of the research, so it is worth describing thoroughly the implications of these strategies.

4.2.1 Constructive research

Constructive research aims to build a construct which will solve a real problem (Kasanen et al., 1993). It has to be a new and distinctive contribution, and through its implementation it would be possible to migrate from the current situation to the defined and desired goal. Considered as applied research, it differs from action research in the final goal of the research project: While action research ends with a substantial change in the field where it is being implemented, constructive research does not mean generating any practical change. Constructive research just develops a contrasted solution to a problem, but does not carry out the actual process of change.

All problem-solving studies do not fulfil the characteristics of constructive research. A key feature of the constructive approach is that it links the initial research problem and the proposed solution with accumulated theoretical knowledge (Kasanen et al., 1993). Figure 4.2 shows the four main elements of this research strategy.

Figure 4.2: Elements of constructive research (Kasanen et al., 1993)

Kasanen et al. (1993) identify six generic phases in constructive research:

1. Find a practically relevant problem, which also has research potential.

2. Obtain general knowledge of the field.
3. Innovate (construct a solution).
4. Demonstrate that the solution works.
5. Show the theoretical connections and the research contribution of the solution concept.
6. Examine the scope of applicability of the solution

Lanning (2001) describes constructive research approach as a normative study, which typically requires case studies to enter the field. Thus, both quantitative and qualitative methods are of common application. The author also points that this research strategy uses a limited number of research objects.

According to Lanning (2001), there are two special circumstances that make constructive research appropriate for implementation, (1) when an innovative and theoretically grounded solution for a relevant problem is required, and (2) when 'how things ought to be in order to attain goals' is desired, rather than 'how things are'.

Constructive research usually involves case studies. This study will also give much importance to the case study research strategy, as it will be used both for theory building (among other research methods) and theory testing.

Next section will present specific details and features of this case study research strategy, as it required considerable resources and its outcome was highly relevant for this study.

4.2.2 Case study research

Robert K Yin is one of the most important exponents of the case study research strategy. Many other authors have based their research on Yin's book. This author defines case study research as:

> *'An empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident. The case study inquiry copes with the technically distinctive situation in which there will be many more variables of interest than data points, and as one result relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result benefits from the prior development of theoretical propositions to guide data collection and analysis.'* (Yin, 2003:13)

This definition highlights some key characteristics of this research strategy which are also outlined by other authors of the field. Table 4.1 gathers these key characteristics and the references that support the relevance of these characteristics.

Table 4.1: Key characteristics of Case Study research strategy

Characteristic	**Author(s)**
Context and phenomenon are studied	Johnston, Leach and Liu, 1999; Voss et al., 2002; Meredith et al., 1989, 1998; Eisenhardt, 1989; Yin, 2003; Gummesson, 2000; Stake, 1995
Temporal aspects are considered	Voss et al., 2002; Meredith, 1998; Yin, 2003; Gummesson, 2000
Multiple sources of evidence: Direct observation, interviewing, etc.	Voss et al., 2002; Meredith, 1998; Eisenhardt, 1989; Yin, 2003; Gummesson, 2000; Stake 1995
Single-case vs. Multiple-cases	Voss et al., 2002; Meredith, 1998; Eisenhardt, 1989; Yin, 2003; Gummesson, 2000
Provides description, theory building or theory testing	Voss et al., 2002; Meredith et al., 1989; Eisenhardt, 1989; Yin, 2003; Gummesson, 2000
Qualitative and/or quantitative	Meredith, 1998; Eisenhardt, 1989; Yin, 2003; Gummesson, 2000
What, how and why questions can be answered	Meredith, 1998; Eisenhardt, 1989; Yin, 2003; Gummesson, 2000

Positivist authors have often doubted about the validity of case study strategy for making research. Their main concerns have arisen from the lack of rigour that this approach might have during the data collection and analysis processes. This fact might affect both the reliability and generalisability of the conclusions, specially the validity of the new theory built. These potential weaknesses will be addressed in the section dedicated to assess the quality of the research.

The authors that support the characteristics of the case study strategy shown above also tackle some challenges that might arise during the case study process:

- Accessibility for direct observation of the phenomenon.
- Multiple research methods for triangulation are required.
- There is no control over the context under study.
- Personal attitudes play a key role during the data collection phase.

Case studies can be used for different types of research purposes such as exploration, theory building, theory testing, and theory extension/refinement (Voss et al., 2002). These four phases have a direct relationship with this study, so, the implications of case studies for each of the stages are analysed in the table 4.2 presented below.

Table 4.2: Matching research purpose with methodology (Voss et al., 2002)

Purpose	Research Question	Research structure
Exploration Uncover areas for research and theory development	Is there something interesting enough to justify research?	In-depth case studies. Unfocused, longitudinal field study.
Theory building Identify/describe key variables. Identify linkages between variables. Identify 'why' these relationships exist.	What are the key variables? What are the patterns or linkages between variables? Why should these relationships exist?	Few focused case studies. In-depth field studies. Multi-site case studies. Best-in-class case studies.
Theory testing Test the theories developed in the previous stages. Predict future outcomes.	Are the theories we have generated able to survive the test of empirical data? Did we get the behaviour that was predicted by the theory or did we observe another unanticipated behaviour?	Experiment. Quasi-experiment. Multiple case studies. Large-scale sample of population.
Theory extension/refinement To better structure the theories in light of the observed results	How generalisable is the theory? Where does the theory apply?	Experiment. Quasi-experiment. Case studies. Large-scale sample of population.

It was stated in the analysis of the constructive research strategy that a theoretically grounded construct was built in order to solve a practical problem (Kasanen et al., 1993). This table shows that case studies perfectly fit during the theory building process, that is, this strategy will be appropriate for building the construct closed to another theory building methods.

Yin (2003:21) highlights five components as relevant to design the case study research design:

1. a study's questions;
2. its propositions, if any;
3. its unit(s) of analysis;
4. the logic linking the data to the propositions; and
5. the criteria for interpreting the findings.

The first three components have already been described in previous chapters, thus, this chapter will cope with the last two components. The fourth feature will require justifying the way upwards from specific data collected and the methods for doing it to the initial research questions and their propositions. The last component will describe the patterns necessary for

analysing the nature of the findings. It will be useful for comparing the data collected to the construct to test, and if appropriate validate or refuse it.

More operationally, case research design requires making a set of specific decisions concerning the procedure of carrying out the case studies (Yin, 2003:39). These decisions will serve as a guideline for the researcher before he/she enters the field of study.

Authors such as Yin (2003), Voss et al. (2002), Gummesson (2000), Amaratunga et al. (2001) and Eisenhardt (1989) among others suggest three main decisions to make in order to give shape to the case studies:

1. Number of cases: Single or multiple.
2. Time context of cases: Longitudinal or retrospective.
3. Type of cases: Literal replication or theoretical replication.

The decisions made for this particular study will be described later in this chapter when the specific research design adopted for each stage is analysed.

At this point, both constructive research and case study research strategies have been analysed. Constructive research requires a theoretical construct to solve a problem. Case studies are appropriate for description, theory building, theory testing, and even theory extension/refinement. Case study research will be considered as both a method for building the construct (theory building) and a strategy for carrying out the data collection and analysis processes (theory testing and refinement).

Next section will present some of the methods available for building theory and testing it.

4.3 Research methods

Research methods are defined as the individual techniques for data collection, analysis, and so on (Easterby-Smith et al., 2002:31). Each philosophical research paradigm and research strategy has some characteristic research methods, for example, direct observation method will normally be implemented through a phenomenological approach and a case study strategy.

Considering the philosophical research paradigm and the strategies selected in Chapter 3, the methods that could be used in this study can be classified in three families: *Theory building methods*, *data collection methods* and *data analysis methods*.

Table 4.2 shows under these three classification levels the methods that this section will describe. It is worth to highlight that the boundary between these methods is not always very

clear (Yin, 2003), and rather than being opposite between them, they often overlap. Far from considering it a pitfall, this matter enriches the quality of the research.

Table 4.3: Portfolio of research methods

Theory Building	Data Collection	Data Analysis
Categorical aggregation Interpretation Identification of differences Replication logic Triangulation of data Enfolding theory Induction of data Deduction of data	Documentation Archival records Interviews Direct observation Participant observation Questionnaire Diary methods Survey	***Data reduction*** Documentation Coding ***Data display*** Tables Graphs ***Analysing data and drawing conclusions*** *Within-case analysis* *Cross-case analysis* Comparison of similar categories Comparison of pair of cases Division of data by data source

4.3.1 Theory building methods

There is a scarcity of formal methods for theory building compared with other methods for other phases of the research (Martinez, 2003). Martinez (2003) presented a compilation of different methods for building theory as a consequence of an extended literature review. Some of these methods may be considered as part of the case studies, however, it is worth analysing their implications.

- *Categorical aggregation*: This method aims to encompass different elements and concepts until a new insight arises from this association of ideas. Buckley (1976) compares knowledge with building blocks, and proposes to assemble different building blocks in order to create more complex structure to solve new problems (Martinez, 2003:59).
- *Identification of differences*: Also known as 'decomposition' this research method focuses on breaking a problem into its primary parts. Miles and Huberman (1994) highlights this method stating that it aims to split the variables which interact in a problem, helping this way on the conceptualisation of a new model (Martinez, 2003:60).
- *Replication logic*: This method has already been described in a previous section when analysing the choices that a researcher has to make in order to specify the typology of the case studies (single vs. multiple). Yin (2003:47) proposes two types of replications: (1) Literal replication, which is predicting similar results; and (2) theoretical replication, producing opposite results but for predictable reasons.

Both theory and data can be used for accomplishing this replication logic. This method is essential in case studies to gain external validity.

- *Triangulation of data*: This method aims to collect data over different sources, time and procedures (Easterby-Smith et al., 2002; Yin, 2003; Stake, 1995). The purpose of this practice is to ensure reliability of the construct. Reaching the same findings through different sources and procedures strengthens and provides consistency to the construct.
- *Enfolding theory*: According to Eisenhardt (1989) an essential characteristic of theory building is comparison of the new concepts and constructs with the current literature. This characteristic involves searching for similarities and contradictions, and understanding their explanation.

  Using contradictory findings ensures the quality of the final conclusions: It means that a wide scope of findings has been considered, and also contradictory findings may provide potential new insights and perspectives to analyse the problem.
- *Induction of data*: Buckley (1976) defines the data induction as the process by which theory is generated (Martinez, 2003). It involves finding a new particular theory from general issues.
- *Deduction of data*: Deduction method is opposite to the inductive process. It is the process that leads to the testing of new theory. It involves generalising issues from particular ones (Easterby-Smith et al., 2003:28).
- *Interpretation*: The purpose of this method is to try to understand the meaning behind the facts (Meredith et al., 1989), in this case the meaning behind the new insights or set of building blocks. According to Martinez (2003) this method is complementary to the categorical aggregation technique: The aggregation of existing concepts will require direct interpretation for achieving new findings.

The purpose of all these methods is to build a new theory which will address a different solution to a problem. Meredith (1993) identifies two pre-theory stages which may have a descriptive and explanatory content, do not fulfil the basic requirements defined by Dubin (1969) for a theory. According to Dubin (1969) a new theory has to fulfil requirements in order to be considered as theory (Meredith, 1993). There are the five requirements identified by Dubin:

1. Allows prediction or increased understanding.
2. Is interesting (i.e. non-trivial).
3. Includes attributes or variables and their interactions.

4. Does not include 'composite' variables (i.e. variables which include a number of other variables, elements, or attributes which are undefined).
5. Includes boundary criteria.

In the case that one of these characteristics is not fulfilled, a theory is considered to be a framework, or even a conceptual model (Figure 4.3).

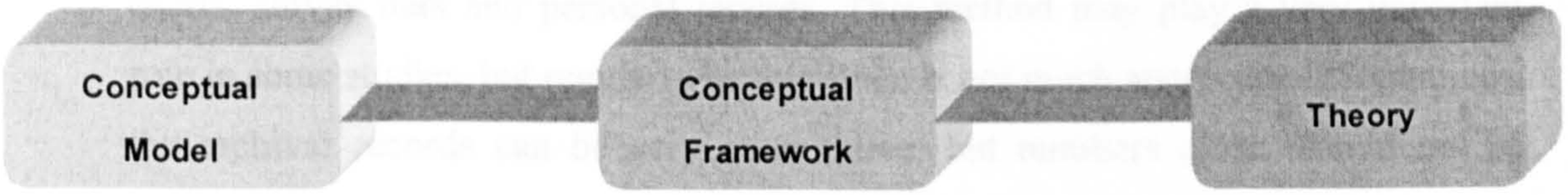

Figure 4.3: The way towards building theory

A conceptual model is primarily descriptive in its modelling of an event or phenomenon (Meredith, 1993). It may be well-structured or semi-structured, and the description may be highly simplified or extensive. An important feature is that a model does not explain why things happen.

The distinction between frameworks and the conceptual models is not the complexity of the model, but rather its explanatory power (Meredith, 1993). On the other hand, a theory may be as simple as a framework that satisfies Dubin's five requirements.

4.3.2 Data collection methods

To choose appropriate data collection methods will play a key role in the evolution of this study, and generally in every research. These methods will enable both to build theory and to test it, that is why they require a thorough process of selection.

An extended list of data collection methods is presented below. Some of these methods are considered to be quantitative (e.g. questionnaire, survey), they aim to collect basically numerical data, as they represent reality through descriptive variables (Stake, 1995:37). The rest of the methods meet the characteristics of a qualitative approach. The data collected is mainly non-numerical, and interpretation is required for understanding the nature of the phenomenon under study (Stake, 1995:37; Yin, 2003).

- *Documentation*: This method is focused on reviewing and processing all the relevant documents associated to the phenomenon under study (e.g. company annual reports, government reports, newspaper articles) (Stake, 1995). Internal documents such as memoranda, minutes of meetings, proposals, plans, and the like are likely to be required in order to track back events and intentions, both realised and unrealised,

over time (Barnes, 2001; Yin, 2003:85). Where such records exist, a researcher should gain accessibility to them. It is complicated to achieve this access.

Researchers relying on documentary evidence are advised to use triangulation to enhance data reliability and validity (Saunders et al., 1997 in Barnes, 2001).

- *Archival records*: Yin (2003:88) states that this method often takes the form of computer files and records such as service records, organisational records, maps and charts, survey data and personal records. This method may play a very important role in some studies, but regularly its relevance is not much appreciated. Sometimes, the archival records can be very quantitative, but numbers alone should not be considered a sign of accuracy.

- *Interviews*: This method is considered to be one of the most important sources of case study information (Yin, 2003:89; Stake, 1995). Qualitative interviews aim to collect first hand information (description and interpretation) from the experiences of the interviewee directly related to the phenomenon under study.

  Meredith et al. (1989) distinguish between intensive or unstructured interviewing, and structured interviews. Yin (2003:90) and Easterby-Smith et al. (2002:86) also use the same approach for classifying different types of interviews, therefore he proposes three types of interviews: Open-ended interviews, focused or semi-structured interviews, and structured interviews.

  These two classifications deal with the degree of openness of the questions asked to the interviewee. The more structured the interview, the more limited the questions are, hence, the chance to carry out an informal conversation with the interviewee is minimal.

  Yin (2003:92) highlights that interviews might be subject to problems of bias and inaccurate articulation. Triangulation of data sources is recommended to avoid this potential weakness.

- *Direct observation*: Direct observation method aims to collect data through making a field visit to the phenomenon (Yin, 2003:92). The analysis of the context in which the events occur may provide an additional source of data that any other method cannot deal with.

  This direct observation can differ from casual data collection method to formal ways of observation (Yin, 2003; Stake, 1995).

Impartialness of the researcher will be an essential requirement for this method. To increase reliability of observational evidence, Yin (2003:93) proposes to use multiple observers.

- *Participant observation*: Participant observation differs from direct observation by the fact that in the former researchers get involved in the events studied (Easterby-Smith et al., 2002:110; Yin, 2003:94). This method provides more opportunities for collecting data, but it involves major problems as well.

  The main feature of this method relies on the ability to gain access to events or groups that are otherwise inaccessible to scientific investigation. However, the researcher has less opportunity to work as an external observer, thus, objectivity of the data observed may be decreased through personal bias (Yin, 2003: 95).

- *Questionnaire*: This method has the benefit of greater efficiency for the researcher, as he/she has a pattern of fixed questions to follow (Barren, 2001). Key issues in this method are what questions to ask, in what form, and of whom.

  Easterby-Smith et al. (2002:133) and Barren (2001) distinguish three different types of questionnaires according to the nature of the questions:

  1. Closed questions: They require a yes/no answer from the interviewee.
  2. Likert scale: The answer considers a numeric scale (e.g. 1-5). The interviewee will be offered to choose one number on the scale. Each number on the scale will represent a specific answer (e.g. 1-Low, 2-Medium, 3-High)
  3. Open questions: The interviewee will be able to answer to the question in an unrestricted way, giving an extended opinion, thought, or idea.

  Some authors such as Easterby-Smith et al. (2002) identify this method as a quantitative method. Although the questionnaire may provide quantitative data, it should be stressed that this data may need to be interpreted through a qualitative analysis (Barren, 2001).

- *Diary methods*: The objective of diary methods is to keep the story line of the research (Easterby-Smith et al., 2002). The researcher has to keep writing notes about the events on a regular time basis. It is highly recommended for action research, and also for direct and participant observation.

- *Survey*: Survey method is considered to be one of the most important quantitative methods. It usually aims to assess causal relationships, hence, a deductive orientation is emphasised (Gill & Johnson, 2002:96). Such analytical survey approaches state

their link with the deductive approach by their emphasis on reliability in data collection and the statistical control of variables.

As a consequence of these characteristics, generalisability of the findings plays a key role in this method. Sample size, data collection procedures, analysis and measurement are the main factors of survey methods (Gill & Johnson, 2002:97).

Questionnaires and interviews are generally used for data collection (Easterby-Smith et al., 2002:135) in surveys. Surveys may have several limitations such as potential ambiguity of questions, lack of depth of data, and low ability to explain relationships between variables (Easterby-Smith et al., 2002).

As a summary, table 4.4 represents the strengths and weaknesses of the data collection methods described above.

Table 4.4: Strengths and weaknesses of the data collection methods (adopted and modified from Yin, 2003; Easterby-Smith et al., 2002; Barnes, 2001; Martinez, 2003; Mendibil, 2003)

Data collection method	Strengths	Weaknesses
Documentation	• Stable – it can be reviewed repeatedly • Exact content of data of events • Extended on time, events and settings	• Documents may be unavailable • Access can be restricted • Low reliability – potential bias of the observer
Archival records	• Primary data source • Precise and quantitative	• Access can be restricted
Interviews	• Effective for collecting large quantities of data • Do not require much time on site • Focuses on the topic of the case study • It can clarify misunderstandings	• Bias due to poorly constructed questions • Response bias – high subjectivity • The interviewee might answer what the interviewer wants to hear • Interviewing and analysing the data time consuming • Requires special skills
Direct observation	• Primary source of data, reality is observed • The context of the events is analysed	• Time consuming • The event may proceed differently because of the observation • Not broad coverage of samples
Participant observation	• (same as above for direct observations) • Insightful into interpersonal behaviour and motives	• (same as above for direct observations) • bias due to participant's manipulation of events
Questionnaire	• High time efficiency • Responses can be easily quantified and analysed	• Response bias • Not broad quantity of data • Questions can not be deep
Diary methods	• Broad and detailed information	• Difficult to analyse the data
Survey	• Broad sample size • Time efficient • Easy to collect the data • Responses can by statistically analysed	• Potential low rate of responses • Possible ambiguity of the questions • Lack of in-depth data

Before entering the field, it is suggested to plan all the data collection process designing a case study protocol (Yin, 2003:67; Eisenhardt, 1989). The objective of this protocol will be to continuously remind the researcher about the research questions, to keep the details of the data which is considered relevant for the study, and to prepare the researcher to tackle

potential problems which may arise on site. Typically a case study protocol contains (Yin, 2003:69):

- An overview of the case study project.
- Field procedures.
- Case study questions.
- A guide for the case study report.

The specific case study protocol used for this study will be described in chapter 7 (Theory Testing) when the actual fieldwork is presented.

Next section will deal with the methods used to analyse the data collected through the methods described above.

4.3.3 Data analysis methods

Eisenhardt (1989) describes the tactics for analysing data driven by the fact that people are poor processors of information. They reach conclusions based on limited data, they are influenced by own experiences, and they ignore basic statistical procedures. According to Eisenhardt (1989) the danger of data analysis relies on reaching premature and false conclusions as a result of these information-processing biases.

This phase of the research is considered to be the heart of building theory from case studies. At the same time, it is both the most difficult and the least codified part of the process. This statement is easy to understand when the researcher is forced to process thousand of field-notes to extract the final conclusions (Miles and Huberman, 1994).

It is highlighted by many authors that there are as many approaches to analyse data as researchers, however, some key features of analysis can be identified. Miles and Huberman (1994) distinguish three main activities in the data analysis process: *Data reduction*, *data display*, and *conclusion drawing and verification*.

- *Data reduction*: Miles and Huberman (1994) state that is extremely hard to process great quantity of data. Especially qualitative methods for data collection (see section 4.3.2) gather huge amounts of data which require thorough interpretation. It is necessary to reduce this data in order to gain efficiency and effectiveness. *Documentation* and *coding* are two techniques for reducing data in a reliable and accurate way.

  Documentation technique suggests creating a detailed report of the fieldwork after each visit to the site. The structure of the report can be similar to the case study

protocol, this way it gains coherence and a standard format. This standardised structure will enable inter-comparison between reports of different cases. Contact summary sheets, site analysis meetings or document summary forms can be some examples of the documentation technique (Miles and Huberman, 1994).

On the other hand, *coding* refers to linking specific codes or numbers to a segment of words. This technique allows the researcher to create some pattern of categories and as a consequence, reduce the data. Comparison between codified events becomes more structured and visual (Miles and Huberman, 1994; Glaser and Strauss, 1967).

- *Data display*: A recommended technique for analysing data relies on representing it in a visual format which allows the researcher to reproduce the data in a standard way (Miles and Huberman, 1994). This way, the researcher may gain both clarity of the data and comparison between cases in a structured and graphical manner. Formats such as, listings, charts and matrixes are the most common for displaying the data (Miles and Huberman, 1994).

- *Analysing data and drawing conclusions*: Eisenhardt (1989), Amaratunga et al. (2001) and Voss et al. (2002) among others recommend two steps in analysis, analysis *within-case* data, and searching for *cross-case* patterns.

  Within-case analysis typically involves thorough case study write-ups for each site (Eisenhardt, 1989). There is not a formal procedure or structure for this analysis, but normally these write-ups are focused on pure descriptions of the facts. The main idea in the within-case analysis is to become familiar with the particular data obtained in each case, and initiate shaping the first conclusions. An effective within-case analysis will accelerate the cross-case comparison.

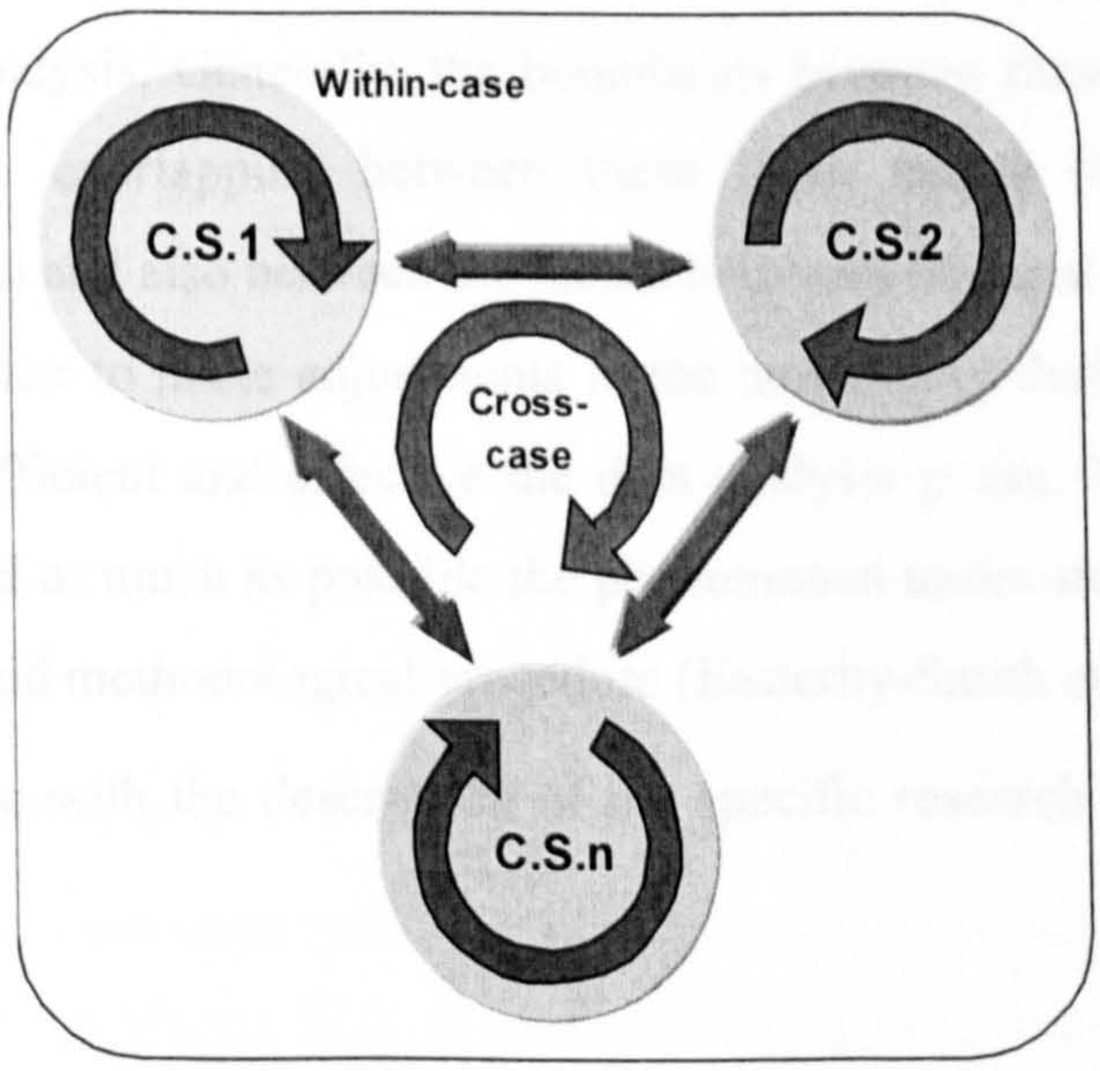

Figure 4.4: Within- and cross-case analysis

Cross-case analysis aims to look for similarities and differences among all the cases. It plays a key role enhancing generalisability of the conclusions extracted from the individual cases in the within-case analysis stage (Voss et al., 2002). There are three strategies to carry out this search for common patterns among the cases (Eisenhardt, 1989):

1. Comparison of similar categories: It focuses on selecting similar categories or dimensions, and then look for within-group similarities coupled with intergroup differences. Dimensions can be stated by the research problem or by existing literature.

2. Comparison of pairs of cases: It is based on selecting pairs of cases and then listing the similarities and differences between each pair. These comparisons might create new sophisticated understandings that the researcher did not foresee.

3. Division of data by data source: The third strategy relies on classifying the data according to the data source. For example, all the data obtained through a questionnaire would be compared together, while the data collected through the interviews would be analysed independently.

The idea behind the cross-case analysis technique aims to force the researcher to seek for new insights and impressions that cannot be realised through an individual analysis of each case.

This section has described the research methods that can be used for theory building, data collection and data analysis. Generally, the boundaries between these methods are clearly established. However, overlapping between these three stages (theory building, data collection and analysis) and also between the methods is very frequent (Yin, 2003). This fact may allow the researcher to make adjustments in the new theory during the data collection stage, making more efficient and effective the data analysis phase. The objective of these phases is to understand as much as possible the phenomenon under study and not to limit its perception due to a rigid methodological procedure (Easterby-Smith et al., 2002).

Next section will cope with the description of the specific research methods used in each phase of this study.

4.4 Research design for this study

This section will first present the general structure and the phases of this study. This will allow the author to identify the research methods used in each of the principal phases of this research.

4.4.1 Structure of the study

Four main phases can be distinguished in this research: *Pre-understanding* stage, *theory building* stage, *theory testing* stage, and finally, *research evaluation* stage (Figure 4.5).

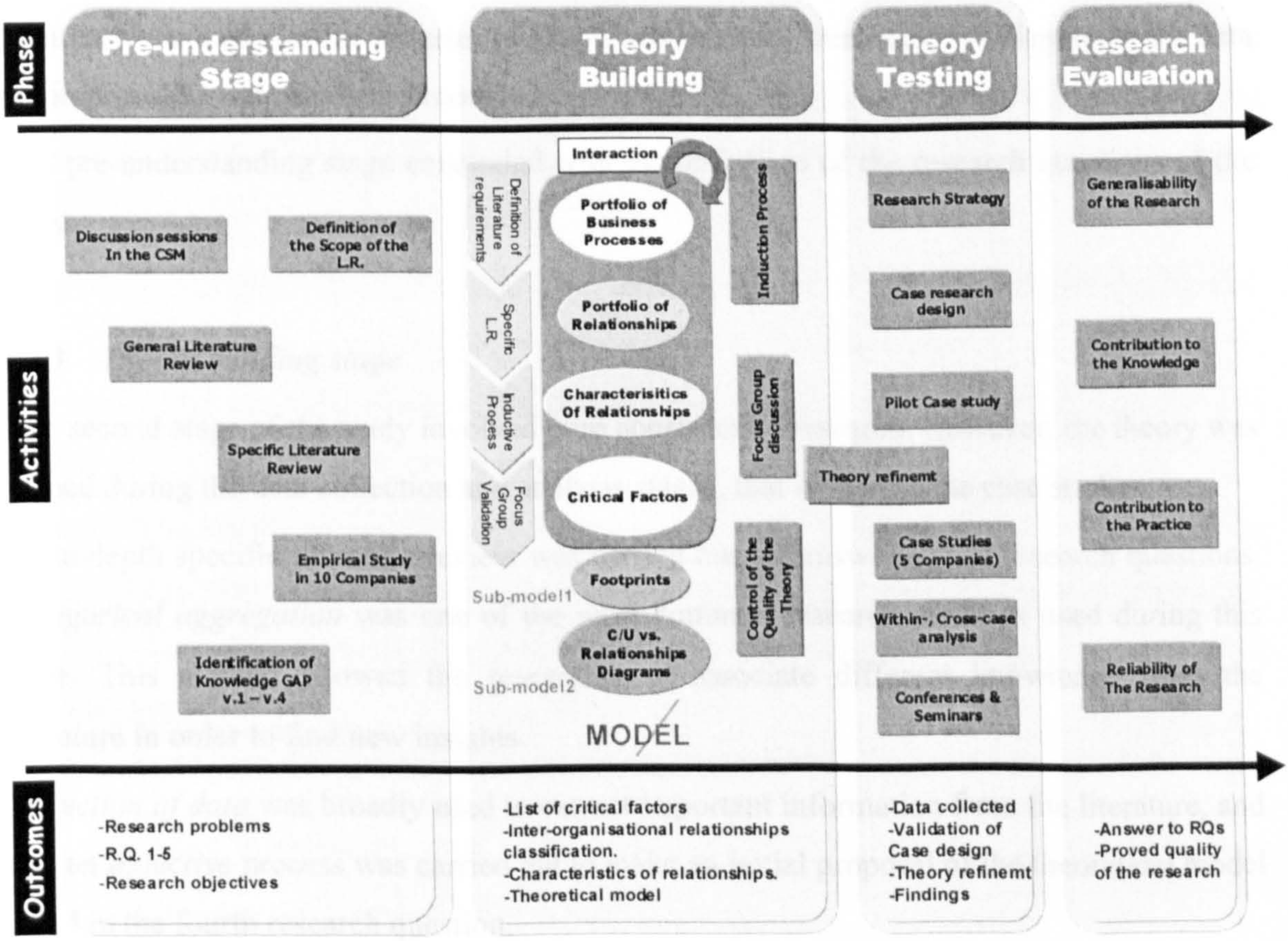

Figure 4.5: Structure of the study

Each of these stages required specific research methods for its accomplishment. Each stage will be briefly analysed and the main research methods used will be identified.

4.4.2 Pre-understanding stage

This study started with a pre-understanding stage where two main activities were carried out: The review of the literature in the field, and an exploratory study involving 10 companies.

After some *informal discussions* and *meetings* with experts of the field, the scope of the literature was identified. This allowed the author first to carry out a general literature review, and secondly to focus specifically on topics of high interest through a specific literature review (Chapters 1 and 2).

The initial findings of the literature review were corroborated through empirical case studies in 10 companies. A research protocol was designed to this end, and also a *quantitative questionnaire*. *Semi-structured interviews* were carried out with managers of the organisation involved, they provided some *documentation*, and *observation* of the sites was possible.

Both *within-case* and *cross-case* (*comparison of similar categories)* analysis were used to process the data collected during this pre-understanding stage. As the data was both quantitative and qualitative, a series of *charts* and *matrixes* were used for displaying the data and improve the data analysis process.

This pre-understanding stage concluded with the definition of the research questions of the study.

4.4.3 Theory building stage

This second stage of the study involved pure constructive research. However, the theory was refined during the data collection and analysis stages, that is, during the case studies.

An in-depth specific literature review was carried out for answering the research questions.

Categorical aggregation was one of the most common research methods used during this stage. This method allowed the researcher to associate different knowledge from the literature in order to find new insights.

Deduction of data was broadly used to extract important information from the literature, and also an *inductive* process was carried out to make an initial proposal of the theoretical model asked in the fourth research question.

Replication logic and *triangulation of data* were also used for building theory. All these methods would miss much of their sense if the researcher did not build the construct using his personal *interpretation*.

4.4.4 Theory testing stage

Case studies were carried out in five organisations for testing and validating the construct built in the theory building stage. It has been stated before that overlapping between both theory building and theory testing is common and also recommendable (Yin, 2003). In this

particular case this overlapping existed. It was stated that a direct study of the phenomenon provides many clarifying ideas. As a consequence, after carrying out a pilot case study, theory was adjusted and new insights were added to the construct built in the previous stage. The remainder of the case studies (five) aimed to test both the initial and the new construct.

A case study protocol was designed initially to start the case studies. A *qualitative questionnaire* was created to be filled by the managers of the organisations. Once the researcher was in the field, *semi-structured interviews* were carried out with several managers of the organisations. Access to *documentation* of the companies and *direct observation* was viable in most cases, and also personal notes were collected from all the visits.

The amount of qualitative data was considerable after all the case studies were accomplished. The researcher *documented* all the data collected after each case study, and also *transcribed* all the interviews as they were recorded with the permission of the interviewees.

The data was *graphically displayed* in order to facilitate the cross case-analysis. To this end, a set of charts and matrixes were built. Finally, the data was analysed through both *within-*, and *cross-case* methods. *Comparison of similar categories*, and *division of data by data source* were developed to do the cross-case analysis.

A final comparison between the two constructs proposed (i.e. the initial one developed in the theory building stage, and the second proposed after the pilot case study) was carried out. Based on the cross-case method, a *comparison of similar categories* was done between these two constructs.

All the research methods described in these three stages (Pre-understanding, theory building and theory testing) are shown in table 4.5.

4.4.5 Research evaluation

This last stage plays a key role in this and every research. It aims to assess the quality, reliability and generalisability of the findings and the conclusions. Another objective of this stage is to assess the contribution to the knowledge and also to the practice, as the nature of this research meets the characteristics of *applied* research.

Due to the high relevance of this stage, it has been considered necessary to dedicate a section apart for a better analysis of the implications of the evaluation of the study.

Table 4.5: Research methods used in this study

Pre-understanding	Theory building	Theory testing
Exploratory study – data collection Quantitative questionnaire Semi-structured interviews Direct observation Documentation	***Constructive research*** Categorical aggregation Deduction of data Induction of data Replication logic Triangulation of data Interpretation	***Data collection*** Qualitative questionnaire Semi-structured interviews Direct observation Documentation
Data analysis Data display: Charts and matrixes Within-case Cross-case: Comparison of similar categories	***Case study research*** Overlapping practice was used for theory refinement (Yin, 2003). To this end, the methods shown in 'theory testing' column were used	***Data analysis*** Transcriptions of the interviews Data reduction: Documentation Data display: Charts and matrixes Within-case Cross-case: Comparison of similar categories; division of data by data source Comparison of constructs: Comparison of similar categories

4.5 Criteria for assessing the quality of the research

The purpose of defining these criteria is to assess the quality of the research process and the final outcomes. This evaluation will be carried out in chapter 9, however, it is recommended by researchers to define at the beginning of the research the measures that will be used to validate it.

The criteria necessary for this study will be conditioned by the research strategies adopted in the research design. As has been described, this research will be based on constructive research and case study research. Table 4.6 shows the criteria associated to each of these research strategies and the authors that support them.

Table 4.6: Criteria for evaluating the research strategies

Research Strategy	Criteria	Reference
Constructive research	Relevant, simple, an easy to use Practical relevance Practical utility Proved to be useful Theoretical novelty Link to theory Applicable in other environments	Kasanen et al., 1993; Lanning, 2001; Martinez, 2003; Mendibil, 2003
Case Study research	Construct validity Internal validity External validity Reliability Contribution to knowledge	Yin, 2003; Easterby-Smith et al., 2002; Eisenhardt 1989, Kasanen et al., 2003; Stake, 1995; Meredith, 1998; Voss et al., 2002 Martinez, 2003; Mendibil, 2003; Amaratunga et al., 2001

Both groups of criteria will merge in table 4.7 in order to unify these criteria and work with just one list. To this end, the classification proposed by Martinez (2003) will be followed as a guideline.

Table 4.7: Criteria for assessing the quality of this study (adopted and modified from Martinez, 2003)

Code	Criterion
1	Rigour of the research process **1.1** Construct validity **1.2** Internal validity **1.3** External validity **1.4** Reliability
2	Evidence to support the construct (*Link to theory*)
3	Contribution to knowledge (*Theoretical novelty*)
4	Contribution to practice (*Practical relevance; Practical utility*)
5	Application of the construct in other environments

This list of criteria will be considered throughout all the research process. The tactics implemented to meet the requirements defined by these criteria will be presented punctually in each chapter, depending on the necessities of the research. Chapter 9 will cope with an extended analysis of the final evaluation of this study.

4.6 Conclusions of the chapter

This chapter has dealt with the design of the research methods selected during this research process. The chapter described the characteristics of the research strategies selected (i.e. constructive research, and case study research) and the research methods associated with them. To this end, an extended list of theory building, data collection, and data analysis methods was presented.

This chapter also coped with the structure and the different phases that this research study encompasses. This allowed the author to identify the research methods used during each of the phases of this study.

Finally, the quality criteria which will be used to evaluate this research were presented. This last section will be expanded in chapter 9.

Next chapter will aim to address an appropriate answer to the research questions defined in chapter 2. To this end, it will analyse the particular implementation of the research methods selected to build the construct and the theory associated to it (theory building).

5. COLLABORATION LEVELS AND THEIR CRITICAL FACTORS

Chapter 2 ended with the definition of the research objectives of this study, and the research questions (RQ) that will be necessary to answer in order to fulfil these objectives. The following two chapters (i.e. chapters 3 and 4) described an appropriate research methodology that will lead the author to find a solution to these questions and propositions, and to support it.

This chapter plays a key role on the way towards building the theory required to answer the research questions and their propositions. As a reminder, these were the propositions defined in section 3.3 and their link to the research questions:

Prop.1 – To agree a portfolio of generic inter-organisational relationships *(RQ1)*.

Prop.2 – To define the characteristics that make each collaboration level different *(RQ2)*.

Prop.3 – To identify the critical factors that make possible to develop one certain collaboration level *(RQ3)*.

Prop.4.1 – To analyse the features of business processes in a collaborative environment *(RQ4)*.

Prop.4.2 – To design the desirable relationships depending on the critical factors *(RQ4)*.

Prop.4.3 – To build a model that graphically represents the desirable relationships and their characteristics *(RQ4)*.

The nature of the first three propositions (i.e. to agree, to define, and to identify) suggests to carry out an exploration of the current literature to answer the research questions associated to them. On the other hand, the propositions linked to the fourth research question involve a more constructive approach, that is, the researcher will have to develop a new construct (Kasanen et al., 1993) to fulfil the objectives stated by the propositions. As a conclusion, it

can be deduced that the methodological requirements for these two approaches will be different.

Same way, it can be observed that the outcome of the propositions one to three serves as the input for the rest of the propositions. Thus, it can be concluded asserting that the findings of RQ1-3 will be used to answer RQ4 (see figure 5.1).

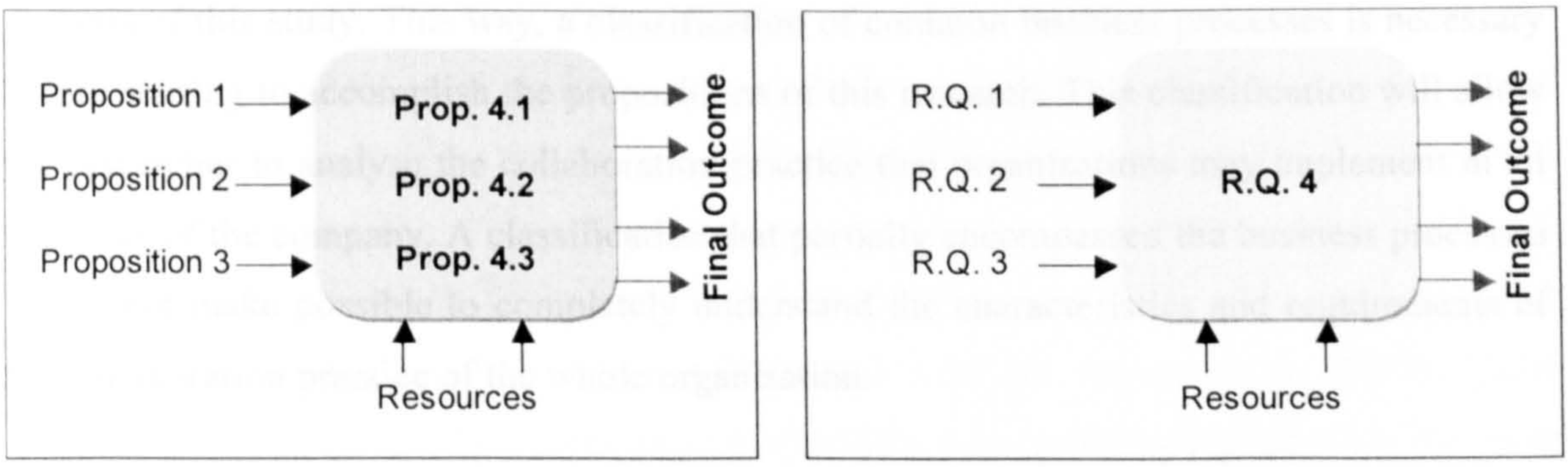

Figure 5.1: Relationship between the propositions (left) and link between the RQ's (right)

These two facts led the author two split the theory building phase into two parts in order to give a different treatment to both specific literature exploration and constructive approaches. The first part, this chapter, will cope with the first three propositions. The second part, chapter 6, will tackle the rest of the propositions, that is, the fourth research question.

Thus, this chapter aims to address an answer to the first three research questions. Through this, it will create the theoretical base necessary to support the fourth research question. Before starting to develop the propositions, it is compulsory to review the configuration of the unit of analysis[1] of this study, that is, the business processes. This will facilitate the comprehension of the scope of the propositions in this and the next chapters.

Once that a portfolio of generic business processes is presented, this chapter will describe the research carried out to accomplish each proposition. Finally, it will finish presenting the bridge between the findings of this chapter and the requirements of the fourth research question and its propositions.

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[1] Chapter 1 concluded stating that the business processes of the organisation are the unit of analysis of this study, as it was demonstrated in the conclusions of the empirical study presented in chapter 2.

5.1 A review of Business Processes

Chapter 2 ended stating that collaboration between organisations is carried out at a business process level. This means that an organisation and its supplier may collaborate developing a joint product, or they may do the same supplying material according to some specific settings.

Based on this conclusion, the organisational business processes were identified as the unit of analysis of this study. This way, a classification of common business processes is necessary before starting to accomplish the propositions of this research. This classification will allow the researcher to analyse the collaboration practice that organisations may implement in all the areas of the company. A classification that partially encompassed the business processes would not make possible to completely understand the characteristics and requirements of the collaboration practice of the whole organisation.

A business process is perceived as a horizontal chain of activities (Childe et al., 1994, Maull et al., 1995). According to Davenport and Short (1990), a business process is defined as 'the logical organisation of people, materials, energy, equipment and procedures into work activities designed to produce a specified end result' (Childe et al., 1994). These two authors also highlight two characteristics of business processes:

- A business process always has a customer that gets an outcome out of it.
- They cross organisational-boundaries and are generally independent of organisational structures.

Hickman (1993) provides a similar description of business processes defining them as 'a logical series of dependent activities which use the resources of the organisation to create, or result in, an observable or measurable outcome, such as a product or service'. Childe et al. (1994) add to these definitions that a business process must be initiated by and must provide results to a customer, who may be internal or external.

These definitions lead this researcher to outline some generic characteristics of a business process:

- It is a series of interlinked activities.
- It requires tangible and intangible resources of an organisation.
- It always generates and outcome.
- A (potential) customer is at the origin and end of it.

Although some authors defend that each organisation should customise its own business process classification, the generic models may be seen to facilitate the identification of core processes and the construction of process-oriented management models (Childe et al., 1996). This study will adopt a generic model that will enable the researcher to generalise and extend the conclusions of this research to any organisation. A customised business process model will jeopardise the generalisability of the findings (Yin, 2003; Eisenhardt, 1989, amongst others).

Three generic business process models (also architectures) were reviewed for the purposes of this study: Porter's classification (Porter, 1985); CIM-OSA architecture (AMICE, 1989); and VSM (Beer, 1979, 1981, 1985). There are other reference architectures such as, ENV 40 0003 (CEN, 1990), ARIS (Scheer, 1992), PERA (Williams, 1992, 1994) and GERAM (Bernus and Nemes, 1994; Williams, 1995) were analysed (Smart et al., 1999). These models do not substantially present any considerable difference among them, so, the most used architectures were selected for analysis.

A short description of the characteristics and implications of each architecture will lead to select an appropriate model for this study.

Porter (1985) proposes a general classification identifying 'primary' and 'support' activities. The 'primary' are considered to be value-adding activities from an external customer perspective. On the other hand, 'support activities' are those that enable the 'primary activities' to function (Childe et al., 1996).

The other two architectures provide a more detailed classification of business processes. The particular characteristics of these architectures are presented in the next sections.

5.1.1 CIM-OSA architecture

The CIM-OSA standard is a widely recognised framework around which to configure the business processes of organisations (AMICE, 1989). This architecture takes Porter's 'primary' and 'support' activities and proposes a third type of activity: Manage activities (AMICE, 1989; Childe et al., 1994; Childe et al., 1996; Bititci and Turner, 1999; Bititci and McCallum, 2003). This way, CIM-OSA framework considers 'Operate' processes, 'Manage' processes and 'Support' processes.

- Operate processes: These processes encompass the activities that are directly responsible of satisfying the requirements of the external customer. As it is shown in figure 5.2, four generic operate processes are 'demand generation', 'product development', 'order fulfilment', and 'product support' (Smart et al., 1999).

- Manage processes: Those processes that are related to the strategy, direction setting and business planning and control of the organisation. As Bititci and McCallum (2003) state, 'although the operate-processes create value, it is the manage-processes that sustain competitive advantage by recognising and responding to changes in their internal and external environment either through maintaining and developing a winning formula or through identifying and changing to a winning formula' (see figure 5.2).

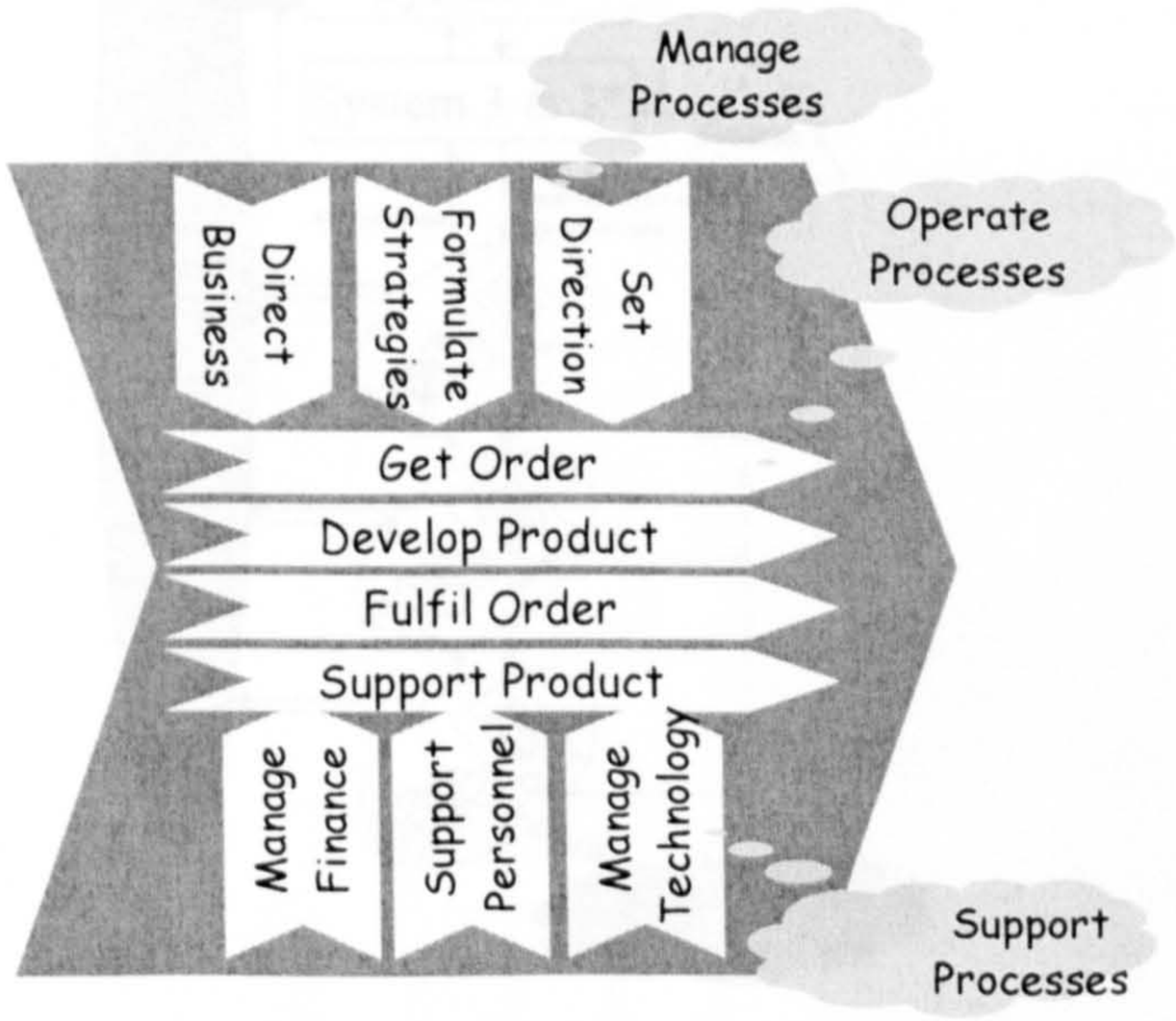

Figure 5.2: Business process architecture based on CIM-OSA model (Bititci and Turner, 1999)

- Support processes: This third set of processes play the role of supporting the 'operate' and 'manage' processes of the organisation. Typically they include processes for financial, personnel, and technological management (see figure 5.2).

5.1.2 Viable System Model (VSM)

Beer (1979, 1981, 1985) developed the concept of viability of an organisation to survive in the middle of a dynamic and changing environment (Bititci et al., 1999). He highlighted the capability to adapt to continuous challenges as a key feature of this concept of viability. To this end, Beer developed the Viable System Model (VSM), a business-process architecture that defines the components required by an organisation to be a viable system.

At a basic level, VSM proposes two different sets of activities, productive and management functions. Productive functions are known as SYSTEM 1s in the model. They are responsible of producing goods and services for which the organisation exists (Bititci et al., 1999). On the other hand, the management functions aim to manage the productive activities.

Figure 5.3 shows the graphical representation of VSM. VSM split the management functions into five main activities. Basically it differentiates between four management activities, and considers a fifth function as a supervisory system.

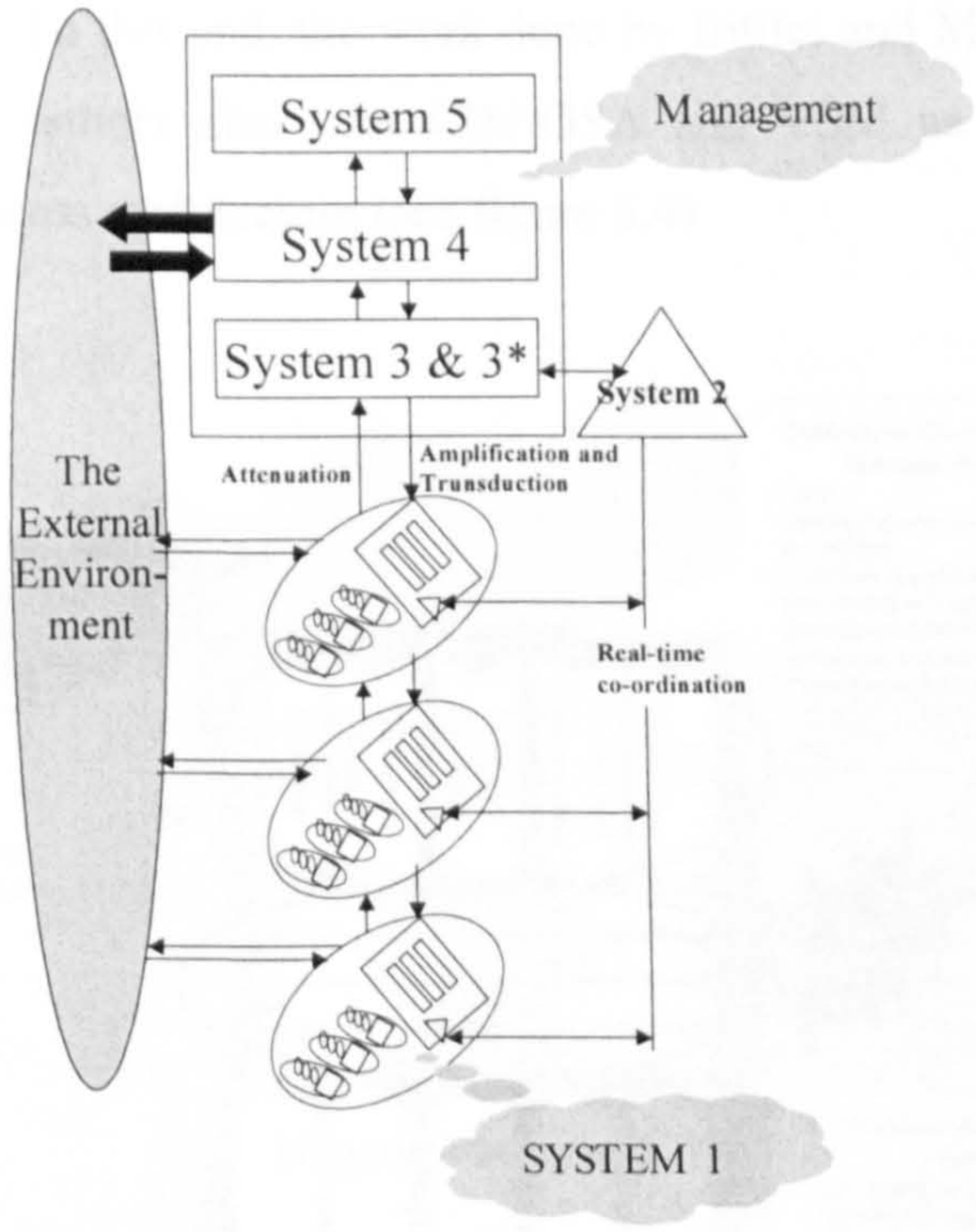

Figure 5.3: The Viable System Model (Bititci and McCallum, 2003)

- System 5: It is the core of the management activity. It defines the direction, the policy and strategy of the organisation.
- System 4: It is the developmental system. It is in charge of analysing the external environment, and aims to improve the system focusing on this external information.
- System 3: This system is responsible of the tactical management, which manages the operations tasks of the productive function (System 1).
- System 3*: It is responsible of linking system 3 and system 2, and provides an audit channel between the system 1 and system 3.
- System 2: This system is in charge of supervising and co-ordinating the activities of operational units in real time. It is often considered an independent system from management functions.

Figure 5.3 also shows more than one System 1 for the same organisation. It is normal to find more than one unit of production in the same company. This feature will be an additional challenge for the management functions.

5.1.3 A mid architecture between CIM-OSA and VSM

The configuration and characteristics of both CIM-OSA and VSM have been described so far. Both have substantial differences, therefore, the author aims to find an architecture that encompasses the strengths of both models, and also meets the features of the classification made by Porter (1985). To this end, the work done by Bititci and McCallum (2003) is used as a guideline. These authors also take CIM-OSA and VSM as the basis for an own-developed business-process architecture (see figure 5.4).

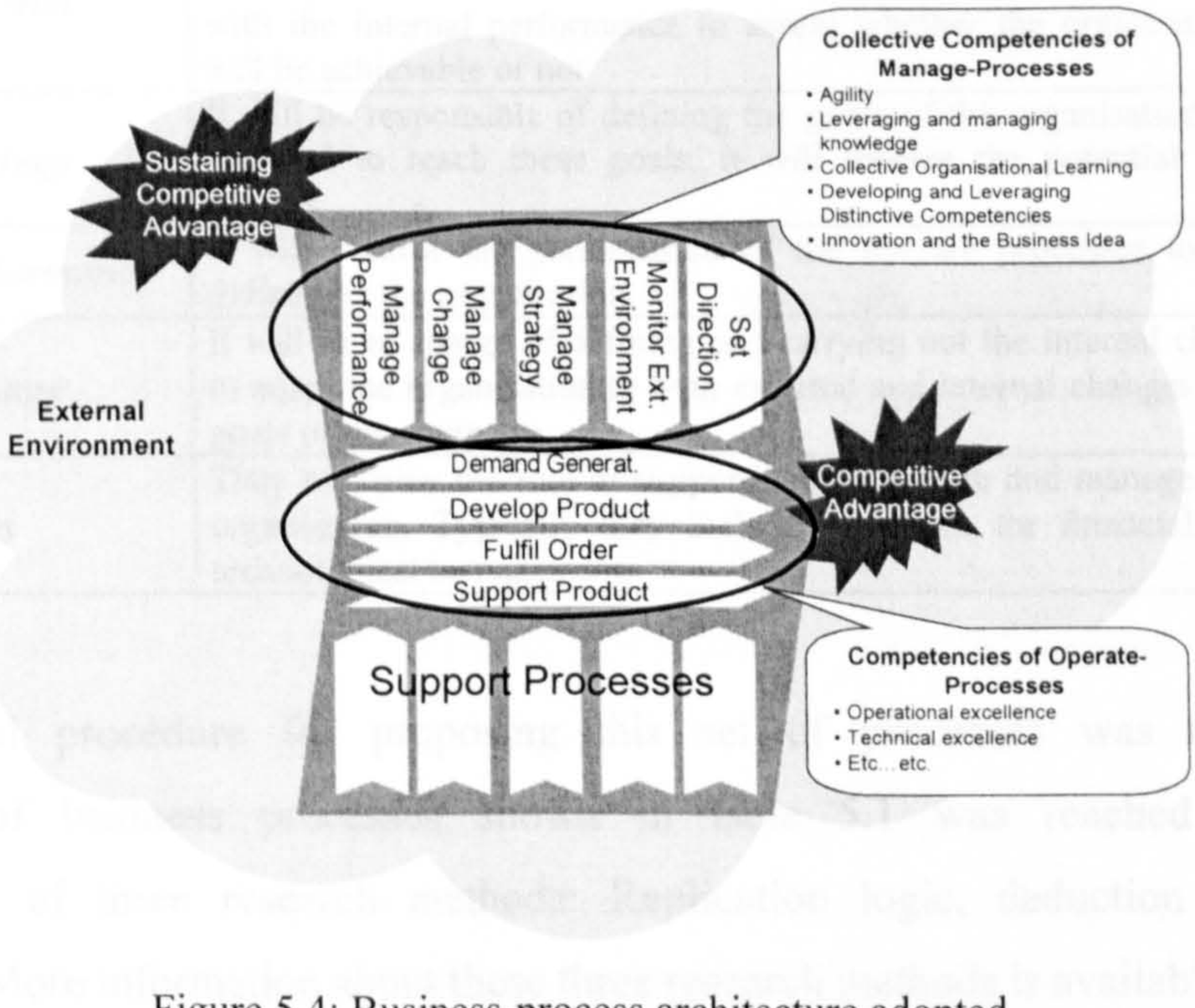

Figure 5.4: Business-process architecture adopted for this study (Bititci and McCallum, 2003)

This architecture proposes three basic processes as CIM-OSA model does: Operate, Manage, and Support processes.

The classification of operate processes remains the same, differentiating between 'demand generation', 'product development', 'order fulfilment', and 'product support'. Same thing can be said concerning the support processes. On the other hand, both CIM-OSA and VSM are merged to define more specific management processes.

Table 5.1 presents the final list of processes that this study is going to use in advance. A brief description of each process can be also found in the same table.

Table 5.1: Classification and description of the processes used in this study

	Process	Description
Operate	*Demand Generation*	It will be responsible of reaching new orders for the organisation. To this end it will collect the specifications of the customers and also analyse the trends pf the market.
	Product Development	It will be in charge of processing the requirements of the customer and the market and transforming them into a viable product or service.
	Order Fulfilment	This process encompasses all the activities required to delivery the product or service to a final customer according to the specification defined in the new product/service order.
	Product Support	It will consider the activities necessary to ensure an after sale product service according to the requirements of the customer.
Manage	*Set Direction*	It aims to identify the future environment in which the organisation can achieve its aims.
	Monitor External Environment	It analyses the characteristics of the external environment and compares them with the internal performance to assess whether the organisational objectives will be achievable or not
	Manage Strategy	It will be responsible of defining the goals of the organisation and the actions required to reach these goals. It will foresee the potential impact of these actions.
	Manage Performance	It will control the performance of the operate processes towards the goals defined by the organisation.
	Manage Change	It will be in charge of defining and carrying out the internal changes necessary to adapt the organisation to both external and internal changes according to the goals of the company.
Support Processes		They will play the role of supporting the operate and manage processes of the organisation. Typically they include processes for financial, personnel, and technological management.

The operational procedure for proposing this set of processes was rigorous. The classification of business processes shown in table 5.1 was reached through the implementation of three research methods: Replication logic, deduction of data, and interpretation. More information about these three research methods is available in chapter 4.

Replication logic (Yin, 2003:47) was used to gather as many evidences as possible in order to enforce the results of this exploratory study. Aggregation of several approaches from different authors (Childe et al., 1994; Maull et al., 1995; Smart et al., 1999, amongst others) allowed the author to identify some features common to all of these approaches.

Deduction of data (Easterby-Smith et al., 2002:28) was another method used to process all the data gathered through the replication logic. This second method enabled the author to draw specific findings and conclusions from general issues of the literature.

Finally, direct *interpretation* played an essential role to analyse the requirements and results of the other two research methods.

The generic business-process architecture led this study to deal with the first three propositions and research questions defined in chapter 2 and 3, and at the beginning of this chapter. At this point this list of processes played a key role in the answer to the research

questions because it was stated that this research was going to be focused on a business process level. To this end, next section will aim to investigate the first proposition:

Prop.1 – To agree a portfolio of generic inter-organisational relationships *(RQ1)*.

5.2 Analysis of Collaboration levels

One of the conclusions stated in the pre-understanding stage (chapter 2) highlighted that there was a misunderstanding concerning the collaboration levels (also inter-organisational relationships) between organisations both in the literature and among practitioners.

The literature reviewed showed that there were as many classifications of collaboration levels as authors. At the same time, it was stated that some concepts were often mixed and a broad terminology was used to describe some basic concepts. As a result, it was complicated to deduce a clear and agreed portfolio of inter-organisational relationships.

The empirical study carried out during that stage also outlined a lack of understanding about collaboration practice among practitioners. There was no a clear insight of the different collaboration levels that organisation could develop. Although the concept of external integration was found to be familiar between practitioners, actual differences and boundaries between different integration levels were unclear.

In order to clarify this misunderstanding surrounding the concept of inter-organisational relationships, this research proposes to carry out an exploratory (also descriptive; Meredith, 1993, 1998) study of the current references in the field. To this end, the work of an extended list of authors will be reviewed and an agreed portfolio of relationships will be proposed.

5.2.1 Research methods

The research methods used in this first part of the theory building phase included four main techniques: Replication logic, deduction of data, induction of data, and interpretation.

External validity, that is generalisation of the findings, was gained through theoretical *replication logic* (Yin, 2003:47). To this end, several authors' work was reviewed, and different classifications of inter-organisational relationships were analysed.

The data was taken from theory, mainly from books, websites and journals. The identification of several references allowed generalising the conclusions of this first proposition.

Theoretical replication logic facilitated a considerable amount of data. It was necessary to extract particular conclusions from all this data. Therefore, *deduction of data* was used as a

research method. These particular conclusions led the author to propose a portfolio of organisational relationships that would encompass all the findings of this exploratory study. While deduction of data was useful to extract particular conclusions from general issues, the opposite process was now necessary, i.e. generalising issues from particular findings. The research method selected to this end was *induction of data*. These three research methods were supported by the direct *interpretation* of the author.

Other techniques such as *comparison of similar categories*, and *comparison of pare of cases* were also used for the *cross-reference analysis* of the theoretical data collected through the replication logic.

Next sections cope with the actual implementation of these research methods. It will first make an extended review of the theoretical sources related to the field of inter-organisational relationships.

5.2.2 Review of collaboration levels

Collaboration was defined in the pre-understanding stage (chapter 2) as the act of working with another group of people to create or produce an outcome. However, this is a too broad and generic definition as there might be hundreds of ways of working together (Lopez et al., 2004). Kanter (1994) uses the metaphor of a man/woman couple to explain the different levels of collaboration that an organisation may present.

There are several stages in a human relationship before marriage, the furthest level of relationship (Kanter, 1994). Each of these stages will involve different features, e.g. the risk that marriage involves will differ from that of a couple that only meets for having some drinks once a week.

The same deduction may be done for an organisational environment. Relationships between organisations may considerably differ from firm to firm depending on several factors. However, what are the relationships that an organisation may have?

Mighell and Jones (1963) refer to the concept of vertical co-ordination as the transaction carried out within the supply chain. These authors distinguished between four production and marketing stages: The market-price system; vertical integration; contracting; and co-operation, both singly or in combination. The first two stages are radically opposed: The market-price system is focused on a vendor relationship, that is, a pure material/money transaction. On the other hand, vertical integration refers to the own production of the goods required, without any external relationship. Finally, contracting and co-operation are in the

mid-way between these two extremes. They are based on different ways of alliances with external entities.

Based on this work, Hobbs (1996) proposed a much more detailed portfolio of relationships. This researcher differentiated between four main types of relationships: Spot market relationship, strategic alliance, formal written contract, and vertical integration.

This classification differed from the previous one in the sub-classification that Hobbs proposes for formal written contracts and vertical integration. Thus, three types of formal written contracts can be found: Market specification contracts, production-management contracts, and resource-providing contracts.

Something similar is proposed for vertical integration, splitting this relationship into quasi-vertical integration, tapered-vertical integration, and full-vertical integration.

Stevens (1989) presented the concept of integration both within an organisation and externally. He highlighted the internal integration as a previous stage toward external integration. To this end, the author differentiated between baseline organisation, functional integration, and process integration as three different levels of internal integration. These three stages focused on the type of internal flow of information within the organisation (i.e. departmental configuration, functional configuration, and process configuration). Once that process integration was achieved, Stevens proposed to tackle external integration.

Sako (1992) and Lamming (1993) dealt with two opposite relationship levels, arm's-length contractual relation (ACR) and obligational contractual relation (OCR). The first style considered an adversarial relationship between customer and supplier, based on price and little sharing of risks. On the other hand, OCR aimed to maintain a closer relationship between customer and supplier throughout an enriched flow of information, sharing benefits and risks, or trust.

Rich and Hines (1997) proposed three relational styles, very similar among them. The first one emphasized the development of long-term partnerships based on trust and benefits/risk sharing. The second focused on the development of a structured process of information exchange between organisations within the supply chain. Finally, the third approach was inspirited on the Japanese lean-supply network.

Spekman *et al.* (1998) developed a classification of four stages. (1)Open market negotiation was the first stage: Price is the feature used to take decisions, and relationship between customer-suppliers is adversarial. (2)Next relationship is based on co-operation: Long-term relationship starts being common, and suppliers' quantity lower. (3)The third relationship proposed by Spekman et al. (1998) was focused on the co-ordination among organisations

within the supply chain. In this stage, not only information sharing between companies is necessary, but also system (processes, resources) sharing. (4)The final relationship modality was collaboration among partners. Collaboration basically involved relationship at strategic, tactical and operational levels, sharing benefits and risk.

Transaction cost theory (TCT), resource-based theory (RBT), and strategy-structure theory (SST) is the differentiation that Hoyt et al. (2000) make in their classification of relationships. Basically, transaction cost theory encompasses the features of the arm's-length relationship, based on price, opportunism and no other contact but a material/money transaction. RBT is focused on long-term relationships founded on a win-win premise with a core group of suppliers. As a third stage, SST highlights a systematic and dynamic view of the supply chain in order to develop more efficient information transfer systems.

Meenakshi Sundaram and Mehta (2002) developed three decisions-taking models depending on the relationship style existing among the companies. While analysing the possible relationships among organisations, they differentiated between independent approach, semi-integrated approach and integrated approach. Basically these classification did not differ from other authors' approaches presented before.

Rather than analysing the whole range of relationships, Lewis (1990) coped just with a specific type of them: organisational alliances. He proposed a list of five different modalities of alliances, informal alliances, contractual alliances, minority investments, joint ventures, and strategic network.

The informal alliances involve minimal risks, as there is no considerable commitment between partners. Contractual alliances require major risks, although they will be arranged just for a project time. Minority investments have the same operational links as contractual alliances, however, multiple projects are involved here. Like minority investments, joint ventures build long-term mutual interests and give each partner an equity investment. Finally, strategic network encompasses all the rest of kinds of alliances.

Kanter (1994) carried out a similar research focusing exclusively on co-operative arrangements: This way, she proposed a range of four degrees of co-operation: Mutual service consortia (e.g. clusters), joint ventures, value-chain partnerships and collaboration. Although the terminology is completely different, Lewis and Kanter coped with similar concepts. They both described different degrees of partnership between two or more organisations that decided to work together.

Fontenot and Wilson (1997) analysed the spectrum of business-relationships from a marketing perspective. They described up to seven relationships types, ranging from pure

opportunistic transactions (arm's-length style) to vertical integration. Between these two poles, these researchers identified other relationships such as, repeated transactions, long-term relationships, buyer-seller partnerships, strategic alliances and network organisations. There are two main drivers that differentiate these seven relationships:

1. - Lower stages just involve the activity of purchasing of goods, whereas upper stages focus more on other *type of services* (e.g. product development).

2. - *Time commitment* is higher in upper stages.

Cousins and Spekman (2003) described two levels of classifications that are complementary among them. First, they highlighted two opposite clusters: Opportunistic relationships and Collaborative relationships. Opportunistic relationships are focused mainly on short-term price reduction technique; the strategy is to create a competitive advantage via leveraging the supply market but only on the ability to extract a price concession. On the other hand, Collaborative relationships aim to sustain cost reduction along long periods of time. Time-to-market improvement and access to new technologies are other features that this cluster pursuits.

Secondly, based on the work done by Harland et al. (1999), Cousins and Spekman (2003) highlighted other three types of relationships, differentiating between dyadic linkage (pair of organisations), chain or pipeline of supplies, and finally network structure of supply.

Merging both classifications, it can be stated that opportunistic behaviour will be a feature of dyadic linkage and vice versa.

Gray (1996) in Huxham (1996) tackled the concept of joint agreements. Again it can be concluded that behind this new terminology relies the same concepts analysed by Lewis (1990) and Kanter (1994). Gray identified four types of agreements between organisations: Public-private partnerships, joint ventures, R&D consortia, and labour-management cooperatives.

Tyndall et al. (1998) talked about a shift in the level of intensity between trading partners. In order to describe these levels of intensity, these authors present three different stages: Co-operation, co-ordination, and collaboration. The basic stage, co-operation, involves a rich exchange of information and long-term contracts. On the other hand, co-ordination requires exchange of workflow and information in a manner that JIT-systems and EDI can operate. Finally, collaboration takes place when organisations have a joint planning system, they share technology and there is organisational integration.

According to Webster (1992) (Lemke et al., 2003), the relationship between manufacturers and suppliers could take many forms. This can be seen on a continuum ranging from purely

discrete transactions at one end, to long-term relational exchanges between interdependent partners at the other. While Webster proposed one type of partnership, Lambert et al. (1996) (Lemke et al., 2003) suggested three types: Short-term partnership, long-term partnership, and long-term partnership with no end. Also these authors described a basic buyer/seller relationship called arm's-length, and vertical integration as the other extreme of the spectrum. They proposed joint ventures as the stage before vertical integration.

Lamming et al. (2000) carried out an extended review of the different classifications of supply network. They analysed a total of seven references that coped with the concept of network.

1. Grandori and Soda (1995) differentiated between network forms according to their characteristic mix of co-ordination mechanisms. They identified three types of network: (1) Social network, such as parity-based personal network; (2) bureaucratic network such as trade associations and consortia (e.g. clusters); and (3) proprietary network such as joint ventures and capital ventures.
2. Rosenfeld (1996) focused on the object of exchange as the criteria for classification. He distinguished between 'hard' network in which three or more firms join forces to perform together, and 'soft' network in which groups of firms form in order to solve common problems or share information.
3. Hinterhuber and Levin (1994) proposed different criteria for network classification based on the direction or orientation of networks. They differentiated between horizontal, vertical, and diagonal networks.
4. Focusing on the level of joint creation and strategic alignment of the actors, Campbell and Wilson (1996) described two level of networks: Social and value-creating network.
5. Snow and Miles (1992) classified networks according to the concept of 'network dynamic'. As a consequence, these authors distinguished Internal, Stable, and Dynamic networks.
6. Based on the integration of both ownership and co-ordination, Robertson and Langlois (1995) proposed two types of networks, Japanese Kaisha and Venture capital.
7. Finally Cravens et al. (1996) identified four types of network – 'flexible', 'hollow', 'virtual', and 'value-added' – according to the dimensions of volatility of environmental change and the type of inter-organisational relationship involved (collaborative or transactional). Furthermore, they identify the variations in factors

such as market structure, technological complexity and core competency of the co-ordinating organisation.

Hill (1995) defined customer-vendor relations as the most basic linkage between organisations. Then, he proposed other three relationships that involve a higher interaction between companies: Long-term contracts where predictability and assurance is increased; joint ventures when companies have similar needs and a separate entity is sponsored by them to satisfy these needs; and, non-equity-based collaboration. This last relationship provides the means of establishing co-operative working arrangements. Such arrangements include R&D consortia, cross-marketing agreements, or cross-production agreements.

Porter (1985) coped with the concept of contractual integration. To this end, he defined three basic types of integration. (1) Tapered integration involves partial integration backward or forward in the supply chain. The company purchases the rest of the services/products on the open market. (2) Quasi-integration is the establishment of a relationship between vertically related businesses that is somewhere in between long-term contracts and full ownership. Finally, (3) full integration involves total ownership of the related business.

Cox and Lamming (1997) focused on a different approach to classify relationships. They differentiated between the looped chain where the customer is also a supplier to the supplier; lateral links where the supplier is a supplier to both the customer and another supplier; and dependencies where the performance of one supplier is intrinsically linked to that of another. The highlighted networks as an alternative to the supply chains. Firms involved in a network play several roles simultaneously.

Yu et al. (2001) proposed three level of external integration according to the situations of information sharing and ordering information co-ordination. This way, the first level, also called decentralised control, shows a lack of information sharing and there is no co-ordination between manufacturer and supplier. Level two, referred as coordinated control, is based on controlling the inventories through real information of the demand. Finally, centralised control involves the implementation of an EDI system in order to share all the information along the supply chain.

Coughlan et al. (2003) identified four configurations of joint-performance between organisations. Despite they do not offer any additional characteristics of these four stages, these are the relationships defined: Co-operation, co-ordination, collaboration, and networking.

Depending on the levels of certainty and dependency, Harland et al. (2004) proposed four types of relationships. At a basic level they identified traditional/adversarial relationship.

Opportunistic behaviour was the next approach of their relational spectrum, and two degrees of collaboration, tactical and strategic, were the other to relationships highlighted by these authors. The first two relationships present a buyer/vendor type of linkage, whereas tactical and strategic collaboration involved close performance among organisations.

Table 5.2 shows all the classifications described so far.

Table 5.2: Review of organisational relationships

Reference	**Stages of collaboration defined**								
Mighell and Jones (1963)	Market price system		Vertical Integration		Contracting		Cooperation singly or in combination		
Hobbs (1996)	Spot market	Strategic alliances	Formal written contracts			Vertical Integration			
			M.S.	P.M.	R.P.	Quasi-	Tapered-	Full-	
Stevens (1989)	Baseline Org.	Functionally integrated Co.	Internally integrated Co.			Externally integrated Co.			
Sako (1992) and Lamming (1993)	ACR		OCR						
Rich and Hines (1997)	Long-term relationship		Information-flow relationship			"Lean" Supply network			
Spekman et al. (1998)	Open Market Negotiation	Co-operation	Co-ordination			Collaboration			
Hoyt et al. (2000)	TCT		RBT			SST			
M.S. and Mehta (2002)	Independent approach		Semi-integrated approach			Integrated approach			
Lewis (1990)	Informal alliances	Contractual alliances	Minority investments			Joint Ventures		Strategic Network	
Kanter (1994)	Mutual service consortia (e.g. clusters)		Joint Ventures			Value-chain partnerships		Collaboration	
Fontenot et al. (1997)	Transactions	Repeated transactions	Long-term relationships	Buyer-seller partnerships		Strategic alliances		Network organisations	Vertical Integration
Cousins et al. (2003)	Opportunistic					Collaborative			
	Dyadic		Chain			Network			
Gray (1996)	Public-private partnerships		Joint Ventures			R&D consortia		Labour-management co-operatives	
Tyndall et al. (1998)	Co-operation		Co-ordination			Collaboration			
Webster (1992) in Lemke et al. (2003)	Transactions		Repeated Transactions			Long-term Relationships		Buyer-seller partnerships (Mutual total dependence)	
Lambert et al. (1996) in Lemke et al. (2003)	Arm's Length	Partnerships				Joint Ventures		Vertical Integration	
		Short-term	Long-term	Long-term with no end					
Grandori and Soda (1995) in Lamming et al. (2000)	Social network		Bureaucratic network			Proprietary network			
Rosenfeld (1996) in Lamming et al. (2000)	Hard network					Soft network			
Hinterhuber and Levin (1994) in Lamming et al. (2000)	Internal network		Vertical network			Horizontal network		Diagonal network	

Campbell and Wilson (1996) in Lamming et al. (2000)	Social network		Value-creating network	
Snow and Miles (1992) in Lamming et al. (2000)	Internal network	Stable network		Dynamic network
Robertson and Langlois (1995) in Lamming et al. (2000)	Japanese Kaisha		Venture capital	
Cravens et al. (1996) in Lamming et al. (2000)	Flexible network	Virtual network	Hollow network	Value-added network
Hill (1995)	Customer-vendor	Long-term contracts	Joint Ventures	Non-equity-based collaboration
Porter (1985)	Tapered Integration	Quasi Integration		Full Integration
Cox and Lamming (1997)	Looped chain	Lateral links	Dependencies	Network
Yu et al. (2001)	Decentralised	Co-ordinated		Centralised
Coughlan et al. (2003)	Co-operation	Co-ordination	Collaboration	Networking
Harland et al. (2004)	Traditional/adversarial	Opportunistic behaviour	Tactical collaboration	Strategic collaboration

5.2.3 Analysis and comparison of collaboration levels

The creation of table 5.2 facilitated the cross-reference analysis task and it was essential for comparing similar categories (Eisenhardt, 1989). An appropriate comparison of all these references will help finding a pattern of relationships that considers the individual approach of each reference. To this end, a conceptual model of relational strategies was taken from the literature as a reference to compare the propositions of all these authors.

Many authors give much importance to the decision about maintaining the performance of core competencies internally, and outsource or use external sources to carry out other activities: i.e. Strategic decisions on **make**[2] or **buy**[3] (Spina et al., 2000; McIvor and Humphreys, 2000; Fill and Visser, 2000; Probert, 1996; Manders and Brenner, 1995; Stuckey and White, 1993; McIvor et al., 1997; Spina and Zotteri 2001).

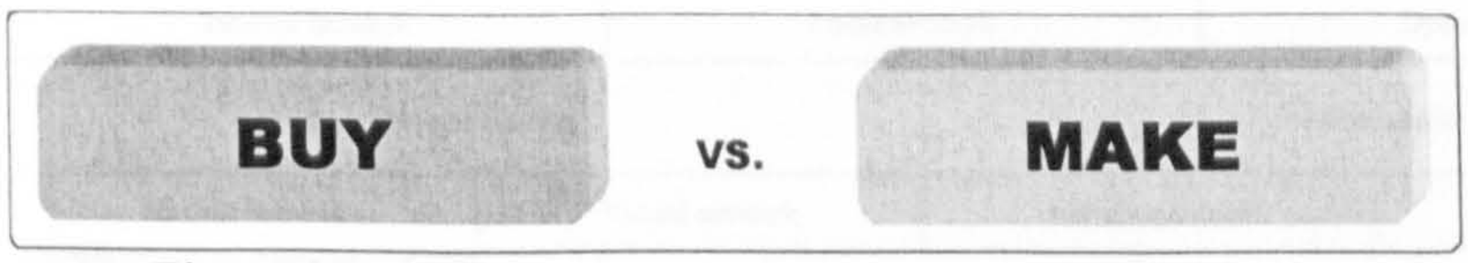

Figure 5.5: Make vs. buy strategy for cross-case analysis

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[2] When all the production, distribution, selling and other economic processes required are carried out within a single firm (McIvor and Humphreys, 2000; Spina and Zotteri 2001).

[3] There is no more commitment than the transaction carried out between both sides.

Many researchers have defended this approach as a relational strategy (e.g. cost theory of Williamson, 1975) for decades. Each of these strategies will be associated to particular types of relationships. Analysing the nature of these two strategies, it can be deduced that this two opposite strategies can be located at the two extremes of the spectrum of relationships.

It would be necessary to compare this make/buy approach with all the references reviewed above in order to assess whether the relationships described support these strategies or not. In case that the references do it, it will be concluded that "buy" strategy will be at one of the poles of the relationship types, and at the other "make" strategy. To this end, the relationships that present the same nature as "buy" strategy will be represented in green colour, and the ones that support "make" strategy in red (see table 5.3). This will be a basic way to code the relationships.

Table 5.3: Identification of relationships that support make/buy strategy

Reference	Stages defined						
Mighell and Jones (1963)	Market price system	Contracting	Cooperation singly or in combination	Vertical Integration			
Hobbs (1996)	Spot market	Strategic alliances	Formal written contracts			Vertical Integration	
			M.S.	P.M.	R.P.	Quasi-	Tapered-	Full-
Stevens (1989)	Baseline Org.	Functionally integrated Co.	Internally integrated Co.			Externally integrated Co.		
Sako (1992) and Lamming (1993)	ACR		OCR					
Rich and Hines (1997)	Long-term relationship		Information-flow relationship			"Lean" Supply network		
Spekman et al. (1998)	Open Market Negotiation	Co-operation	Co-ordination			Collaboration		
Hoyt et al. (2000)	TCT		RBT			SST		
M.S. and Mehta (2002)	Independent approach		Semi-integrated approach			Integrated approach		
Lewis (1990)	Informal alliances	Contractual alliances	Minority investments		Joint Ventures		Strategic Network	
Kanter (1994)	Mutual service consortia (e.g. clusters)		Joint Ventures		Value-chain partnerships		Collaboration	
Fontenot et al. (1997)	Transactions	Repeated transactions	Long-term relationships	Buyer-seller partnerships	Strategic alliances	Network organisations	Vertical Integration	
Cousins et al. (2003)	Opportunistic				Collaborative			
	Dyadic		Chain		Network			
Gray (1996)	Public-private partnerships		Joint Ventures		R&D consortia		Labour-management co-operatives	
Tyndall et al. (1998)	Co-operation		Co-ordination		Collaboration			
Webster (1992) in Lemke et al. (2003)	Transactions	Repeated Transactions	Long-term Relationships		Buyer-seller partnerships (Mutual total dependence)			
Lambert et al. (1996) in Lemke et al. (2003)	Arm's Length	Partnerships			Joint Ventures	Vertical Integration		
		Short-term	Long-term	Long-term with no end				
Grandori and Soda (1995) in Lamming et al. (2000)	Social network		Bureaucratic network		Proprietary network			
Rosenfeld (1996) in Lamming et al. (2000)	Hard network				Soft network			
Hinterhuber and Levin (1994) in Lamming et al. (2000)	Internal network	Vertical network			Horizontal network	Diagonal network		
Campbell and Wilson (1996) in Lamming et al. (2000)	Social network				Value-creating network			
Snow and Miles (1992) in Lamming et al. (2000)	Internal network		Stable network		Dynamic network			
Robertson and Langlois (1995) in Lamming et al. (2000)	Japanese Kaisha				Venture capital			
Cravens et al. (1996) in Lamming et al. (2000)	Flexible network	Virtual network	Hollow network	Value-added network				
Hill (1995)	Customer-vendor	Long-term contracts	Joint Ventures	Non-equity-based collaboration				
Porter (1985)	Tapered Integration		Quasi Integration		Full Integration			
Cox and Lamming (1997)	Looped chain	Lateral links	Dependencies	Network				
Yu et al. (2001)	Decentralised		Co-ordinated		Centralised			
Coughlan et al. (2003)	Co-operation	Co-ordination	Collaboration	Networking				
Harland et al. (2004)	Traditional/adversarial	Opportunistic behaviour	Tactical collaboration	Strategic collaboration				

It can be seen that some authors support the approach of make vs. buy as two extremes of the range of relationships. However, it is meaningful that only 7 and 16 relationships out of a list of 111 are supporting make strategy (vertical integration) and buy strategy (transactional relationship) respectively. Thus, what do the rest (80%) of the relationships refer to?

Among other researcher, Spina and Zotteri (2001) identified a "third way" for redefining the make or buy strategy: Ally.

When a firm does not want to lose its operational flexibility integrating vertically some activities (make) or on the other hand, when market opportunism of a transactional relationship is not desired (buy), as it was described in chapter 2 there is the alternative to arrange close relationships. Alliances, partnerships, networks or joint ventures are some of the examples that support this third strategy.

Analysing table 5.3, it is deduced that the relationships in white colour support the "ally" relational strategy. As a conclusion, it can be asserted that buy/ally/make approach encompasses all the range of relationships that companies may arrange. This statement can lead the author to induce that organisations must adopt one or more of these three strategies for their performance.

5.2.4 Joined classification of collaboration levels

An initial range of three relational strategies has been deduced in the previous section: To buy, to ally, and to make. However, it is necessary to translate these strategies into the common terminology of relationships presented above in table 5.2.

"Buy" strategy was supported by these references through this terminology (see table 5.4):

Table 5.4: Relationships that support "buy" strategy

Strategy	Relationship	Reference
BUY	Market price system	*Mighell and Jones (1963)*
	Spot market	*Hobbs (1996)*
	Baseline Org.	*Stevens (1989)*
	ACR	*Sako (1992) and Lamming (1993)*
	Open Market Negotiation	*Spekman et al. (1998)*
	TCT	*Hoyt et al. (2000)*
	Independent approach	*M.S. and Mehta (2002)*
	Transactions	*Fontenot et al. (1997)*
	Repeated transactions	*Fontenot et al. (1997)*
	Opportunistic	*Cousins et al. (2003)*
	Transactions	*Webster (1992) in Lemke et al. (2003)*
	Arm's Length	*Lambert et al. (1996) in Lemke et al. (2003)*
	Customer-vendor	*Hill (1995)*
	Decentralised	*Yu et al. (2001)*
	Traditional/adversarial	*Harland et al. (2004)*
	Opportunistic behaviour	*Harland et al. (2004)*

Analysing table 5.4, it is proposed that the relationship that meets the characteristics of "buy" strategy, that is, the linkage that does not involve high commitment or other similar features will be known as **transactional relationship**.

Following the same procedure with "make" strategy, these are the authors that support this approach as a potential organisational relationship, and the terminology that they use for referring to it (see table 5.5).

Table 5.5: Relationships that support "make" strategy

Strategy	Relationship	Reference
MAKE	Vertical Integration	*Mighell and Jones (1963)*
	Quasi-vertical Integration	*Hobbs (1996)*
	Tapered-vertical Integration	*Hobbs (1996)*
	Full-vertical Integration	*Hobbs (1996)*
	Vertical Integration	*Fontenot et al. (1997)*
		Lambert et al. (1996) in Lemke et al. (2003)
	Full Integration	*Porter (1985)*

Table 5.5 clearly shows that the relationships that supports "make" strategy should be known as **vertical integration**.

The previous section showed that the 80% of the relationships identified by all these authors could be group under "ally" strategy, a strategy on the mid way between "buy" and "make". Analysing thoroughly these 88 relationships, it is extremely difficult to identify a standard relationship that groups the characteristics of the rest of the relationships. Joint ventures, networks, alliances, short-term agreements or information-flow relationships present completely different features and approaches.

However, Spekman et al. (1998), Tyndall et al. (1998), and Coughlan et al. (2003) proposed a range of relationships that might encompass the characteristics of all the relationships linked to "ally" strategy: **Co-operation**, **co-ordination**, and **collaboration**.

These three relationship levels represent different relational intensities, that is ally strategy will be stronger in a collaboration relationship than in a co-operation one. It is necessary to ensure that these three categories encompass all the 80% of the relationships of table 5.2. that do not belong to neither "make" nor "buy" strategy. To this end, the description of all the relationships will be reviewed again and their features will be interpreted to assess whether they meet the characteristics of any of these three relationships or not.

A comparison of similar categories was done contrasting pair of references (Eisenhardt, 1989). The results of this process were collected in table 5.6. This table shows the classification of the relationships according to the characteristics of co-operation, co-ordination, and collaboration.

Table 5.6: Classification of relationships that meet "ally" strategy under "co-operation, co-ordination, and collaboration" approach

Generic Relationship	Relationship	Reference	Relationship	Reference
Co-operation	Contracting	*Mighell and Jones (1963*	Labour-management cooperatives	*Gray (1996)*
	Co-operation singly or in combination	*Mighell and Jones (1963*	Co-operation	*Tyndall et al. (1998)*
	Formal written contracts	*Hobbs (1996)*	Repeated transactions	*Webster (1992) in Lemke et al. (2003)*
	Information-flow relationship	*Rich and Hines (1997)*	Short-term partnerships	*Lambert et al. (1996) in Lemke et al. (2003)*
	Co-operation	*Spekman et al. (1998)*	Tapered integration	*Porter (1985)*
	Informal alliances	*Lewis (1990)*	Quasi integration	*Porter (1985)*
	Mutual service consortia (e.g. clusters)	*Kanter (1994)*	Looped chain	*Cox and Lamming (1997)*
	Dyadic	*Cousins et al. (1993)*	Lateral links	
			Co-operation	*Coughlan et al. (2003*
Co-ordination	Externally integrated co.	*Stevens (1989)*	R&D consortia	*Gray (1996)*
	Lean supply networks	*Rich and Hines (1997)*	Co-ordination	*Tyndall et al. (1998)*
	Co-ordination	*Spekman et al. (1998)*	Long-term relationships	*Rich and Hines (1997)*
				Fontenot et al. (1997)
	RBT	*Hoyt et al. (2000)*		*Webster (1992) in Lemke et al. (2003)*
	Semi-integrated approach	*M.S. and Mehta (2002)*	Long-term contracts	*Lambert et al. (1996) in Lemke et al. (2003)*
	Contractual alliances	*Lewis (1990)*	Dependencies	*Cox and Lamming (1997)*
	Value-chain partnerships	*Kanter (1994)*	Co-ordination	*Yu et al. (2001)*
	Chain	*Cousins et al. (1993)*		*Coughlan et al. (2003*
	Public-private partnerships	*Gray (1996)*	Tactical collaboration	*Harland et al. (2004)*
Collaboration	Strategic alliances	*Hobbs (1996)*	Network	*Cousins et al. (1993)*
	OCR	*Sako (1992) and Lamming (1993)*	Buyer-seller partnership	*Fontenot et al. (1997); Webster (1992) in Lemke et al. (2003)*
	Collaboration	*Spekman et al. (1998)*	Strategic alliances	*Fontenot et al. (1997)*
	SST	*Hoyt et al. (2000)*	Network organisation	*Fontenot et al. (1997)*
	Integrated approach	*M.S. and Mehta (2002)*	Long-term partnership with no end	*Lambert et al. (1996) in Lemke et al. (2003)*
	Minority investments	*Lewis (1990)*	NETWORKS	*Lamming et al. (2000)*
	Joint ventures	*Lewis (1990)*	Non-equity-based collaboration	*Hill (1995)*
		Kanter (1994)	Network	*Cox and Lamming (1997)*
		Gray (1996)	Centralised	*Yu et al. (2001)*
		Lambert et al. (1996) in Lemke et al. (2003)	Collaboration	*Coughlan et al. (2003)*
		Hill (1995)	Network	
	Strategic network	*Lewis (1990)*	Strategic Collaboration	*Harland et al. (2004)*
	Collaboration	*Kanter (1994)*		
		Cousins et al. (2003)		
		Tyndall et al. (1998)		

Table 5.6 certifies that all the relationships that support "ally" strategy can be grouped under **co-operation**, **co-ordination** and **collaboration** relationships.

Review of a considerable number of authors that coped with organisational relationships issue, and the classification of them under the buy/ally/make strategies has enabled to identify a generic portfolio of relationships. This portfolio of relationships encompasses the

characteristics described by these authors, so, it can be induced the list of relationships proposed in this study will be of general applicability. Figure 5.7 represents the research process carried out in this section.

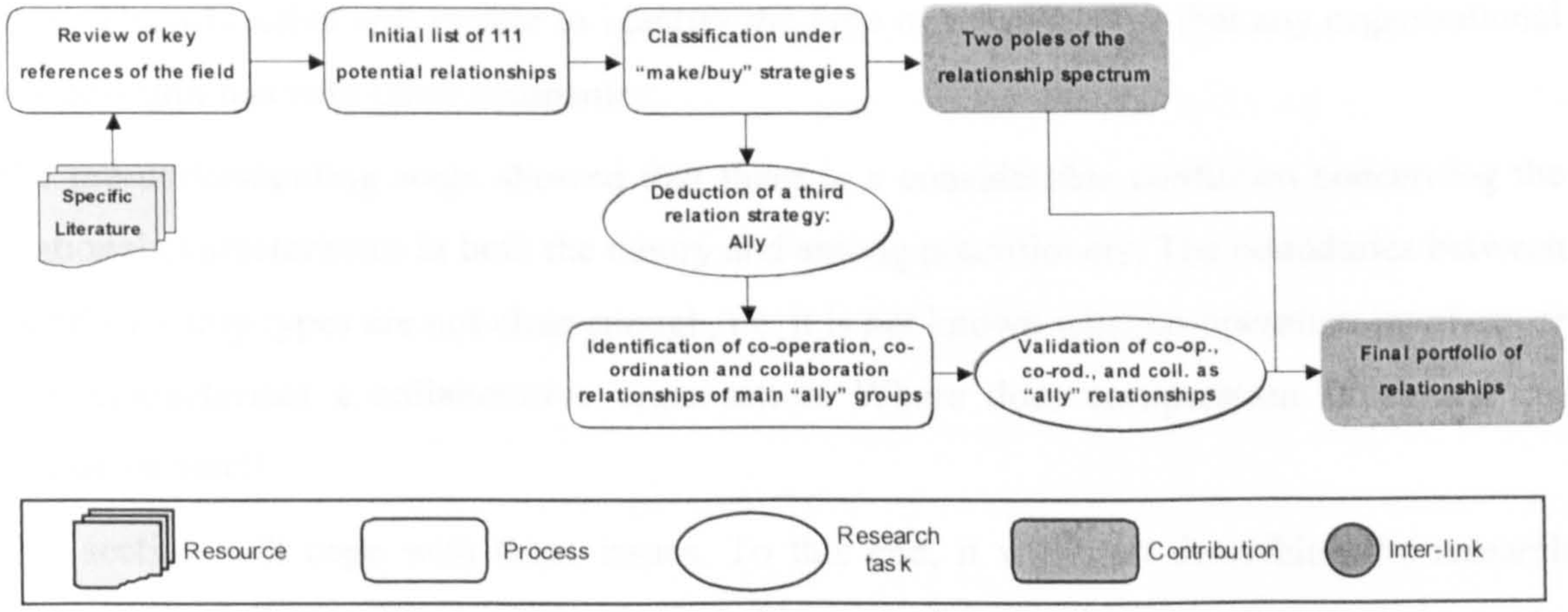

Figure 5.6: Research process for coping with proposition 1

This way, the first proposition of this research (**Prop.1** – To agree a portfolio of generic inter-organisational relationships -*RQ1)* has been fully accomplished. Figure 5.7 shows the final portfolio of relationships proposed by the author.

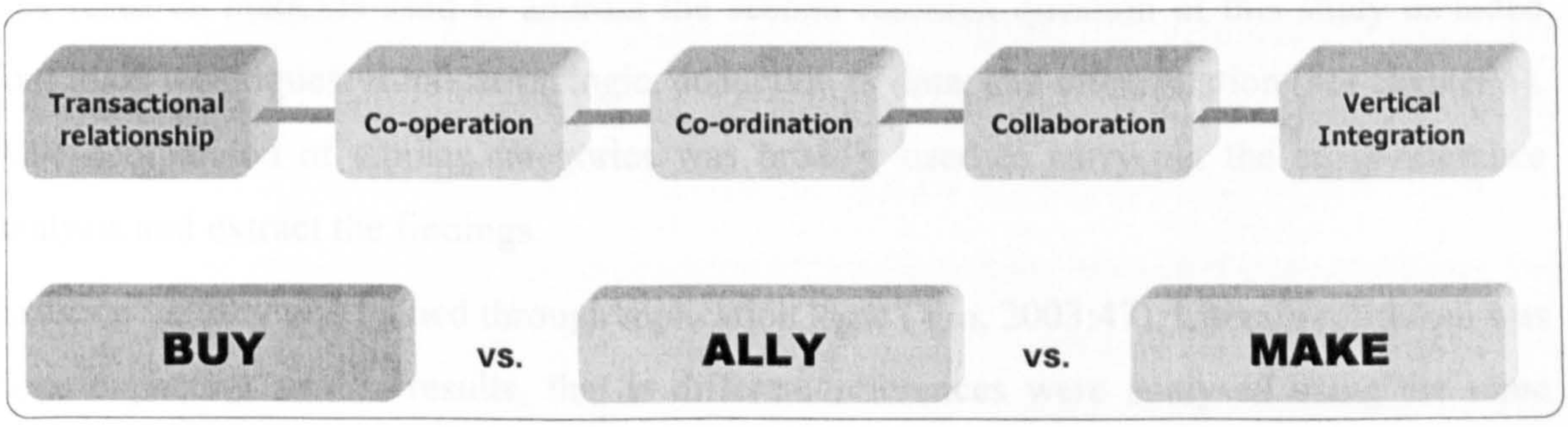

Figure 5.7: Final portfolio of organisational relationships

This section has reviewed the spectrum of relationships that any organisation may arrange, and as a conclusion a generic portfolio of relationship has been agreed. However, it is still unclear to state where the boundaries between these relationship levels are, e.g. whether a company maintains a co-ordination relationship or a collaboration relationship. Next section will cope with the second proposition, which is focused on clarifying this issue.

Prop.2 – To define the characteristics that make each collaboration level different *(RQ2)*.

5.3 Analysis of the characteristics of the collaboration levels

The second research question of this study is directly linked to the first question. While the initial research question was focused on clarifying the range of relationships, this second question will aim to find the particular characteristics that distinguish these levels between them. This objective will enable to identify the type of relationships that any organisational business unit has with other companies.

The pre-understanding stage showed that there is a considerable confusion concerning the relational characteristics in both the theory and among practitioners. The boundaries between the relationship types are not clear enough, i.e. it is not known what co-operation involves, or what characterises a collaborative organisation. Where does co-operation finish and co-ordination start?

This section will cope with these issues. To this end, it will start describing the research methods used during the investigation of this second proposition, as it was done in the previous section. Then, a review of the specific literature about relational characteristics will be carried out and a group of characteristics will be presented. A cross-reference analysis will lead to propose a final list of characteristics for each relationship level.

5.3.1 Research methods

The research methods used to address the second research question of this study included four main techniques: Replication logic, deduction of data, and interpretation (see chapter 4). Also comparison of similar categories was broadly used to carry out the cross-reference analysis and extract the findings.

External validity was gained through replication logic (Yin, 2003:47). Literal replication was done expecting similar results, that is different references were analysed using the same criteria aiming to reach the same conclusions.

Replication logic was supported on deduction of data method (Easterby-Smith et al., 2002:28). The specific literature review developed through the replication logic collected great amount of data. This data was processed and specific conclusions were deduced from general issues.

The analysis of the data required by this deductive process was carried out through a cross-reference analysis. Comparison of similar categories (Voss et al., 2002; Eisenhardt, 1989) was the research method used to this end. This method focused on matching similar data from different authors.

As many authors suggest it, direct interpretation of the data was essential during this process. It allowed extracting enriching information from a great amount of qualitative data when other research methods were not applicable.

Next section will present the implementation of the research methods described above. Thus, it will start reviewing different sources of data related to the characteristics that the relationship levels fulfil.

5.3.2 A comparison of the characteristics of the collaboration levels

As it happened with the classification of relationship levels in the previous chapter, a broad number of authors coped with the characteristics of collaboration levels (i.e. relationship levels) as well. In order to maintain coherence and theoretical connection between this proposition and the first one, the same authors will be reviewed searching for characteristics of the relationships that they identified.

5.3.2.1. Transactional Relationship

Rich and Hines (1997) associated this basic relationship with the classic system of management of organisation, where the essential motivation is profit maximisation, and high functional specialisation is pursuit. These authors also stated that organisations under this relationship cannot adapt quickly to the changeable environment. A low ability to exploit materials flow or market information was another feature highlighted by Rich and Hines.

Stevens (1989) focused more his work on the internal characteristics of the organisations that arrange a transactional relationship. This way, he typified this relationship by stating that different departments address the activities of the supply chain internally, almost independently. Stevens also highlighted three key features:

- Staged inventories in the supply chain caused by failure to integrate and synchronise activities and information (e.g. Bullwhip effect).
- Independent and often incompatible control systems between internal departments and external enablers.
- Both the internal and external links of the supply chain perform isolated.

According to Stevens, organisations maintaining a transactional relationship tend to be reactive, based on the quick fix, and jumping from crisis to crisis. Thus, company planning is very short term.

These characteristics lead this relationship to generate inefficiencies within the supply chain and also put under threat operational effectiveness. The company becomes more vulnerable to the effects of external changes (Stevens, 1989).

Fontenot et al. (1997) described transactional relationship as the most minimal form of relationship. It is basically an exchange of money for material. As the relationship is fully driven by price, each event is independent of all other. The marketplace defines the price and the interaction between buyer and seller begins and ends with the transaction, there is no future commitment. As a conclusion, the product or service is considered to be a commodity; brand names, product differentiation and brand loyalty are unknown. The relationship is mainly adversarial, as both the buyer and the seller aim to achieve the best economic position. Spekman et al. (1986) also highlighted the importance of the price in this relationship.

5.3.2.2. Co-operation

This relationship is characterised by fewer potential suppliers. Thus, the contracts are arranged for longer terms (Spekman et al., 1998). Tyndall et al. (1998) also highlighted the long-term contracts between suppliers and customers. These authors identified the exchange of bits of essential information among suppliers and customers as a key characteristic of this relationship level.

Organisations maintaining co-operation with other companies start concentrating on customer service and sales order rather than on short-term financial focus (Rich and Hines, 1997). This relationship aims to gain efficiency of the system through sharing information that may be useful for the performance of the individual organisations.

Comparing to transactional relationship, there is an increase in communication and involvement between the seller and the buyer, increased involvement of multiple parties, increased contractual agreement, and also enough trust to share essential information (Fontenot et al. 1997).

Information sharing plays a key role in co-operation relationship, however, it is stated that this information is not generally directed to improve the performance of operate processes but to enhance support processes.

5.3.2.3. Co-ordination

Co-ordination relationship is not characterised only by an information linkage, but also by process and system interaction (Spekman et al., 1998). The buying organisation aims to

found a long-term relationship and commitment between the companies involved in the relationship (Shapiro et al., 1985 in Spekman et al., 1986).

Tyndall et al. (1998) also highlighted that both workflow and information is shared in a way that allows JIT-systems, EDI, extranets and similar systems to make the relationship between customer/supplier more intense, endurable and trustful.

Stevens (1989) stated that co-ordinating companies do not focus on the flow of goods into the organisation anymore, but on the whole flow of the supply chain. This way, the local performance of the organisation gives priority to the global requirements of the value chain. Supply and demand get integrated through system sharing, and it is characterised by integrated planning and control systems.

These are other characteristics extended by Stevens (1989):

- Full system visibility.
- Organisations are focused on tactical rather than only on operational issues. However, management processes are not strategically involved yet.
- Extensive use of electronic data interchange (EDI) to support linkage between organisations.

5.3.2.4. Collaboration

Collaboration relationship is characterised by supply chain integration, joint planning, technology sharing, trust and commitment (Spekman et al., 1998). It also involves joint design and product development, long-term strategy sharing, and solving common problems together.

Stevens (1989) highlighted that collaboration relationships requires a change of focus. Rather than product-orientated, collaboration requires being customer-orientated, penetrating deep into the customer organisation to understand the products, culture, market and organisation. Stevens also noted that collaborative relationship starts at the early stages of product development and encompasses full management involvement at all levels (i.e. operational, tactical, strategic).

In a collaborative relationship the company seeks deliberately to manage the interfaces between companies to generate a flexible and responsive system of long-term agreement (Rich and Hines, 1997). According to Cousins et al. (2003) a collaborative approach requires a strategic alignment across the organisation involved in the relationship. Partners will share benefits and risks of joint investments.

Partners may experience personal, non-economic satisfactions (Fontenot et al., 1997). Dwyer et al. (1997) also stated an increased communication in time and history, joint planning, contractual agreement and both implicit and explicit trust (Fontenot et al., 1997).

Spekman et al. (1994) described an essential characteristic of collaboration, the concept of 'disintegration of the firm': Non-essential activities will be externalised from the organisation to its network and this resultant web of firms will perform as though the work was done internally. Thus, this practice suggests organisations to maintain their core-competence and outsource the rest of the activities to close partners.

Concurrent activities such as, procurement, design and delivery are also common among collaboration relationships (Spekman et al., 1994).

5.3.2.5. Vertical Integration

Vertical integration is the process by which organisations internalise activities that are fulfilled in external firms (Stuckey and White, 1993). Although any vertically integrated organisation is not supposed to have external linkages, the strategic decision of vertically integrate is considered to be the development of a new relational status with specific implications. This way, when an organisation decides to vertically integrate any activity, two different approaches may arise:

1. The activity/process integrated is internalised in the organisation, which is inside the physical space of the organisation. In this case, the external relationship ends as this new process/activity becomes another competence more of the organisation. It does not make sense to consider it as an external relationship.

2. The activity/process integrated requires a new physical location independent from the original organisation. There will be two (or more) physical entities, although the owner will be the same for both. There will arise an external relationship among both, as there will be necessary to establish a flow of material and information, systems will be shared, a common strategy will be implemented, and so on. In this case, this vertical integration will fulfil the same characteristics as collaboration relationship. The only different between these two relationships will be the ownership of the organisations involved in the partnership: In collaboration both firms are financially independent (some common investments are viable) and two companies vertically integrated share the same owner.

As a conclusion, this section will cope with this second type of vertical integration as it can be treated as an external relationship. Hence, the characteristics reviewed for collaboration relationship will be extended to vertical integration.

5.3.2.6. Conclusions of the review of the characteristics

The review of the characteristics of the relationship levels showed that three key factors that distinguish the relationships are the degree of (1) information, (2) system, and (3) benefit/risk sharing (Spekman et al., 1998; Fontenot et al., 1997, amongst others). The aim of this section is to analyse the implications of each relationship level proposed by this study at a process (manage, operate and support) level from the perspective of these three criteria. To this end, the relationship types and the business processes will be combined. This analysis will summarise the individual characteristics described above.

In transactional relationship there is not any interaction between customer/supplier, but a buy and sell interaction among companies. The key driver in this basic relationship is the flow of material and money.

When companies are co-operating, there is a flow of information between them at a support process level. This way, companies will inter-change basic information, details and data about their new technologies, IT systems, R&D projects, and so on. However, this information will not have operational purpose, that is, it will not be useful for the daily operations fulfilment. It can be said that it is the flow of support-information between organisations what actually makes organisations co-operate.

The main characteristic of co-ordination relationship is that there is a system sharing between organisations (apart from information sharing). Close relationship is developed particularly at operate and support processes, sharing both information and systems between partners. This way, all the information gathered is orientated to fulfil the requirements of operate processes. Eventually there might be shared performance measurement systems (Management processes) that provide data exclusively for operational purposes (e.g. deliveries on time, lead-times, etc.), not for management objectives.

Collaboration relationship implies full interchange of information, system and risk/benefits between the partners involved. All business processes are involved in this relationship, so, management practice is commonly shared for all the partners. Although economically the partners are independent, they perform as they were just one organisation.

The literature showed that the main difference between collaboration and vertical integration relationships relies on the ownership of the companies involved in the partnering.

Finally figure 5.8 shows the physical configuration of the organisation involved in each of the relationships. It shows three typical supply chains where the white circles represent the

companies of the chain. Companies A and B represent the organisations under different relationships.

The first supply chain on the left is characterised by transactional relationships (T.R.). The supply chain in the middle represents companies A and B co-operating, co-ordinated or collaborating. These two companies will gain strength against other single organisation of the supply chain. Finally, companies A and B are vertically integrated in the supply chain on the right. Although both A and B remain physically independent, they are grouped under one organisation because they are owned by the same figure.

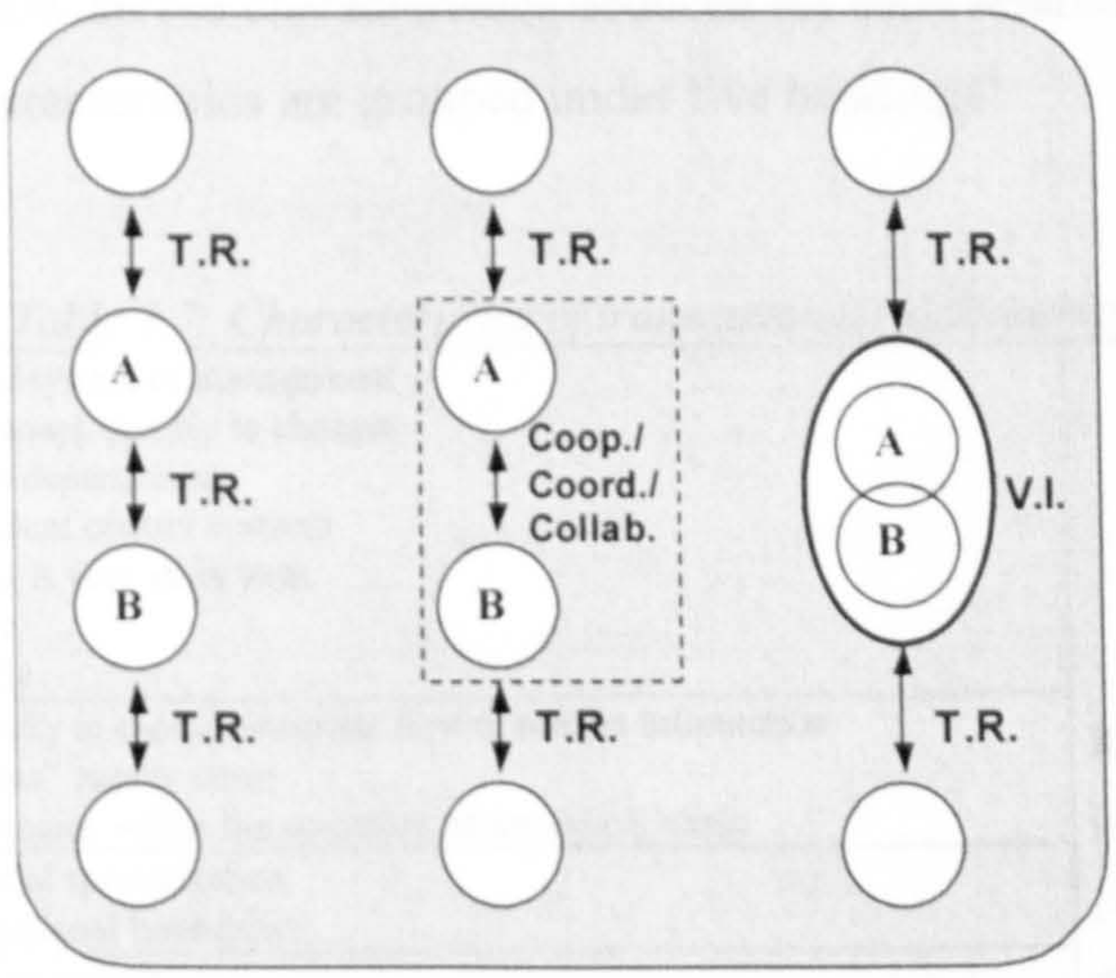

Figure 5.8: Organisational configuration of each relationship

At this point, this section has coped with the review of the literature about the characteristics of the relationship levels proposed in the previous section. These characteristics have been described according to some specific criteria (information, system or benefit/risk sharing), and finally, this section has illustrated the physical configuration of the organisations under each relationship.

There is still one step remaining to fulfil the second proposition stated at the beginning of this section: To propose a list of characteristics for each relationship level deduced from the literature. Next section will deal with this last step.

5.3.3 Joined classification of characteristics

The specific literature review carried out at the beginning of the section enabled to deduce some particular characteristics of the relationship types. Theoretical replication logic allowed generalising (external validity) these findings. The key ideas proposed by each author were extracted and compared through a cross-reference analysis process. Similar categories were identified and grouped under five generic families proposed by the author: *Strategy & management model*; *order winner criteria & aim*; *organisational structure*; *operations performance*; and *external relationships*. It was considered that these five headings would encompass all the characteristics proposed by the authors.

Tables 5.7 to 5.10 show all the characteristics deduced for each relationship level. As it was highlighted, these characteristics are grouped under five headings[4].

Table 5.7: Characteristics of transactional relationship[5]

Transactional Relationship	• Classical system of management • Cannot adapt quickly to changes • Separate departments • Independent control systems • Planning is very short term • Reactive • Quick fix	Rich and Hines (1997); Stevens (1989); Fontenot et al. (1997); Spekman et al. (1986)
	• Low ability to exploit materials flow or market information • "Base line" supply chain • Inefficiencies within the operation of the supply chain	
	• Functional specialization • Organisational boundaries	
	• Profit maximization • Money exchange for an easily measured commodity • Price alone guides the exchange • Price is established by the marketplace • Adversarial relationship • Objective: achieve the best economic position • Purchased on the basis of physical attributes, availability, convenience, or price	
	• Staged inventories caused by failure to integrate and synchronise activities (Bullwhip) • Each event is independent • No anticipated future interaction • No brand names	

[4] It may happen that the same characteristic is grouped under more than one heading.

[5] It might seem that transactional relationship has negative connotations according to the characteristics shown in table 5.7. However, this relationship level is as much necessary as the rest of the relationship levels under certain circumstances.

Table 5.8: Characteristics of co-operative relationship

Co-operation	• Short-term financial focus • Customer service reactive • Poor visibility of real customer demand • Inadequate planning and generally poor performance • Fewer supplies	Rich and Hines (1997); Stevens (1989); Spekman et al. (1998); Spekman et al. (1986)
	• Collaboration between sales and distribution • Functional integration which focuses principally in the inward flow of goods • Inventory • High plant utilisation and batch sizing • MRP or MRPII techniques • Poor visibility of real customer demand • Inadequate planning and generally poor performance	
	• Erode the hierarchical structure • Distribution efficiency of the system • Collaboration between sales and distribution • Functional integration which focuses principally in the inward flow of goods	
	• Cost reduction rather than performance improvement	
	• Limited interaction with suppliers • Longer-term contracts • Information sharing with other entities	

Table 5.9: Characteristics of co-ordinated relationship

Co-ordination	• Planning horizon medium term • Cross-functional management: Process orientated • Outward goods management • Integrating supply and demand • Synchronised demand management • Full systems visibility • Medium-term planning • Tactical rather than strategic • Reacting to customer demand rather than "managing" the customer	Rich and Hines (1997); Stevens (1989); Spekman et al. (1998); Spekman et al. (1986)
	• Align the activities • Reduced the number of administrative functions • Operates effective interfaces between departments • Cross-functional management: Process orientated • Flow is well managed on the way to the customer • Integration of those aspects of the supply chain directly under the control of the company • Integrating supply and demand • DRP systems • Well-managed master schedules: MRP II • JIT manufacturing techniques • Synchronised demand management • Efficiency rather than effectiveness • Information linkages • WIP linkages • EDI exchange	
	• Reduced the number of administrative functions • Operates effective interfaces between departments	
	• Limited interaction with suppliers • Flow is well managed on the way to the customer • Integrating supply and demand • Synchronised demand management • Reacting to customer demand rather than "managing" the customer • Information linkages • EDI exchange • Long-term relationship and commitment	

Table 5.10: Characteristics of collaborative relationship and vertical integration

Collaboration & Vertical Integration	• Joint planning • Joint design and product development • Long-term strategy sharing • Solve common problems together • Customer-orientated • Penetrating deep into the customer organisation to understand the products, culture, market and organisation • Full management involvement at all levels • Elimination of multiple sourcing • Integration of the supply base with the demands • Manage the interfaces between companies • Strategic alignment required • Increased joint planning • Concurrent procurement • Shared or simultaneous design • 'Disintegration' of the firm • Risk/benefit sharing • Joint-investments • Long-term commitment	Spekman et al. (1998); Stevens (1989); Rich and Hines (1997); Cousins et al. (2003); Fontenot et al. (1997); Spekman et al. (1994); Spekman et al. (1986)
	• Supply chain integration • Technology sharing • Joint design and product development • Information sharing • Solve common problems together • Supply of high quality products shipped direct to the line on-time • Shared product, process and specification change information • Technology exchange • Design support • Integration of the supply base with the demands • Restructuring of its internal supply-chain • Synchronise the supply process • Concurrent procurement • Shared or simultaneous design	
	• Integration outside the company • Penetrating deep into the customer organisation to understand the products, culture, market and organisation • Externalisation of the alignment process • Restructuring of its internal supply-chain • 'Disintegration' of the firm	
	• Supply chain integration • Joint planning • Technology sharing • Trust • Commitment • Joint design and product development • Long-term strategy sharing • Information sharing • Mutual support and co-operation • Shared product, process and specification change information • Technology exchange • Design support • Materials and information exchange • Manage the interfaces between companies • Flexible and responsive system of long-term collaboration • Strategic alignment required • Communication and involvement • Increased joint planning • Contractual agreement • Implicit and explicit trust • Concurrent procurement • Shared or simultaneous design • Risk sharing • Joint-investments • Long-term commitment • Win to win	

The presentation of these tables allows asserting that the second proposition (**Prop.2** – To define the characteristics that make each collaboration level different – *RQ2*) has been totally accomplished. In summary, Figure 5.9 shows the research process carried out to deal with this proposition.

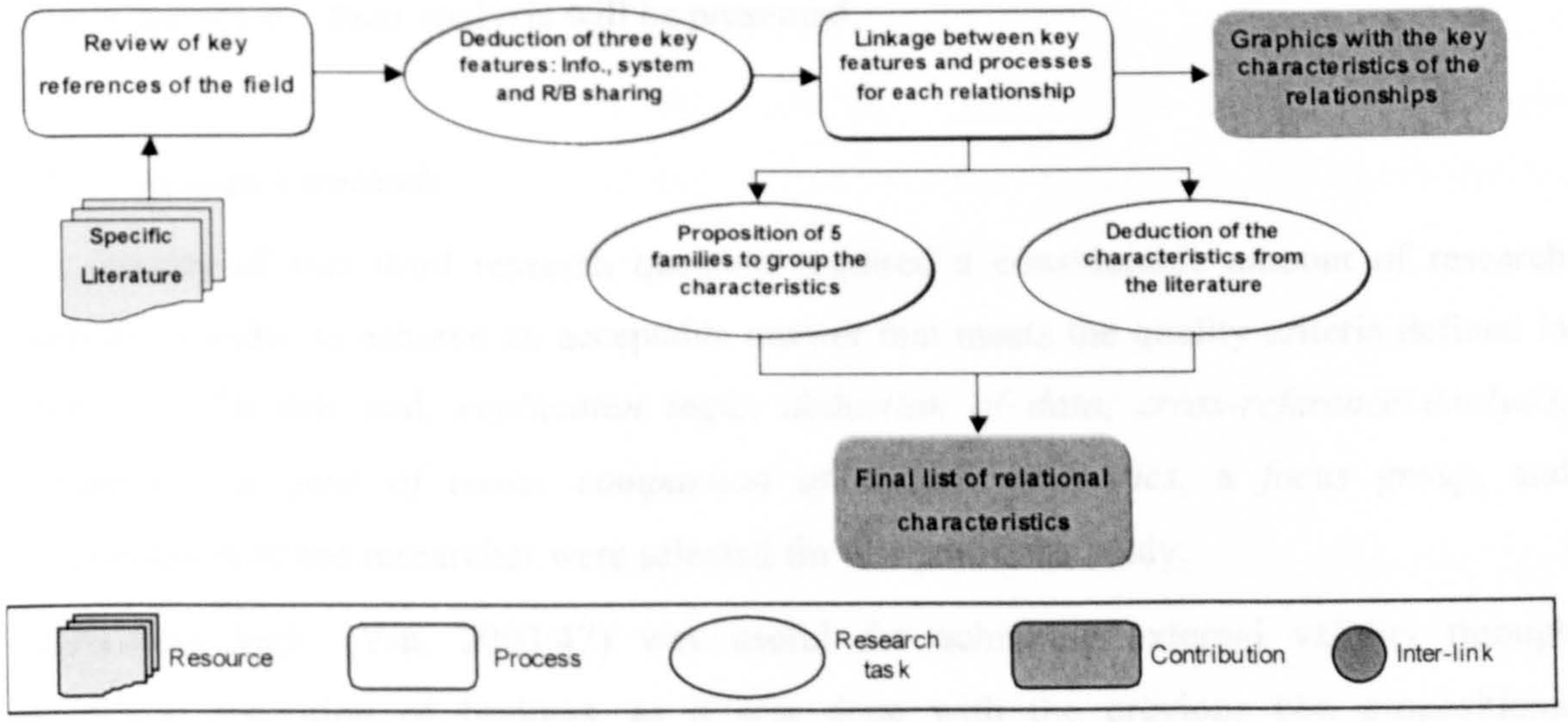

Figure 5.9: Research process for coping with proposition 2

At this point, this chapter has proposed a portfolio of inter-organisational relationships, and also the particular characteristics of each of them. However, it is still unknown when an organisation should develop one relationship type or another. E.g. should a company co-operate or collaborate under specific conditions?

Next section will tackle the factors that both impact the relationship levels and suggest developing one certain relationship. Proposition 3 deals with this issue:

Prop.3 – To identify the critical factors that make possible to develop one certain collaboration level *(RQ3)*.

5.4 Analysis of the Critical Factors influencing collaboration

It was deduced from the pre-understanding stage that there is a lack of knowledge about the factors that enable to collaborate.

The empirical study carried out in ten companies showed that each organisation had a particular range of relationships with other entities of its environment. This range of relationships was found to be unrepeatable, specific for each organisation.

This finding allowed deducing that there might be some critical factors associated to organisations that lead them to arrange some specific relationship levels rather than others.

As an example, the product/service type produced by an organisation will recommend to develop one certain relationship with key suppliers.

This section will first present the research methods used to address this third proposition. The implementation of these methods will lead this section to present an initial extended list of critical factors. A deductive process will follow this phase, and a final classification of critical factors and their analysis will be presented.

5.4.1 Research methods

The novelty of this third research question required a considerable amount of research methods in order to achieve an acceptable answer that meets the quality criteria defined in chapter 4. To this end, *replication logic*, *deduction of data*, *cross-reference analysis*, *comparison of pair of cases*, *comparison of similar categories*, a *focus group*, and *interpretation* of the researcher were selected for this particular study.

Replication logic (Yin, 2003:47) was useful for achieving external validity through theoretical repetition of findings, as it was done with the previous two propositions. Generalisability of the conclusions of this third proposition was a key issue, as the critical factors identified had to be extensible to any organisation.

The great number of references reviewed required a continuous process of deduction of data. This enabled to extract particular conclusions from general matters. The data deduction method played a key role in this study: A three step deductive process was carried out and it was essential for reaching the final approach.

A cross-reference analysis was done with the initial set of references identified in the specific literature review. To this end, comparison of both pair of cases and similar categories was fulfilled. The former one allowed comparing the references in pairs in order to analyse the differences, whereas the comparison of similar categories allowed grouping all the similar approaches.

Academics and practitioners with contrasted expertise in this field participated in a focus group. The objective of this group meeting was to get information and feedback about the intermediate findings obtained during the research process. A detailed document/filling form was prepared to this end, and it was fulfilled in a three hours session.

Finally, interpretation of the data and the findings was used during all the research process. It added a valuable insight to understand all the information and conclusions found in the study.

Next section will put into practice these research methods. It will present the full list of critical factors extracted from the specific literature review. To this end, the work of a group of authors will be presented and an initial cross-reference analysis will be fulfilled.

5.4.2 A comparison of Critical Factors

A critical factor is defined as one that actively contributes to the production of a result (Merriam-Webster Dictionary). In this case the result is the relationship between organisations. These factors will not only impact over the relationships, but also determine the characteristics of this relationship (Lopez et al., 2005).

E.g.: Manufacturing a totally customised product (critical factor: *Product type*) might suggest a higher level of collaboration in the product development process, rather than maintaining a transactional relationship (Lopez et al., 2005).

Although it is not a very common research field, there are some authors that indirectly coped with this same approach of critical factors. It is said indirectly because the aim of most of these authors was not to analyse the impact of critical factors, but to fulfil other related objectives. Table 5.11 gathers the propositions of 15 references.

Table 5.11: Review of the references that cope with critical factors

	Author(s)	Factors									
A1	*Slack and Lewis, 2002*	Operations Resources				Market Requirements					
		Transaction Costs	Economies of Scale	Resource deficiencies	Learning potential	Market position	Market risks	Market structure	Competitor behaviour		
A2	*Sako, 1992*	Government Policy & Legal Framework	Corporate Strategy & Entrepreneurship	Technological Factors (*)	Market conditions	Past & Contemporary Ideology: Cultural traditions	Individual Preferences	Social & Moral Norms			
A3	*Spekman, 1981*	Inventory	Suppliers	Governmental influences	Sales	Economic Conditions	Corporate planning/ strategy	General economic factors			
A4	*Grønhaug, 1975*	Degree of routinisation of the buying problem	Type of product (**)	Size of the purchase	Organizational size						
A5	*Ozzane and Churchill, 1971*	Age	R&D commitment	Rate of growth	Industrial environment	Cash position	Net income	Assets	Number of employees	Proportion of elite personnel	Decision-group identity (see figure 1 in paper)
A6	*Sriram, Krapfel and Spekman, 1992*	Buyer/Supplier dependence (Balance vs. Asymmetry)	Transaction costs	Transaction Importance							
A7	*Grønhaug, 1976*	Type of Organization (***)		Structure					Environment		Perceived risk			Information about suppliers, bids, etc.
		Product dependent	Product Independent	Size	Relative portion of managers	Number of departments	Number of levels	Education of top man	Competition	Perceived slack	Importance	Uncertainty	Venture-someness	
A8	*Lambe and Spekman, 1997*	Size of the firm	Marketing skill	Production expertise	R&D capability									

A9	*Heide and John, 1990*	Uncertainty			Relationship Importance		Manufacturing process	History effects			
		Volume unpredictability	Technological unpredictability	Performance ambiguity	Size of purchase	Criticality of the product/ service					
A10	*Stevens, 1989*	Order winning criteria	Product & Market segment								
A11	*Spekman et al., 1999*	Technical Complexity	Commercial Complexity								
A12	*Spekman et al., 1994*	Sector Organisation	Patterns of industrial policy								
A13	*Puttick, 1982*	Product/Market complexity	Product/Process complexity	Volume/Mix complexity	Supply Chain complexity						
A14	*Bititci et al., 1997*	Information Flow					Shared Resources			Time Relationship	
		Frequency	Volume	Type	Route	Criticality	Human	Equipment	Financial	Sequential	Parallel	Independent
A15	*Harland et al., 2004*	Market environment	Product/service package	Operations process	Supply network structure	Focal firm supply-network strategy						

The review of these 15 references involved the analysis of a great quantity of critical factors. From the definition of each critical factor it was deduced that there might be some factors that were conceptually repeated. Thus, a cross-reference analysis was proposed in order to carry out this comparison between all the references.

To this end, comparison of both pair of cases and similar categories were planned to do. The former focused on grouping the references in pairs and analysing their similarities and differences according to the definition of each critical factor provided by the original author. On the other hand, those critical factors that showed a similar content, that is, category, were grouped under a common term.

Figure 5.10 shows the scheme of the process of comparison of similar cases. The common list of critical factors (Cross-Reference A1, i.e. C-R A1) deduced from the comparison of two references (e.g. A1 and A2) is compared with the list (C-R A2) deduced from other two references (A3 and A4), and so on. The final list of critical factors, i.e. C-R A11, encompasses the non-repeated-critical factors of all the references.

The entire cross-reference analysis is available in appendix A.

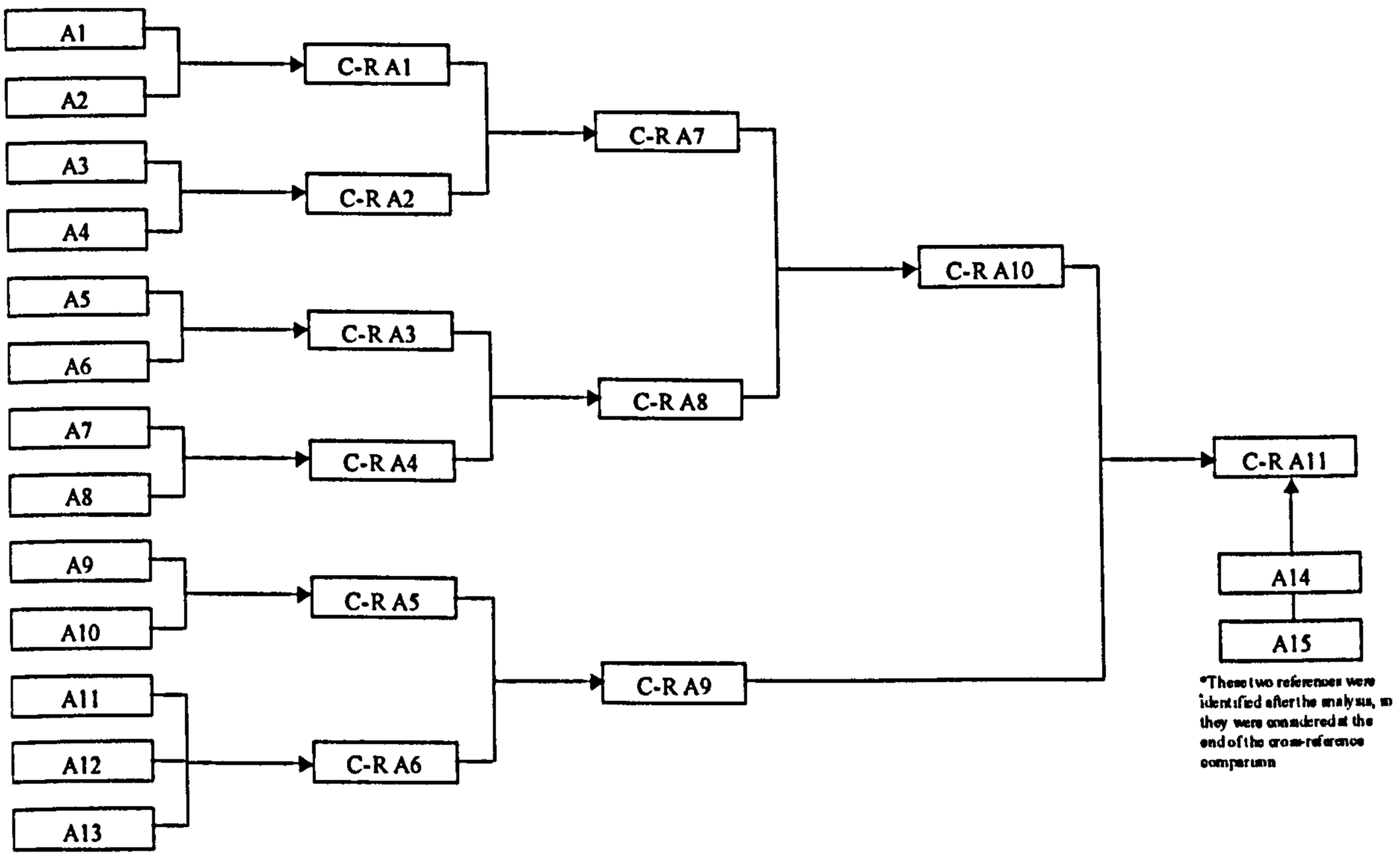

Figure 5.10: Scheme of the cross-reference analysis by comparison of pare of cases

The cross-reference analysis processed 91 critical factors of 15 references and a final amount of 53 factors were proposed as the outcome of this process of comparison. Table 5.12 shows

the 53 critical factors[6] extracted from the literature references. Note that some of them are grouped under some families or headings (in colours).

Table 5.12: Final list of critical factors after the cross-reference analysis

	Degree of routinisation of the buying problem	Type of product	Inventory	Government Policy & Legal Framework	Corporate Strategy & Entrepreneurship (R&D commitment, etc.)	General economic factors
	Past & Contemporary Ideology: Cultural traditions	Social & Moral Norms	Buyer/Supplier dependence (Balance vs. Asymmetry)	Age	Rate of growth	Information about suppliers, bids, etc
	Operations Resources				Technological Factors	Product & Market segment
	Transaction Costs	Transaction importance (Econ. Scale)	Suppliers	Learning potential		
	Market Requirements		Type of Organisation		Structure	
C-R	Competitor behaviour	Marketing skills	Product dependent	Product Independent	Size	Relative portion of managers
A11	Structure					
	Number of departments	Number of levels	Education of top managers	Number of employees	Proportion of elite personnel	Decision-group identity
	Perceived risk			Economic Conditions		
	Importance	Uncertainty	Venture-someness	Cash position	Net income	Assets
	Economic Conditions		History effects	Order winning criteria	Criticality of the product/ service	Sector Organisation
	Others					
	Complexity / Uncertainty					
	Product/Market complexity	Product/Process complexity	Volume/Mix complexity	Supply Chain complexity	Technological unpredictability/ complexity	Performance ambiguity
	Industrial Environment		Market Requirements			Manufacturing process & expertise
	Competition	Perceived slack	Market position	Market risks	Market structure	

****53 Critical factors***

5.4.3 Description of the critical factors

This section will describe the content and the characteristics of the 53 critical factors shown in table 5.12. This will allow fulfilling these three objectives:

1. To carry out a final comparison between the critical factors to group them under common headings.
2. To identify some features that will allow classifying the critical factors.
3. To foresee the potential impact of the critical factors over the organisational relationships.

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[6] For more details of this deductive process consult appendix A, full cross-reference analysis.

This is the description of the critical factors identified in this study:

- ***Degree of routinisation of the buying problem (Gronhaug, 1975):*** When making a purchase for the first time, this decision – given a certain degree of complexity – will tend to be "open" and "un-programmed". Both the buying itself and the use of the product bought will result in insight (which may be regarded as the inverse of uncertainty) and tend to routinise the decision-making in re-buying situation. The buying-decision will in this way be easier to handle, and result in less need for problem-solving capacity, and thus less need for joint decision-making.

- ***Type of Product (Gronhaug, 1975):*** The marketing literature distinguishes between the consumer market and the industrial market. The industrial market may be subdivided in other two types: (1) Production goods and (2) institutional goods. Production goods enompass the products and services directly related to the end-product (out-put) of the buying organisation (i.e. raw materials, production, equipment, etc.). Institutional goods refer to all the products and services which are necessary in order to keep the organisation going, but not directly related to the out-put of the buying organisation (paper, pencils, a saw-mill, and so on).

- ***Inventory (Spekman, 1981):*** It suggests a concern for those factors, both internal and external to the organisation, that impact on inventory control decisions. Lead-time reports, current inventory levels and future market conditions should help frame a purchasing managers' buying decisions as they attempt to minimise investing money in unneeded inventory.

- ***Government Policy & Legal Framework (Spekman, 1981; Sako, 1992):*** It refers to the influences of the decisions of a govern on the performance of the organisation.

- ***Corporate Strategy & Entrepreneurship (R&D commitment, etc.) (Ozzane and Churchill, 1971; Spekman, 1981; Sako, 1992):*** It reflects how corporate strategy and suppliers'/customers' marketing strategies influence an organisation's performance decisions. This factor deals with the less immediate, more long-range aspects of performance that are often framed by corporate objectives.

The efforts and the commitments of the companies in order to develop specific aims such as R&D strengthen and cost reduction are considered by this factor.

- ***General Economic factors (Spekman, 1981):*** It reflects those general economic factors lying beyond the organisation's environment, which can also impact on its performance decisions and are likely to be outside of its sphere of influence. Macro-economic factors.

- ***Past & Contemporary Ideology: Cultural traditions (Sako, 1992):*** General cultural matters of the environment where the company is located. These issues will be in close

relationship with the historical events and evolution of the environment. It encompasses "soft" issues such as beliefs, values, and so on.

- ***Social & Moral Norms (Sako, 1992):*** Set of implicit rules and characteristics of the culture, country, area, and organisation that determines the behaviour of the people involved. These features will influence the decision taking process, the trouble solving protocol, and so on.

- ***Buyer/Supplier dependence (Balance vs. Asymmetry) (Sriram et al., 1992):*** Dependence has been shown to flow from the availability of scarce resources and one party's ability to mediate access to these resources. The more important these resources are to the firm, the greater the firm's dependence on the party controlling them. Extreme dependency leads to asymmetry in the trading relationship and heightens the buyer's fears of opportunism on the part of the more powerful supplier. However, opportunism may be held in check when the supplier has dedicated specific assets to the trading relationship. Asset specificity serves to balance the trading relationship as the supplier acknowledges a heightened state of mutual dependence.

- ***Age (Ozzane and Churchill, 1971):*** It refers to the influence of the age of the organisation over the performance and decision-making process.

- ***Rate of growth (Ozzane and Churchill, 1971):*** It concerns the business expansion (positive or negative) suffered by the company, as well as the expectance for the future mid/long term. The sharper the growth planned by a company, the higher the necessity for investments, new acquisitions, possible collaboration agreements, and so on.

- ***Information about suppliers/customers, bids, etc. (Gronhaug, 1976):*** The accessibility to the information about the characteristics and conditions of suppliers and customers will impact over the relationship type, level of trust, and so on.

- ***Transaction Costs (Slack and Lewis, 2002; Sriram et al., 1992):*** Williamson (1981) argues that although production cost efficiencies should motivate organisational decision makers, transaction cost efficiencies should be considered in evaluating alternative forms of exchange. Williamson (1985) further explains that transaction costs (i.e., the costs of negotiating, writing, monitoring, and enforcing contracts between trading parties) are the costs of running an economic system. Phillips (1982) argues that the issue is not whether or not these costs exist, as it is impossible to conduct exchanges without incurring some level of transaction costs. The issue is whether a market exchange can be performed more efficiently through an internal organization or through some more intermediary form.

This way, low intrinsic transaction costs might favour market-based relationships, while the chance of jointly reducing transaction costs makes partnership an attractive option.

- ***Transaction Importance (Economies of Scale, etc.) (Slack and Lewis, 2002; Sriram et al., 1992):*** Dependency arises directly from the exchange relationship and is directly proportional to the importance of the product/service of exchange, and is inversely related to the availability of alternative sources of supply. Importance is a function of the criticality of the resource to the firm's operation and survival. Jacobs (1974) suggests that where few alternatives exist and the resources are critical to the firm, a state of dependency is created.

- ***Suppliers (Slack and Lewis, 2002; Spekman, 1981):*** It reflects the feasibility to achieve and maintain close relationships with suppliers. Resource criticality, strength/weakness of customer/supplier, dependency, make vs. buy strategies, etc. will have influence over the viability of create close relationship within customer and supplier.

- ***Learning Potential (Slack and Lewis, 2002):*** Partnership also becomes attractive when there is the potential for learning from a partner. An absence of any potential learning (Honda and Rover case for example) suggests a more market-based relationship.

- ***Technological factors (Sako, 1992):***

  - Degree of asset specificity.
  - Customisation level/Product differentiation and diversification through the shortening of the product-life.
  - Uncertainty of market demand.

- ***Product & Market segment (Porter, 1985; Stevens, 1989):*** The characteristics of a particular buyer group, segment of the product line, or geographic market where an organisation is performing will be another critical factors. Although the low cost and differentiation strategies are aimed at achieving their objectives industry wide, the entire focus strategy is built around serving a particular target very well, and each functional policy is developed with this in mind.

The strategy rests on the premise that the firm is thus able to serve its narrow strategic target more effectively or efficiently than competitors who are competing broadly. As a result, the firm achieves either differentiation from better meeting the needs of the particular target, or lower costs in serving this target, or both.

- ***Competitor behaviour (Slack and Lewis, 2002):*** Firms will also be influenced by the behaviour of the competitors' performance. For example, close partnership, or even vertical integration, may be seen as a defensive move against a competitor acquiring a major supplier or customer.

- ***Marketing skills (Lambe et al., 1997):*** It reflects the ability of a company to get related with customers and suppliers (collaboration culture). The more developed marketing skills the easier to establish new relationships, find new customers/suppliers, etc.
- ***Product dependent vs. Independent (Gronhaug, 1976):*** The first type is formed by organisations for which survival mainly depends on the exchange of output. Business organisations operating in competitive markets are an example. For other organisations, where an important part of the income (budget) is distributed by regulatory groups, the output-income relationship is less clear. Of course, such organisations also are dependent on output, not at least in order to get support from the regulatory group(s). However, it seems reasonable to assume that the two types of organisation are apt to stress different parts of the environment, so that product dependent more than product independent organisations will emphasise markets rather than a regulatory group.
- ***Size (Gronhaug, 1975, 1976):*** In a given industry or type of market organisational size may be an indicator variable for division of labour. The assumption here is that the larger the organisation (e.g. measured in terms of employees), the more people will be involved in dealing with external entities, thus, a higher level of relationship might be more viable.
- ***Relative portion of managers (Gronhaug, 1976):*** This ratio shows the proportion between the number of managers of an organisation and the number of total employees. According to the author, this ratio can certainly have influence over decisions as establishing close relationships with customers/suppliers.
- ***Number of departments (Gronhaug, 1976):*** Ratio that indicates the number of different functional departments in an organisation.
- ***Number of levels (Gronhaug, 1976):*** Ratio referring to the hierarchical structure of the organisation. The flatter the organisational structure, the less management levels the organisation will have. Tis way, it is supposed that a flatter organisation might be more flexible, dynamic and proactive developing partnerships with its customers and suppliers.
- ***Education of top managers (Gronhaug, 1976):*** It refers to the percentage of top managers with high education. It is assumed that the higher the number of managers with high education, the higher will be the expertise or skills of these managers, and consequently the management affairs of the company are supposed to be stronger.
- ***Number of employees (Ozzane et al., 1971):*** This ratio will be directly linked to the organisational size.
- ***Proportion of elite personnel (Ozzane et al., 1971):*** This critical factor represents the amount of high qualified personnel working in the organisation. The higher this number, the

more competitive will be the company. Similar way, it is supposed that this ratio will be directly proportional to the collaboration practice.

- ***Decision group identity (Ozzane et al., 1971):*** It is obvious that there will be a decisional panel in all organisations that makes strategic decisions. From the collaborative perspective, this panel will be responsible for deciding whether one type of relationship is more suitable than other or not. This way, the characteristics of this decisional panel such as age, education, past experience, etc. will be critical when decisions have to be made.

- ***Importance (Gronhaug, 1976):*** It is related to the criticality and risk of the product/service transaction between customer and supplier. That is, the importance of the transaction.

- ***Uncertainty (Gronhaug, 1976; Heide and John, 1990):*** At a basic level, uncertainty creates adaptation and information processing problems for a firm (Aldrich, 1979). This way, an unknown environment will lead organisations to strength the external relationships with other entities.

- ***Venture-someness (Gronhaug, 1976):*** It determines the characteristics that are assessed or pursuit when a transaction of a product or service is planned to carry out. E.g. "Would you buy such a computer? What was assessed in the purchase? Probe: quality, guarantees, price deduction, relationship with supplier, and so on.

- ***Cash position (Ozzane and Churcill, 1971; Spekman, 1981); Net income (Ozzane and Churcill, 1971; Spekman, 1981); Assets (Ozzane and Churcill, 1971; Spekman, 1981); Others (Ozzane and Churcill, 1971; Spekman, 1981):*** Set of economical ratios and variables referring to the internal economic situation of the company. These measures will determine the feasibility of the organisation for new investments, participation in new markets, business span, etc. Hence, this economic situation will suggest carrying out closer relationships or not.

- ***History effects (Heide and John, 1990):*** The age or historical length of the relationship is another key factor because parties that have managed to align their interests effectively over time are more likely to expect continued future exchange.

- ***Order winning criteria (Stevens, 1989):*** Criteria highlighted by the market as order-winners will describe the specific requirements of the strategy of the company. Hill (1999) lists a set of order-winner criteria:

  - Price
  - Delivery Reliability
  - Delivery Speed: Design to order; Engineer to order; Make to order; Assemble to order; Make to stock.

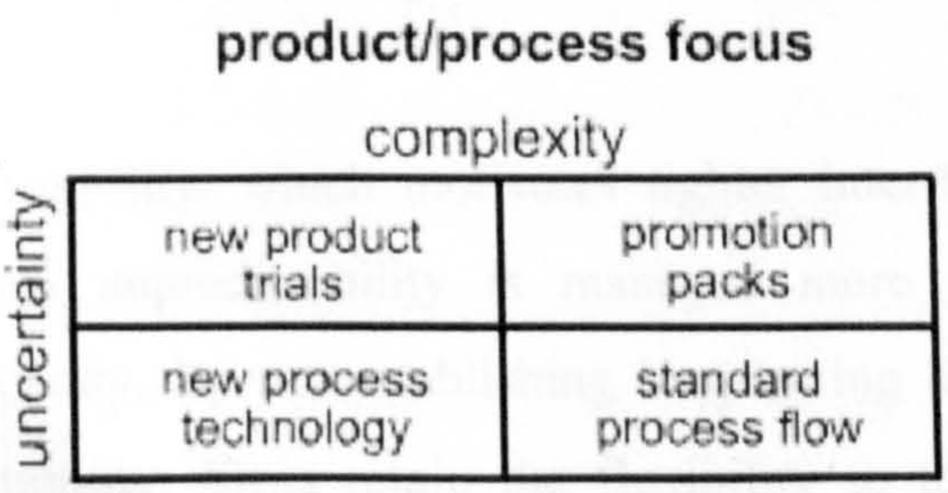
- Quality: Performance quality; Features; Reliability; Conformance; Durability; Serviceability; Aesthetics; Perceived quality.
- Demand satisfaction capacity
- Product Range

❑ ***Criticality of the product/service (Heide and John, 1990):*** It refers to the importance or value that the product or service provided has for us. It can be influenced by the scarce of the product/service, number of suppliers, strength of the supplier, value that it adds to the final product/service received by the final customer, and so on. Also known as complexity.

❑ ***Sector Organisation (Spekman et al., 1994):*** Depending on the characteristics, habits, requirements and traditions of industrial sectors, feasibility for accomplishing relationships between customers, suppliers and OEM's will be variable. Competitive and highly innovative sectors such as Aeronautic will be more likely to develop closer relationships along the value chain.

❑ ***Product/Market complexity (Puttick, 1982):*** It refers to the implications of specific characteristics of a certain product over the market where this product is offered.

❑ ***Product/Process complexity (Puttick, 1982):*** It refers to the impact that the characteristics of a particular type of product may have over the organisational business processes.



❑ ***Volume/Mix complexity (Puttick, 1982; Heide and John, 1990):*** Volume unpredictability is defined as the inability to forecast accurately the volume requirements in the relationship (Walker and Weber, 1984). In this context, the volatility of the downstream

market and the manufacturer's share of this market both contribute to unpredictability, which in turn requires a firm to develop mechanisms for adaptation. One approach to adaptation is to design procedures for sequential decision making within the context of an ongoing relationship, thereby economising on the difficulty of making changes (Williamson, 1985).

volume/mix focus

uncertainty \ complexity		
	special order branded products	seasonal demand
	own label promotions	high volume standard range

- ***Supply Chain complexity (Puttick, 1982):*** The characteristics of the manufacturing strategy, i.e. make to order, make to stock and so on, will vary the complexity and uncertainty level of the supply chain as the flow of goods will have specific requirements for each case.

supply chain focus

uncertainty \ complexity		
	make to order	pack to order
	make to forecast	make to stock

- ***Technological unpredictability/complexity (Heide and John, 1990; Spekman et al., 1999):*** Technological unpredictability is defined as the inability to forecast accurately the technical requirements in the relationship (Walker and Weber, 1984). It may vary from changes in the specifications of the components or end product, to general technological developments.

Unlike volume unpredictability, which motivates tighter inter-firm linkages to facilitate adaptation, technological unpredictability is managed more efficiently through loose coupling or lower continuity. By not establishing long-lasting linkages in the presence of technological unpredictability, firms retain the flexibility to terminate relationships and switch to partners with more appropriate technological capabilities (Balakrishnan and Wernerfelt, 1986).

- ***Performance ambiguity (Heide and John, 1990):*** Performance ambiguity is defined as the difficulty of accurately measuring *ex post* the exchange partner's compliance with

expected output (Williamson, 1985). To the degree that such *internal uncertainty* is present, a firm is exposed to the risks of opportunistic exploitation. In this context, the observability of component quality and production processes is at the core of internal uncertainty.

Performance ambiguity motivates a firm to find means of reducing the risks of opportunism. As Ouchi (1980) has argued persuasively, high levels of performance require that output-based measures be supplemented with other control mechanism.

- ***Competition (Gronhaug, 1976):*** It is based on the description of the power of perceived competitors, i.e. organisations offering approximately the same output on the market. A wide range of potential suppliers/customers may suggest maintaining arm's-length relationship with them.

- ***Perceived slack (Gronhaug, 1976):*** It is based on determining the perceived scarcity in budgets. It can be motivated by macro-economic factors, governmental policies, etc.

- ***Market Position (Slack and Lewis, 2002):*** From a market perspective, the most obvious issue will be how the firm intends to differentiate itself through its market positioning. If a firm is competing primarily on price then the relationship could be dictated by minimising transaction costs. If it is competing primarily on product or service innovation, then it may well wish to form a collaborative alliance with a partner with whom it can work closely.

- ***Market risks (Slack and Lewis, 2002):*** Usually the market from which innovations derive is turbulent and fast growing (as with many software and Internet-based industries), in which case it might wish to retain the freedom to change partners quickly through the market mechanism. However, in such turbulent markets, a firm might wish to develop closer relationship in order to share and reduce risks. One way to do this is to form relationships with many different potential long-term customers and suppliers, until the nature of the market stabilises.

- ***Market Structure (Slack and Lewis, 2002):*** Opportunities to develop relationships may be limited by the structure of the market. If the number of potential suppliers, or customers, is small, then it would probably be sensible to attempt to develop a close relationship with at least one customer or supplier. Opportunities to play off customers and suppliers against each other may be limited.

- ***Manufacturing process & expertise (Heide and John, 1990; Lambe et al., 1997):*** The OEM firm's manufacturing process may impose certain requirements on its supplier/customer relationships (Hakansson, 1982). For instance, relatively more automated processes such as assembly-line operations have lower tolerances for instability than small-

batch or job-shop operations. Hence, longer run relations are more likely to be found for more automated processes.

The analysis of these definitions led the author to group again some critical factors under a common concept. These are the similarities found between the critical factors:

✓ Buyer/Supplier dependence (Sriram et al., 1992); Transaction Importance (Economies of Scale, etc.) (Slack and Lewis, 2002; Sriram et al., 1992); Suppliers (Slack and Lewis, 2002; Spekman, 1981): ***Supplier's behaviour and relationship; Customer's behaviour and relationship.***

✓ Market Position (Slack and Lewis, 2002); Product & Market segment (Porter, 1985; Stevens, 1989): ***Product & Market Segment.***

✓ Education of top man (Gronhaug, 1976); Proportion of elite personnel (Ozzane et al., 1971): ***Personnel's skills.***

✓ Importance (Gronhaug, 1976); Criticality of the product/service (Heide and John, 1990): ***Product/service criticality.***

✓ Uncertainty (Gronhaug, 1976; Heide and John, 1990); Puttick's Grid (1982): ***Puttick's Grid.***

✓ Competitor behaviour (Slack and Lewis, 2002); Competition (Gronhaug, 1976): ***Competitor's behaviour and relationship.***

✓ Market Structure (Slack and Lewis, 2002); Sector Organisation (Spekman et al., 1994); Market risk (Slack and Lewis, 2002): ***Market Structure & Behaviour.***

✓ Cash position (Ozzane and Churcill, 1971; Spekman, 1981); Net income (Ozzane and Churcill, 1971; Spekman, 1981); Assets (Ozzane and Churcill, 1971; Spekman, 1981); Others (Ozzane and Churcill, 1971; Spekman, 1981)***: Economic Conditions***

This comparison and grouping of similar critical factors modify the list from the 53 factors presented before to 45 critical factors. Next section will deal with the final list of critical factors. These final critical factors will be classified according to a framework developed through some characteristics extracted from the definitions above.

5.4.4 Classification of the critical factors

The analysis of the individual definition of the critical factors lead to deduce that they may be classified in three different levels. The criterion used to this end was focus on the scope of influence of the critical factors. This way, an initial level will cope with the critical factors that are part of the *general environment* of the organisation. The main feature of this level is that the organisation cannot modify the critical factors at this stage.

A second level encompasses the critical factors that can be found in the *specific environment* of the organisation, that is, in the particular market and segment of the organisation. Finally, the third level deals with the critical factors internal to the company. Normally, these critical factors will be under the control of the company.

Figure 5.11 represents the framework adopted for the classification of the critical factors. It is built based on the work proposed by Bueno (1996), Porter (1985), and Mintzberg (1978). This framework clearly shows three different layers representing each of the levels described before.

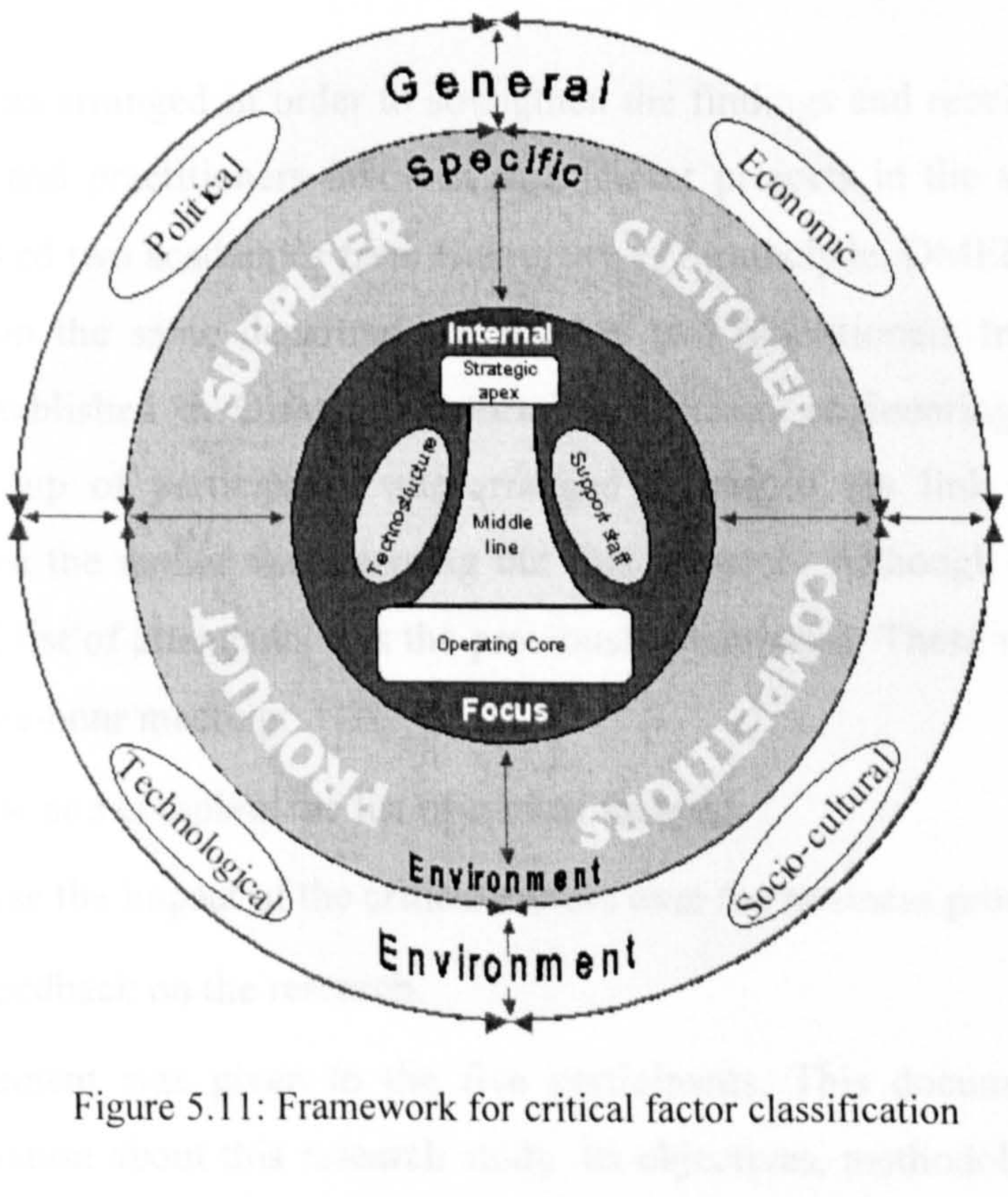


Figure 5.11: Framework for critical factor classification

Using this framework, the critical factors were classified in three different levels. Table 5.13 shows the final classification of the 41 critical factors deduced from the literature.

Table 5.13: Final classification of the critical factors

General Environment	Government Policy & Legal Framework; General Economic factors; Past & Contemporary Ideology: Cultural traditions; Social & Moral Norms; Perceived slack.
Specific Environment	Degree of routinisation of the buying problem; Technological factors; Information about suppliers/customers, bids, etc.; Transaction Costs; Learning Potential; History effects; Order winning criteria; Product/Market complexity; Product/Process complexity; Volume/Mix complexity; Supply Chain complexity; Technological unpredictability/complexity; Performance ambiguity; Type of Product; Product & Market Segment; Product/service criticality; Market Structure & Behaviour; Supplier's behaviour and relationship; Customer's behaviour and relationship; Competitor's behaviour and relationship.
Internal Focus	Inventory; Corporate Strategy & Entrepreneurship; Age; Rate of growth; Marketing skills; Product dependent vs. Independent; Size; Relative portion of managers; Number of departments; Number of levels; Number of employees; Decision group identity; Manufacturing process & expertise; Venture-someness; Economic conditions; Personnel's skills.

41 Critical factors

Table 5.13 could fulfil the third proposition defined in this study (i.e. **Prop.3** – To identify the critical factors that make possible to develop one certain collaboration level - *RQ3*): These 41 critical factors influence the inter-organisational relationships according to the authors reviewed. However, it was considered necessary to ensure the validity of this new proposition.

A focus group was arranged in order to strengthen the findings and receive some feedback from academics and practitioners involved in different projects in the same area. Totally there were involved two academics from University of Strathclyde, DMEM department, one PhD student from the same department and other two practitioners from two industrial organisations established in Glasgow performing in heavy engineering and construction sectors. This group of participants was arranged thanks to the link of them with the department where the author was carrying out this research. Although more people were invited, the final list of attendants was the previously mentioned. These were the objectives defined for a three-hour meeting:

- To review and complete the list of critical factors.
- To analyse the impact of the critical factors over the business processes.
- To get feedback on the research.

A detailed document was given to the five participants. This document provided them extended information about this research study, its objectives, methodology, key steps, and so on. Similarly, the objectives of the focus group were clearly presented (see above), as well as the tasks of each participant for the session.

The author of this study leaded this three-hour meeting. He started making a power-point presentation highlighting the key content of the document provided to the participants and the goals of the meeting. After this presentation each of the tasks associated to the objectives of the session were accomplished. The method used to this end was based on having a cross-disciplinary discussion co-ordinated by the author. The session was held in DMEM department, University of Strathclyde. This discussion was recorded and partially transcribed in order to enhance reliability and lack of biased of the final outcome. Conclusions of this discussion were validated by all the participants.

Next section will deal with the outcome related to the first objective achieved through the focus group. It will propose a reduced list of critical factors deduced from the set of 41 critical factors presented in this section. The outcome of the other two objectives will be presented in the following chapter dedicated to building the construct.

5.4.5 Focus group: Reduction of Critical Factors through deduction

The analysis of the critical factors proposed by the author led the academics and practitioners involved to state that the list of 41 factors was not operational due to its numbers. At the beginning of this chapter (see figure 5.1) it was highlighted that the first three propositions will be the input for the fourth research question. This way, the list of critical factors will be used for defining desirable relationships between organisations, i.e. the fourth research question.

It was considered that 41 potential variables would be practically uncontrollable. Therefore it was decided in the focus group to deduce some generic factors that will encompass all the 41 factors. In order to facilitate this deductive task, an initial review of the factors concluded selecting some irrelevant factors[7] and removing them from the list. At the same time, two critical factors were proposed to incorporate to the list. Table 5.14 shows the irrelevant and the proposed critical factors in the focus group.

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[7] This set of critical factors was considered to be of less importance than the rest of factors. As a result, these factors were considered irrelevant for this research. They are still considered to be valid factors that influence the organisational relationships though.

Table 5.14: Removed and added critical factors in the focus group

Removed critical factors		***Added critical factors***
History effects	Relative portion of managers	Value Proposition
Order winning criteria*	Number of departments	Location (Physical, Logical)
Age	Number of levels	
Marketing skills	Venture-someness	
Size		

(*) This factor, rather than irrelevant, is part of other critical factors (e.g. Manufacturing strategy).

From the rest of 32 critical factors remaining (41-9 irrelevant in table 5.14), a total of 12 families of factors were identified (table 5.15).

Table 5.15: Deduction of critical factors proposed in the focus group

Families identified	***Critical factors related (table 5.13)***
Degree of routinisation of the buying problem	Degree of routinisation of the buying problem
Resources	Technological factors; Information flow about suppl./custom., bids, etc. (Frequency, volume, type, route, criticality); Inventory; Economic conditions; Personnel's skills; Rate of growth; Technological unpredictability/complexity; Number of employees; Decision group identity
Transaction Costs	Transaction Costs
Learning Potential	Learning Potential
Performance ambiguity	Performance ambiguity
Type of Product	Type of product; Product dependent vs. independent
Product & Market Segment	Product & Market Segment; Product/Market complexity; Product/Process complexity; Volume/Mix complexity; Supply Chain complexity; Product/service criticality
*Value Proposition**	Value Proposition
General Economic factors	General Economic factors
*Location (Physical, Logical)**	Government Policy & Legal Framework; Past & Contemporary Ideology: Cultural traditions; Social & Moral Norms; Perceived slack; Location (Physical, Logical)
Manufacturing Strategy	Manufacturing process & expertise; Corporate Strategy & Entrepreneurship
Behaviour and relationship of other Org.	Supplier's behaviour and relationship; Customer's behaviour and relationship; Competitor's behaviour and relationship; Market Structure & Behaviour

(*) New families of critical factors identified in the focus group (see table 5.14)

Table 5.16 shows the description of these 12 families of critical factors (critical factors in advance).

Table 5.16: Description of the critical factors deduced in the focus group

Critical Factor	Description
Degree of routinisation of the buying problem	Frequency of transaction of a certain item: First purchase (new product/service), regular purchase or very frequent purchase.
Resources	Availability of resources such as human resources, technology, money, special skills, information, and so on.
Transaction Costs	The cost of negotiating, writing, monitoring and enforcing contracts between trading parties (Williamson, 1981).
Learning Potential	Capability for learning new practices, and skills from a partner, environment, and so on.
Performance ambiguity	Degree of difficulty of accurately knowing and measuring the exchange partner's compliance with expected output (Williamson, 1985)
Type of Product	Nature of the product/service depending on the level of customisation of it ordered by the customer
Product & Market Segment	Nature of the market (product dependable) where the org. is performing and competing
Value Proposition*	The implicit promise a co. makes to customers to deliver a particular combinations of values: Low price, innovation, brand, etc. (Treacy and Wiersema, 1993)
General Economic factors	Macro-economics factors (strength of currency, raw material's price, inflation, etc.) that are likely to be outside of the sphere of influence of the org.
Location (Physical, Logical)*	Quality and availability of infrastructures that influence performance; industrial culture (Governmental policy, etc,) of the area.
Manufacturing Strategy	Strategy concerning the production of the org. influenced by the degree of customisation of the prod./service, the "decoupling point" (information about the demand), and so on.
Behaviour and relationship of other Org.	Degree of strength/weakness of the organisation when relating with suppliers/customers/competitors: Aggressiveness, easy to handle, and so on.

The deductive process described in section 5.4 has concluded with the presentation of 12 critical factors. This way, the third proposition of this study (i.e. **Prop.3** – To identify the critical factors that make possible to develop one certain collaboration level - *RQ3*) has been fulfilled.

In summary, Figure 5.12 shows the research process carried out to deal with this proposition.

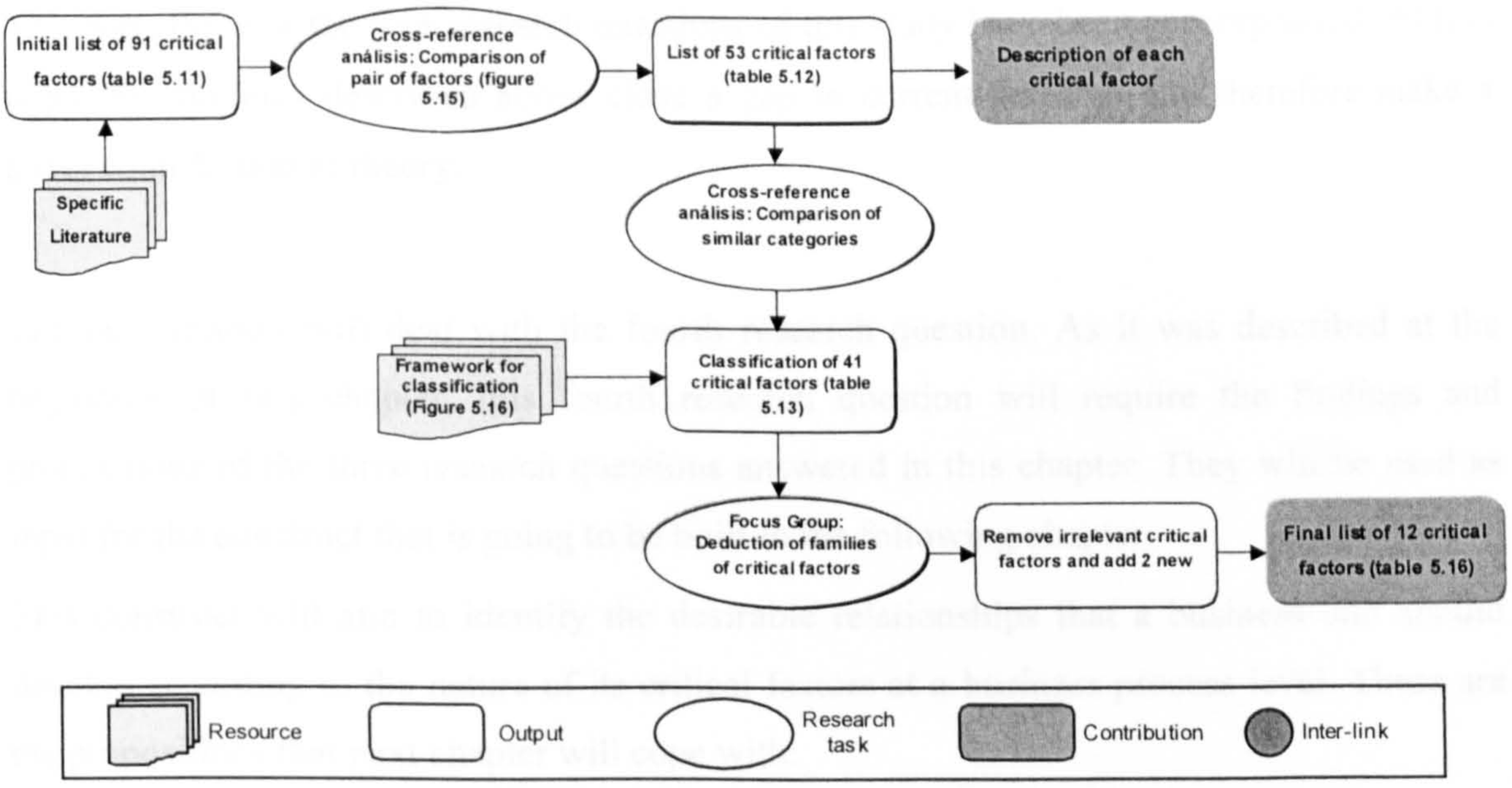

Figure 5.12: Research process for dealing with proposition 3

5.5 Conclusions of the Chapter

This chapter has dealt with the first three proposition defined at the beginning of this study:

Prop.1 – To agree a portfolio of generic inter-organisational relationships *(RQ1)*.

Prop.2 – To define the characteristics that make each collaboration level different *(RQ2)*.

Prop.3 – To identify the critical factors that make possible to develop one certain collaboration level *(RQ3)*.

Initially, a classification of business processes was proposed to support the findings achieved in all the propositions. A total of 10 processes were identified classified in three families, i.e. manage, operate and support processes.

The first proposition was fulfilled through the proposition of five relationship stages that may be arranged between organisations. To this end, and extended literature review was done, and a cross-reference analysis concluded highlighting five different relationships.

The second proposition, directly linked to the first one, aimed to describe the specific characteristics of each of these relationship stages proposed previously. The research process carried out was similar to that used in the first proposition. This section ended proposing an extended list of characteristics for each relationship.

Finally, a complex deductive process was developed in order to fulfil the third proposition. An initial list of 91 critical factors was reduced to 12 factors through different cross-reference analysis processes and the contribution of academics and practitioners gathered in a focus group.

This way, three of the four research questions of this study have been accomplished. At this point, the findings described above close a gap in current research and therefore make a novel contribution to theory.

The next chapter will deal with the fourth research question. As it was described at the beginning of this chapter, this fourth research question will require the findings and propositions of the three research questions answered in this chapter. They will be used as input for the construct that is going to be built in the following chapter.

This construct will aim to identify the desirable relationships that a business unit should develop according to the nature of its critical factors at a business process level. These are the propositions that next chapter will cope with:

Prop.4.1 – To analyse the features of business processes in a collaborative environment *(RQ4)*.

Prop.4.2 – To design the desirable relationships depending on the critical factors *(RQ4)*.

Prop.4.3 – To build a model that graphically represents the desirable relationships and their characteristics *(RQ4)*.

6. THEORY BUILDING: OPTIMISATION OF ORGANISATIONAL RELATIONSHIPS

One of the findings highlighted in the conclusions of chapter 2 was the lack of a formal guideline for companies to design efficient relationships between organisations. This gap in knowledge was associated to the fourth research question of this study:

R.Q.4: *Can we create a standard profile that corresponds to a desirable collaborating footprint?*

Based on Yin's (2003) work, chapter 3 divided this research question into three different propositions (also objectives):

Prop.4.1 – To analyse the features of business processes in a collaborative environment *(RQ4)*.

Prop.4.2 – To design the desirable relationships depending on the critical factors *(RQ4)*.

Prop.4.3 – To build a model that graphically represents the desirable relationships and their characteristics *(RQ4)*.

These three propositions suggest developing a construct that will deal with the interaction between the business processes, the organisational relationships and their characteristics, and the critical factors. To this end, chapter 3 and 4 coped with the specific research methodology (i.e. constructive research; Kasanen et al., 1993) required to build this kind of construct. On the other hand, chapter 5 thoroughly described the input (i.e. business processes, relationship levels, characteristics of the relationship levels, and the critical factors) necessary to build the construct.

This chapter will deal with the process of developing this new construct. Initially it will describe the structure of the construct that best meets the requirements defined by the research propositions. Then, it will develop the content and the relationships between the variables of the construct. At this point, a pilot case study carried out in a company will be

presented as well as the conclusions obtained from it. These conclusions led the author to refine the initial model by providing a new approach. Finally, the chapter will close with some conclusions.

6.1 Model for optimisation of the relationships in a supply chain

Chapter 5 started differentiating between the nature of the first three research questions and the fourth one. It was stated that these three research questions involved an exploratory research where specific literature review played a key role. On the other hand, the fourth research question was expected to involve a more constructive approach, where different research methods and procedures were going to be required.

Also it was stated that the first three research questions were going to be integrated in the fourth research question (figure 5.1, chapter 5). They were going to be the input of the construct required to answer this fourth research question.

The three research propositions presented above highlight the basic lines that the construct will have to fulfil:

- It will take business processes as a basis. The construct will have to deal with the features that the business processes have under different relationship scenarios.
- It will have to analyse how the critical factors identified in the previous chapter influence the organisational relationship. The knowledge and control of this impact will allow designing the desirable relationship for each case depending on the particular nature of the critical factors.
- Meeting the theoretical requirements described above, it would be useful if the construct was built in a friendly format and easy to use by both academics and practitioners.

All these characteristics that the construct had to fulfil led the author to propose a conceptual model, which would also encompass the input (i.e. initial three research questions) described previously.

Next section will describe how the model was structured, the main variables and interaction between variables that it has and related issues.

6.1.1 Structure of the model

The model that is developed to address the fourth research question has to fulfil two main objectives:

1. To define desirable relationships on a business process basis.
2. To define the characteristics that business processes should meet in each relationship level.

Although these two objectives seem to be independent, a detailed analysis of them lead to the conclusion that there is a high interaction between them. The first objective will lead to design a portfolio of desirable relationships for a business unit, while the second objective will aim to specify the operational characteristics that the business processes will have to meet in order to develop these desirable relationships.

Table 6.1 shows the variables (i.e. input) and their origins required by the conceptual model.

Table 6.1: Variables and their origins required by the conceptual model

Variable	Objective associated	Origin
Critical Factors	To define desirable relationships on a business process basis	R.Q.3
Business Processes	To define desirable relationships on a business process basis. To define the characteristics that business processes should meet in each relationship level	Exploratory Research in section 5.1
Portfolio of Relationships	To define desirable relationships on a business process basis. To define the characteristics that business processes should meet in each relationship level	R.Q.1
Operational characteristics of Relationships	To define the characteristics that business processes should meet in each relationship level	R.Q.2

Not only the variables will play a key role in the configuration of the conceptual model, but also the relationship and interaction between all of them will be of much importance. This feature was highlighted in chapter 4 by Dubin (1969) (in Meredith, 1993) as one of the five ingredients that a new theory should contain. The interaction between the variables is considered to be a key step toward theory building. As a consequence, this conceptual model will put much emphasise on studying the relationship between the four variables presented on table 6.1.

Figure 6.1 represents the variables described above and the interaction between them. Note that this interaction is described in the small white boxes over the arrows. Details of the relationship between variables will be provided in the following sections of this chapter.

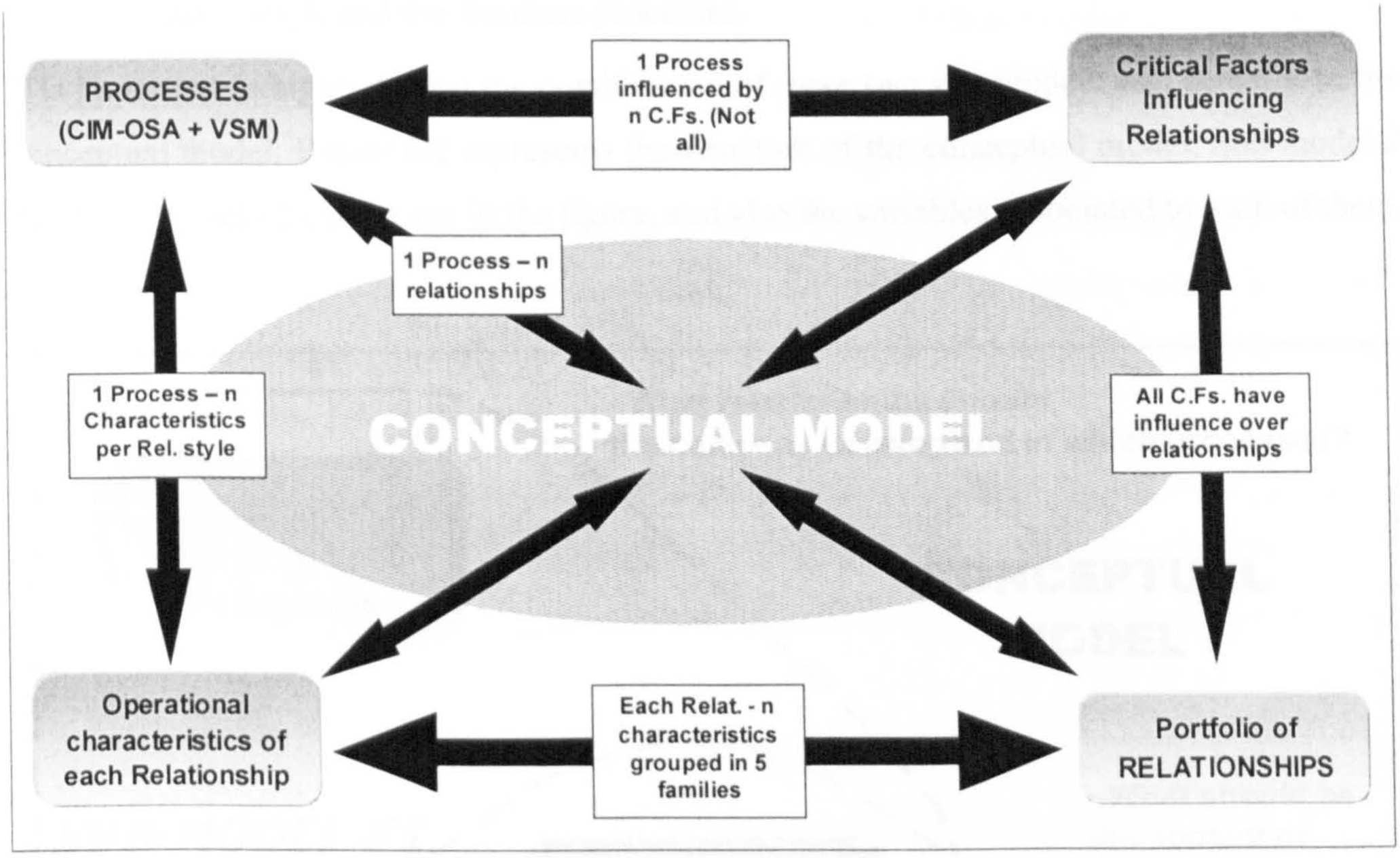

Figure 6.1: Variables of the conceptual model and their relationship

Considering the two objectives of this conceptual model, and the variables and their relationships identified for satisfying these two aims, a customised structure was designed. The structure had to fulfil these objectives and also deal with the variables described in a logical and efficient way. It also had to meet the requirement highlighted by the third research proposition, that is, to provide a graphical format to the conceptual model in order to facilitate its utilisation.

It was decided to split the conceptual model into two sub-models to meet all the features and requirements described. These sub-models could work independently but they were designed to overlap between them. Each sub-model was orientated to fulfil each of the two objectives associated to the conceptual model; therefore they will require specific variables from the table 6.1. Basically this is the configuration of the two sub-models:

- Sub-model #1: It will aim to define desirable relationships according to the nature of the critical factors on a business process basis (i.e. objective no.1). The variables required by this sub-model will be the critical factors, the business processes and the portfolio of relationships (see table 5.1).

- Sub-model #2: It will aim to fulfil the second objective, that is, to describe the operational characteristics that the business processes should meet to arrange each particular organisational relationship. The variables necessary to build this sub-model will be the portfolio of relationships, the operational characteristics of the relationships, and the business processes.

It is important to highlight that the combination of these two sub-models will actually be the conceptual model. Figure 6.2 represents the structure of the conceptual model. Sub-model # 1and sub-model #2 can be see in the figure, and also the variables associated to each of them.

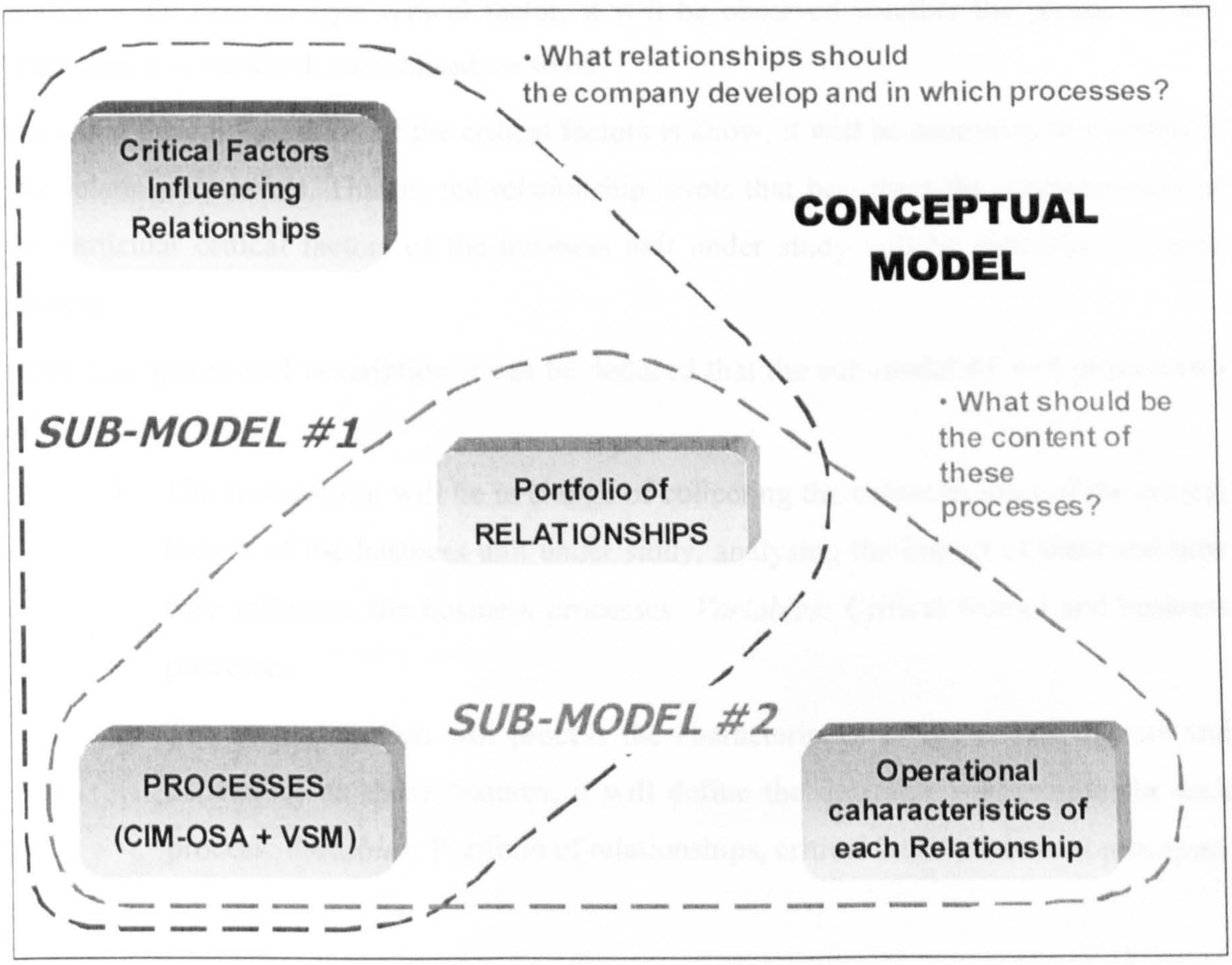

Figure 6.2: The structure of the conceptual model with its two sub-models

Once that the main structure of the conceptual model has been described, next sections will deal with each of the two sub-models proposed. To this end, all the details of each sub-model, the research process carried out and the outcome of the constructs will be presented. Finally, the interaction between these two sub-models, i.e. the utilisation of the conceptual model will be explained.

6.1.2 Sub-model #1: Desirable relationships

As it has been described before, the objective of this sub-model #1 is to define the desirable organisational relationships for each process depending on the nature of the critical factors of a business unit. Also it was stated that the input required by this first part of the conceptual model would basically be the critical factors, the portfolio of relationships, and the business processes.

The operational functionality of this model initially suggests assessing the influence of the critical factors over the processes of a particular business unit. To this end, each critical factor will be analysed individually according to the organisation under study: E.g. When analysing the *Product type* critical factor, it will be observed whether the product of the organisation is standard, customised, or so on.

Once that the configuration of the critical factors is know, it will be necessary to translate it into relationship levels. That is, the relationship levels that best meet the characteristics of the particular critical factors of the business unit under study will be identified for each process.

From this operational description it can be deduced that the sub-model #1 will present two different sections:

1. The first section will be in charge of collecting the characteristics of the critical factors of the business unit under study, analysing the impact of them and how they influence the business processes. *Variables:* Critical factors and business processes.
2. The second section will process the characteristics of the critical factors and depending on these features, it will define the desirable relationship for each process. *Variables:* Portfolio of relationships, critical factors, business processes.

6.1.2.1. Section 1: Collection and analysis of the characteristics of the critical factors

The first step toward defining desirable relationship will be to assess the influence of the critical factors over the processes of the business unit that it is being studied. The third research question concluded that there are 12 critical factors that impact over the relationships of an organisation. Hence, the process for relationship optimisation will start assessing the nature of the particular critical factors.

Before designing a procedure to collect the characteristics of the critical factors, it is worth analysing the relationship or interaction between the two main variables of this first section,

i.e. the critical factors and the business processes. Are all the processes influenced by all the critical factors, or do some critical factors impact over just certain business processes?

The focus group arranged during this research (see chapter 5, section 5.4.4) played a key role to find an answer to this question. The second objective of the focus group described in the previous chapter was focused on "to analyse the impact of the critical factors over the business processes". As a reminder, the first objective of the focus group was orientated to answer the third research question, so it was accomplished in chapter 5.

The academics and practitioners involved in the focus group analysed the scope of influence of each of the 12 critical factors proposed in the third research question. This way, each critical factor was analysed and it was deduced[8] what processes were affected by each of these factors.

Table 6.2 shows the relationship between the critical factors and the business processes. The cells in green represent that the business process (column) is indeed influenced by the critical factors (row).

Table 6.2: Impact of the critical factors over the business processes

Critical Factors	**Processes**										**TOTAL 1**
	Set Direction	**Monitor ext. environment**	**Manage Strategy**	**Manage Perform.**	**Manage Change**	**Demand Generation**	**Product Development**	**Order Fulfilment**	**Product Support**	**Support Processes**	
Degree of routinisation of the buying problem							■	■	■		**3**
Resources	■	■	■	■	■	■	■	■	■	■	**10**
Transaction Costs				■				■			**2**
Learning Potential				■						■	**2**
Performance ambiguity	■	■	■	■	■	■	■	■	■	■	**10**
Type of Product						■	■	■	■		**4**
Product & Market Segment	■	■	■	■	■	■	■	■	■		**9**
Value Proposition	■	■	■	■	■	■	■	■	■	■	**10**

[8] This deduction was based on the experience and knowledge of the academics and practitioners involved after a thorough discussion and agreement. This recorded discussion is available in 'WAP' format.

General Economic factors											**10**
Location (Physical, Logical)											**10**
Manufacturing Strategy											**9**
Competitor's behaviour and relationship											**10**
TOTAL 2	**8**	**8**	**8**	**10**	**8**	**9**	**10**	**11**	**10**	**8**	

Both the *Total 1* column and the *Total 2* row provide interesting information about the nature of the critical factors. The *Total 1* column shows the number of business processes that each critical factor influences. On the other hand, the numbers written in the *Total 2* row show the number of critical factors that influence each business process.

This information allows doing a ranking of both the critical factors and the business processes depending on their scope of influence. Table 6.3 presents the critical factors classified according to the degree of interaction that they have. Similarly, table 6.4 shows the ranking of the business processes depending on their possibility to be influenced by the critical factors.

Table 6.3: Ranking of critical factors depending on their scope of influence

Critical Factors
1. Resources
1. Performance ambiguity
1. Value Proposition
1. General Economic factors
1. Location (Physical, Logical)
1. Competitor's behaviour and relationship
2. Manufacturing Strategy
2. Product & Market Segment
3. Type of Product
4. Degree of routinisation of the buying problem
5. Transaction Costs
5. Learning Potential

Table 6.4: Ranking of business processes depending on their degree to be influenced

Business Processes	
1. Order Fulfilment	**Operate Processes**
2. Product Development	
3. Product Support	
4. Demand Generation	
5. Manage Performance*	**Management Processes**
6. Set Direction	
7. Monitor External Environment	
8. Manage Strategy	
9. Manage Change	
10. Support Processes	**Support Processes**

(*) This process should be represented between second-third positions.

6.1.2.1.1. Adoption of Complexity/Uncertainty approach

Once that the relationship between these two variables was studied, a key decision was taken at this point: To assess the impact of the characteristics of the critical factors against a reference model from the complexity and uncertainty classification proposed by Puttick (1982). These are the reasons why Puttick's complexity/uncertainty approach was adopted:

- It is deduced from the definitions of the 12 critical factors that all of them involve a complexity and/or an uncertainty dimension. This way, complexity and uncertainty values could be calculated assessing the impact of the 12 critical factors and they would be inter-linked.
- A contrasted reference model used by many researchers would strengthen the reliability and feasibility of the conceptual model.
- It would be easier to deal with just two factors (i.e. complexity and uncertainty) rather than 12. This way, the conceptual model would be easier to build, graphically represent, and also use.
- Analysis of each business process would be easier because a particular value of complexity and uncertainty would be calculated for each of them. That is, each business process would have its specific complexity and uncertainty.
- The content of the conceptual model would remain the same. This decision would not imply forgetting about the 12 critical factors, but to group them under a well-known complexity/uncertainty reference model.

From an operational perspective this decision would considerably simplify the implications of the section 2 of this sub-model. While considering all the 12 critical factors would mean to deal with thousands of possible combinations of different characteristics, this new approach would reduce them to just a reasonable quantity.

E.g. If each critical factor has averagely three options (i.e. Product type: Standard, modular, and customised), there will be 3^{12} combinations. Each of this combination would have one pattern of desirable relationships, so it is almost impossible to build such a complex model.

Analysing the implications of this new approach, the author finally decided to base the decisions about the desirable relationships on the complexity and uncertainty dimensions. This decision would not make the future model meaningless because both complexity and uncertainty dimensions will gather all the implications of the 12 critical factors, as it will be described in the tables shown below.

One of the fundamental requirements for the application of Puttick's reference model was that both complexity and uncertainty values would have to be extracted from the 12 critical

factors identified previously. In other words, the characteristics of the critical factors of a particular organisation would have to assess the complexity and uncertainty that this company had in its business processes. To this end, the relationship between the 12 critical factors and the complexity/uncertainty dimensions was necessary to study for each process.

It was deduced that each process was influenced by specific critical factors (see table 6.2) when the relationship between both variables was analysed. In this new environment the objective was to take each process, the critical factors involved and assess whether these particular factors generated complexity, uncertainty or both over this business process.

The research method used to study this new relationship between variables was based on deduction. To this end, the authors proposing the critical factors shown in table 5.11 were reviewed again. The interpretation of other academics and practitioners was also required to provide reliability to this process.

Table 6.5 shows the implication of each critical factor in the complexity/uncertainty dimensions for each business process. Note that '*C*' refers to complexity and '*U*' to uncertainty. The tick in the box will mean that this critical factor generates complexity or uncertainty, depending on whether the box is on the left or right respectively. It is possible that one critical factor presents both complexity and uncertainty implications, that is, it will have two ticks in the table[9].

Table 6.5: Relationship between the critical factors and complexity/uncertainty dimensions

Process:	**SET DIRECTION**	
Critical Factors	**C / U**	**Observations**
General Economic factors	☐ ☑	When identifying the future environment in which the organisation can achieve its aims (Set Direction process), Uncertainty will be the main driver. The more uncertain the environment where the org. is performing, the more important will be the fact of maintaining a strong process for setting the direction of the company. In this way, General Economic factors of the nation, country or market will have a sharp impact on this process, as it will be difficult to foresee the trends of the medium/long term. Being an innovator organisation will add uncertainty to the performance of the org. The more innovating the product, the higher the difficulty to predict the demand of it, so, the process of setting the direction of the org. will become critical. Resources of the company will be uncertain in the medium/long term, as they are very changeable. However, the more resources the company has at the present, the lower the uncertainty for the future, so the less risky to set the direction of the org.
Location (Physical, Logical)	☑ ☐	
Behaviour and relationship of other Org.	☑ ☐	
Value Proposition	☑ ☑	
Resources	☑ ☑	

[9] The observations described in table 6.5 were deduced from the comments made by the authors presented in table 5.11. These comments led the author to assess the complexity/uncertainty dimension of each critical factor.

Performance ambiguity	☐ ☑	risky to set the direction of the org. In the same way, the higher the difficulty of knowing the activity of the partners of the company, the more uncertain will be their behaviour in the future, adding risk to the process of setting the direction. 'Design to order' strategy will imply high uncertainty, as the respond to the customer (Special requirements, quantity, etc.) will be unknown. On the other hand, factors motivating complexity in performance of the org. will have influence over the direction of the company but not as much as uncertainty factors over the process of defining this direction itself.
Product & Market Segment	☑ ☑	
Manufacturing Strategy	☑ ☑	

Process:	**MONITOR EXTERNAL ENVIRONMENT**	
Critical Factors	**C / U**	**Observations**
General Economic factors	☐ ☑	The objective of monitoring the external changes and developments will be to have a better and more accurate knowledge about the trends of the environment. It will aim to reduce uncertainty of these external conditions, mapping the behaviour of the environment. In this way, critical factors generating uncertainty within the firm will be critical for this process: Lack of control over General Economic factors, the uncertainty derived from the degree of acceptance of the value proposition of the org by the market, the evolution of the resources of the company in a medium/long term, the degree of knowledge of the performance of the partners, and the uncertainty generated from some manufacturing strategy as a consequence of difficulty in their forecasting activity. All these variables will determine the specific requirements that 'Monitor external environment process' would have to fulfil. On the other hand, factors generating complexity in the performance of the org. will impact directly over the content of the process, but not as much as uncertainty in the requirements of the process *per se*. Complexity derived from the specific characteristics of the location and the behaviour of other org. performing in the environment of the company; the difficulties driven by specific value proposition of the organisation, such as technological complexity of an innovative product; the peculiarities of the market where the org. is located; and finally the degree of complexity of the manufacturing strategies (i.e. a 'design to order' demand will be much more exigent than a 'make to stock' one) will define the requirements that the org. should monitor from its environment. However, the process of doing it will not be so influenced by these factors.
Location (Physical, Logical)	☑ ☐	
Behaviour and relationship of other Org.	☑ ☐	
Value Proposition	☑ ☑	
Resources	☑ ☑	
Performance ambiguity	☐ ☑	
Product & Market Segment	☑ ☑	
Manufacturing Strategy	☑ ☑	

Process:	**MANAGE STRATEGY**	
Critical Factors	**C / U**	**Observations**
General Economic factors	☐ ☑	The process of managing the strategy will be conditioned mostly by uncertainty. In this sense, here the aim of this process is not to design a new strategy for the company, but to define the process or activity of doing it. Critical Factors generating uncertainty to the organisations will be very important when a new inter-organisational relationship is going to be established: General Economic factors will be specially important motivated by the high uncertainty that an unpredictable economic environment generates. Certain Value Propositions that companies might adopt might increase uncertainty level to organisations. Market performance of an innovator company might be much more uncertain than a price minimiser organisation. In the same way, availability of resources of the company; lack of clear insight of performance of other collaborators; the nature of the product and the market where the company is competing; or the specific manufacturing strategy of the firm will have to be much considered
Location (Physical, Logical)	☑ ☐	
Behaviour and relationship of other Org.	☑ ☐	
Value Proposition	☑ ☑	
Resources	☑ ☑	
Performance ambiguity	☐ ☑	

Product & Market Segment	☑ ☑	when new relationships are going to be created. Critical Factors generating complexity to the companies will be important as well, but their influence when decisions taking might be less considerable than all the former Critical Factors. However, a case-by-case analysis is recommended as each organisations might have a very specific casuistic.
Manufacturing Strategy	☑ ☑	

Process:	**MANAGE PERFORMANCE**	
Critical Factors	**C / U**	**Observations**
General Economic factors	☐ ☑	Defining 'Manage Performance' as a process that monitors and co-ordinates the performance of the operate process with respect to the goals, complexity of this performance will be a key issue when developing this process. In this way, Critical Factors that have influence over the complexity of performance of the firm will be highly important for this process when decisions about collaboration with other organisations have to be taken. As mostly all the Critical Factors have some impact over the complexity dimension, they should be analysed one by one assessing their individual importance in each case or situation.
Location (Physical, Logical)	☑ ☐	
Behaviour and relationship of other Org.	☑ ☐	
Value Proposition	☑ ☑	
Resources	☑ ☑	
Performance ambiguity	☐ ☑	
Product & Market Segment	☑ ☑	
Manufacturing Strategy	☑ ☑	
Learning Potential	☑ ☑	
Transaction Costs	☑ ☐	

Process:	**MANAGE CHANGE**	
Critical Factors	**C / U**	**Observations**
General Economic factors	☐ ☑	'Manage Change' is defined as a process that manages change within the organisation. New directions and new strategies define what the new order should be - the future reality - however, the transition from the current order to the future order needs to be achieved efficiently and effectively. According to this definition, both complexity and uncertainty dimensions should be equally considered when decision-taking process: When talking about 'definition of the future reality' uncertainty is being underlined. On the other hand, the definition talks about a transition from the current order to the future one, being the complexity of these two orders a critical issue to do this transition. In this way, all the Critical Factors should be considered in the 'Manage Process'. Logically, some Critical Factors might have more impact as they may influence both complexity and uncertainty dimensions. As a conclusion, it is suggested to analyse each case and situation.
Location (Physical, Logical)	☑ ☐	
Behaviour and relationship of other Org.	☑ ☐	
Value Proposition	☑ ☑	
Resources	☑ ☑	
Performance ambiguity	☐ ☑	
Product & Market Segment	☑ ☑	
Manufacturing Strategy	☑ ☑	

Process:	**DEMAND GENERATION**	
Critical Factors	**C / U**	**Observations**
General Economic factors	☐ ☑	Depending on the casuistic of the firm, either complexity or uncertainty will be more important. For example, an innovating new product might generate high uncertainty when generating new orders, as market's respond will be completely unknown. On the other hand, some locations of a firm, or specific behaviours of
Location (Physical, Logical)	☑ ☐	
Behaviour and relationship of other Org.	☑ ☐	

Value Proposition	☑ ☑	customers might become complex the process of generating new orders. In the same way, availability of resources; the segment of the market where the firm is competing; the strategy of manufacturing; or the nature of the product might add special value to the complexity dimension. As the casuistic could be so wide, is complicated to define a single pattern that describes the impact of all these Critical Factors. Hence, it is suggested to analyse thoroughly each scenario and assess the impact of each Factor for each organisation.
Resources	☑ ☑	
Performance ambiguity	☐ ☑	
Product & Market Segment	☑ ☑	
Manufacturing Strategy	☑ ☑	
Type of Product	☑ ☑	

Process:	**PRODUCT DEVELOPMENT**	
Critical Factors	**C / U**	**Observations**
General Economic factors	☐ ☑	Depending on the casuistic of the firm, either complexity or uncertainty will be more important. When developing a brand new product, complexity of carrying out this process might be influenced by several Critical Factors: Scarcity of resources will be a key constrain of this process; behaviour of suppliers, customers and competitors will impact sharply, as well as the value proposition of the firm; the market segment where the company is performing; or the product type, obviously. On the other hand, it might happen under certain circumstances that Critical Factors impacting over uncertainty become more important than Factors generating complexity. For example, a high recession in the global economy might not recommend to start with a new product development project alone but in collaboration with other firms. In the same way, uncertainty derived from the availability of resources; the market segment where the organisation is situated; the manufacturing strategy implemented (e.g. make to stock or design to order); or the product type again might have much impact over the relationships that the firm should create at this process level.
Location (Physical, Logical)	☑ ☐	
Behaviour and relationship of other Org.	☑ ☐	
Value Proposition	☑ ☑	
Resources	☑ ☑	
Performance ambiguity	☐ ☑	
Product & Market Segment	☑ ☑	
Manufacturing Strategy	☑ ☑	
Degree of routinisation of the buying problem	☑ ☑	
Type of Product	☑ ☑	

Process:	**ORDER FULFILMENT**	
Critical Factors	**C / U**	**Observations**
General Economic factors	☐ ☑	In this process of getting supplied and fulfilling the orders of the customers, complexity might have more importance than uncertainty. However, there will be many cases where uncertainty will be a key driver for managers to take decisions: Lack of control over the shipments of the suppliers with many delays; lack of insight of the real demand of the customers (Bullwhip effect); scarcity of resources either technological, information or skills; etc. Complexity will be of much interest when analysing the impact of the Critical Factors. Location of the firm might be a considerable constrain specially from the logistics point of view. Availability of resources will add more or less difficulty to this process, the same as the manufacturing strategy: From the complexity point of view, a 'make to stock' strategy might be easier to handle than a 'design to order' strategy. Depending of the complexity of the product, it might require a complex supply chain with many suppliers. In this case both the product type, and the behaviour of these suppliers will be sharply important. Every case, every organisation will need a specific and individual analysis of its Critical Factors.
Location (Physical, Logical)	☑ ☐	
Behaviour and relationship of other Org.	☑ ☐	
Value Proposition	☑ ☑	
Resources	☑ ☑	
Performance ambiguity	☐ ☑	
Product & Market Segment	☑ ☑	
Manufacturing Strategy	☑ ☑	
Type of Product	☑ ☑	

Degree of routinisation of the buying problem	☑ ☐	
Transaction Costs	☑ ☐	

Process:	**PRODUCT SUPPORT**	
Critical Factors	**C / U**	**Observations**
General Economic factors	☐ ☑	Both complexity and uncertainty will be relevant for decision taking in this process. Service to customers after sales will be either complex or uncertain for the organisation, or even both. Impact of the Critical Factors over complexity might be generated by the location of the organisation: Service to all customers could be very difficult geographically. Behaviour of customers and suppliers will be a key driver in this process, as their attitude will define the nature of the relationship when any problem flourishes. Scarcity of resources might be another Critical Factor to consider when new inter-organisational relationships have to be built. In the same way, the segment of the market where the company competes and the product type will be highly important from the complexity point of view (e.g. Aeronautics sector). On the other hand, uncertainty will be dominated by the lack of real knowledge about the demand of support services by customers in the future. It might happen that a brand new product has unpredictable and unknown problems. Hence, type of product, behaviour of suppliers and customers, and performance ambiguity of suppliers will be very important from the uncertainty point of view.
Location (Physical, Logical)	☑ ☐	
Behaviour and relationship of other Org.	☑ ☐	
Value Proposition	☑ ☑	
Resources	☑ ☑	
Performance ambiguity	☐ ☑	
Product & Market Segment	☑ ☑	
Manufacturing Strategy	☑ ☑	
Degree of routinisation of the buying problem	☑ ☐	
Type of Product	☑ ☑	

Process:	**SUPPORT PROCESSES**	
Critical Factors	**C / U**	**Observations**
General Economic factors	☐ ☑	As these processes encompass such a high variety of processes (e.g. HHRR, Finances, etc.), it is quite difficult to define one complexity/uncertainty scheme common for all of them. It is clear that depending on each specific case, each support process will be influenced by different Critical Factors, from the point of view of either complexity or uncertainty, or even from both points of view. As a conclusion, it suggested to study each case independently.
Location (Physical, Logical)	☑ ☐	
Behaviour and relationship of other Org.	☑ ☐	
Value Proposition	☑ ☑	
Resources	☑ ☑	
Performance ambiguity	☐ ☑	
Learning Potential	☑ ☑	

When the two sections of this sub-model #1 were first presented, it was stated that the function of the first part (i.e. the current one) would be to assess the characteristics of the critical factors, now under complexity/uncertainty dimensions. On the other hand, the second section would process these characteristics and define the desirable relationships. At this point, the next step will be to design this procedure to assess the characteristics of each particular organisation.

This section 1 aims to assess the characteristics of the critical factors, however, first of all these characteristics will have to be defined. This definition process will lead to develop an assessment method.

When talking about the characteristics of the critical factors it means to specify the different levels or categories that each critical factor may present in each organisation. An example mentioned before stated that the *Product type* might have three levels: Standard, modular, and customised. Depending on the category of the *Product type*, the business processes will have different levels of complexity and uncertainty, and as a result, the desirable relationship will differ.

The specific literature reviewed for searching the critical factors made also possible to deduce the categories that each critical factor has. The application of this deductive research method enabled to build table 6.6 where all the 12 critical factors and their categories are presented.

Table 6.6. Categories of the critical factors

Critical Factors	**Categories**																							
General Economic factors	Highly Favourable							Favourable							Low Recession							High Recession		
Location (Physical, Logical)	Very good infrastructures and industrial environment							Good infrastructures and industrial environment							Average infrastructures and industrial environment							Poor infrastructures and industrial environment		
Behaviour and relationship of other Org.	Stronger than Supplier							Stronger than Customer							Stronger than Competitors							Balanced strength with S/C/Comp.		
Value Proposition	Simplifiers							Price Minimisers							Socialisors							Technological Integrators		
Resources	Availability of Resources														Medium availability of Resources							Scarcity of Resources		
Performance ambiguity	Low														Medium							High		
Product & Market Segment	*Consumer Market*														*Industrial Market*									
	Services				Fast moving consumer goods			Soft goods			Consumer durables				Services			Components				Finished goods		
	Commodity Market														Capital Market									
Manufacturing Strategy	Make to Stock														Assemble to Order									
	Make to Order														Engineer to Order									
	Design to Order																							
Type of Product	Standard														Modular									
	Customised																							
Degree of routinisation of the buying problem	Frequent Procurement														Random Procurement									
	First Procurement																							
Learning Potential	High														Medium							Low		
Transaction Costs	Low														Medium							High		

0 ***Complexity/Uncertainty*** 100

It is necessary to estimate the complexity and the uncertainty values of an organisation to define its desirable relationships. This study is going to calculate these values through a simple scoring process of the categories shown in table 6.6. This way, each critical factor will be scored from 0 to 100 according to the complexity and uncertainty that it generates. In other words, a customised product for example will increase the complexity/uncertainty of the organisational performance more than a standard product type.

First, a logic and simple deduction allowed classifying the categories of each critical factor according to the impact of them over complexity and uncertainty dimensions. The categories represented in table 6.6 are already organised from left to right according to this criterion. This way, the categories on the top right will involve higher complexity/uncertainty that the other categories located in the other extreme (see complexity/uncertainty arrow in table 6.6).

The second step was to give a score or value to each category from a 0-100 range. In order to simplify the operations, it was decided to divide the maximum scoring (i.e. 100) by the number of categories of the critical factor. The value obtained from this operation will represent the increment of score between categories.

E.g.: *Product type* critical factor has three categories: Standard, modular, and customised.

So, the following operation will be done: Increment= $\frac{100}{\text{No. of categories}}$; in this case:

$\boxed{Increment = \frac{100}{3} = 33{,}33}$; this value will mean that *Standard product* will be scored with 33 points out of 100, *Modular product* with 66 and *Customised product* with 100. This operation will be repeated with all the critical factors.

There are two critical factors (*Behaviour and relationship of other Organisations,* and *Product & Market Segment*) that have a different way of scoring due to their nature. The first one, *Behaviour and relationship of other Organisations,* concerns the behaviour of three enablers, i.e. customers, suppliers, and competitors. Thus, each of these enablers will have a 0-100 scoring. On the other hand, something similar happens with *Product & Market Segment* critical factor.

Table 6.7 and 6.8 show all the scores of each category for both complexity and uncertainty dimensions. As it was described in table 6.5, not all the critical factors involve complexity or uncertainty. This way, table 6.7 will encompass the scores of the categories concerning complexity and table 6.8 will do the same with the scores of the critical factors related to uncertainty.

Table 6.7: Score of the categories related to complexity dimension

COMPLEXITY			
Critical Factor	**Category**		**Score range**
General Economic factors	High Recession		
	Low Recession		
	Favourable		
	Highly Favourable		
Location (Physical, Logical)	Very poor infrastructures and industrial environment		81-100
	Poor infrastructures and industrial environment		61-80
	Average infrastructures and industrial environment		41-60
	Good infrastructures and industrial environment		21-40
	Very good infrastructures and industrial environment		0-20
Behaviour and relationship of other Org.	Strong/Aggressive Supplier		67-100 (1)
	Strong/Aggressive Customer		67-100 (2)
	Strong/Aggressive Competitor		67-100 (3)
	Balanced strength with S/C/Comp		34-66 (1)(2)(3)
	Stronger than Supplier		0-33 (1)
	Stronger than Customer		0-33 (2)
	Stronger than Competitors		0-33 (3)
Value Proposition	Innovators		85-100
	Brand Managers		67-84
	Technological Integrators		51-66
	Socialisors		34-50
	Price Minimisers		17-33
	Simplifiers		0-16
Resources	Scarcity of Resources		67-100
	Medium availability of Resources		34-66
	Availability of Resources		0-33
Performance ambiguity	Low		
	Medium		
	High		
Product & Market Segment	Consumer Market	Fast moving consumer goods	56-100
		Consumer durables	51-75
		Soft goods	26-50
		Services	0-25
	Industrial Market	Finished goods	67-100
		Components	34-66
		Services	0-33
	Commodity Market		0-25
	Capital Market		75-100
Manufacturing Strategy	Design to Order		81-100
	Engineer to Order		61-80
	Make to Order		41-60
	Assemble to Order		21-40
	Make to Stock		0-20
Type of Product	Customised		67-100
	Modular		34-66
	Standard		0-33
Degree of routinisation of the buying problem	First Procurement		67-100
	Random Procurement		34-66
	Frequent Procurement		0-33
Learning Potential	Low		67-100
	Medium		34-66
	High		0-33
Transaction Costs	High		67-100
	Medium		34-66
	Low		0-33

Table 6.8: Score of the categories related to complexity dimension

UNCERTAINTY			
Critical Factor	**Category**		**Score range**
General Economic factors	High Recession		76-100
	Low Recession		51-75
	Favourable		26-50
	Highly Favourable		0-25
Location (Physical, Logical)	Very poor infrastructures and industrial environment		
	Poor infrastructures and industrial environment		
	Average infrastructures and industrial environment		
	Good infrastructures and industrial environment		
	Very good infrastructures and industrial environment		
Behaviour and relationship of other Org.	Strong/Aggressive Supplier		
	Strong/Aggressive Customer		
	Strong/Aggressive Competitor		
	Balanced strength with S/C/Comp		
	Stronger than Supplier		
	Stronger than Customer		
	Stronger than Competitors		
Value Proposition	Innovators		85-100
	Brand Managers		67-84
	Technological Integrators		51-66
	Socialisors		34-50
	Price Minimisers		17-33
	Simplifiers		0-16
Resources	Scarcity of Resources		67-100
	Medium availability of Resources		34-66
	Availability of Resources		0-33
Performance ambiguity	High		67-100
	Medium		34-66
	Low		0-33
Product & Market Segment	Consumer Market	Fast moving consumer goods	56-100
		Consumer durables	51-75
		Soft goods	26-50
		Services	0-25
	Industrial Market	Finished goods	67-100
		Components	34-66
		Services	0-33
	Commodity Market		0-25
	Capital Market		75-100
Manufacturing Strategy	Design to Order		81-100
	Engineer to Order		61-80
	Make to Order		41-60
	Assemble to Order		21-40
	Make to Stock		0-20
Type of Product	Customised		67-100
	Modular		34-66
	Standard		0-33
Degree of routinisation of the buying problem	First Procurement		67-100
	Random Procurement		34-66
	Frequent Procurement		0-33
Learning Potential	Low		67-100
	Medium		34-66
	High		0-33
Transaction Costs	High		67-100
	Medium		34-66
	Low		0-33

Note: The cells in red mean that the categories of this critical factor do not influence this complexity/uncertainty dimension

Simple software, i.e. Ms Excel, was used to collect and process all the scores given to each critical factor. A dynamic matrix was built to manage automatically all the data collected after scoring the critical factors of a particular case.

The user of this matrix (see figure 6.3) will introduce one or more blue scores for each critical factory depending on the category fulfilled by the case under study. It first calculates the average score for each critical factor (i.e. right grey column). Then, using the relationship between the 12 critical factors and the complexity/uncertainty dimensions analysed before in table 6.5 it calculates the average value of complexity and uncertainty of this particular case.

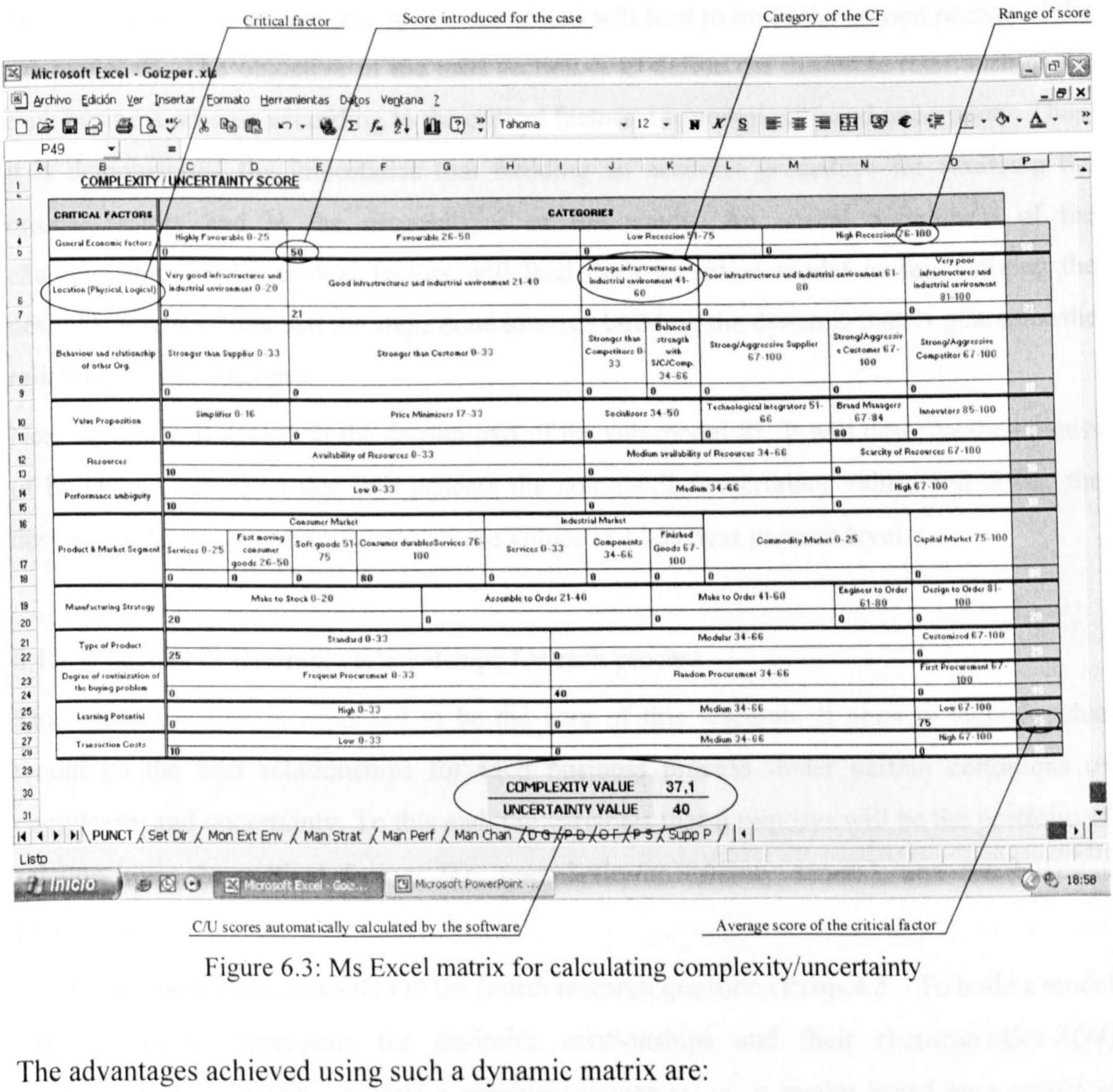

Figure 6.3: Ms Excel matrix for calculating complexity/uncertainty

The advantages achieved using such a dynamic matrix are:

- Very simple and graphical to use.
- The user only has to introduce some basic scores.
- Complexity and uncertainty values are automatically calculated; complex relationships between factors and complexity/uncertainty have not to be considered every time.

- Complexity/uncertainty can be easily estimated independently for each business process.
- The dynamic matrix allows modifying any score and calculating the complexity/uncertainty variation immediately, even for each business process.

The objective of this section 1 of the sub-model #1 was to assess the characteristics of the critical factors. At this point, it can be stated that the dynamic matrix allows not only to score the critical factors according to some categories proposed, but also to deduce the complexity and uncertainty of one particular case at a business process level. Thus, the initial part of the sub-model #1 has been accomplished.

The complexity and uncertainty scores calculated will lead to build the second section of the sub-model #1. The objective of the next section is to define the desirable relationships for each business process according to the critical factors, i.e. complexity and uncertainty. Thus, it is demonstrated the importance that building an accurate procedure for assessing the critical factors had in the propositions of this study. An unreal assessment of the characteristics of the critical factors will lead the conceptual model to fail defining the desirable relationships. All the steps done towards building the dynamic matrix guarantee the reliability of the outcome.

Next section will deal with the second part of the sub-model #1. It will describe the process of building a construct that will process the complexity/uncertainty values and define the desirable relationships associated to these values at a business process level.

6.1.2.2. Section 2: Desirable relationships for each process

This second section is supposed to be the core of this research. It aims to identify what would be the best relationships for each business process under certain conditions of complexity and uncertainty. To this end, the variables that it requires will be the portfolio of relationships, the critical factors (i.e. complexity/uncertainty scores), and the business processes.

The third proposition associated to the fourth research question (**Prop.4.3** – To build a model that graphically represents the desirable relationships and their characteristics-*RQ4*) highlighted the necessity to build a graphical construct, i.e. a model based on a graphical format that would allow a rapid comprehension of the functionality and the outcome of the system. This requirement will play a key role in the building process of the new construct.

It was decided by the author that rather than developing a new architecture for the construct it would be more reliable to use a contrasted reference model. To this end, Puttick's work

was again reviewed and the architecture used by the author for representing the impact of complexity and uncertainty dimensions was adopted (Puttick, 1982).

The architecture of Puttick's reference model is basically a two-dimension chart where complexity and uncertainty are the inputs (figure 6.4).

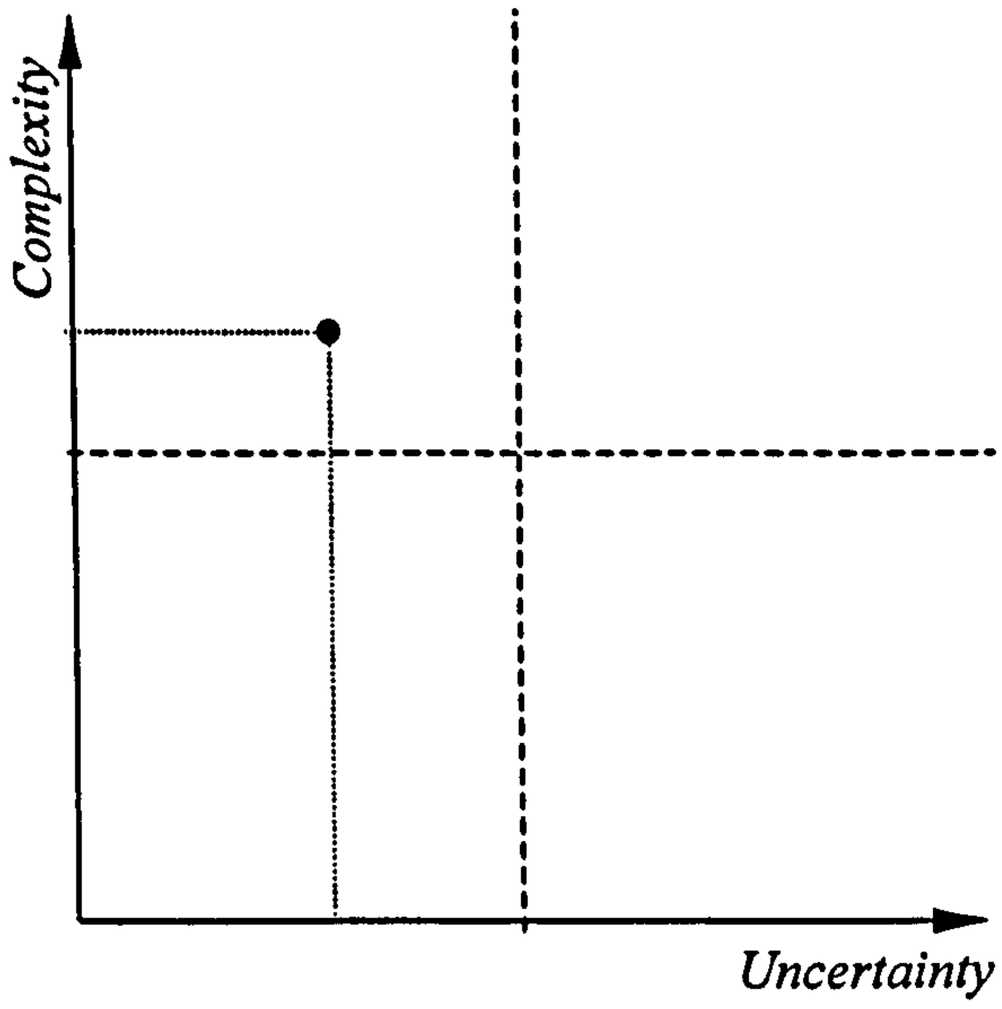

Figure 6.4: Complexity/uncertainty architecture of Puttick's reference model

This architecture is suitable for the objectives of the conceptual model of this study. It allows dealing with the three variables (i.e. complexity/uncertainty score, portfolio of relationships, business processes) and also it is a very graphical construct.

The first variable is already incorporated in the architecture: complexity and uncertainty are the two dimensions of the chart. The portfolio of relationships, the input of the construct, will be represented in the area between two dimensions. This way, it will relate the scores of complexity and uncertainty introduced in the chart (see black dot in figure 6.4) with a level of organisational relationship. If this procedure is repeated with the particular score of complexity/uncertainty of each business process, the construct will define the desirable relationships for each business process. To this end, each process will have its own complexity/uncertainty chart.

The next step was critical in the process toward building the conceptual model. One of the main contributions to knowledge of this study will be to find the relationship between the complexity/uncertainty of a particular case and the desirable relationship for its business processes. In other words, the area between the complexity and uncertainty dimensions in figure 6.4 had to be distributed according to the organisational relationship that best meets the complexity/uncertainty values.

Figure 6.5 shows just some examples of the possible constructs that would deal with the relationship between complexity/uncertainty and the relationships in a different way.

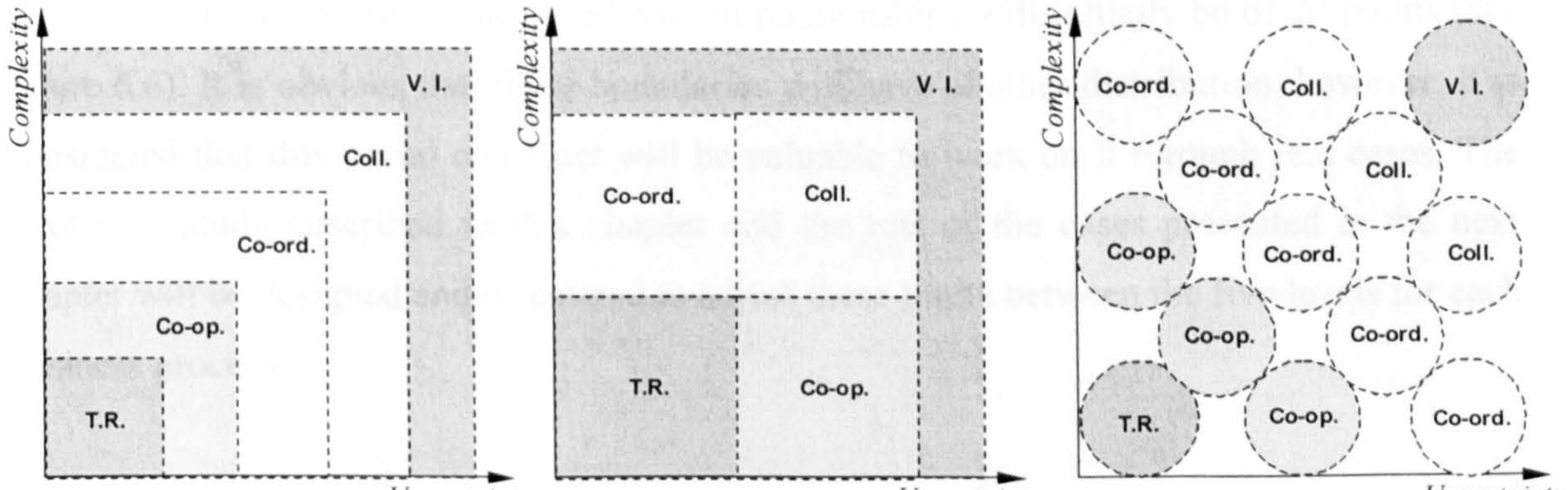

Figure 6.5: Different distributions of the relationship levels according to complexity/uncertainty

Finding the model that best deals with the link between these two variables was a key outcome of this study. The literature reviewed showed that there is not much information or similar work that cope with this issue. Thus, the author decided to propose a distribution as shown in figure 6.5 and then refine it through the data gathered in the case studies. The configuration of the relationships according to the complexity and uncertainty dimensions proposed by the author is represented in figure 6.6.

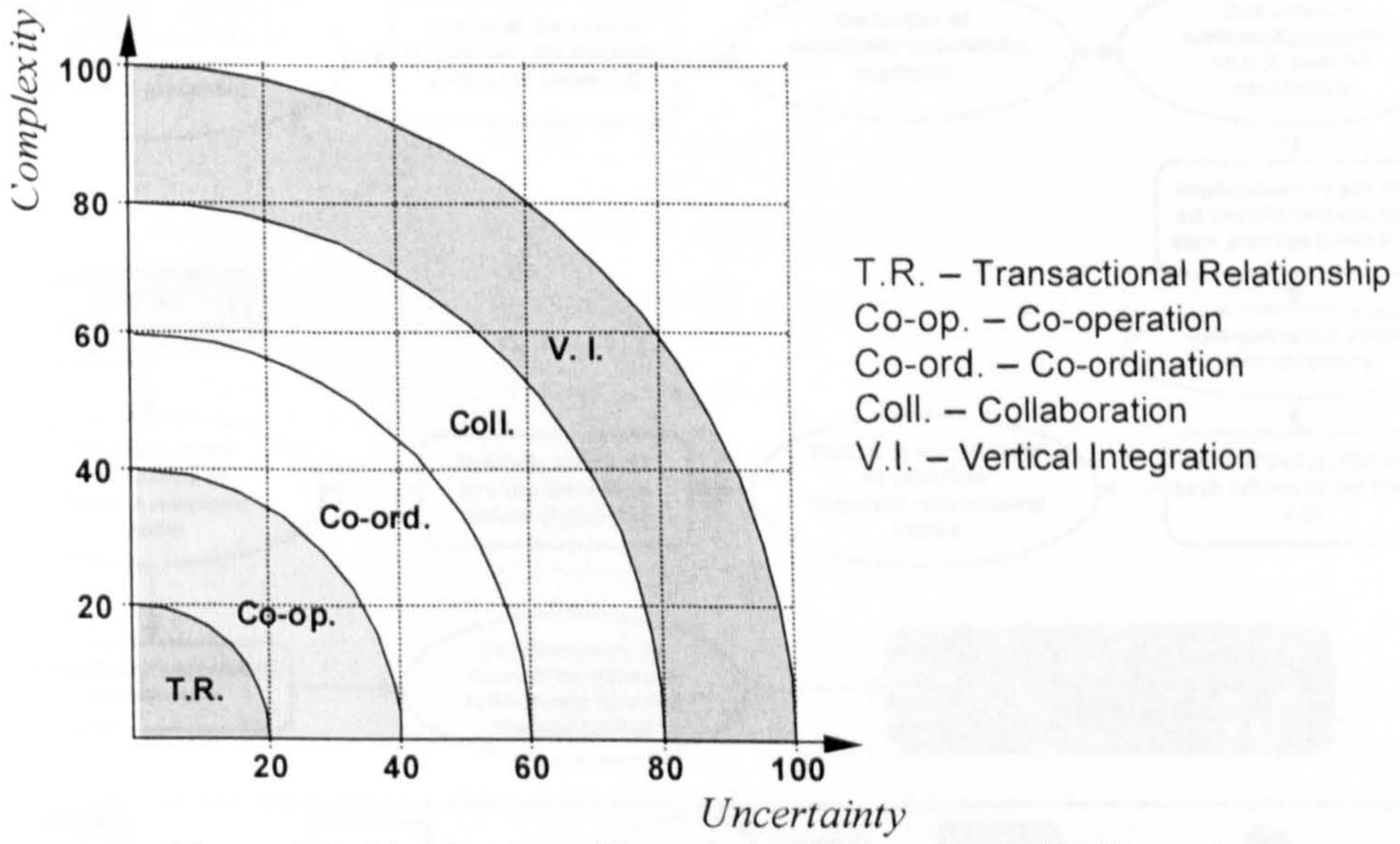

Figure 6.6: Distribution of the relationships selected by the author

The key decision when designing this kind of constructs is where to put the boundaries between relationships. Many of the authors reviewed in chapter 5 related to the first research question (i.e. *what are the levels of collaboration?*) stated that actually it is very hard to distinguish these limits between the relationship levels. According to these authors real

experiences had shown that the characteristics of different levels are often overlapped, that is, it is not so clear where one relationship level begins and ends.

Considering this feature, the author initially proposes to distribute the boundaries between levels proportionally: the difference between relationships will initially be of 20 points (see figure 6.6). It is obvious that these boundaries will have another distribution, however, it is considered that this initial construct will be valuable to work on it through real cases. The pilot case study described in this chapter and the rest of the cases presented in the next chapter will be designed and orientated to adjust these limits between the five levels for each business process.

At this point of the study the sub-model #1 of the conceptual model has been accomplished. This sub-model starts scoring the categories of the critical factors of a particular case through the dynamic matrix shown in figure 6.3. A complexity and uncertainty score will be deduced for each business process. These values will be introduced in the chart represented in figure 6.6, one chart for each business process, and the desirable relationship will be identified. The chart presented in figure 6.6 is a proposal, which will be refined through a set of case studies.

Figure 6.7 shows the research process carried out to build the sub-model #1.

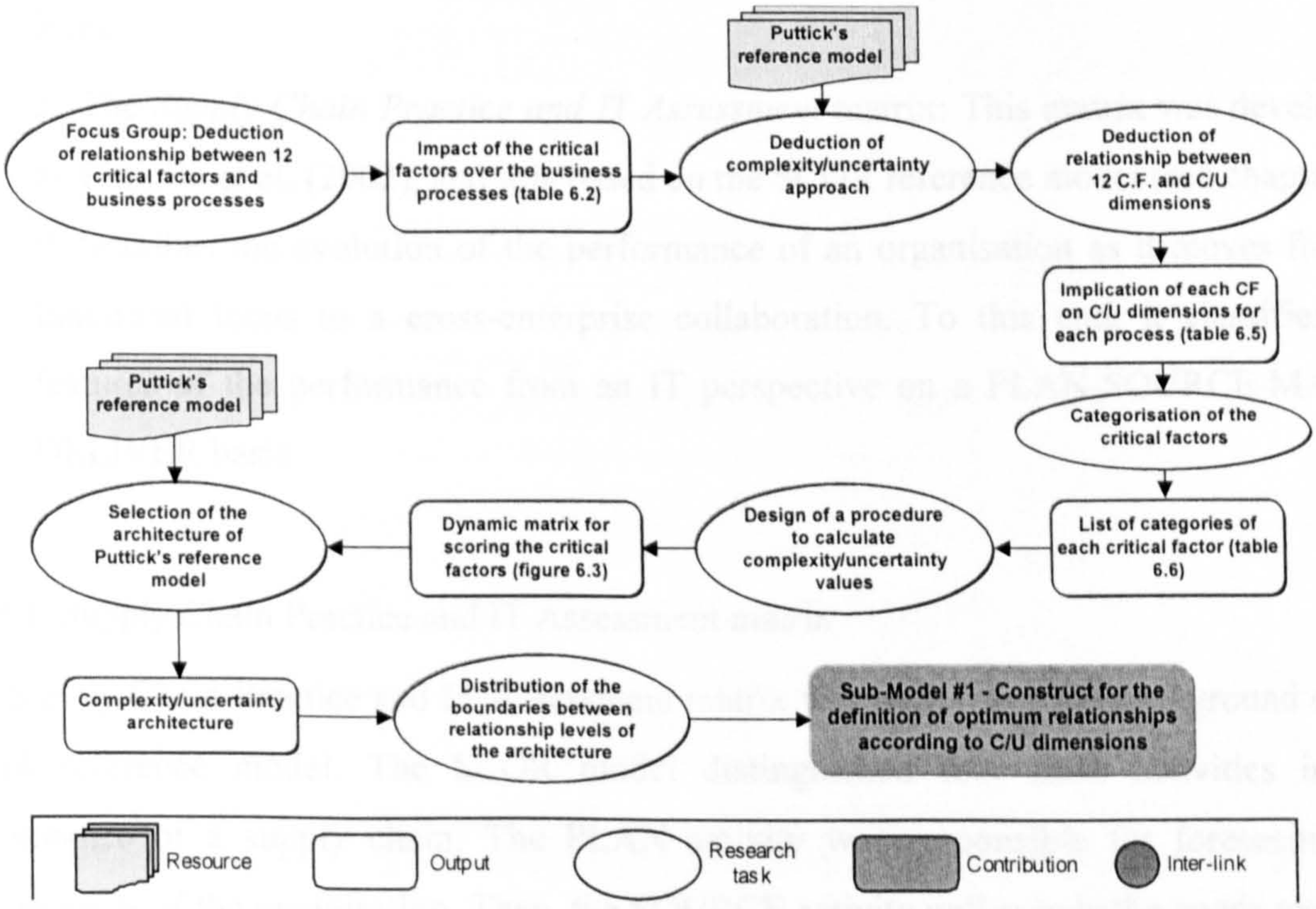

Figure 6.7: Research process for building sub-model #1

Next section will deal with the second part of the conceptual model, i.e. sub-model #2. This second sub-model will describe the operational characteristics that the desirable relationships identified by the sub-model #1 should fulfil. The conceptual model suggested by the fourth

research question and its propositions will be completely built with the development of sub-model #2.

6.1.3 Sub-model #2: Operational implications for business processes

The variables involved in this second sub-model are basically the portfolio of relationships, the business processes and the characteristics of the relationships (see table 6.1 and figure 6.2). The aim of this second part of the conceptual model is to define the operational characteristics[10] of the business processes necessary to meet the requirements of the different relationship levels. In other words, the objective of this section is to define what an organisation should operationally do to maintain a particular relationship level with another entity.

Two sources of data will be used to build this sub-model:

1. General characteristics of the relationship levels: This was the outcome of the research question number 2 of this study analysed in chapter 5. A full list of characteristics was extracted from the literature based on authors such as Rich and Hines (1997), Stevens (1989), Spekman et al. (1998), and Fontenot et al. (1997) between others. Table 5.7 showed all the particular characteristics of each relationship level.

2. The *Supply Chain Practice and IT Assessment* matrix: This matrix was developed by Pittiglio et al. (2002), and it is based on the SCOR reference model (see chapter 2). It describes the evolution of the performance of an organisation as it moves from a functional focus to a cross-enterprise collaboration. To this end, it classifies the features of the performance from an IT perspective on a PLAN-SOURCE-MAKE-DELIVER basis.

6.1.3.1. Supply Chain Practice and IT Assessment matrix

The Supply Chain Practice and IT Assessment matrix was built using the background of the SCOR reference model. The SCOR model distinguished four main activities in the performance of a supply chain: The PLAN activity was responsible for foreseeing the requirements of the organisation. Then, the SOURCE activity will supply the goods required by the MAKE activity. Finally, the final products will be DELIVERED to the customer.

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[10] It is understood by operational characteristics the set of tools, methodologies, resources, systems and procedures that any organisation needs to have in place.

Pittiglio et al. (2002) defined a four-stage migration model:

1. Functional focus
2. Internal integration
3. External integration
4. Cross-enterprise collaboration.

These authors took each of these stages and identified the features of the supply chain practice and IT resources for each of the activities defined by the SCOR model, i.e. PLAN, SOURCE, MAKE, and DELIVER.

A comparison of similar cases was selected as a research method to find the linkage between the characteristics of the relationships proposed by this study (chapter 5) and this matrix developed by Pittiglio et al. (2002). The objective of this cross-reference comparison was to fit the content of this matrix in the classification of five relationships developed by this study. Table 6.9 shows the relationship between the characteristics of this matrix and the portfolio of relationships proposed in chapter 5.

Table 6.9: Link between 'SC Practice and IT Assessment' matrix and the relationship levels proposed by this study

Characteristic	Activity of SCOR	Stage in the matrix	Relationship level
Discrete Supply Chain processes and data flows well documented and understood	Enablers/ Operat. Capability	1	TR
Strategic partners throughout the global Supply Chain collaborate to 1)Identify joint business objectives and actions plans; 2)Enforce common processes and data sharing	Enablers/ Operat. Capability	3	Co-op
IT and solutions enable a collaborative Supply Chain strategy that aligns participating companies' business objectives and associated processes	Enablers/ Operat. Capability	4	Co-ord
All supply planning is performed within company boundaries, and is not consistent across companies	PLAN	1	TR
Integrated tools do not exist	PLAN	1	TR
Informal agreements and relationships exist for some supply chain partners	PLAN	2	TR
Planning is viewed as a critical lever and engages strategic partners in a direct exchange of planning information on a regular basis	PLAN	3	Co-op
Global demand forecasts are captured directly from customers, and expressed in standard terms	PLAN	3	Co-op
Supply chain integration agreements specify the roles of each party in the planning process and specify penalties for demand or supply shortfalls and surplus	PLAN	3	Co-op
Performance metrics governing supplier relationships are available via real-time control panels	PLAN	3	Co-op
Supply chain integration service agreements define specific roles and responsibilities, including explicit guidelines about issue resolution as it relates to external supply chain partners.	PLAN	3	Co-op
Global demand forecast information flows freely between customer, manufacturer, and supplier	PLAN	4	Co-op/Co-ord/ Coll
Primarily a functional strategy-focus is on budget and purchase price valance	SOURCE	1	TR
Little attention is paid to supply market analysis.	SOURCE	1	TR
Focus is on supplier rationalization where the majority of buyer's time is spent on purchase order placement and fire fighting	SOURCE	1	TR
Use a combination of EDI, fax, paper-based, and manual transactions	SOURCE	1	TR
Arms-length and/or poorly defined supplier partnership relationships. No formal supplier	SOURCE	1	TR

management process in place			
All large suppliers linked via EDI	SOURCE	2	Co-op
Commodity strategies determine supplier relationships. Formal supplier relationships are defined reflecting cross-functional requirements for buyer/supplier communication	SOURCE	2	Co-op
Integrated value chain strategy - strategic partners are identified based on competencies, cross - enterprise TCO (Total Cost of Ownership), and improvement strategies with specific goals in mind	SOURCE	3	Co-op.
Joint service/partnership agreements for objectives and incentives, performance targets, benefit sharing agreements, and Terms and Conditions	SOURCE	3	Coll.
Strategic suppliers have access to selected on-line information	SOURCE	3	Co-op.
Cross-enterprise optimisation based on TCO for strategic commodities, Net-market enablement, auctions, and supply market sensing/research/analysis	SOURCE	4	Co-ord
All transactions, including eRFQ, on-line bid/quote/mark-up, on-line supplier catalogues, and automated supplier performance tracking and benchmarking, are automated	SOURCE	4	Co-ord
On-line, virtual management of supply relationships for data visibility, collaborative planning, performance tracking, and virtual workspace	SOURCE	4	Co-ord
Organisation alignment via an e-enabled environment that includes Net-markets integration and an integrated enterprise IT architecture, customised to support strategic priorities	SOURCE	4	Co-ord
Customer priorities are rarely considered in day-to-day planning activities	MAKE	1	TR
Advanced scheduling systems resolve conflicts automatically by considering customer priority	MAKE	3	Co-op
Planning and scheduling are joint activities between customer, manufacturer, and supplier(s) with appropriate system links, and other predetermined factors, in place	MAKE	3	Co-op
APS systems are linked to customer and supplier systems to enable instantaneous transfer of changes in production requirements. Customers and suppliers have secure visibility to manufacturing scheduling performance	MAKE	4	Co-ord
Customer order inquiries and quotes typically require research and call back	DELIVER	1	TR
Well-integrated data maintenance procedures and e-commerce ensure that product and process data is accurate and visible to all Supply Chain partners in real time	DELIVER	3	Co-op
Purchase Orders can be received by e-commerce with Automatic Credit Checking	DELIVER	3	Co-op
Product and process data is visible to, and can be queried by, the whole supply chain. It is free of errors and easy to maintain with comprehensive e-commerce linkages to customers and suppliers	DELIVER	4	Co-ord
Warehouse management ensures that distribution partners are fully integrated with electronic transaction and movement tracking information.	DELIVER	4	Co-ord
Discrete supply chain processes (Plan, Source, Make, Deliver) are completely documented, with both process steps and data flows identified	Overall	1	Co-op
A balanced supply chain scorecard integrates Customer, Cost, and Asset metrics and is structured at three levels (overview, process, diagnostics).	Overall	2	Co-ord
A supply chain process and data model is defined and it integrates all of the supply chain processes	Overall	2	Co-ord
Supply chain strategies are developed in collaboration with strategic partners (key suppliers and key accounts). These strategies identify business objectives and major actions required to implement the strategy over a minimum 12-month horizon	Overall	3	Co-ord
Supply chain performance targets are set across the supply chain and are tracked with key suppliers and customers based on commonly defined metrics	Overall	3	Co-ord
Key requirements for data sharing with both customers and suppliers are identified. Common process and data models are defined and implemented with key suppliers and customers to support the relationship	Overall	3	Co-ord
Supply chain strategies and information technology strategies are integrated across key business partners	Overall	4	Co-ord
Customer and Supplier performance scorecards are integrated with the firm's key business performance metrics (e.g., revenue targets, market share, etc.)	Overall	4	Co-ord
The enterprise can compare performance metrics across all customers and suppliers in order to identify potential opportunities for supply chain reconfiguration and improvement	Overall	4	Co-ord

Table 6.9 demonstrated that the matrix proposed by Pittiglio et al. (2002) may be adapted to the classification of relationship levels proposed in this study. Thus, the next step to build the sub-model #2 was to merge both sources of data, i.e. the outcome of the second research question and the characteristics presented in table 6.9.

The resulting table is available in the appendix B of this thesis, at the end of the document. This table presents the operational characteristics of each relationship level. The difference between this classification and the general characteristics proposed in the second research question is that the specificity degree is higher in the former one, as it involves operational features.

However, the objective of this sub-model #2 is not just to describe the general operational characteristics of an organisation under one relationship level, but to specify these characteristics for each business process of the organisation (appendix C).

To this end, the operational characteristics of each relationship level were related to each business process, and a set of tools, methodologies and systems that met these characteristics was defined for each process (sub-model #2, appendix C). The pattern used for this definition was based on the graphics presented in chapter 5 (figures 5.8 to 5.12) where the implication of the relationship types by process was described at information, system and benefit/risk sharing levels.

As no interaction with other firms was described in transactional relationship, there was not defined any tool, methodology or system for the business processes under this relationship type.

Co-operation relationship shared information in support processes; therefore, the operational instruments required to fulfil this activity were defined only for these processes.

There was a system sharing between organisations when they were co-ordinated at operate and support processes level, and eventually information sharing in some manage processes. The sub-model #2 defines the operational requirements for each particular process to meet these system and information sharing needs.

Finally, both collaboration and vertical integration relationship level share benefit and risk (also information and systems) in all the processes, i.e. manage, operate and support processes. As a result, all the ten processes will need specific tools and procedures to enable the organisation to collaborate/vertically integrate with other partners.

Sub-model #2 can be found in appendix C of this thesis. Each of the matrixes of the sub-model related to the five relationship levels has a column (left hand side) where the general operational characteristics of each relationship are described. There can be seen another 10 columns, one per process, where the operational tools, methodologies and so on are described. There are some columns that do not have any content. This fact is due to the lack of interaction between the company and other organisations at this process under this certain level of relationship.

At this point the objectives defined for this sub-model #2 has been fulfilled. A set of matrixes have been developed where the operational details of each business process is described for each relationship level. The research process carried out to this end is shown in figure 6.8.

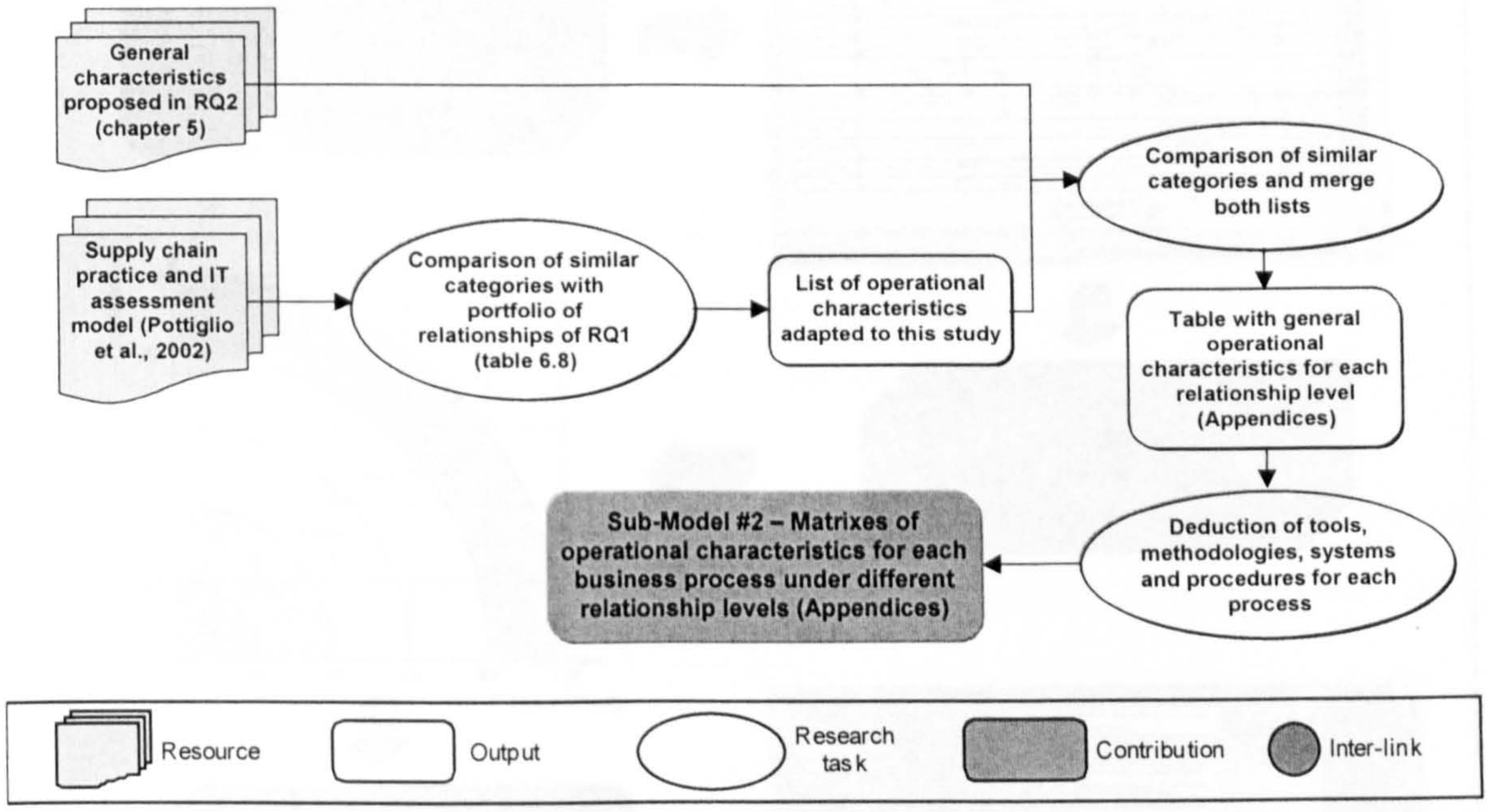


Figure 6.8: Research process carried out to build sub-model #2

Both sub-model #1 and sub-model #2 have been already built, therefore, the conceptual model proposed by the fourth research question has been developed. However, the author estimates that it is necessary to deal with the linkage between both sub-models in order to create an integral insight of the conceptual model. The answer to the research question number 4 and its propositions is given by a conceptual model, and not through two sub-models.

Next section will cope with the functionality of the conceptual model and how to use it in a real environment.

6.1.4 Interaction between sub-models

Although the sub-models built in the previous sections might be used independently, they were designed to use together, complementing one each other. It is objective of this section to clarify the relationship between these two sub-models. When describing this relationship between the two sub-models, the full functionality of the conceptual model will be explained. Figure 6.9 describes graphically the procedure to use the conceptual model, its components and the linkages within it.

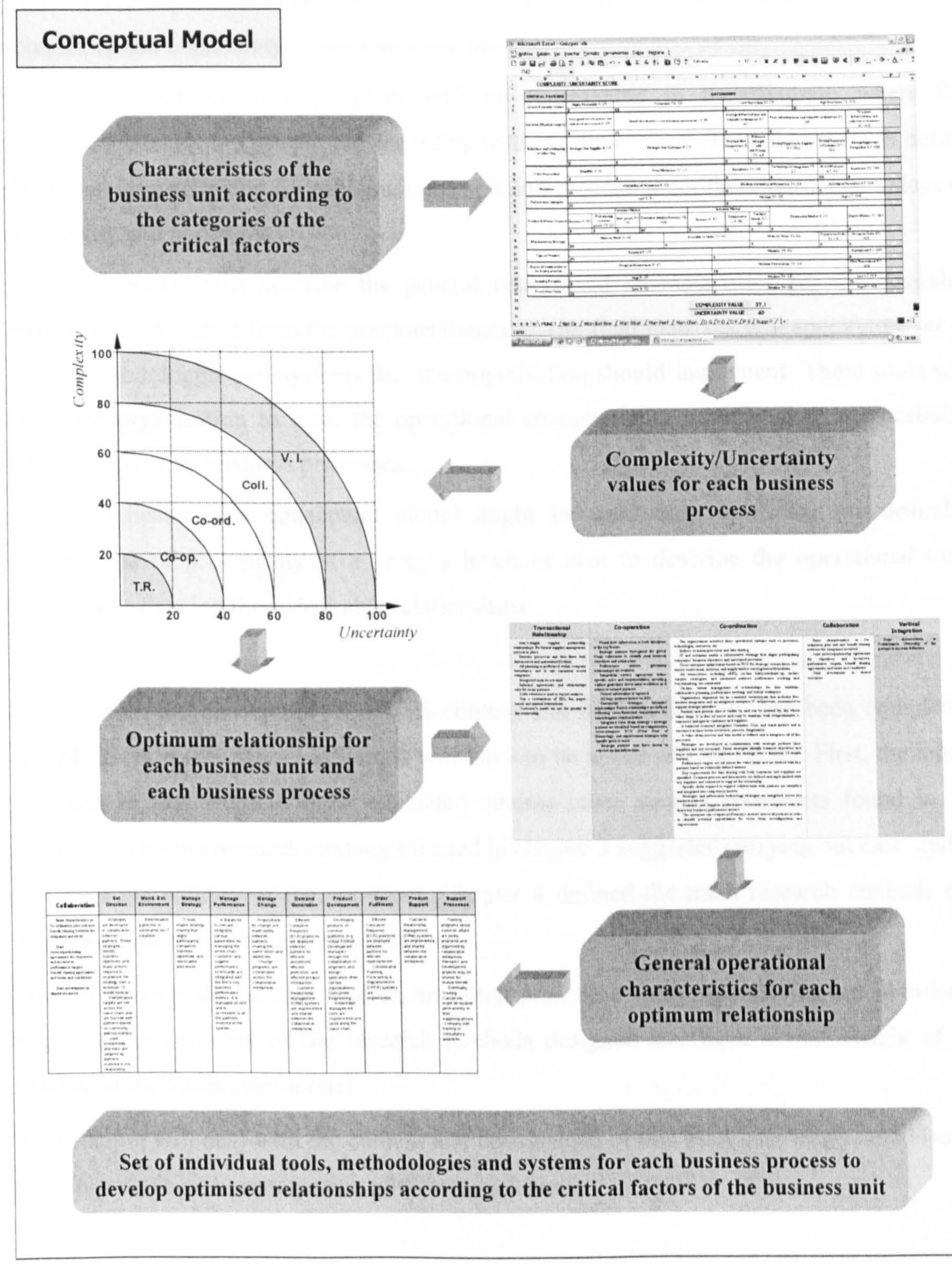


Figure 6.9: Description and functionality of the conceptual model

When implementing the conceptual model in a real case, the input required by the model is the basic characteristics of the organisation or business unit. These characteristics were grouped under 12 critical factors; each of them has some categories. The categories of the organisation are scored using a Ms Excel table according to the range of scores shown in this

table. When these scores are added to the table, it will calculate the average value of complexity and uncertainty of each business process.

These complexity/uncertainty values will be represented in the diagram where the relationships levels are distributed according to these dimensions. This diagram will define the desirable relationship for each business unit and process under these particular values of complexity and uncertainty.

An initial matrix will describe the general operational characteristics for the desirable relationships extracted from the previous diagram. The final matrixes will specify the set of tools, methodologies and systems that the organisation should implement. These tools will allow the organisation to meet the operational characteristics associated to the desirable relationships of its business processes.

As a conclusion, this conceptual model might be used only to define the desirable relationships of a company at a process level, or also to describe the operational tools necessary to develop these desirable relationships.

At this point the conceptual model, its content and its functionality has been completely described. As it is a new construct, it will have to be tested and validated. First, the model proposed in this study will be evaluated against other similar constructs found in the literature. Also the research strategy selected in chapter 3 suggested carrying out case studies to ensure the validity of the construct. Chapter 4 defined the main research methods that would be used to fulfil these case studies.

Prior to develop all the case studies, an initial pilot case study was carried out in order to both test the accuracy of the research methods designed and have a first insight of the validity of the conceptual model.

Next section will deal with the content and conclusions of this pilot case study, and also the decisions made as a consequence of these conclusions.

6.2 Partnership model found in the literature

A similar model for improving organisational relationship was found in the literature. Lambert and Knemeyer (2004) proposed a three-stage partnership model. The objective of these authors was to offer a process for aligning expectations between organisations and determining the level of co-operation that would be most productive.

Basically, the partnership model aims to illuminate the drivers behind each company's desire for partnership, allows managers to examine the conditions that facilitate or hamper co-

operation, and specifies which managerial activities managers in the two companies must perform, and at what level, to implement the partnership. These are the three steps of the partnership model (Lambert and Knemeyer, 2004):

- *Assessment of the relationship necessity*: The organisations willing a new relationship are gathered, and their desire for partnership and a set of facilitating factors of each other are scored from 0 to 24.
- *The propensity-to-partner matrix*: The scores defined by the organisations are introduced in a special matrix built by Lambert and Knemeyer. This matrix will recommend a relationship type out of four potential types as a result.
- *Management components for partnerships*: A second matrix provides information about key management decisions that managers of the involved organisations should carry out according to the relationship type suggested by the previous matrix.

As a conclusion, it can be stated that the model based on complexity and uncertainty built by the author and the one analysed in this section proposed by Lambert and Knemeyer (2004) share the same structure based on three basic steps: Data/characteristics assessment, relationship optimisation and finally, recommended measures for reaching the features of the ideal relationships provided by the previous step.

The main differences rely on the critical factors considered by these authors and their scoring procedure. Same way, the relationship types defined by the propensity-to partner matrix considerably differ. While the third step proposed by Lambert and Knemeyer (2004) highlight managerial activities that the organisations should carry out, the matrixes proposed by the author deals with operational tools and systems that should be implemented.

The review of the partnership model confirms the accuracy of the structure chosen for the complexity/uncertainty model. The application of the pilot case study presented in the following section will vary the content of this model and as a consequence, the content of the new proposal will considerably differ from the model proposed by Lambert and Knemeyer (2004).

6.3 Application of the pilot case study

The author considered necessary to incorporate the details of the pilot case study in this 'Theory Building' chapter. The nature of this section led to think that it should be part of the following chapter referred to testing and validating the proposals developed in this study so far. However, the findings of this pilot case study contributed specially to build a new approach of the theory, as it will be described in this section.

The objective of this section is to describe the initial findings extracted from the pilot case study, and how they conditioned the theory building process. The research methods used during this case will not be described into detail, as next chapter will do it. If it is necessary more information about the procedure followed to get the conclusions described in this section, it is suggested to read chapter 7 (i.e. Theory testing).

The pilot case study was carried out with two major aims:

- To refine the research methods such as data collection tools, and also the protocol designed to develop the case studies in a reliable way (Yin, 2003:67; Eisenhardt, 1989).
- To gain an initial sight of the validity of the construct proposed by this study through real field-data analysis.

The pilot case study allowed the author to optimise the data collection tools and the procedure to gather this data when approaching an organisation. Substantial changes were done in some of the methods used (see chapter 7), therefore, it enabled to develop the rest of the case studies more efficiently.

On the other hand, the data provided by this pilot case study was determinant to give a new approach to the conceptual model built in the previous sections. The analysis of the data and the findings suggested changing some of the content of the construct, as it will be described in the following sections. First, this chapter will present the characteristics of the organisation where this pilot case study was carried out. Next section will deal with the presentation of the company.

6.3.1 Goizper S.Coop.

Goizper S. Coop. was established in 1959 in Antzuola, a small industrial village in the Basque Country (Spain). Since the very beginning it was structured as a cooperative, a very spread economic model in this region, where all the employees of the organisations are active owners of the company. Currently, this company employs up to 200 people depending on the season.

From its beginnings, Goizper has specialised in the manufacturing of two main product lines:

- Sprayers for agricultural and garden use.
- Components for power transmission.

In order to adapt to such different product and market environments, the company has organised itself in two business units that operate independently: Agricultural unit and Industrial unit.

The Agricultural business unit represents approximately 70% of Goizper's turnover. Its purpose is the manufacturing of manually operated sprayers and dusters for agricultural, garden, industrial and home use. Goizper is the Spanish market leader in manual sprayers, with a market share of more than 65%. It has its own sales network, which includes 20 representatives with stocks on deposit, and it is present at more than 2,500 points of sale. More than two thirds of the production is exported, to more than 120 countries throughout the world. This makes the organisation one of the world's leading manufacturers of manually operated sprayers.

The Industrial business unit represents approximately 30% of the turnover. The main products manufactured are:

- Mechanical, electromagnetic, pneumatic and hydraulic brakes and clutches.
- Cam-operated mechanisms and special cams.

The production equipment includes a large number of CNC machines, principally lathes, machining centres, grinders and milling machines, and a 3D machine and profile projectors for measurement and verification.

The principal machine tool manufacturers in Spain are among the customers. The export market represents 30% of our turnover, with sales principally to Japan, Brazil and the EU.

For the purpose of this pilot case study, it was estimated that it would be better focusing on just one business unit. Hence, one of both units will have to be chosen for this study. Criteria used for selecting the most suitable business unit:

- Percentage of the company's turnover.
- Proportion of resources dedicated to each unit.
- Popularity of the brand/product.
- Nature of the map of relationships of each unit.

Considering these criteria, the unit of analysis of this case study (Johnston et al., 1999; Yin, 2003:22) will be the Agricultural division.

6.3.2 Review of the research methods used

The research methods selected for the data collection stage were basically four: A questionnaire, semi-structured interviews, documentation and direct observation. The research implications of these methods were described in chapter 4. An extended explanation of the specific content and characteristics of each of these techniques applied to this study will be presented in the following chapter 7.

The use of four different research methods allowed gaining reliability of this pilot case study. This issue is called by Yin (2003) triangulation of methods, and it is based on collecting data from the same case through different research methods in order to provide consistency and objectiveness to this data.

Next section will deal with the findings and the conclusions extracted from the data collected in this pilot case study.

6.3.3 Findings and conclusions of the pilot case study

The within-case analysis carried out with all the data gathered in the organisation allowed to gain two types of conclusions. First, general conclusions concerning issues such as, the structure and the content of the conceptual model, the configuration of the variables and the procedure for implementing the model were extracted.

A second analysis of the data provided specific conclusions related to the particular case under study, that is Goizper S.Coop. The research methods used allowed the author to have a detailed perspective of issues such as the collaboration practice of the organisation.

This section will deal with the first set of conclusions as they might influence substantially the theory building process. The rest of the specific conclusions of the case will be analysed in the theory testing chapter with the other cases selected.

The pilot case study provided highly valuable information concerning the practical implication of the conceptual model and its variables (i.e. relationship levels, critical factors, characteristics of the relationships and business processes). Although the conceptual model was completely supported by the theory, this first contact with a real business unit highlighted important conclusions from a practical perspective:

- The overall structure of the conceptual model was found to be effective. The three-stage architecture, i.e. scoring the characteristics of the company, definition the desirable relationships by the diagram (figure 6.6), and definition of the operational characteristics by the matrixes (appendix C) was highly valuated during the pilot case study.

- Portfolio of relationships: RQ1 was answered through the proposal of five different relationship levels as the range of potential relationships between organisation. All the data collected led the author to conclude stating the validity of this proposal. Thus, transactional relationship, co-operation, co-ordination, collaboration and vertical integration may be provisionally defined as relationship levels after this initial pilot case study. More case studies will be necessary to definitely validate RQ 1.

- Business processes: The organisation did not distinguish different types of manage-processes. This way, set direction, monitor external environment, manage strategy, manage performance and manage change were considered to be common practices of a generic management process. It was supposed that all these processes were integrated, therefore, it was not clear the boundaries between these activities.

At the same time, it was stated that the three families of processes (i.e. manage, operate and support processes) were inter-related. The data collected showed that in the cases where the organisation was collaborating in the operate processes, this relationship level was spread to the other two generic processes in a similar way, that is, the organisation tend to collaborate in manage and support processes as well. Same way, a transactional relationship in the operate processes normally involved the same relationship level in the other two families (i.e. manage and support processes).

These two conclusions led the author to focus specially on the operate processes in the rest of the case studies and the research, as these processes were the most specific and known.

- Critical factors: Important findings were extracted concerning the critical factors and their influence over the relationships. First it was stated that the complexity/uncertainty approach was not so deterministic when a relationship had to be developed or modified by the organisation. Moreover, rather than complexity and uncertainty the data of this pilot case study highlighted the value and risk concepts as key factors.

The semi-structured interviews held with different managers of the organisation led the author to deduce that the key drivers considered by the organisation to develop close relationships are the value that the organisation receives from the supplier or gives to the customer (or other entities), and the risk associated with this transaction. At the same time, complexity and uncertainty dimensions were highlighted as potential risk generators. So complexity and uncertainty were not rejected as drivers influencing relationships, but they were defined as part of a more deterministic factor, i.e. risk.

The role of the 12 critical factors was also analysed and interesting conclusions were reached. This pilot case study showed that these critical factors define the general

collaborative nature of the organisation. While value/risk drivers were highlighted as primary factors influencing the decision process concerning the specific organisational relationships, the 12 critical factors were described as secondary drivers that outline the collaborative nature of the organisation.

These critical factors would define the openness of the organisation to other entities: E.g. a customised product company would be more collaborative (in all its processes) than a standard product firm. Hence, it can be said that these factors would describe the general nature of the relationships, but not specific relationships between one particular supplier and its customer.

On the other hand, value and risk dimensions would allow defining specific relationships between a company and particular suppliers/customers, or other organisations. Table 6.10 summarises these explanations.

Table 6.10: Conclusions about the critical factor classification of the pilot case study

<table>
<tr><th colspan="3">Critical Factors</th></tr>
<tr><th colspan="2">Primary factors</th><th>Secondary factors</th></tr>
<tr><td colspan="2">❑ Value</td><td rowspan="3">• General Economic factors
• Location (Physical, Logical)
• Behaviour and relationship of other Org.
• Value Proposition
• Resources
• Performance ambiguity
• Product & Market Segment
• Manufacturing Strategy
• Type of Product
• Degree of routinisation of the buying problem
• Learning Potential
• Transaction Costs</td></tr>
<tr><td rowspan="2">❑ Risk</td><td>Complexity</td></tr>
<tr><td>Uncertainty</td></tr>
</table>

❑ Sub-model #1: The first implementation of the conceptual model showed that the initial part, i.e. sub-model # 1, required substantial changes. Different problems were identified:

- The procedure for scoring the critical factors, and so complexity/uncertainty dimensions, was not rigorous enough. Bias and subjectivity might have high influence on the results.
- The complexity/uncertainty diagram (figure 6.6) only defined one desirable relationship for each business process. For example, the organisation should collaborate in the product development process, or co-operate in the product support process. However, this outcome did not fulfil the aim of this study.

  It would be ideal to make more efficient the particular relationships for each linkage that the organisation has with its suppliers/customers/other organisations at

a process level. It is obvious that each organisation will have hundreds of different relationships with many other companies at each business process, and not just one as the current sub-model #1 suggests. E.g. an organisation will collaborate with supplier A, co-operate with supplier B, have a transactional relationship with customer C, and collaborate with competitor D in the order fulfilment process. This example clearly shows that sub-model #1 should define particular relationships for each linkage, and not just one generic relationship.

- Sub-model #2: The set of tools, methodologies, systems and so on grouped in the sub-model #2 were found to be a normative model, that is, what the company should do in order to gain a particular objective. In this case, the pilot case study showed that although the managers stated that the organisation was collaborating with a supplier in a specific process, the operational features suggested by the sub-model #2 were not actually implemented. This fact led the author to deduce that this collaboration might be more efficient if the tools described in the sub-model would be implemented.

As a consequence, it was deduced that the implementation of these tools is not compulsory to gain a particular relationship. However, this sub-model would be useful for making more efficient and effective the organisational relationships.

These were the main conclusions extracted from the initial pilot case study concerning the structure, procedure, and variables of the conceptual model. These conclusions have to be interpreted in a relative way as they are generated from just one case. However, these conclusions are valuable and specific actions will be taken to solve the problems described above. Next section will deal with these actions.

Conclusions about the particular collaborative practice of Goizper S.Coop. will be presented in chapter 7.

6.3.4 Implications of the conclusions over the study

A set of decisions was taken as a consequence of the findings from this pilot case study. It is important to highlight that none of the proposals developed so far was rejected after this initial case. It was considered that one case study was not enough to take any definitive action, so the author decided both to maintain the conceptual model as it was and to propose a new approach in parallel according to the conclusions stated above. This way, the following case studies will be critical for selecting the most accurate conceptual model through an objective and reliable decision process.

Table 6.11 shows the main problems found in the pilot case study and the action planned to improve these problems.

Table 6.11: Actions taken to improve the problems found in the pilot case study

Problem detected	Action proposed
The boundaries between the manage processes were not known. The three families of processes (i.e. manage, operate and support processes) were inter-related: Collaboration in operate processes made easier to collaborate in the other two families of processes.	The following case studies will be more focused on operate processes as this family is well distinguished by the managers. Manage and support processes will not be rejected.
Complexity/uncertainty dimensions	Value and risk drivers will be analysed.
	Complexity and uncertainty values might be potentially part of the risk driver.
The impact of the 12 critical factors differed from the expectations	The 12 critical factors will be considered to be secondary factors. These critical factors will define the general collaborative openness of the organisation, rather than define specific relationships between organisations
Lack of rigour in the procedure for scoring the critical factors and complexity /uncertainty	A new approach will be given to the sub-model #1
Sub-model #1 only defines one generic desirable relationship for each business process. Particular relationships with each organisation at each business process are required.	
The operative tools defined in sub-model #2 were not implemented according to the model.	Sub-model #2 will be considered to be normative, i.e. what an organisation should do, and not compulsory

Concerning the research methods and the protocol of the case studies (the second objective of the pilot case study), a set of modifications were done to the questionnaire. At the same time, the configuration of the semi-structured interview was changed, as much effort and time was dedicated to secondary issues, whereas other important fields were more time constrained. All this modifications were ready to deal with the following case studies.

The actions proposed in table 6.11 will be analysed in the next section. A new approach concerning the conceptual model, especially sub-model #1, will be presented to find a solution to the problems found as part of the theory building process.

6.4 Model refinement: Value/Risk approach

The problems found during the pilot case study suggested to provide a new approach to the conceptual model of this study. The aim of this section is not to substitute the previous model, but to build a new proposal in parallel considering the actions described above.

As figure 6.10 shows, the weaknesses of the conceptual model were focused on the initial part, i.e. sub-model #1.

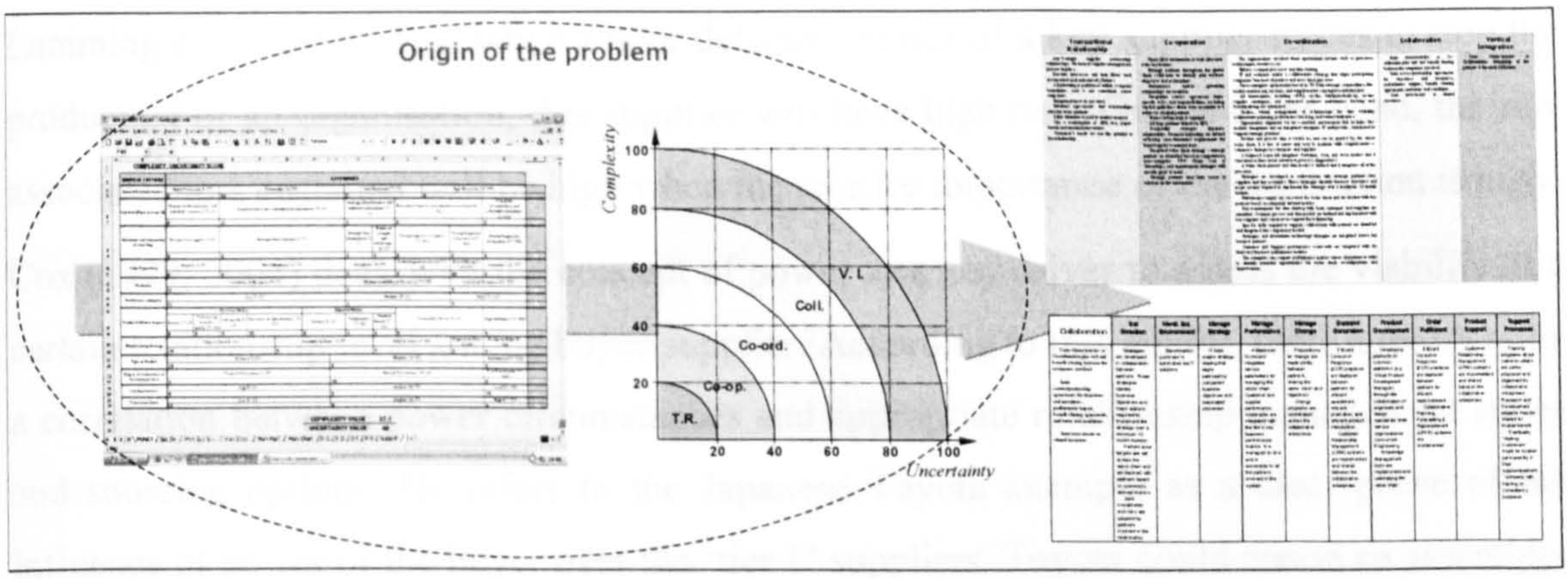


Figure 6.10: Content of the conceptual model that requires refinement

First, the process of assessing the characteristics of the organisation, that is, the procedure for scoring the critical factors resulted to be subjective. A more rigorous method will be required to gain reliability of the results.

Complexity and uncertainty drivers were found to be of less influence than expected by the conceptual model. Rather than complexity and uncertainty, value and risk were discovered to be the key drivers for the relationship level decision process. At the same time, the outcome of the complexity/uncertainty diagram was found to be unrealistic, as it defined just one desirable relationship per business process. The ideal outcome of the model should identify one desirable relationship per supplier/customer/other organisation and business process.

At this point, theoretical background concerning value and risk concepts was necessary in order to provide theoretical consistency to the conceptual model. Analysing the work of authors such as Martinez (2003), Cox (1997, 1999, 2004) and Cousins, Lamming et al. (2004), relationship between value, risk and power factors was analysed. The next section will cope with the theory behind this relationship and the decisions taking for this research.

6.4.1 Value vs. Risk vs. Power

After reviewing some key literature in the field, value was defined as the perceived additional benefit, tangible and/or intangible, as a result of a specified relationship with a partner (Martinez, 2003). It is understood by tangible value as the material goods that an organisation receives from a supplier or provides to a customer or other organisation. Intangible value encompasses soft assets such as knowledge and information.

The definition of risk involved the negative implications of not having a specified relationship with the partner. This driver will measure the impact that a negative transaction with a supplier or a customer has over the performance of an organisation (Cousins,

Lamming et al., 2004). E.g. when a poor delivery service of a key supplier forces to stop the production of an organisation, this supplier will have high risk. On the other hand, the risk associated to a customer will be high when the relative importance of the transaction is high.

Cox (1999, 2004) dealt with the concept of power as a key driver to assess the viability of a certain relationship level among buyer/supplier. According to this author, there appears to be a correlation between power circumstances and appropriate relationship management styles and sourcing options. He refers to the Japanese Toyota example as a clear prove of the influence of power of the buyer over the 'tier 1' suppliers. Toyota could create an assembly-based, demand-pull and JIT system because it had a dominant power relationship with its suppliers.

Cox (1999) highlights that in understanding how to manage supply chains strategically and operationally it is essential that practitioners properly understand the power structures that exist in their supply chains. If they do not, then both practitioners and academics may well be guilty of recommending strategies and operational practices that are inappropriate for the supply chains in which they operate. Table 6.12 shows different power scenarios proposed by Cox (2004) and their effect over the relationships.

Table 6.12: The power matrix: the attributes of buyer and supplier power

Attributes to Buyer Power Relative to Supplier	Attributes to Supplier Power Relative to Buyer: LOW	Attributes to Supplier Power Relative to Buyer: HIGH
HIGH	**BUYER DOMINANCE** Few buyers/many suppliers. Buyer has high % share of total market for supplier. Supplier is highly dependent on buyer for revenue with few alternatives. Supplier's switching costs are high. Buyer's switching costs are low. Buyer's account is attractive to supplier. Supplier's offering is a standardised commodity. Buyer's search costs are low. Supplier has no information asymmetry advantages over buyer	**INTERDEPENDENCE** Few buyers/few suppliers Buyer has relatively high % share of total market for supplier. Supplier is highly dependent on buyer for revenue with few alternatives. Supplier's switching costs are high. Buyer's switching costs are high. Buyer's account is attractive to supplier. Supplier's offering is relatively unique. Buyer's search costs are relatively high. Supplier has moderate information asymmetry advantages over buyer.
LOW	**INDEPENDENCE** Many buyers/many suppliers. Buyer has low % share of total market for supplier. Supplier has little dependence on buyer for revenue and has many alternatives. Supplier's switching costs are low. Buyer's switching costs are low. Buyer's account is not particularly attractive to supplier. Supplier's offering is a standardised commodity. Buyer's search costs are relatively low. Supplier has very little information asymmetry advantages over buyer.	**SUPPLIER DOMINANCE** Many buyers/few suppliers. Buyer has low % share of total market for supplier. Supplier has no dependence on buyer for revenue and has many alternatives. Supplier's switching costs are low. Buyer's switching costs are high. Buyer's account is not particularly attractive to supplier. Supplier's offering is relatively unique. Buyer's search costs are very high. Supplier has substantial information asymmetry advantages over buyer.

Attributes to Buyer Power Relative to Supplier

Attributes to Supplier Power Relative to Buyer

At this stage, it is necessary to analyse and assess the relationship between value, risk and power factors. According to Cox (1999), power is achieved through appropriateness of the value of the supply chain. In this way, it is deduced that the more value received from a supplier, the more powerful this supplier will be. Referring to the work by Cousins, Lamming et al. (2004), it can be deduced in a similar way that the higher the power of a supplier/stakeholder, the higher will be the risk involved in the transaction.

From these two statements, to effects of this study the author will consider that both **value** and **risk** factors will encompass the effect of power factor over relationships. As a result, when assessing the value and the risk associated to a supplier/stakeholder, the power of this supplier/stakeholder will also be considered by these two factors.

6.4.2 Building the Value/Risk construct

It was deduced from the pilot case study that the sub-model #2 would not need any modification. The new approach would be focused on improving sub-model #1.

Three were the requirements highlighted above for the new proposal:

- Value/Risk approach.
- Specific relationships for each supplier/customer/other organisation and process.
- More efficient procedure for scoring the characteristics.

The first task was to build a similar diagram as the complexity/uncertainty one but with these two new dimensions, i.e. value and risk.

The second requirement for the new approach was focused on defining specific relationships for each supplier, customer, or other organisations. A substantial difference was proposed to fulfil this objective. In the initial sub-model #1 (based on complexity/uncertainty) the characteristics of the organisation under study were assessed. This procedure did not allow customising the relationships with other organisations, as the features of them were not considered.

The new approach aims to measure the characteristics of the individual linkages between single organisations (i.e. supplier, customers, and so on) and the company under study. This fact will enable to study the particular requirements of each case, and as a consequence all the relationships that a company has with its environment will be made more desirable.

The third characteristic of the new conceptual model approach should improve the scoring procedure. It was found that the scale from 0 to 100 of the initial sub-model was too wide, and the managers interviewed often scored the critical factors not very rigorously. It was

decided to reduce the scale and simplify it substantially. This simplified scoring system would allow both to gain reliability of the scoring process and also to compare easily the relative scores given to different cases.

Value and risk of the transaction were the two dimensions to score. The author decided to define three levels of value/risk: Low, medium and high.

Apart from these three requirements, another conclusion of the pilot case study was that the study should be more focused on operate processes rather than in the three families of processes (i.e. manage, operate and support processes). All these characteristics were combined to build the new conceptual model approach.

The complexity/uncertainty sub-model #1 had two main parts: A dynamic table for scoring the critical factors, and a complexity/uncertainty diagram for defining the desirable relationships for each business process. It was found in the pilot case study that this structure was effective, so it will remain the same. Thus, it will have a first part where the value and risk drivers will be scored, and the second part will be based on a value/risk diagram, which will define the desirable relationships.

Figure 6.11 represents the matrix used for scoring the nature of the relationships from a value and risk perspective.

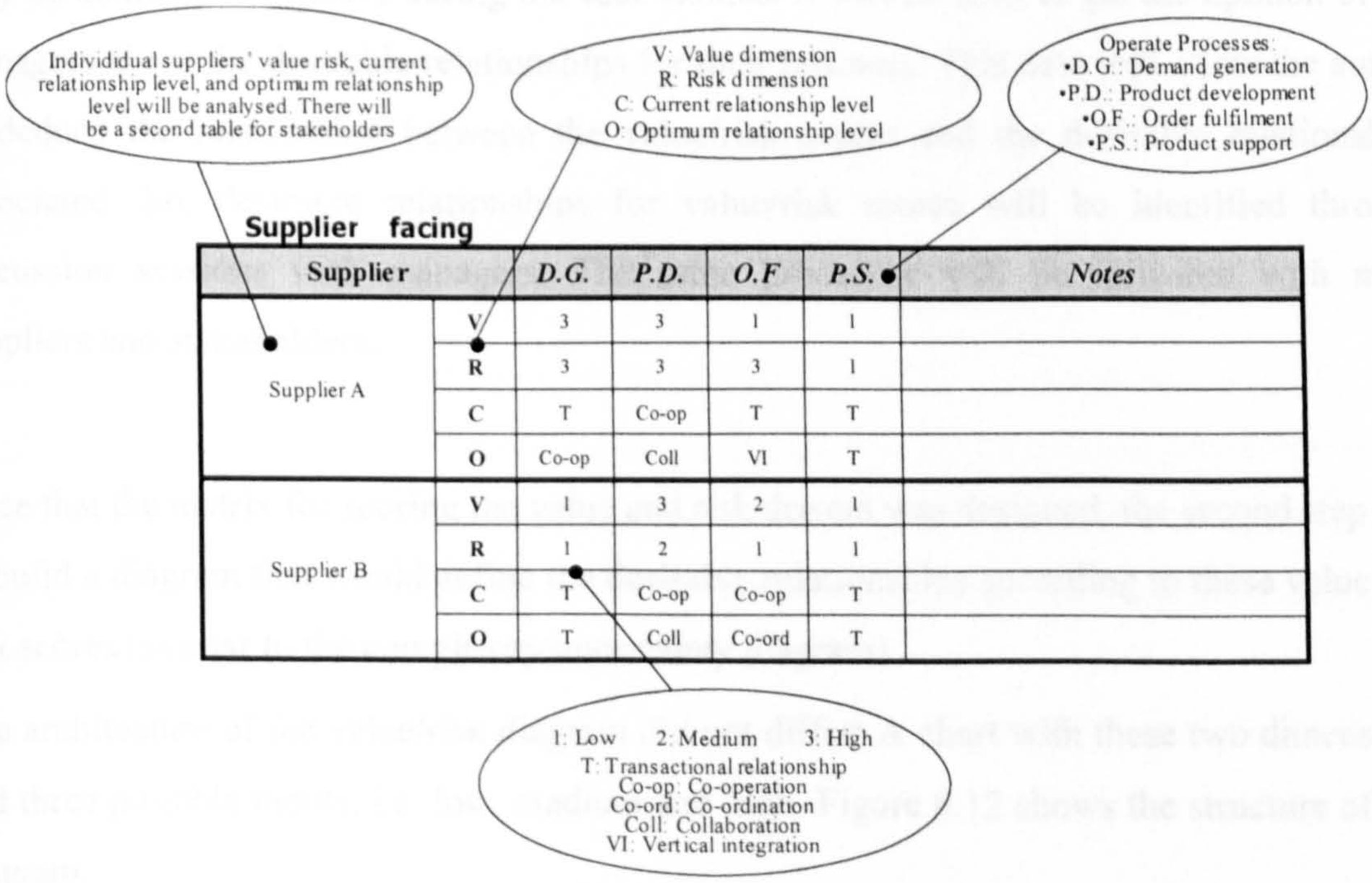


Figure 6.11: Procedure for suppliers' value/risk assessment

Two matrixes like the one shown in figure 6.11 will be used to assess the characteristics of the linkages of the organisation with other external firms. While one of them will collect the scores of the suppliers (supplier facing), the second matrix will be in charge of the stakeholders (stakeholder facing) such as customers, technologic centres, universities, and so on.

Each matrix may include as many suppliers/stakeholders as desired by the organisation that aims to improve its relationships. When the organisation wants to improve the relationships with a supplier (supplier A), its name will be written in the cell on left hand side (see figure 6.11). The first row will assess the value that the organisation receives from supplier A in each of the four operate processes, i.e. demand generation, product development, order fulfilment and product support process. There will be three possible scores: '1' when the value received is low, '2' when it is medium, and '3' when the value is high.

The second row will follow the same procedure but it will be focused on the risk perceived from supplier A. The processes involved will be the same, and also the scoring system.

The two rows remaining will deal with the nature of the relationships between the organisation and supplier A in each of the four operate processes. First the current relationship levels will be identified. To this end, the portfolio of relationships developed when answering the first research question will be used (see figure 6.11). The last row will only be added to the matrix during the case studies. It will be used to get the opinion of the managers about the desirable relationships for their business. This data will allow the author to deduce the relationship between the value/risk scores and the desirable relationships associated. So, desirable relationships for value/risk scores will be identified through discussion sessions with managers. The same procedure will be followed with more suppliers and stakeholders.

Once that the matrix for scoring the value and risk drivers was designed, the second step was to build a diagram that would define the desirable relationships according to these value and risk scores (similar to the complexity/uncertainty diagram).

The architecture of the value/risk diagram did not differ: A chart with these two dimensions and three possible inputs, i.e. low, medium and high. Figure 6.12 shows the structure of this diagram.

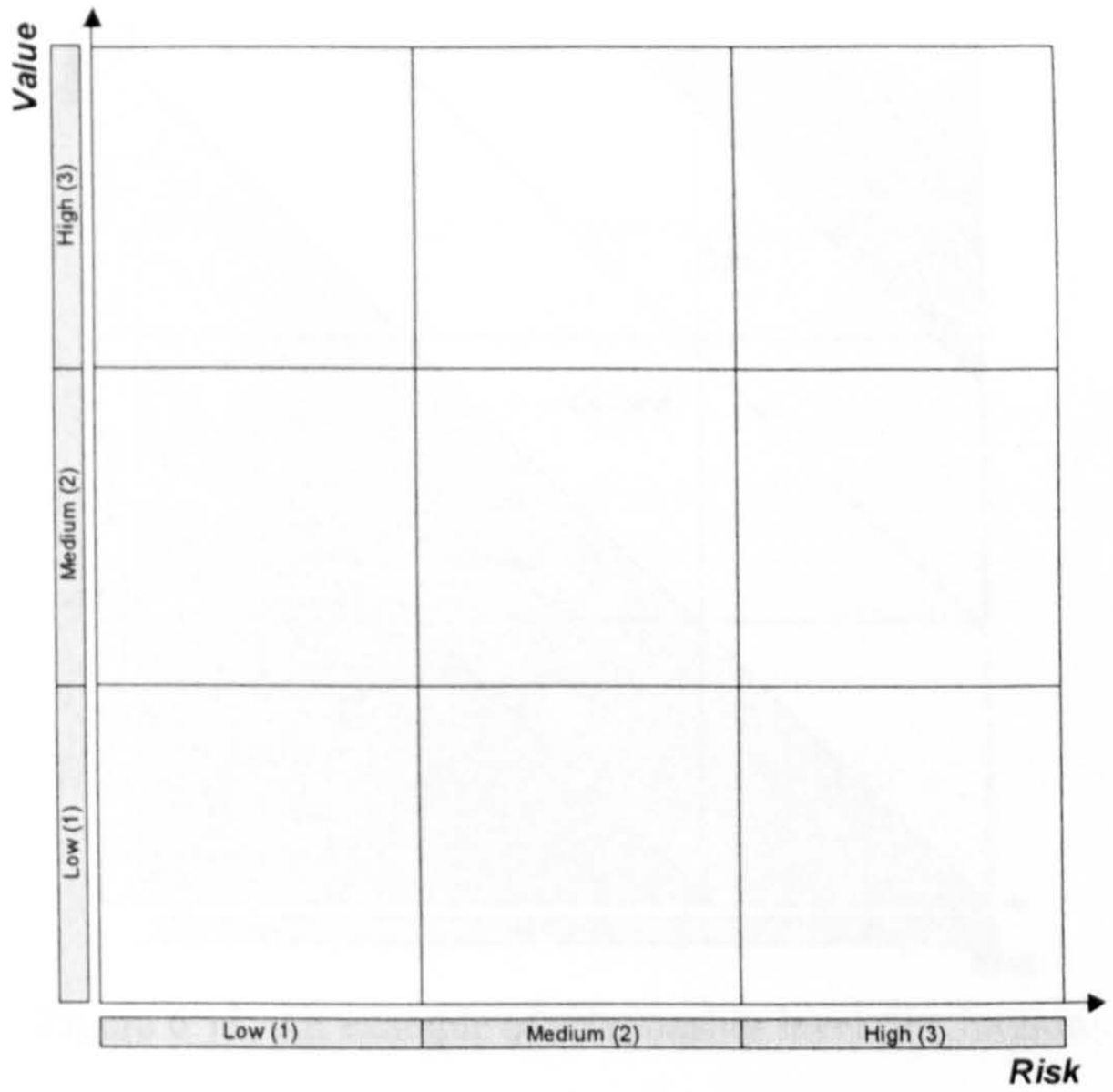


Figure 6.12: Structure of the value/risk diagram

The scores of value and risk collected by the matrixes will be represented in the diagram shown above. It is important to note that there will be two groups of diagrams, one group for the suppliers and another group for the stakeholders. It was decided two create two sets of diagrams because the relationship requirements will vary from the supplier's perspective to the stakeholder's perspective.

Same way, each of these groups will have specific diagrams for each operate process. Considering the two perspectives and the four operate processes, an amount of eight diagrams will be built for the conceptual model.

As happened with the complexity/uncertainty approach, the key step toward building this conceptual model will be to define where the boundaries of the value/risk scores are for each relationship level. Figure 6.6 proposed a rough distribution of the relationship levels. It was highlighted that one of the objectives of the case studies would be to define the right location of these limits between the relationships. In the value/risk approach defining accurately these boundaries will also be a challenge (see figure 6.13).

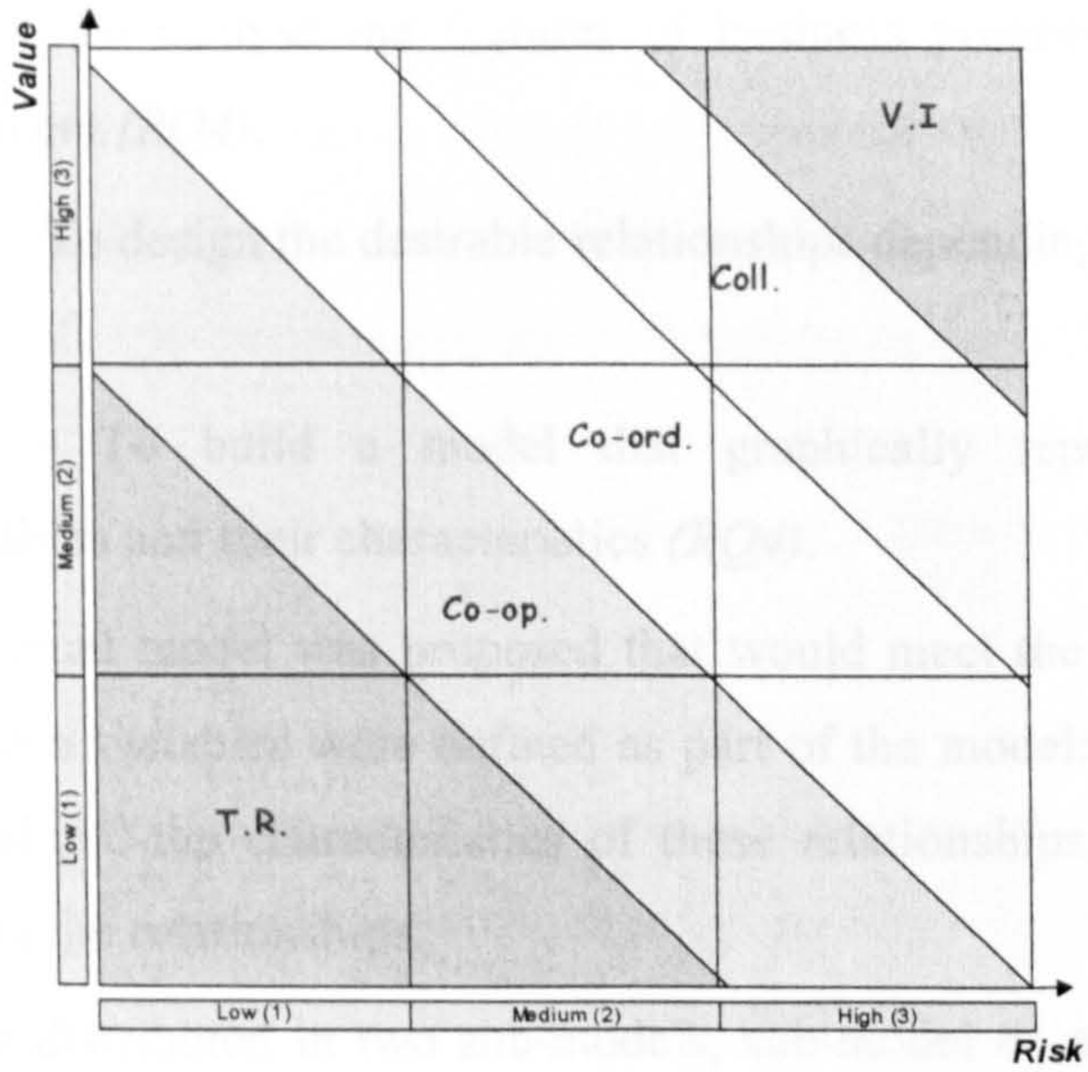


Figure 6.13: An example of relationship level distribution

However, the author will not propose a possible distribution of the levels as it was done with the complexity/uncertainty diagram. The data collected in the case studies through the matrixes explained before will help to define these boundaries. The desirable relationships for the value/risk scores given by the managers interviewed will be used to this end (fourth row of the matrix, 'O' in figure 6.11).

As a conclusion, this new approach will allow to make more desirable the relationships with each supplier/stakeholder for each of the four operate processes depending on the value and risk involved in the transaction.

The outcome of this diagram would be linked to the sub-model #2. Thus, operational characteristics (i.e. tools, methodologies, systems, and so on) would be defined for the relationship with each supplier/stakeholder at a business process level.

This chapter will end with some conclusions related to the research process and its outcome described above.

6.5 Conclusions of the chapter

The objective of this chapter 6 was to answer the fourth research question and its propositions:

R.Q.4: *Can we create a standard profile that corresponds to desirable collaborating footprint?*

Prop.4.1 – To analyse the features of business processes in a collaborative environment *(RQ4)*.

Prop.4.2 – To design the desirable relationships depending on the critical factors *(RQ4)*.

Prop.4.3 – To build a model that graphically represents the desirable relationships and their characteristics *(RQ4)*.

To this end, a conceptual model was proposed that would meet the requirements of these propositions. Four main variables were defined as part of the model: Business processes, a portfolio of relationships, the characteristics of these relationships, and a set of critical factors that influenced the relationships.

These variables were distributed in two sub-models, sub-model #1 and sub-model #2. The aim of sub-model #1 was to assess the impact of the critical factors over the business processes of the organisation. These critical factors were used to calculate the complexity and uncertainty (Puttick's reference model) of the organisation.

A complexity/uncertainty diagram was built, which defined the desirable relationships based on the values of the complexity and uncertainty of the company. Each business process had its own diagram.

The outcome of these diagrams was used by sub-model #2. A set of matrixes described the operational characteristics (i.e. tools, methodologies, systems, and so on) that an organisation should implement in order to gain these desired relationships. All the input of both the sub-model #1 and sub-model #2, that is the four variables, was obtained from the research carried out to answer the first three research question of this study (chapter 5).

Chapter 4 ended stating that one of the research strategies selected for validating the theory building process would be case study research. This way, an initial pilot case study was programmed both to optimise the research methods and the protocol (Yin, 2003) required to develop the case studies, and to get initial data concerning the conceptual model built in the theory building stage.

The pilot case study generated important conclusions that led the author to propose a second conceptual model. This new approach was based on value and risk concepts as drivers for relationship optimisation, rather than on complexity and uncertainty. At the same time the procedure for scoring these drivers was changed, and individual relationships for each supplier/stakeholder were defined through a set of new value/risk diagrams.

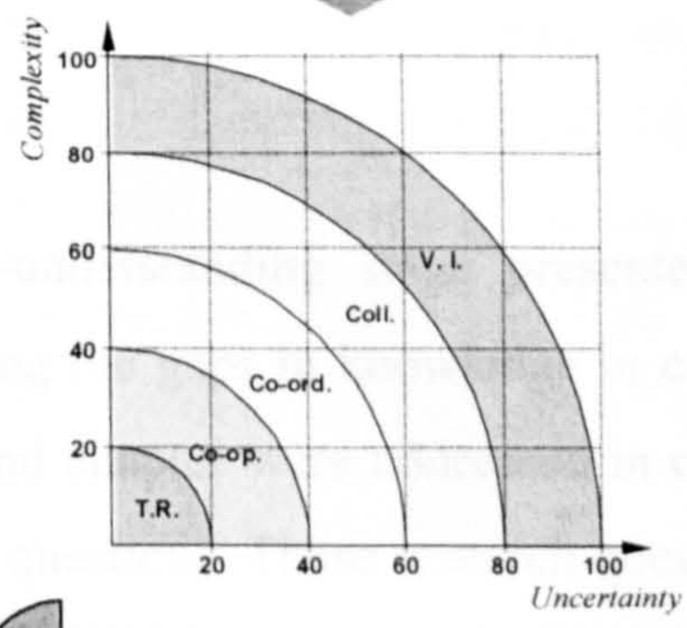
The chapter ends proposing two potential conceptual models for relationship optimisation in a supply chain. The data gathered in the pilot case study was not enough to determine which

of the models will best meet the propositions of the fourth research question. More cases would be necessary to generalise the conclusions and make the right decision.

The author decided to test both conceptual models in the case studies, rather than rejecting one of them at this stage. Specific research methods will be designed to deal with the testing process of both approaches. Figure 6.14 shows the conceptual model with the two potential approaches. The decision will have to focus on selecting the most accurate sub-model #1, as sub-model #2 will remain the same.

Next chapter will describe the empirical study carried out in some organisations to validate all the developments related to the four research questions proposed by this study so far. It will start describing the research methods and the protocol designed to carry out the empirical study. Then, the individual study of each of the organisations contacted will be studied, and all the data collected will be analysed through a cross-case analysis. This empirical study will lead to highlight the general conclusion related to this study.

Sub-model #1

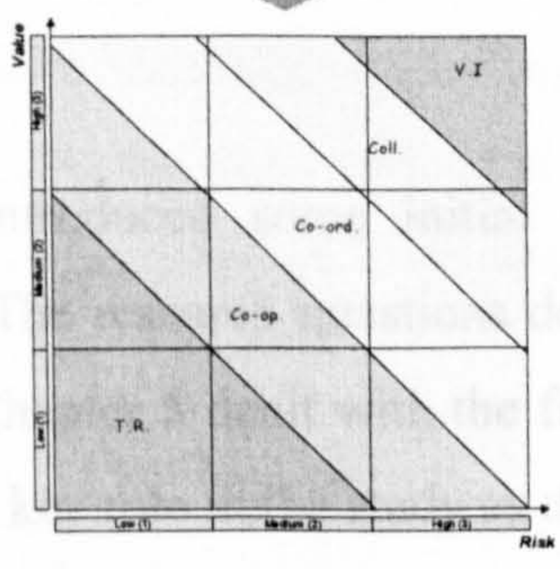


Supplier facing

Supplier		D.G.	P.D.	O.F	P.S.	Notes
Supplier A	V	3	3	1	1	
	R	3	3	3	1	
	C	T	Co-op	T	T	
	O	Co-op	Coll	VI	T	
Supplier B	V	1	3	2	1	
	R	1	2	1	1	
	C	T	Co-op	Co-op	T	
	O	T	Coll	Co-ord	T	

Stakeholder facing

Supplier		D.G.	P.D.	O.F	P.S.	Notes
Stakeholder A	V	3	3	1	1	
	R	3	3	3	1	
	C	T	Co-op	T	T	
	O	Co-op	Coll	VI	T	
Stakeholder B	V	1	3	2	1	
	R	1	2	1	1	
	C	T	Co-op	Co-op	T	
	O	T	Coll	Co-ord	T	



Sub-model #2

Transactional Relationship	Co-operation	Co-ordination	Collaboration	Vertical Integration
Arm's-length supplier partnership relationships. No formal supplier management policies in place. Decision processes and data flows well structured (if) and rudimentary (loose). 4-5 planning to performance ratings completed occasionally, and is not important across companies. Integrated mode are not open. Informal agreements and relationships exist for some products. Little attention is paid to market analysis. Use a combination of EDI, fax, paper-based, and manual transactions. Customer's needs are not the priority in the relationship.	Pursue the implementation of a basic framework of business relationships. Strategic partners distinguished, but global supply collaboration is towards cross functional objectives and metrics global. Performance metrics common governing relationships are evaluated. Integrated service agreements define specific roles and responsibilities, including explicit guidelines where cross functional as it relates to individual purchases. Global performance is neglected. 4-5 major partners tracked via EDI. Ownership, and responsibilities managed with specific goals in mind. Strategic partners may have access to selected but limited information.	The organizations involved share operational controls such as processes, methodologies, resources, etc. Explicit business processes and data sharing. IT and extranet enable a collaborative strategy that aligns participating companies' business objectives and associated processes. Cross enterprise optimization based on TCO for strategic cross-functional, like-market customization initiatives, and supply chain planning/synchronization. All transactions, including eCFO, real-time bid/quote/matching, on-line supplier catalogues, and automated payment performance tracking and benchmarking are automated. On-line, virtual management of relationships for data validation, collaborative planning, performance tracking, and virtual workspace. Organizational alignment has led to a modified environment that includes like-market integration and the reorganized enterprise IT architecture, restructured to support strategic partnerships. Product and process data is visible to, and can be queried by, the whole value chain. It is free of errors and easy to maintain with comprehensive e-commerce linkages to customers and suppliers. A balanced scorecard recognizes Customer, Unit, and Asset metrics and is structured as three levels (enterprise, process, diagnostic). A value chain process and data model is defined and is recognized all of the processes. Strategies are developed in collaboration with strategic partners (key suppliers and key customers). These strategies identify business objectives and major actions required to implement the strategy over a minimum 12-month horizon. Performance targets are set across the value chain and are tracked with partners based on commonly defined metrics. Joint investments and risks are adopted by partners involved in the relationship. Specific skills required to support collaboration with partners are identified and assigned into competency models. Strategies and performance methodology strategies are integrated across key business partners. Customer and Supplier performance scorecards are integrated with the firm's key business performance scorecard. The complete cost compact performance metrics across all partners in order to identify potential opportunities for value chain reconfiguration and improvement.	Some characteristics of Co-ordination plus risk and benefit sharing between the companies involved. Joint venture/partnership agreements for objectives and incentives, performance targets, benefit sharing agreements, and terms and conditions. Joint investments in shared resources.	Some characteristics of Co-ordination plus risk and benefit sharing between the companies involved. Joint venture/partnership agreements for objectives and incentives, performance targets, benefit sharing agreements, and terms and conditions. Joint investments in shared resources.

Collaboration	Bal Direction	Mand. Bal. Environment	Manage Strategy	Manage Performance	Manage Change	Demand Generation	Product Development	Order Fulfilment	Product Support	Support Processes
Some characteristics of Co-ordination plus risk and benefit sharing between the companies involved. Joint venture/partnership agreements for objectives and incentives, performance targets, benefit sharing agreements, and terms and conditions. Joint investments in shared resources.	Strategies are developed in collaboration between partners. These strategies identify business objectives and major actions required to implement the strategy over a minimum 12-month horizon. Performance targets are set across the value chain and are tracked with partners based on commonly defined metrics. Joint investments and risks are adopted by partners involved in the relationship.	Benchmarking process is automated via IT solutions.	ITools enable strategy sharing that align participating companies' business objectives and associated processes.	A Balanced Scorecard integrates various parameters for managing the whole chain. Customer and supplier performance scorecards are integrated with the firm's key business performance metrics. It is managed on-line and is accessible to all the partners involved in the system.	Propositions for change are made jointly between partners, sharing the same vision and objectives. Change programs are coordinated across the collaborative enterprises.	Efficient Consumer Response (ECR) practices are deployed between partners for efficient assortment, efficient promotion, and efficient product introduction. Customer Relationship Management (CRM) systems are implemented and shared between the collaborative enterprises.	Developing products on common platforms (e.g. Virtual Product Development Manager) through the collaboration of engineers and design specialists (from various organisations). Concurrent Engineering. Knowledge Management tools are implemented and used along the value chain.	Efficient Consumer Response (ECR) practices are deployed between partners for efficient replenishment. Collaborative Planning, Forecasting & Replenishment (CPFR) systems are implemented.	Customer Relationship Management (CRM) systems are implemented and shared between the collaborative enterprises.	Training programs about common efforts are jointly proposed and organised by collaborative enterprises. Research and Development projects may be shared for mutual benefit. Eventually, Visiting Customers might be located permanently in their suppliers/partners company with training or consultancy purposes.

Figure 6.14: The structure of the conceptual model and the potential two approaches of the sub-model #1

7. THEORY TESTING

The pre-understanding stage presented in chapter 2 introduced some initial thoughts concerning the gaps in knowledge in collaboration area. The research questions defined in the second chapter were addressed in chapters 5 and 6. Chapter 5 dealt with the first three research questions. These research questions would play a key role in the study as they were going to be the input required for the conceptual model developed in the fourth research question (chapter 6).

While the answer to the three research questions developed in chapter 5 required an in depth specific literature review, chapter 6 was based on constructive research. The fourth research question involved the construction of a new conceptual model where a set of variables and relationships were analysed.

Previously, case study research strategy and the research methods used to validate the new conceptual model were selected in chapter 3 and 4. The connection between the first three research questions and the conceptual model (i.e. R.Q. 4) allowed validating all the research questions through the validation of the model.

The objective of this chapter is not just to validate the conceptual model, but to select one of the two sub-models #1 developed in chapter 6 and also to collect data to define the boundaries between the relationship levels according to complexity/uncertainty or value/risk scores (depending on the chosen sub-model #1).

This chapter will initially cope with the preparation of the case studies and the development of the research methods will be analysed. The application of a pilot case study and its conclusions will lead this chapter to deal with the rest of the cases. The evidence found in these cases will be analysed and both validation and theory refinement will be carried out. Finally, this chapter will end with some conclusions.

7.1 Preparing for data collection

Two research strategies were selected in chapter 3, constructive research (Kasanen et al., 1993) and case study research (Yin, 2003; Eisenhardt, 1989; Voss et al., 2002, amongst others). Constructive research was applied in the conceptual model was built in chapter 6. Case study research was originally chosen to collect evidence from real cases that would refine and validate the developments of the constructive stage. This section will cope with the preparation required to proceed with the case studies, particularly with the data collection process.

Before approaching any organisation to carry out the study, a set of decisions and arrangements has to be made in order to achieve reliable findings. According to Yin (2003:57), three key preparations are required to start with the data collection process: Personal skills, selection of the right cases and a case study protocol. This section will describe the characteristics of each of these three requirements.

7.1.1 Skills required

Authors such as Yin (2003:58) give much importance to the skills required by the researcher to carry out good case studies. The lack of standard routine for collecting data in the case studies demands great personal attitude and skills. Case studies are difficult to replicate (Yin, 2003:58), therefore the researcher will have to be able to conduct efficiently and effectively the data collection process in order to gain reliability in the findings. Yin (2003:59) highlights some essential skills that every researcher should consider before approaching the first case. There are these key requirements:

- Good question asking and interpreting the answer: The ability to ask good questions is relevant during data collection. Although data collection follows a particular plan, relevant information is not predictable. The skills of the researcher play a key role to get this data that not was foreseen.
- Good "listener": Being a good listener means assimilating large amounts of data without any judgement (Yin, 2003:60). It is not only to listen to the words that the interviewee says, but to interpret the context of the interview, the body language of the interviewee, and so on. Listening skills also need to be applied to revision of documentary evidences, as well as to observation of real situations.
- Be adaptive and flexible: Rarely a case study will finish as it was planned. The investigator will have to adapt the procedure of the case study to take the maximum information out of it. Although the original purpose of the research will not be modified,

the plans to carry out the study will have to be adapted to the especial requirements of each situation.

- Have a firm grasp of the issues being studied: Having a strong knowledge of the topic and area of research will allow the researcher to interpret the information as it is being collected. The researcher will be able to analyse whether the information contradicts or not the theoretical sources. It will enable the investigator to conduct the data collection process according to the theoretical background and findings on real-time.
- Be unbiased by preconceived notions: The researcher has to be opened to contrary findings; the case study will lose its value if the researcher only aims to substantiate a preconceived position (Yin, 2003:62).

These five skills were considered by the author before approaching the first organisation. The participation in a workshop[11] related to these issues enabled the researcher to practice these skills before carrying out the case studies.

7.1.2 Case study protocol

According to Yin (2003:67) it is essential to develop and follow a well-defined case study protocol in a multiple-case study. Other authors such as Eisenhardt (1989) also outline the importance of designing a research protocol. The main purpose of the case study protocol is both to increase reliability of the study and to facilitate data gathering and processing tasks during the single-case study development. According to Yin (2003:69), these are other benefits that can be gained through a case study protocol implementation:

- The researcher is focused on what he/she defined previously as essential for his/her research and avoids accomplishing other fields that are not meaningful.
- It enables the researcher to foresee possible failures that during the data collecting process may arise.

The author presents other benefits that were found during his particular study:

- Data collection and analysis processes are easier and clearer: cross-case analysis is possible and it becomes more trustful.
- The researcher is more confident with a systematic way of carrying out the case study when he/she approaches the company.

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[11] Research methodology workshop sponsored by EPSRC held in University of Cambridge.

- Case study refinement is easier as there is a well-described process, everything is documented and the sequence of accomplishing all the activities is not random.

A case study protocol was built following eight basic steps (Figure 7.1). The initial three tasks were carried out before starting the fieldwork. Their objective was to prepare the meetings with the managers of the organisation and also to explain the aim of the case study. On the other hand, the rest of the tasks (see tasks in grey, figure 7.1) were specific for each interviewee, they were repeated with each manager contacted at each organisation. This same scheme was repeated in the pilot case study and the rest of the case studies. This is a brief description of each of the tasks of the case study protocol:

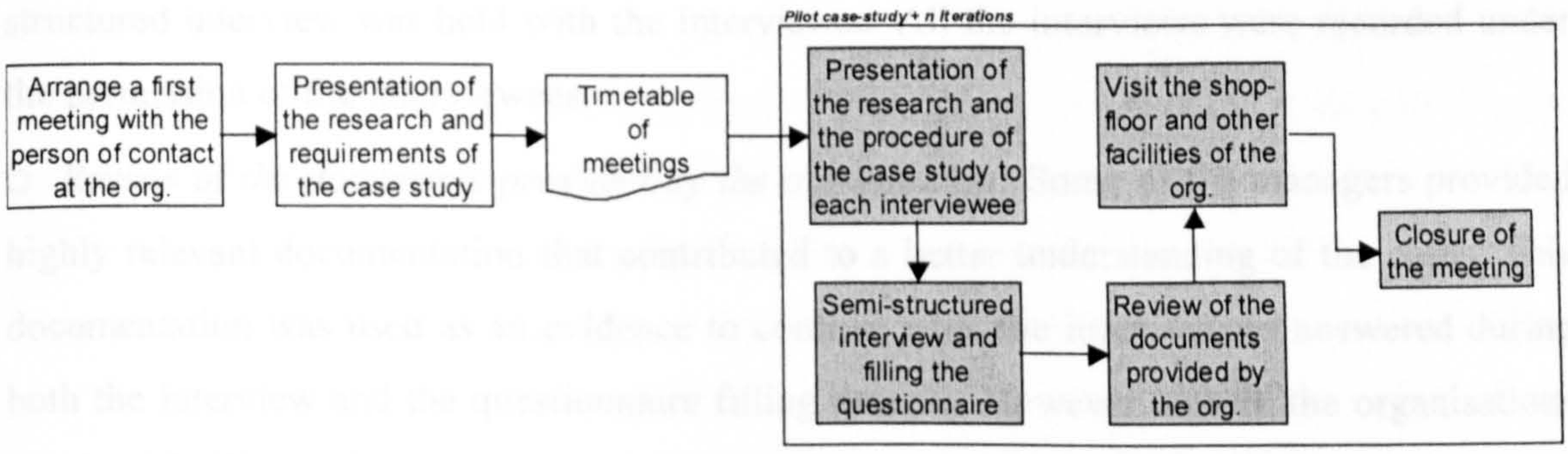

Figure 7.1: Case study protocol designed for this research

- *Arrange a first meeting with the person of contact at the company:* One of the objectives of the case studies was to analyse the map of relationships of the organisation. Mostly all organisations were valid for this stage, as every single organisation has a range of relationships with its suppliers, customers or competitors. The companies involved in the case studies were selected mainly according to convenience, access and geographic proximity criteria (Yin, 2003:79).

An initial meeting was arranged via telephone or e-mail with one person in every company selected: In most of the cases, this person was known before this research was launched.

- *Presentation of the research and requirements for the case study:* During the first meeting a presentation of the details of the research was done: a set of 'Ms PowerPoint' slides was used for this purpose. After explaining the content of the research, the requirements such as number and characteristics of the people required for the case study or accessibility to documents were presented.

- *Timetable of meetings:* As it is suggested by Yin (2003:72), both the number of meetings and the schedule for them was managed by the organisation, so the author was adapted to

their circumstances. A complete list of the meetings, the managers involved and the dates was facilitated by the organisation.

- *Presentation of the research and the procedure of the case study:* Detailed presentation of the research was done to all participants of the meetings using the same Ms PowerPoint presentation of the research. The structure of the whole case study was presented, its objectives, the different sections it was made of, and his/her roll in the study.

- *Semi-structured interview and filling the questionnaire:* Once that the interviewee got an initial view of the research and its objectives, the first two research methods described in chapter 4 (i.e. semi-structured interview and a questionnaire) were applied. A specific questionnaire (see next section for more details) was filled at the same time that a semi-structured interview was held with the interviewee. All the interviews were recorded under the permission of the interviewees.

- *Review of the documents provided by the organisation:* Some of the managers provided highly relevant documentation that contributed to a better understanding of the cases. This documentation was used as an evidence to contrast what the interviewees answered during both the interview and the questionnaire filling process. However, not all the organisations involved facilitated the access to their internal documents due to confidentiality.

- *Visit the shop-floor and other facilities of the organisation:* Once that these three research methods were completely fulfilled, a guided visit to the shop-floor of the organisation and other key areas was provided by the interviewees. Key field notes were taken and used for the within-case analysis.

- *Closure of the meeting:* At the end of the meeting, all the information gathered was reviewed in order to achieve the agreement and acceptance of the interviewee. This step was considered highly important for writing up a reliable final report.

After each visit to the organisations a case study database (Yin, 2003:101) was prepared. The answers to the questions of the questionnaire, the transcripts of the interviews, the documentation provided by the interviewee and the field notes were some of the content of this case study database. The final case study report was developed using the information kept in this database.

7.1.3 Selection of case studies

Rather than literal replication, theoretical replication logic was pursued when selecting the cases. This logic aims to find contrasting results for predictable reasons (Yin, 2003:47). It would be extremely difficult to find two cases, which had the influence of the same critical factors. Thus, literal replication logic was not viable in this study. The model built and the theoretical framework behind it was used to foresee contrasting outcome of each of the cases.

It was necessary to deal with different cases in order to gain a wide spectrum of casuistic. Cases with all kind of organisational relationships, and different levels of complexity/uncertainty and value/risk values would be required to find generalisable conclusions[12].

Following Yin's (2003:47) suggestion, a total of 5 cases were selected. According to Yin, the optimum number of cases for a theoretical replication was between 4 and 6 (Yin, 2003:47), and between 2 and 3 for a literal replication. The criteria used for the selection of the cases were the location and the accessibility to the organisations. Many authors such as Yin (2003) and Martinez (2003) accept these criteria as gaining relevant information will be more viable.

Four different sectors were analysed through the cases selected: Machine tool[13], automotive, agricultural goods and heater sector. Accessibility to 2 cases of the same sector (machine tool) allowed analysing the behaviour of two organisations that could be operating under the same critical factors. This fact would allow fulfilling some of the features of the literal replication logic described before.

7.2 Data collection process

The data collection process was made over a period of 6 months between November 2004 and April 2005. Different managers were contacted according to their availability and the accessibility of the resources provided by the organisations. The managers had a wide different background, such as operations management, quality management, R&D

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[12] One of the aims of the case studies was to refine the complexity/uncertainty or value/risk diagrams, to adjust the boundaries between the relationships according to these drivers. A wide spectrum of cases would allow dealing with all the area of the diagrams, and not just for certain levels of complexity/uncertainty or value/risk.

[13] Two cases were machine tool manufacturers.

management, sales management, and so on. It enabled gaining a broad number of different perspectives over the same reality, i.e., data triangulation (Yin, 2003:97), therefore, reliability of the findings and conclusions was enhanced.

During each visit four main research methods were used, as it was presented in both chapter 4 and the case study protocol: Semi-structured interviews, a questionnaire, review of relevant documentation and a non-participant direct observation of the site. The next section will cope with the description of the content of each of the research methods.

7.2.1 Data collection methods

Case study research strategy was defined in chapter 4 as *'an empirical inquiry that investigates a contemporary phenomenon within its real-life context'* (Yin, 2003:13). It is clear that studying a phenomenon within its context will require a data collection process. Data collection methods or techniques will play a key role, gathering an accurate perception of the reality. Quality of the research will directly depend on the effectiveness of the design of the research methods and the representation of the real-life context.

A full list of potential research methods for data collection process was presented in chapter 4. According to the objectives of the case studies of the study, four research methods were selected from this classification: A questionnaire, semi-structured interviews, documentation and direct observation.

Using these four data collection methods would allow the author to fulfil the 'data triangulation' requirement proposed by Yin (2003:97) for construct validity. It was considered that these four methods would gather all the data necessary to both address the requirements of the research questions and gain an accurate insight of the cases. These are the data collection methods and the description of their content:

a) The questionnaire

An extended questionnaire was designed covering issues related to the four research questions. The questionnaire had four types of questions:

- Close questions: The possible answer was either *yes* or *no*.
- Open questions: The answer required an extended explanation about the topic enquired.
- Likert scale: It was asked to score some specific issues from 1 to 5, and also from 0 to 100 in another section of the questionnaire.

- Filling charts: The respondents had to fill some charts and graphics.

Five main objectives were defined for this questionnaire:

1. To have an accurate knowledge of the performance of the organisation under study.
2. To analyse the strategic, tactical and operational characteristics and performance of the business processes (Current and future).
3. To analyse the nature of the external organisational relationships between the organisation and its suppliers, customers, competitors and other entities.
4. To study the impact of the critical factors over the external relationships of the organisation.
5. To refine the conceptual model built depending on the complexity and uncertainty values of the organisation.

Six different sections were distinguished in the questionnaire, each of them orientated to fulfil one specific objective. Table 7.1 shows the sections of the questionnaire and the specific objective associated.

Table 7.1: Structure of the questionnaire and the specific objectives

Section	Specific Objective
1-General information about the organisation and its performance	To gain a general insight and understanding about the specific performance and characteristics of the organisation under study.
2-External organisational relationships	To map all the key external relationships of the organisation and gain an understanding of the characteristics of these relationships.
3-Operational characteristics of the performance of the business processes	To identify all the operational tools, methodologies, systems and specific resources that the organisation has implemented in each business process.
4-Nature of the critical factors of the organisation	To score the categories of the critical factors using the dynamic table of the conceptual model and calculate the complexity and uncertainty values of the organisation
5-Analysis and discussion of the conceptual model	To discuss the validity of the conceptual model and the boundaries between relationships depending on the complexity/uncertainty scores.
6-Limitations and pitfalls of this research	To gain feedback about the practical limitations, pitfalls, problems, and weaknesses of this research from a practitioner's perspective.

Many authors claim the importance of establishing a chain of evidence between the research questions of the study and the specific data collection techniques used during the case studies to enhance construct validity (Yin, 2003:105). In this study, the relationship between the sections of the questionnaire and the research questions involved was carried out as it is shown in table 7.2

Table 7.2: Establishing a chain of evidence between the questionnaire and the research questions

Section of the questionnaire	Research question involved
1-General information about the organisation and its performance	----------
2-External organisational relationships	RQ1; RQ2; RQ3
3-Operational characteristics of the performance of the business processes	RQ1; RQ2
4-Nature of the critical factors of the organisation	RQ3; RQ4
5-Analysis and discussion of the conceptual model	RQ1; RQ2; RQ3; RQ4
6-Limitations and pitfalls of this research	RQ1; RQ2; RQ3; RQ4

The questionnaire was originally built in Spanish and also the responses were done in the same language. In order to keep coherency with all the research, both the questionnaire and all the answers were translated into English.

A full copy of the questionnaire is available in appendix D at the end of this thesis.

b) Semi-structured interviews

Semi-structured interviews were held with each of the respondent of the questionnaire. The questions asked in the interviews were complementary to the questions quoted by the questionnaire. The semi-structured interviews were highly valuable because they allowed the researcher to gain an in depth knowledge about key comments that the respondent did not answer in the questionnaire.

The semi-structured interviews allowed the case study research strategy to collect highly relevant and rich data that other strategies and methods such as surveys could not provide. Concerning whether it is legitimate to alter the questions and the procedure to carry out them or not, Eisenhardt (1989) states that indeed it is, because researchers aim to understand each case individually and in as much depth as is feasible.

c) Review of documentation

This research method aimed to analyse key documentation of the organisation related to the issues studied in this research. As these documents might be confidential, access to them was not possible in all the cases. The objective of this research method was to assert what both the questionnaire and the semi-structured interviews stated.

As an example, one of the interviewees of the fourth case study performing in the automotive section provided information about the Basque automotive cluster (ACICAE),

such as the number of organisations involved, diagrams concerning the evolution of sales of this cluster, and so on.

d) Direct observation of the organisation

As the review of documentation did, the objective of this research method was to state and confirm what the initial two data collection methods (i.e. the questionnaire and the semi-structured interview) found. It provided practical examples of the information collected during the interviews.

A non-participant observation of the organisation, specially the shop floor, was arranged at the end of each interview. As an example, collaboration between the organisation and its supplier was stated through the observation of the supplier in a meeting for the development of a new product.

As presented in chapter 6, an initial pilot case study was carried out in this research. It was stated in chapter 6 that the pilot case study would fulfil two objectives. The first objective was already described in the previous chapter. The next section will deal with the second objective of the pilot case study, i.e. to refine the data collection plans (Yin, 2003: 79)

7.2.2 Pilot case study

Chapter 6 already presented part of the findings of the application of a pilot case study. This pilot case study was carried out based on Yin's (2003:79) work, which strongly suggests planning a pilot case study in order to test and optimise the data collection process. As a reminder, these two objectives were defined for the pilot case study in chapter 6:

- To refine the research methods such as data collection tools, and also the protocol designed to develop the case studies in a reliable way (Yin, 2003:67; Eisenhardt, 1989).
- To gain an initial sight of the validity of the construct proposed by this study through real field-data analysis.

The second objective was already fulfilled in the previous chapter. This section will deal with the refining process of the research protocol and the data collection process.

Both the research protocol and the set of four data collection methods presented in this chapter were applied in the pilot case study. Although the research protocol was found to be accurate, some changes were done in the questionnaire.

The previous chapter concluded proposing a new approach for the conceptual model, value and risk approach. In order to test this second new approach, a especial table was designed for data collection related to the value and risk dimension. This table is available in appendix D. The content of this table led the author to substitute part of the section 2 of the questionnaire, since similar information was collected by a *relationship map of the organisation* included in this section.

The pilot case study was also highly valuable as it helped distributing the time spent in the semi-structured interview more efficiently. It was stated that managers used to spend too much time in the first section of the questionnaire, i.e., general information about the organisation and its performance. It was decided to dedicate more time to the following sections which would really add value to the research questions, rather than to the presentation of the organisation. As a conclusion, it can be said that the pilot case study was very useful to define the rhythm of the questionnaire and the semi-structured interview. A categorisation of data was done according to the relevance and value from the perspective of the research questions and the objectives of the case study.

Highly relevant conclusions were extracted from the pilot case study. Its contribution to the theory building process was essential for the final conclusions of this study, and also for the refinement of the data collection process.

The findings of the pilot case study and the subsequent modifications of both the conceptual model and the data collection process led the author to deal with the case studies.

7.2.3 Case studies

This section presents the organisations where the case studies were carried out. 5 organisations were analysed, all of them located in the Basque Country (north of Spain). According to their size, they can be classified as SME's[14] as the number of employees of the organisations is under 250 in all the cases. As it will be stated in the presentations, these 5 companies perform in 4 main sectors: Agricultural goods, heater and comfort sector, machine tool (2 organisations), and finally automotive sector.

Apart from the characteristics of the organisations, a SWOT (strengths, weaknesses, opportunities, and threats) analysis of each company will also be presented. This SWOT analysis was one of the questions included in section No. 1 of the questionnaire.

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[14] Small and medium enterprise

While this section presents the general characteristics of the 5 cases, the analysis of the data collected during the visits to the organisation will be presented in the following section.

7.2.3.1. Goizper S.Coop.

Goizper S.Coop. was first contacted to do the pilot case study. After modifying the data collection procedure, the author decided to visit again the same organisation and fill the questionnaire and develop the semi-structured interviews with a different set of managers. Goizper was already presented in chapter 6; however, the main characteristics will be described again as a reminder.

Goizper S.Coop. was launched in 1959 as a co-operative where all the employees are the shareholders of the company. The business unit analysed in the study is based on the agricultural goods sector, manufacturing sprayers for agricultural and garden use.

Goizper is the leader in the Spanish market with a market share of more than 65%. It has its own sales network, which includes 20 representatives with stocks on deposit, and it is present at more than 2,500 points of sale. More than two thirds of the production is exported to more than 120 countries throughout the world. This makes the organisation one of the world's leading manufacturers of manually operated sprayers. Currently, this company employs up to 200 people depending on the season. Figure 7.2 shows the SWOT analysis of Goizper.

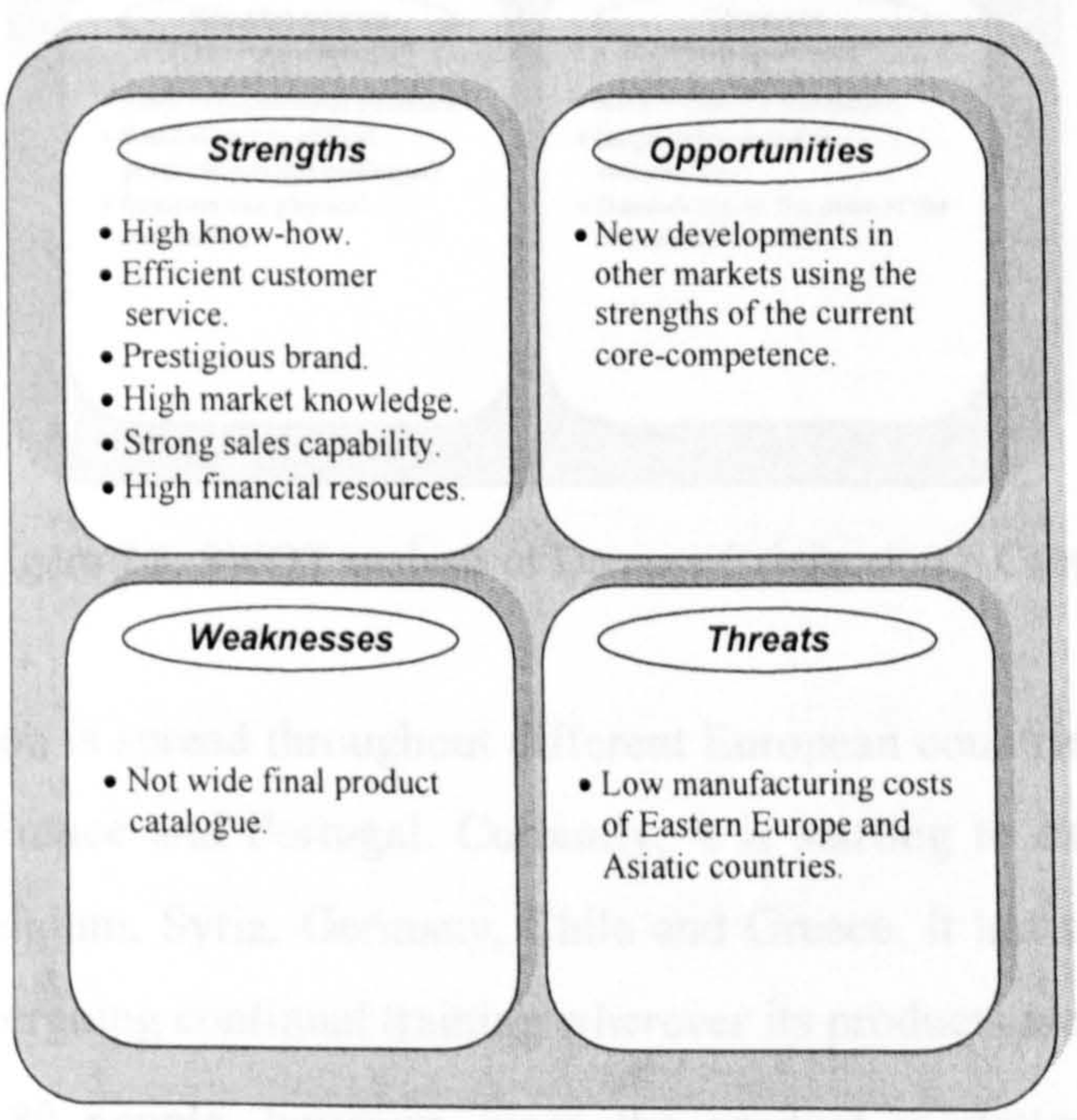

Figure 7.2: SWOT analysis of Goizper S.Coop.

7.2.3.2. Domusa Calefaccion S.Coop.

Domusa Calefaccion S.Coop. was founded in Errezil (Basque Country) in 1976 as a private company. In 1998 it became a cooperative and currently is part of Mondragon Co-operative Corporation (MCC). MCC is made up of more than 200 industrial companies, 5 financial institutions, 8 distribution companies, 3 research centres, one University and more than 40 international sales coverage and service companies. MCC has more than 70000 employees all over the world.

Domusa offers a wide range of heating and domestic hot water producing boilers. Industrial activities focus on the manufacturing of diesel oil burners, cast iron and steel plate boilers fired by gas or oil and electric boilers. All the products are certified according to ISO 9001:2000 standards.

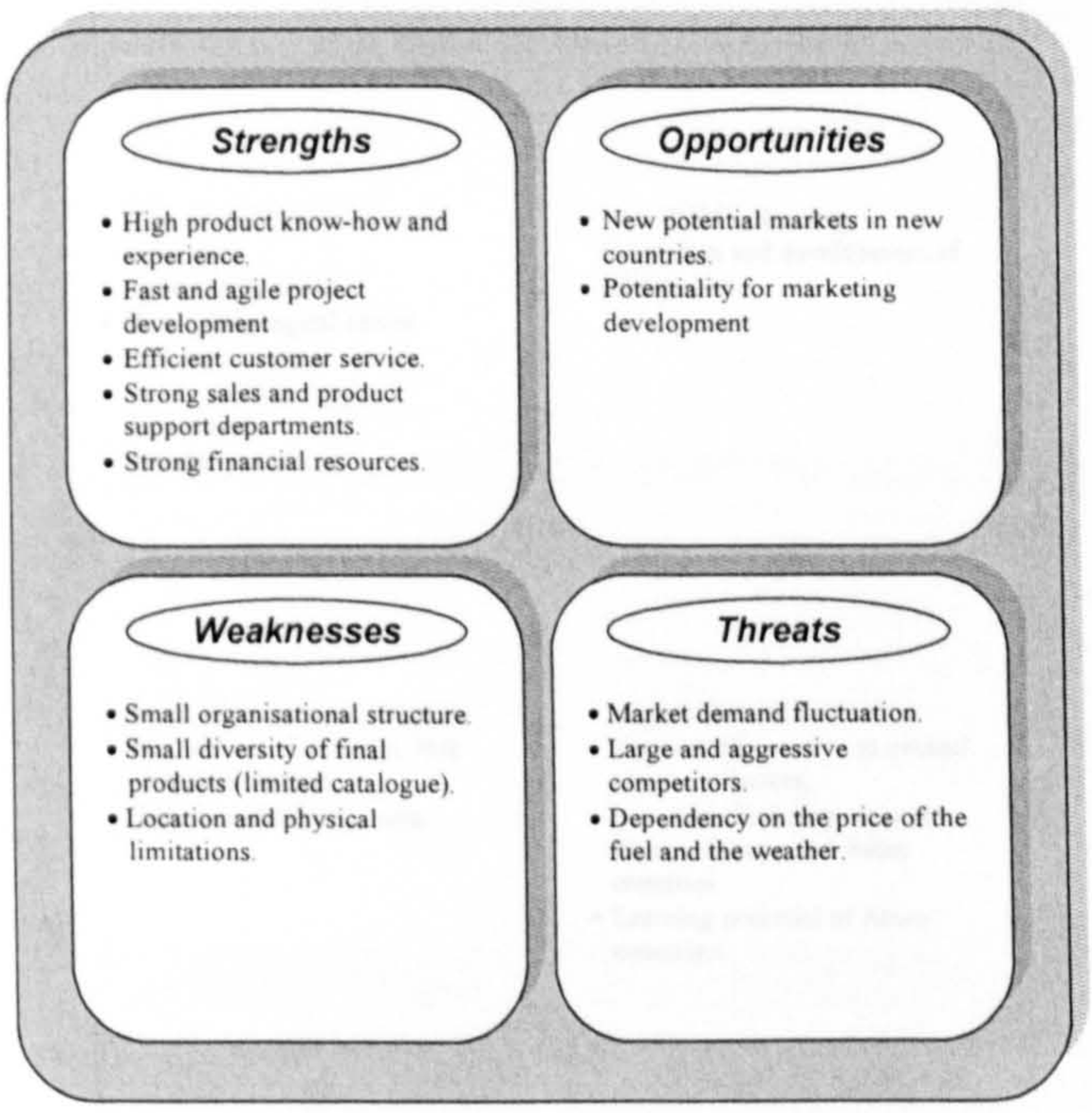

Figure 7.3: SWOT analysis of Domusa Calefaccion S.Coop.

The sales organisation is spread throughout different European countries, with its own sales network in Spain, France and Portugal. Currently, it is starting to export to international markets, such as Belgium, Syria, Germany, Chile and Greece. It has a technical assistance service network undergoing continual training wherever its products are sold.

Domusa employs 180 people, however, since the product is stationary, the number of employees often varies according to the season. Figure 7.3 shows the SWOT analysis of Domusa.

7.2.3.3. ONA Electroerosion S.A.

Founded in 1952, ONA Electroerosion has always led the way in electronic-discharge machine (EDM) technology. As a result, the company is world leader in the manufacture of large-scale EDM machines. It is also the largest producer in the European Union, and the oldest manufacturer of EDM machines in the world.

10% of ONA's resources go to Research and Development. Mechanical design of the machines and generator electronics, development of numerical controls (software and hardware) and even own filtering units are undertaken entirely by ONA. All these developments are carried out in a research centre owned by the organisation. ONA's main assembly and manufacturing units have a production capacity of up to 1000 machines per year.

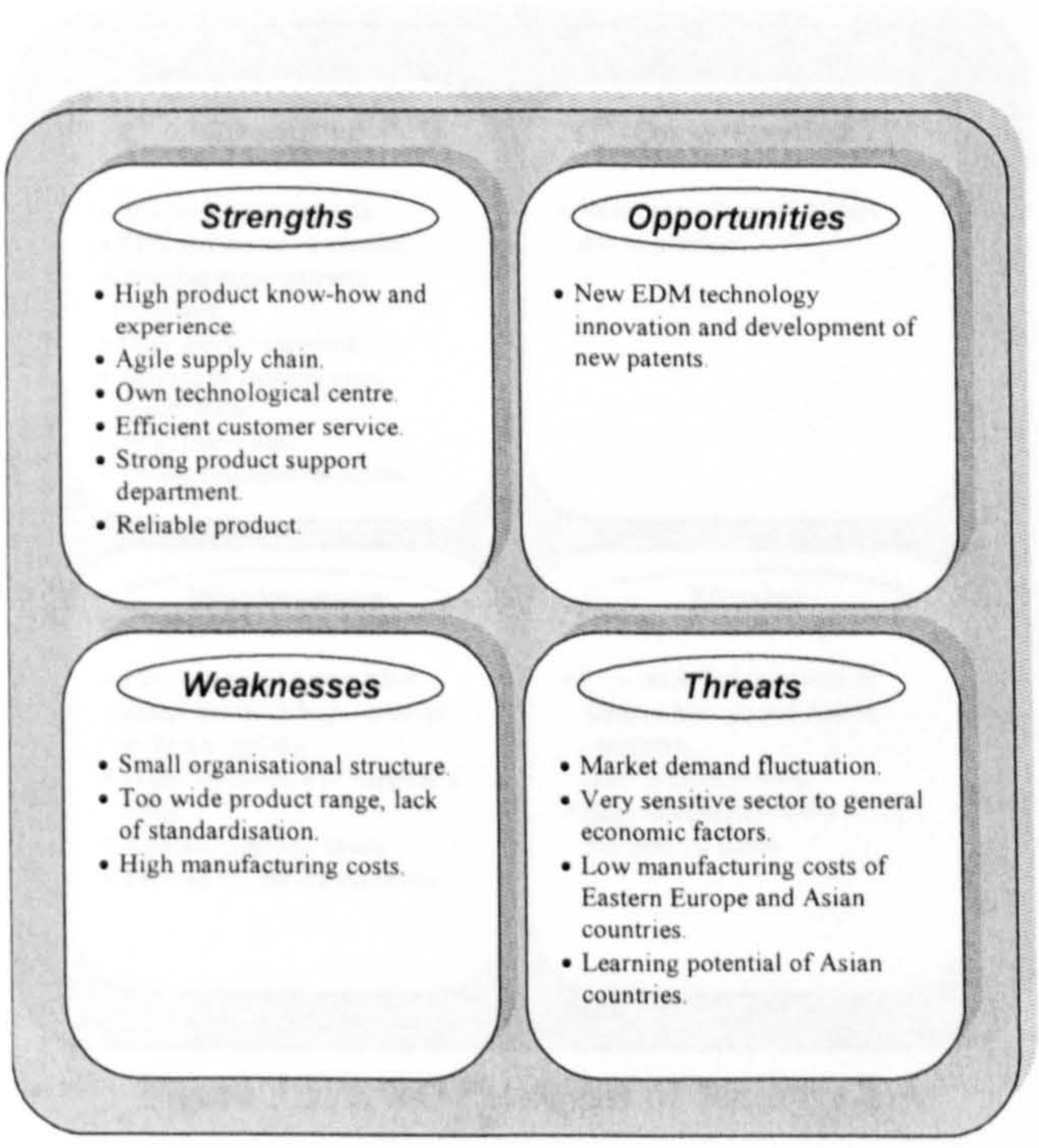

Figure 7.4: SWOT analysis of ONA Electroerosion S.A.

ONA dedicates much effort in the after sales service: training, application assistance, and technical services are widely provided all over the world. It exports to countries of the 5 continents. Air France, Bridgestone Firestone, Jaguar, KLM, Rolls Royce or Siemens are some of ONA's customers.

Currently ONA employs around 200 people distributed in the main manufacturing plant in Durango (Basque Country) and in delegate-offices located in different countries. Figure 7.4 describes the SWOT analysis of ONA Electroerosion S.A.

7.2.3.4. Metagra S.A.

Based on Bergara (Basque Country) Metagra has over thirty years experience in cold forming technology for the automotive sector. Metagra manufactures various styles of bolts, axles and other types of fasteners using rolls of carbon steel wire and alloyed steel wire of Ø6mm to Ø30mm. While 90% of the production is absorbed by the automotive sector, other markets such as the truck sector is also important for this organisation.

Metagra's performance has been widely recognised by many customers and public and private institutions as the best SME of the Basque Country or ecologically the most-friendly organisation in Spain. It is certified according to EAQF, VDA, AVSQ, QS9000, ISO TS 16949 and ISO 14001 standards.

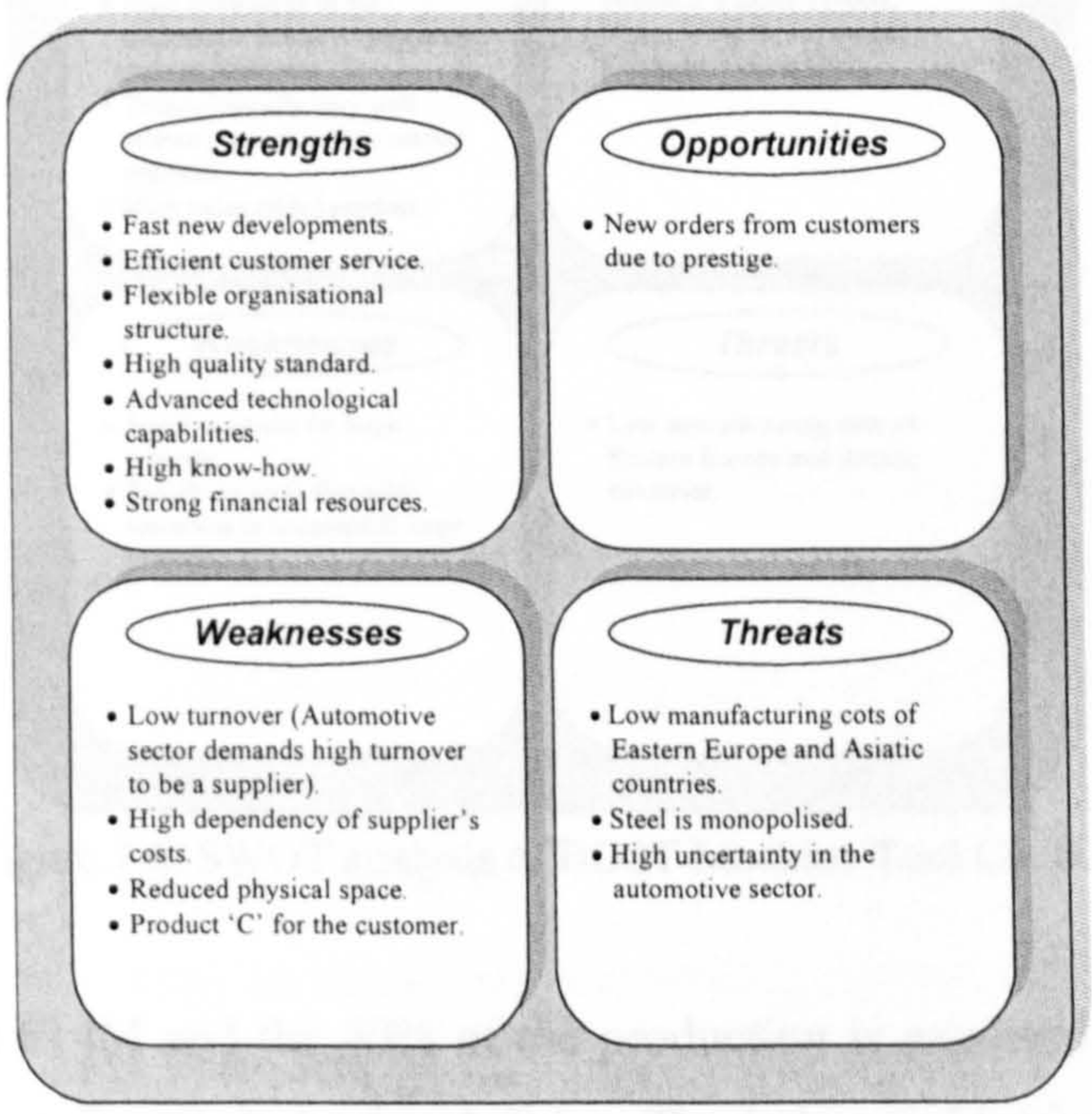

Figure 7.5: SWOT analysis of Metagra S.A

Metagra basically operates in the Spanish and French markets, but it also exports to other European countries. Renault, PSA, Bosch, Michelin and Mercedes Benz are some of Metagra's most important customers.

It is an active member of the Basque automotive cluster (ACICAE), and also the knowledge and innovation Basque clusters.

Metagra is the only supplier of this structure (80 employees) in Spain that supplies directly to this type of large automotive customers, not through an automotive supplier consortium. Figure 7.5 shows the SWOT analysis of Metagra S.A.

7.2.3.5. BOST Machine Tool Co. S.L.

BOST Machine Tool Company is located in Asteasu (Basque Country). It has 85 employees, 15 of them are engineers dedicated to the product development and customisation of horizontal lathes, vertical lathes, slant bed lathes and floor type boring mills. One of the main characteristics of BOST is that the final product is 100% customised; any new order requires a complete development in order to customise the product according to the requirements of the final customer.

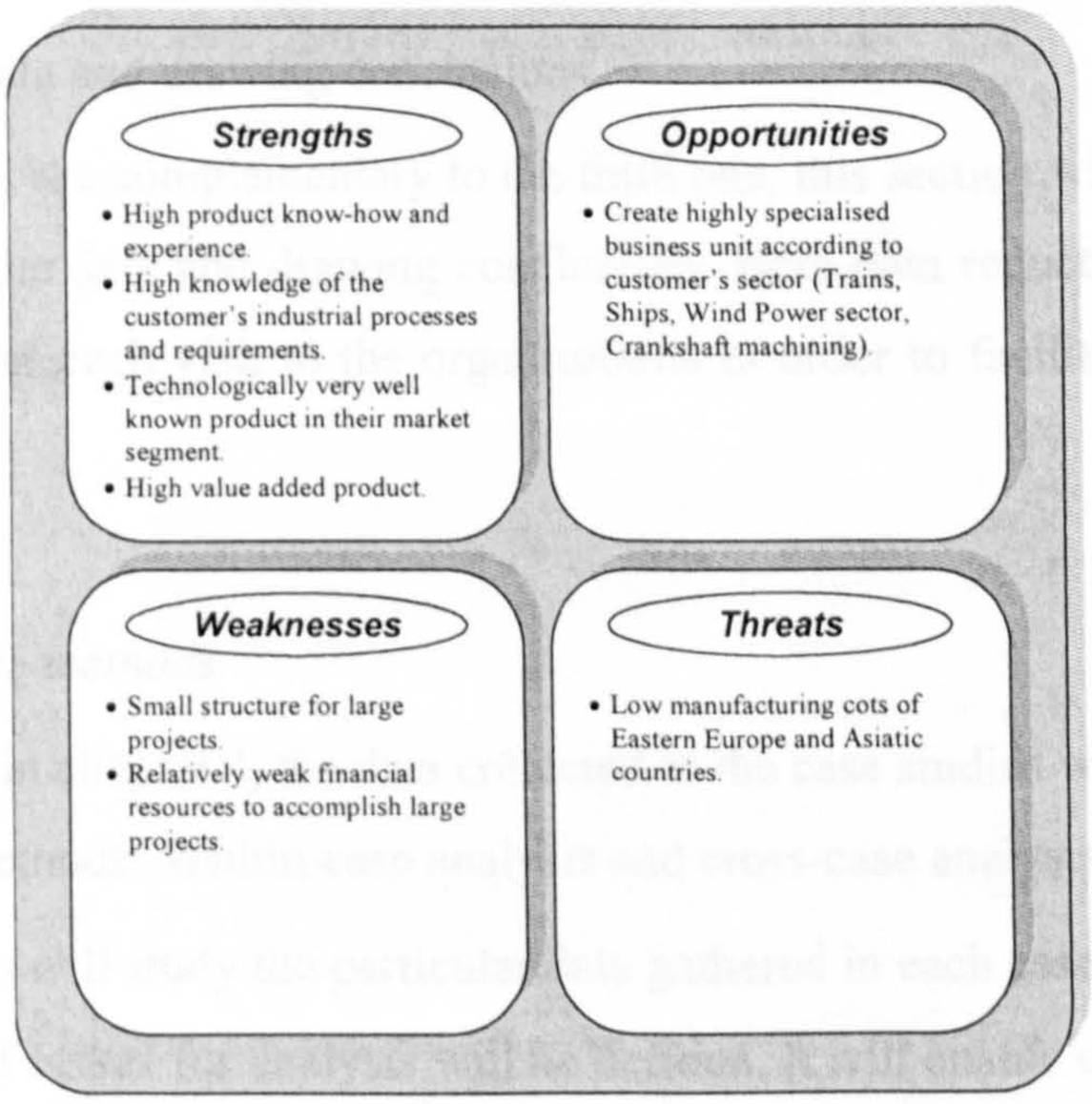

Figure 7.6: SWOT analysis of BOST Machine Tool Co. S.L.

BOST's turnover is €14M and the 60% of the production is exported to countries such as Germany, UK, France, Brazil, Poland and China. The lathes and boring mills manufactured by BOST are mainly orientated to meet the characteristics and requirements of special markets, such as railway, ship, wind power and automotive (crankshaft machining) sector.

BOST is certified according to ISO 9001:2000 standards, and currently ISO 14001 environmental certification is being implemented.

After sales service plays a key role in BOST's final product, thus, the organisation offers a maintenance and reparation service that covers all international markets. Figure 7.6 describes the SWOT analysis of BOST Machine Tool Co. S.L.

7.3 Data analysis process

Chapter 4 highlighted the main characteristics of the data analysis process according to Miles and Huberman (1994). Once that the 5 case studies were carried out, all the data gathered was processed. The data analysis procedure defined by these two authors was followed.

Miles and Huberman (1994) defined three basic steps to extract conclusions from the data collected:

- Data reduction.
- Data display.
- Analysing data and drawing conclusions.

As the first two steps are complementary to the third one, this section will deal with the final step, i.e. analysing the data and drawing conclusions. Both data reduction and data display were carried out after each visit to the organisations in order to facilitate the data analysis process.

7.3.1 Data analysis methods

As it was presented in chapter 4, the data collected in the case studies was processed through two data analysis methods: Within-case analysis and cross-case analysis.

Within-case analysis will study the particular data gathered in each case study. To this end, a structure or index of issues for analysis will be defined. It will enable comparing the data of the different cases using a common scheme.

Cross-case analysis will focus on comparing and finding similarities between the five case studies. As described in chapter 4, two main data analysis techniques will be used to carry out the cross-case analysis: Comparison of similar categories and division of data by data sources (Eisenhardt, 1989). These two techniques will aim to find common patterns between the cases focusing on theory behind the finding and the data collection method (i.e. data source), respectively.

7.3.2 Within-case analysis

The objective of within-case analysis will be to process all the data collected in each case study following a pattern of issues to investigate. Analysis of each case individually according to a common pattern will help comparing the findings of all the case studies through the cross-case analysis.

Before dealing with the analysis of the first case study, the structure of the data analysis will be presented. This pattern will be repeated in each case analysis, and also in the cross-case analysis. Reliability of the findings will be increased, as the analysis process will be focused on the same information categories. Figure 7.7 shows the pattern for data analysis and the main issues analysed.

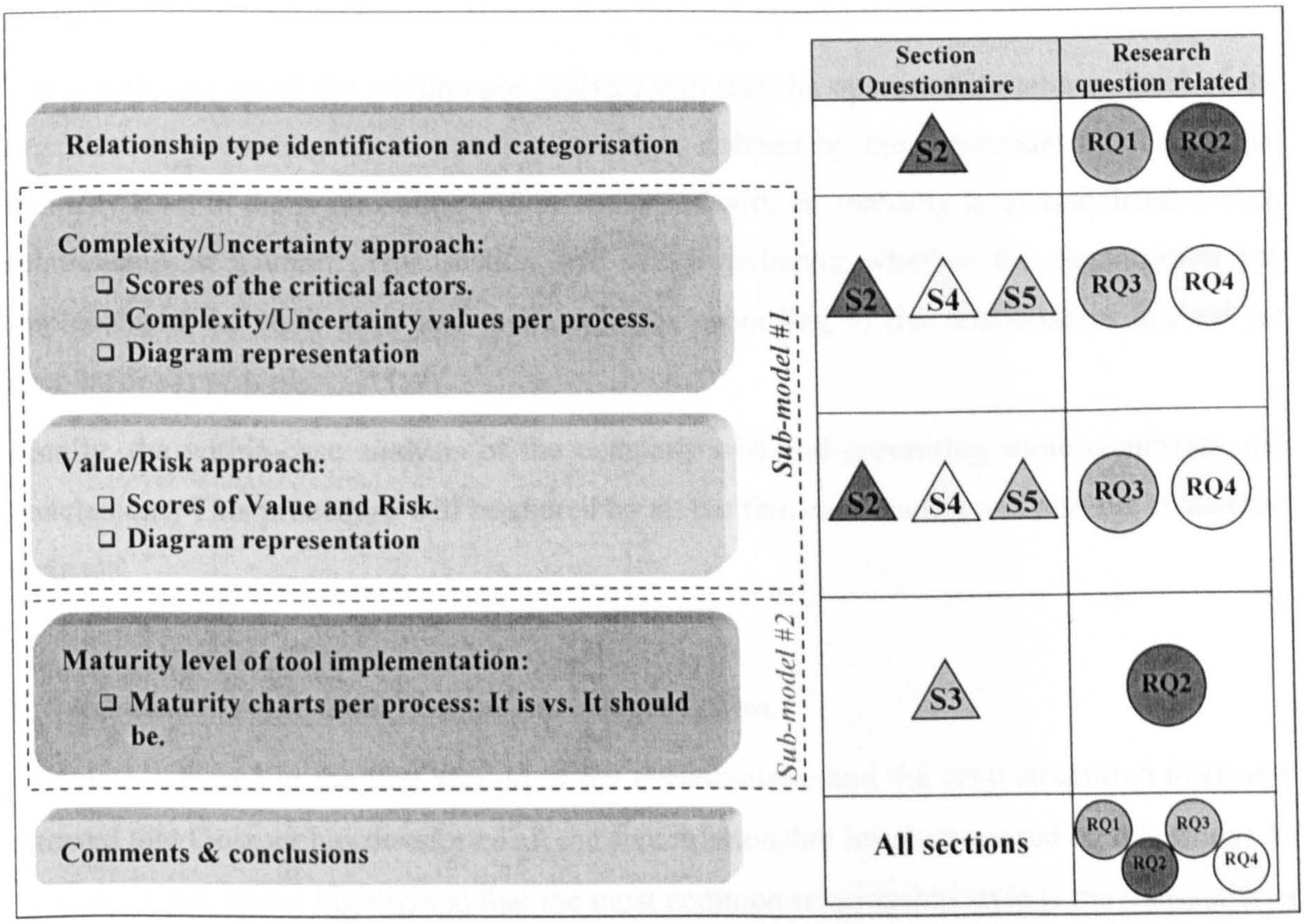

Figure 7.7: Analysis pattern for the within-case analysis process

Within-case analysis will focus on these five sections presented in figure 7.7. In order to maintain a chain of evidence (Yin, 2003:105), the sections involved and the research questions associated are also described in figure 7.7.

7.3.2.1. Goizper S.Coop. analysis

Goizper S.Coop. was the first organisation studied by the author. The data gathered during the visits to the company allowed the author analysing the five main sections described in figure 7.7. The first section will aim to identify the degree of collaboration practice developed by the organisation, what kind of relationship levels can be identified in the organisation. This analysis will be useful for validating the first research question.

Secondly, the sub-model #1 will be tested from both complexity/uncertainty and value/risk perspectives. Initially section b will score the critical factors of the organisation and it will represent these scores in the complexity/uncertainty diagram. Thirdly, section c will cope with the second approach presenting specific relationships of the organisation with a set of suppliers and stakeholders. The four operate processes will be studied from the value and risk perspective. All the scores gathered at this stage will be represented in the value/risk diagram.

The fourth section of the within-case analysis will test the operational maturity level of the organisation according to the operational stages defined by the sub-model #2. The actual maturity level of the organisation will be compared with the maturity level associated to each relationship in a chart. This section will allow deducing whether the organisation has implemented the right tools and methodologies according to the relationships desired for each business process.

Finally, the within-case analysis of the company will end presenting some comments and conclusions. This procedure will be shared by all the five case studies and also the cross-case analysis.

a) *Relationship type identification and categorisation*

The data gathered in the first section of the questionnaire and the semi-structured interview showed that Goizper has developed all the five relationship levels proposed by this study. At the same time, it was highlighted that the most common relationship style is the transactional relationship, while the most unusual type is vertical integration.

Table 7.3: Implementation and ranking of relationship levels – Goizper S.Coop.

Relationship level	Implementation	Ranking
Transactional Relationship	Yes	1
Co-operation	Yes	3
Co-ordination	Yes	2
Collaboration	Yes	4
Vertical Integration	Yes	5

Table 7.3 shows the relationship types implemented by Goizper and the classification of them according to the frequency of implementation.

b) *Sub-model #1 – Complexity/Uncertainty approach*

Table 7.4 represents the scores given to all the critical factors. The complexity and uncertainty values were calculated automatically using some equations through Ms Excel as it was described in chapter 6. The individual complexity and uncertainty values were also calculated through the same procedure.

Table 7.4: Scores of the critical factors and the complexity/uncertainty values for each business process – Goizper S.Coop.

Critical Factor	Score		
Degree of routinisation of the buying problem	40	**COMPLEXITY**	**37,1**
Resources	10		
Transaction Costs	10		
Learning Potential	75		
Performance ambiguity	10		
Type of Product	25		
Product & Market Segment	80	**UNCERTAINTY**	**40**
Value Proposition	80		
General Economic factors	50		
*Location (Physical, Logical)**	21		
Manufacturing Strategy	20		
Behaviour and relationship of other Org.	10		

Complexity/Uncertainty per business process									
1-S.D.	**2-M.E.E.**	**3-M.S.**	**4-M.P.**	**5-M.C.**	**6-D.G.**	**7-P.D.**	**8-O.F.**	**9-P.S.**	**10-S.P.**
36,8/41,6	36,8/41,6	36,8/41,6	38,2/41,3	36,8/41,6	35,1/39,2	32,9/39,7	30,6/39,7	32,9/39,7	39,2/45

High scores given to three of the critical factors increase the complexity and uncertainty values of the organisation. Learning potential, the specific value proposition of the company and the characteristics of the product and market segment suggest the organisation to arrange closer relationships.

Particular complexity and uncertainty values of each business process are represented in figure 7.8, i.e. the complexity/uncertainty diagram. It can be seen that the range of both complexity and uncertainty is very narrow; the difference between the two poles of each dimension is less than 8 points. At the same time, both the complexity and the uncertainty of Goizper are not high, as the average values are around 40.

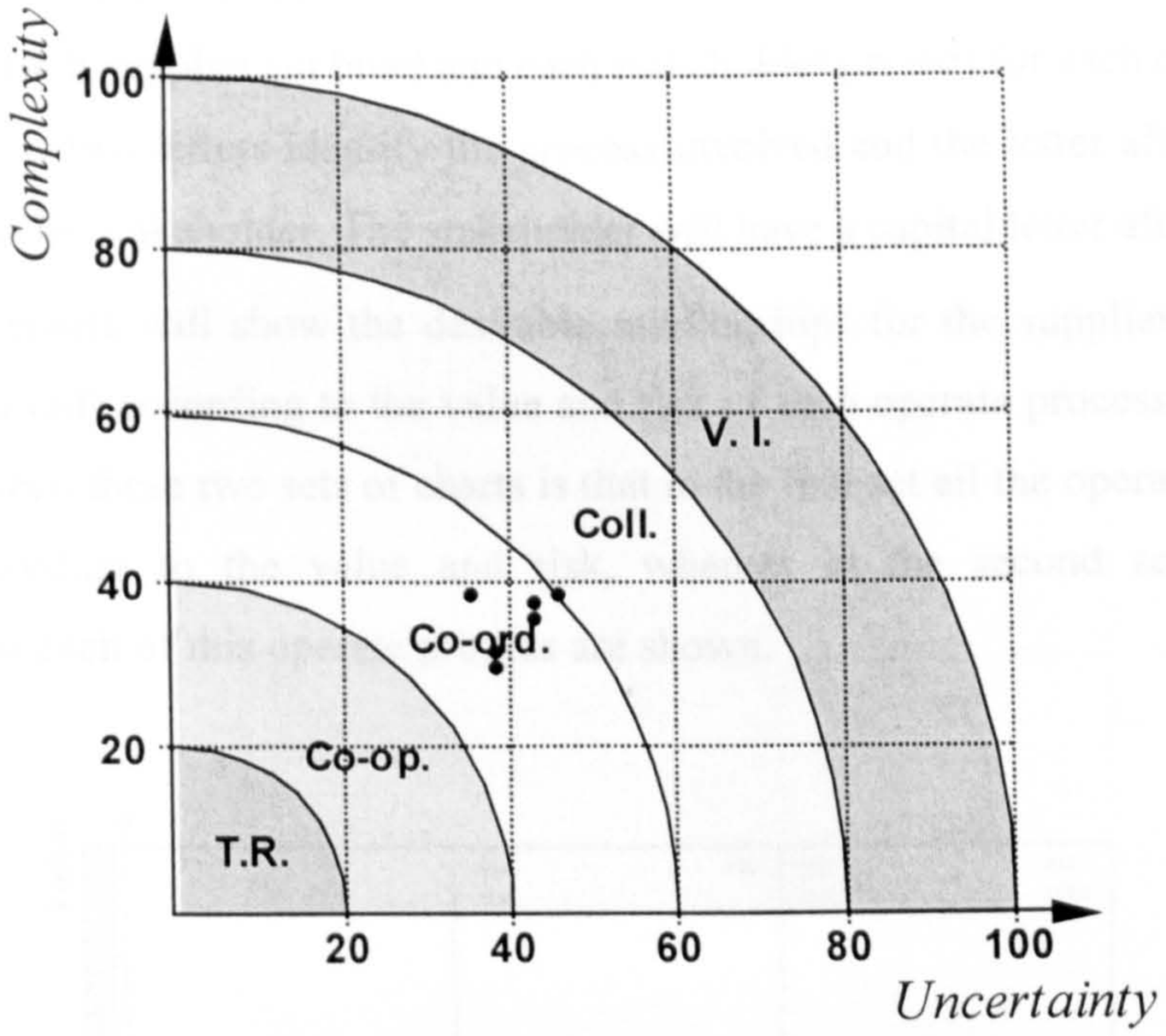

Figure 7.8: Representation of Complexity/Uncertainty values – Goizper S.Coop.

c) *Sub-model #1 – Value/Risk approach*

A set of five suppliers and five stakeholders were analysed to test the second approach of the sub-model #1, value and risk approach. Table 7.5 shows the key suppliers and stakeholders highlighted by the interviewee.

Table 7.5: Value and risk for each key supplier/stakeholder and their current desirable relationships – Goizper S.Coop.

Supplier			D.G.	P.D.	O.F.	P.S.
a	Plastinka	V	1	3	3	1
		R	1	1	3	1
		C	T	Co-op	Co-ord	T
		O	T	Co-ord	Coll	T
b	Urola	V	1	2	3	1
		R	1	2	3	1
		C	T	Co-op	Co-ord	T
		O	T	Co-ord	Coll	T
c	Portuguese Molding	V	1	3	3	1
		R	1	2	2	1
		C	T	Co-ord.	Co-ord.	T
		O	T	V.I.	V.I.	T
d	Supplier C	V	1	1	1	1
		R	1	1	1	1
		C	T	T	Co-op	T
		O	T	T	Co-op	T
e	Olaker	V	1	3	2	3
		R	1	2	2	1
		C	T	V.I.	V.I.	V.I.
		O	T	V.I.	V.I.	V.I.

Stakeholder			D.G.	P.D.	O.F.	P.S.
A	Technology Centres (Ikerlan, Gaiker)	V	2	3	1	1
		R	2	1	1	1
		C	Coll.	Coll.	T	T
		O	Coll.	Coll.	T	T
B	Small Retailers	V	3	2	1	2
		R	1	1	1	1
		C	Co-ord.	Co-op.	T	T
		O	Coll.	Co.op	Co-op.	Co-op.
C	Carrefour	V	3	2	2	1
		R	2	1	1	1
		C	Co-ord.	Co-op.	Co-ord.	T
		O	Co-ord.	Co-op.	Co-ord.	T
D	Delegates	V	3	3	1	2
		R	2	1	1	1
		C	Coll.	Co-op.	T	Co-op.
		O	Coll.	Coll.	Co-op.	Co-ord.
E	Representantes multi-cartera	V	2	1	1	2
		R	2	1	1	1
		C	Co-ord.	T	T	T
		O	Co-ord.	Co-op.	T	Co-op.

Value, risk and desirable relationship (the 'O' rows in the table 7.5) scores were represented in the value/risk diagrams built in chapter 6. Four different diagrams with different

information will be represented in this section: The first two will show the value and risk perceived from each supplier (in blue) and each stakeholder (in red) for each operate process. Note that the first two letters identify the process involved and the letter after the 'dot' the code of the supplier/stakeholder. The stakeholder will have a capital letter after the 'dot'.

The other two charts will show the desirable relationships for the suppliers (in blue) and stakeholders (in red) according to the value and risk of each operate process perceived. The difference between these two sets of charts is that in the first set all the operate processes are distributed according to the value and risk, whereas in the second set the desirable relationships for each of this operate process are shown.

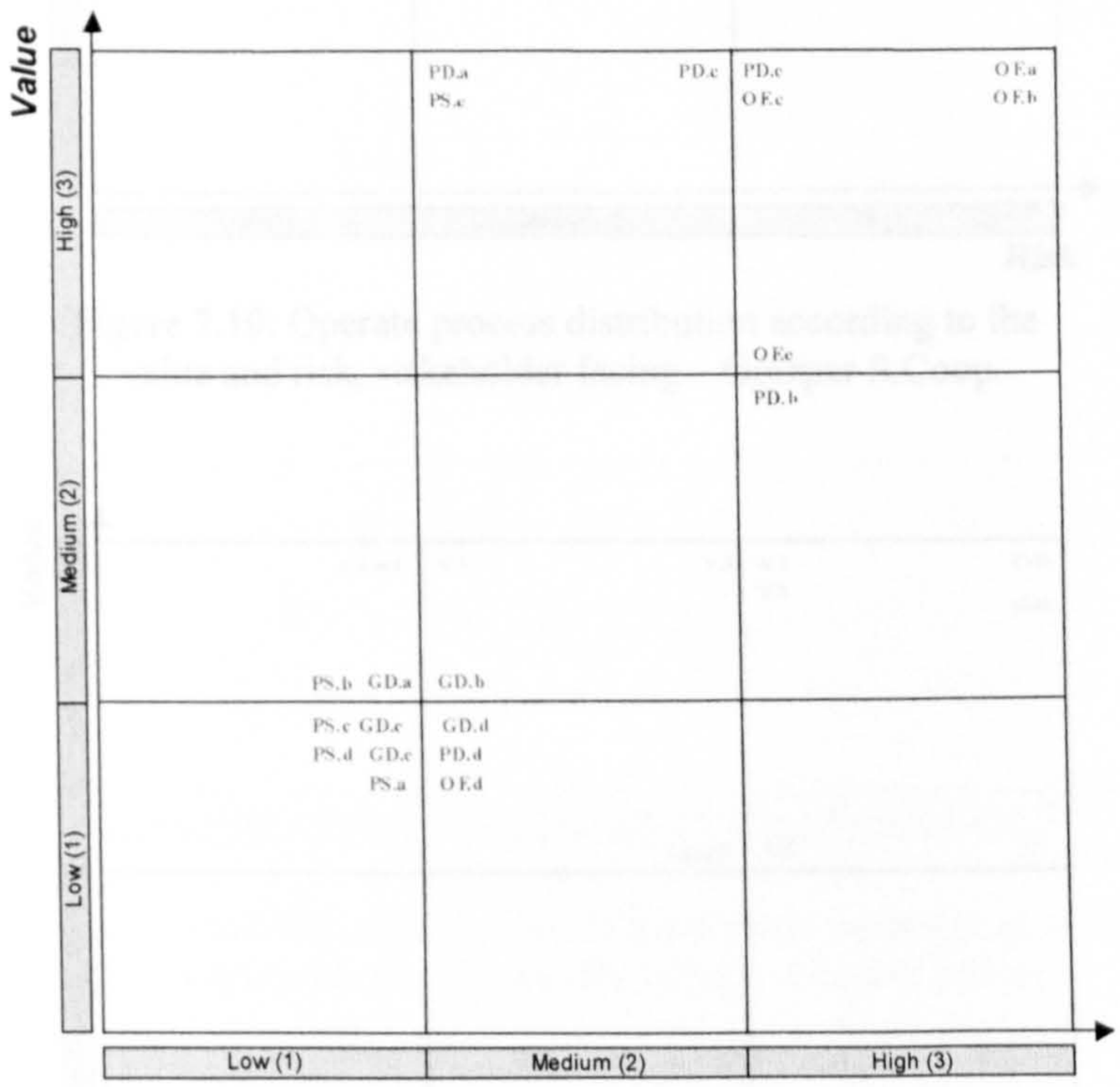

Figure 7.9: Operate process distribution according to the value and risk, supplier facing – Goizper S.Coop.

Analysing figure 7.9 it can be stated that Goizper receives more value and risk from its suppliers at the product development and order fulfilment processes. On the other hand, suppliers do not play an important role at demand generation and product support processes.

Figure 7.10 shows the same information but from the perspective of stakeholders. Demand generation process is highlighted as the operate process that more value and risk generates for Goizper. Product development process has a similar behaviour, whereas it is stated that the influence of the stakeholders in the order fulfilment is minimum.

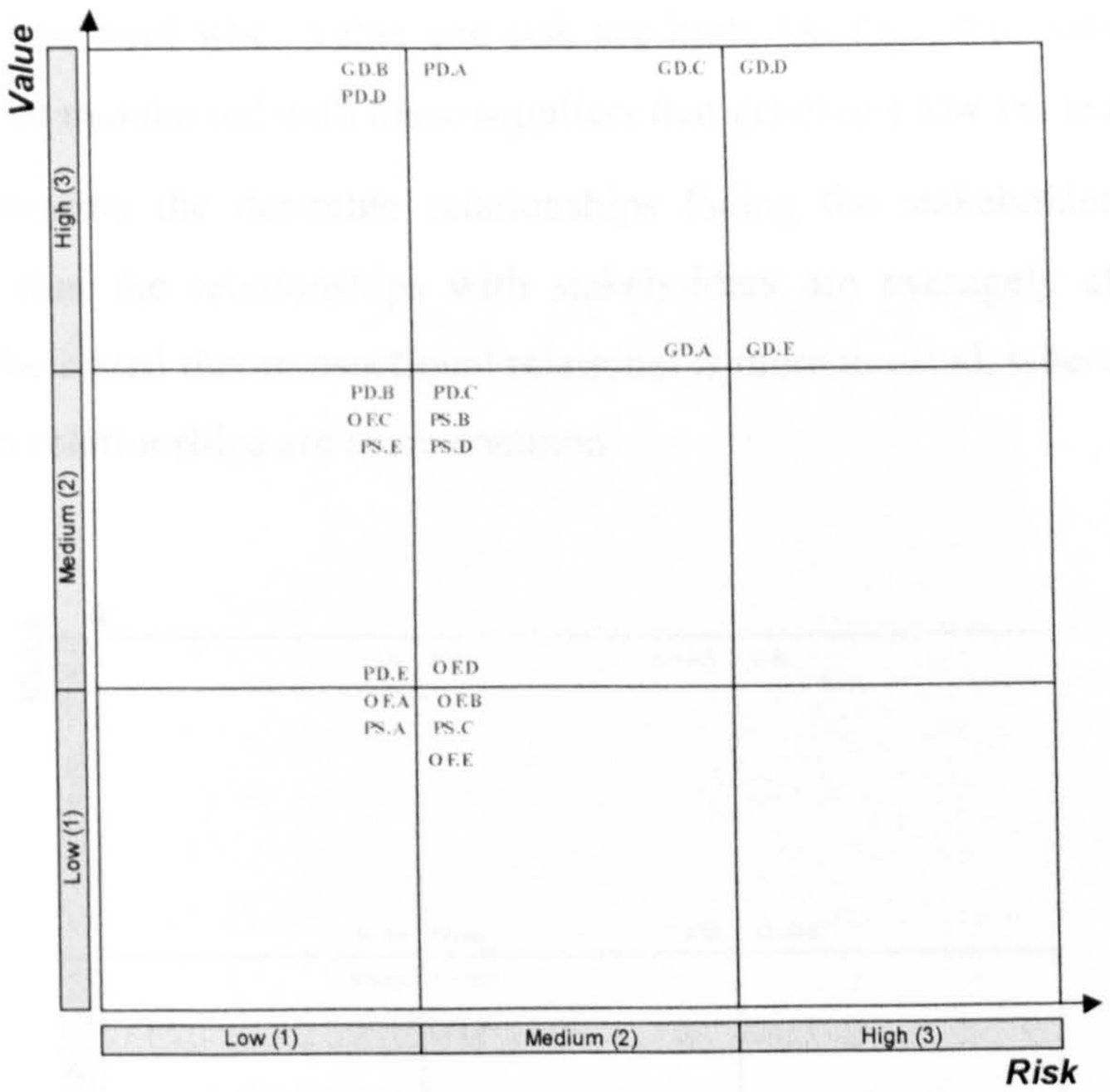

Figure 7.10: Operate process distribution according to the value and risk, stakeholder facing – Goizper S.Coop.

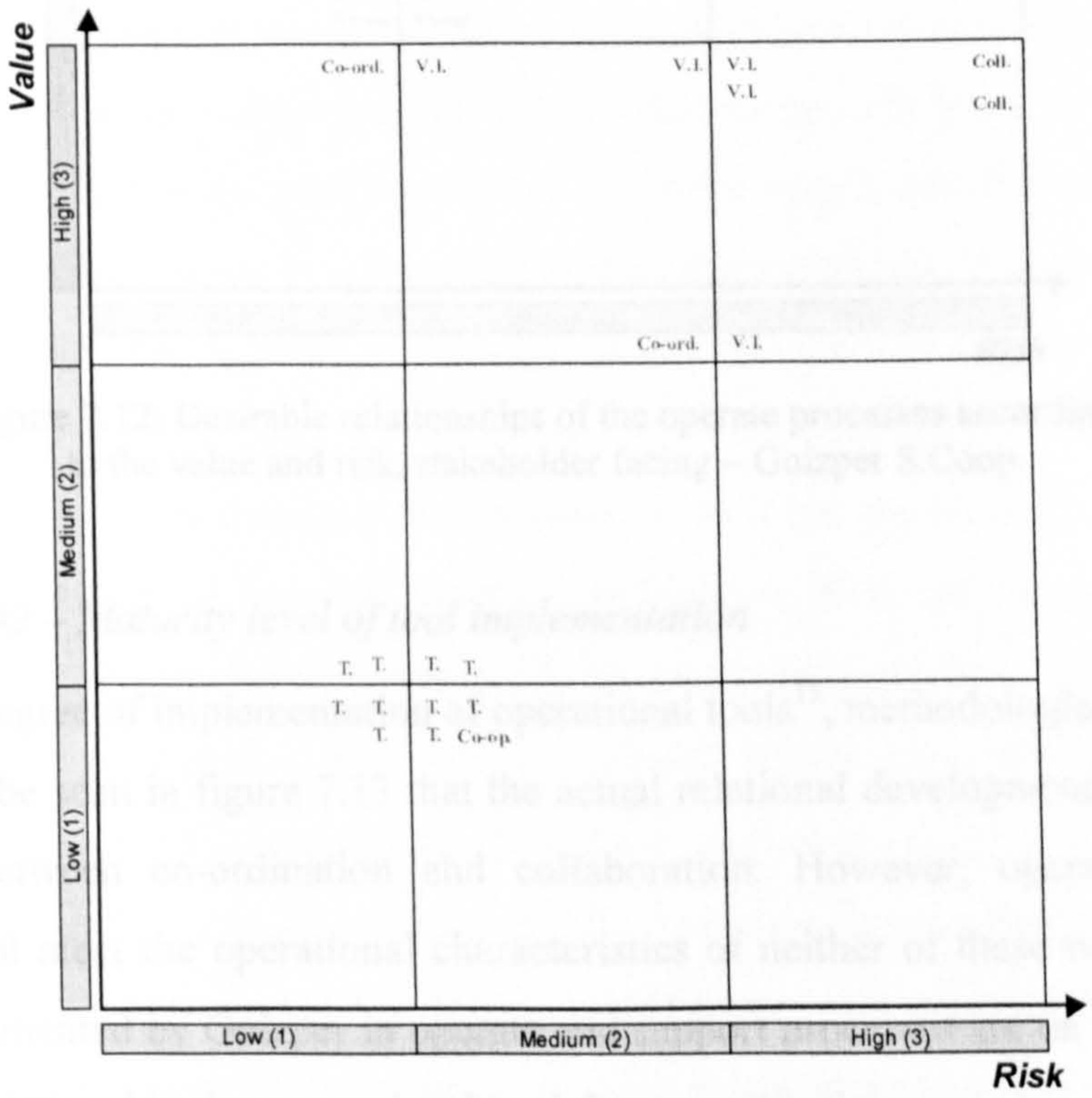

Figure 7.11: Desirable relationships of the operate processes according to the value and risk, supplier facing – Goizper S.Coop.

It can be noticed in figure 7.11 that the higher the value and the risk perceived by Goizper from the suppliers, the closer the relationship it is arranged. Collaboration and vertical

relationships will be held when value and risk are high. On the other hand, transactional relationship will be maintained with these suppliers that generates low value and risk

Figure 7.12 represents the desirable relationships facing the stakeholders. A notorious characteristic is that the relationships with stakeholders are averagely closer than with suppliers. It can be stated that transactional relational is more unusual, whereas co-operation and collaboration relationships are more common.

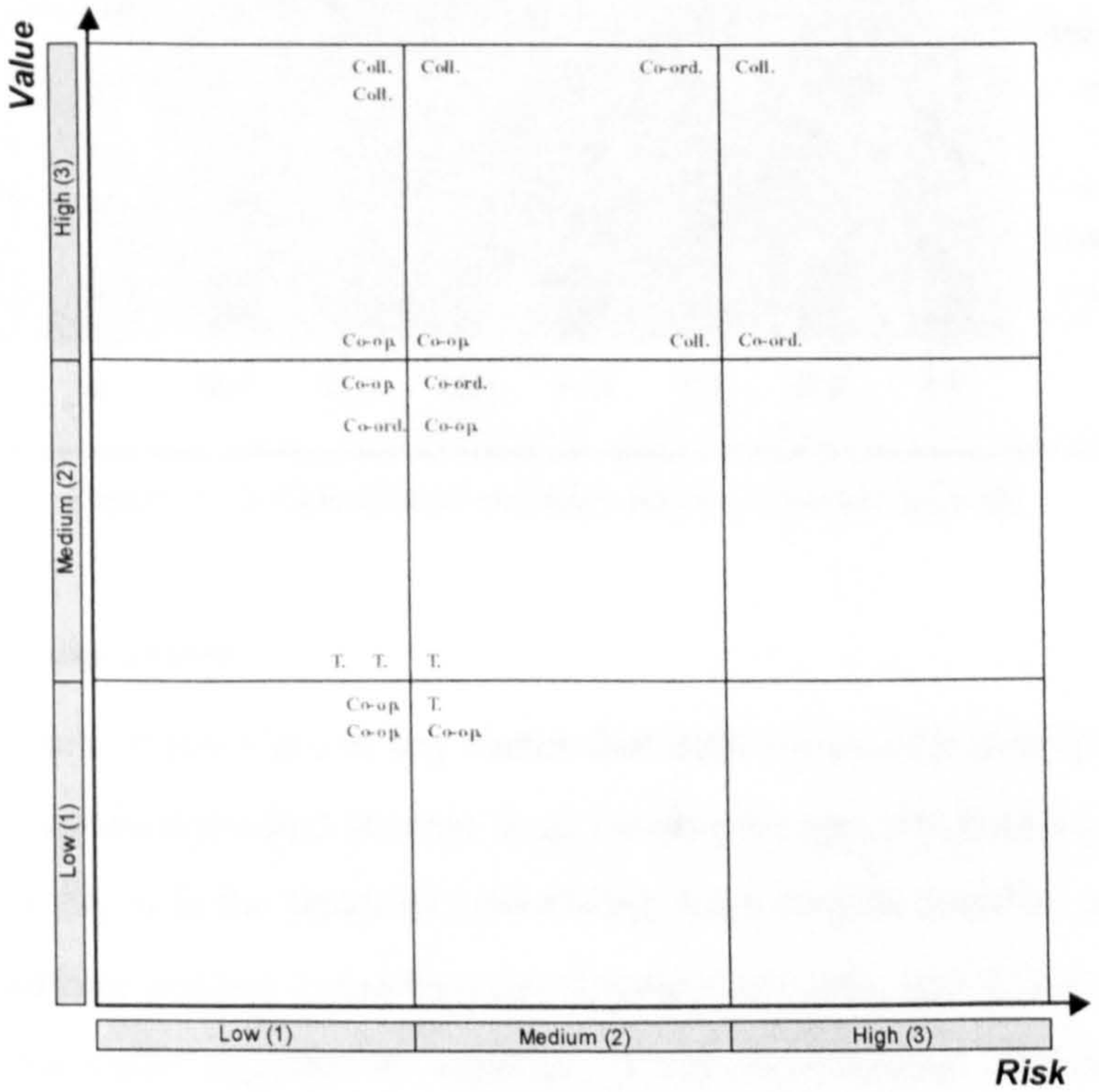

Figure 7.12: Desirable relationships of the operate processes according to the value and risk, stakeholder facing – Goizper S.Coop.

d) *Sub-model #2 – Maturity level of tool implementation*

Analysing the degree of implementation of operational tools[15], methodologies and systems in Goizper, it can be seen in figure 7.13 that the actual relational development of management processes is between co-ordination and collaboration. However, operate and support processes do not meet the operational characteristics of neither of these two relationships. The tools implemented by Goizper in operate and support processes are on the way towards co-ordination relationship, but more developed than co-operation.

Another important feature is that three of the business processes do not have any kind of external relationship, they are internally focused.

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[15] The maturity model is available in the questionnaire, section 3.

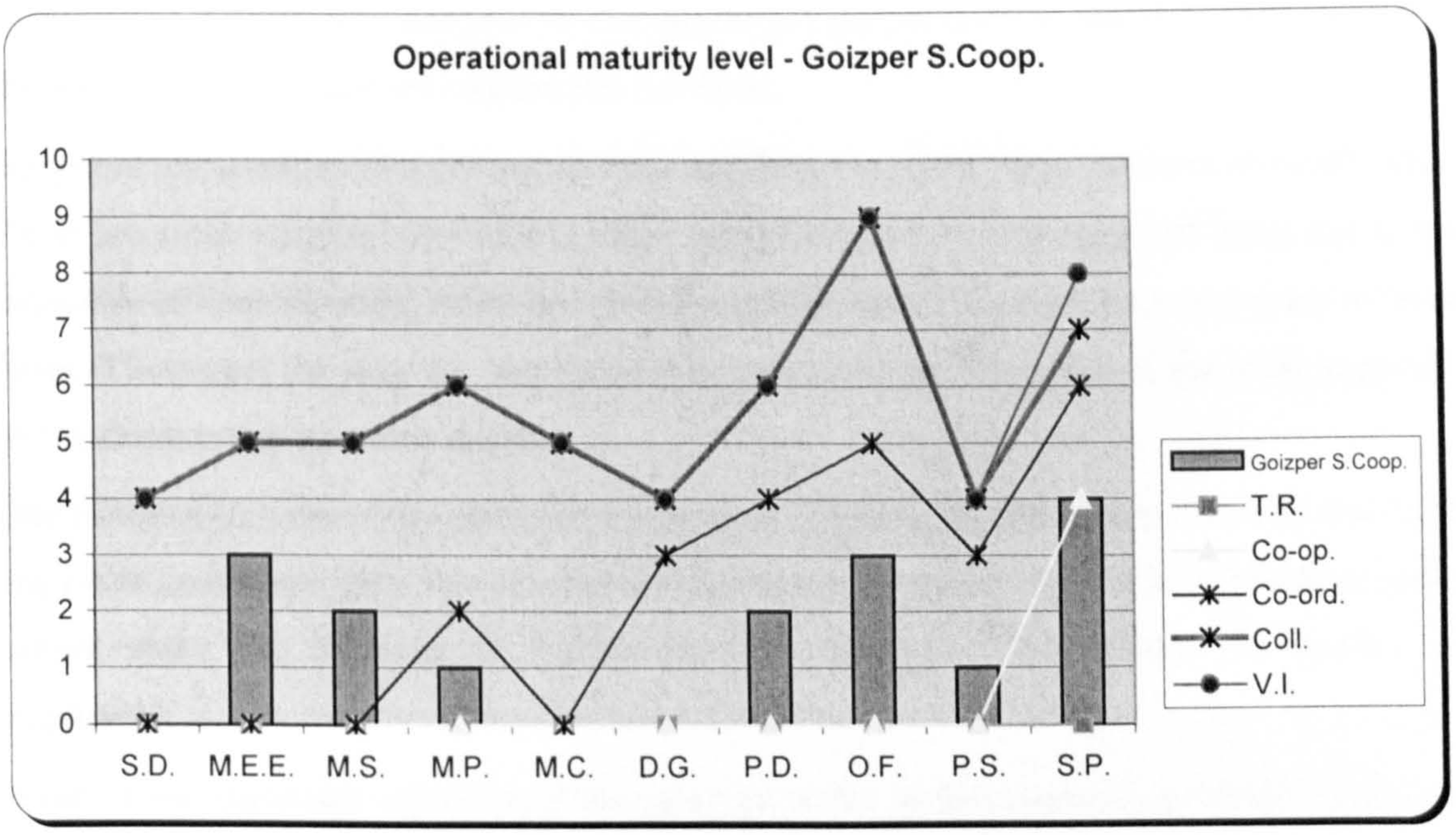


Figure 7.13: Operational maturity level – Goizper S.Coop.

e) *Comments & conclusions*

Product type of the company is one key factor that determines relationships with suppliers. It is a completely standard product (except large batches for specific brands), technologically very simple: Basically it is the result of assembling some simple metallic and plastic items. The most value-adding process is product development process, and it is carried out almost internally. Tangible value supplied by suppliers is not considerable. Technologies used are very common (low asset specifity) and complexity of the items required by Goizper is low.

Goizper is averagely much **stronger than suppliers**, so it has the chance to negotiate with them. Competency in price between suppliers is high, as there are several organisations providing a similar service. It might search for the cheapest competitor, but Goizper rather prefers dealing with a range of 15 suppliers and maintain a good relationship with them.

As a high percentage of the components of the final product are made of injected plastic, a large number of moulds are required (around 500). These moulds are Goizper's property, so they lend the moulds to the suppliers. It is considered very **risky** to lend all the moulds to one supplier as **dependency** arise dramatically. This is one important reason to work with a group of suppliers rather than just with one or two.

The moulds of key elements have been duplicated in order to reduce risk and they have been given to 2 suppliers. At the same time, these moulds are always adapted to the machines of Olaker (Goizper's technology centre) and eventually it would be possible to take any mould

from a supplier and inject components there. It provides high flexibility and considerably reduces risk. Olaker also adjusts the moulds before giving them to suppliers and calculates the value of all the injection-parameters for them.

Suppliers are classified depending on their capability to inject large, medium or small items. There are some suppliers that cannot offer competitive prices in some small items due to the large size of their injecting machines. Small suppliers (just 2-3 people) are necessary in these cases. The bigger the supplier, the higher the complexity and the value of the items supplied, so the relationship becomes closer.

One of the objectives of the policy of a Cooperative (all the employees are the owners of the org.) is to create new jobs for the community where it is located. As a result, the organisation cannot make the decision of outsourcing a competence, and reduce the number of employees.

Some of the managers interviewed thought that some of the assembly processes might be viable of outsourcing. However, it would not be considered a good strategic choice due to the policy explained previously.

Recent evolution

Historically Goizper was responsible for the development of products and the final assembly process. It outsourced all the components.

They did not have any know-how in plastic injection technology neither about mould manufacturing. They collaborated very closely with one plastic supplier responsible for the development of all the injection process, its parameters, and requirements. Costs were fixed by this supplier.

Risk was very high as Goizper was in its supplier's hands: Goizper developed the idea and its supplier provided the technological know-how for accomplishing it.

Seven years ago Goizper made a strategic decision to vertically integrate this knowledge in plastic injection technology. It co-operated with several universities and technologic centres to get this know-how. Currently, one of their core-competences is their knowledge about plastic and the technologies for its transformation. They vertically integrated the R&D of this field.

The reason for doing this was to reduce dependency (risk) on the supplier. Goizper gave up collaborating with this supplier and moved to a co-ordination relationship. Costs are better controlled and Goizper has the chance to negotiate with more suppliers. Currently, it co-operates with this supplier in the product development process.

Although they moved from a collaborative relationship to a co-ordination environment, future plans are directed to move back to collaboration. This time product development capability will not be the link between them: Goizper and this plastic supplier are planning to carry out an 'in-house' project, the supplier would implement an injection cell next to Goizper's assembly line. Joint investments and risks will be necessary, but profits (tangible/intangible) will be shared.

Another important outsourced competence is mould building. Goizper has 2 types of mould suppliers according to the size of the mould required: The supplier for large moulds is located in Portugal and the rest closed to the company.

The problem with these suppliers, especially with the one in Portugal, is the same as the one described about the know-how in plastic injection field. Goizper would like to gain more knowledge in moulding in order to negotiate more accurately with its suppliers and be able to control more this process.

As a result, Goizper has recently decided to vertically integrate this Portuguese mould supplier, buying its 60%. This strategic decision will enable Goizper to have access to moulding knowledge and higher flexibility and agility to build its moulds. It is planned to run a new business unit of this supplier closed to Goizper that would supply it small moulds. Large moulds would still be manufactured in Portugal.

One manager of Goizper was considering during the interview that maybe this strategic decision was not completely right. He thinks that vertical integration is not a current trend and there might be better practices to ensure an efficient relationship with this supplier.

A third key supplier is actually very critical and risky because of the technology that it uses. There is just one supplier in the Basque Country that provides this service and very few in Spain. Relationship with this supplier is complicated as Goizper does not have much power to negotiate with it: Prices are high and service level average.

Initially, there were many components of the final product that were developed to be manufactured using this technology. As other technologies (conventional plastic injection) were more common, these developments were modified to meet the characteristics of these latter technologies. Costs, quality, service level and nature of the relationship with the suppliers were improved with this decision.

The current relationship that Goizper has with this critical supplier is based on co-operation and co-ordination. A collaborative relationship was considered to be desirable but quite difficult to achieve. As dependency on the supplier is very high and there is no other closed supplier, the supplier prefers to keep this strength as a key factor for negotiating.

One important characteristic of Goizper is that its most important customer is responsible for just the 2% of the total sales. As a result, risk generated by the customers is very low, as well as dependency on them.

As a final conclusion, it can be stated that Goizper trend has been to vertically integrate all the knowledge about the key processes of the supply chain: plastic injection and moulding. The objective of this strategic choice is to reduce risk and dependency on the suppliers, and gain control over the costs of the critical supplies. Once that this know-how is integrated, relationship with suppliers can be based more on price, as the transaction between them becomes material, rather than developing the product and the process for it.

As plastic injection is a very common technology and there are plenty potential suppliers, Goizper decided to maintain a bidding relationship with a relatively reduced group of suppliers. Also the low technological requirements of the product lead Goizper to focus on price.

However, future lines suggest collaborating at least with the main plastic supplier, developing an 'in-house' project.

On the other hand, policy defined to the other key supplier, the moulding supplier, has been similar. It was decided to integrate the knowledge about this product/process, therefore the supplier was vertically integrated.

7.3.2.2. Domusa Calefaccion S.Coop. analysis

Domusa was the second organisation studied by the author. The data gathered in the visits to the organisation is analysed in the following five sections.

a) *Relationship type identification and categorisation*

Three of the five relationship types proposed in the first research question of this study were identified in the organisation. Both collaboration and vertical integration were not current practices in Domusa, mainly because it is a very traditional company and its financial strength does not force the organisation to make any substantial relational improvement.

Table 7.6: Implementation and ranking of relationship levels – Domusa Calefaccion S.Coop.

Relationship level	Implementation	Ranking
Transactional Relationship	Yes	1
Co-operation	Yes	2
Co-ordination	Yes	3
Collaboration	No	-----
Vertical Integration	No	-----

Transactional relationship was the most common practice with both suppliers and stakeholders, followed by co-operation and co-ordination. It was highlighted that collaboration could be a future strategic development of the organisation.

b) *Sub-model #1 – Complexity/Uncertainty approach*

Complexity/uncertainty approach was tested in Domusa. The categories of the 12 critical factors were scored as it is shown in table 7.7.

The nature of the product and market segment and the location of the organisation were defined as key critical factors with high score. Access to new international markets was highlighted as a critical issue that would need close relationship with other organisations with more experience in international markets. On the other hand, the current location lacks good infrastructures.

After processing the scores of all the critical factors, general complexity and uncertainty values obtained were quite low, around 40. However, the individual values of each of the business processes showed higher value of complexity and uncertainty in some cases.

Table 7.7: Scores of the critical factors and the complexity/uncertainty values for each business process – Domusa Calefaccion S.Coop.

Critical Factor	Score		
Degree of routinisation of the buying problem	20	**COMPLEXITY**	**43**
Resources	10		
Transaction Costs	15		
Learning Potential	30		
Performance ambiguity	60		
Type of Product	40		
Product & Market Segment	90	**UNCERTAINTY**	**36**
*Value Proposition**	25		
General Economic factors	30		
*Location (Physical, Logical)**	95		
Manufacturing Strategy	40		

Behaviour and relationship of other Org.	65		

Complexity/Uncertainty per business process									
1-S.D.	**2-M.E.E.**	**3-M.S.**	**4-M.P.**	**5-M.C.**	**6-D.G.**	**7-P.D.**	**8-O.F.**	**9-P.S.**	**10-S.P.**
54,1/42,5	54,1/42,5	54,1/42,5	46,2/37,5	54,1/42,5	52,1/42,1	49,4/39,3	46/39,3	49,4/39,3	45/31

These particular complexity and uncertainty scores were represented in the complexity/uncertainty diagram (figure 7.14).

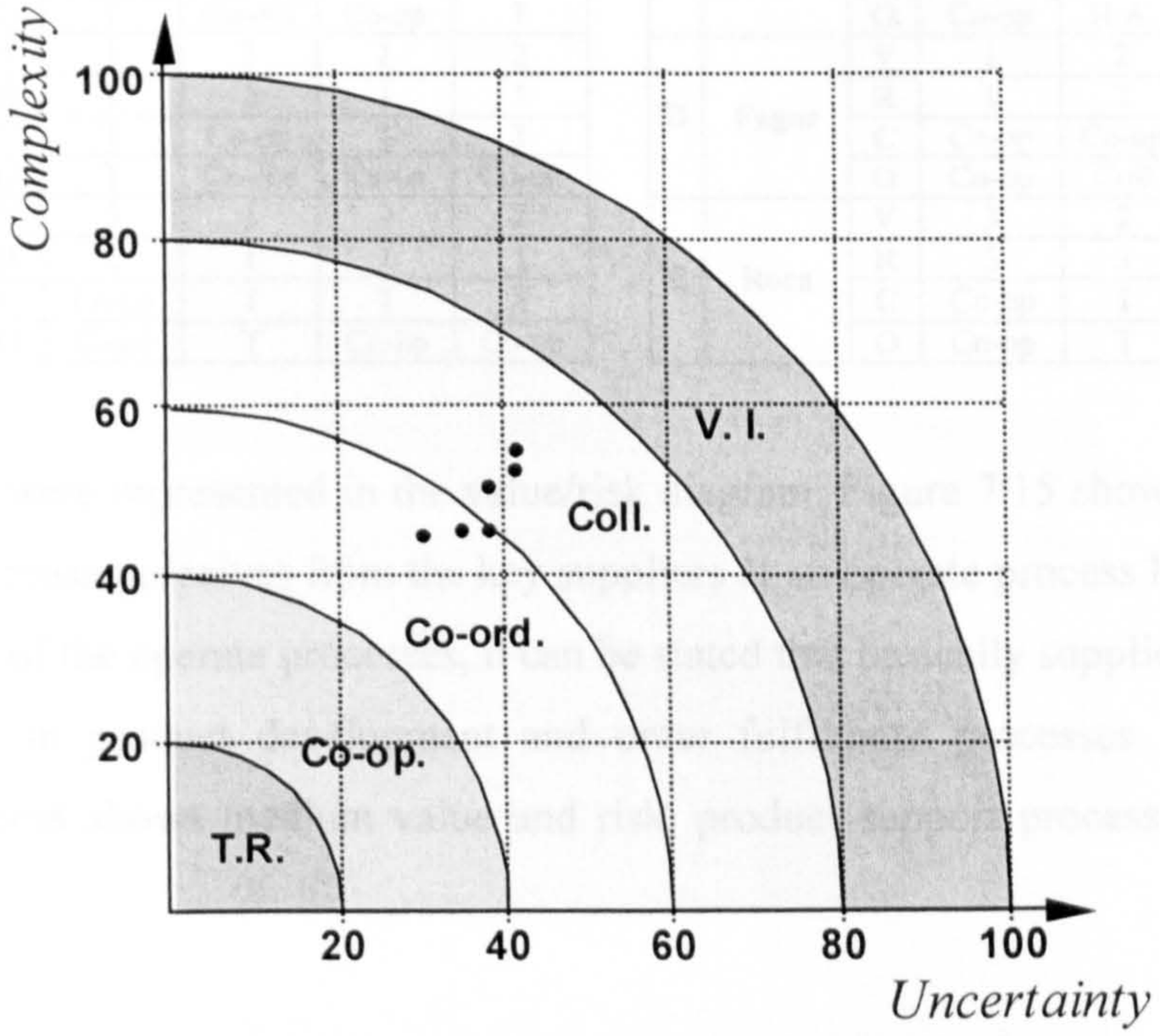


Figure 7.14: Representation of Complexity/Uncertainty values – Domusa Calefaccion S.Coop.

Analysing the distribution of the values in the diagram, it can be stated that the average requirement of close relationship would be medium/high for Domusa.

c) *Sub-model #1 – Value/Risk approach*

The relationships held with five suppliers and five stakeholders by Domusa were analysed in order to test the value/risk approach. Table 7.8 shows all the value and risk scores of each supplier/stakeholder for each operate process. At the same time, the current and the desirable relationships are presented also for each supplier/stakeholder and each operate process.

Table 7.8: Value and risk for each key supplier/stakeholder and their current desirable relationships – Domusa Calefaccion S.Coop.

Supplier			D.G.	P.D.	O.F.	P.S.
a	Foundry	V	2	3	1	1
		R	2	3	3	1
		C	T	Co-op	T	T
		O	Co-op	Coll	V.I.	T
b	Proveedor chapa	V	2	1	2	1
		R	2	1	3	1
		C	T	T	T	T
		O	Co-op	T	Co-ord	T
c	Artolazabal	V	1	2	2	1
		R	1	1	1	1
		C	T	Co-op	T	T
		O	T	Co-ord	Co-op	T
d	Izurza Procal	V	1	3	1	2
		R	1	2	1	1
		C	T	Co-op	T	T
		O	T	Co-ord	Co-op	Co-op
e	TDN logistics	V	3	1	3	2
		R	1	1	1	1
		C	Co-op	T	T	T
		O	C-ord	T	Co-op	Co-op

Stakeholder			D.G.	P.D.	O.F.	P.S.
A	7H	V	3	3	1	2
		R	3	1	1	1
		C	Co-op	Co-op	T	T
		O	Co-ord	Coll	T	Co-op
B	MCC	V	3	3	2	1
		R	2	1	1	1
		C	Co-ord	T	T	T
		O	Coll	Coll	Co-op	Co-op
C	Errezil	V	1	1	1	1
		R	1	1	1	1
		C	Co-op	N.A.	Co-op	N.A.
		O	Co-op	N.A.	Co-op	N.A.
D	Fagor	V	1	2	1	2
		R	1	2	1	2
		C	Co-op	Co-op	T	Co-op
		O	Co-op	Coll	Co-op	Coll
E	Roca	V	3	2	1	1
		R	3	3	3	3
		C	Co-op	T	T	T
		O	Co-op	T	Co-ord	Co-ord

All these score were represented in the value/risk diagram. Figure 7.15 shows the value and the risk that Domusa perceives from the key suppliers at an operate process level. Analysing the distribution of the operate processes, it can be stated that basically suppliers provide high value and risk in product development and order fulfilment processes. While demand generation process shows medium value and risk, product support process gets low value and risk scores.

From the stakeholders' perspective, the processes that more value and risk involve for Domusa are product development and demand generation processes. This issue can be seen in figure 7.16. The other two operate processes have a similar behaviour, because both process support and order fulfilment processes perceive a medium/low value from the transactions with the stakeholders.

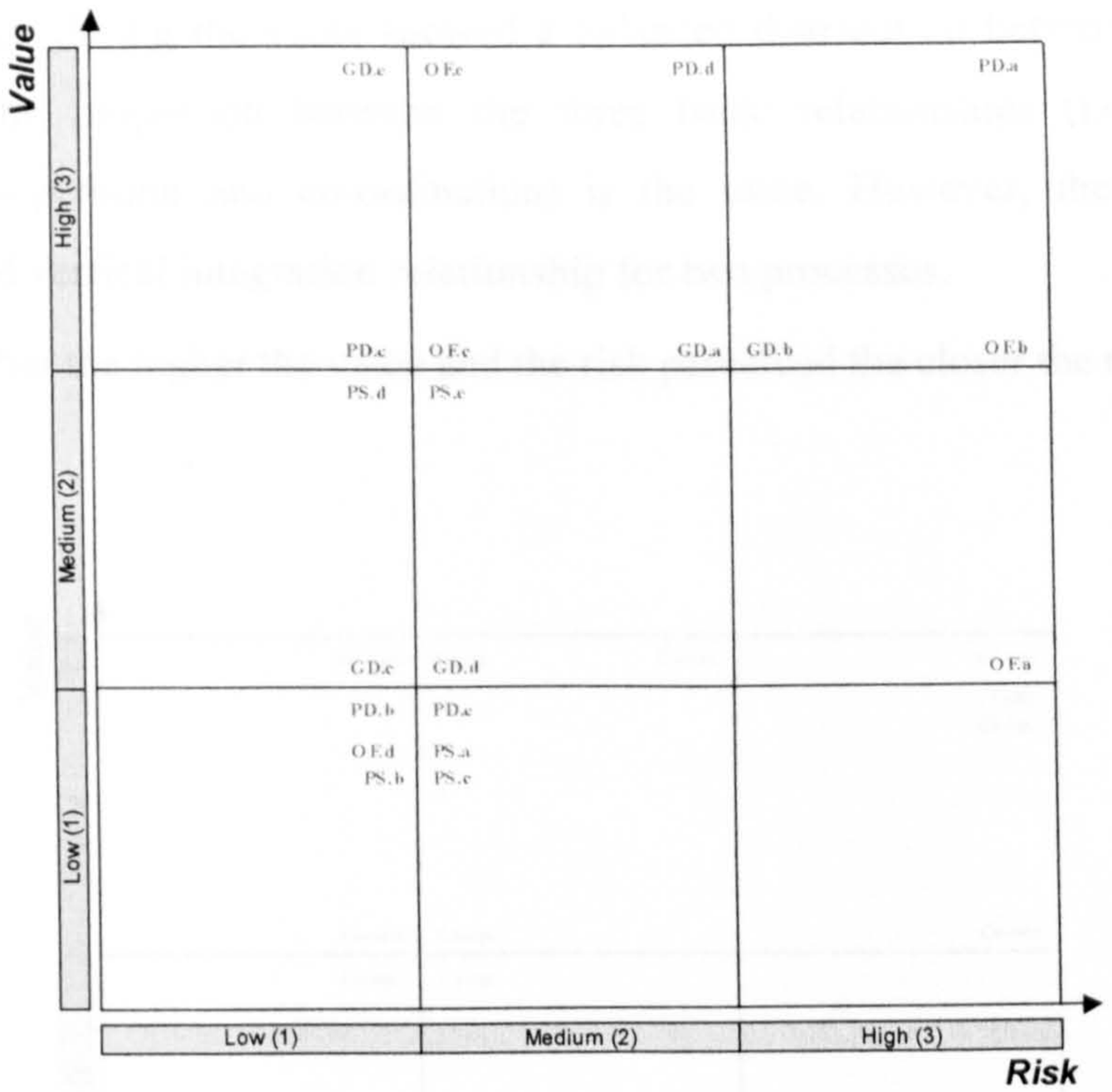


Figure 7.15: Operate process distribution according to the value and risk, supplier facing – Domusa Calefaccion S.Coop.

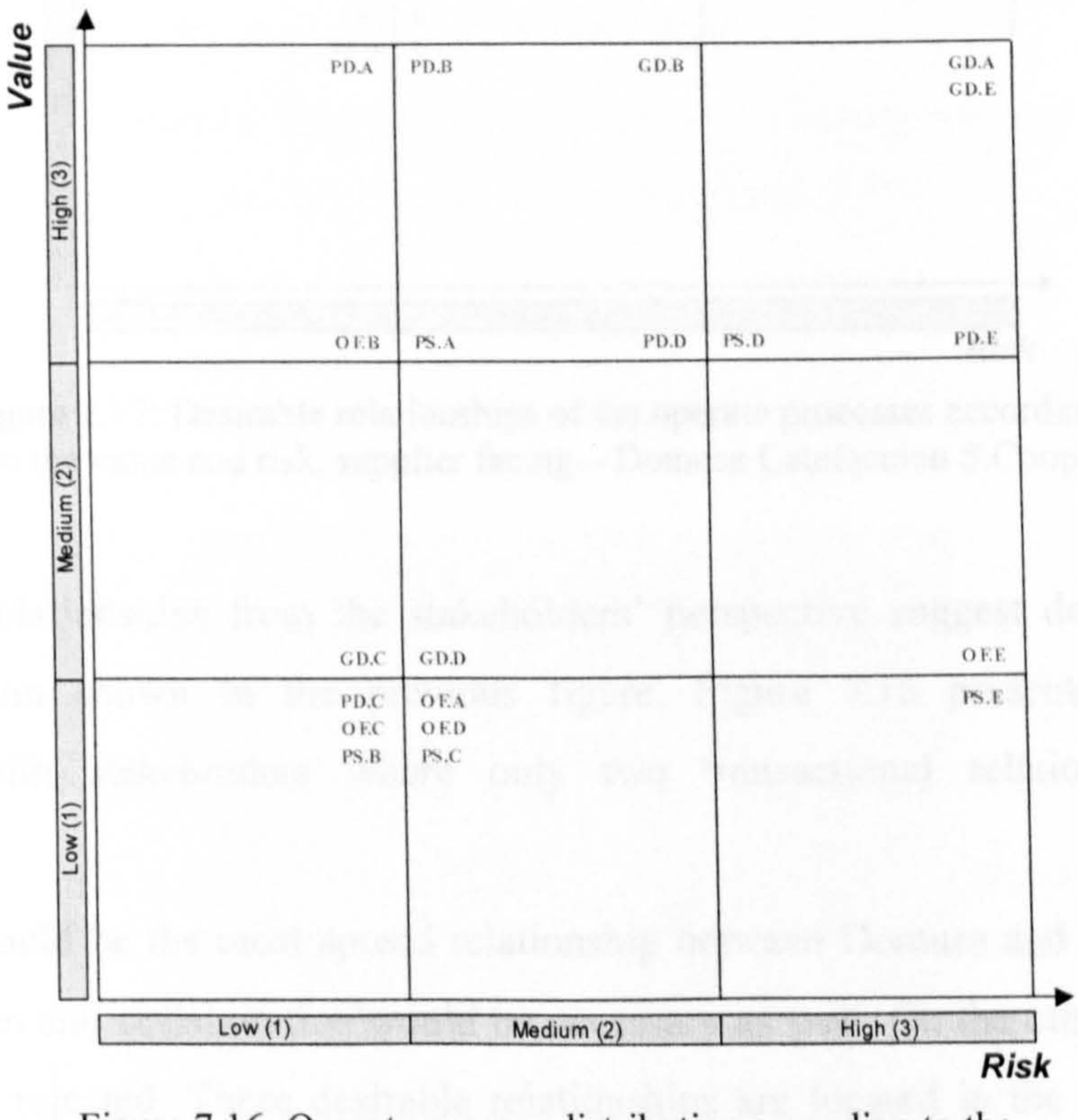


Figure 7.16: Operate process distribution according to the value and risk, stakeholder facing – Domusa Calefaccion S.Coop.

Figure 7.17 represents the desirable relationships for Domusa according to the value and risk for each of the processes analysed.

The data gathered during the visits showed a balanced distribution between the desirable relationships. The proportion between the three basic relationships (i.e. transactional relationship, co-operation and co-ordination) is the same. However, there is only one collaboration and vertical integration relationship for two processes.

It can be stated that the higher the value and the risk perceived the closer the relationship will be necessary.

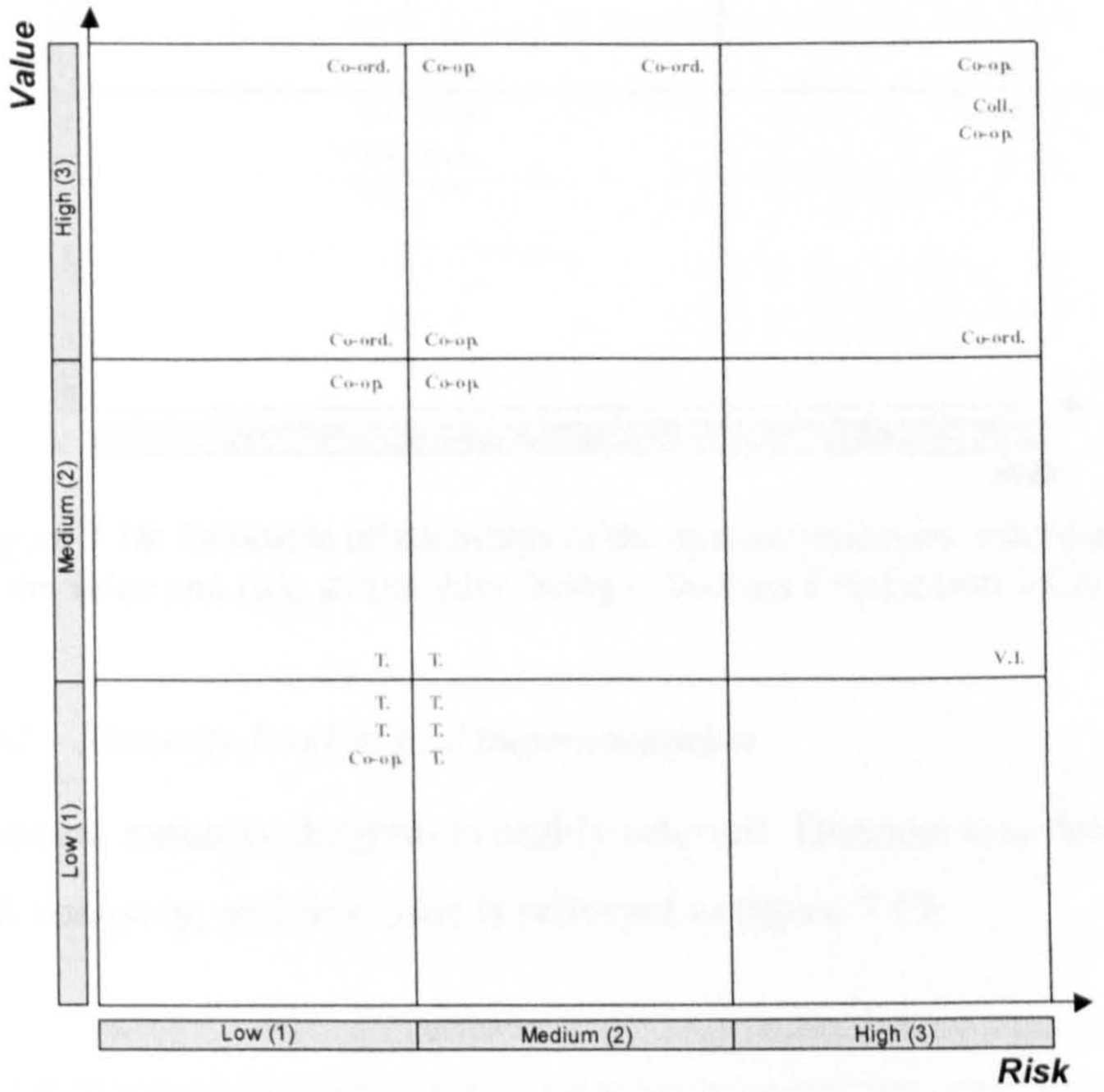


Figure 7.17: Desirable relationships of the operate processes according to the value and risk, supplier facing – Domusa Calefaccion S.Coop.

The desirable relationships from the stakeholders' perspective suggest developing closer relationships than shown in the previous figure. Figure 7.18 presents the desirable relationships with stakeholders where only two transactional relationships can be distinguished.

Co-operation would be the most spread relationship between Domusa and its stakeholders, but co-ordination and collaboration would be necessary as well. On the other hand, vertical integration was rejected. These desirable relationships are located in the chart apparently without any value and risk distribution pattern.

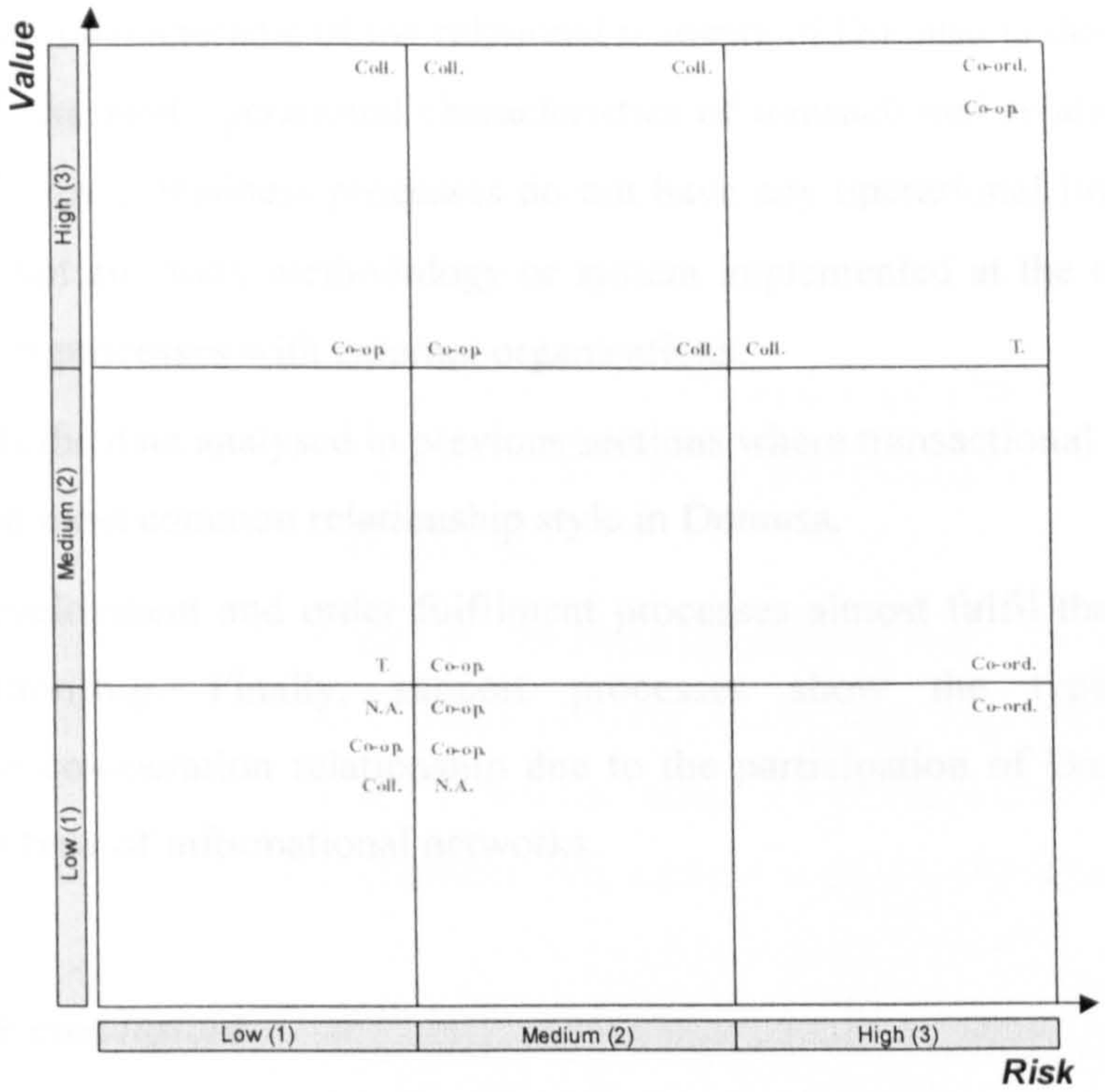


Figure 7.18: Desirable relationships of the operate processes according to the value and risk, stakeholder facing – Domusa Calefaccion S.Coop.

d) *Sub-model #2 – Maturity level of tool implementation*

Domusa's operational maturity diagram is highly relevant. Domusa was described before as a very traditional company, and this issue is reflected in figure 7.19.

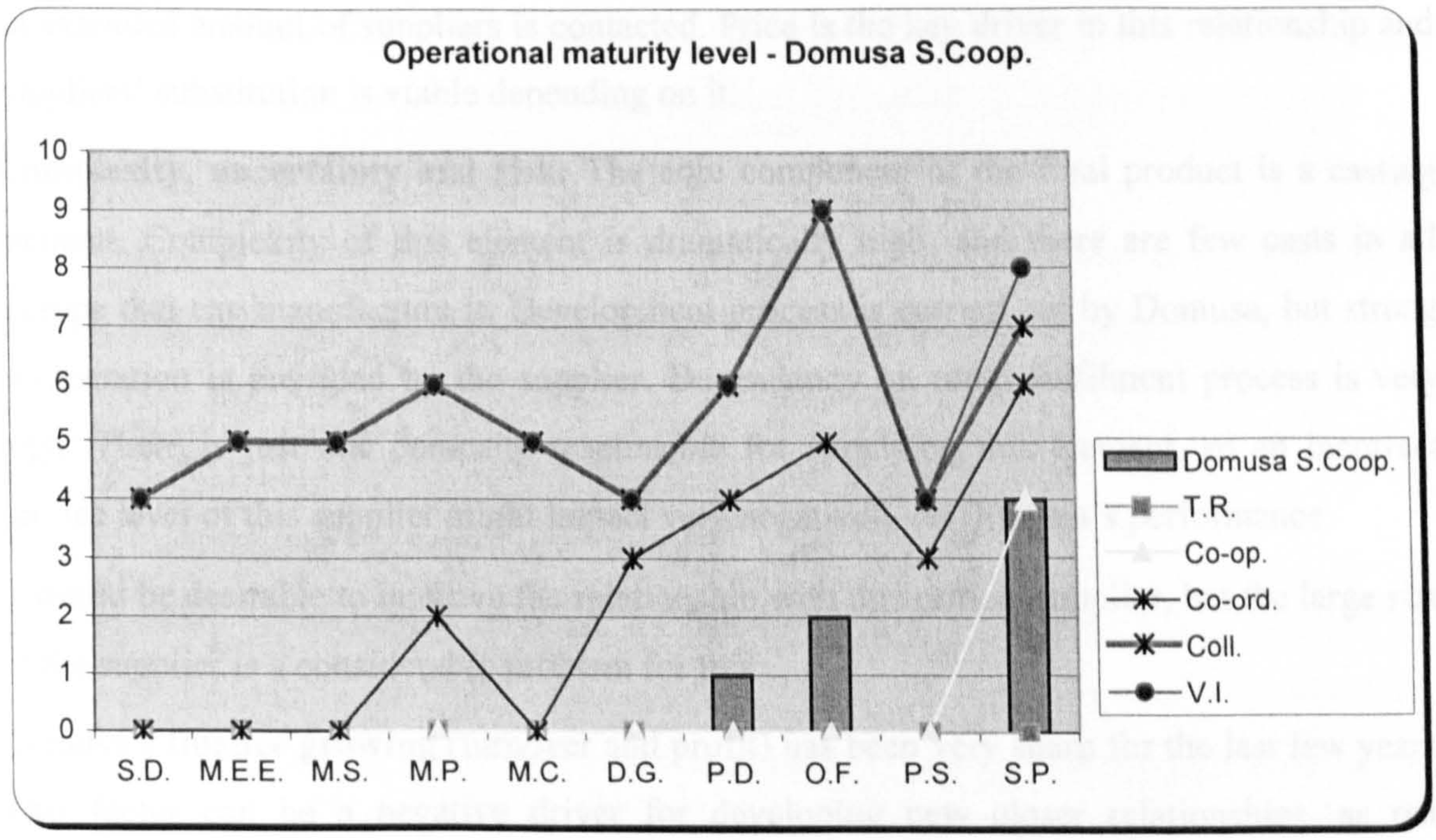


Figure 7.19: Operational maturity level – Domusa Calefaccion S.Coop.

The first important characteristic of the relational maturity of Domusa is that seven business processes out of ten meet operational characteristics of transactional relationship. In other words, Domusa's seven business processes do not have any operational linkage with other entities, there is not any tool, methodology or system implemented at the organisation that relates these seven processes with external organisations.

This fact supports the data analysed in previous sections where transactional relationship was highlighted as the most common relationship style in Domusa.

Both product development and order fulfilment processes almost fulfil the features of co-ordination relationship. Finally, support processes show the typical operational characteristics of co-operation relationship due to the participation of Domusa in forums, cluster and other type of informational networks.

e) *Comments & conclusions*

Domusa's organisational **culture** has always been focused on internal development rather than externalising its performance. It can be said that Domusa maintains a very traditional relationship policy. Its collaborative culture is not developed yet.

Transactional relationship is a very common practice between the company and its suppliers.

Products of Domusa require average technology development. They require very specific know-how in energetic processes, therefore, product development is completely vertically integrated. Many commercial components are necessary for assembling the final product, so an extended amount of suppliers is contacted. Price is the key driver in this relationship and suppliers' substitution is viable depending on it.

Complexity, uncertainty and risk: The core component of the final product is a casting element. Complexity of this element is dramatically high, and there are few casts in all Europe that can manufacture it. Development process is carried out by Domusa, but strong co-operation is provided by the supplier. Dependency on order fulfilment process is very high: There is just one company responsible for supplying this element, so an incorrect service level of this supplier might impact very negatively on Domusa's performance.

It would be desirable to improve the relationship with this critical supplier, but the large size of the supplier is a considerable problem for this.

Domusa's **finance growing** (turnover and profit) has been very sharp for the last few years. This factor can be a negative driver for developing new closer relationships, as real requirement for it is not considered essential. Some managers stated that if competitiveness

gets higher (e.g. Asiatic competitors), prices start decreasing gradually, and Domusa's profits are reduced, collaboration within the supply chain would be an important strategic decision.

Recent evolution

Domusa became a co-operative (the employees owners of the org.) few years ago, after its owner's (CEO) death. Before this conversion, the CEO of the organisation made the strategic choice of vertically integrate the cast process.

Domusa started a small cast unit next to the main assembling line. The objective of this decision was to gain flexibility and reduce risk due to the high dependency on a unique supplier. Having an own cast unit would provide faster new product development. It would reduce the stock level of casting elements (the current supplier supplies batches of one month).

This decision for vertical integration seemed to be necessary and logic. However, there was an important problem: The cost of each casting element would be higher than the one purchased in Easter Europe. Cost vs. service and flexibility. Finally, the cast unit was implemented considering the importance of the flexibility against the costs.

After the co-operative was created, the new CEO's economic profile based on costs and the quality problems arisen during the performance of the unit stimulated the closure of the cast unit. The driver for this measure was exclusively cost.

Some years after this strategic decision, a partial acquisition of the casting supplier is being considered. It seems to be an intermediate decision: Manufacturing costs of the casting elements remain economic, and flexibility is gained through the control of the company.

Analysing stakeholders, close relationship with customers is highlighted due to the product support requirements. This after-sales service provided by Domusa is highly appreciated by customers.

Dependency on customers is not very high as the percentage of sales by customer is reduced. Missing a customer is not such a critical fact.

Sales network is necessary to reach all the small retailers. Co-operation between the organisation and these small retailers is common: New product developments, characteristics of the products, or tips for correct installation and use are shared through some annual conferences.

Analysing current relationships of Domusa, it is stated a strong vertical integration. One of the drivers for it is the traditional culture that the organisation has. Also, the positive financial results of the organisation do not force the company to restructure its external relationships. The interviews showed that higher levels of efficiencies would be pursued if financial profits were dramatically reduced.

Integrating vertically the casting supplier is assessed as right strategic decision, due to criticality of the current transaction and risk perceived from it. It will provide Domusa more flexibility and agility in the development of new products, and reliable service level.

7.3.2.3. ONA Electroerosion S.A. analysis

The third case analysed was the machine tool company ONA Electroerosion S.A. All the research methods used in the visits to the organisation provided useful data for this study. The data analysis process was divided in five sections as it was done with the previous cases.

a) *Relationship type identification and categorisation*

Both the second section of the questionnaire and the semi-structured interviews held at the organisation showed that the five relationship levels proposed by this study were implemented. These five relationships were known by the organisation and all of them were common between the organisation and suppliers/stakeholders.

Table 7.9: Implementation and ranking of relationship levels – ONA Electroerosion S.A.

Relationship level	Implementation	Ranking
Transactional Relationship	Yes	1
Co-operation	Yes	2
Co-ordination	Yes	3
Collaboration	Yes	5
Vertical Integration	Yes	4

Figure 7.9 shows the classification of the relationship levels depending on the number of actual implementations between ONA and other external organisations. It can be stated that the more basic the relationship the more often it is held. Transactional relationship is the relationship type most common in ONA, followed by co-operation and co-ordination.

On the other hand, vertical integration relationship was found to be more important than collaboration for ONA at the present time.

b) *Sub-model #1 – Complexity/Uncertainty approach*

Analysing the complexity and uncertainty values of ONA, three main critical factors got the highest score: Product & market segment, value proposition and general economic factors.

The product and market of ONA is currently threat by new emergent competitors such as Chinese organisations and their low labour costs. This issue makes ONA create close relationships within its value chain. Related to the effect of these new emergent competitors are the general economic factors. The impact of the Chinese economy on the global economy has modified the competitiveness of organisations such as ONA.

Finally, the value proposition of this organisation (i.e. Innovators) suggests developing collaborative relationships that would increase the capability for innovation.

Table 7.10: Scores of the critical factors and the complexity/uncertainty values for each business process – ONA Electroerosion S.A.

Critical Factor	Score		
Degree of routinisation of the buying problem	20	**COMPLEXITY**	**37**
Resources	40		
Transaction Costs	10		
Learning Potential	20		
Performance ambiguity	10		
Type of Product	35		
Product & Market Segment	80	**UNCERTAINTY**	**41,5**
Value Proposition	85		
General Economic factors	75		
Location (Physical, Logical)	10		
Manufacturing Strategy	45		
Behaviour and relationship of other Org.	30		

Complexity/Uncertainty per business process									
1-S.D.	**2-M.E.E.**	**3-M.S.**	**4-M.P.**	**5-M.C.**	**6-D.G.**	**7-P.D.**	**8-O.F.**	**9-P.S.**	**10-S.P.**
47,5/55	47,5/55	47,5/55	39,3/45	47,5/55	45,7/52,1	38,9/48,1	36/48,1	38,9/48,1	36/45

Table 7.10 also shows the general complexity and uncertainty values and the specific values for each business process. One of the key features of these values is that uncertainty is higher than complexity in ONA, mostly due to the influence of the specific product and market, and the threat of the new competitors.

Representation of these complexity/uncertainty scores in the complexity/uncertainty diagram shows that difference between business processes is considerable from a relational perspective (figure 7.20).

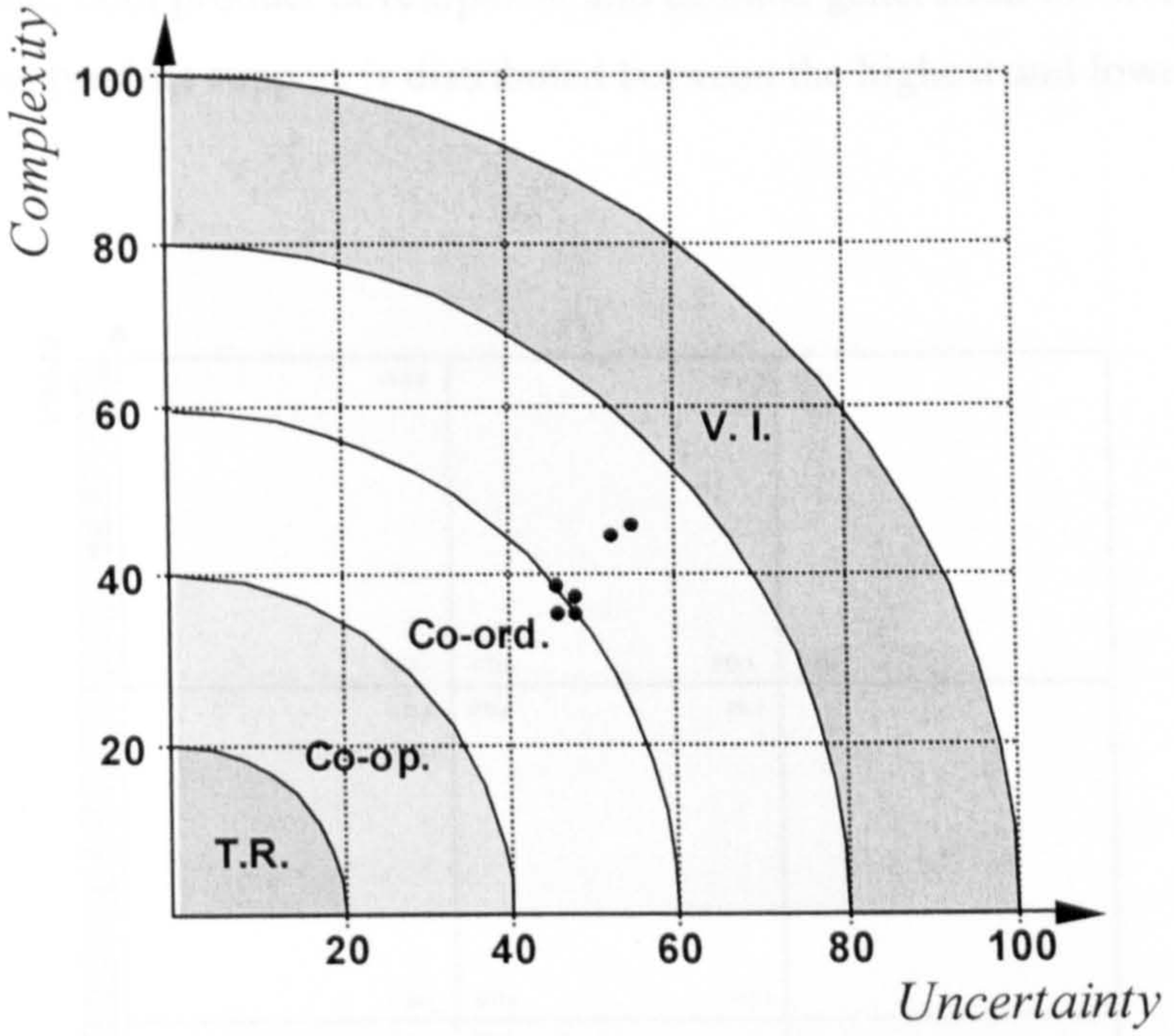


Figure 7.20: Representation of Complexity/Uncertainty values – ONA Electroerosion S.A.

c) *Sub-model #1 – Value/Risk approach*

Relationship between ONA and five suppliers and four stakeholders were analysed to test the value/risk approach of the sub-model #1 (Table 7.11).

Table 7.11: Value and risk for each key supplier/stakeholder and their current desirable relationships – ONA Electroerosion S.A.

Supplier			D.G.	P.D.	O.F.	P.S.
a	Cast Supplier	V	2	2	2	1
		R	1	1	2	1
		C	T	Co-op.	Co-ord.	T
		O	Co-op.	Co-ord.	Coll.	T
b	Supplier of standard commercial components	V	2	2	1	3
		R	1	2	2	2
		C	T	T	T	T
		O	T	Co-op.	Co-op.	Co-op.
c	Machining supplier (Externalised)	V	1	2	3	2
		R	1	1	2	2
		C	T	Co-op.	Coll.	Co-ord.
		O	T	Co-ord.	Coll.	Co-ord.
d	Supplier of customisable commercial components	V	2	3	3	3
		R	1	2	1	2
		C	Co-op.	Co-op.	Co-ord.	T
		O	Co-ord.	Co-ord.	Co-ord.	Co-op.
e	Suppliers C	V	1	1	1	1
		R	1	1	1	1
		C	T	T	T	T
		O	T	T	Co-op.	T

Stakeholder			D.G.	P.D.	O.F.	P.S.
A	Average customer	V	3	2	1	3
		R	2	1	1	3
		C	Co-ord	Co-op	T	Coll.
		O	Co-ord	Co-op	T	Coll.
B	Specific Technology Centre (EDM)	V	1	3	2	3
		R	1	3	1	2
		C	T	V.I.	T	Co-op
		O	T	V.I	Co-op	Coll.
C	General Technology Centres	V	1	2	1	1
		R	1	1	1	1
		C	T	Co-op	T	T
		O	T	Co-op	Co-op	T
D	Sales Delegations	V	3	2	1	3
		R	3	1	1	3
		C	V.I.	T	T	V.I.
		O	V.I.	Co-op	T	V.I.

Figure 7.21 shows the value and risk that ONA perceives from the key suppliers at the operate process level. Analysing the chart, it can be seen that order fulfilment process gets averagely the highest value and risk scores.

On the other hand, both product development and demand generation involve medium value and risk, whereas product support is distributed between the highest and lowest scores of the chart.

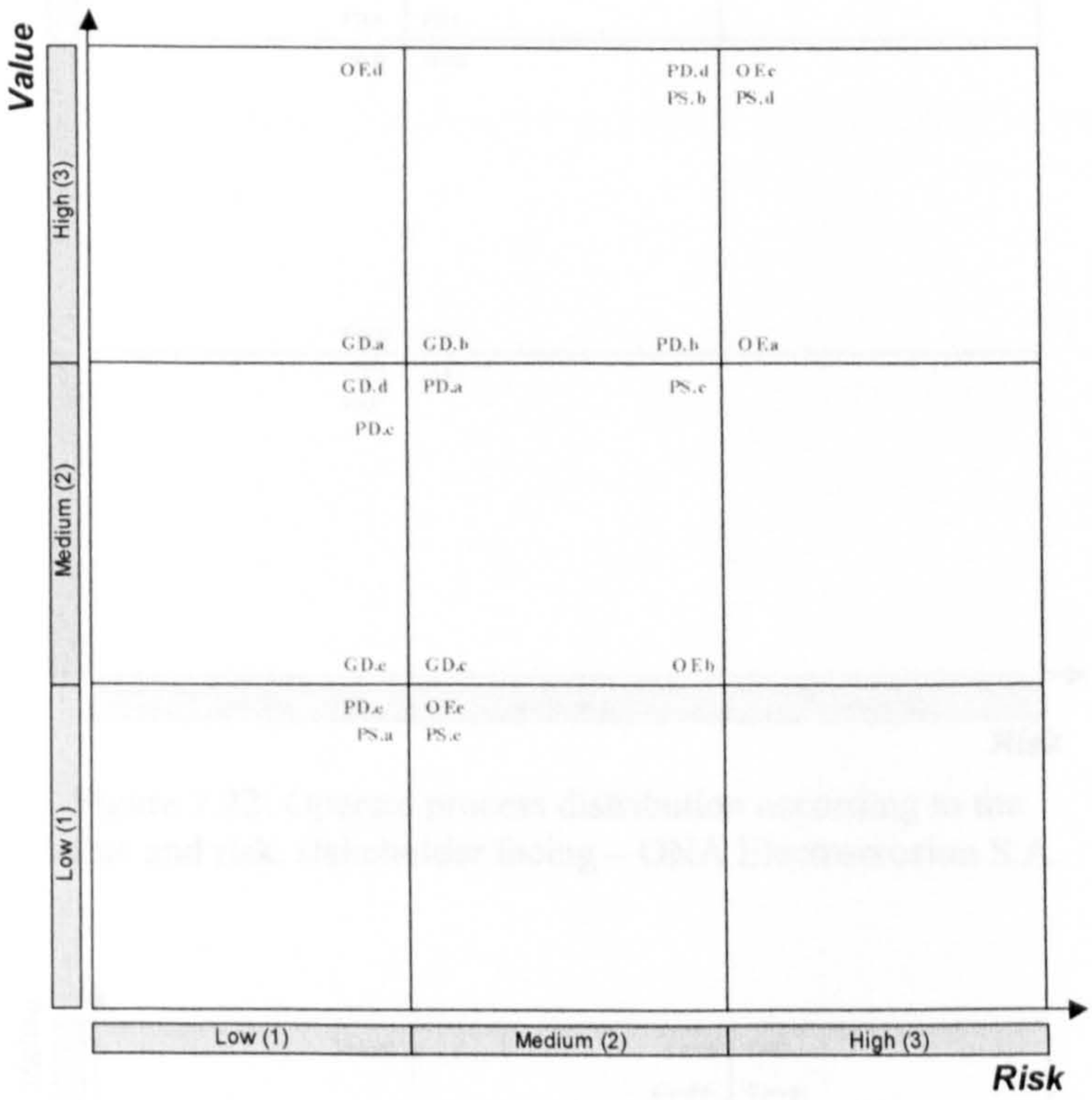


Figure 7.21: Operate process distribution according to the value and risk, supplier facing – ONA Electroerosion S.A.

Analysing the information of figure 7.22 concerning the value and risk perceived from the relationships with the key stakeholders, product support process is highlighted. It was stated during the visits to the organisation that after sales service plays a key role in the organisation, consequently both value and risk are high.

Another important detail is the low influence of stakeholders over order fulfilment process. Averagely the value and risk associated to this process are low.

Figure 7.23 represents the distribution of the desirable relationships for all these processes from the perspective of suppliers. Transactional relationship is considered for the relationships that involve low value and risk, whereas the opposite can be stated with collaboration.

On the other hand, both co-operation and co-ordination are supposed to be more efficient when the value and risk are medium/high.

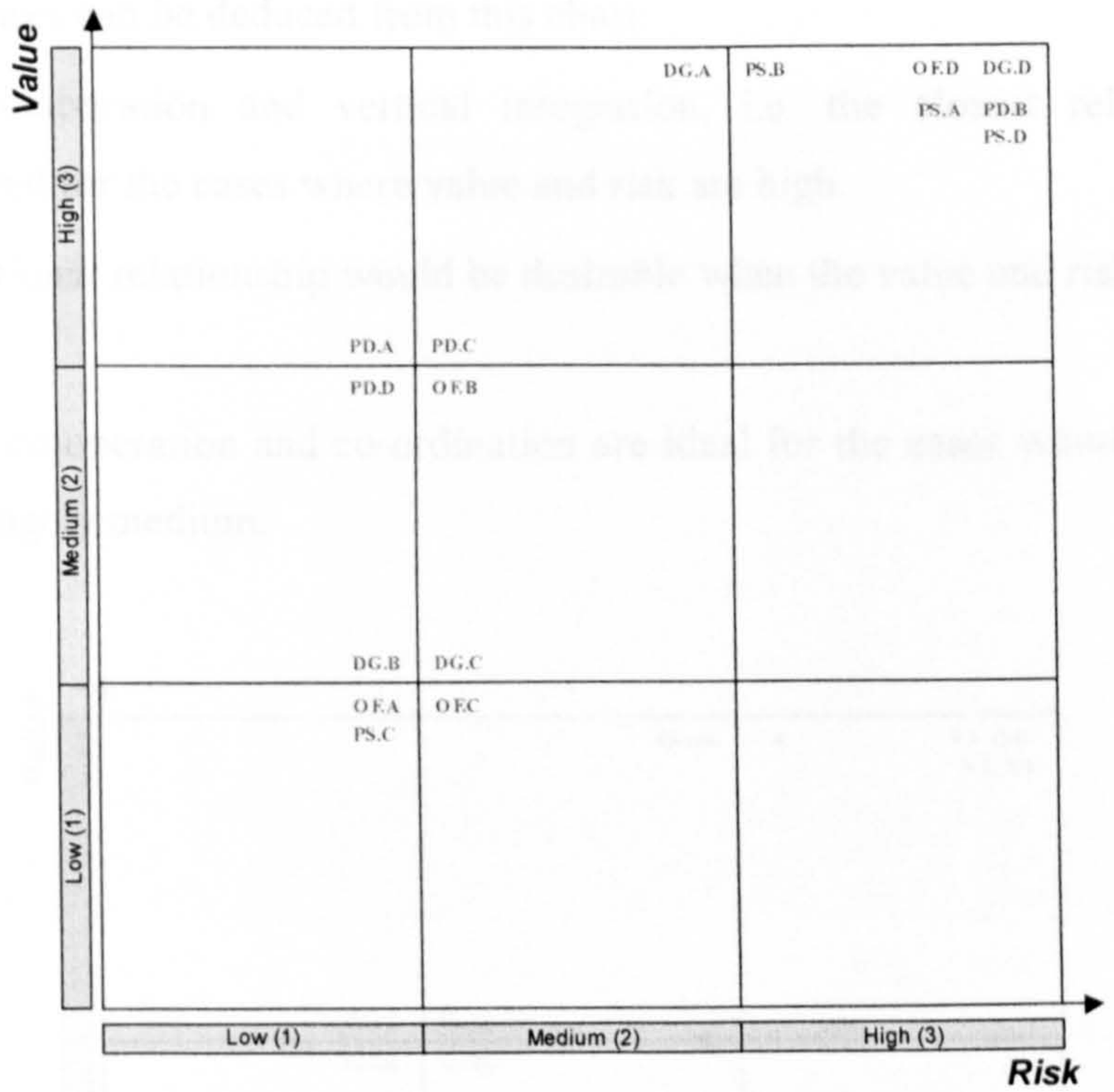


Figure 7.22: Operate process distribution according to the value and risk, stakeholder facing – ONA Electroerosion S.A.

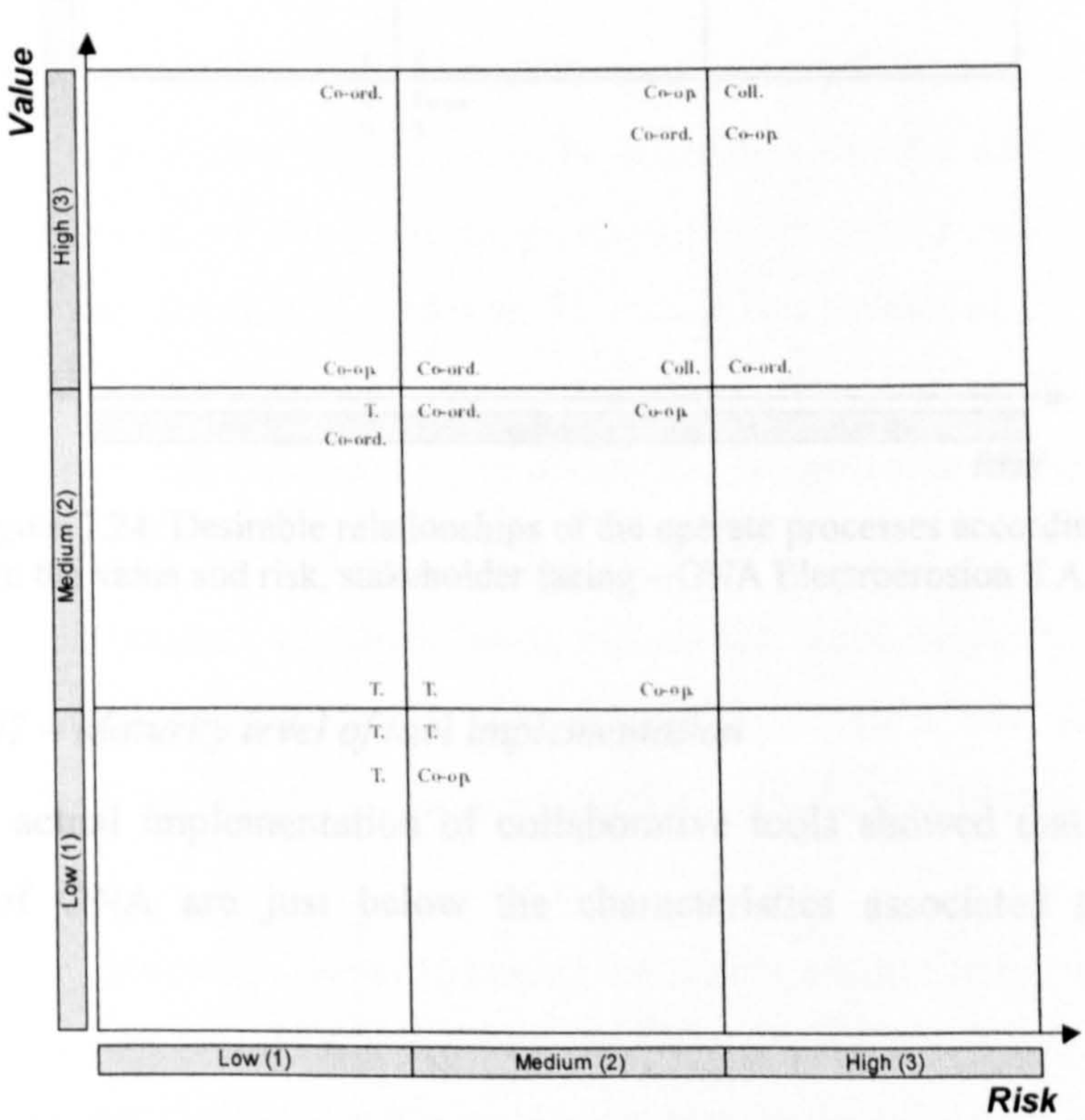


Figure 7.23: Desirable relationships of the operate processes according to the value and risk, supplier facing – ONA Electroerosion S.A.

Analysis of figure 7.24 leads the author to state the same pattern of desirable relationships as described in the previous figure. This value/risk chart shows the desirable relationships for the operate processes of ONA from the perspective of stakeholders.

Three main features can be deduced from this chart:

- Both collaboration and vertical integration, i.e. the closest relationships, are considered for the cases where value and risk are high.
- Transactional relationship would be desirable when the value and risk associated are low.
- Finally, co-operation and co-ordination are ideal for the cases where value and risk are averagely medium.

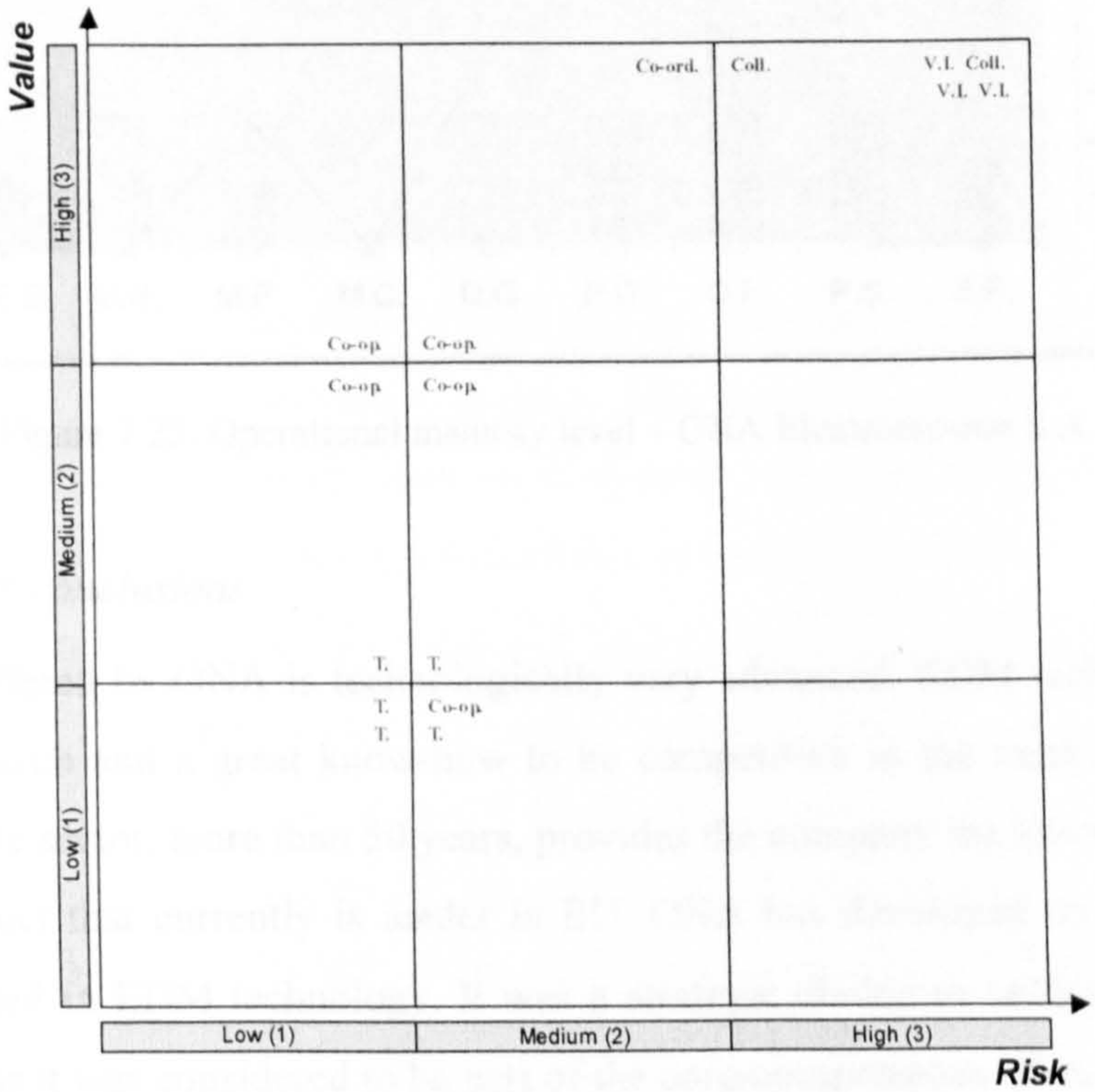


Figure 7.24: Desirable relationships of the operate processes according to the value and risk, stakeholder facing – ONA Electroerosion S.A.

d) *Sub-model #2 – Maturity level of tool implementation*

Analysis of the actual implementation of collaborative tools showed that the operational characteristics of ONA are just below the characteristics associated to co-ordination relationship.

Three business processes do not have any tool or system that relate them with other external organisations, two of them are management processes and the third one is demand generation operation process.

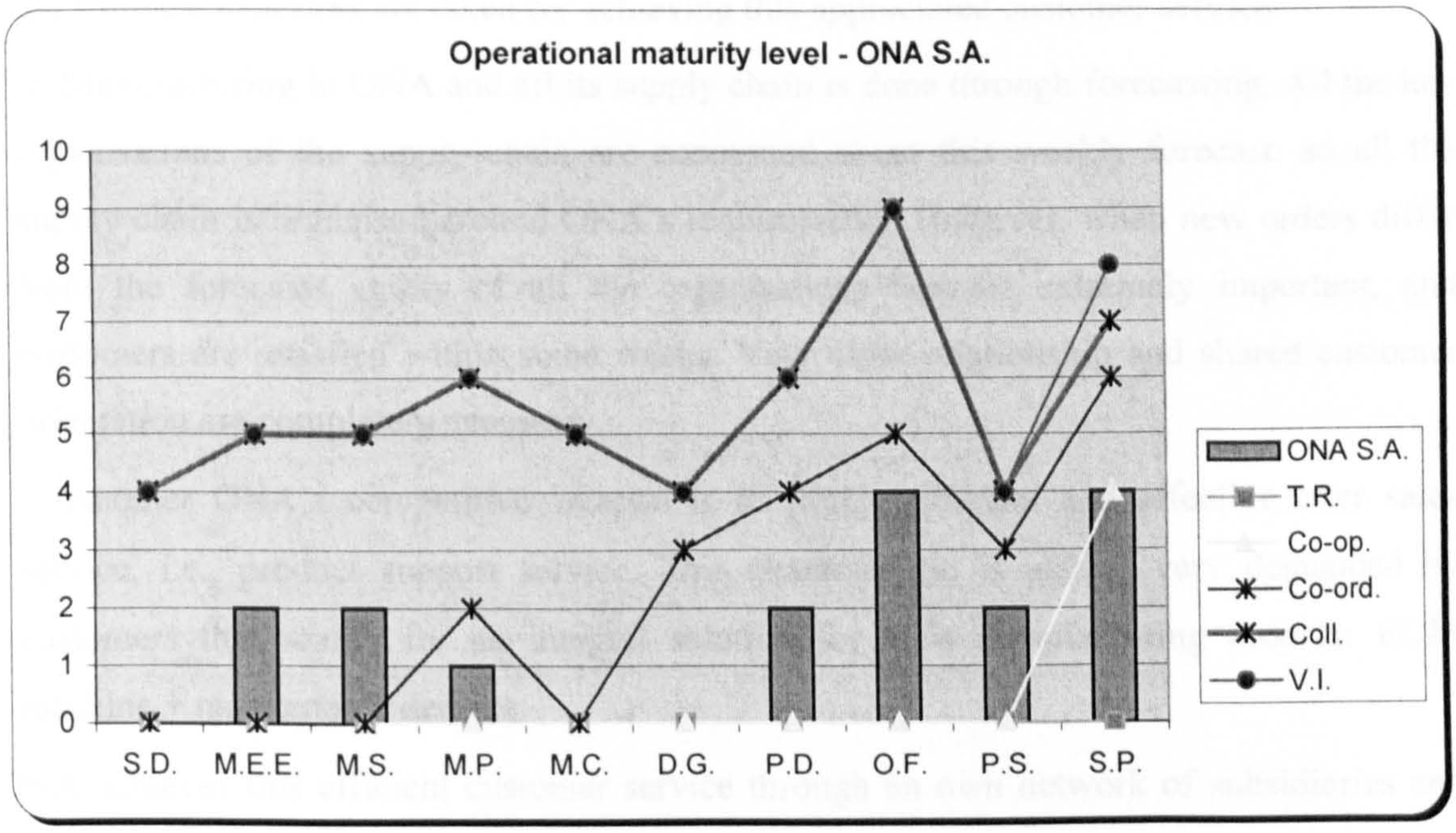


Figure 7.25: Operational maturity level – ONA Electroerosion S.A.

e) *Comments & conclusions*

The **product** offered by ONA is technologically very advanced. EDM technology requires continuum research and a great know-how to be competitive in the market. The extended experience in the sector, more than 50 years, provides the company the knowledge necessary to offer a product that currently is leader in EU. ONA has developed its own technology centre specialised in EDM technology. It was a strategic choice to vertically integrate the R&D process, as it was considered to be part of the core-competences of the organisation.

EDM machines produced by ONA are standard, so price is usually an important driver for the acquisition of the product. However, being the product technologically highly complex, technical features of the product play an essential role. This type of machine tool is a long-term investment for an organisation, as a consequence technological characteristics are often more valued.

High technology requirement is translated along the supply chain. Quality and reliability are the most critical factors for ONA's key suppliers. ONA's relational policy is focused on close relationships with the key suppliers: co-ordination among them is common, and some characteristics of collaboration are also fulfilled.

Asian competition is becoming higher day after day. Low manufacturing costs in these countries are forcing ONA and similar organisations to offer a more value added product rather than economic. **Efficient and agile customer respond** is being a critical competitive advantage to become an order winner organisation.

Two strategic measures are taken for achieving this appreciated customer service:

- Manufacturing in ONA and all its supply chain is done through forecasting. All the key organisations of the supply chain are concerned about this weekly forecast, so all the supply chain is organised around ONA's requirements. However, when new orders differ from the forecasts agility of all the organisations become extremely important, and customers are satisfied within some weeks. Very close relationship and shared customer orientation are completely necessary.
- Another ONA's competitive weapon is its highly efficient and effective after sales service, i.e., product support service. This characteristic is getting very demanded by customers that search for an integral solution for their manufacturing process: EDM machine + maintenance service.

ONA achieves this efficient customer service through an own network of subsidiaries and distributors located in the 5 continents. Relationships within this network are essential, as distributors from all over the world have to be directly linked to ONA's R&D. Customers demanding any service or spare are approached in a couple of days time.

Agility in the supply chain is achieved through close co-ordination and collaboration within the key suppliers. Long-term relationship with them (some of them around 20 years), trust and full flow of real information are some of the magnitudes that make this supply chain agile. ONA considers that agility of its supply chain makes them competitive, as a consequence they make continuum effort to keep very good relationships with all the companies.

ONA can be considered to be pioneer in close inter-organisational relationships. 20 years ago ONA made the strategic decision of externalising the activities that were not part of its core-competences. Therefore, ONA decided not just to outsource these activities, but to collaborate (also invest) with key suppliers. As a result, core-competences were much more developed and the whole organisation was focused on them. Establishing a collaborative relationship with its key suppliers also provided agility to respond effectively to customers.

ONA Electro-erosion S.A. – EUSKO S.A.: An example of collaboration

Relationship between ONA and EUSKO was established more than two decades ago. When ONA decided to focus on its core-competences, R&D of EDM equipment, final assembly process, and after-sale service, all the machining activities and initial assembly was outsourced.

At this time EUSKO was recently created (ONA invested in its creation) and it was gaining considerable expertise in general machining processes, so all the machining and initial assembly activities were assigned to EUSKO.

The outsourcing relationship went a step further and other collaboration characteristics started being fulfilled:

- ONA's customised products (engineer to order EDM products ordered to ONA) were completely manufactured and expedited to the final customer by EUSKO.
- Continuum improvement tasks in EUSKO are carried out by ONA's engineers.
- EUSKO's technicians often provide direct after-sale service to the final product when it is required a solution where EUSKO is involved.
- Joint planning and forecasting is carried out weekly.
- Both companies are linked via an extranet. ONA's orders and other requirements can be displayed on real time.
- Concurrent engineering tasks are common practice. EUSKO collaborates in ONA's product development process prototyping new products.

. Medium-term efforts are going to be addressed to reinforce the relationship. However, a new threat is arising for this collaboration: Asian competition. EUSKO's and ONA's manufacturing costs are high comparing to manufacturing companies in Asia. New strategic decision could be orientated to take advantage of these low costs of Asian companies. Moreover, ONA already started assembling its most standard and basic model in China.

However, EUSKO offers to ONA some advantages that make this collaboration strong and endurable:

- Same industrial culture.
- Close location (12 miles).
- High experience and know-how in machining processes.
- High manufacturing agility.

Uncertainty and new threats in this highly competitive sector make the future unknown for ONA and other similar organisations. It is extremely difficult, almost impossible, to be competitive in low costs, as a consequence European organisations like ONA have to pursue alternative value adding features.

In this particular case, this study clearly showed that an efficient and effective customer service could be a valid order winner criterion, based on high technology. ONA achieves this feature through an agile supply chain, maintaining very close relationships with its key suppliers. Very long-term relationships based on trust, commitment and joint-benefit are the essential ingredients for this.

7.3.2.4. Metagra S.A. analysis

The fourth case study was carried out in Metagra S.A. As described in previous sections, this organisation manufactures cold-stamped fixing elements for the automotive sector. The next sections will deal with the analysis of the data gathered during the visits to the organisation.

a) *Relationship type identification and categorisation*

It was found during the case study that two of the relationship levels proposed by this study were not implemented at the organisation. Both co-operation and collaboration were not common practices for the organisation, mainly due to the characteristics of the suppliers and customers.

Table 7.12: Implementation and ranking of relationship levels – Metagra S.A.

Relationship level	Implementation	Ranking
Transactional Relationship	Yes	1
Co-operation	Yes	2
Co-ordination	No	-----
Collaboration	No	-----
Vertical Integration	Yes	3

Table 7.12 shows current relationship types held by Metagra and their ranking according to the frequency of implementation. Note that transactional relationship is the most spread relationship, while vertical integration the most uncommon.

b) *Sub-model #1 – Complexity/Uncertainty approach*

Analysis of the impact of the critical factors highlighted that there are two key factors that jeopardise close relationships: Performance ambiguity and behaviour of suppliers and customers.

It was stated in the semi-structured interviews carried out in Metagra that this organisation type is known as *'sandwich organisation'* due to the large size and power of both suppliers and customers. This nature of the supply chain makes highly difficult to have any information about the performance of suppliers and customers.

This issue and the aggressive behaviour of suppliers and customers make very difficult to develop collaborative relationships with them. Both complexity and uncertainty of Metagra are considerable, and equilibrium between them is high.

Table 7.13: Scores of the critical factors and the complexity/uncertainty values for each business process – Metagra S.A.

Critical Factor	Score		
Degree of routinisation of the buying problem	30	**COMPLEXITY**	**46,1**
Resources	40		
Transaction Costs	10		
Learning Potential	20		
Performance ambiguity	80		
Type of Product	65		
Product & Market Segment	66	**UNCERTAINTY**	**47,1**
*Value Proposition**	60		
General Economic factors	40		
*Location (Physical, Logical)**	10		
Manufacturing Strategy	60		
Behaviour and relationship of other Org.	100		

Complexity/Uncertainty per business process									
1-S.D.	**2-M.E.E.**	**3-M.S.**	**4-M.P.**	**5-M.C.**	**6-D.G.**	**7-P.D.**	**8-O.F.**	**9-P.S.**	**10-S.P.**
56/57,7	56/57,7	56/57,7	45,7/47	56/57,7	57,3/58,7	56,8/55,1	52,1/55,1	56,8/55,1	46/48

Table 7.13 shows the scores of the critical factors of Metagra and the general complexity and uncertainty values of the organisation. The particular complexity and uncertainty values for each business process can also be seen in this table.

The high scores of these two dimensions in all the business processes are reflected in figure 7.26. The complexity/uncertainty diagram shows that requirement of close relationships of business processes would be high.

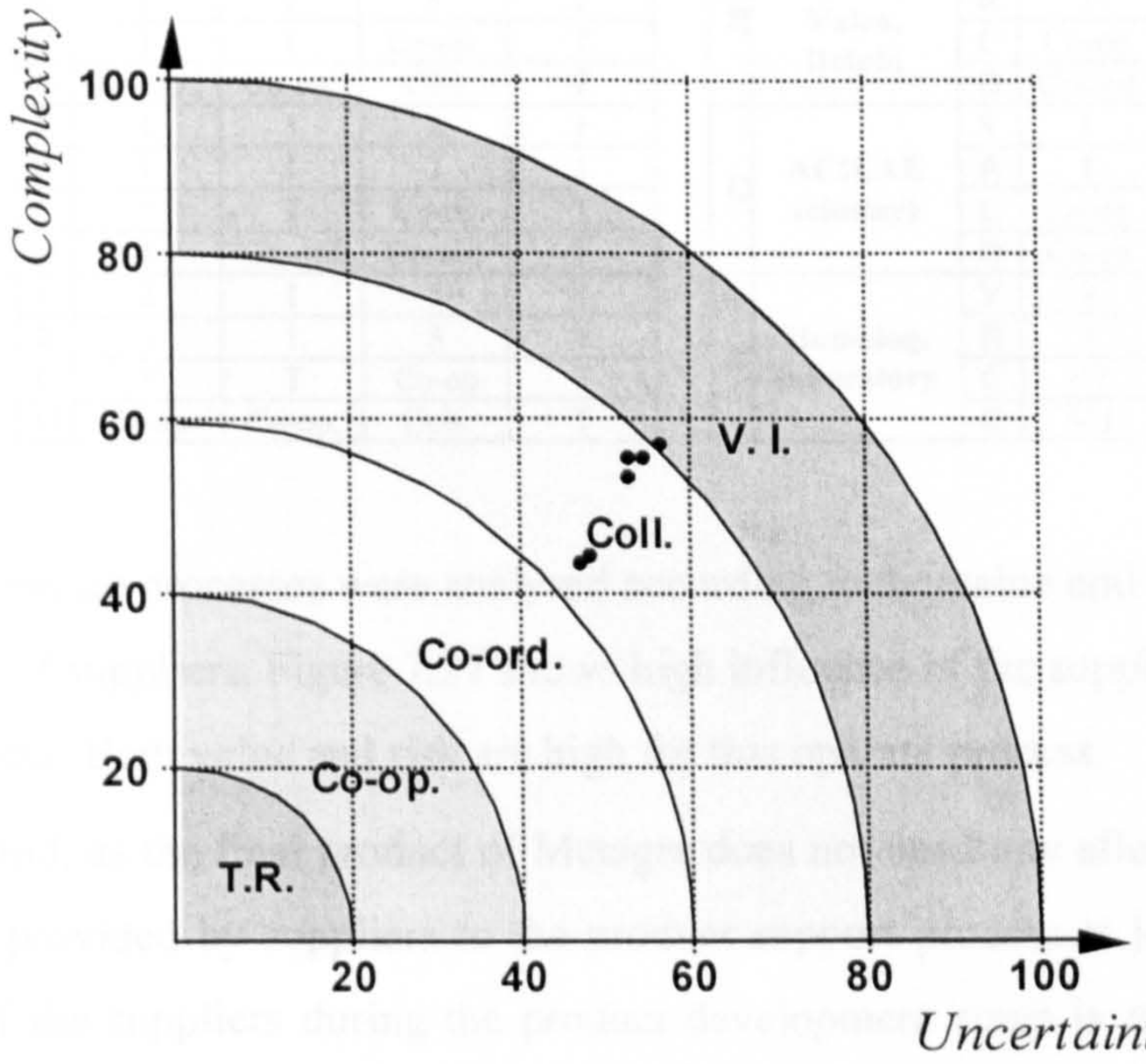


Figure 7.26: Representation of Complexity/Uncertainty values – Metagra S.A.

Note that the nearer the small *'dots'* are located from the right-top corner of the chart, the higher will be the necessity for developing collaborative relationships.

c) *Sub-model #1 – Value/Risk approach*

Relationship between Metagra and four key suppliers and four stakeholders was analysed in this case study in order to test the value/risk approach of sub-model #1. Table 7.14 collects the responses of the questionnaire concerning the value and risk perceived from both the suppliers and stakeholders at operate process level.

Value and the risk associated to the processes and the desirable relationships according to the interviewees were graphically represented through the value/risk diagram.

Table 7.14: Value and risk for each key supplier/stakeholder and their current desirable relationships – Metagra S.A.

Supplier			D.G.	P.D.	O.F.	P.S.
a	Steel Supplier	V	1	1	3	1
		R	1	1	3	1
		C	T	T	Co-op.	T
		O	T	Co-op.	Co-ord.	T
b	Coating Supplier	V	2	1	3	1
		R	1	1	3	1
		C	T	T	Co-op.	T
		O	Co-op.	Co-op.	Coll	T
c	Mold Supplier	V	1	3	2	1
		R	1	1	2	1
		C	T	T	Co-op	T
		O	T	Co-ord	Co-ord	T
d	Tempering supplier	V	2	1	3	1
		R	1	1	3	1
		C	T	T	Co-op	T
		O	Co-op.	Co-op.	Coll.	T

Stakeholder			D.G.	P.D.	O.F.	P.S.
A	Renault, PSA, Mercedes	V	3	3	2	1
		R	3	3	1	1
		C	Co-op	Co-op	Co-op	T
		O	Co-ord	Coll.	Co-op	T
B	Bosch, Valeo, Delphi	V	3	3	2	1
		R	3	3	1	1
		C	Co-op	Co-op	Co-op	T
		O	Co-ord	Coll.	Co-op	T
C	ACICAE (cluster)	V	1	1	1	1
		R	1	1	1	1
		C	Co-op	T	T	T
		O	Co-op	T	T	T
D	Homolog. laboratory	V	3	3	3	1
		R	1	3	3	1
		C	V.I.	V.I.	V.I	T
		O	V.I	V.I	V.I	T

First, the four operate processes were analysed according to the value and risk involved from the perspective of suppliers. Figure 7.27 shows high influence of the suppliers over the order fulfilment process. Both value and risk are high for this operate process.

On the other hand, as the final product of Metagra does not need any after sales service, the risk and value provided by suppliers to the product support process is low. The minimum participation of the suppliers during the product development stage is reflected in the low value and risk perceived by Metagra at product development process.

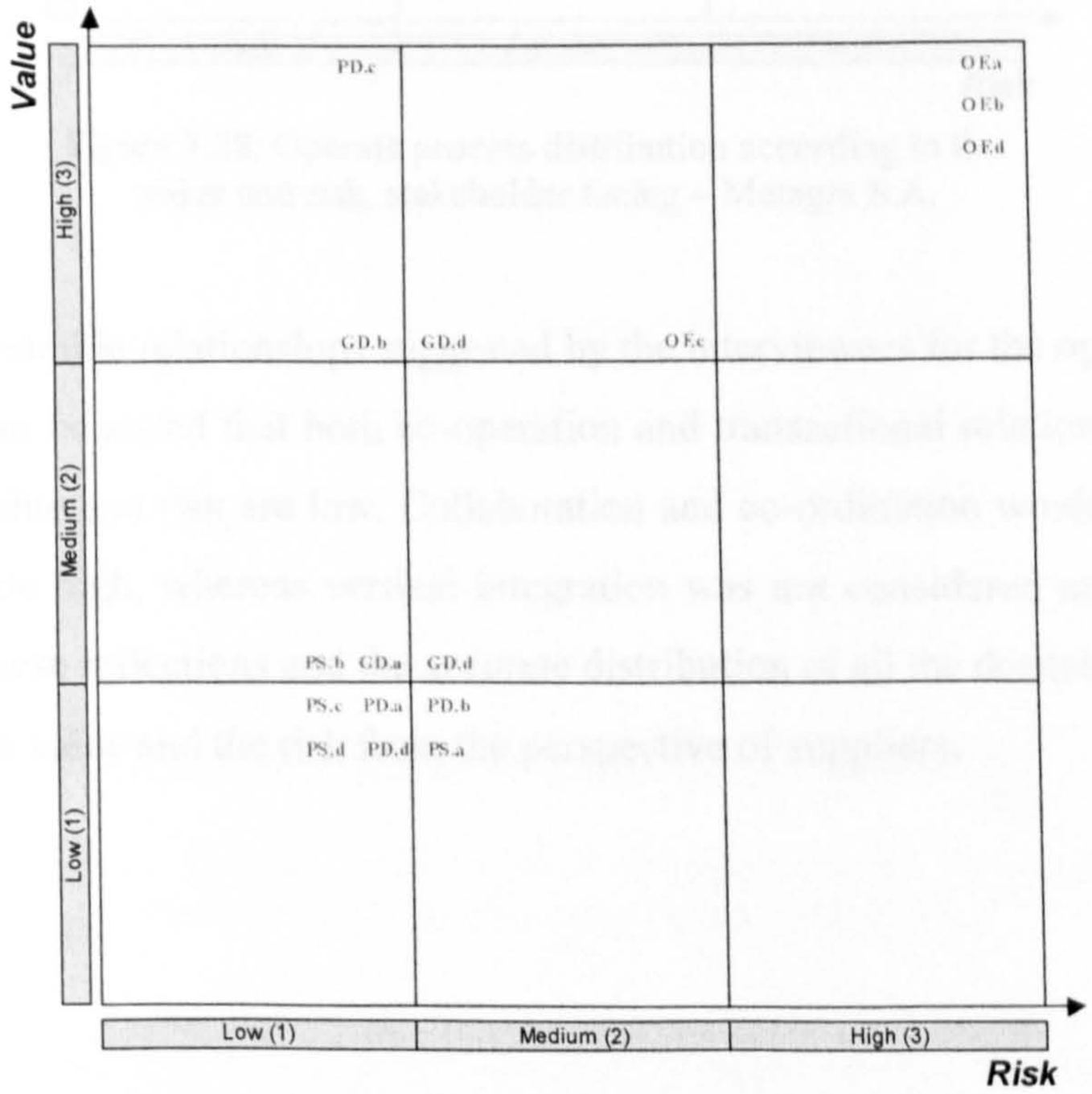


Figure 7.27: Operate process distribution according to the value and risk, supplier facing – Metagra S.A.

The same analysis done from the perspective of the stakeholders showed that the customers play a key role in the product development process. The value and the risk perceived from the customers are high at this process.

Figure 7.28 also shows the same effect that was stated in the previous figure. The value and risk associated to the support process is minimum. On the other hand, order fulfilment process is located midway between the highest and lowest positions of the diagram.

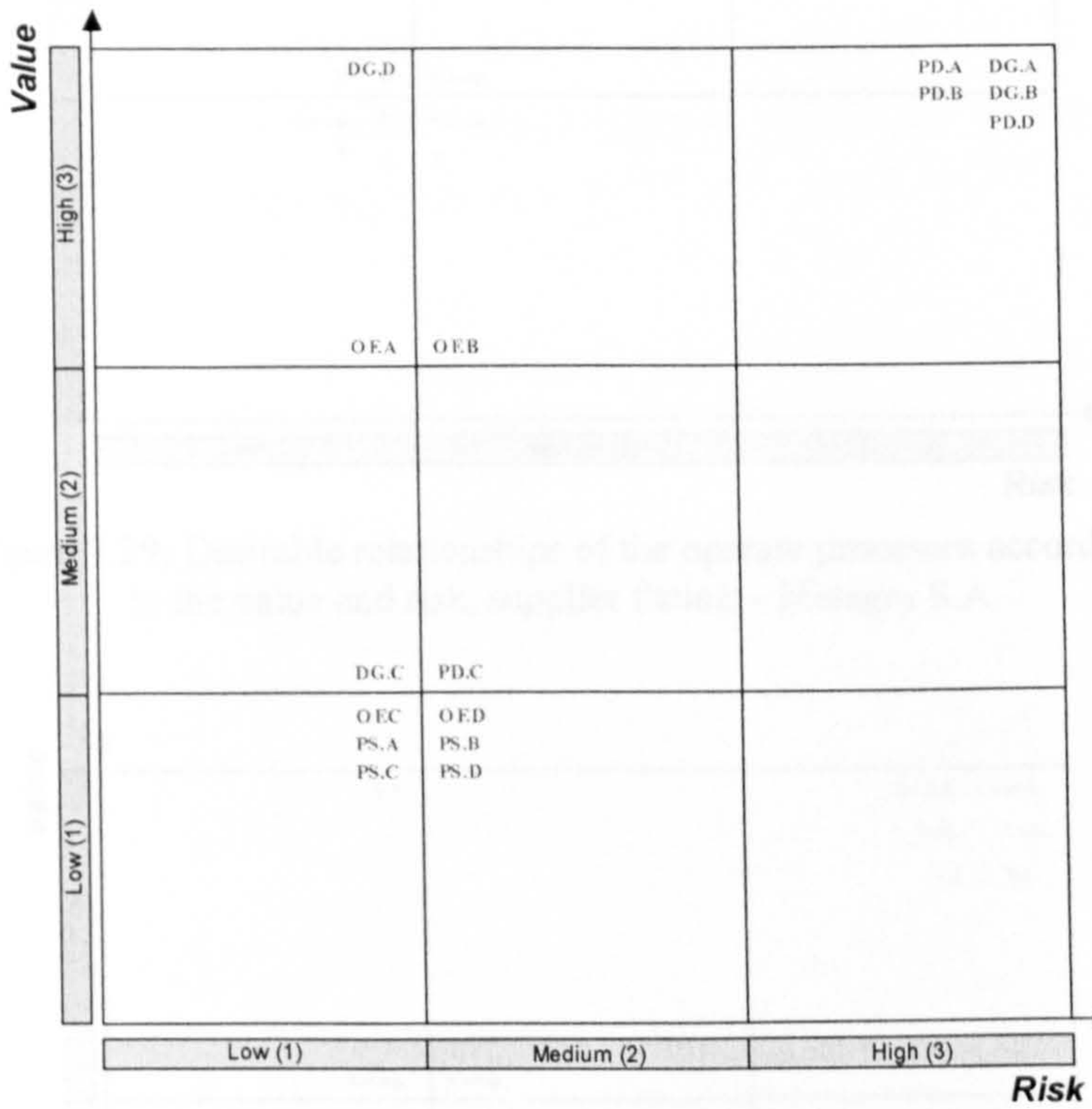


Figure 7.28: Operate process distribution according to the value and risk, stakeholder facing – Metagra S.A.

Analysing the desirable relationships suggested by the interviewees for the operate processes of Metagra, it can be stated that both co-operation and transactional relationships would be suitable when value and risk are low. Collaboration and co-ordination would be ideal when value and risk are high, whereas vertical integration was not considered necessary. Figure 7.29 shows all these reflections and the accurate distribution of all the desirable relationships depending on the value and the risk from the perspective of suppliers.

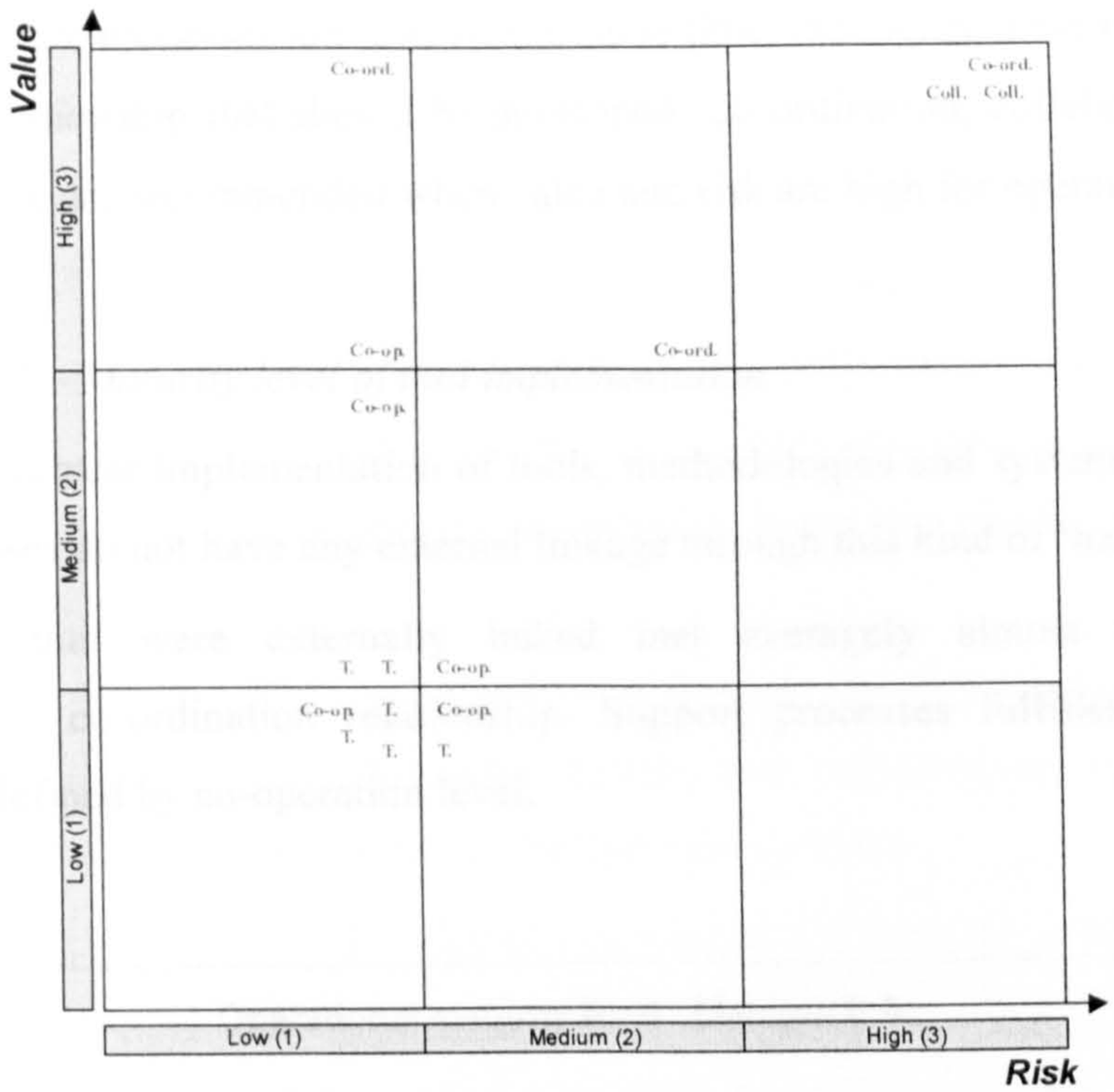


Figure 7.29: Desirable relationships of the operate processes according to the value and risk, supplier facing – Metagra S.A.

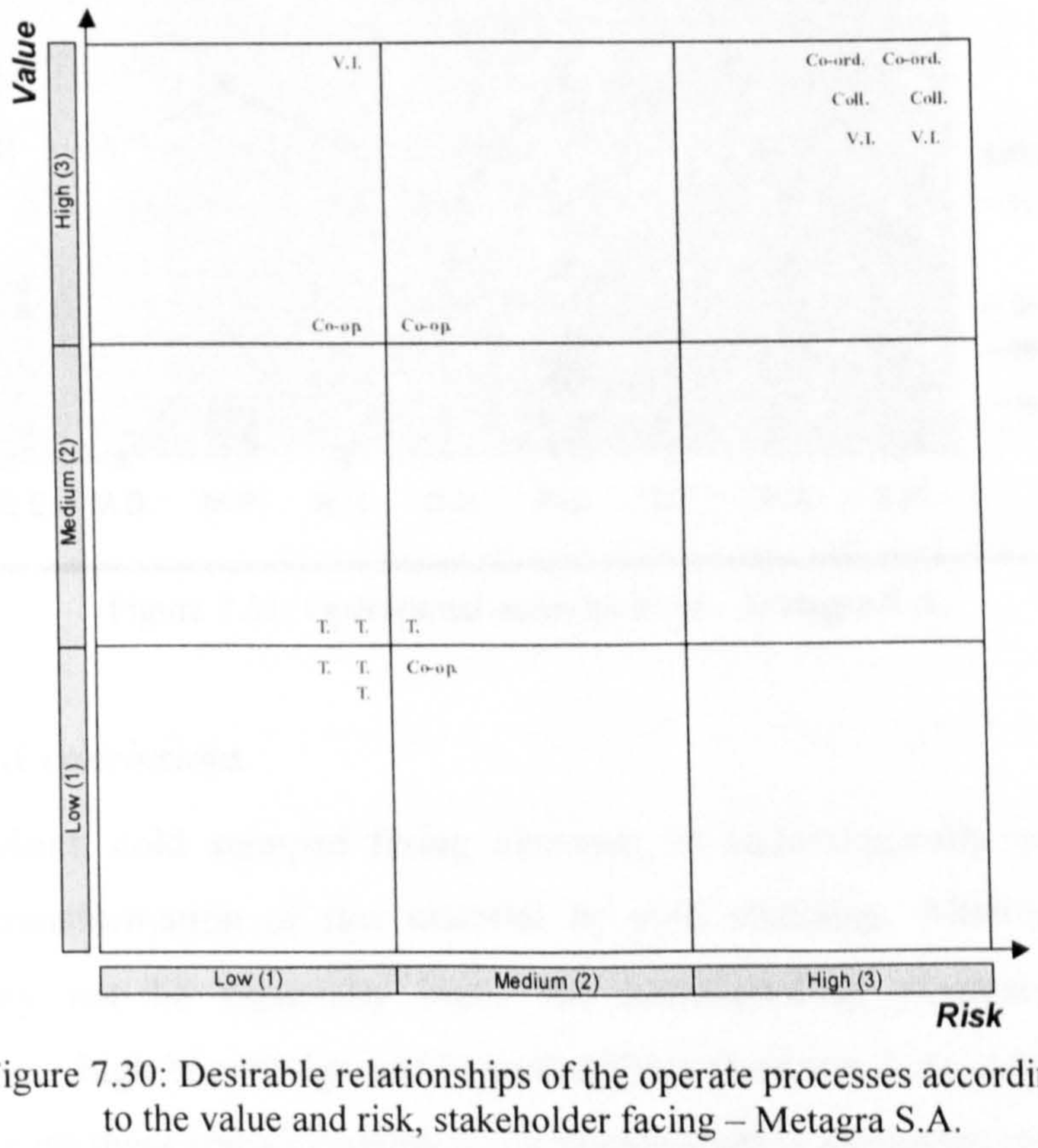


Figure 7.30: Desirable relationships of the operate processes according to the value and risk, stakeholder facing – Metagra S.A.

Doing the same with the desirable relationships between the stakeholders and Metagra, figure 7.30 suggests developing transactional relationships when the value and risk

associated to operate processes are low. At the same time, the higher these two dimensions, the closer the relationship that should be developed. Co-ordination, collaboration and also vertical integration are recommended when value and risk are high for operate processes.

d) *Sub-model #2 – Maturity level of tool implementation*

Analysis of the current implementation of tools, methodologies and systems showed that 5 out of 10 processes do not have any external linkage through this kind of 'hard' systems.

The processes that were externally linked met averagely almost the operational characteristics of co-ordination relationship. Support processes fulfilled the minimum characteristics defined by co-operation level.

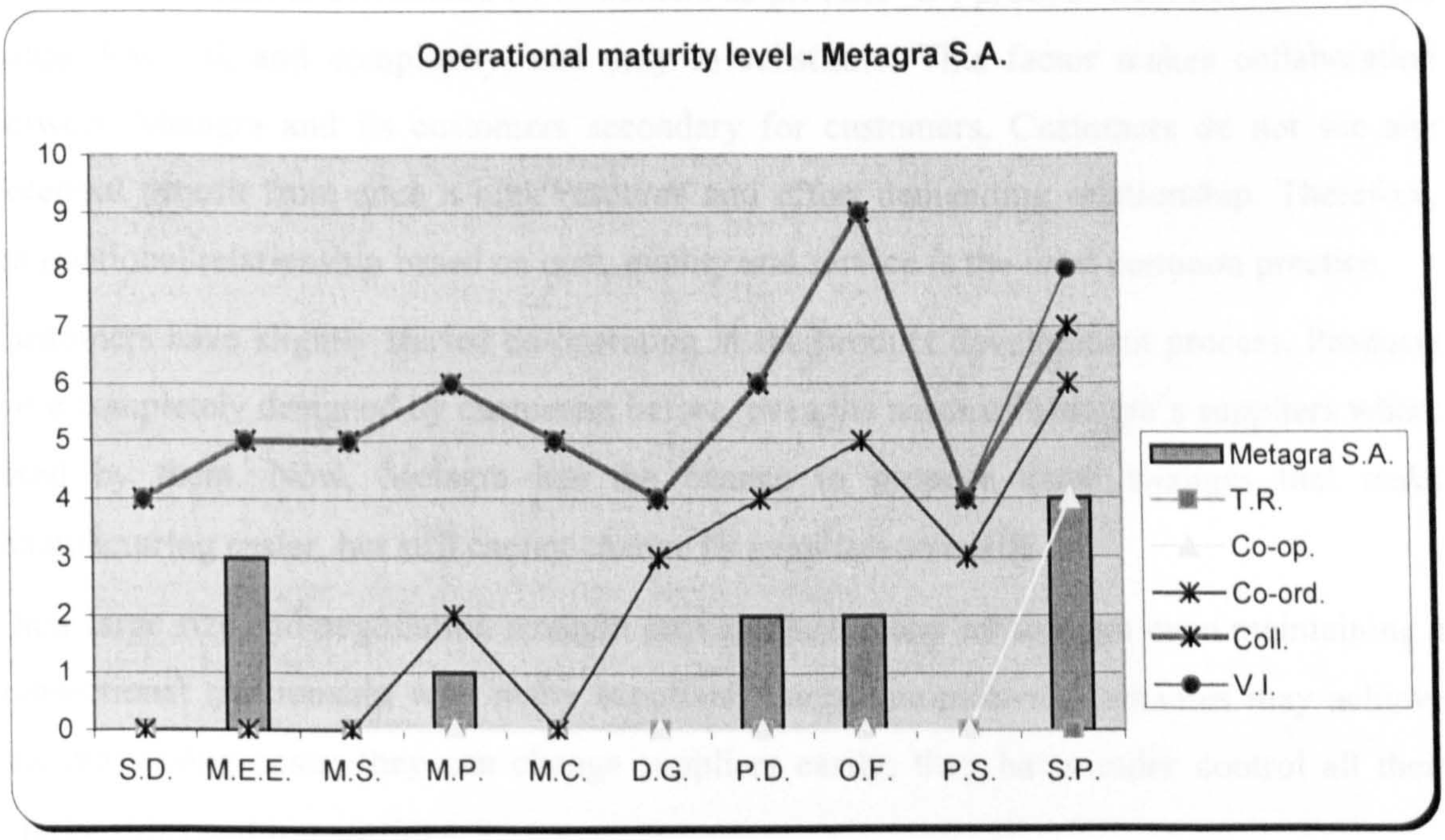


Figure 7.31: Operational maturity level – Metagra S.A.

e) *Comments & conclusions*

Metagra's **product**, cold stamped fixing elements, is technologically very simple; it is basically the transformation of raw material by cold stamping. Although technological complexity may not be especially high, the manufacturing processes necessary for production require high knowledge and expertise. Only the know-how gained through many years working with these transformation technologies enables maximum product quality and new product development capability.

Being technologically of low complexity, just other two technologies are required apart from cold stamping: Tempering and coating processes. While cold stamping is Metagra's core-competence, these two processes are outsourced.

Customers' behaviour and requirements are of special importance in Metagra's daily performance. Metagra is currently working for the automotive sector (Tier 1 and 2), all its customers are the European most powerful automotive companies such as Renault, PSA and Mercedes-Benz. Components suppliers for automotive sector like Bosch, Valeo or Delphi are other Metagra's customers.

Negotiation power and strength of these customers is extremely high, and also their quality, cost and service requirements. They have annual cost reduction policies, and quality requirements are exceptional, measured in ppm (part per million).

Metagra's product is considered by customers as product 'C', product with not much added value, low risk and complexity, and easy to substitute. This factor makes collaboration between Metagra and its customers secondary for customers. Customers do not see any potential benefit from such a high resource and effort demanding relationship. Therefore, transactional relationship based on cost, quality and service is the most common practice.

Customers have slightly started co-operating in the product development process. Products were completely designed by customers before, even the name of Metagra's suppliers where fixed by them. Now, Metagra has the chance to propose some changes that make manufacturing easier, but still cannot change its suppliers so easily.

Their large size and negotiation strength provide them many advantages even maintaining a transactional relationship with many suppliers: Large automotive companies may achieve low purchasing costs; they can change suppliers easily; they have under control all their relationships and transactions.

Suppliers' behaviour and relationship is not much better than customers'. There are 3 main suppliers: Steel bar supplier, tempering supplier and coating supplier. Relationship with all of them is mainly transactional, although there is some eventual co-operation in order fulfilment process.

There are two important factors that make these relationships transactional:

- Large size of steel companies and monopoly: Similar characteristics of Metagra's customers.
- Tempering and coating suppliers have to be close to Metagra, as these two technologies are key processes. As there are not too many suppliers available in a

short distance, Metagra is forced to deal with them. Under these circumstances, negotiation power and strength is on suppliers' hands.

Characteristics of products and customers suggest creating a lean supply chain, where leanness, i.e., lack of waste, on time deliveries or fulfilment of quality standards, is the key feature. For this purpose, all the key customers should be aligned towards the same objective and commitment should be a common feature.

Due to the behaviour and strength of Metagra's suppliers this leanness is just a desired aim, not achievable at the moment. More collaboration was defined as the desirable disposal for this supply chain in Metagra's managers' words. There is not too much hope about a new and better scenario.

7.3.2.5. BOST Machine Tool Co. S.L. analysis

Another machine tool company was contacted for carrying out the fifth case study, BOST Machine Tool Company S.L. High customisation of the product made BOST a very suitable organisation to study. Although BOST performs in ONA's same sector, this case will highlight different relational requirements of these two organisations due to the different characteristics of the final product.

a) *Relationship type identification and categorisation*

The semi-structured interviews and the second section of the questionnaire concluded that vertical integration was the only relationship that was not implemented by the organisation. Transactional relationship, co-operation, co-ordination and collaboration were held between BOST and other external organisations.

Table 7.15: Implementation and ranking of relationship levels – BOST Machine Tool Co. S.L.

Relationship level	Implementation	Ranking
Transactional Relationship	Yes	1
Co-operation	Yes	2
Co-ordination	Yes	3
Collaboration	Yes	4
Vertical Integration	No	-----

Table 7.15 shows the classification of the relationships implemented by the organisation and the ranking depending on the frequency of implementation.

b) *Sub-model #1 – Complexity/Uncertainty approach*

Analysis of the complexity/uncertainty approach of sub-model #1 highlighted high influence over the organisational relationships of four critical factors: Type of product, resources, product and market segment, and the general economic factors.

Characteristics of the machine tool sector are reflected on the last two critical factors as it was described in the within-analysis of ONA. On the other hand, the full customisation of the final product by BOST according to the specific requirements of the customer dramatically increases both complexity and uncertainty of the organisation. The resources necessary to accomplish this type of customised projects generate high complexity and uncertainty as well.

Table 7.16: Scores of the critical factors and the complexity/uncertainty values for each business process – BOST Machine Tool Co. S.L.

Critical Factor	Score		
Degree of routinisation of the buying problem	20	**COMPLEXITY**	**51**
Resources	70		
Transaction Costs	10		
Learning Potential	60		
Performance ambiguity	30		
Type of Product	100		
Product & Market Segment	70	**UNCERTAINTY**	**55**
*Value Proposition**	60		
General Economic factors	70		
*Location (Physical, Logical)**	20		
Manufacturing Strategy	60		
Behaviour and relationship of other Org.	40		

Complexity/Uncertainty per business process									
1-S.D.	**2-M.E.E.**	**3-M.S.**	**4-M.P.**	**5-M.C.**	**6-D.G.**	**7-P.D.**	**8-O.F.**	**9-P.S.**	**10-S.P.**
53,3/60	53,3/60	53,3/60	48,7/53,7	53,3/60	60/65,7	52,2/60	48/60	52,2/60	50/58

Table 7.16 presents all the scores of the critical factors and the complexity/uncertainty values of both the organisation and the particular business processes. The reasons explained above increase the individual scores of business processes. It may be deduced that this organisation would need close relationships in its business processes due to high complexity and uncertainty. Figure 7.32 also supports this deduction as the small *'dots'* represented in the chart are located quite near of top right corner.

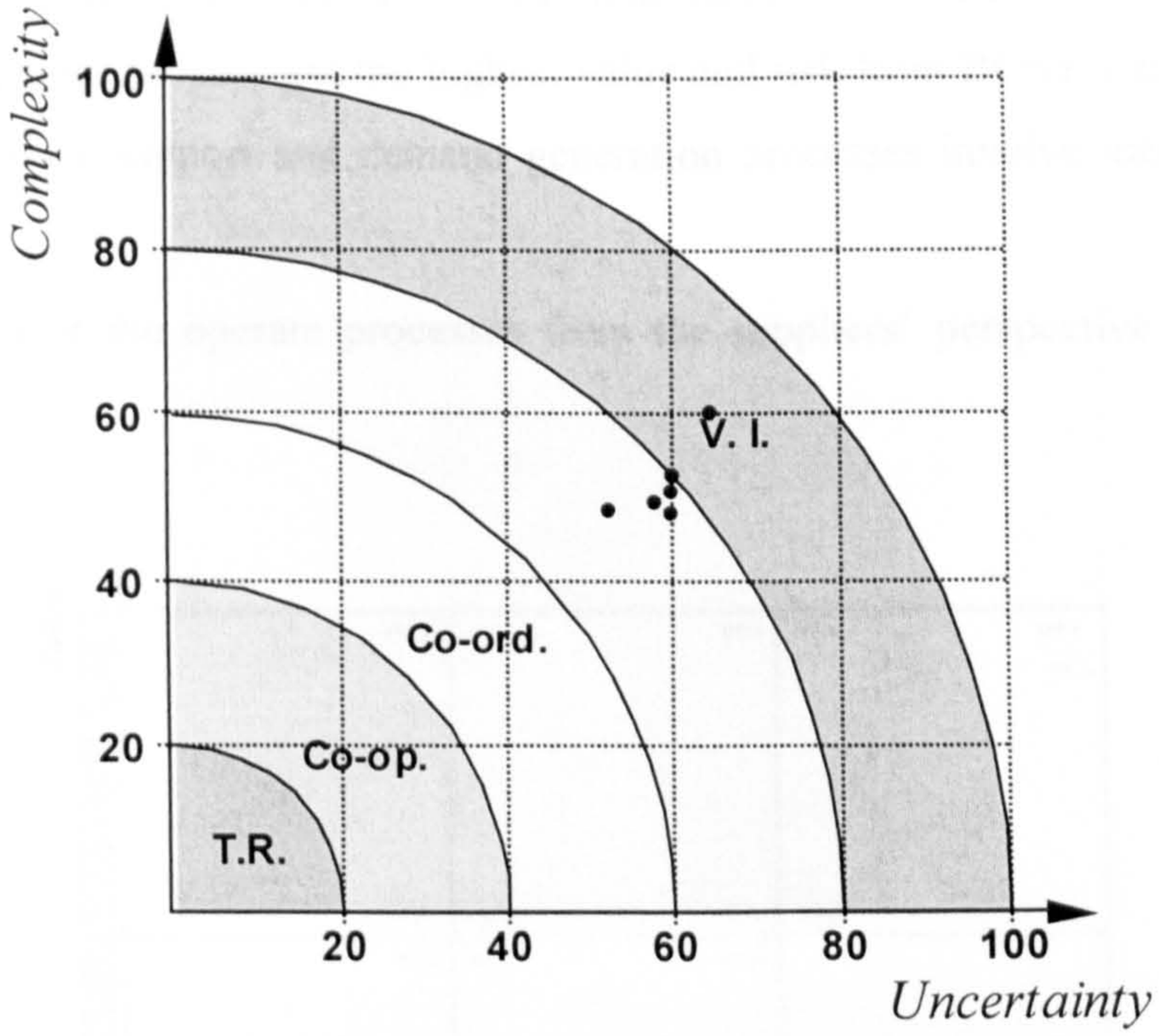


Figure 7.32: Representation of Complexity/Uncertainty values – BOST Machine Tool Co. S.L.

c) *Sub-model #1 – Value/Risk approach*

Relationships between BOST and five suppliers and one stakeholder was analysed in this section. An average customer was selected to study the behaviour of the stakeholders. However, the analysis of more stakeholders was not possible due to lack of data. Table 7.17 shows the value and risk associated to each operate process, and also the current and desirable relationships suggested.

Table 7.17: Value and risk for each key supplier/stakeholder and their current desirable relationships – BOST Machine Tool Co. S.L.

Supplier			D.G.	P.D.	O.F.	P.S.
a	Cast Supplier	V	2	3	3	1
		R	1	2	3	1
		C	T	Co-op.	Co-op.	T
		O	Co-op.	Coll.	Coll.	T
b	Supplier of electronic components	V	2	3	3	3
		R	1	1	2	3
		C	T	T	Co-op.	T
		O	Co-op.	Coll.	Co-ord.	Coll.
c	Machining supplier (Mainly Integrated)	V	1	2	2	1
		R	1	1	2	1
		C	T	Co-op.	Co-op.	T
		O	T	Co-op.	Co-ord.	T
d	Supplier of hydraulic components	V	1	2	2	2
		R	1	1	2	2
		C	T	T	Co-op.	T
		O	T	Co-op.	Co-ord.	Co-ord.
e	Suppliers C	V	1	1	1	1
		R	1	1	1	1
		C	T	T	T	T
		O	T	T	Co-op.	T

Stakeholder			D.G.	P.D.	O.F.	P.S.
A	Normal customer	V	3	3	2	3
		R	2	3	1	3
		C	Co-ord	Co-ord	Co-op	Coll.
		O	Co-ord	Coll.	Co-op	Coll.

Analysing the responses obtained, it can be concluded that both order fulfilment process and product development process get the highest value and risk from BOST's suppliers. On the other hand, product support and demand generation processes involve medium/low value and risk.

Full distribution of the operate processes from the suppliers' perspective can be seen in figure 7.33.

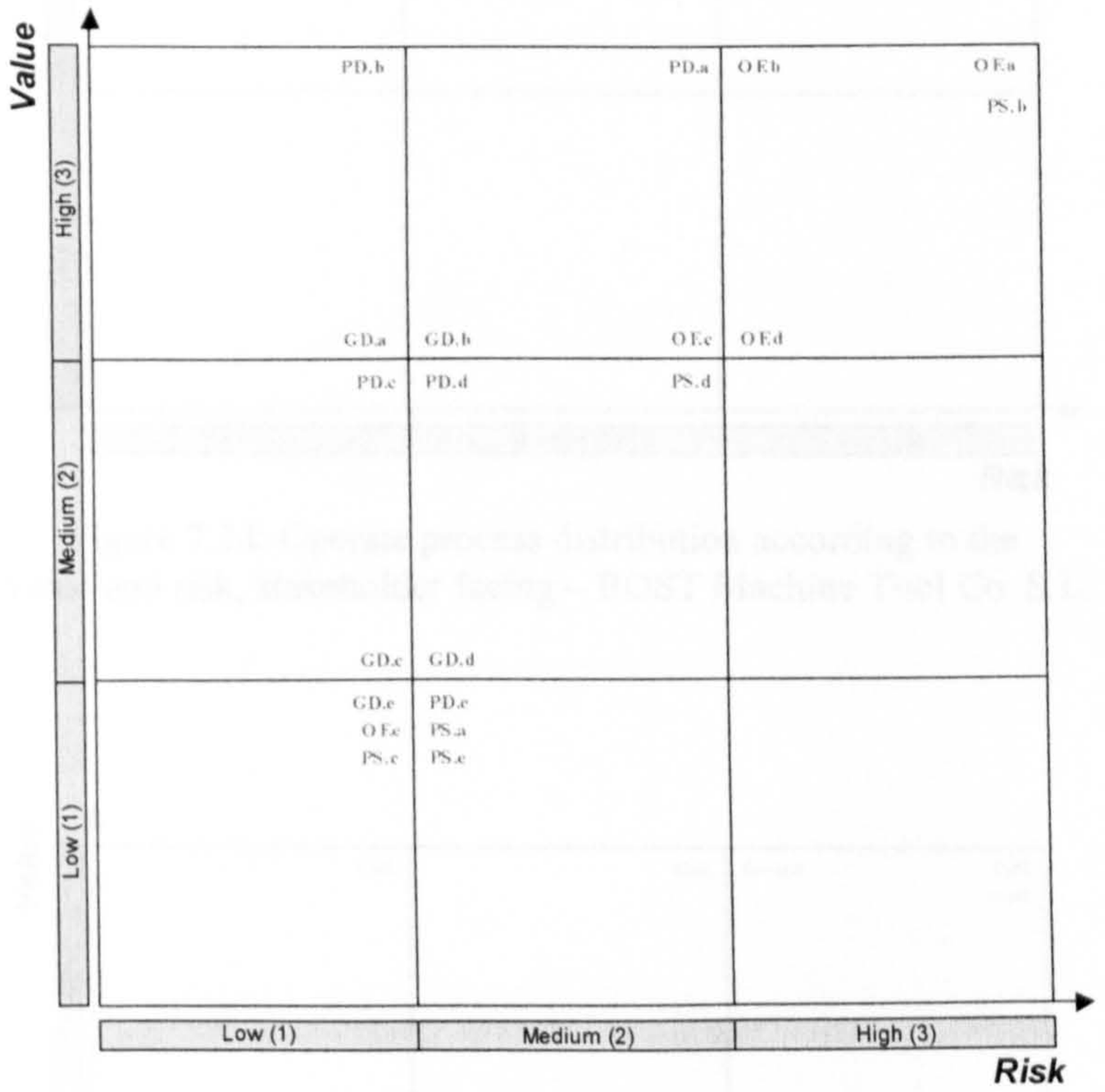


Figure 7.33: Operate process distribution according to the value and risk, supplier facing – BOST Machine Tool Co. S.L.

As only one stakeholder was analysed in this section, figure 7.34 shows the distribution of just four operate processes. However, it can be seen that the value and risk perceived from the customer are high at the product development and product support processes.

This fact is due to the high importance of the contribution of the customer during the product development stage and the after sales service. This last issue is very relevant for the organisation.

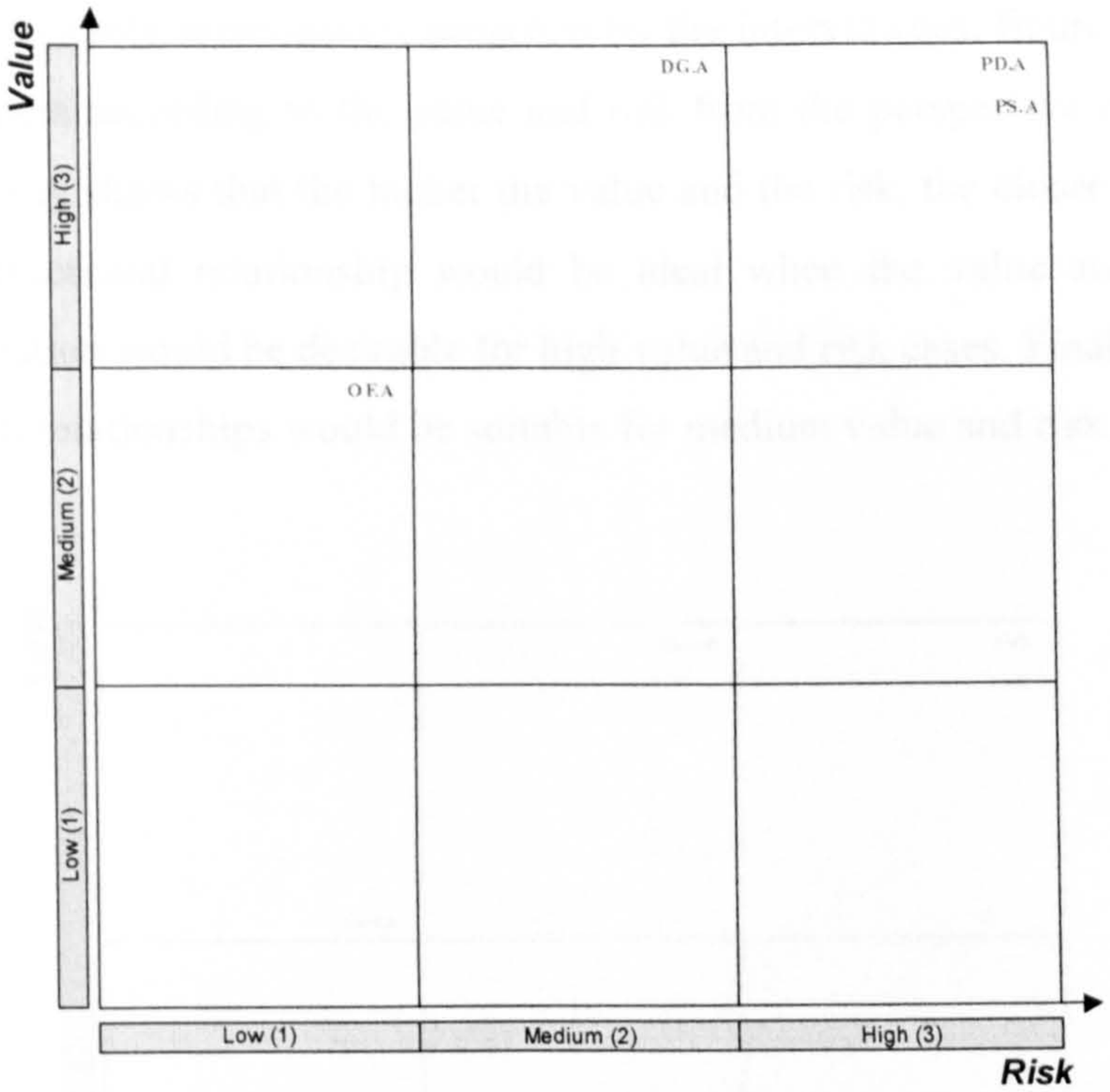


Figure 7.34: Operate process distribution according to the value and risk, stakeholder facing – BOST Machine Tool Co. S.L.

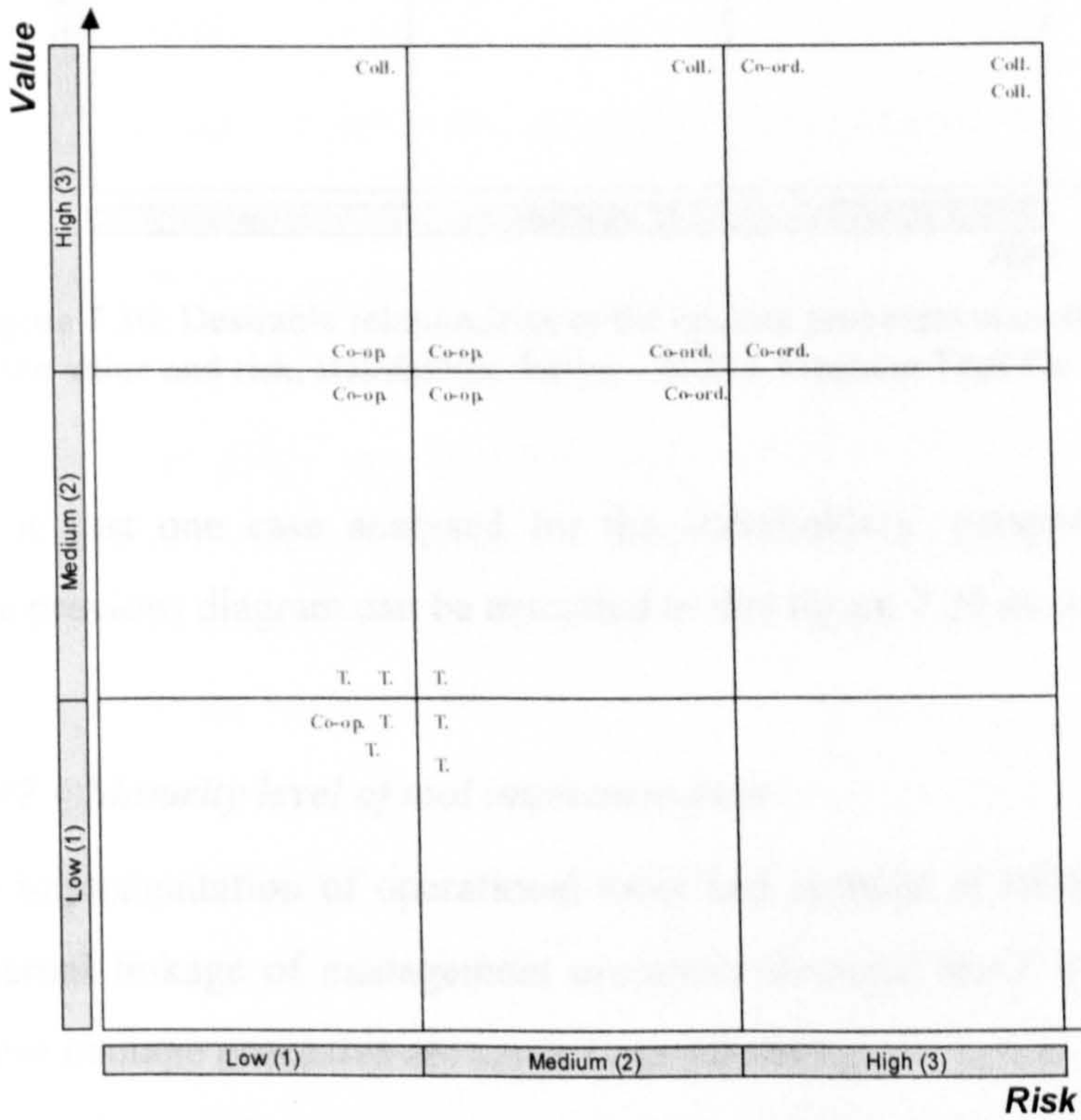


Figure 7.35: Desirable relationships of the operate processes according to the value and risk, supplier facing – BOST Machine Tool Co. S.L.

Concerning the desirable relationships proposed by the interviewees, figure 7.35 shows the distribution of them according to the value and risk from the perspective of the suppliers. The diagram clearly shows that the higher the value and the risk, the closer the relationship should be. Transactional relationship would be ideal when the value and risk are low, whereas collaboration would be desirable for high value and risk cases. Finally, co-operation and co-ordination relationships would be suitable for medium value and risk situations.

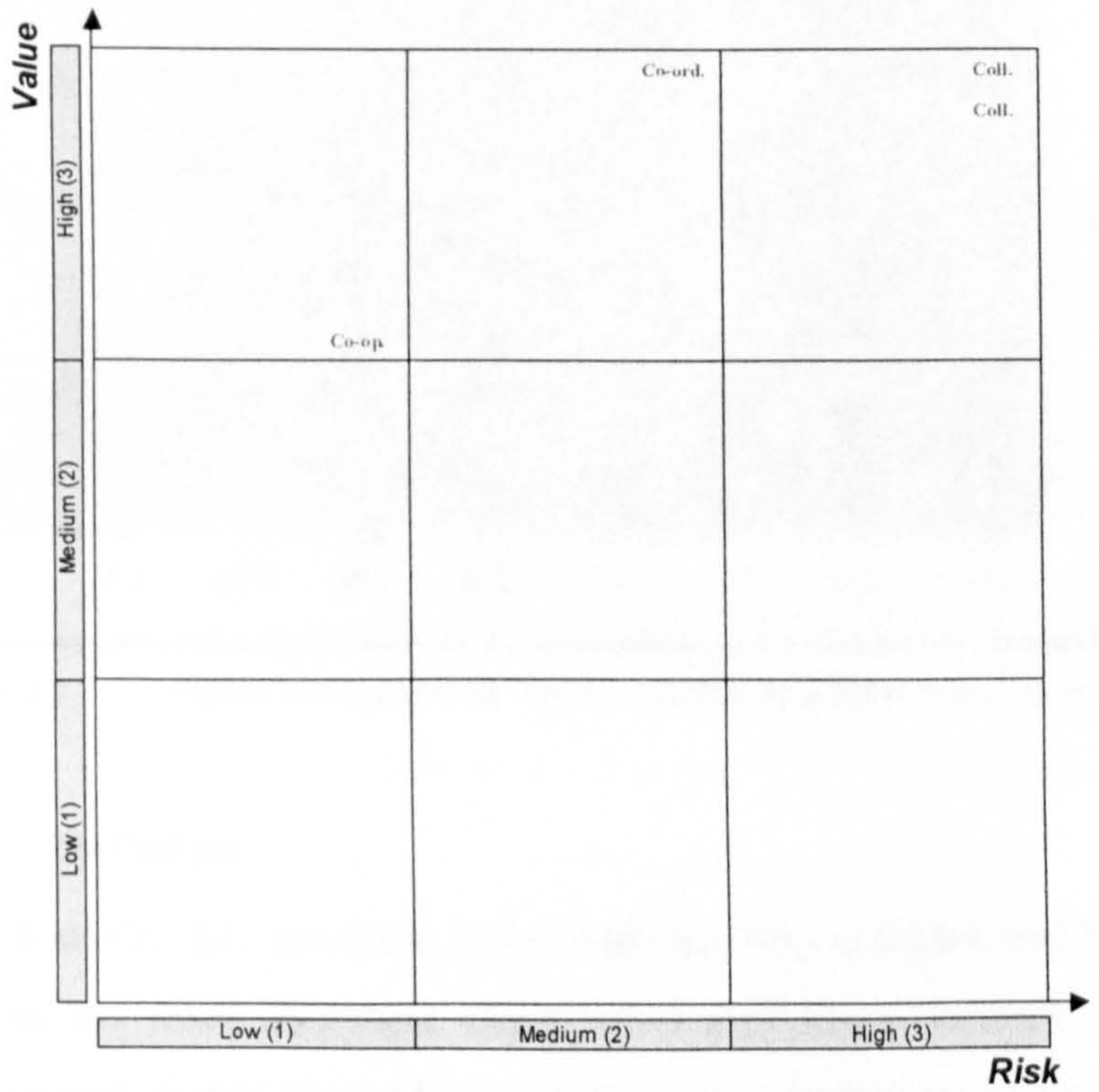


Figure 7.36: Desirable relationships of the operate processes according to the value and risk, stakeholder facing – BOST Machine Tool Co. S.L.

Although there is just one case analysed for the stakeholders' perspective, the scheme described for the previous diagram can be extended to this figure 7.36 as well.

d) *Sub-model #2 – Maturity level of tool implementation*

Analysis of the implementation of operational tools and systems at BOST highlighted the lack of any external linkage of management processes through *'hard'* systems. It may be deduced that these manage processes are carried out internally.

On the other hand, three of the operate processes met some operational characteristics. As can be seen in the figure 7.37, these characteristics did not fulfil the features required by co-ordination relationship. Finally, although support processes showed some relational

advances, according to the maturity level they lack some key characteristics typical of co-operation relationship.

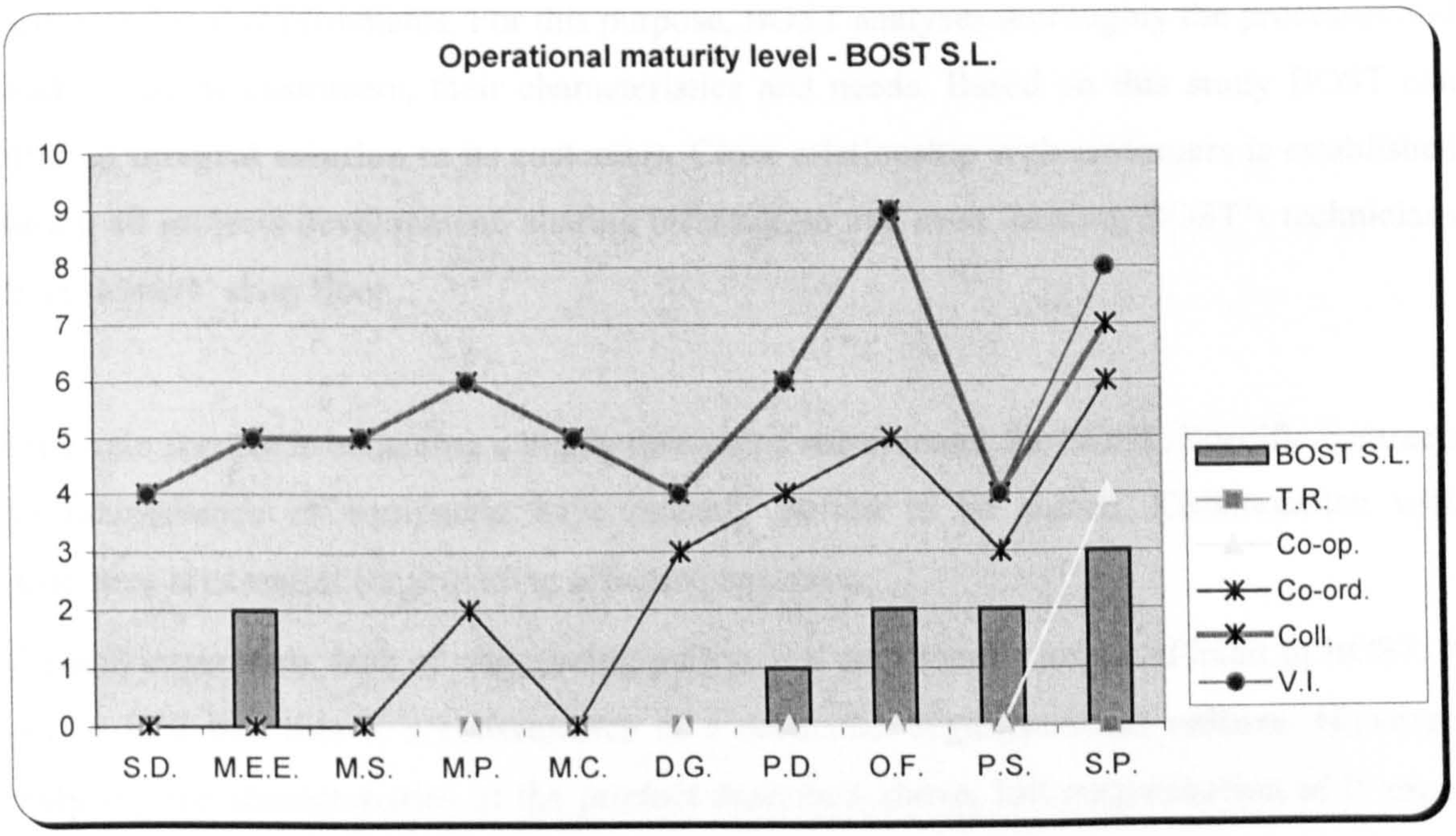


Figure 7.37: Operational maturity level – BOST Machine Tool Co. S.L.

e) *Comments & conclusions*

BOST Machine Tool Co. S.L. produces technologically very complex and highly developed **products**. One of the most important characteristics of these products is that they are completely customised. Every new order requires a new project, a new design and a totally new development.

This feature is what makes BOST very interesting for customers that seek highly specialised and personalised products. Price is no longer an order winner criterion for BOST, but factors such as short project lead-time, quality, after sale service and fulfilment of customers' specific requirements become essential drivers.

Machine tool sector is suffering a considerable threat because of Asian low manufacturing costs. Those companies that only offer a standard product based on low prices will have many problems for survival. However, BOST's strategy focused on more value added product seems to remain highly competitive at least in a medium-term. During this case study, interviewed managers asserted that Asian competitors have serious limitations to develop own high technology products. So far, these competitors seem to be highly efficient imitating others' technology, but not able to develop own technology. Also it was stated that

this constrain can just be a matter of time until R&D competences are gained by these countries.

This product customisation requires a highly appreciated characteristic: Knowledge of customers' real requirements. For this purpose, BOST analyses thoroughly the processes and products of its customers, their characteristics and needs. Based on this study BOST can offer an **integral solution** to its customers. Close relationship with customers is established during all projects development, sharing information and even locating BOST's technicians on customers' shop floor.

After sale **service** is becoming a highly demanded requirement for BOST. Specific contracts for maintenance of equipment have recently started to be signed. Collaboration with customers is essential for providing effective response.

Vertical integration, lack of outsourcing policy, is a traditionally accepted habit in BOST. It can be said that this is a consequence of a particular **organisational culture**. However, analysing the characteristics of the product described above, full customisation of it might difficult outsourcing as every project differs considerably from the previous ones. This statement leads the researcher to extract two conclusions about outsourcing:

1. The more standard the product, the more viable to outsource it is.
2. When customisation degree is very high and outsourcing is required, suppliers should be integrated during all the project development in order to have a high knowledge of the product and its requirements. Collaboration within the supply chain is necessary.

Interviewed managers considered that outsourcing practice would reduce the value of the product. According to the theory reviewed in chapter 2, a proper outsourcing activity carried out through a collaboration relationship would not reduce the value of the product, but to enhance it. Practices such as concurrent engineering could reduce the lead-time of projects and also reduce costs.

Limited resources (financial and human) were identified as one of the constraints of the organisation when large projects have to be accomplished. Large project lead-time requires considerable financial strength. Costs during projects are high and payment is fulfilled much time after the project has been started. On the other hand, as each project needs a complete design and development, human resource requirement is high as well.

Collaboration within the supply chain might be a desirable solution to strengthen this limitation. Collaborating actively, sharing risks and investments with key suppliers might

enable accomplishing more ambitious and complex projects. New outsourcing policy based on closer relationships might generate many competitive advantages to BOST, according to the literature review presented in chapter 2.

7.3.3 Cross-case analysis

Cross-case analysis is highlighted by authors such as Voss et al. (2002) and Yin (2003) as a technique for increasing internal validity of the research. The objective of this technique is to search for common patterns and categories across the particular cases in order to extract generalisable conclusions.

The same structure as within-case analysis will be used in this section. This fact will allow a more effective comparison between cases.

a) *Relationship type identification and categorisation*

Analysis of the implementation of different relationship types at the five organisations showed that just two of the five levels were common to all the cases. Transactional relationship and co-operation were held at all the organisations, whereas the other three relationship levels showed some discontinuity.

On one hand, co-ordination was known for four of the five organisations. On the other hand, both collaboration and vertical integration were common at three of the five cases analysed.

Table 7.18 also presents the final ranking of the relationship levels after processing all the data of the individual cases. Hence, transactional relationship is the most spread relationship, followed by co-operation and co-ordination.

An important finding of this comparison between cases is that collaboration is the last relationship of the ranking, even behind vertical integration. However, the difference between these two levels is minimum. It may be deduced that collaboration practice is highly difficult for these organisations.

Table 7.18: Comparison of the implementation of different relationship levels

Company	Transactional Relationship	Co-operation	Co-ordination	Collaboration	Vertical Integration
Goizper S.Coop. (G)	1	3	2	4	5
Domusa Calefaccion S.Coop. (D)	1	2	3	-----	-----
ONA Electroerosion S.A. (O)	1	2	3	5	4
Metagra S.A. (M)	1	2	-----	-----	3
BOST Machine Tool Co. S.L. (B)	1	2	3	4	-----
Ranking of Relationship levels	**1**	**2**	**3**	**5**	**4**

b) *Sub-model #1 – Complexity/Uncertainty approach*

Cross-case analysis was also carried out to test the validity of the complexity/uncertainty approach of sub-model #1. Scores of the specific critical factors of each case led the author to calculate the individual complexity and uncertainty values for each business process. Table 7.19 shows all the values for each business process of all the organisations studied.

Analysing the scores of the table, it can be stated that BOST and Metagra got the highest complexity and uncertainty at their processes. On the other hand, Goizper and Domusa had the lowest scores, while ONA is in the midway between these four organisations.

Table 7.19: Comparison of the complexity/uncertainty values within the cases at a process level

Complexity/Uncertainty per business process										
Company	1-S.D.	2-M.E.E.	3-M.S.	4-M.P.	5-M.C.	6-D.G.	7-P.D.	8-O.F.	9-P.S.	10-S.P.
Goizper S.Coop. (G)	36,8/41,6	36,8/41,6	36,8/41,6	38,2/41,3	36,8/41,6	35,1/39,2	32,9/39,7	30,6/39,7	32,9/39,7	39,2/45
Domusa Calefaccion S.Coop. (D)	54,1/42,5	54,1/42,5	54,1/42,5	46,2/37,5	54,1/42,5	52,1/42,1	49,4/39,3	46/39,3	49,4/39,3	45/31
ONA Electroerosion S.A. (O)	47,5/55	47,5/55	47,5/55	39,3/45	47,5/55	45,7/52,1	38,9/48,1	36/48,1	38,9/48,1	36/45
Metagra S.A. (M)	56/57,7	56/57,7	56/57,7	45,7/47	56/57,7	57,3/58,7	56,8/55,1	52,1/55,1	56,8/55,1	46/48
BOST Machine Tool Co. S.L. (B)	53,3/60	53,3/60	53,3/60	48,7/53,7	53,3/60	60/65,7	52,2/60	48/60	52,2/60	50/58

Representation of all these scores in the complexity/uncertainty diagram in figure 7.38 shows that the area where all the processes are located has a difference of 30 points in both complexity and uncertainty dimensions.

Considering the high differences between the critical factors of the organisations, this is not actually reflected in the complexity/uncertainty diagram. It can be stated that the area occupied by all the processes is relatively narrow, the complexity and uncertainty of the organisations are very similar. However, the analysis of the critical factors does not allow reaching the same conclusion.

The final conclusions of this cross-case complexity/uncertainty approach will be provided in the following section dedicated to the refinement of the conceptual model.

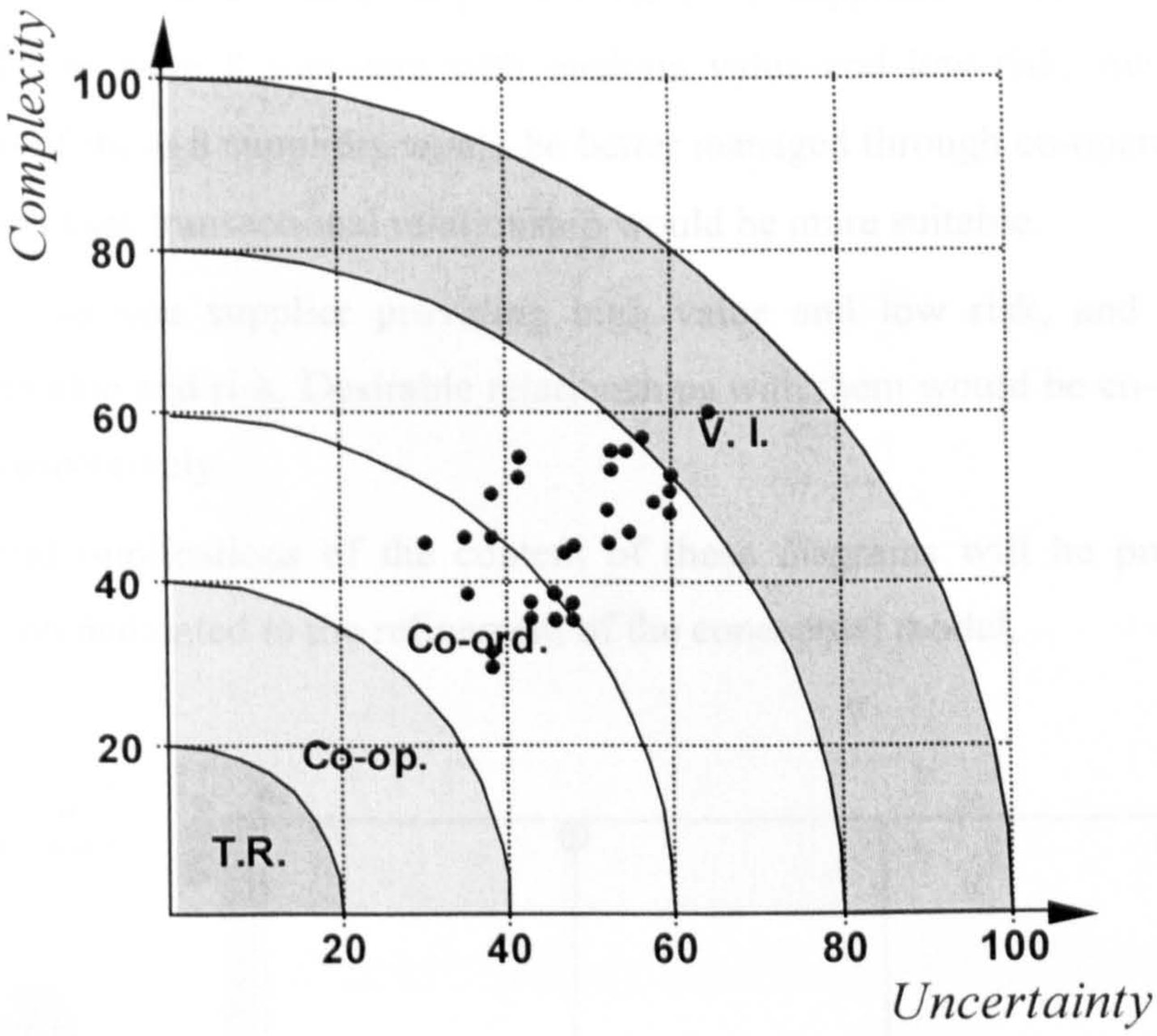


Figure 7.38: Representation of Complexity/Uncertainty values – Cross-case analysis

c) *Sub-model #1 – Value/Risk approach*

Cross-case analysis of the value/risk approach provided highly relevant information. As the objective of the conceptual model of this study was to make more desirable the external relationships, this cross-case analysis gathered all the particular data of each case concerning the desirable relationships. Note that these desirable relationships were suggested by the interviewees for the operate processes of their organisations.

As it was done during the within-case analysis, there will be two types of charts: The diagrams that will analyse the processes from the perspective of suppliers (in blue), and the diagrams that will do the same but from the perspective of stakeholders (in red).

Each chart will show all the desirable relationships according to the value and risk with different colours: Green for transactional relationship; blue for co-operation; yellow for co-ordination; orange for collaboration; and red for vertical integration. Same relationships for a certain score of value/risk will be grouped and they will be represented by a circle with the colour of the relationship and with the number of relationships that are repeated.

Figure 7.39 presents the desirable relationships for demand generation process from the perspective of the suppliers. Relationships with 24 suppliers were finally analysed during the case studies for each operate process. The diagram shows that there were 13 suppliers providing low value and low risk in their transactions. According to the different

interviewees the desirable relationship with these 13 suppliers would be transactional relationship. There were 8 suppliers with medium value and low risk. According to the interviewees, 6 of these 8 suppliers would be better managed through co-operation, whereas in the other two cases transactional relationship would be more suitable.

Finally, there was one supplier providing high value and low risk, and two suppliers involving high value and risk. Desirable relationships with them would be co-ordination and co-operation, respectively.

Conclusions and implications of the content of these diagrams will be presented in the following section dedicated to the refinement of the conceptual model.

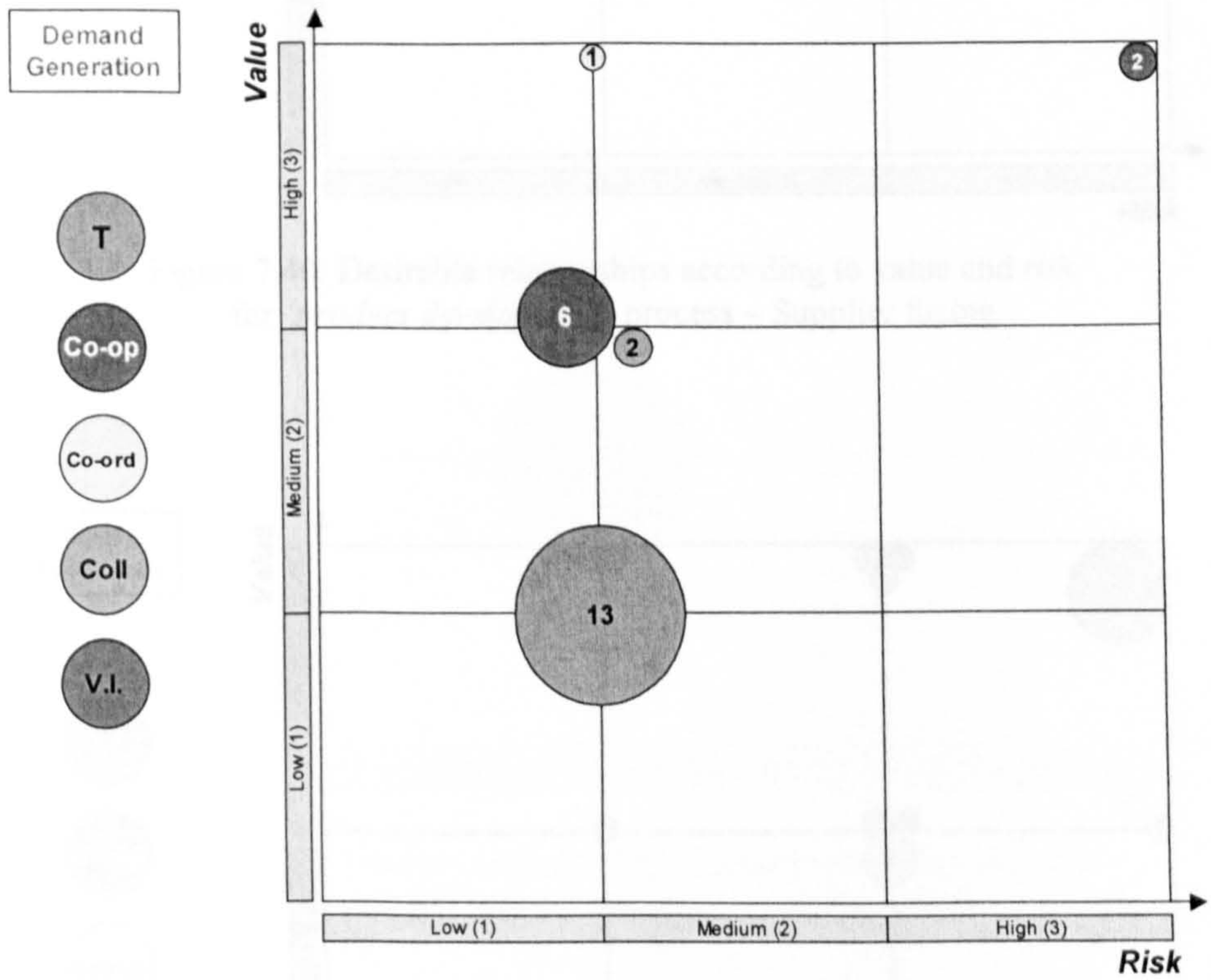


Figure 7.39: Desirable relationships according to value and risk for *'demand generation'* process – Supplier facing

The desirable relationships with the 24 suppliers at product development process were represented in figure 7.40. According to the interviewees the desirable relationships would be closer the higher the value and risk are.

When value and risk are low the desirable relationships with 8 suppliers are transactional relationship, whereas when the value and risk are higher collaboration and vertical integration are more common.

Both co-operation and co-ordination are considered desirable relationships when both value and risk are medium.

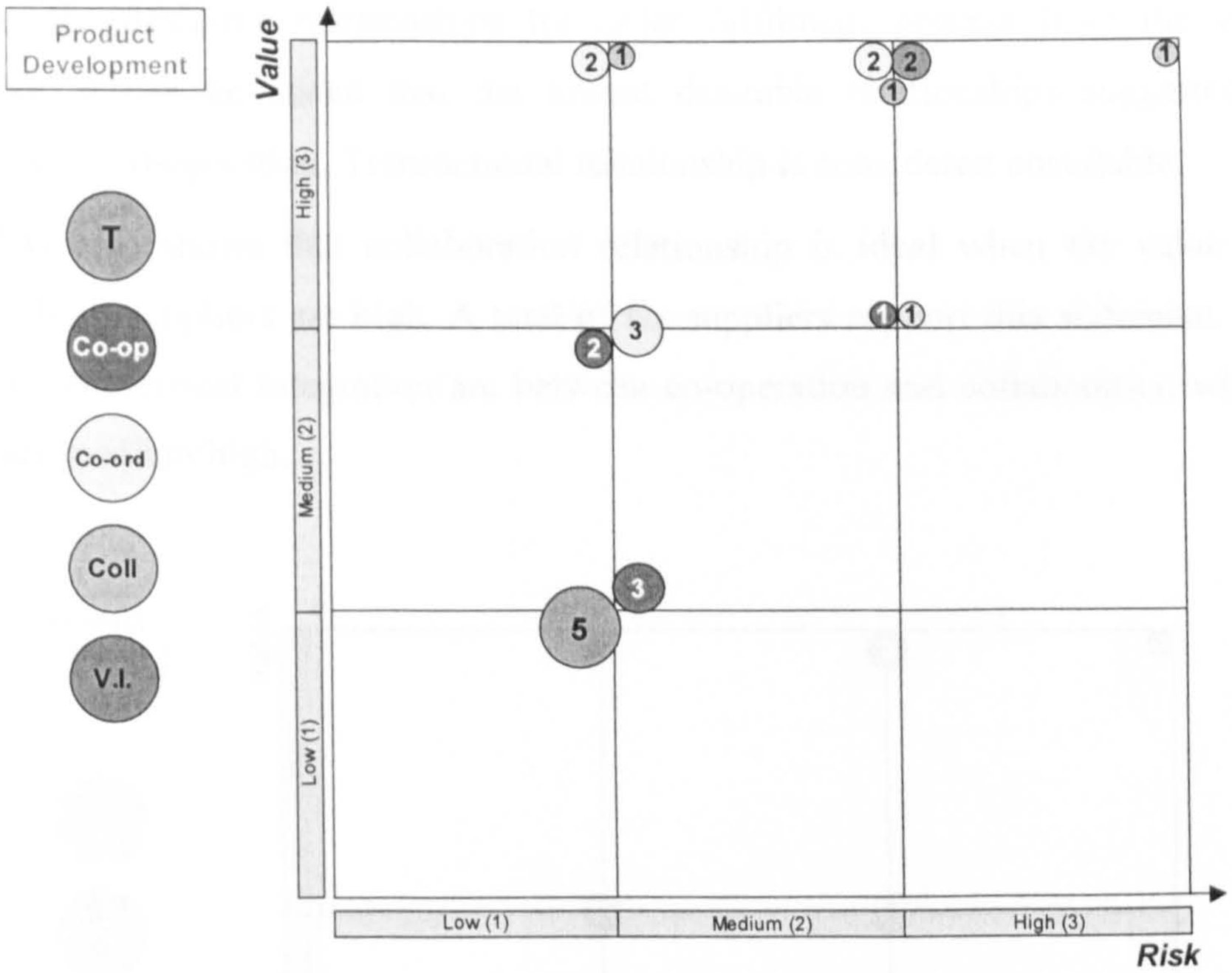


Figure 7.40: Desirable relationships according to value and risk for *'product development'* process – Supplier facing

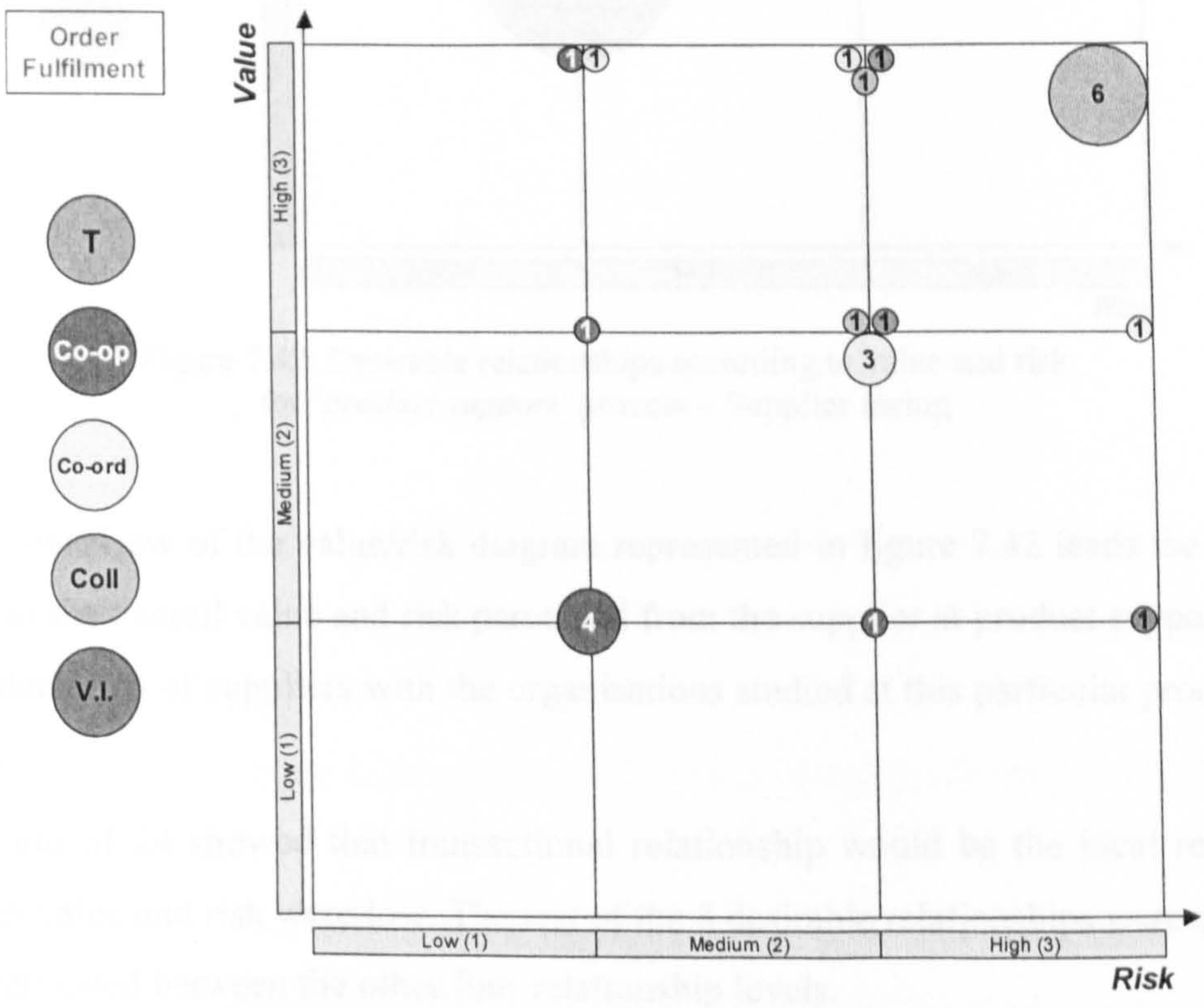


Figure 7.41: Desirable relationships according to value and risk for *'order fulfilment'* process – Supplier facing

Analysing the desirable relationships for order fulfilment process from the suppliers' perspective, it can be stated that the lowest desirable relationships suggested by the interviewees is co-operation. Transactional relationship is considered unsuitable.

Figure 7.41 also shows that collaboration relationship is ideal when the value and risk perceived from suppliers are high. A total of six suppliers support this statement. Both co-ordination and vertical integration are between co-operation and collaboration when value and risk are medium/high.

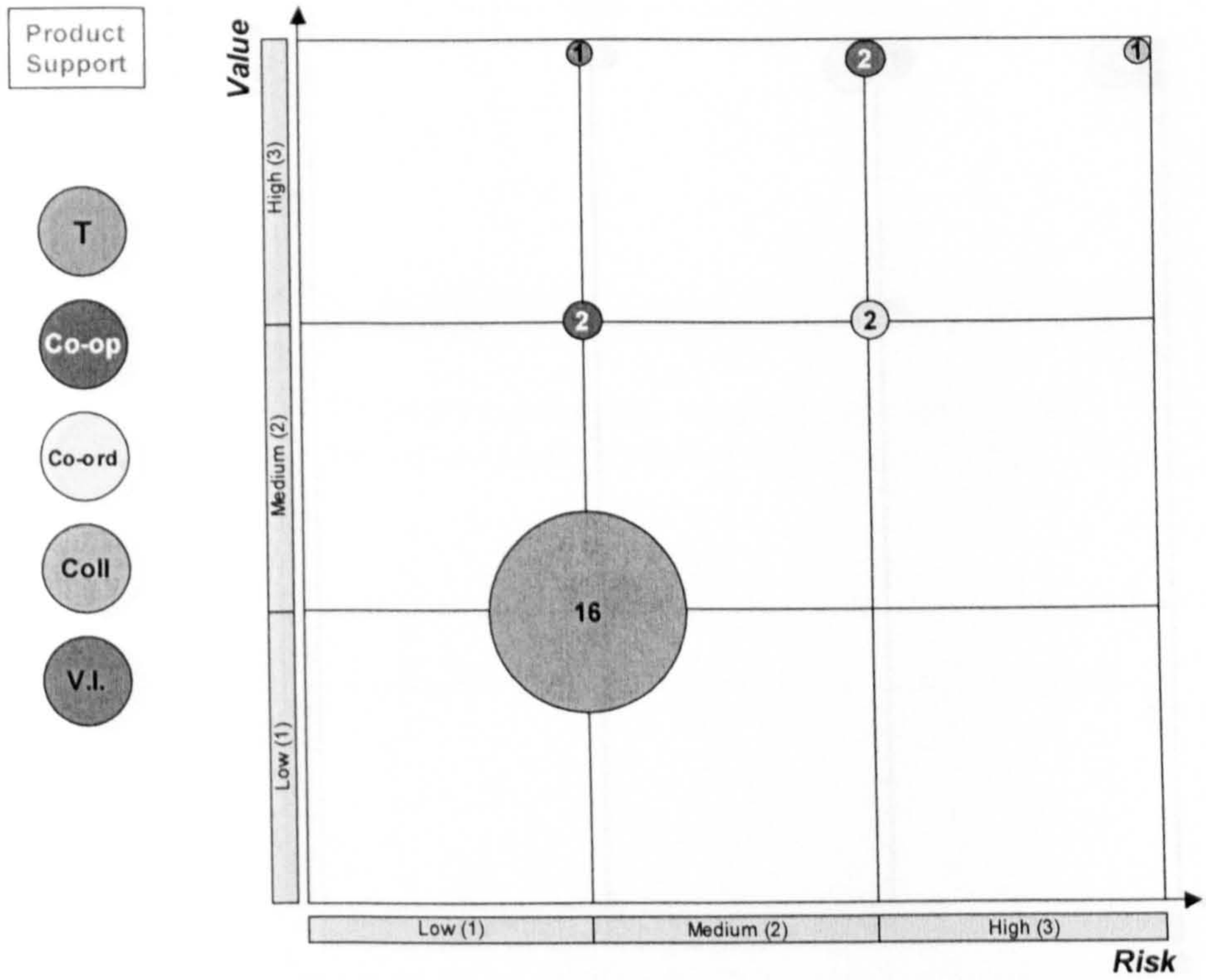


Figure 7.42: Desirable relationships according to value and risk for *'product support'* process – Supplier facing

An initial overview of the value/risk diagram represented in figure 7.42 leads the author to deduce that the overall value and risk perceived from the supplier at product support process is low. Interaction of suppliers with the organisations studied at this particular process is not common.

16 cases out of 24 showed that transactional relationship would be the ideal relationship when both value and risk were low. The rest of the 8 desirable relationships were distributed highly segregated between the other four relationship levels.

Analysing the desirable relationships for demand generation process from the stakeholders' perspective, it can be stated that segregation of desirable relationships is very high. However, the most basic relationships, i.e. transactional relationship and co-operation, are suitable for low value and risk, according to the interviewees.

On the other hand, co-operation and collaboration relationships would be ideal when both value and risk were medium/high. This high dispersion of relationships made difficult stating any final conclusion.

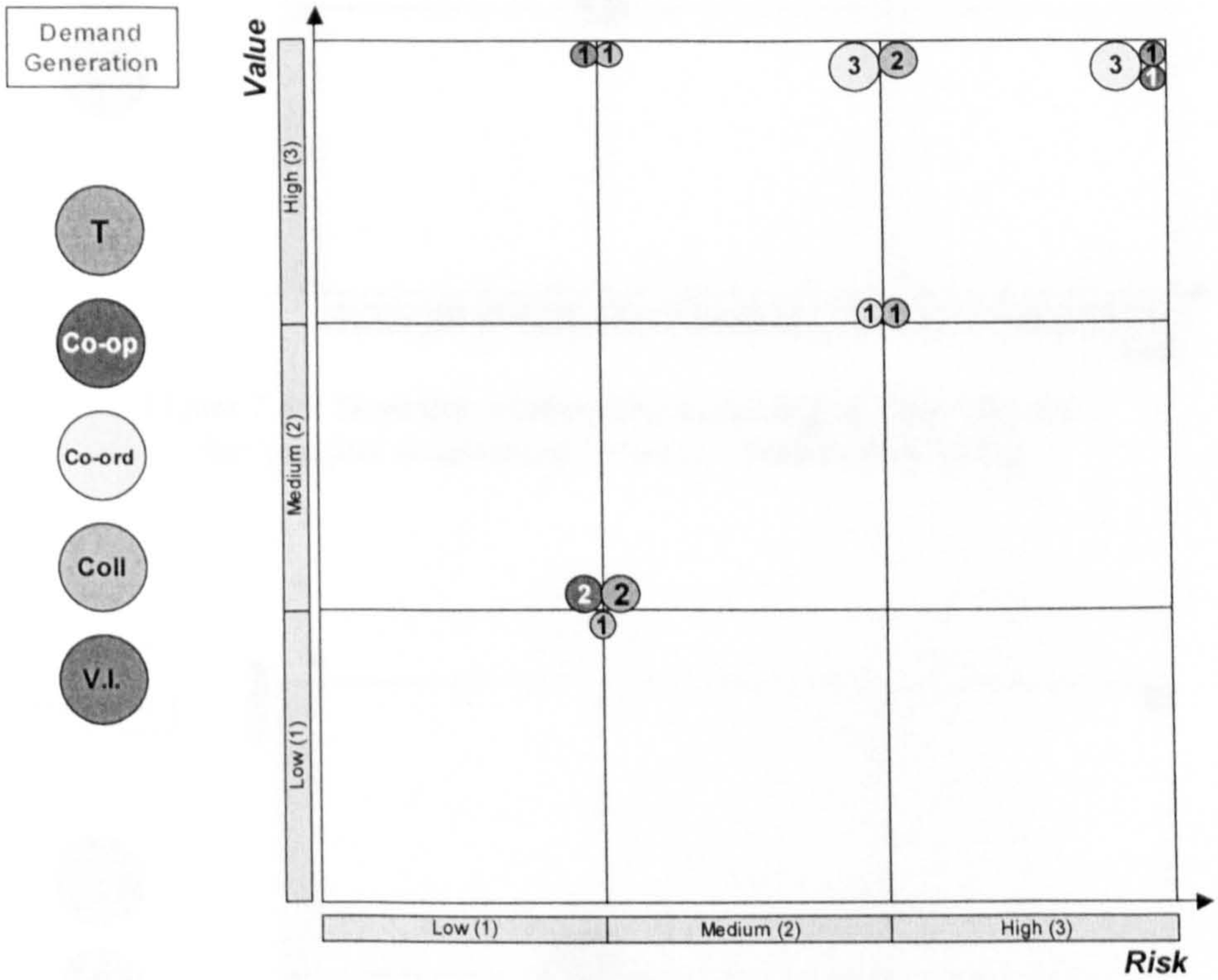


Figure 7.43: Desirable relationships according to value and risk for *'demand generation'* process – Stakeholder facing

Figure 7.44 concerns the ideal relationships between the organisations studied and their stakeholders for product development process. Two main characteristics can be highlighted after analysing the configuration of the diagram:

- There are two main relationships proposed by the interviewees, co-operation and collaboration.
- Co-operation will be ideal when both value and risk are medium, whereas collaboration will be desirable when these two dimensions are medium/high.

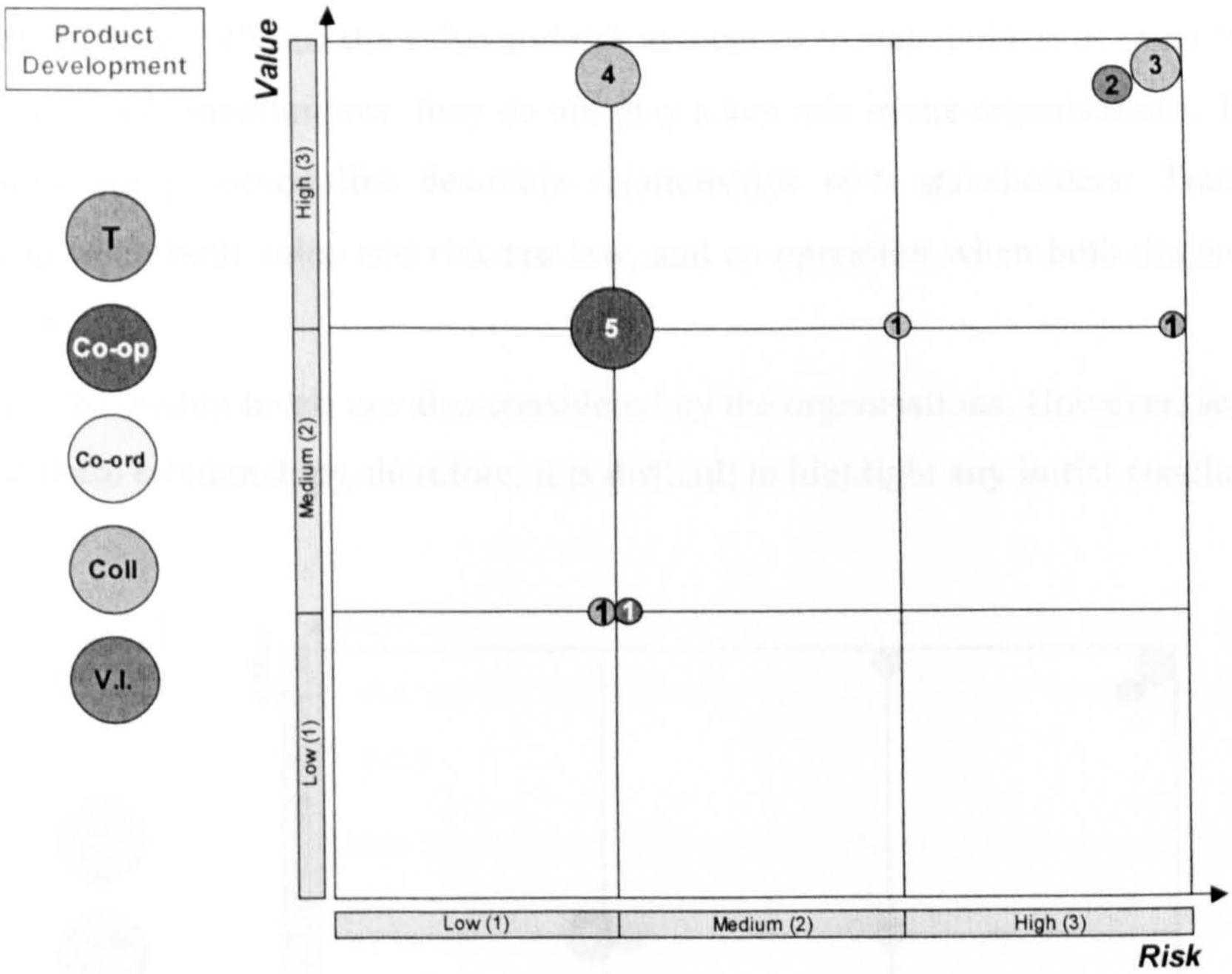


Figure 7.44: Desirable relationships according to value and risk for *'product development'* process – Stakeholder facing

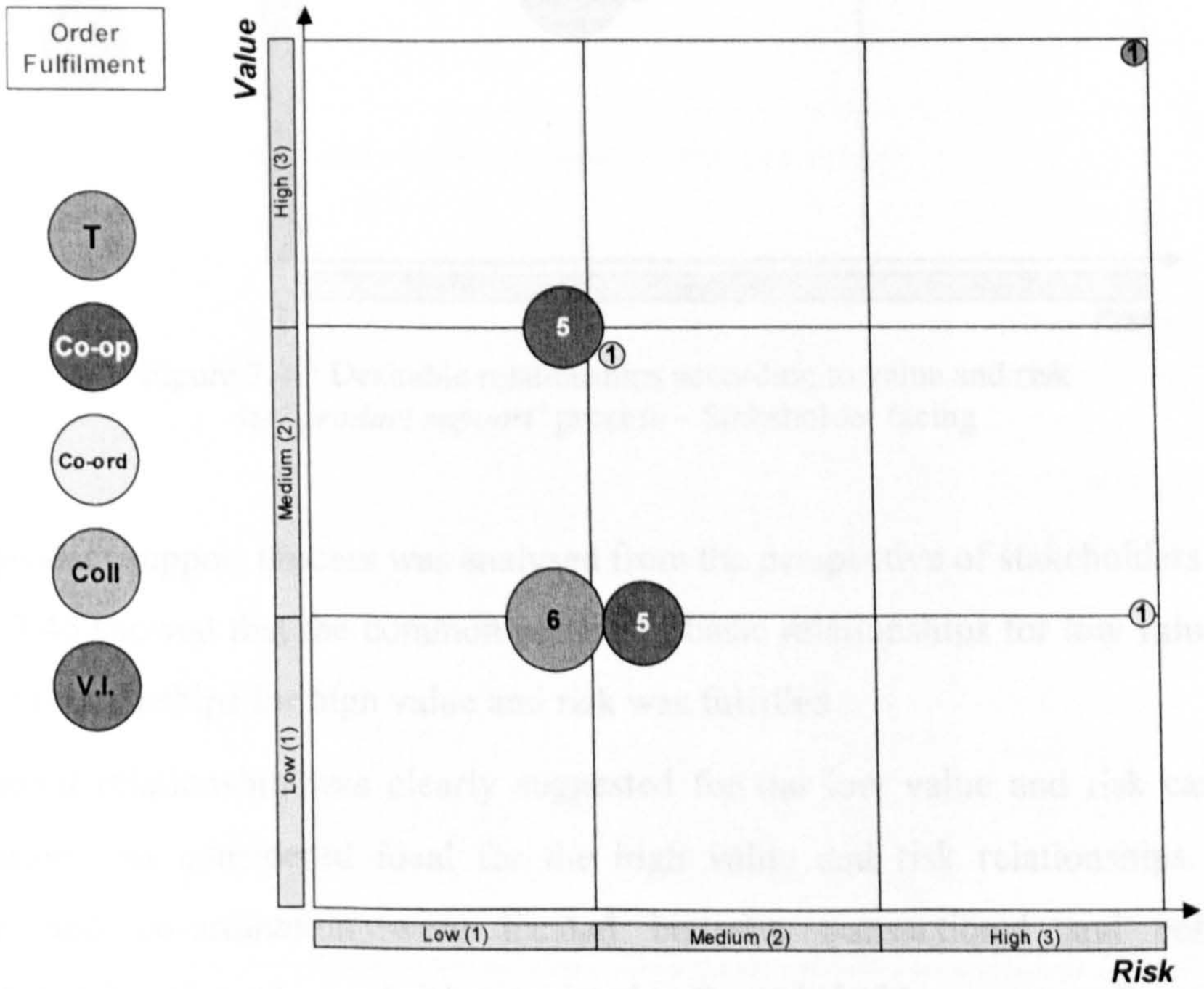


Figure 7.45: Desirable relationships according to value and risk for *'order fulfilment'* process – Stakeholder facing

It is stated in figure 7.45 that the value and risk associated to stakeholders at order fulfilment process is normally medium/low, they do not play a key role in the organisations. Two main relationships are proposed like desirable relationships with stakeholders: Transactional relationship when both value and risk are low, and co-operation when both dimensions are medium/low.

Other two relationship levels are also considered by the organisations. However, segregation is high for these relationships, therefore, it is difficult to highlight any initial conclusion.

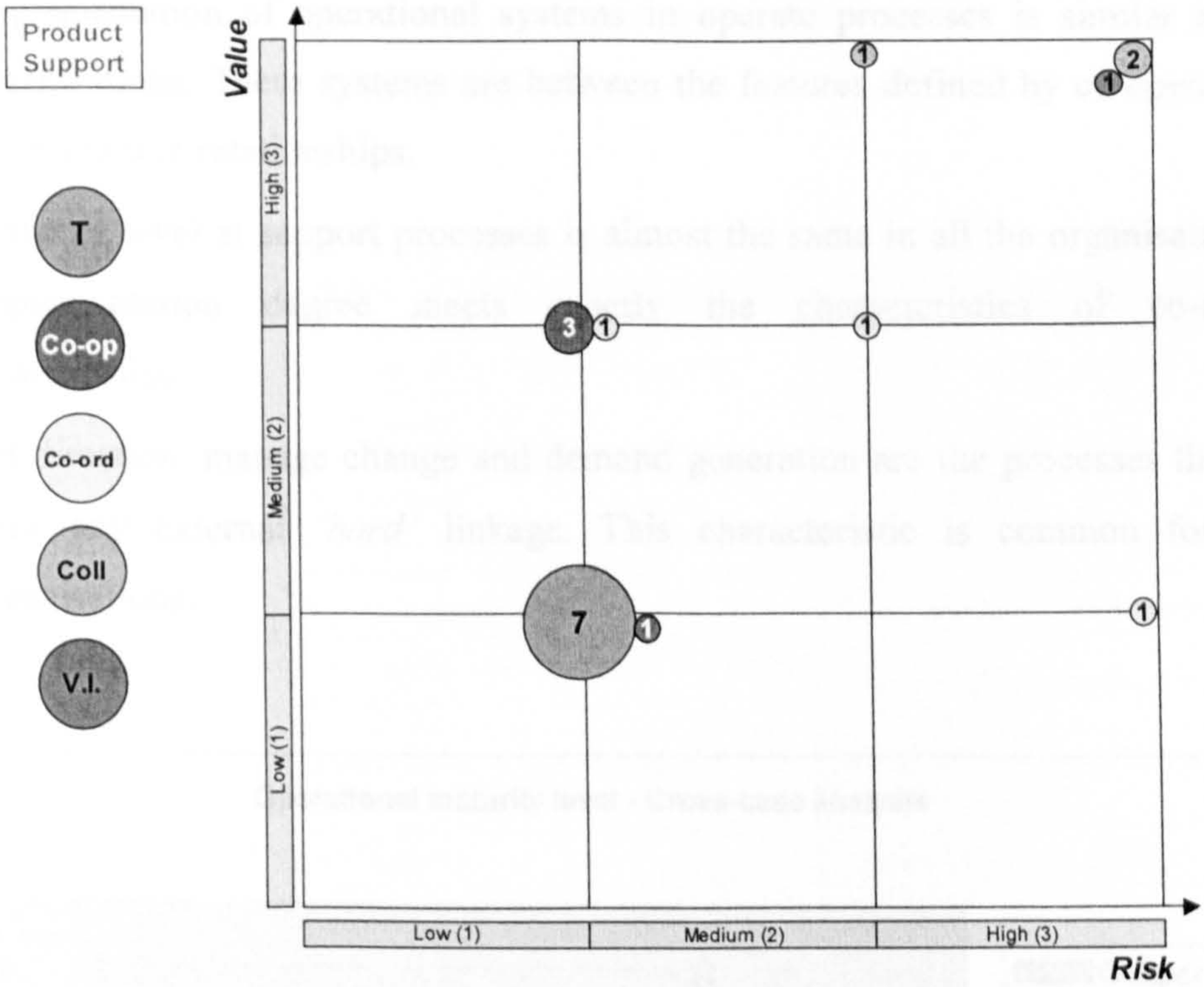


Figure 7.46: Desirable relationships according to value and risk for *'product support'* process – Stakeholder facing

Finally, product support process was analysed from the perspective of stakeholders. Analysis of figure 7.46 showed that the common pattern of basic relationships for low value and risk and closer relationships for high value and risk was fulfilled.

Transactional relationship was clearly suggested for the low value and risk cases, while collaboration was considered ideal for the high value and risk relationships. Both co-operation and co-ordination were located between transactional and collaboration relationships when the value and risk associated to the stakeholders were medium.

d) *Sub-model #2 – Maturity level of tool implementation*

Current implementation of tools, methodologies and systems of the five case studies were compared through a chart shown in figure 7.47. Although there are some differences between the maturity levels of the organisations, some common characteristics can be highlighted:

- *Monitor external environment* is the most developed process between the manage process. Implementations of the organisations averagely are above co-ordination for this process.
- Implementation of operational systems in operate processes is similar in all the organisations. These systems are between the features defined by co-operation and co-ordination relationships.
- Maturity level at support processes is almost the same in all the organisations. The implementation degree meets exactly the characteristics of co-operation relationships.
- Set direction, manage change and demand generation are the processes that do not have any external *'hard'* linkage. This characteristic is common for all the organisations.

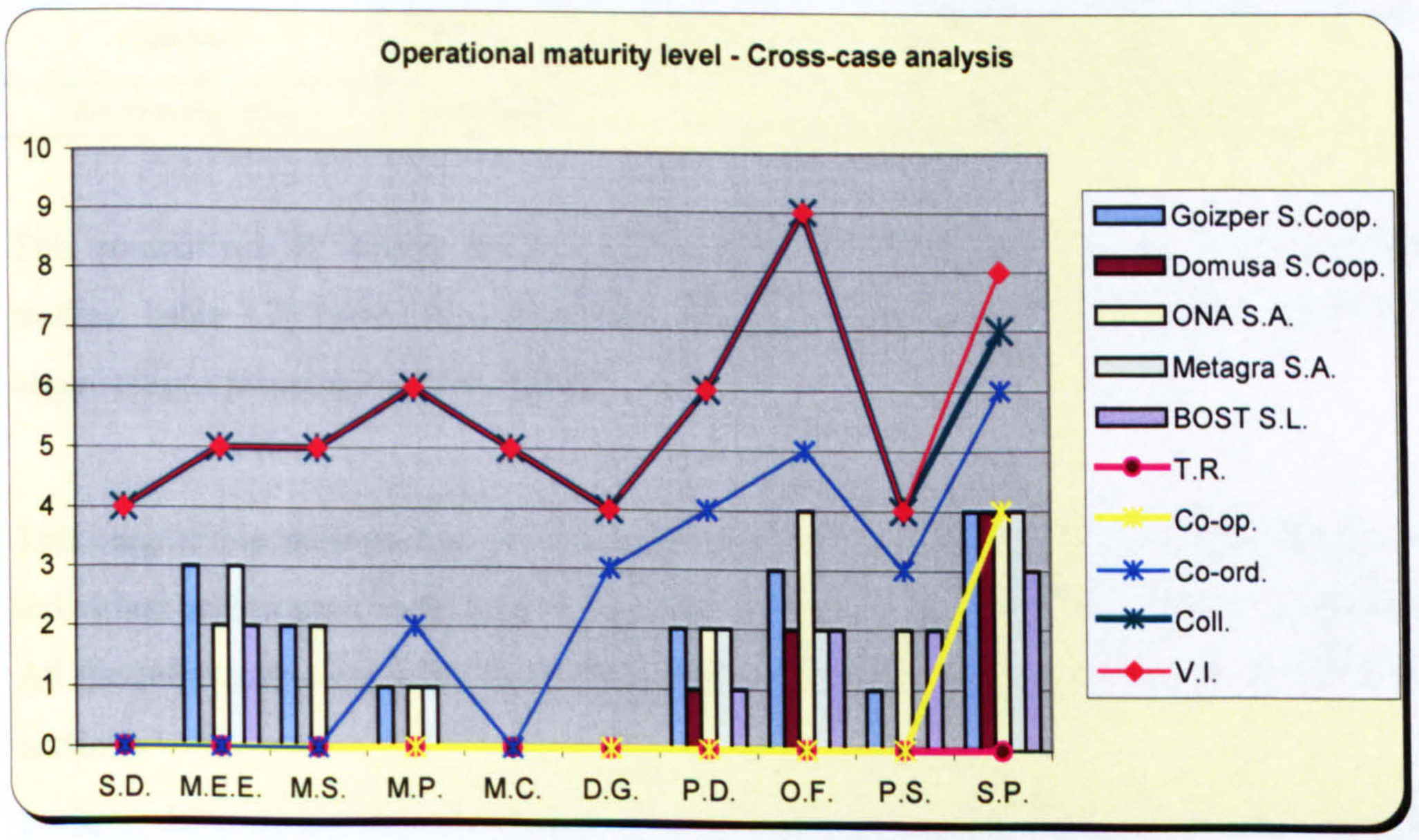


Figure 7.47: Comparison of the operational maturity level between cases

e) *Comments & conclusions*

This section will aim to gather the key comments made during the within-case analysis of the five organisations studied. To this end, *comparison of similar categories* (Miles and Huberman, 1994) data analysis method will be used. Some characteristics will be compared in order to search for commonalities and differences within the cases.

As there are two cases operating in the same sector, i.e. machine tool sector, it was decided two initially carry out the comparison of similar categories between both ONA and BOST organisations. This task will allow reaching a more accurate explanation of the behaviour of the organisations from an external relationship perspective.

Table 7.20 shows the comparison of both cases.

Table 7.20: Comparison between ONA and BOST cases

Characteristics	ONA Electroerosion S.A.	BOST Machine Tool Co. S.L.
Product	High technology; standard product	High technology; customised product
Manufacturing strategy	Make to order	Design to order
Customer response lead-time	Short/medium	Long/very long
Strategic policy	Collaboration with suppliers enables an agile customer service	In-house activities provide more value to the product. Vertical integration.
Supply chain	Agile supply chain, based on close relationships	Traditional transactional supply chain
Customer	Standard EDM equipment is required. After sale services is essential	Needs an integral solution. After sales service is essential
Relationship style	Co-ordination	Transactional/co-operation

This comparison of similar categories was also carried out between the rest of the case studies. Table 7.21 shows the comparison of some common characteristics between the five organisations presented in this chapter.

This chapter has presented so far the analysis of the data gathered in five organisations. An individual within-case analysis and a general cross-case analysis have been accomplished. All the information extracted from these analysis stages will be processed in the following sections.

Initially, the conceptual model built in chapter 6 will be refined. The information concerning both complexity/uncertainty and value/risk approaches will be analysed and the most accurate approach will be selected.

Table 7.21: Comparison of characteristics between cases

	Goizper	Domusa	ONA	Metagra	BOST
Product type	Technologically not very developed product and standard. Most of the value provided by Goizper (R&D).	Technologically average product. Value provided by Domusa: all the R&D. Standard product and some customisation.	Technologically very developed product. Mainly standard and R&D is the key value adding process.	Technologically very simple product. Make to order product. Quality and reliability of the product is very important.	Technologically very developed product. Total product customisation, design to order. Reliability very important.
Technology	Low technology level required. Mainly plastic injection. Outsourcing is a very common practice.	Very wide spectrum of technologies required, part of the outsourced. High quantity of components.	Wide spectrum of technologies required, all of them outsourced. High quantity of commercial components.	Very few technologies required and mainly outsourced (difficult to vertically integrate). Almost whole raw material transformation in-house.	Wide spectrum of technologies required, some outsourcing. High quantity of commercial components.
Supplier(s)	High competition between suppliers, easy to substitute. Goizper is stronger. Not much value added.	Cost driven suppliers. Not development, just transaction of standard components. Key supplier: Cast (Very complex element).	Agility is a key driver. Very developed outsourcing policy. Close work with key suppliers but prod. development not required. High supplier fidelity.	Suppliers very strong. Monopoly of raw material and key technologies (suppliers can not be substituted). Cost and quality key drivers.	Experience of suppliers important, more than price. Co-operative relationship, product development not required.
Customer(s)	Low dependency on customers. Largest customer only 2% of sales. Very spread commercial network required.	Average dependency on customers. Important commercial network, and high requirements for product support process.	Low dependency on customers, low risk. Important commercial network required and product support is highly important.	Very powerful suppliers and high dependency, not too many suppliers. Annual cost reduction policies, C product for customer. Difficult to relate to.	Knowledge of the customers processes and requirements is highly important. Close relationship as the product is completely customised.
Order winner criteria	Quality and customer efficient service (high stock). Famous brand. Sales network in almost all the world: 123 countries.	Price/quality relationship key driver. Technical features of the product important. Good product support essential.	Price/quality relationship very important. Product support service is a key driver: An agile after-sales service is dramatically valued.	Low price and high quality are the main drivers. Service level is essential. Fast process developments necessary.	Full customisation service the main driver, more than the price. Quality is very important and an agile after-sales service is dramatically valued.
Features of the supply chain	Few key suppliers: Mainly co-ordinated with them. Cost is a key driver. Collaboration and V.I. future lines.	Mainly transactional relationship with all the suppliers. Cost is a key driver. Vertically very integrated company, internal approach.	An agile supply chain is the most important factor: High response level is essential for all the supply chain. Cost is becoming more important due to the Asiatic competence.	Metagra is a 'sandwich' org. in the supply chain: Powerful suppliers and customers. Lean supply chain required. Mainly transactional relationship, some co-operation.	Not very developed supply chain, relationships mainly based on transaction/co-operation. Vertical integration is considerable.

Once that the final conceptual model is proposed, the following section will deal with the discussion concerning the specific conclusions and findings achieved during the case studies. All these findings and the information gathered from the literature review will contribute to the final answer to the research questions of this study.

7.3.4 Conceptual model refinement

The objective of this section is to review the findings and conclusions stated after the analysis of the pilot case study presented in chapter 6. Although different conclusions were presented in that section, only the issues concerning the conceptual model will be analysed here.

The pilot case study highlighted four main potential pitfalls related to the conceptual model. It was stated that both complexity and uncertainty might not be the key drivers that determine the desirable relationship levels. On the other hand, it was noticed that the procedure for scoring the critical factors and calculating the complexity/uncertainty of the organisations was not very accurate. Basically, the scoring system lacked rigour and objectiveness.

The structure and procedure of the sub-model #1 were not able to define desirable relationships between the organisation and other external entities, but just one desirable relationship per business process. This issue was found to be a limitation for the conceptual model and its real applicability.

Finally, the fourth pitfall was associated to the sub-model #2. It was found that there was not a real relationship between the relationships that the organisation was maintaining and the operational characteristics suggested by this sub-model. In other words, although the organisation was apparently collaborating, there were not implemented the tools and systems pointed by the sub-model.

Chapter 6 ended stating that these pitfalls were not generalisable to all the cases due to the lack of different sources of data, so, more case studies were necessary to confirm these conclusions. As a result, the case studies presented in this chapter were planned to address all the issues described above, and also to test a new approach, i.e. value/risk approach, developed after analysing the conclusions of the pilot case study. After the within- and cross-case analysis, these four pitfalls were individually reviewed with the information extracted from these analysis stages. The resolution of these issues will lead to refine the conceptual model and to propose the final version of it.

7.3.4.1. Sub-model #1

Most of the limitations of the conceptual model during the pilot case study were identified in this first sub-model. Three of the four pitfalls described before were related to this part of the conceptual model:

- Complexity/Uncertainty as key drivers for relationship definition
- Procedure for scoring the critical factors and complexity/uncertainty
- One desirable relationship per business process

These three issues were modified in the new value/risk approach proposed, as it was described in chapter 6. The case studies were responsible for testing and comparing both approaches, i.e. complexity/uncertainty and value/risk approaches.

Real application of both approaches in the organisations involved in the case studies and the information gathered from the analysis of the results allow the author to state that the second approach, i.e. value/risk approach, fulfils more accurately the objectives of this study. These are the differences and the advantages found throughout the case studies:

- All the studies demonstrated that both value and risk factors play a more critical role in the definition of relationships than complexity and uncertainty.
- The procedure for assessing the value and risk involved in the relationship was more accurate than the scoring method of the complexity/uncertainty approach.
- It is possible through the value/risk approach to get specific desirable relationships for each supplier and stakeholder at an operate process level. Any relationship of the organisation can be made more desirable.
- The complexity and uncertainty values of each business process of the five organisations represented in the diagram of the figure 7.38 did not provide enough information to define the right boundaries between the relationships levels. The segregation of the scores was too narrow to locate accurately these limits. On the other hand, as 24 suppliers and 18 stakeholders were analysed through the value/risk approach, the diagram built showed more realistic information. Thus, initial conclusions could be more accurate and reliable.
- The value/risk approach makes more desirable the relationships according to the characteristics (i.e. value and risk) of the relationship between the organisations and the supplier/stakeholder. On the other hand, the complexity/uncertainty approach makes more desirable the relationships depending on the own characteristics (i.e. 12 critical factors) of the performance of the organisation. It was stated that it is

necessary to first analyse the relationship in order to make it more desirable. Thus, only the analysis of the own characteristics of the company does not provide enough information *per se*.

- The value/risk approach does not need any software (e.g. Ms Excel) to calculate the input for the diagram, as the complexity/uncertainty approach does. The functionality of the former is considerably higher.

All these findings led the author to select the value/risk approach for this study. The information obtained in the cross-case analysis from the value/risk diagrams will be used to define the desirable relationships for each business process (supplier and stakeholder facing), depending on the value and risk of the relationship. This definition process will be presented in the section of this chapter dedicated to analyse the findings of the case studies.

7.3.4.2. Sub-model #2

The findings of the pilot case study stated that there was a lack of synchronisation between the current relationship of the organisation and its operational implementations defined by the maturity level of the sub-model #2.

Figure 7.47 of the cross-case analysis clearly showed that the current relationships of the organisations do not reach the characteristics of co-ordination relationship in the best of the cases.

Quality of the sub-model #2 is guaranteed through the literature, as it was built using the work of several authors. The conclusion that the author extracts from the case studies is that although the organisations are maintaining certain levels of relationships, they do not implement all the tools, methodologies and systems that would make more efficient and effective these relationships. It can be deduced that organisations first develop 'soft' linkages (i.e. trust, commitment, and so on) with suppliers and stakeholders, and then start implementing *'hard'* systems (i.e. EDI, shared PMS, and so on) gradually.

The maturity level of section 3 of the questionnaire was found to be a highly valuable tool to assess the operational characteristics of any organisation. It could be incorporated to the sub-model #2 as a complementary tool.

As a conclusion, the validation of this second sub-model was fulfilled through literature. Moreover, the interviewees highlighted the functionality of the sub-model #2 as a very interesting guideline for organisations.

Next section will present the specific conclusions and findings extracted from the information of each of the five sections of both the within- and cross-case analysis. In the same way, the last version of the conceptual model will be presented. This last version will show the patterns of desirable relationships for each operate process from both the suppliers' and stakeholders' perspective.

7.4 Discussion and findings of the case studies

The testing and validation process of the answer to the research questions of this study also highlighted other findings and conclusions. This section will present these issues grouped under four different headings: Firstly, the deductions concerning the relationship levels will be described. Secondly, the conclusions extracted from the information about the critical factors will be presented. Thirdly, this section will deal with the findings related to the characteristics of the current collaboration practice of the five organisations analysed. Finally, the specific behaviour of the business processes under different value and risk transactions will be described. This last section will present the patterns of desirable relationships built from the information collected in the case studies.

a) *Relationship levels between the organisations*

The author proposed a portfolio of relationships based on five different levels. This classification of relationship levels was achieved through specific literature review. Although theoretical validity of the classification was assured, its practical applicability was remaining.

The case studies showed that the portfolio of these five relationships dealt with all the casuistic available at the five organisations analysed. Section 1 of the questionnaire and the semi-structured interview gathered the data necessary to reach this conclusion.

At the same time, the case studies showed that collaboration practice is a very difficult practice for the organisations, even more than the acquisition of a new business unit trough vertical integration. The data collected provided enough evidence to state that collaboration was the most uncommon relationship level between the organisations due to the effort that it requires. On the other hand, transactional relationship was the most spread relationship, followed by co-operation.

However, the interviewees highlighted the great benefits that collaboration provides to their organisations. Although the difficulties and the resources required by this practice, the interviewees expressed that it is worth to make the effort and implement it.

b) *Critical factors influencing the organisational relationships*

The conclusions of the pilot case study presented in chapter 6 made a first picture about the nature of the critical factors, their impact and a potential classification of them. It was stated that there could be two levels of critical factors, i.e. primary and secondary critical factors.

According to the data of the pilot case study, value and risk were defined as the primary critical factors. These two factors would define the specific relationship that the organisation should develop with each supplier and stakeholder at a process level.

On the other hand, the 12 critical factors deduced in chapter 5 would be the so-called secondary critical factors. These factors would define the openness of the organisation and its readiness for collaboration.

After carrying out all the five case studies, new findings and conclusions are proposed concerning the critical factors. It was found that actually there are two families of critical factors. However, the effect of these two families is quite different from that noticed in the pilot case study. This is the description of each of these critical factor groups:

- Value/risk critical factors: These two critical factors were identified during the pilot case study. The rest of the case studies confirmed their validity. These factors will determine the desirable relationships of the organisation, i.e., the relationships that any company should develop in order to maximise the efficiency of the external linkages. Thus, the nature of these critical factors is normative as they define what the organisation ***should*** do.
- The group of 12 critical factors: This set of critical factors was the outcome of a deductive process that started with the review of the work of 15 authors and a total of 91 critical factors. A theoretical deductive process and a focus group activity grouped these 91 critical factors into 12 main factors (see chapter 5 for more details).

  These 12 critical factors were found to be responsible of the definition of the collaborative openness of the organisations in the pilot case study. However, both the questionnaire and the semi-structure interviews carried out in the five case studies highlighted that these critical factors show whether the organisation ***can*** collaborate or not.

  Although the value and risk involved in one relationship suggest collaborating with one organisation, these 12 critical factors will finally define whether this collaboration relationship is viable or not.

  For example, the value and the risk perceived by Metagra from the steel supplier suggest maintaining a collaborative relationship between them. However, the large size and the

aggressiveness of the supplier (i.e. critical factor: behaviour and relationship of other org.) did not make possible these two organisations two collaborate. Negotiating power of the supplier was more important than the potential benefits of the collaboration for the supplier.

Similarly, both value and risk were high for Metagra in the transactions with most of the customers such as Renault, PSA, and so on. According to these factors Metagra should collaborate with the key customers. However, Metagra's product was a 'product C' for the customers, it was very easy to substitute and it was not critical at all (fixing elements). Thus, the product type did not allow Metagra to collaborate with its customers because they were not interested in making any effort to collaborate with this kind of supplier/product.

At this point, the author would like to refer to section 6.4.1 of this study. This section analysed the relationship between value, risk and power concepts (Martinez, 2003; Cox, 1997, 1999, 2004; Cousins, Lamming et al., 2004). After carrying out all the case studies, the author considers that the decision taken about integrating power factor into value and risk factors was appropriate. In future research, this factor (i.e. power) could be independently analysed. In this case, the author suggests that power factor should be grouped with the rest of 12 factors, because the case studies showed that power factor within supply chains define whether the organisation **can** or **cannot** develop certain levels of relationships.

As a conclusion of this *section b*, the case studies allowed the author to distinguish between the factors that define what the organisation **should** do, and the factors that define what the organisation **can** do. These two groups should be considered to study the effectiveness of the relationships of any organisation.

c) *Current collaboration practice of the cases*

Some of the cases analysed showed that there are still organisations that do not distinguish between their core-competences and their secondary activities. Both Domusa and BOST were vertically integrated, the degree of outsourcing was low. The data gathered in the study of these two organisations highlighted that these two organisations do not manage the performance of the company according to their core-competences.

As a result, they still carry out many activities and operations that might be outsourced. Both the traditional nature and the little collaborative culture of the organisations might be the

responsible of this issue. It was found that there is direct relationship between the degree of vertical integration of the organisation and its attitude to collaborate with external entities.

On the other hand, Goizper, ONA and Metagra showed that while they dedicate all their effort to their core-competences, the secondary activities are outsourced through different relationship levels according to the nature of the transactions.

These case studies also provided evidence of the dynamic nature of relationships. It was found that inter-organisational relationships are constantly changing, and they are evolving depending on the actual needs of both organisations involved in the relationship. New relationships are created or existent ones are modified because of the launching of new projects, the requirement of new competences, and so on. External relationships should be considered to be in constant evolution and should be modified according to the particular requirements of the organisation.

For example, the relationship between Metagra and Renault changes quite often because the purchasing managers of Renault are replaced every two years. Every new manager has his/her own pattern of relationships and Metagra has to adapt to this new situation.

Goizper is planning to tie the relationship with its most important plastic supplier and to carry out an 'in-house' project. This relationship will shortly evolve from co-ordination to collaboration. Goizper is also planning to deal with new markets such as the bioengineering sector. This new project will force Goizper to search for new collaborating organisations that will provide the competences required for this market.

The current relationships of the organisations involved in the case studies showed that the 'soft' issues between the organisations are more important than the 'hard' linkages, as it was described when validating the sub-model #2. It was stated that the first contact between the organisation is done through 'soft' issues, such as trust, commitment, cultural affinity, similar objectives and so on. These cases showed that sharing 'soft' issues is the first step towards a healthy relationship. Thus, 'hard' linkages such as EDI, extranets, common ERP or PMS are considered to be secondary developments, and not necessary in all the cases. In other words, it can be highlighted that two organisations that are sharing 'soft' issues could be collaborating without any 'hard' system.

As a conclusion, the implementation of sub-model #2 of this study is seen to be additional, although it is strongly recommended by the literature for a more efficient relationship.

The cross-case analysis showed that each organisation has its own relationship requirements. These requirements are unique and not repeatable, thus, it is very hard to generalise a common collaborative behaviour for all the organisations. Each company will need an exclusive study of its own characteristics.

d) *Behaviour of the business processes under different conditions*

It was presented in chapter 2 that this study was going to focus on the business processes of the organisations. The theory building process was also aware of the requirements of the business processes, and so was the theory testing stage of the research. As a consequence, interesting findings were identified during the data analysis of the case studies.

The value/risk diagrams gathered valuable information concerning the business processes, their behaviour and the relationship between these processes and the suppliers/stakeholders.

It was stated during the pilot case study that there was a considerable misunderstanding concerning the manage processes of the organisation. Rather than distinguishing between different manage processes, the organisation involved in the pilot case only considered that there was one manage process. The following case studies also showed that these organisations neither had much knowledge about these processes. The interviewees used to talk about management in general, not about specific processes of management. Thus, it was found that knowledge around operate processes was considerably higher than around manage processes.

Despite this lack of understanding of the concept of manage processes, the interviews highlighted that there was a certain degree of interaction between the process of management and the operate processes of the organisation from the perspective of external relationships. This finding was first stated during the pilot case study, and the rest of the case studies confirmed it.

When there was a certain relationship level between the organisation and any supplier/stakeholder at operate processes, it was found that this interaction was also spread to manage processes. Thus, collaboration at management process was much easier when the organisations were collaborating at operate processes. This conclusion is also strengthen by literature when it is said that relationships are first arranged at an operational level, then at a tactical level, and finally, at a strategic level (i.e. management).

The cross-case analysis of the value/risk diagrams provided interesting conclusions about operate processes. It was stated that the interaction between the organisations and their suppliers is basically carried out at product development and order fulfilment processes. The value and risk involved in these two processes, and the relationship levels required are considerably higher than in demand generation and product support processes.

It can be concluded that both product development and order fulfilment processes will be critical for an organisation and its key suppliers.

On the other hand, the relationship between the organisations and their stakeholders also showed some specific characteristics. The highest value and risk involved in the relationships were perceived at demand generation and product development processes. The importance of the relationship at product support was medium, whereas order fulfilment process had low relevance for the transaction between the organisations and their stakeholders.

The interaction between the organisations and the stakeholder will be especially relevant at demand generation and product development processes.

From these findings it is stated that product development process is highly important for both suppliers' and stakeholders' perspectives. It can be deduced that the organisations consider necessary to jointly develop new products, i.e. concurrent engineering.

Analysing the information of all the value/risk diagrams of the cross-case analysis, an important statement can be done:

> *The higher the value and the risk involved in the transaction, the higher the requirement for a higher relationship level, and vice versa.*

In most cases, the right top corner of the value/risk diagram will involve a closer relationship level than the left down corner.

This conclusion and the specific information of each value/risk diagram of the cross-case analysis allowed the author inducing a pattern of desirable relationships for each operate process and supplier/stakeholder perspective. These desirable relationships will vary depending on the value and the risk involved in the transaction. The patterns of desirable relationships built from the cross-case analysis will be useful for identifying the desirable relationships between any organisation and its suppliers/stakeholders depending on the value and risk for each operate process.

Figure 7.48 shows all the 8 patterns of desirable relationships of the conceptual model. One of the aims of this theory testing stage was to define the right location of the boundaries

between the relationship levels depending of the value/risk scores. The cross-case analysis provided the information required to this end. The information given by the relationships and their distribution in the value/risk diagrams enabled the author to induce the configuration of the areas for each desirable relationship.

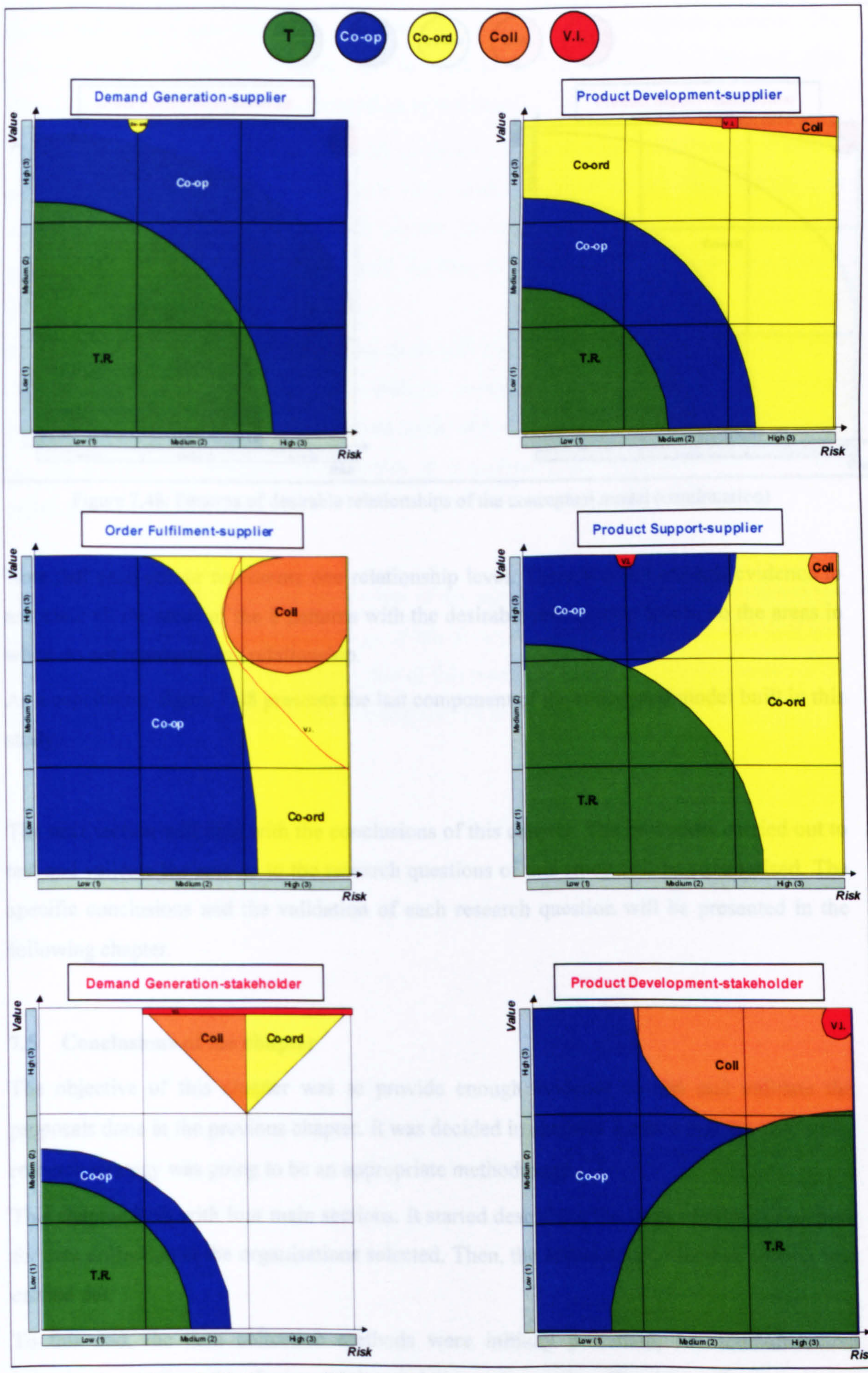


Figure 7.48: Patterns of desirable relationships of the conceptual model

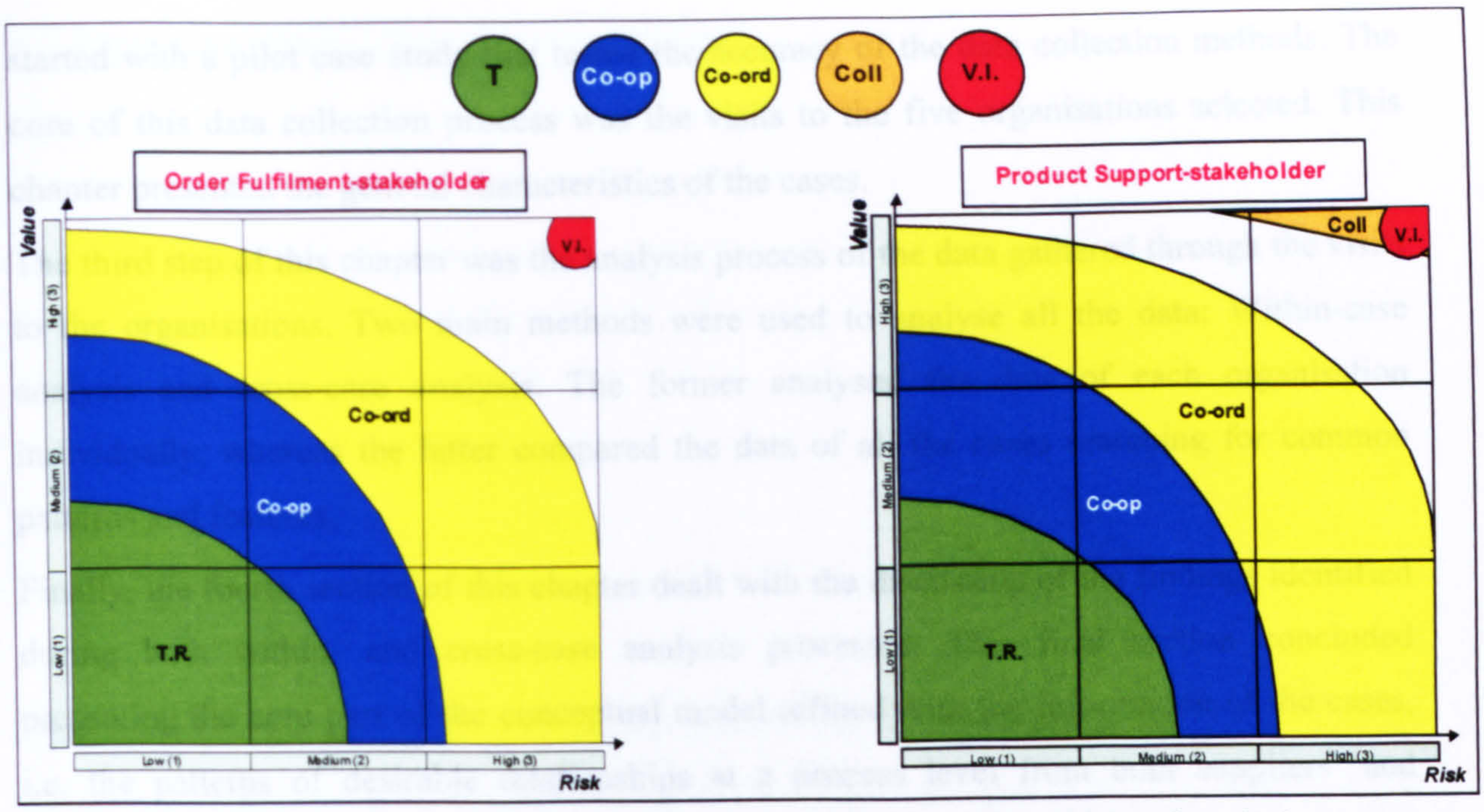


Figure 7.48: Patterns of desirable relationships of the conceptual model (continuation)

Note that each colour represents one relationship level. There was not enough evidence to associate all the areas of the 8 patterns with the desirable relationship levels, so the areas in white do not represent any relationship.

As a conclusion, figure 7.48 presents the last component of the conceptual model built in this study.

The next section will deal with the conclusions of this chapter. The procedure carried out to test and validate the answer to the research questions of this study will be summarised. The specific conclusions and the validation of each research question will be presented in the following chapter.

7.5 Conclusions of the chapter

The objective of this chapter was to provide enough evidence to test and validate the proposals done in the previous chapter. It was decided in chapters 3 and 4 that the case study research strategy was going to be an appropriate methodology.

This chapter dealt with four main sections. It started describing the steps required to prepare for data collection at the organisations selected. Then, the actual data collection process was carried out.

To this end, the data collection methods were initially presented, i.e. semi-structured interviews, questionnaire, documentation and direct observation. The data collection process

started with a pilot case study that tested the accuracy of the data collection methods. The core of this data collection process was the visits to the five organisations selected. This chapter presented the general characteristics of the cases.

The third step of this chapter was the analysis process of the data gathered through the visits to the organisations. Two main methods were used to analyse all the data: Within-case analysis and cross-case analysis. The former analysed the data of each organisation individually, whereas the latter compared the data of all the cases searching for common patterns and features.

Finally, the fourth section of this chapter dealt with the discussion of the findings identified during both within- and cross-case analysis processes. This final section concluded presenting the core part of the conceptual model refined with the information of the cases, i.e. the patterns of desirable relationships at a process level from both suppliers' and stakeholders' perspectives.

The next chapter will cope with the review of the answers to the research questions of this study and their linkage with the findings of this theory testing chapter. It will also deal with the contribution to knowledge and practice of this research, and finally the limitations of the study and the suggestions for future research will be presented.

8. DISCUSSIONS AND CONCLUSIONS

Chapter 8 will first summarise the research process and its different stages. So far, chapter 2 presented the general review of the literature in the field. An empirical study carried out in 10 organisations was also described, and the research questions of this study were defined from these two sources. Chapter 3 and 4 dealt with the appropriate research methodology and the specific research design that would best meet the characteristics and requirements of these research questions.

Chapter 5 and 6 aimed to search for an answer to the research questions of the study. To this end, chapter 5 coped with the research questions that needed a thorough specific literature review for their resolution. On the other hand, chapter 6 dealt with the theory building stage. The main outcome was the development of a new construct for optimisation of relationships.

Chapter 7 presented the theory testing process carried out through a set of case studies. The objective of this stage was to test and validate the answers given to the research questions in the previous two chapters. Hence, relevant findings were identified in this chapter and the first steps toward the validation of the proposals of chapters 5 and 6 were done. The validation of the research questions will be further described in this chapter 8.

Then, it will present both the final answer to the research questions and its validation. This chapter will also describe the contribution to knowledge and practice of this study. The final conceptual model for the optimisation of relationships will be presented in the following section. Chapter 8 will finish with the description of the limitations of the study, the guidelines for further research and a reflection from the author on the whole research process.

8.1 Summary of the research

Chapter 1 started off with the background to supply chain management and collaboration. It moved onto the current research explaining briefly the gap identified for this research, i.e. "there was very little solid research evidence that illustrates the desirable external relationships for organisations". The rest of this chapter explained the structure of this thesis.

The second chapter presented the scope of the literature review required to deal with the field of the research. It followed with a review on each of the following:

- The evolution of supply chain management: The origins of supply chain management were reviewed in this section. Also the transformation suffered during the years and the different approaches were analysed from a historical perspective.
- Definition and key characteristics of supply chain management: The definitions found in the literature, the main advantages and pitfalls of this practice, and the different approaches of the supply chain management were described.
- The SCOR model: The Supply Chain Operations Reference model was analysed in this section. The structure, content and aims of the reference model were described. The SCOR model was presented during the theory building stage.
- Definition and key characteristics of the collaboration practice: It reviewed the definitions given by different authors, the advantages and pitfalls, and also the process of building a collaborative relationship.

Chapter 2 also highlighted the findings of the general literature review and identified the problems that this research would deal with. These problems were supported by an empirical study. The results of both the general literature review and the empirical study allowed defining the research questions and the objectives of this study as follows:

Prop.1 – To agree a portfolio of generic inter-organisational relationships *(RQ1)*.

Prop.2 – To define the characteristics that make each collaboration level different *(RQ2)*.

Prop.3 – To identify the critical factors that make possible to develop one certain collaboration level *(RQ3)*.

Prop.4.1 – To analyse the features of business processes in a collaborative environment *(RQ4)*.

Prop.4.2 – To design the desirable relationships depending on the critical factors *(RQ4)*.

Prop.4.3 – To build a model that graphically represents the desirable relationships and their characteristics *(RQ4)*.

Chapter 3 reviewed the research methodology paradigms and philosophies associated to management research as well as the research strategies available for this field. This third chapter ended presenting the justification of the research methodology adopted for this research, i.e. constructive research and case study research.

Chapter 4 went into more detail and presented the particular research design of this study. To this end, the characteristics of the research strategies were described and also the research techniques, such as the data collection and analysis methods. The quality criteria for the validation of this research were proposed as well.

The following chapters, i.e. chapter 5 and 6, coped with the theory building stage of this research. Chapter 5 dealt with the research questions that required a specific literature review and a deductive process, whereas the construction of the conceptual model was explained in chapter 6. Four main issues were analysed in chapter 5:

- Business processes: A classification of typical business process was proposed based on other business process models.
- Classification of relationship levels: An extended literature review was carried out and different approaches and classifications were identified. A final list of relationship levels was deduced.
- Characteristics of the relationships levels: Following the same research procedure as the previous section, the specific characteristics of each relationship level were identified.
- Critical factors: A wide literature review concerning the factors that influence the organisational relationship was carried out. An initial list of 91 factors was found in this process. This set of factors was reduced to 12 main critical factors through different stages of deduction and a focus group. Puttick's complexity/uncertainty approach was also adopted.

On the other hand, chapter 6 took these four variables and built a conceptual model for the optimisation of organisational relationships. These four variables were the input to the model, whereas the output of the model was the relationships that the organisation should develop at a process level depending on its complexity and uncertainty values (sub-model #1). The set of operational tools and systems that the organisation should implement for developing each type of relationship was another outcome of the model (sub-model #2).

The results of a pilot case study were also presented in chapter 6. These findings suggested building a new approach for the conceptual model focusing on value and risk parameters rather than on complexity and uncertainty.

Chapter 6 ended presenting a new partial construct for the conceptual model and highlighting the necessity for testing both approaches (i.e. complexity/uncertainty and value/risk) through case studies.

The theory testing stage of this study was presented in chapter 7. The case study research strategy selected in chapter 4 was implemented in this chapter. Three main sections were distinguished: Preparation for data collection at the organisation; data collection process; and the data analysis process.

Five organisations were selected and presented in this chapter. The data gathered in these organisations was analysed from two perspectives: First, a within-case analysis of each organisation was carried out, and secondly, a cross-case analysis comparing commonalities and differences between the cases was accomplished. Both the within- and the cross-case analysis used the following process of analysis:

a) Relationship type identification and categorisation.

b) Sub-model #1 – Complexity/Uncertainty approach.

c) Sub-model #1 – Value/Risk approach.

d) Sub-model #2 – Maturity level of tool implementation.

e) Comments & conclusions.

These sections of the within- and cross-case analysis highlighted some findings and conclusions concerning the organisational relationships and their characteristics at a process level. The information extracted from the case studies was also used for refining the conceptual model. As a result, value/risk approach was selected as the most accurate approach for the model.

This thesis will finish with the presentation and validation of the final answers to the research questions, the theoretical and practical contribution made by the research, and also with the limitations and proposal for further research. Chapter 8 will tackle these issue. Finally, chapter 9 will analyse the quality of the research according to the quality criteria defined in chapter 4.

Figure 8.1 presents a flow-chart of the whole research process described in this section.

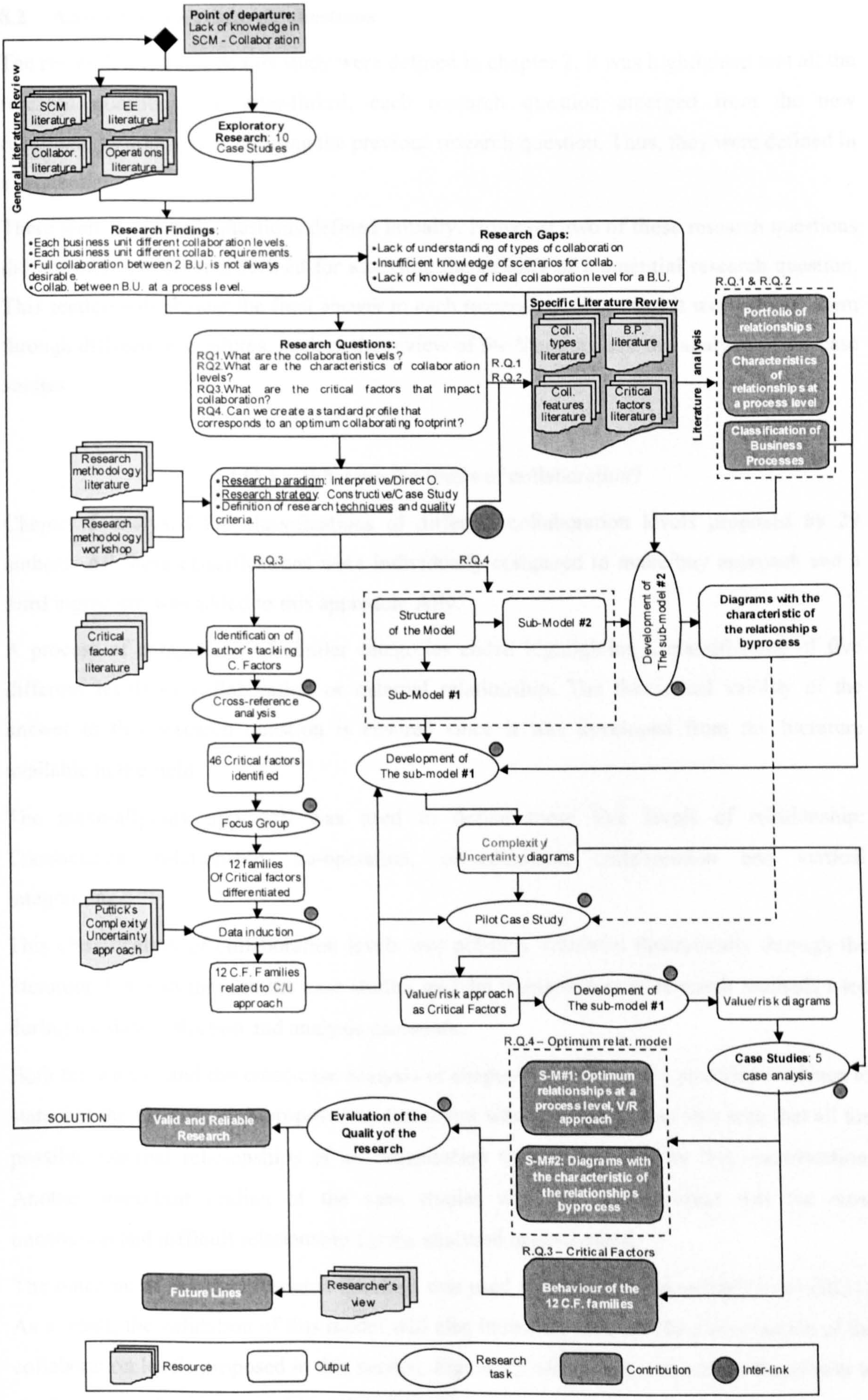


Figure 8.1: Flow-chart of the research process

8.2 Answer to the research questions

The research questions of this study were defined in chapter 2. It was highlighted that all the research questions are inter-linked, each research question emerged from the new requirements arisen after defining the previous research question. Thus, they were defined in a sequential order.

There were 6 research questions defined initially. However, two of these research questions did not meet the criteria defined for assessing the validity of a potential research question. This section will present the final answer to each research question and it will validate them through different procedures, such as the review of the literature and the analysis of the case studies.

R.Q.1 – What are the levels of collaboration?

Chapter 5 analysed the classifications of different collaboration levels proposed by 29 authors. All these classifications were individually compared to make/buy approach and a third ingredient was added to this approach: Ally.

A process of comparison of similar categories ended highlighting a classification of five different levels of collaboration or external relationship. The theoretical validity of the answer to this research question is ensured since it was developed from the literature available in the field.

The make-ally-buy approach was used to define these five levels of relationship: Transactional relationship, co-operation, co-ordination, collaboration and vertical integration.

This classification of collaboration levels was not only validated theoretically through the literature, but also through the case studies and the triangulation of research methods used during the data collection and analysis processes.

Both the within- and the cross-case analysis of chapter 7 (sections 'a') provided evidence to state that the classification proposed by the author was accurate. It was also seen that all the possible external relationships of an organisation were considered by this classification. Another important finding of the case studies was that collaboration was the most uncommon and difficult relationship for the analysed organisations.

The outcome of this first research question was used to build the conceptual model (RQ4). As a result, the validation of this model will also indirectly validate the classification of the collaboration levels proposed in this section. Figure 8.2 shows the summary of the answer to the first research question and its validation.

The specific literature review presented in chapter 5, section 5.2 supported theoretically the validity of the classification of collaboration levels. Moreover, the section 1 of the questionnaire used in the case studies also confirmed that all the potential relationship types were considered by this classification. Both the within- and the cross-case analysed presented valuable information about the importance of these relationships levels for the organisations involved. Finally, the validation of the conceptual model of the RQ4 also validates the classification of collaboration levels, as it is used as an input.

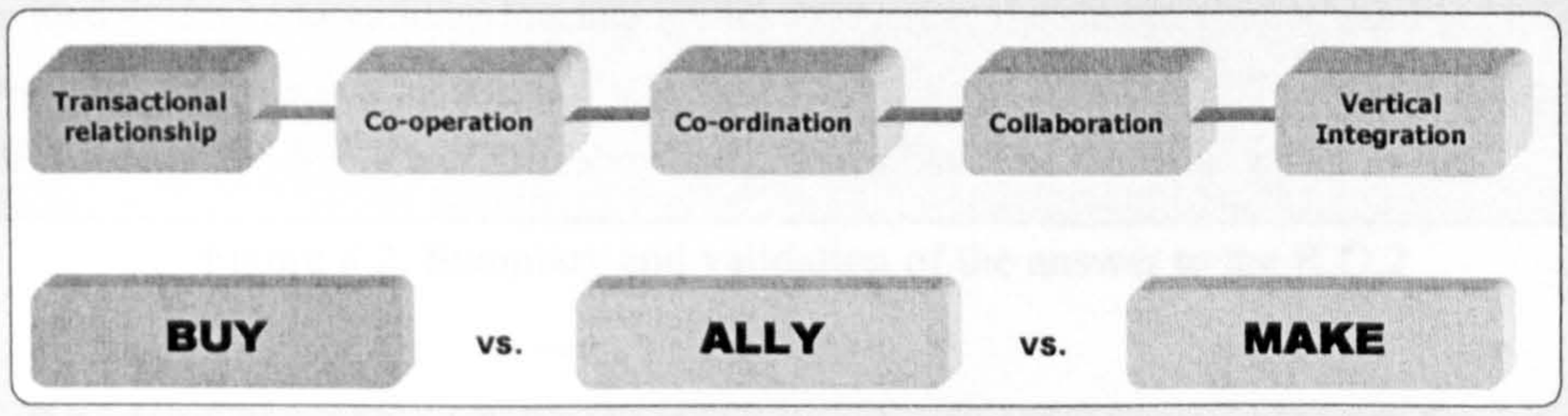


Figure 8.1: Summary and validation of the answer to the R.Q.1

R.Q.2 – What are the characteristics of each level?

The second research question emerged in chapter 2 as a consequence of the definition of the first research question. RQ1 provided the different relationship levels available. However, there was not any theoretical way of distinguishing between the relationship types, i.e. the specific characteristics of each relationship level were unknown.

The research process for answering this second research question was very similar to the previous question. Initially, a detailed specific literature review was presented in chapter 5, section 5.3. From that different characteristics for each relationship level proposed by several authors were reviewed. Tables 5.7, 5.8, 5.9 and 5.10 showed the final characteristics of the relationship levels after carrying out different deductive and cross-reference analysis methods. Theoretical validation was fulfilled through the support of the literature to the final outcome and also through the consistent research process carried out.

The output of this research question was used to build the sub-model #2 of the conceptual model. This sub-model was tested through the case studies, section 3 of the questionnaire. A maturity level checklist was designed for testing the accuracy of the sub-model #2. The data processed in the within- and cross-case analysis processes highlighted the validity of the sub-model #2, and as a conclusion the characteristics of the relationship level were also accepted.

The final validation of the conceptual model will indirectly provide more evidence to state the accuracy of the answer to the second research question, in a similar way to the previous research question.

Figure 8.3 shows the summary of the evidence that validates the answer to the second research question.

> The specific literature review presented in chapter 5, section 5.3 supported theoretically the characteristics of the collaboration levels. These characteristics were used to build the sub-model #2 of the conceptual model. Section 3 of the questionnaire used during the case studies provided evidence to validate this sub-model #2. Hence, the characteristics used to build this sub-model were also validated, and as a result the answer to the second research question as well. Tables 5.7, 5.8, 5.9 and 5.10 show the characteristics of the relationship levels.

Figure 8.2: Summary and validation of the answer to the R.Q.2

R.Q.3 – What are the critical factors of a company that determine its collaborative profile?

The empirical study presented in chapter 2 section 2.2 showed that there are some factors related to any organisation that influence the external relationships, what relationship level to develop and when. This third research question was defined as a result of this finding.

To answer this third research question the author reviewed the work of 15 authors that proposed a total of 91 potential critical factors. Different deductive activities reduced this list to 41 factors. A focus group was arranged to analyse the validity of these critical factors and finally all these factors were grouped under 12 main critical factors. The focus group also suggested to use the complexity and uncertainty factors proposed by Puttick's reference model.

The application of an initial pilot case study (chapter 6, section 6.3) showed that both value and risk of the transaction might also be relevant critical factors. Thus, both complexity/uncertainty and value/risk approaches were tested through the case studies.

Sections 2 and 4 of the questionnaire (chapter 7) were used to analyse the validity of these two approaches. Both the within- and the cross-case analysis showed that the value/risk critical factors are more relevant for the definition of desirable relationships.

The case studies also confirmed that although value and risk factors define the desirable relationships, there are other factors that actually enable and/or constraint developing these relationships. It was deduced from the analysis of the cases (chapter 7, sections 'e' of the within- and cross-case analysis) that the 12 critical factors defined in the focus group were these factors. Table 5.16 presented the 12 critical factors deduced in the focus group.

Figure 8.3 represents the deduction process carried out in order to answer this research question.

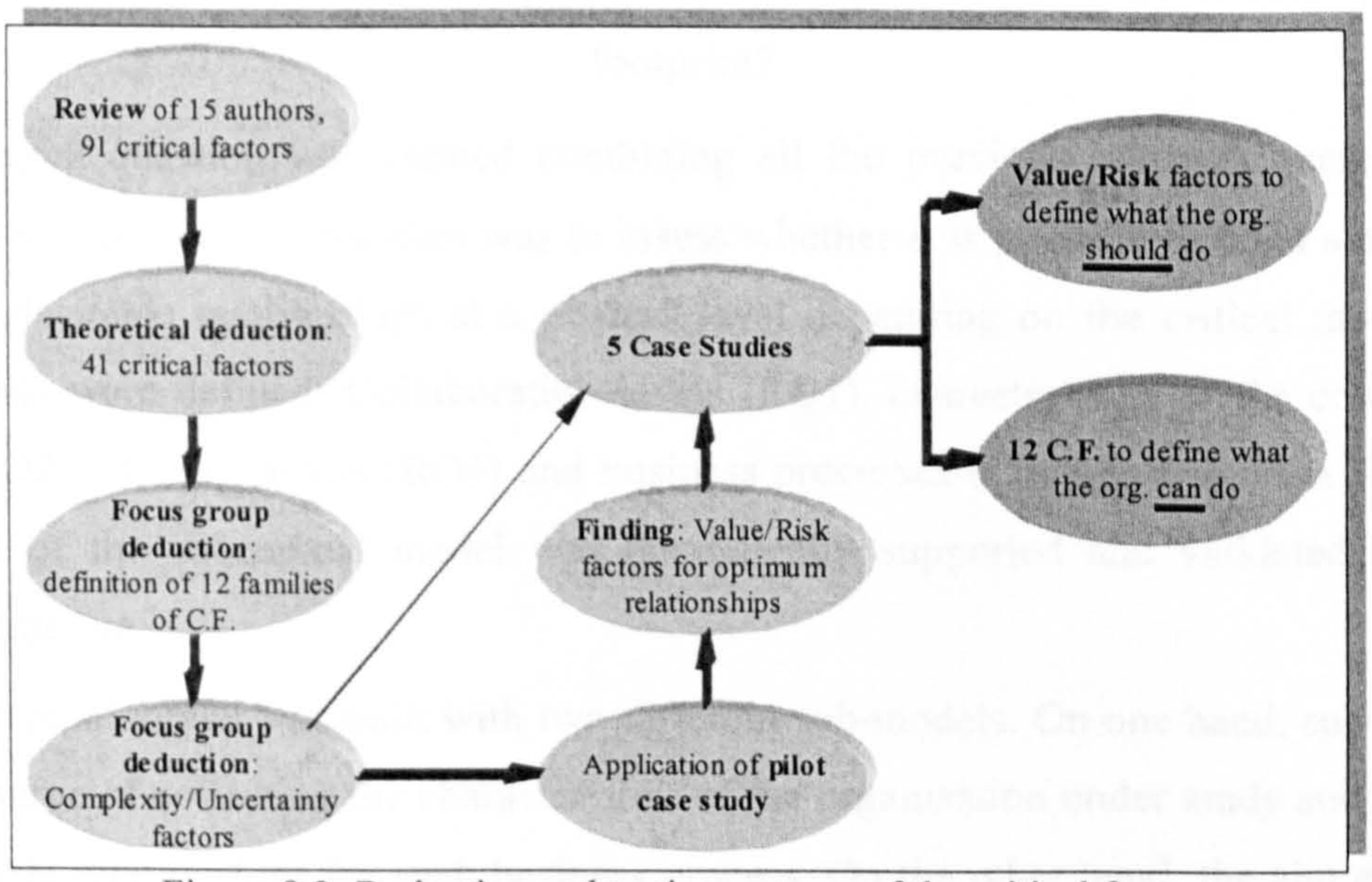


Figure 8.3: Deduction and testing process of the critical factors

Figure 8.4 shows the summary of the validation process for the answer to the third research question. It also includes the structure of the critical factors.

The specific literature review presented in chapter 5, section 5.4 supported theoretically the validity of the critical factors. The theoretical deduction process and the focus group provided consistency to the research. Sections 2 and 4 of the questionnaire were in charge of testing the critical factors proposed by this author. Both the within- and the cross-case analysis provided information that validated the value/risk approach. The 12 critical factors were found to be the factors that define what the organisation **can** do, whereas value and risk defines what the company **should** do. Finally, the validation of the conceptual model of the RQ4 will also indirectly validate the critical factors, as they are used as an input for the model.

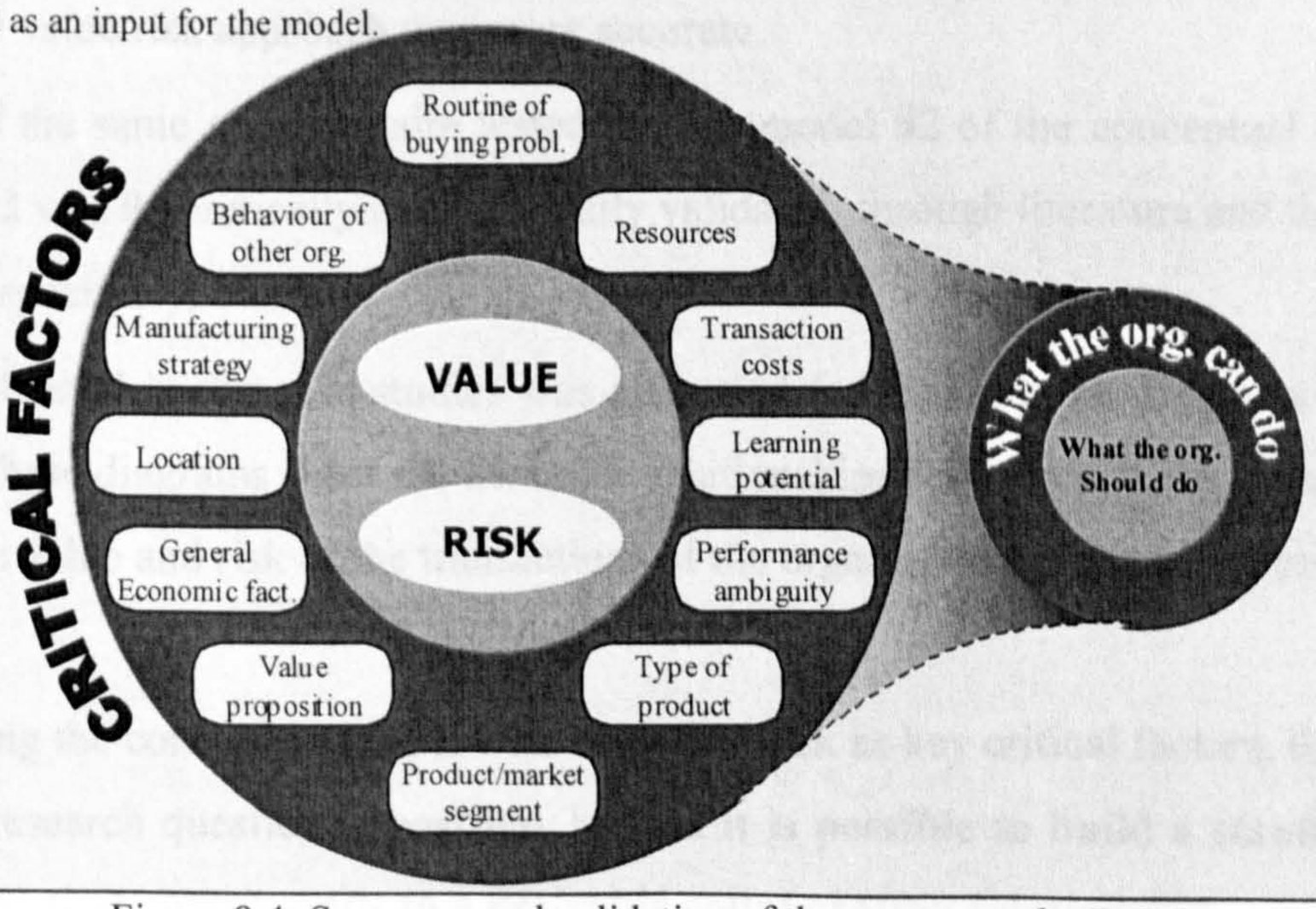


Figure 8.4: Summary and validation of the answer to the R.Q.3

R.Q.4 – Can we create a standard profile that corresponds to a desirable collaborating footprint?

This research question was created combining all the previous research questions. The objective of this research question was to assess whether it is possible to build a model that proposes desirable relationships at a process level depending on the critical factors. Four main inputs were defined: Collaboration levels (RQ1), characteristics of the collaboration levels (RQ2), critical factors (RQ3) and business processes (Chapter 5, section 5.1). Thus, the input of the conceptual model was theoretically supported and validated as it was described before.

The conceptual model was built with two different sub-models. On one hand, sub-model #1 was in charge of collecting the characteristics of the organisation under study and providing its desirable relationships for each business process. On the other hand, the aim of the sub-model #2 was to define the operational practices that the organisation should implement in order to efficiently develop and maintain these desirable relationships.

Two approaches were built and tested for the model throughout the case studies, one with complexity/uncertainty as critical factors, and the second approach with value/risk as the main factors. This second approach was built as a consequence of the findings of the pilot case study.

Sections 2,4 and 5 of the questionnaire were focused on testing and validating the sub-model #1 of both approaches. Reliability of the results was ensured through the triangulation of methods during the case studies. The within- and cross-case analysis provided evidence to state that the value/risk approach was more accurate.

Section 3 of the same questionnaire tested the sub-model #2 of the conceptual model. The sub-model #2 was theoretically and practically validated, through literature and the data from section 3, respectively.

The data collected in the case studies was also used for building the diagrams of the sub-model #1. These diagrams show the desirable relationships for each process according to the scores of the value and risk of the transactions of the organisation. Figure 7.48 presents these diagrams.

After building the conceptual model with value and risk as key critical factors, the answer to this fourth research question is **positive. Indeed it is possible to build a standard profile (Figure 7.48) that corresponds to a desirable collaborating relationship.**

Figure 8.5 shows the summary of the answer to this research question.

The conceptual model built was based on four main theoretically validated concepts: Collaboration levels (RQ1), characteristics of collaboration levels (RQ3), critical factors (RQ3) and business processes (Chapter 5, section 5.1). Two sub-models were distinguished in this model: Sub-model #1 was validated through the sections 2, 4 and 5 of the questionnaire, whereas sub-model #2 was validated through the data gathered in the section 3. Triangulation of methods in the case studies provided construct validity to the results.

The cross-case analysis was also used for building the diagrams of the optimum relationships of the sub-model #1 (Figure 7.48). The answer to this research question is positive, i.e. it is possible to create a model that provides optimum collaborative relationships.

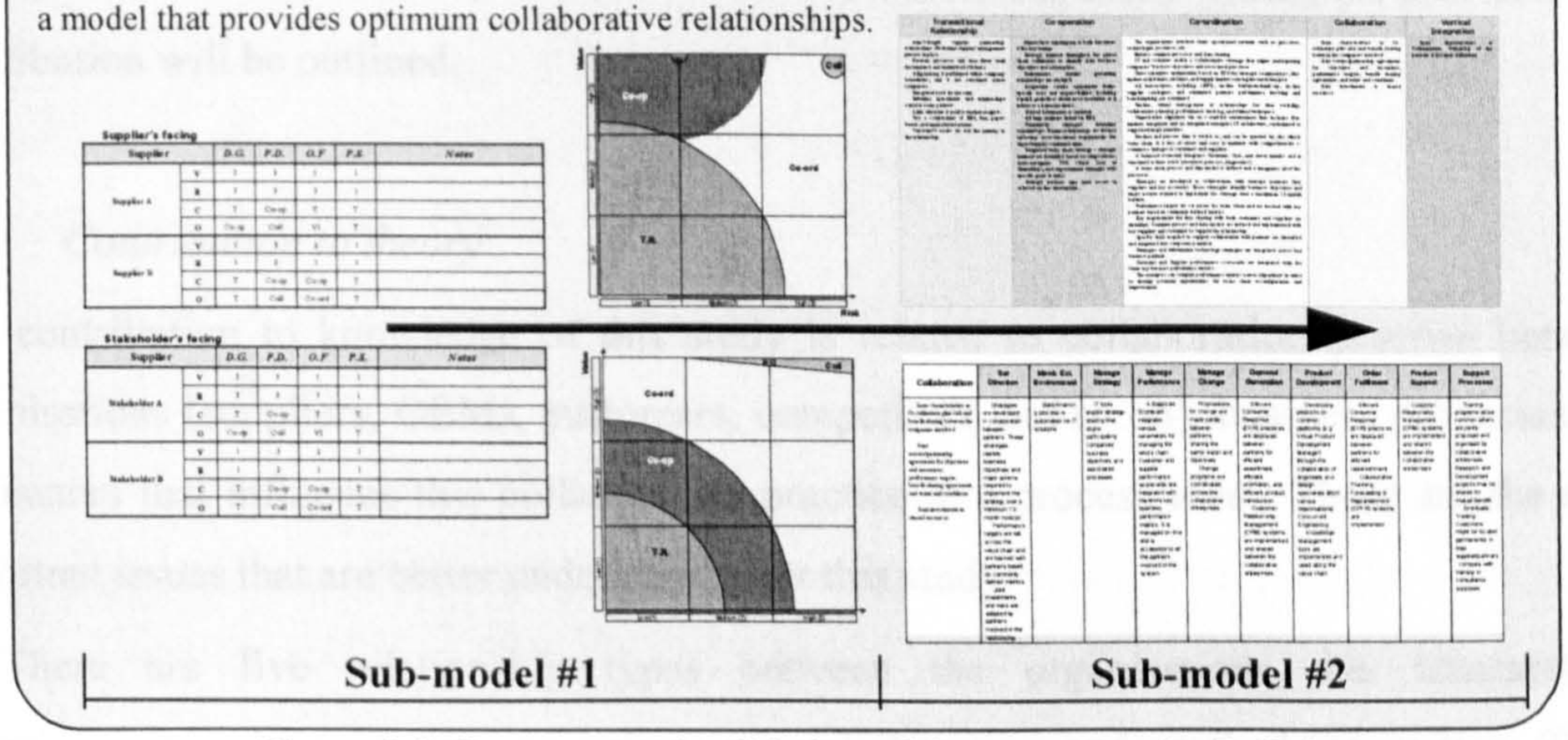


Figure 8.5: Summary and validation of the answer to the R.Q.4

This section has dealt with the answers to the research questions and this validation. In order to ensure the quality of the research, the contribution of this study to theory and practice will be analysed in the following section. The theoretical and practical contribution of the research was one of the quality criteria defined in chapter 4.

8.3 Theoretical and practical contribution of the research

Constructive research and case study research were the research strategies selected for this study in chapter 4. When analysing the characteristics of constructive research in section 4.2.1, figure 4.2 showed that one of the key elements of this research strategy was the contribution to theory.

Chapter 4 also dealt with the quality criteria suitable for each of these two research strategies. These criteria were presented in table 4.6 at the end of chapter 4. Authors such as Kasanen et al. (1993), Lanning (2001), Martinez (2003) and Mendibil (2003) highlighted that constructive research should provide practical relevance, practical utility and also theoretical novelty.

Table 4.6 also presented that case study research should contribute to knowledge according to Yin (2003), Easterby-Smith et al. (2002), Eisenhardt (1989), Kasanen et al. (2003), Stake (1995) and Meredith (1998), among others.

It is deduced from these two statements that contribution to theory (*Theoretical novelty; contribution to knowledge*) and contribution to practice (*Practical relevance; practical utility*) are highly important for this research. These authors also highlighted that contribution to knowledge is *the most important criterion for a PhD research.*

This section will first deal with the contribution to theory of this study. It will tackle the key issues, which are known now and were not known before this study. Then, the practical new contribution will be outlined.

8.3.1 Contribution to theory

The contribution to knowledge of this study is related to collaboration practice between organisations (suppliers, OEMs, customers, competitors and so on), business processes and the factors that influence this collaboration practice at a process level. These are the most important issues that are better understood after this study:

- There are five relationship types between the organisations, i.e. transactional relationship, co-operation, co-ordination, collaboration and vertical integration. These new portfolio of relationships (RQ1, chapter 5, section 5.2) is proposed by this study.
- Each of the relationship level proposed has a set of strategic, tactical and operational, 'hard' and 'soft' characteristics. These characteristics allow distinguishing between the five relationship levels. Tables 5.7, 5.8, 5.9 and 5.10 show all the characteristics (RQ2, chapter 5, section 5.3).
- A group of 12 critical factors that influence the development of new external relationships is provided by this study. These factors define what relationship the organisation **can** and **cannot** develop. Value and risk factors are also highlighted by this study, as factors that define what relationships the company **should** develop (RQ3, chapter 5, section 5.4; chapter 7, section 7.4).
- The behaviour of the external relationships of the organisations at a process level is provided according to the value and risk associated. This thesis suggests that value and risk allow determining the desirable characteristics of an efficient relationship. This way, it was highlighted that both product development and order fulfilment processes involve high value and risk with the supplier. Close relationships were required for these cases.

  Product development and demand generation required close relationships with the stakeholders due to the high value and risk associated to the typical transactions (RQ4, chapter 7, section 7.4).

- This study proposed the operational practices such as tools, methodologies and systems that any organisation should implement to develop certain relationship types at a process level (RQ4, chapter 6, sections 6.1.3 and 6.1.3.1 and appendix C).
- The conceptual model provided 8 patterns of desirable relationships (Figure 7.48) depending on the value and the risk related to the transaction between the organisation and the suppliers/stakeholders. Four of these 8 patterns showed the desirable relationships for the operate processes from the perspective of the suppliers, whereas the rest of the patterns did the same from the perspective of the stakeholders (RQ4, chapter 7, section 7.4, figure 7.48).

8.3.2 Contribution to practice

This study also contributed to practice by proposing a model that facilitates organisations and their managers to better understand the most suitable external relationships for them and the procedure for achieving this desired scenario. These are the most relevant practical issues:

- Organisations have a better understanding of the influence that their characteristics and the environment (i.e. critical factors) have over their external relationships. This way, the analysis of the critical factors of this study provides details concerning what relationships the organisations can or cannot develop, and also they should or should not develop.
- The conceptual model provides an easy and effective tool to assess the value and the risk perceived from the suppliers and the stakeholders at a business process level.
- The conceptual model helps identifying the desirable relationships between the organisation and the suppliers/stakeholders depending on the value and risk of the transaction at a business process level.
- Organisations can gain an initial idea about the operational systems that should be implemented to develop these desirable relationships and to make them more efficient.

8.4 The conceptual model for the optimisation of external relationships

Once that the conceptual model has been built, tested, refined and finally validated, it is time to briefly present the final model proposed by this study, including its parts, functionality and instructions as a tool for organisations.

As it was described it previous chapters, the conceptual model for relationship optimisation has three main sections:

1. *Value/risk scoring matrix:* The first step of the conceptual model is to gather some data required to feed the model. This data will be focused on the relationship between the organisation and the suppliers/stakeholders involved in the optimisation process. This way, three main measures will be scored for each supplier/stakeholder: The value perceived in the transaction, the risk associated to the transaction, and finally the current relationship level.

   This matrix will allow the organisation to gain a better understanding of the nature of its external relationships because all the desired relationships would be represented and analysed. Table 8.1 shows the structure of the matrix for scoring the value and risk associated to the suppliers/stakeholders.

Table 8.1: Matrix for value/risk scoring

Supplier/Stakeholder			D.G.	P.D.	O.F.	P.S.
a	Plastinka	V	1	3	3	1
		R	1	1	3	1
		C	T	Co-op	Co-ord	T
b	Urola	V	1	2	3	1
		R	1	2	3	1
		C	T	Co-op	Co-ord	T
c	Portuguese Molding	V	1	3	3	1
		R	1	2	2	1
		C	T	Co-ord.	Co-ord.	T
d	Supplier C	V	1	1	1	1
		R	1	1	1	1
		C	T	T	Co-op	T
e	Olaker	V	1	3	2	3
		R	1	2	2	1
		C	T	V.I.	V.I.	V.I.

2. *Value/risk diagrams for relationship optimisation:* 8 patterns of desirable relationships were built from the data gathered in the case studies. There are four diagrams for the operate processes related to the suppliers, and other four for the stakeholders. Each of these diagrams will define the desirable relationship level (i.e. transactional relationship, co-operation, co-ordination, collaboration or vertical integration) according to the value and risk scores collected in the previous matrix (table 8.1) for each supplier/stakeholder at an operate process level.

   Thus, the second step of the conceptual model will be to feed the 8 diagrams with the scores collected in the value/risk scoring matrix. The output of this second step will be a set of desirable relationships. Figure 7.48 shows the 8 diagrams or patterns.

3. *Matrix for operational tool implementation:* While the previous two steps collected the data from the organisation and defined the desirable relationships, this last step of the model will describe the operational tools, methodologies and systems that the organisation should implement at a process level in order to efficiently meet the requirements defined by these desirable relationships. In other words, this matrix will describe what the organisation should do to migrate towards the desirable relationships defined by the previous diagrams.

   These matrixes are available in the appendix C at the end of this thesis.

As a conclusion, it can be highlighted that the conceptual model will not just be useful for the definition of desirable relationships, but to also:

(1) Map all the external relationships of the organisation and their nature,

(2) To describe what the organisation should both internally and externally do to meet these desirable relationships.

8.5 Limitations of the study

So far this study has dealt with the construction and validation of a set of proposals generated according to the requirements of the research questions. Although both theory and practice have supported these proposals and evidence has been provided to ensure the validation of them, it is irrefutable that there are some limitations for both the research and the conceptual model built.

This section first presents the limitations of the conceptual model and then it will describe the constraints of the research process.

8.5.1 Limitations of the conceptual model

There are some limitations associated to the conceptual model that should be defined in order to increase the quality of the results. Bounding the limitations of the conceptual model would make stronger the conceptual model, rather than weaker.

As it was presented in chapter 7, the core of the conceptual model (i.e. the patterns of desirable relationships. Figure 7.48) was built from the data gathered during the case studies. The characteristics of the organisations were specific:

- They were located in the same geographical area, i.e. Basque Country.
- All the organisations analysed are SMEs, i.e. the largest organisation has around 200 employees.

- The profile of all the organisations is similar, they all are industrial companies, thus, there is not any organisation performing in the 'service' sector.

As a consequence, the results provided by this research are extendible to organisations that meet these characteristics. Generalisability of the conclusions might seem difficult, however, the author states that there is no evidence to prohibit generalising the outcome of this research to other larger organisations, or in other geographical areas.

Concerning the profile of the organisations, sub-model #2 of the conceptual model was built to satisfy the requirements of mainly industrial organisations. For example, this sub-model suggests sharing CAD systems along the supply chain to maintain co-ordination relationship. It is obvious that an organisation offering consultancy service would not need any design tool.

The induction process carried out to build the patterns of desirable relationships was done from the data gathered in 5 organisations. Although there are many authors claiming that it is hardly difficult defining exactly the boundaries between the relationship levels, more organisations would be necessary to both confirm the limits depicted in the diagrams and analyse the areas in white that currently do not show any desirable relationship. This conclusion will be extended in the next section when analysing the limitations of the research.

The conceptual model deals with a purely 'soft' issue, i.e. organisational relationships. As a consequence, it is difficult to define a set of rules that controls the behaviour of these relationships according to a logic pattern. Thus, this conceptual model should be used as a guideline for the optimisation of relationships, and then each organisation should customise the configuration of these desirable relationships according to its specific requirements.

8.5.2 Limitations of the research

The overall research process had some limitations as well. This study had to be completed in the period required for a doctoral submission. Therefore, time was one of the constraints of the research. The model proposed was not possible to implement due to the limitation of time. The implementation of the model and the relational changes proposed require much time and effort, not viable for this PhD.

The number of organisations involved and accessibility to them was another limitation of the research. Access to the organisations was possible thanks to the personal contacts of the author and different managers of these organisations. It would have been difficult to approach an organisation without any reference or contact. However, as Yin (2003)

highlights five case studies was enough to validate the model proposed and also to accomplish theoretical replication (chapter 7, section 7.1.3) of the findings.

From the perspective of the research methodology, the subjectivity of some of the data collection methods could be another limitation of this research. As it is based on qualitative research and there is no any mathematic logic or equations within this research, some of the data collected could be biased. Although the structure and the protocol of the case studies were shared by all the cases, the responses to both the questionnaire and the semi-structured interview could be subjective. However, triangulation of methods and triangulation of data sources were some of the actions fulfilled in order to avoid or minimise this potential problem.

One last limitation of this research was the lack of experience of the author in doing research, specially conducting the case studies. This constrain was minimised through the theoretical training of the author and a highly valuable supervision of the research by the supervisor of the study. This limitation is common to most of the research carried out towards the degree of PhD.

8.6 Future research

Even though all the initial objectives of the study have been fulfilled and the four research questions have been answered, the author is convinced that there is still future work to do in the collaboration area, specifically with the conceptual model for optimising external relationships. These are some of the proposed suggestions for future research:

- The conceptual model proposed in this study should be implemented in a pilot organisation through action research. It would provide highly relevant data and its functionality would be better understood. The implementation of this model would require much time and the whole supply chain should be involved in the project.
- More case studies would provide more data to complete the lack of information of the white areas of the patterns of desirable relationships of the model (Figure 7.48). The more case studies carried out in the future, the more accurate the boundaries between the relationship types depicted in the patterns would be. A balance between the effort and time required and the advantages or improvements achieved should be assessed by the researcher.
- Automotive, machine tool, agriculture and boiler sector have been analysed throughout this study. Other sectors could be investigated to extend the results of the conceptual

model. Special effort could be done to adapt the conceptual model to sectors based on services.

- Sub-model #2 should be updated with more tools, methodologies and systems that are continually developed to improve the relationships within a supply chain. The implementation of this sub-model #2 would provide valuable information about the practical accuracy of the content.
- The behaviour of the second level of critical factors, the factors that define what the organisation can do should be further investigated. This research has been more focused on the first type of critical factors, i.e. value and risk. The influence of these two factors was completely analysed. However, the impact of the other 12 critical factors could need further study. Interaction between the factors, relationships between both levels of critical factors and their impact over the relationship should be investigated.
- The conceptual model deals with the operate processes of the organisation, i.e. demand generation, product development, order fulfilment and product support. Future research could be focused on extending the scope of the model to the rest of business processes, i.e. manage processes and support processes. However, the author found that the organisations studied lacked knowledge about manage processes, so it could be complicate to cope with these processes and include them in the conceptual model.
- During these study it was stated that external relationships play a key role in the success of the organisations. Thus, the author suggests to develop a specific performance measurement system that would assess the evolution of the main relationships of the organisation. Maintaining updated data related to the situation of the relationships would enable the organisation to have healthy relationships according to its objectives.

These were some of the future activities foreseen by the author as a conclusion of this study. It is obvious that the more this research field and questions are investigated, the more specific issues will arise.

Finally, next section will present some personal opinions of the author concerning his own experience throughout this research journey.

8.7 The research journey

This author got some interesting and valuable learning out of this three-year research experience. It was a challenging process for a beginner in research, but also highly enjoyable and enriching. Retrospectively, there are some issues that the author would have done in a different way.

The general literature review provided considerable amount of data that was relevant for this study. However, as the scope of the research was quite wide before defining the research questions of the study, it was found very difficult to process the data, categorise it and discard the unnecessary information. The author would like to suggest to anybody which is going to deal with a research process for the first time to carry out a systematic literature review (Franco and Bourne, 2003). This measure would make this literature review stage much more efficient and effective.

The empirical study carried out in the pre-understanding stage of this study played a key role in the definition of the research questions and the objectives. This process provided a practical view to both the research questions and objectives. This task is highly recommended to increase the validity of the research questions.

One of the most difficult issues for the author was to involve a set of organisations in this research for carrying out the case studies. It was found that organisations were not very interested in spending their time in such a theoretic work. Moreover, the availability of most of the managers was quite reduced, so, it was quite challenging to convince them to get involved in a meeting for some hours. One of the conclusions was that companies will not be completely convinced to participate in this kind of projects, as long as they do not get anything out of it for their own profit. As a conclusion, it is recommended to make or have some contacts to visit organisations and involve them in a case study.

It was noticed during these three years that supply chain management area, especially collaboration field will be one of the key areas in the near future. All the workshops and conferences attended showed that there are many researchers working in this area, and also there are many official projects funded by several public and private institutions trying to develop more knowledge on the field.

Finally, the author would like to highlight the importance of the supervision of the research in this PhD journey. The supervisor played a relevant role in this transferring important research skills.

Next chapter will assess the quality of this research process and its results. To this end, the quality criteria defined in chapter 4 will be reviewed and the activities of this study will be analysed according to these criteria.

9. EVALUATION OF THE QUALITY OF THE RESEARCH

Chapter 8 validated the answers given to the four research questions. However, there is still a link missing in the overall research: The evaluation of the quality of the research and its validation.

To this end, the quality criteria defined in chapter 4 will be taken and all the research process will be evaluated against these criteria. This chapter will start with a review of the criteria that will be used. Then, each criterion will be individually analysed against the different stages of the thesis. Once this comparison is done, the final validation of the research project will be discussed. This chapter will end highlighting the key steps and outcomes of the research.

9.1. Review of the quality criteria to be used

Most of the researchers highlight three main concepts that any research process should consider. *Generalisation* of the findings and conclusions to other areas, *validity* of the activities carried out and *reliability* of the research outcomes are considered to be the key issues for the quality of any research process (Rowley, 2002; Voss, Tsikriktsis et al., 2002; Yin, 2003). This research will also have to ensure that the right decisions have been made to guarantee the fulfilment of these three issues.

As presented in chapters 3 and 4, this research was based on two different research strategies, case study research and constructive research. As a result, the quality criteria associated to each of these strategies were substantially different (table 4.6). Based on the proposal made by authors such as Yin (2003), Easterby-Smith et al. (2002), Kasanen et al.

(1993), Stake (1995), Meredith (1998), Voss et al. (2002), Martinez (2003) and Mendibil (2003), a combined set of criteria was presented in chapter 4. Table 9.1 shows the criteria that will be used in this chapter.

Table 9.1: Quality criteria for this research

Code	Criterion
1	Rigour of the research process **1.1** Construct validity **1.2** Internal validity **1.3** External validity **1.4** Reliability
2	Evidence to support the construct (*Link to theory*)
3	Contribution to knowledge (*Theoretical novelty*)
4	Contribution to practice (*Practical relevance; Practical utility*)
5	Application of the construct in other environments

The first criterion shown in this table is associated to case study research, whereas the other four criteria are mainly related to constructive research. Also it can be seen that the first criterion, i.e. the rigour of the research process, is formed by four sub-criteria. These sub-criteria and the rest criteria will be analysed in the following sections.

On the other hand, the third and fourth criteria refer to both theoretical and practical contribution of the research. These criteria are highly relevant for any research project as it was described in chapter 8.

9.2. Criterion 1 – Rigour of the research process

Rigour of a research study is demonstrated through logical and rational research design (Yin, 2003; Easterby-Smith et al., 2002). According to these authors, any research project requires a sequential set of methods and techniques that guarantees the quality and accuracy of the results of the research. Generally, four tests are applied to assess the rigour of the research process. These sub-criteria are: *construct validity, internal validity, external validity and reliability*.

9.2.1. Criterion 1.1 – Construct validity

Construct validity is especially problematic in case study research. Many authors that are critical of this research strategy claim that subjective analysis and interpretations of the data collected might lead the research output to lack rigour.

This criterion is gained through establishing correct operational measures for the concepts being studied (Yin, 2003; Easterby-Smith, 2002; Voss, Tsikriktsis et al., 2002; Rowley, 2002). Yin (2003:35) recommends that an investigator must cover two main steps:

- Select the specific types of changes that are to be studied (and relate them to the original objectives of the study) and
- Demonstrate that the selected measures of these changes do indeed reflect the specific types of change that have been selected.

In other words, the researcher has to make sure that the research design properly deals with the research questions/objectives defined and that the subjectivity of the project is minimised through a chain of evidence (Yin, 2003; Easterby-Smith, 2002). According to Voss, Tsikriktsis et al. (2002), construct validity can be tested by:

- Observing whether predictions made about relationships to other variables are confirmed.
- Using multiple sources of evidence (similar results are evidence of convergent validity).
- Seeing if a construct is measured can be differentiated from another (evidence of discriminant validity).
- Seeking triangulation that might strengthen construct validity.

Table 9.2 shows the measures taken throughout the phases of the research to ensure construct validity. Different activities and decisions made in each research stage will be identified.

Table 9.2: Measures taken for ensuring construct validity

	Research stage									
	I	**P-U**	**R.M.**		**T.B.**		**T.T**	**F&C**	**Q**	
Criterion	*Chapter 1*	*Chapter 2*	*Chapter 3*	*Chapter 4*	*Chapter 5*	*Chapter 6*	*Chapter 7*	*Chapter 8*	*Chapter 9*	**Measure and tactic**
Construct Validity			■							❑ Multiple data collection methods (Table 4.5)
				■						
					■					❑ Enfolding theory (Chapter 5) ❑ Triangulation of data
						■				
							■			❑ Establishing chain of evidence (figure 7.7.) ❑ Multiple data source ❑ Data display through standard charts and tables (Chapter 7) ❑ Comparison of different approaches (Complexity/uncertainty vs. value/risk)
								■		❑ Triangulation of data

9.2.2. Criterion 1.2 – Internal validity

Internal validity relies on the establishment of causal relationship whereby certain conditions are shown to lead to other conditions, as distinguished from spurious relationships (Yin, 2003:36; Voss, Tsikriktsis et al., 2002; Rowley, 2002).

Internal validity is only a concern for causal (or explanatory) case studies, in which a researcher is trying to determine whether event *X* led to event *Y*. If there is another factor *Z* that actually influences this relationship and the investigator does not detect it, the research will lack internal validity (Yin, 2003:36). To effects of this research, R.Q.4 will be critical for its internal validation as relationship between the value and risk critical factors and the relationship level is analysed through the model for relationship optimisation.

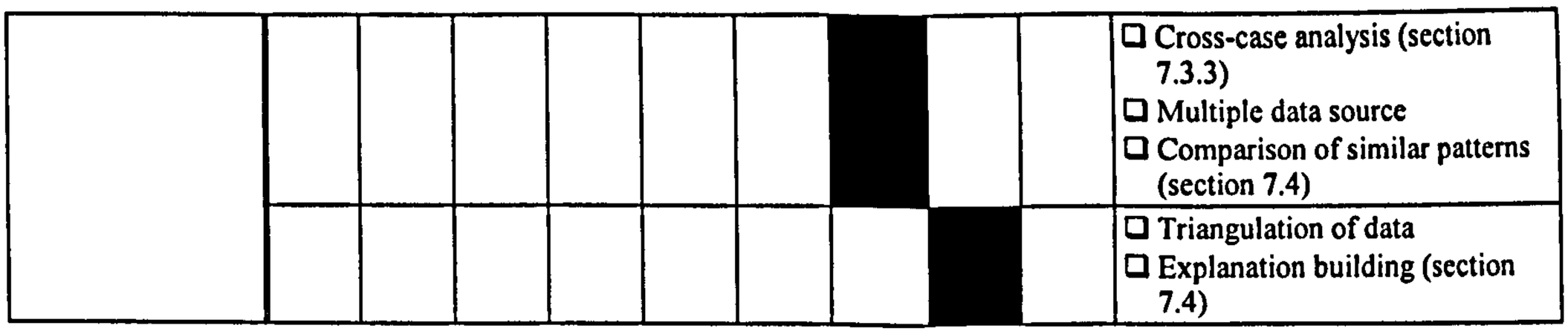
The internal validity of this research was first considered throughout the design process of the research methods required. Triangulation of methods was planned for data collection, data analysis and construction phases (table 4.5). Internal validity was ensured through the application of the 'categorical aggregation' theory building method. This way, different concepts and elements were associated until a new insight arose. Literature of the field played a key role searching for explanation between factors and the relationships.

Using different sources of data during the theory testing stage (i.e. carrying out multiple case studies) helped ensuring the internal validation of the construct. The cross-case analysis enabled finding similar patterns among the cases. As mentioned in this section, different data collection and analysis methods were used during the case studies. As a result, internal validity was enhanced.

Table 9.3 shows the measures and tactics selected for fulfilling the requirements defined by this sub-criterion.

Table 9.3: Measures taken for ensuring internal validity

	Research stage									
	I	**P-U**	**R.M.**		**T.B.**		**T.T**	**F&C**	**Q**	
Criterion	*Chapter 1*	*Chapter 2*	*Chapter 3*	*Chapter 4*	*Chapter 5*	*Chapter 6*	*Chapter 7*	*Chapter 8*	*Chapter 9*	**Measure and tactic**
Internal Validity			■							❑ Multiple data collection methods (Table 4.5)
				■						
					■					❑ Enfolding theory (Chapter 5) ❑ Categorical aggregation ❑ Triangulation of data ❑ Focus group activity (section 5.4.5)
						■				



9.2.3. Criterion 1.3 – External validity (Generalisability)

External validity is defined by Rowley (2002) as the establishment of the domain to which a study's findings can be generalised. The aim of this criterion is to ensure whether the construct developed by the researcher is extendable to all the cases specified by him/her. Research strategies close to phenomenological paradigm, such as case studies and action research, have been criticised for their lack of external validity or generalisability. However, Yin (2003) states that it is possible to build extendible theory through case studies. Generalisation is mainly based on replication logic (Yin, 2003; Voss, Tsikriktsis et al., 2002; Easterby-Smith et al., 2002).

In this research, external validity will play a key role in the model developed in the fourth research question. One of the goals of this research and the case studies was to build a model from a reduced number of cases and to expand it to other context, i.e. to deduce a generalisable construct.

Replication logic was considered in this research. According to Yin (2003:47) there are two procedures for accomplishing this replication logic, *literal replication*, which predicts similar results, and *theoretical replication*, which predicts contrasting results but for predictable reasons. This last procedure was used during the case studies. Organisations with different critical factors were selected for theory testing. Based on the literature, the effects of these critical factors were predicted: e.g. for organisations with high negotiation power collaboration was easier, whereas organisation with weak negotiation influence could not establish a collaborative relationship. This example shows how contrasting results were achieved due to predictable reasons, i.e. high or low negotiation power.

As described in chapter 7, four different sectors were selected for carrying out the case studies. It was also presented that all the organisations visited were small or medium enterprises. As a consequence, generalisability of the results (i.e. the extend to which the model built can be transferred to other organisation types) is transcendental.

All these features of the case studies may jeopardise the generalisability of the conclusions, specially the external validity of the outcome of RQ4. The model proposed by the author

gathers quite subjective data of 5 organisations, so, it is strongly recommended to analyse more cases in order to strengthen the generalisability of the results.

It also important to state that the replication logic and the cross-case analysis did not find any evidence that would limit the future domain extension of the model proposed by this research.

Table 9.4 shows the decisions made throughout this research to guarantee the external validity, i.e. generalisation, of the outcome.

Table 9.4: Measures taken for ensuring external validity

Criterion	Research stage: I – Chapter 1	P-U – Chapter 2	R.M. – Chapter 3	R.M. – Chapter 4	T.B. – Chapter 5	T.B. – Chapter 6	T.T – Chapter 7	F&C – Chapter 8	Q – Chapter 9	Measure and tactic
External Validity (Generalisation)					■					❑ Replication logic (Theoretical)
						■				
							■			❑ Cross-case analysis (section 7.3.3) ❑ Replication logic (Theoretical) ❑ Use multiple sources of data ❑ Enfolding theory

9.2.4. Criterion 1.4 – Reliability

The objective of ensuring reliability of a research process is to demonstrate that if a later investigator followed the same procedures as described by an earlier investigator and conducted the same case study all over again, the latter investigator would reach the same findings and conclusions (Yin, 2003:37). In qualitative studies, the key to reliability is to demonstrate through argument and analysis that the process of data collection and analysis have been appropriate to answer the research questions as well as thorough, careful, honest and accurate (Lanning, 2001; Mendibil, 2003). Thus, the goal of this quality criterion is to minimise the errors and biases in a study.

In order to ensure repeatability of the results of a study, future investigators should consider using *structured documentation and reporting* of the steps done (Yin, 2003; Stake, 1995). There are other measures to guarantee reliability of the research, such as using a *case study protocol*, *case study database*, *interview guide* and *pilot case studies* (Yin, 2003; Voss, Tsikriktsis et al., 2002; Eisenhardt, 1989).

This research project gave much importance to reliability of the expected output. From the beginning of the study different tactics and measures were selected for ensuring that any other researcher could repeat both the research process and the results.

Selection of the questionnaire as a data collection method, designing (Appendix D) and using it in all the case studies was one of the decisions made in order to gain reliability. This questionnaire was actually part of the case study protocol (section 7.1.2) that the author built and used to approach all the organisations contacted. The case study protocol ensured that the procedure for carrying out the case studies was the same in all the cases. It also guaranteed that the data collected was the consequence of a standard process.

Another tactic adopted by the author was creating a case study database (section 7.1.2) for organising and documenting the data collected from the case studies. After every visit to an organisation documents such as filled questionnaires, transcriptions of the recorded interviews, field notes of the researcher, documentation provided by organisations and other support documents were organised and kept in a specific folder. This fact facilitated processing all this information and writing the report of each case study.

Authors such as Yin (2003) recommend carrying out a pilot case study before accomplishing the rest of cases. This research also considered this suggestion and a pilot case study (section 6.3 and section 7.2.2) was carried out to test the case study protocol and the data collection and analysis methods. It was also valuable to gain an initial insight of the theoretical proposal of this study.

Finally, establishing a chain of evidence between the research questions, the related sections of the questionnaire and the data analysis procedures guaranteed the repeatability of the data collection and analysis process.

Table 9.5 shows the measures and tactics adopted in each chapter of this study to ensure the reliability of the research process.

Table 9.5: Measures taken for ensuring reliability

	Research stage									
	I	**P-U**	**R.M.**		**T.B.**		**T.T**	**F&C**	**Q**	
Criterion	*Chapter 1*	*Chapter 2*	*Chapter 3*	*Chapter 4*	*Chapter 5*	*Chapter 6*	*Chapter 7*	*Chapter 8*	*Chapter 9*	**Measure and tactic**
External Validity (Generalisation)			■							❑ Selection of the questionnaire as a research method
				■						
					■					❑ Enfolding theory ❑ Interpretation ❑ Pilot case study (section 6.3)
						■				

										❑ Case study protocol (section 7.1.2) ❑ Case study database (section 7.1.2) ❑ Pilot case study (section 7.2.2) ❑ Chain of evidence

9.3. Criterion 2 – Evidence to support the construct

This second criterion relies on the establishment of evidence that ensure the quality of the construct (Martinez, 2003; Easterby-Smith et al., 2002). This thesis will have to provide enough evidence to support the accuracy of the model proposed in the fourth research question. In order to better analyse the actions fulfilled for supporting the construct, each of the main components of the model will be studied. Figure 9.1 shows the main components of the model for optimisation of relationships.

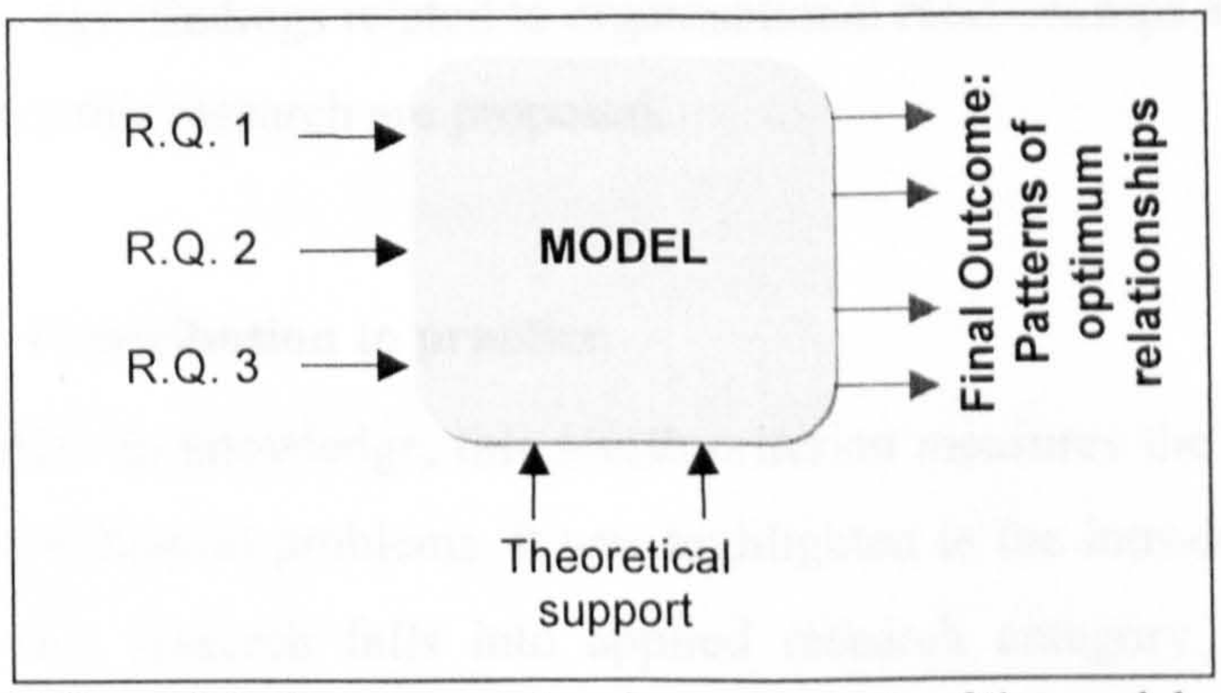


Figure 9.1: Structure and main components of the model

- *Input of the model*: The inputs to the model were four elements, the first three research questions of this research and a generic classification of business processes. This classification of processes, RQ1 and RQ2 were totally based on theory, they were extracted from literature (sections 5.1, 5.2, 5.3). On the other hand, R.Q3 was also answered through specific literature and an additional focus group activity was organised (sections 5.4, 5.4.5) to strengthen the output.
- *Theoretical support of the model*: The architecture of the model based on a three-step structure (i.e. value/risk data collection, definition of desirable relationship and description of recommended operational tools) was supported by the literature (section 6.2). A model with a similar structure was identified in the literature, so, it provided evidence of the accuracy of the structure built for the construct.
- *Final outcome*: The output of the model can be divided into two parts. The first part, i.e. sub-model #1, was developed through the data collected in the application of one pilot

case study (sections 6.3 and 7.2.2) and five case studies (sections 7.2 and 7.4). On the other hand, the second part, i.e. sub-model #2, was developed through data extracted from multiple sources of literature.

As a conclusion, all this evidence split into three main parts of the model supports the validity of the construct proposed in the fourth research question.

9.4. Criterion 3 – Contribution to knowledge

Contribution to knowledge is outlined by authors such as Easterby-Smith at al (2002), Eisenhardt (1989), Stake (1995), Voss et al. (2002) and Kasanen et al. (1993) as a highly relevant requirement of case study and constructive research. Moreover, it is also highlighted that the main objective of any PhD research must be to contribute to knowledge.

The contribution to knowledge made by this research is presented in section 8.3.1 of this thesis. A total of six new findings related to organisational relationships and their nature that were unknown before this research are proposed.

9.5. Criterion 4 – Contribution to practice

Related to contribution to knowledge, this fourth criterion measures the applicability of the outcome to existing industrial problems. It was highlighted in the introduction to this thesis in chapter 1 that this research falls into applied research category. As a result, close relationship with organisations was required throughout the research to both assess their real problems and their linkage to theory, and collect real data to feed the research. Therefore, it is logical that this research aims to search for a practical solution to these problems.

The contribution to practice of this research project is presented in section 8.3.2 of this thesis. Basically this contribution is provided by the model for optimisation of organisational relationships and the critical factors associated to it.

9.6. Criterion 5 – Application of the construct in other environments

Section 4.2.1 of this thesis highlighted that one of the key features of constructive research relies on the wide scope of applicability of the construct developed. It can be said that this criterion will be directly linked to the external validity analysed in section 9.2.3 of this chapter.

Throughout this research project two main empirical studies were carried out. The first one was part of the pre-understanding stage of this research where 10 organisations were

contacted. Table 2.6 showed that these organisations were based on 9 different sectors. The findings extracted from this study led this study to develop the model proposed in the fourth research question. Similarly, this model was later built using extended data collected from five organisations of four different sectors.

These two empirical studies did not show any evidence that would limit the application of this model in other environments. However, more work could be done to extend this outcome to other sectors that have completely different characteristics.

As a conclusion, the findings obtained so far and the literature reviewed by the author do not constrain the scope of application of the output of this study.

9.7. Final assessment of the research project

Table 9.6 summarises the comparison of the quality research criteria against this research project analysed in the previous sections. The individual evaluation of each criterion has shown that this research fulfils the requirements defined by the quality criteria selected in chapter 4. As a conclusion, it can be highlighted that ***this research is valid and reliable***.

Quality criterion		Is it satisfied?	How is it satisfied?
1- Rigour of the research	*1.1 - Construct validity*	Yes	Multiple data collection methods, enfolding theory, triangulation of data, establishing chain of evidence, data display through standard charts and tables, comparison of different approaches.
	1.2 – Internal validity	Yes	Multiple data collection methods, enfolding theory, categorical aggregation, triangulation of data, focus group activity, cross-case analysis, comparison of similar patterns, explanation building.
	1.3 – External validity	Yes	Theoretical replication logic, cross-case analysis, replication logic, data triangulation, enfolding theory.
	1.4 – Reliability	Yes	Selection of the questionnaire as a research method, enfolding theory, interpretation, pilot case study, case study protocol, case study database, chain of evidence
2 – Evidence to support the construct		Yes	The model developed was supported through 3 different ways: The theoretical basis of the input of the model and a focus group activity, the validation of the architecture of the construct through literature, and the development of the outcome of the model through 5 case studies and literature.
3 – Contribution to knowledge		Yes	Six new findings that were previously unknown are provided by this study (section 8.3.1)
4 – Contribution to practice		Yes	Four new practical improvements are provided by this study (section 8.3.2)
5 – Application of the construct in other environments		Yes	Two empirical studies carried out (the first one in 9 sectors and the second in 4) and the literature do not provide evidence to disallow the application of the construct in other environments.

Once that the validity and reliability of this research project have been ensured, this chapter will finish summarising the key steps and the main outcome of the study.

9.8. Key steps and outcome of the research

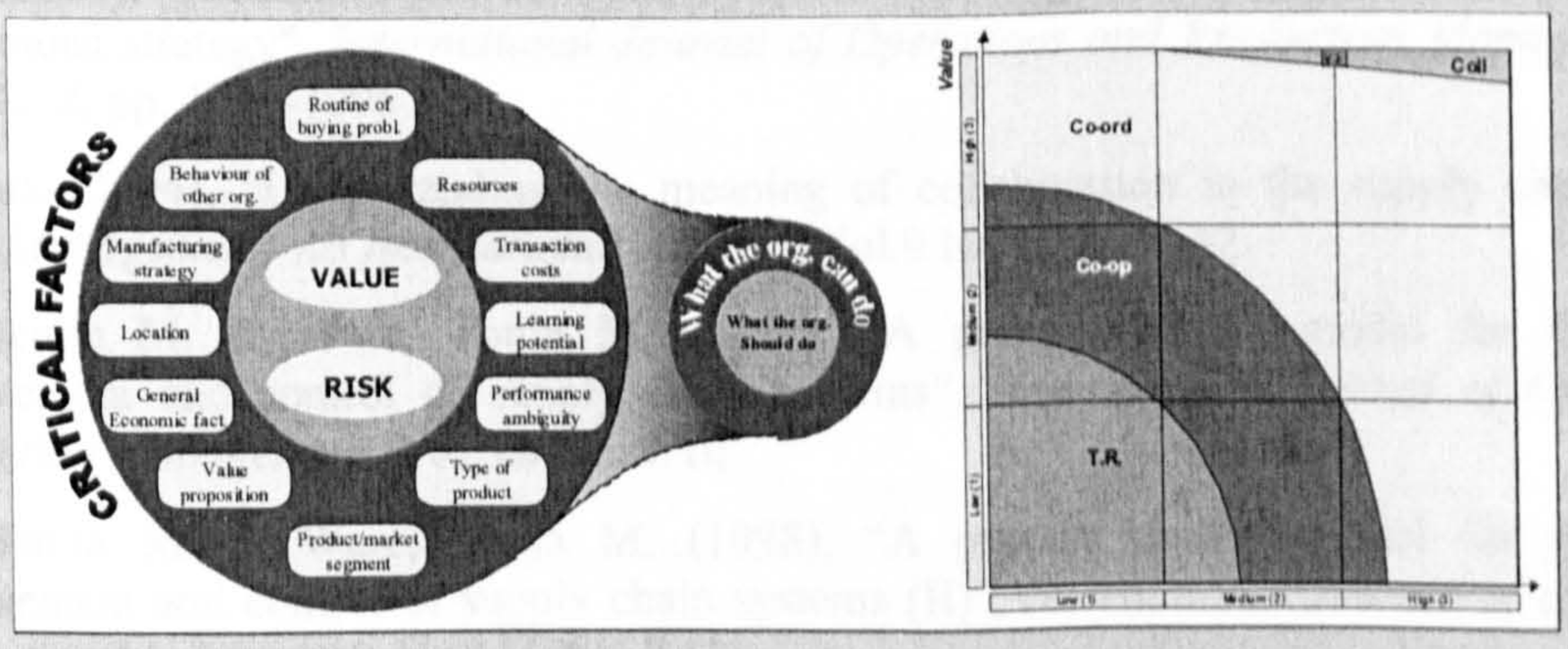
Background: Globalisation and saturation of the markets after the 1970s resulted in increased competition between organisations all over the world. Practices such as JIT, TQM and concurrent engineering are some of the measures taken by organisations to deal with competitiveness. Similarly, there is an emergent trend based on the management of the supply chain and the relationships within it. This research will focus on the study of this emergent practice.

Scope of the research: Supply chain management practice was defined as *the sequence of processes and activities involved in the complete manufacturing and distribution cycle, including everything from product design through materials and component ordering through manufacturing and assembly and onto warehousing and distribution until the finished product is in the possession of the final owner*. The review of the literature showed that collaboration based on trust, commitment and log-term relationship between the members of this chain will be the future trend.

Research questions: What are the collaboration levels? What are the characteristics of each level? What are the critical factors of a company that determine its collaborative profile? Can we create a standard profile that corresponds to a desirable collaborating footprint?

Research methodology: This study falls into the *applied research* category. Inside phenomenological research philosophy, the strategies selected for this study were *constructive research* and *case study research*. Different *theory building*, *data collection* and *data analysis* methods were chosen during the design process of the research.

Theory Building: The answer to the research questions proposed that there are five collaboration levels, *transactional relationship*, *co-operation*, *co-ordination*, *collaboration* and *vertical integration*. A set of characteristics was identified for each of these relationship levels (tables 5.7, 5.8, 5.9 and 5.10). The third research question provided the critical factors that influence the organisational relationships (left figure), whereas the fourth question proposed a model for optimisation of relationships depending on the critical factors of organisations (right figure).



Theory Testing: A pilot case study and 5 more case studies provided real data to test, refine and validate the proposals developed in the previous stage. Chapter 7 presented this theory testing stage and important findings identified from the data processed.

Research Assessment: The conclusions of the research project were presented in chapter 8, and finally this thesis ended assessing the quality of this research against some criteria. These criteria tested the construct validity, internal validity, external validity and reliability of the study. Similarly, some evidence to support the outcome of the research, its theoretical and practical contribution and the scope of applicability were analysed to ensure the quality of the study.

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APPENDICES

APPENDIX A – Cross reference analysis

Author(s)	Factors											
Slack and Lewis, 2002	Operations Resources				Market Requirements							
	Transaction Costs	Economies of Scale	Resource deficiencies	Learning potential	Market position	Market risks	Market structure	Competitor behaviour				
Sako, 1992	Government Policy & Legal Framework	Corporate Strategy & Entrepreneurship	Technological Factors (*)	Market conditions	Past & Contemporary Ideology: Cultural traditions	Individual Preferences	Social & Moral Norms					
Spekman, 1981	Inventory	Suppliers	Governmental influences	Sales	Economic Conditions	Corporate planning/ strategy	General economic factors					
Grønhaug, 1975	Degree of routinization of the buying problem	Type of product (**)	Size of the purchase	Organizational size								
Ozzane and Churchill, 1971	Age	R&D commitment	Rate of growth	Industrial environment	Cash position	Net income	Assets	Number of employees	Proportion of elite personnel	Decision-group identity (see figure 1 in paper)		
Sriram, Krapfel and Spekman, 1992	Buyer/Supplier dependence (Balance vs. Asymmetry)	Transaction costs	Transaction Importance									

	Type of Organization (***)		Structure					Environment		Perceived risk			Information about suppliers, bids, etc.	
Grønhaug, 1976	Product dependent	Product Independent	Size	Relative portion of managers	Number of departments	Number of levels	Education of top man	Competition	Perceived slack	Importance	Uncertainty	Venture-someness		
In Lambe and Spekman, 1997	Size of the firm	Marketing skill	Production expertise	R&D capability										
Heide and John, 1990	Uncertainty			Relationship Importance		Manufacturing process	History effects							
	Volume unpredictability	Technological unpredictability	Performance ambiguity	Size of purchase	Criticality of the product/ service									
Stevens, 1989	Order winning criteria	Product & Market segment	---------											
Spekman et al., 1999	Technical Complexity	Commercial Complexity												
Spekman et al., 1994	Sector Organisation	Patterns of industrial policy												
Puttick, 1982	Product/Market complexity	Product/Process complexity	Volume/Mix complexity	Supply Chain complexity										

(*) Technological factors: -Degree of asset Specificity.

-Customisation level/Product differentiation and diversification through the shortening of the product-life.

-Uncertainty of market demand.

(**) -Production Goods: All the products and services directly related to the end product.

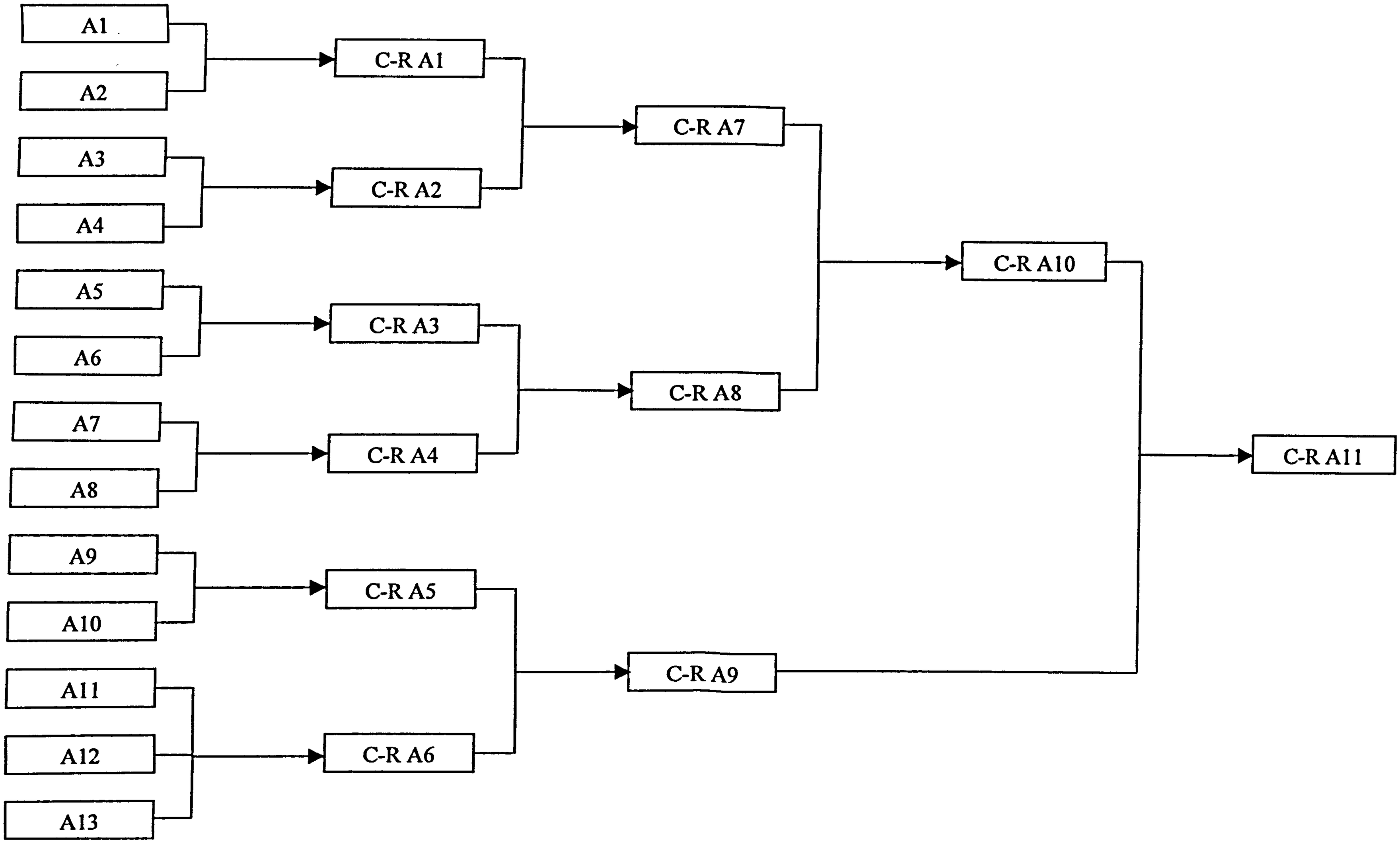
-Institutional Goods: All the products and services which are necessary in order to keep the organization going, but not output of the company (e.g. paper, pencils, a saw-mill, etc)

(***) –Product Dependent: Organisation which survival depends on the exchange of output.

-Product Independent: Organisation where an important part of the income (budget) is distributed by regulatory groups; the output-income relationship is less clear.

- **Spekman, Kamauff and Salmond, 1994:** Sector Organisation (Partnering vs. competing within the supply chain); Patterns of industrial policy (Complex inter-firm relationships, etc.).
- **Stevens, 1989:** Order winning criteria; company's competitive package (product and market segment; balance between product availability, service level, lead time, technical support and after sales support).
- **Spekman, Kamauff and Spear, 1999:** Degree of Technical Complexity; Degree of Commercial Complexity.

Structure of Cross-reference analysis



A1-A2

Slack and Lewis, 2002	Operations Resources				Market Requirements							
	Transaction Costs	Economies of Scale	Resource deficiencies	Learning potential	Market position	Market risks	Market structure	Competitor behaviour				
Sako, 1992	Government Policy & Legal Framework	Corporate Strategy & Entrepreneurship	Technological Factors (*)	Market conditions	Past & Contemporary Ideology: Cultural traditions	Individual Preferences	Social & Moral Norms					

Cross-reference analysis 1	Operations Resources				Market Requirements				Government Policy & Legal Framework	Corporate Strategy & Entrepreneurship	Technological Factors (*)	Past & Contemporary Ideology: Cultural traditions	Individual Preferences	Social & Moral Norms
	Transaction Costs	Economies of scale	Resource deficiencies	Learning potential	Market position	Market risks	Market structure	Competitor behaviour						

A3-A4

Spekman, 1981	Inventory	Suppliers	Governmental influences	Sales	Economic Conditions	Corporate planning/ strategy	General economic factors					
Grønhaug, 1975	Degree of routinization of the buying problem	Type of product (**)	Size of the purchase	Organizational size								

Cross-reference analysis 2	Degree of routinization of the buying problem	Type of product (**)	Size of the purchase	Organizational size	Inventory	Suppliers	Governmental influences	Sales	Economic Conditions	Corporate planning/ strategy	General economic factors		

A5-A6

Ozzane and Churchill, 1971	Age	R&D commitment	Rate of growth	Industrial environment	Cash position	Net income	Assets	Number of employees	Proportion of elite personnel	Decision-group identity (see figure 1 in paper)		
Sriram, Krapfel and Spekman, 1992	Buyer/Supplier dependence (Balance vs. Asymmetry)	Transaction costs	Transaction Importance									

Cross-reference analysis 3	Buyer/Supplier dependence (Balance vs. Asymmetry)	Transaction costs	Transaction Importance	Age	R&D commitment	Rate of growth	Industrial environment	Cash position	Net income	Assets	Number of employees	Proportion of elite personnel	Decision-group identity (see figure 1 in paper)

A7-A8

	Type of Organization (***)		Structure					Environment		Perceived risk			Information about suppliers, bids, etc.	
Grønhaug, 1976	Product dependent	Product Independent	Size	Relative portion of managers	Number of departments	Number of levels	Education of top man	Competition	Perceived slack	Importance	Uncertainty	Venture-someness		
In Lambe and Spekman, 1997	Size of the firm	Marketing skill	Production expertise	R&D capability										

Cross-reference analysis 4	Type of Organization (***)		Structure					Environment		Perceived risk			Information about suppliers, bids, etc.	Marketing skill	Production expertise	R&D capability
	Product dependent	Product Independent	Size	Relative portion of managers	Number of departments	Number of levels	Education of top man	Competition	Perceived slack	Importance	Uncertainty	Venture-someness				

A9-A10

Heide and John, 1990	Uncertainty			Relationship Importance		Manufacturing process	History effects					
	Volume unpredictability	Technological unpredictability	Performance ambiguity	Size of purchase	Criticality of the product/ service							
Stevens, 1989	Order winning criteria	Product & Market segment	---------									

Cross-reference analysis 5	Uncertainty			Relationship Importance		Manufacturing process	History effects	Order winning criteria	Product & Market segment			
	Volume unpredictability	Technological unpredictability	Performance ambiguity	Size of purchase	Criticality of the product/ service							

A11-A12-A13

Spekman et al., 1999	Technical Complexity	Commercial Complexity										
Spekman et al., 1994	Sector Organisation	Patterns of industrial policy										
Puttick, 1982	Product/Market complexity	Product/Process complexity	Volume/Mix complexity	Supply Chain complexity								

Cross-reference analysis 6	Sector Organisation	Patterns of industrial policy	Product/Market complexity	Product/Process complexity	Volume/Mix complexity	Supply Chain complexity	Technical Complexity					

C-R A1 – C-R A2

Cross-ref. analysis 1	Operations Resources				Market Requirements				Government Policy & Legal Framework	Corporate Strategy & Entrepreneurship	Technological Factors (*)	Past & Contemporary Ideology: Cultural traditions	Individual Preferences	Social & Moral Norms
	Transaction Costs	Economies of scale	Resource deficiencies	Learning potential	Market position	Market risks	Market structure	Competitor behaviour						

Cross-ref. analysis 2														
	Degree of routinization of the buying problem	Type of product (**)	Size of the purchase	Organizational size	Inventory	Suppliers	Governmental influences	Sales	Economic Conditions	Corporate planning/ strategy	General economic factors			

Cross-ref. analysis 7														
	Degree of routinization of the buying problem	Type of product (**)	Organizational size	Inventory	Government Policy & Legal Framework	Economic Conditions	Corporate Strategy & Entrepreneurship	General economic factors	Technological Factors (*)	Past & Contemporary Ideology: Cultural traditions	Individual Preferences	Social & Moral Norms		
	Operations Resources				Market Requirements				sales					
	Transaction Costs	Economies of scale	Suppliers	Learning potential	Market position	Market risks	Market structure	Competitor behaviour						

C-R A3 – C-R A4

Cross-ref. analysis 3	Buyer/Supplier dependence (Balance vs. Asymmetry)	Transaction costs	Transaction Importance	Age	R&D commitment	Rate of growth	Industrial environment	Cash position	Net income	Assets	Number of employees	Proportion of elite personnel	Decision-group identity (see figure 1 in paper)

Cross-ref.													
	Type of Organization (***)		Structure		Environment		Perceived risk	Information	Marketing	Production	R&D		

analysis 4	Product dependent	Product Independent	Size	Relative portion of managers	Number of departments	Number of levels	Education of top man	Competition	Perceived slack	Importance	Uncertainty	Venture-someness	about suppliers, bids, etc.	skill	expertise	capability

Cross-ref. analysis 8	Buyer/Supplier dependence (Balance vs. Asymmetry)	Transaction costs	Transaction Importance	Age	R&D commitment and capability	Rate of growth	Cash position	Net income	Assets	Information about suppliers, bids, etc	Marketing skill	Production expertise
	Type of Organization (***)		Structure								Industrial Environment	
	Product dependent	Product Independent	Size	Relative portion of managers	Number of departments	Number of levels	Education of top man	Number of employees	Proportion of elite personnel	Decision-group identity	Competition	Perceived slack
	Perceived risk											
	Importance	Uncertainty	Venture-someness									

C-R A5 – C-R A6

Cross-reference analysis 5	Uncertainty			Relationship Importance		Manufacturing process	History effects	Order winning criteria	Product & Market segment			
	Volume unpredictability	Technological unpredictability	Performance ambiguity	Size of purchase	Criticality of the product/ service							

Cross-reference analysis 6	Sector Organisation	Patterns of industrial policy	Product/Market complexity	Product/Process complexity	Volume/Mix complexity	Supply Chain complexity	Technical Complexity					

Cross-reference analysis 9	Sector Organisation	Patterns of industrial policy	Complexity / Uncertainty						Relationship Importance		Manufacturing process	History effects
			Product/Market complexity	Product/Process complexity	Volume/Mix complexity	Supply Chain complexity	Technological unpredictability/ complexity	Performance ambiguity	Size of purchase	Criticality of the product/ service		
	Order winning criteria	Product & Market segment										

C-R A7 – C-R A8

Cross-ref. analysis 7	Degree of routinization of the buying problem	Type of product (**)	Organizational size	Inventory	Government Policy & Legal Framework	Economic Conditions	Corporate Strategy & Entrepreneurship	General economic factors	Technological Factors (*)	Past & Contemporary Ideology: Cultural traditions	Individual Preferences	Social & Moral Norms
	Operations Resources				Market Requirements				sales			
	Transaction Costs	Economies of scale	Suppliers	Learning potential	Market position	Market risks	Market structure	Competitor behaviour				
Cross-ref. analysis 8	Buyer/Supplier dependence (Balance vs. Asymmetry)	Transaction costs	Transaction Importance	Age	R&D commitment and capability	Rate of growth	Cash position	Net income	Assets	Information about suppliers, bids, etc	Marketing skill	Production expertise
	Type of Organization (***)		Structure								Industrial Environment	
	Product dependent	Product Independent	Size	Relative portion of managers	Number of departments	Number of levels	Education of top man	Number of employees	Proportion of elite personnel	Decision-group identity	Competition	Perceived slack
	Perceived risk											
	Importance	Uncertainty	Venture-someness									

Cross-ref. analysis 10														
	Degree of routinization of the buying problem	Type of product (**)	Inventory	Government Policy & Legal Framework	Economic Conditions	Corporate Strategy & Entrepreneurship (R&D commitment, etc.)	General economic factors	Technological Factors (*)	Past & Contemporary Ideology: Cultural traditions	Social & Moral Norms	Buyer/Supplier dependence (Balance vs. Asymmetry)	Age	Production expertise
	Operations Resources				Market Requirements					Type of Organization (***)		Industrial Environment	
	Transaction Costs	Transaction importance (Econ. Scale)	Suppliers	Learning potential	Market position	Market risks	Market structure	Competitor behaviour	Marketing skills	Product dependent	Product Independent	Competition	Perceived slack
	Structure								Perceived risk			Rate of growth	Information about suppliers, bids, etc
	Size	Relative portion of managers	Number of departments	Number of levels	Education of top man	Number of employees	Proportion of elite personnel	Decision-group identity	Importance	Uncertainty	Venture-someness		
	Economic Conditions				sales								
	Cash position	Net income	Assets	Others									

C-R A10 – C-R A9

Cross-ref. analysis 10	Degree of routinization of the buying problem	Type of product (**)	Inventory	Government Policy & Legal Framework	Corporate Strategy & Entrepreneurship (R&D commitment, etc.)	General economic factors	Technological Factors (*)	Past & Contemporary Ideology: Cultural traditions	Social & Moral Norms	Buyer/Supplier dependence (Balance vs. Asymmetry)	Age	Production expertise
	Operations Resources				Market Requirements				Type of Organization (***)		Industrial Environment	
	Transaction Costs	Transaction importance (Econ. Scale)	Suppliers	Learning potential	Market position	Market risks	Market structure	Competitor behaviour	Marketing skills	Product dependent	Product Independent	Competition	Perceived slack
	Structure								Perceived risk			Rate of growth	Information about suppliers, bids, etc
	Size	Relative portion of managers	Number of departments	Number of levels	Education of top man	Number of employees	Proportion of elite personnel	Decision-group identity	Importance	Uncertainty	Venture-someness		
	Economic Conditions				sales								
	Cash position	Net income	Assets	Others									

Cross-reference analysis 9	Sector Organisation	Patterns of industrial policy	Complexity / Uncertainty						Relationship Importance		Manufacturing process	History effects
			Product/Market complexity	Product/Process complexity	Volume/Mix complexity	Supply Chain complexity	Technological unpredictability/ complexity	Performance ambiguity	Size of purchase	Criticality of the product/ service		
	Order winning criteria	Product & Market segment										

C-R A11 (Final list)

Cross-ref. analysis 11												
	Degree of routinization of the buying problem	Type of product (**)	Inventory	Government Policy & Legal Framework	Corporate Strategy & Entrepreneurship (R&D commitment, etc.)	General economic factors	Technological Factors (*)	Past & Contemporary Ideology: Cultural traditions	Social & Moral Norms	Buyer/Supplier dependence (Balance vs. Asymmetry)	Age	Rate of growth
	Information about suppliers, bids, etc	Operations Resources				Market Requirements					Type of Organization (***)	
		Transaction Costs	Transaction importance (Econ. Scale)	Suppliers	Learning potential	Market position	Market risks	Market structure	Competitor behaviour	Marketing skills	Product dependent	Product Independent
	Industrial Environment		Structure								Sector Organisation	Manufacturing process & expertise
	Competition	Perceived slack	Size	Relative portion of managers	Number of departments	Number of levels	Education of top man	Number of employees	Proportion of elite personnel	Decision-group identity		
	Perceived risk			Economic Conditions				History effects	Order winning criteria	Criticality of the product/ service		
	Importance	Uncertainty	Venture-someness	Cash position	Net income	Assets	Others					
	Complexity / Uncertainty						Product & Market segment					
	Product/Market complexity	Product/Process complexity	Volume/Mix complexity	Supply Chain complexity	Technological unpredictability/ complexity	Performance ambiguity						

52 factors

APPENDIX B – Operational characteristics

Transactional Relationship	Co-operation	Co-ordination	Collaboration	Vertical Integration
❑ Arm's-length supplier partnership relationships. No formal supplier management process in place. ❑ Discrete processes and data flows well documented and understood (Orders). ❑ All planning is performed within company boundaries, and is not consistent across companies. ❑ Integrated tools do not exist. ❑ Informal agreements and relationships exist for some partners. ❑ Little attention is paid to market analysis. ❑ Use a combination of EDI, fax, paper-based, and manual transactions. ❑ Customer's needs are not the priority in the relationship.	❑ Fluent flow information in both directions is the key feature. ❑ Strategic partners throughout the global Chain collaborate to identify joint business objectives and action plans. ❑ Performance metrics governing relationships are available. ❑ Integration service agreements define specific roles and responsibilities, including explicit guidelines about issue resolution as it relates to external partners. ❑ Critical information is captured. ❑ All large partners linked via EDI. ❑ Commodity strategies determine relationships. Formal relationships are defined reflecting cross-functional requirements for buyer/supplier communication. ❑ Integrated value chain strategy – strategic partners are identified based on competencies, cross-enterprise TCO (Total Cost of Ownership), and improvement strategies with specific goals in mind. ❑ Strategic partners may have access to selected on-line information.	❑ The organisations involved share operational systems such as processes, technologies, resources, etc. ❑ Enforce common processes and data sharing ❑ IT and solutions enable a collaborative strategy that aligns participating companies' business objectives and associated processes ❑ Cross-enterprise optimisation based on TCO for strategic commodities, Net-market enablement, auctions, and supply market sensing/research/analysis. ❑ All transactions, including eRFQ, on-line bid/quote/mark-up, on-line supplier catalogues, and automated partners performance tracking and benchmarking, are automated. ❑ On-line, virtual management of relationships for data visibility, collaborative planning, performance tracking, and virtual workspace. ❑ Organisation alignment via an e-enabled environment that includes Net-markets integration and an integrated enterprise IT architecture, customised to support strategic priorities. ❑ Product and process data is visible to, and can be queried by, the whole value chain. It is free of errors and easy to maintain with comprehensive e-commerce linkages to customers and suppliers. ❑ A balanced scorecard integrates Customer, Cost, and Asset metrics and is structured at three levels (overview, process, diagnostics). ❑ A value chain process and data model is defined and it integrates all of the processes. ❑ Strategies are developed in collaboration with strategic partners (key suppliers and key accounts). These strategies identify business objectives and major actions required to implement the strategy over a maximum 12-month horizon. ❑ Performance targets are set across the value chain and are tracked with key partners based on commonly defined metrics. ❑ Key requirements for data sharing with both customers and suppliers are identified. Common process and data models are defined and implemented with key suppliers and customers to support the relationship. ❑ Specific skills required to support collaboration with partners are identified and integrated into competency models. ❑ Strategies and information technology strategies are integrated across key business partners. ❑ Customer and Supplier performance scorecards are integrated with the firm's key business performance metrics. ❑ The enterprise can compare performance metrics across all partners in order to identify potential opportunities for value chain reconfiguration and improvement.	❑ Same characteristics as Co-ordination plus risk and benefit sharing between the companies involved. ❑ Joint service/partnership agreements for objectives and incentives, performance targets, benefit sharing agreements, and terms and conditions. ❑ Joint investments in shared resources.	❑ Same characteristics as Collaboration. Ownership of the partners is the main difference

APPENDIX C – Sub-model #2

Transactional Relationship	Set Direction	Monit. Ext. Environment	Manage Strategy	Manage Performance	Manage Change	Demand Generation	Product Development	Order Fulfilment	Product Support	Support Processes
❑ Arm's-length supplier partnership relationships. No formal supplier management process in place. ❑ Discrete processes and data flows well documented and understood (Orders). ❑ All planning is performed within company boundaries, and is not consistent across companies. ❑ Integrated tools do not exist. ❑ Informal agreements and relationships exist for some partners. ❑ Little attention is paid to market analysis. ❑ Use a combination of EDI, fax, paper-based, and manual transactions. ❑ Customer's needs are not the priority in the relationship. ❑ Local/own benefit maximisation is the objective of the relationship.	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable

Co-operation	Set Direction	Monit. Ext. Environment	Manage Strategy	Manage Performance	Manage Change	Demand Generation	Product Development	Order Fulfilment	Product Support	Support Processes
❑ Fluent flow information in both directions is the key feature. ❑ Strategic partners throughout the global chain collaborate to identify joint business objectives and action plans. ❑ Performance metrics governing relationships are available. ❑ Integration service agreements define specific roles and responsibilities, including explicit guidelines about issue resolution as it relates to external partners. ❑ Critical information is captured. ❑ All large partners linked via EDI. ❑ Commodity strategies determine relationships. Formal relationships are defined reflecting cross-functional requirements for buyer/supplier communication. ❑ Integrated value chain strategy – strategic partners are identified based on competencies, cross-enterprise TCO (Total Cost of Ownership), and improvement strategies with specific goals in mind. ❑ Strategic partners may have access to selected on-line information.	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Flow of information between companies. Data related to implemented technologies, IT systems, etc. Direct contact, e-mail, phone or fax are usually used for this purpose. A network between partners is created for information and data sharing. This information is for general purposes, not directed to enforce operate processes. Extranets, on-line forum group systems, etc. may be implemented for facilitating these networks. Collaborative portals; leverage Universities, Governmental Institutions for common benefit (lobbying). Be member of Industry Associations (Industry Road Mapping, etc.)

Co-ordination	Set Direction	Monit. Ext. Environment	Manage Strategy	Manage Performance	Manage Change	Demand Generation	Product Development	Order Fulfilment	Product Support	Support Processes
❑ The organisations involved share operational systems such as processes, technologies, resources, etc. ❑ Enforce common processes and data sharing ❑ IT and solutions enable a collaborative strategy that aligns participating companies' business objectives and associated processes ❑ Cross-enterprise optimisation based on TCO for strategic commodities, Net-market enablement, auctions, and supply market sensing/research/analysis. ❑ All transactions, including eRFQ, on-line bid/quote/mark-up, on-line supplier catalogues, and automated partners performance tracking and benchmarking, are automated. ❑ On-line, virtual management of relationships for data visibility, collaborative planning, performance tracking, and virtual workspace. ❑ Organisation alignment via an e-enabled environment that includes Net-markets integration and an integrated enterprise IT architecture, customised to support strategic priorities. ❑ Product and process data is visible to, and can be queried by, the whole value chain. It is free of errors and easy to maintain with comprehensive e-commerce linkages to customers and suppliers. ❑ A balanced scorecard integrates	Not applicable	Not applicable	Not applicable	Eventually, a Balanced Scorecard might integrate various parameters and gather data for operate processes. Fields of the scorecard related to operate processes would be only implemented, not for management processes.	Not applicable	Customer Relationship Management (CRM) systems are implemented and shared between the collaborative enterprises	Joint design through Collaborative-CAD, ERP, PDM/PLM systems. First steps towards Concurrent Engineering. Knowledge Management tools are implemented along the value chain. Design and product information flows freely between collaborative enterprises.	APS systems are linked to all collaborative enterprises to enable instantaneous transfer of changes in production requirements, orders, delays, etc. Collaborative enterprises have secure visibility to manufacturing scheduling performance via extranets. E-commerce linkages to customers and suppliers. IT technologies widely spread. Well-managed schedules. Purchasing, operations and distribution processes are shared between collaborative enterprises.	Customer Relationship Management (CRM) systems are implemented and shared between the collaborative enterprises.	Training programs about common affairs are jointly proposed and organised by collaborative enterprises. Research and Development projects may be shared for mutual benefit. Eventually, 'Visiting Customers' might be located permanently in their supplier/partners' company with training or consultancy purposes.

Co-ordination	Set Direction	Monit. Ext. Environment	Manage Strategy	Manage Performance	Manage Change	Demand Generation	Product Development	Order Fulfilment	Product Support	Support Processes
❑ The organisations involved share operational systems such as processes, technologies, resources, etc. ❑ Enforce common processes and data sharing ❑ IT and solutions enable a collaborative strategy that aligns participating companies' business objectives and associated processes ❑ Cross-enterprise optimisation based on TCO for strategic commodities, Net-market enablement, auctions, and supply market sensing/research/analysis. ❑ All transactions, including eRFQ, on-line bid/quote/mark-up, on-line supplier catalogues, and automated partners performance tracking and benchmarking, are automated. ❑ On-line, virtual management of relationships for data visibility, collaborative planning, performance tracking, and virtual workspace. ❑ Organisation alignment via an e-enabled environment that includes Net-markets integration and an integrated enterprise IT architecture, customised to support strategic priorities. ❑ Product and process data is visible to, and can be queried by, the whole value chain. It is free of errors and easy to maintain with comprehensive e-commerce linkages to customers and suppliers. ❑ A balanced scorecard integrates	Not applicable	Not applicable	Not applicable	Eventually, a Balanced Scorecard might integrate various parameters and gather data for operate processes. Fields of the scorecard related to operate processes would be only implemented, not for management processes.	Not applicable	Customer Relationship Management (CRM) systems are implemented and shared between the collaborative enterprises	Joint design through Collaborative-CAD, ERP, PDM/PLM systems. First steps towards Concurrent Engineering. Knowledge Management tools are implemented along the value chain. Design and product information flows freely between collaborative enterprises.	APS systems are linked to all collaborative enterprises to enable instantaneous transfer of changes in production requirements, orders, delays, etc. Collaborative enterprises have secure visibility to manufacturing scheduling performance via extranets. E-commerce linkages to customers and suppliers. IT technologies widely spread. Well-managed schedules. Purchasing, operations and distribution processes are shared between collaborative enterprises.	Customer Relationship Management (CRM) systems are implemented and shared between the collaborative enterprises.	Training programs about common affairs are jointly proposed and organised by collaborative enterprises. Research and Development projects may be shared for mutual benefit. Eventually, 'Visiting Customers' might be located permanently in their supplier/partners' company with training or consultancy purposes.

Customer, Cost, and Asset metrics and is structured at three levels (overview, process, diagnostics). ❑ A value chain process and data model is defined and it integrates all of the processes. ❑ Strategies are developed in collaboration with strategic partners (key suppliers and key accounts). These strategies identify business objectives and major actions required to implement the strategy over a maximum 12-month horizon. ❑ Performance targets are set across the value chain and are tracked with key partners based on commonly defined metrics. ❑ Key requirements for data sharing with both customers and suppliers are identified. Common process and data models are defined and implemented with key suppliers and customers to support the relationship. ❑ Specific skills required to support collaboration with partners are identified and integrated into competency models. ❑ Strategies and information technology strategies are integrated across key business partners. ❑ Customer and Supplier performance scorecards are integrated with the firm's key business performance metrics. ❑ The enterprise can compare performance metrics across all partners in order to identify potential opportunities for value chain reconfiguration and improvement.										

Collaboration	Set Direction	Monit. Ext. Environment	Manage Strategy	Manage Performance	Manage Change	Demand Generation	Product Development	Order Fulfilment	Product Support	Support Processes
❑ Same characteristics as Co-ordination plus risk and benefit sharing between the companies involved. ❑ Joint service/partnership agreements for objectives and incentives, performance targets, benefit sharing agreements, and terms and conditions. ❑ Joint investments in shared resources.	Strategies are developed in collaboration between partners. These strategies identify business objectives and major actions required to implement the strategy over a minimum 12-month horizon. Performance targets are set across the value chain and are tracked with partners based on commonly defined metrics. Joint investments and risks are adopted by partners involved in the relationship.	Benchmarking process is automated via IT solutions.	IT tools enable strategy-sharing that aligns participating companies' business objectives and associated processes.	A Balanced Scorecard integrates various parameters for managing the whole chain. Customer and supplier performance scorecards are integrated with the firm's key business performance metrics. It is managed on-line and is accessible to all the partners involved in the system.	Propositions for change are made jointly between partners, sharing the same vision and objectives. Change programs are coordinated across the collaborative enterprises.	Efficient Consumer Response (ECR) practices are deployed between partners for efficient assortment, efficient promotion, and efficient product introduction. Customer Relationship Management (CRM) systems are implemented and shared between the collaborative enterprises.	Developing products on common platforms (e.g. Virtual Product Development Manager) through the collaboration of engineers and design specialists (from various organisations): Concurrent Engineering. Knowledge Management tools are implemented and used along the value chain.	Efficient Consumer Response (ECR) practices are deployed between partners for efficient replenishment. Collaborative Planning, Forecasting & Replenishment (CPFR) systems are implemented.	Customer Relationship Management (CRM) systems are implemented and shared between the collaborative enterprises.	Training programs about common affairs are jointly proposed and organised by collaborative enterprises. Research and Development projects may be shared for mutual benefit. Eventually, 'Visiting Customers' might be located permanently in their supplier/partners' company with training or consultancy purposes.

Vertical Integration	Set Direction	Monit. Ext. Environment	Manage Strategy	Manage Performance	Manage Change	Demand Generation	Product Development	Order Fulfilment	Product Support	Support Processes
❑ Same characteristics as Collaboration. Ownership of the partners is the main difference.	Strategies are developed in collaboration with partners. These strategies identify business objectives and major actions required to implement the strategy over a minimum 12-month horizon. Performance targets are set across the value chain and are tracked with partners based on commonly defined metrics. Joint investments and risks are adopted by key partners involved in the relationship.	Benchmarking process is automated via IT solutions.	IT tools enable strategy-sharing that aligns participating companies' business objectives and associated processes.	A Balanced Scorecard integrates various parameters for managing the whole chain. Customer and supplier performance scorecards are integrated with the firm's key business performance metrics. It is managed on-line and is accessible to all the partners involved in the system.	Propositions for change are made jointly between partners, sharing the same vision and objectives. Change programs are coordinated across the collaborative enterprises.	Efficient Consumer Response (ECR) practices are deployed between partners for efficient assortment, efficient promotion, and efficient product introduction. Customer Relationship Management (CRM) systems are implemented and shared between the collaborative enterprises.	Developing products on common platforms (e.g. Virtual Product Development Manager) through the collaboration of engineers and design specialists (from various organisations): Concurrent Engineering. Knowledge Management tools are implemented and used along the value chain.	Efficient Consumer Response (ECR) practices are deployed between partners for efficient replenishment. Collaborative Planning, Forecasting & Replenishment (CPFR) systems are implemented.	Customer Relationship Management (CRM) systems are implemented and shared between the collaborative enterprises.	As the partners are owned by the same stakeholders, support processes might be shared or unique (finance process, human resources process, etc.), the same process strategically, tactically, operationally.

APPENDIX D - Questionnaire

INTER-ORGANISATIONAL COLLABORATION – COMPANY QUESTIONNAIRE

Interviewer _____ **Date** _____

Interviewee _____ **Job** _____

Interviewee Company _____

Business processes involved _____

These are the key objectives of the questionnaire:

1. To gain a better knowledge of the performance of the organisation.
2. To analyse the configuration and the practice of the business processes (Current/Future).
3. To analyse the map of relationships and its nature at a business process levels.
4. To study the impact of the critical factors of the organisation over the organisational relationships.
5. To discuss and refine the conceptual model developed.

This questionnaire has 6 sections:

Section No.	Key objective
1-General information about the company and its performance	To increase the understanding and have a better insight of the performance of the case under study.
2-Inter-organisational relationships of the company	To build a map with all the key relationships of the organisation, considering customers, suppliers, competitors and other entities.
3-Operational characteristics of the business processes	To identify the tools, methodologies and systems that the organisation has implemented in each business process.
4-Characteristics and behaviour of the critical factors	To score the categories of the critical factors according to the dynamic matrix of the model and calculate the Complexity/Uncertainty values.
5-Discussion of the conceptual model	To get feedback concerning the architecture and content of the conceptual model.
6-Limitations and weaknesses of the research	To get feedback about the content of the research, its weaknesses, limitations and lacks from a practical point of view.

Section 1 - General Information about the company and its performance

***Key Objective** - To increase the understanding and have a better insight of the performance of the case under study.*

1.1 What is the key activity of the organisation?

1.2 What is the configuration of the organisational structure of the company? (Business units; branches; No. employees; etc.)

1.3 What sector does the company perform in?

1.4 What are the characteristics of the product/market of the organisation?

1.5 What is the historical evolution of the organisation/market? What are the expectations for the future?

1.6 What are the core competences of the organisation? What other activities does the organisation have?

1.7 Is the organisation certified according to any standard (ISO9001, ISO 14001, etc.)?

1.8 What are the strengths, weaknesses, opportunities and threats of the organisation?

Section 2 - Inter-organisational relationships of the company

Key Objective *- To build a map with all the key relationships of the organisation, considering customers, suppliers, competitors and other entities.*

2.1 What kind of relationships can you distinguish in your organisation (Suppliers, customers, competitors, universities, technological centres, other entities...)? What are their general features?

2.2 What is the strategy of the organisation concerning the external relationships (alliances, joint ventures, etc.)?

2.3 What is the process for developing new relationships like? What is the criterion?

2.4 What are the advantages and disadvantages of the external relationships for the organisation?

2.5 ¿What factors are considered or have influence when a new relationship is launched (or to change a current relationship)?

2.6 From the perspective of the process that you are involved in, what are the relational characteristics of the business process? How do the external relationship impact? What should be the desirable configuration of the process?

2.7 Could you identify which of these relationships are currently held in your organisation? What is the ranking? Is there any other relationship type not considered in this list?

Weaknesses	Threats
Strengths	**Opportunities**

			Order
• Transactional Relationship (Flow of goods and money)	Y☐	N☐	☐
• Co-operation (Information sharing)	Y☐	N☐	☐
• Co-ordination (System sharing)	Y☐	N☐	☐
• Collaboration (Benefit/Risk sharing)	Y☐	N☐	☐
• Vertical Integration (Same as collaboration but a new entity is owned)	Y☐	N☐	☐

2.8 Could you build the map of the external relationships of the organisation?

SUPPLIERS

Name:	
Relation. level:	
Features:	

Name:	
Relation. level:	
Features:	

Name:	
Relation. level:	
Features:	

COMPETITORS

Name:	
Relation. level:	
Features:	

O.E.M.

OTHER ENTITIES

Name:	
Relation. level:	
Features:	

CUSTOMERS

Name:	
Relation. level:	
Features:	

Name:	
Relation. level:	
Features:	

Name:	
Relation. level:	
Features:	

Section 3 - Operational characteristics of the business processes

Key Objective *- To identify the tools, methodologies and systems that the organisation has implemented in each business process.*

3.1 Could you identify which of these tools, methodologies and systems has the organisation already implemented and is planning to implement in the future?

PROCESS **SET DIRECTION**

		Current implement.	Future implement.
❑	There is a methodology, tool or system that relates this process with other organisation (i.e. this process has external relationships)	Yes ☐ No☐	Yes ☐ No☐
❑	*Organisational strategy is jointly defined by partners. The key performance objectives and the implementation activities are defined by the strategy for a period of at least 12 months.*	Yes ☐ No☐	Yes ☐ No☐
❑	*A PMS system is available for the definition of joint performance*	Yes ☐ No☐	Yes ☐ No☐
❑	Benefits and risks are jointly taken by the organisation and external entities	Yes ☐ No☐	Yes ☐ No☐

PROCESS **MONITOR EXTERNAL ENVIRONMENT**

		Current implement.	Future implement.
❑	There is a methodology, tool or system that relates this process with other organisation (i.e. this process has external relationships)	Yes ☐ No☐	Yes ☐ No☐
❑	*There is a flow of information along the value chain that allows the organisation to gain an insight of the performance of the collaborative enterprise*	Yes ☐ No☐	Yes ☐ No☐
❑	*The organisation carries out benchmarking activities with other entities*	Yes ☐ No☐	Yes ☐ No☐
❑	IT solutions are implemented and used for carrying out benchmarking activities	Yes ☐ No☐	Yes ☐ No☐
❑	Benefits and risks are jointly taken by the organisation and external entities	Yes ☐ No☐	Yes ☐ No☐

PROCESS **MANAGE STRATEGY**

		Current implement.	Future implement.
❑	There is a methodology, tool or system that relates this process with other organisation (i.e. this process has external relationships)	Yes ☐ No☐	Yes ☐ No☐
❑	*There is a flow of information along the value chain that allows the organisation to effectively manage the strategy*	Yes ☐ No☐	Yes ☐ No☐
❑	*Frequent meetings are held to define, control and co-ordinate the shared strategy with other external entities*	Yes ☐ No☐	Yes ☐ No☐
❑	IT solutions are implemented and used for effectively managing the shared strategy between organisations	Yes ☐ No☐	Yes ☐ No☐
❑	Benefits and risks are jointly taken by the organisation and external entities	Yes ☐ No☐	Yes ☐ No☐

PROCESS **MANAGE PERFORMANCE**

		Current implement.	Future implement.
❑	There is a methodology, tool or system that relates this process with other organisation (i.e. this process has external relationships)	Yes ☐ No☐	Yes ☐ No☐
❑	*A PMS that integrates different factors for the global management of the whole value chain is available*	Yes ☐ No☐	Yes ☐ No☐

❑	Same as the one before + definition of the strategy and management of objectives	Yes ☐ No☐	Yes ☐ No☐
❑	All the PMS of the entities of the value chain are integrated.	Yes ☐ No☐	Yes ☐ No☐
❑	The shared PMS is accessible to all the members of the value chain on-line and in real time	Yes ☐ No☐	Yes ☐ No☐
❑	Benefits and risks are jointly taken by the organisation and external entities	Yes ☐ No☐	Yes ☐ No☐

PROCESS MANAGE CHANGE

		Current implement.	Future implement.
❑	There is a methodology, tool or system that relates this process with other organisation (i.e. this process has external relationships)	Yes ☐ No☐	Yes ☐ No☐
❑	*There is a flow of information along the value chain that allows the organisation to effectively manage change*	Yes ☐ No☐	Yes ☐ No☐
❑	*Change projects are commonly defined and carried out by collaborating organisations, sharing the same objectives*	Yes ☐ No☐	Yes ☐ No☐
❑	*Change projects are commonly managed and co-ordinated by the collaborating organisations*	Yes ☐ No☐	Yes ☐ No☐
❑	Benefits and risks are jointly taken by the organisation and external entities	Yes ☐ No☐	Yes ☐ No☐

PROCESS DEMAND GENERATION

		Current implement.	Future implement.
❑	There is a methodology, tool or system that relates this process with other organisation (i.e. this process has external relationships)	Yes ☐ No☐	Yes ☐ No☐
❑	*There is a flow of information along the value chain that allows the organisation to effectively generate new orders*	Yes ☐ No☐	Yes ☐ No☐
❑	*CRM (Customer Relationship Management) systems are implemented and shared by collaborating organisations*	Yes ☐ No☐	Yes ☐ No☐
❑	*ECR (*Efficient Customer Respond*) systems are implemented and shared by collaborating organisations* for introducing new products in the market	Yes ☐ No☐	Yes ☐ No☐
❑	Benefits and risks are jointly taken by the organisation and external entities	Yes ☐ No☐	Yes ☐ No☐

PROCESS PRODUCT DEVELOPMENT

		Current implement.	Future implement.
❑	There is a methodology, tool or system that relates this process with other organisation (i.e. this process has external relationships)	Yes ☐ No☐	Yes ☐ No☐
❑	*There is a flow of information along the value chain that allows the organisation to effectively develop new products*	Yes ☐ No☐	Yes ☐ No☐
❑	*Joint new product design through tools such as CAD, ERP, PDM/PLM. First steps toward concurrent engineering*	Yes ☐ No☐	Yes ☐ No☐
❑	*Especial tools for knowledge management are implemented and shared along the value chain*	Yes ☐ No☐	Yes ☐ No☐
❑	Multidisciplinary engineers and technicians of different organisations of the value chain carry out new product development projects. Total concurrent engineering (e.g. Virtual Product Development Manager)	Yes ☐ No☐	Yes ☐ No☐
❑	Benefits and risks are jointly taken by the organisation and external entities	Yes ☐ No☐	Yes ☐ No☐

PROCESS ORDER FULFILMENT

		Current implement.	Future implement.
❑	There is a methodology, tool or system that relates this process with other organisation (i.e. this process has external relationships)	Yes ☐ No☐	Yes ☐ No☐
❑	*There is a flow of information along the value chain that allows the organisation to effectively fulfil the requirements of the customer*	Yes ☐ No☐	Yes ☐ No☐
❑	APS (Advanced Planning & Scheduling) systems are jointly implemented to review and modify the order on-line and in real time	Yes ☐ No☐	Yes ☐ No☐
❑	Collaborating organisations shared the manufacturing planning through an extranets	Yes ☐ No☐	Yes ☐ No☐
❑	e-commerce technologies are shared by the collaborating organisations to improve the transactions	Yes ☐ No☐	Yes ☐ No☐
❑	Supply and distribution activities are commonly carried out	Yes ☐ No☐	Yes ☐ No☐
❑	*ECR (Efficient Customer Respond) systems are implemented and shared by collaborating organisations for an effective supply of raw materials, goods, and so on.*	Yes ☐ No☐	Yes ☐ No☐
❑	*Shared CPFR (Collaborative Planning, Forecasting & Replenishment) systems are available between the collaborating organisations*	Yes ☐ No☐	Yes ☐ No☐
❑	Benefits and risks are jointly taken by the organisation and external entities	Yes ☐ No☐	Yes ☐ No☐

PROCESS PRODUCT SUPPORT

		Current implement.	Future implement.
❑	There is a methodology, tool or system that relates this process with other organisation (i.e. this process has external relationships)	Yes ☐ No☐	Yes ☐ No☐
❑	*There is a flow of information along the value chain that allows the organisation to offer an effective after sales service*	Yes ☐ No☐	Yes ☐ No☐
❑	*CRM (Customer Relationship Management) systems are implemented and shared by collaborating organisations*	Yes ☐ No☐	Yes ☐ No☐
❑	Benefits and risks are jointly taken by the organisation and external entities	Yes ☐ No☐	Yes ☐ No☐

PROCESS SUPPORT PROCESSES

		Current implement.	Future implement.
❑	There is a methodology, tool or system that relates this process with other organisation (i.e. this process has external relationships)	Yes ☐ No☐	Yes ☐ No☐
❑	*There is a flow of information between the organisation and any other entity with any purpose*	Yes ☐ No☐	Yes ☐ No☐
❑	*The organisation is involved in forums, clusters, networks, etc. for information sharing*	Yes ☐ No☐	Yes ☐ No☐
❑	*The organisation works together with universities and technological centres for mutual benefit*	Yes ☐ No☐	Yes ☐ No☐
❑	Common training programs are arranged by organisations with similar characteristics and requirements	Yes ☐ No☐	Yes ☐ No☐
❑	Eventually the organisation hosts employees of other organisations (normally customer or supplier) to gain a specific expertise. The organisation might lend some of its employees as well with the same purpose.	Yes ☐ No☐	Yes ☐ No☐
❑	Benefits and risks are jointly taken by the organisation and external entities	Yes ☐ No☐	Yes ☐ No☐
❑	*The organisation is vertically integrated with other organisation and some support processes are completely shared*	Yes ☐ No☐	Yes ☐ No☐

Section 4 - Characteristics and behaviour of the critical factors

***Key Objective** - To score the categories of the critical factors according to the dynamic matrix of the model and calculate the Complexity/Uncertainty values.*

4.1 Could you score the categories of the critical factors of the organisation according to the following matrix?

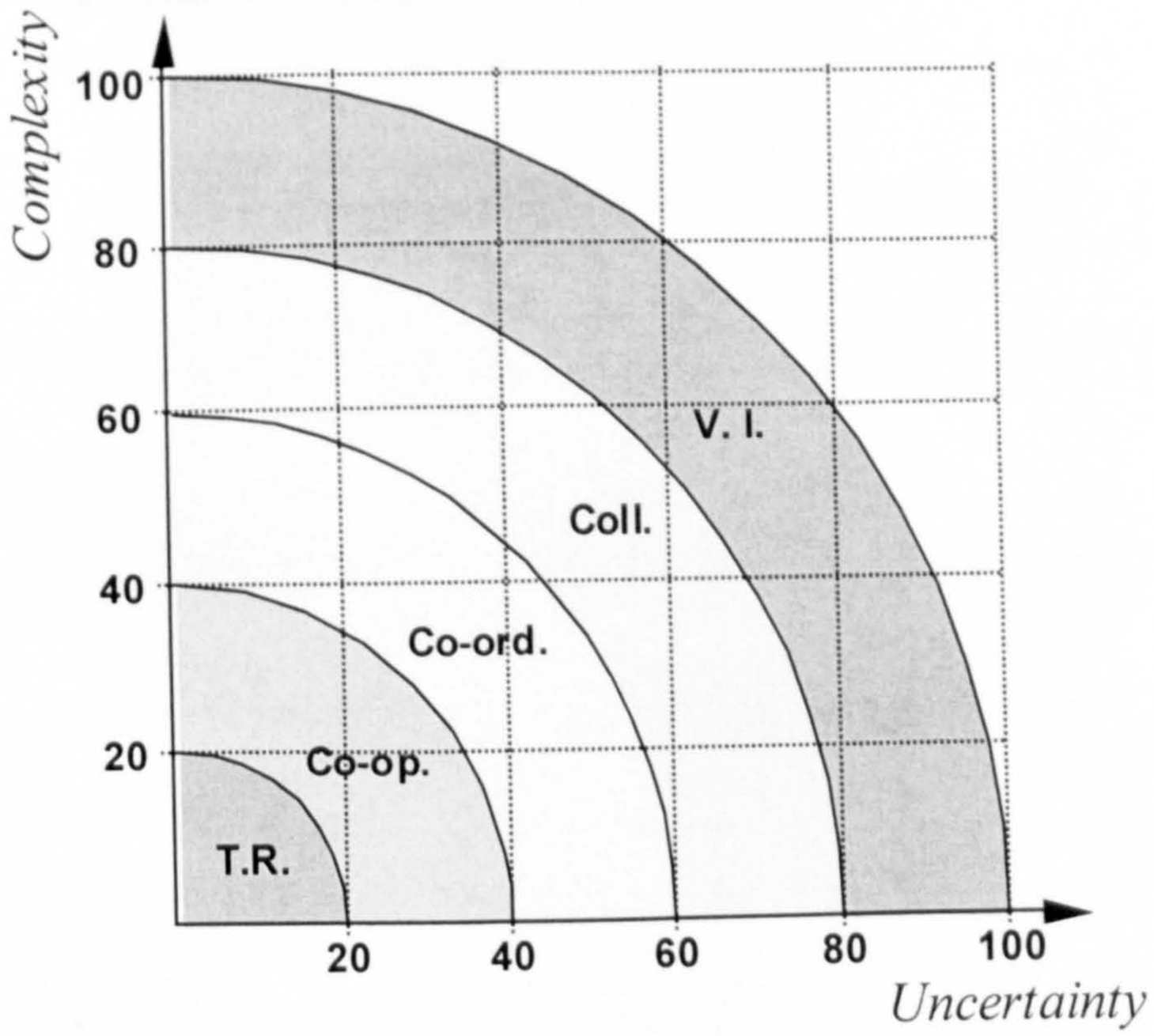
CRITICAL FACTORS	*VARIABLES*										
General Economic factors	Highly Favourable		Favourable		Low Recession				High Recession		
	0 – 25		26 – 50		51 – 75				76 - 100		
Location (Physical, Logical)	Very good infrastructures and industrial environment		Good infrastructures and industrial environment		Average infrastructures and industrial environment				Poor infrastructures and industrial environment		Very poor infrastructures and industrial environment
	0 – 20		21 – 40		41 – 60				61 – 80		81 - 100
Behaviour and relationship of other Org.	Stronger than Supplier		Stronger than Customer		Stronger than Competitors		Balanced strength with S/C/Comp.		Strong/Aggressive Supplier	Strong/Aggressive Customer	Strong/Aggressive Competitor
	0 - 33		0 - 33		0 - 33		34 – 66		67 - 100	67 - 100	67 - 100
Value Proposition	Simplifier		Price Minimisers		Socialisors				Technological Integrators	Brand Managers	Innovators
	0-16		17-33		34-50				51-66	67-84	85-100
Resources	Availability of Resources				Medium availability of Resources					Scarcity of Resources	
	0 – 33				34 – 66					67 - 100	
Performance ambiguity	Low				Medium					High	
	0 - 33				34 – 66					67 - 100	
Product & Market Segment	Consumer Market				Industrial Market				Commodity Market		Capital Market
	Services	Fast moving consumer goods	Soft goods	Consumer durables	Services	Raw<materials - Components		Finished goods			
	0 – 25	26 – 50	51 – 75	76 - 100	0 - 33	34 – 66		67 - 100	0 - 25		75 - 100
Manufacturing Strategy	Make to Stock				Assemble to Order		Make to Order		Engineer to Order		Design to Order
	0 – 20				21 – 40		41 – 60		61 – 80		81 - 100
Type of Product	Standard				Modular						Customised
	0 - 33				34 – 66						67 - 100
Degree of routinization of the buying problem	Frequent Procurement				Random Procurement						First Procurement
	0 - 33				34 – 66						67 - 100
Learning Potential	High				Medium						Low
	0 - 33				34 – 66						67 - 100
Transaction Costs	Low				Medium						High
	0 - 33				34 – 66						67 - 100

Section 5 - Discussion of the conceptual model

Key Objective *- To get feedback concerning the architecture and content of the conceptual model.*

5.1 According to the scores achieved in the previous section, what do you think about the relationship that the diagram below suggests?

5.2 How would you vary the boundaries between the relationship levels in the diagram?



Section 6 - Limitations and weaknesses of the research

Key Objective *- To get feedback about the content of the research, its weaknesses, limitations and lacks from a practical point of view.*

6.1 What is your opinion concerning the relationship classification proposed by this study? Is there any relationship level missing?

6.2 What do you think about the list of critical factors presented in this study? Is there any critical factor missing?

6.3 Do you think that it is viable to build a model to make more desirable the external relationships of a company?

6.4 In your opinion, what are the strengths and weaknesses of this study?

SUPPLIER FACING

Organisation			G.D.	P.D.	O.F.	P.S.	Notes
a		V					
		R					
		N					
		O					
b		V					
		R					
		N					
		O					
c		V					
		R					
		N					
		O					
d		V					
		R					
		N					
		O					
e		V					
		R					
		N					
		O					

V: Value R: Risk N: Now O: Desirable

3: High 2: Medium 1: Low

STAKEHOLDER FACING

Organisation			G.D.	P.D.	O.F.	P.S.	Notes
A		V					
		R					
		N					
		O					
B		V					
		R					
		N					
		O					
C		V					
		R					
		N					
		O					
D		V					
		R					
		N					
		O					
E		V					
		R					
		N					
		O					

V: Value R: Risk N: Now O: Desirable

3: High 2: Medium 1: Low

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