DOCTORAL THESIS

"INFLUENCES OF CHANGE STRATEGIES TO ACHIEVE ORGANIZATIONAL FLEXIBILITY: A SYSTEM DYNAMICS APPROACH"

by

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January, 2016

To my loved daughters, Andrea and Aleyna

ACKNOWLEDGEMENTS

This thesis is the result of a long and hard journey. Although it has taken me quite time and energy, it has been a great journey that I would undoubtedly repeat because it has taught me more than anything. Most of all, it has been a great learning experience in which I have had the opportunity to closely work with brilliant people.

I have had the pleasure to work with an extraordinary team of supervisors. First, I would like to express my sincere and profound gratitude to Professor Martin Kunc who trusted my research proposal and pleasingly accepted providing me his unconditional support since the beginning through these years. He has introduced me into the amazing world of System Dynamics research, guided me in a hard learning process but above all, his continuous encouragement has been of great importance for me. He really did teach me to think, to analyse, model and formalize, argue and write, and mostly, learn from failures and start again. I admire his rigor and integrity as a scientist. I am sincerely grateful to Professor Olga Rivera. Her determination, wise counsel and kindness have been priceless to me during these years. She has given me the most valuable guidance on qualitative research methods and I admire her solid knowledge on organisational management. I feel very fortunate to have such excellent mentors. Furthermore, I am honoured to thank Professor Arturo Rodriguez Castellanos, for kindly providing me his scientific endorsement in the University of Basque Country. I want to mention my special thanks to all his helpful advice, significant discussions and valued lessons on research.

It has been a privilege to have two prestigious researchers as external evaluators of my thesis: Professor Eliseo L. Vilalta-Perdomo and Myrna F. Flores, PhD. I would like to thank them for their insightful and precise comments that I highly appreciate.

Although we hadn't opportunity to meet in person, Professor Henk W. Volberda and Mr. Niels van der Weerdt significantly influenced my work. They encouraged me to acquire deeper understanding and practical experience on Organisational Flexibility and their dimensions. Both considered my research seriously and they made me feel part of the community of organisational scholars.

It has been a privilege to count on the invaluable support from Mr. Javier Aranceta, R&D manager of Mondragon Components, who collaborated in the exploratory study of flexibility diagnosis in a cooperative context and provided insightful and precise comments on managerial practices.

My warmest gratitude goes to all the talented people in Department of Financial Economics II (Financial Economics and Accountancy and Marketing and Market Research), in the Faculty of Economics and Business Studies (Bilbao). From the beginning it has been a personal ambition to demonstrate my capacity as a scientist with a dissertation and get my PhD in the Faculty of Economics and Business Studies at University of Basque Country. I'm so grateful to the people that made this possible, indirectly as intimate supporters or directly working as pre-examiners of my thesis, with special thanks to Professors Jesus Matey and Jon Barrutia.

My doctorate scholarship in the technological centre IKERLAN provided me the opportunity to start this journey. I have to express my special gratitude to Eduardo

Castellanos, PhD, and Mr. Juan Mari Goenaga for their absolute support and reinforcement along my early stage of this learning process. I also want to express my warmest affection to my closest colleagues at Ikerlan – thank you for sharing with me the moments of despair but also those of joy.

My current work as researcher at the Innovation Strategies Division of Tecnalia has provided me with yet another inspiring perspective on research. I would like to thank to Mr. Manuel Olariaga who has been very patient and supportive during the last stage of this journey and to Hanna Kuittinen, PhD, who has provided me valuable advice and answers to critical questions of my research. Thanks to Tecnalia, I had the opportunity to closely work with Politecnico of Milano in a European research project. I want to express my gratitude to Professor Sergio Terci for accompanying me in my learning process during my stay at the above mentioned university.

Finally, I want to express my gratitude from the bottom of my heart to my 'big' family, especially to my mother whose effort and sacrifice allowed me to access to university studies and obtain a professional education and to my sister Inmaculada who has always trusted me and supported me in all my endeavours. I want to say thank you to my beloved friends, Teresa y Charo, for their kindness in understand and always highlight my endeavours. My warmest admiration and gratitude to Angel, without your belief in me and your optimism I would have left this journey in many occasions. Thank you for being there all the time, together we will start a new and fascinating journey!

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1. INTRODUCTION

1.1. RESEARCH MOTIVATION

Currently, companies facing the new pressures from the environment are being compelled to improve their ability of continuously adapt to new competitive scenarios. Among others, the most common pressures cited in literature have been demographic changes, a more global economy, the "hyper-competition" or knowledge-based competition (Daft & Lewin, 1993) which continue active in the competitive landscape and nowadays are pushing the firms to develop new forms of organizing (Graetz & Smith, 2009).

The mentioned ability will depend not only on being efficient in their organisational routines but also on being innovative at the same time (Abernathy, 1978; Hayes & Abernathy, 1980; Tushman & O'reilly, 1996; Teece, Pisano, & Shuen, 1997). It represents the notion of balance between exploration and exploitation activities and it is a common topic in literature related to organisational adaptation (Benner & Tushman, 2001). This balance is related to developing new dynamic processes that enable a fast reconfiguration of the resource base (Teece et al, 1997, Eisenhardt & Martin, 2000, Helfat et al, 2007), or a transformation in the nature of activities (Aaker & Mascarenhas, 1984), or dismantling of current strategies (Harrigan, 1985). Recently, Raisch and Birkinshaw (2008) describe the different contexts in which the need to reconcile the two orientations have been discussed: organisational learning, technological innovation, organisational adaptation, strategic management and organisational design. **Within the theory of organisational adaptation, organisational flexibility – as the ability to adapt quickly to new or changing environments - is a necessary condition for accomplishing this balance** (Sommer, 2003; Dreyer and Grønhaug, 2004; Sherehiy, Karwowski and Layer, 2007; Verdú-Jover and Gomez-Gras, 2009).

The literature around organisational flexibility has started six decades ago and has been associated to several organisational capacities (agility, versatility, adaptability, fit, responsiveness, etc.). A huge variety of studies reveals how companies can gain and sustain competitive advantages, create capabilities to control and influence their environment and manage chaos and adversity. Recently, organisational flexibility has received growing attention from both researchers and managers as a key driver for companies to survive and prosper in turbulent and unpredictable environments (Dreyer and Grønhaug, 2004) and it is becoming the new hallmark of organisational excellence (Volberda et al. 2007).

According to Hatum and Pettigrew (2006), managers face major difficulty in accomplishing organisational change without losing stability because of the lack of models explaining the relationship between flexible capabilities, environmental turbulence and the firm's performance (Suarez, Cusumano & Fine, 2003) along the enterprise lifecycle (Volberda, 1998; Dreyer and Grønhaug, 2004; Verdú-Jover, Lloréns-Montes & García-Morales, 2006). Different approaches have emerged and empirically show the dimensionality of organisational flexibility (e.g. Hatum and Pettigrew, 2006), its interaction with firm size (e.g. Kraatz and Zajac, 2001), the context specificity of flexible capabilities and organisational design (e.g. Volberda, 1998; Verdú-Jover, Lloréns-Montes and Garcia-Morales, 2005; Martínez-Sánchez, A., et al. 2009). The Organisational Flexibility theory appears in a number of conceptual works and in a limited number of empirical studies facing its complexity and the interrelations between variables at organisational level (Table 1).

Some of these empirical studies and others more theoretically focused have stressed the **complex nature and multidimensional structure** of such subject (Volberda 1996, Teece et al, 1997, De Toni and Tonchia, 2005) which is difficult to satisfactorily define. This could be the reason that explains the few empirical studies, which account for such complexity (Dreyer and Grønhaug 2004). According to Hatum and Pettigrew (2006), when managers face flexibility, the major difficulty they find is how to accomplish the change without losing stability and literature is still waiting for models explicating relationships between flexible capabilities, environmental turbulence and firm performance (Suárez et al. 2003). Any change initiative that companies implement when they are looking for balancing stability and change (exploration and exploitation), should be accompanied by the concern of such complexity. Therefore, to address the complex nature of Organisational Flexibility, the analysis of the interrelations between variables of Organisational Flexibility and their consequences at organisational level is still needed in this research field.

Additionally, **the formula to accomplish organisational flexibility along the enterprise lifecycle** (with a temporal basis) **remains limited** (Volberda, 1998; Dreyer and Grønhaug, 2004; Verdú-Jover et al. 2006). Within the context of organisational adaptation, some authors start to investigate the temporal condition of that source of competitive advantage.

On Organisational Flexibility context, Volberda (1998) anticipated the possibility of modelling the adaptation process from a dynamic point of view: *"Flexibility is not a static condition, but it is a dynamic process. Time is a very essential factor of organisational*

flexibility." (Volberda, 1998: 235). He settles the possibility to address such adaptation process as a sequence of stages allowing understanding of the key factors of organisational flexibility with different environmental turbulence levels.

Dreyer and Grønhaug (2004) forecasted the important challenge of creating knowledge around the relationship between change and time concretely, understand when to change to remain competitive. Verdú-Jover et al. (2006) state that their findings capture the company behaviour at one moment of time and, as the companies operate in turbulent environments, the overall construct of flexibility condition should be studied throughout time.

Recently, Tan and Zeng (2009) propose a stage-dependent model of resource utilization which contributes to dynamic capabilities and consequently, to firm performance due to such "time-varying dimension". They consider such flexibility is a key enabler since strategies that formerly provided systemic dynamism might become sources of system rigidity at another stage.

Table 1: Research findings and challenges regarding organisational flexibility

AUTHORS	CONTEXT	OUTCOMES	FUTURE RESEARCH CHALLENGES
Eppink (1978)	**Managerial Capabilities: Strategic Flexibility** Change can be operational, competitive, or strategic. Distinct types of flexibility for each type of change which minimize the vulnerability of organisations and their ability to respond	Suggests multi-dimensionality and hierarchical nature	Comprehensive modelling of relationships
Sanchez (1995; 2004)	**Managerial Capabilities and Organisational Design** Organisational adaptation requires coordination flexibility and resource flexibility; **five modes of competences** reflect hierarchy of flexible capabilities	Suggests high level multidimensionality (managerial and organisational flexibility)	Comprehensive modelling of relationships
Volberda (1996/1998)	**Managerial Capabilities and Organisational Design (responsiveness)** Describes and develops a framework for Organisational Flexibility. In this framework, steady-state, operational, structural, strategic flexibility, responsiveness of technology, structure, and culture are considered	Confirms hierarchical nature and multidimensionality of construct	Inclusion of Time factor
Lund, R. (1998)	**Flexible traits / Functional Flexibility** Operationalises flexibility as manifested in internal dimensions of structure, culture, processes, and external dimensions of technology and product market innovation.	Confirms flexibility is linked to performance: the fulfilment of customer expectations, integration of new technology.	Comprehensive modelling of relationships
Dreyer and Grønhaug (2004)	**Managerial capabilities: Flexibility from Resource-based view** Volume flexibility, product flexibility, labour flexibility, financial flexibility, flexibility impact on performance	Confirms existence of different types of flexible capabilities and their role on achieving competitive advantage	Inclusion of Time factor
Anand and Ward (2004)	**Strategic Flexibility** Mobility flexibility (alter production); range flexibility (product/process diversity)	Confirms multi-dimensionality at first-order level	Comprehensive modelling of relationships
Verdú-Jover, Lloréns-Montes & Garcia-Morales (2006)	**Managerial capabilities: operational, structural and strategic flexibility** Different levels of flexibility and fit between real flexibility and that required by the environment have a positive impact on innovative capacity	Confirms existence of different types of flexible capabilities	Inclusion of Time factor

Hatum and Pettigrew (2006)	**Managerial capabilities and Organisational Design:** Centralization and formalization; institutional embeddedness; environmental scanning; organisational identity	Confirms multi-dimensionality of organisation design construct	Comprehensive modelling
Xie and Ye, (2008)	**Managerial capabilities:** Operational, structural & strategic flexibility	Confirms multi-dimensionality, the relationships between environment and managerial capacities and their impact on performance	Inclusion of Time factor

On the Organisational Ambidexterity context, Raisch and Birkinshaw (2008) highlight the key literature on organisational adaptation (they develop a comprehensive study on Organisational Ambidexterity) and point out several findings about the combination of time-adaptive capacity from some studies: the need for regular and rhythmical organisational change by means of time pacing is latent (Brown and Eisenhardt, 1998) and the different organisational ambidexterity configurations may be compared to alternative solutions for dealing with the exploitation and exploration paradox, such as temporal cycling (Nickerson & Zenger, 2002). Based on the reasons exposed above, the inclusion of the time variable to understand the behaviour of organisational flexibility along the process of change is another component to include in focus of the present thesis.

Some of the aforementioned studies identify variables and specify the relationships between most of them yet comprehensive modelling of these interrelations and the consequent simulation of several strategies of organisational change incorporating the time-varying dimension remains a challenge. Considering the complexity concerns and the lack of comprehensive modelling of the 'organisational flexibility' construct, as it is justified in the literature review, this thesis attempts to use system dynamics modelling (Sterman, 2000; Sastry, 1997, Repenning, 2002) to develop a more robust theoretical model in Organisational Flexibility.

1.2. RESEARCH PURPOSE

The issues discussed above show a path for addressing a significant research area of organisational change and organisational flexibility. This thesis attempts *to expand the Organisational Flexibility theory through a robust causal explanation of organisational adaptation to changing environments.*

A more robust Organisational Flexibility theory will be generated by evaluating the time path of organisational change strategies aimed to achieve the different levels of Organisational Flexibility (OF) while identifying the main barriers that arise when those processes are implemented along the enterprise lifecycle.

Based on such a general objective, the specific aims of this thesis are two-fold:

1. **Build a dynamic model of Organisational Flexibility to enhance the understanding of the Organisational Flexibility theory**. A system dynamics model of Organisational Flexibility is created to enhance the understanding of the Organisational Flexibility's theory by modelling the dynamic relationships of its components. The model captures changes over time by simulating the evolving

behaviour of interrelated variables during the implementation of change strategies towards required flexibility. By translating an existing theory into a system dynamics model, new understanding as well as new questions about the original theory are generated (Sastry, 1995).

2. **Refine and expand academic knowledge** around Organisational Flexibility by exploring and testing moderating factors, which arise along the entire corporate lifecycle when a company implements flexibility initiatives looking for stability or change. This study is focused on identifying and evaluating the core constraints at enterprise level. Strategies that formerly provided systemic dynamism may become sources of system rigidity at another stage (Oliver, 1991).

The simulation of both models allows patterns of behaviours to be analysed and the following research questions to be addressed in this thesis are proposed:

- **Does System Dynamics, as a modelling method, allow creating a micro-world where space and time can be compressed so we can learn, understand and assess the change processes to adapt the required level of flexibility to environmental characteristics?**
- **Does the developed system dynamic model accurately represent the expected behavior that the theory defines?**
- **Are there any constraints of such change strategies that the company should confront during the transformation journey?**
- **Does the extended model allow understanding and representing those constraints as well as evaluating if the expected results on organisational flexibility change occur at the time required or expected?**

1.3. RESEARCH STRATEGY

By improving our understanding of existing explanations for Organisational Flexibility in such a complex concept, the gap between theory and practice could be overcome in this thesis. In order to achieve this thesis' objective the first research question that arises as the main research focus: "*Does System Dynamics, as a modelling method, allow creating a micro-world where space and time can be compressed so we can learn, understand and assess the change processes to adapt the required level of flexibility to environmental characteristics*?" For this, the research strategy proposes analysing Organisational Flexibility, their components and their interrelations and incorporating the time-scale in the analysis that means to consider flexibility as a continuous path along the enterprise lifecycle. Such analysis is proposed taking as a basis Volberda's theory described in

"Building a Flexible firm: How to remain competitive". His work is widely claimed in management literature and this author's trajectory in the field of Flexible Firm is strongly consolidated. We selected this theory based on three main reasons: first, Volberda's theory allows several dimensions and their interrelations to be explored from a comprehensive perspective; second, Volberda highlights that Flexibility requires an inherent paradox – accommodating change and stability simultaneously, which fits with the balance exploration vs exploitation; and third, the multidimensionality of his framework opens the opportunity to explore the theory under a systemic perspective as well as, to explore it including the dynamic nature of the flexibility level, evolving over time.

As a first step, an intensive literature review of theoretical and empirical studies with a fundamental focus on Organisational Flexibility is made. This review provides evidence about the progress made regarding the complexity nature of Organisational Flexibility. The literature review section concludes with a discussion on how empirical data can justify the necessity of time variable consideration as a pre-requisite for achieving required level of flexibility along the enterprise lifecycle (Chapter 2).

As mentioned in Section 1.2, System Dynamics modelling is applied to a pre-existing global framework in Organisational Flexibility developed by Volberda (1998). The second step of this work takes the form of a systematic exploration of Volberda's theory (Volberda, 1998) (described in Chapter 3). The significance of all the concepts in Volberda's framework is explored by identifying the key variables, their relationships and the subsequent dynamic behaviour following Sastry's (1995) reference work. An exhaustive textual analysis of his theoretical assertions (following the Volberda´s theoretical framework foundation) is conducted. Having established a common understanding of the components and their dynamic relationships, a first causal model based on a systemic view is developed illustrating the dimensions of organisational flexibility and their evolution over time.

System dynamics has been successfully applied to provide more robust explanations to organisational theories. Two precedent works appear in the literature within the Systems Dynamic field:

- Sastry's research (Sastry, 1997) has been cited several times in literature within strategy and organisational change field. She analyses Tushman and Romanelli's theory of punctuated change (Tushman and Romanelli, 1985) and develops a theory by modelling organisational change as a function of organisation environment fit and trial periods following reorientations during which the change

process is suspended. Her findings suggest a number of ways in which organisations can fail to manage strategic change successfully.

- Repenning (2002) studies the process of innovation implementation using simulation models. He develops a deeper understanding of the dynamic behaviours generated by the processes common to current theories. His theoretical framework provides understanding of failed efforts to improve organisational effectiveness when innovation is adopted and implemented. The analysis made using systems dynamic highlights and clarifies the complex interactions between the elements common to existing frameworks.

By applying System Dynamics modelling, the dynamic behaviour of the system when transformation strategies towards the required level of organisational flexibility are implemented could be analysed. This step concludes with the formalization of this model and the subsequent validation and model testing exercises.

The longitudinal interaction between the processes that illustrate changes in the dimensions of organisational flexibility and their evolution over time is explored in the fourth step of the present research. In other terms, the model depicted in Chapter 3 is simulated to highlight the role of key constructs such as the Organisational Flexibility, Flexible Form and Perceived Environmental Turbulence when the organisation endeavours to solve the fundamental tension originated by the deficit or surplus of flexibility level as the environment evolves. This step corresponds to Chapter 4, in which the exploration of some of the implications of the qualitative arguments that lay on Volberda's theory by using computer simulation is developed. A systematic approach is used to test and explore the simulation model to examine whether the model depicts Volberda's theoretical model and whether it provides endogenous explanations of the theory. As a consequence, the second thesis's research question is addressed: "*Does the developed system dynamic model accurately represent the expected behavior that the theory defines?*"

In order to discover and analyse possible answers to the following proposed research question: "*Are there any constraints of such change strategies that the company should confront during the transformation journey?*" a qualitative research exploration was developed in a large cooperative industrial group with, in some extend, a longitudinal perspective (Chapter 5). The qualitative approach was devoted to explore the evolution of the processes involved in the theory of Organisational Flexibility, defined by Volberda (1998). This qualitative exploration, with some limitations, allowed relevant managerial

implications to organisational flexibility theory to be formulated for a specific context: a cooperative group of the industrial components sector and for certain period of time. The selection of the period 2007-2011 is primarily motivated by the aim of our study, which is concerned in providing insight into how the cooperative industrial group adjusts its current and potential level of flexibility in response to external rates of change in the components industry (and the role of potential absorptive capacity herein). This qualitative exploration is based on the data gathering process proposed by Volberda through the application of the Quick Scan Questionnaire. After the application of the questionnaire in the two explored years (see Annex I-QSF questionnaire and see Annex II-Adapted QSF questionnaire) several semi-structured interviews were developed with the involvement of the R&D manager in order to complete the data gathering process. During the interviews[1], the results from the two questionnaires were compared and verified with the manager's arguments in order to assess and highlight the main causes of the evolution followed by the variables that have been studied.

Given the Base Case as a benchmark, the next step is to explore other potential behaviour modes. In this stage, based on the conclusions obtained in the previous step, a theoretical synthesis was firstly conducted in order to explore new insights that will serve to extend the Base Case model by adding new variables and relationships and, furthermore, the dynamic behaviour of the new extended model to be explored. Therefore, we focus on which factors may inhibit or drive the pathway of Flexible Form when both types of change strategies are implemented. Those factors that have been anticipated at the end of Chapter 4 and empirically explored in previous Chapter 5 lately will be incorporated into Volberda's framework under the system dynamics perspective. After illustrating the theoretical findings and empirical findings from a qualitative research exploration that lay the foundation for incorporating new variables into the model described in Chapter 4, the formalization of the 'Extended model' is developed and described. This extended model represents the evolution of flexible capabilities and responsiveness when strategies of change are implemented, however unlike the base case model, it allows anticipating some constraints. In order to answer the fourth proposed research question: "*Does the extended model allow understanding and representing those constraints as well as evaluating if the expected results on organisational flexibility change occur at the time required or expected?*" different sets of simulations were conducted with the Extended Model. The simulation exercises enabled to explore the conditions under which a particular structure plays a key role in determining the dynamics of the system and to evaluate some dynamic

[1] See Annex V – interview guide

propositions. Through the simulation of an extension of the basic model we showed how well the simulations match the predictions from the theory and from the original descriptive model (Chapter 6).

Figure 1 shows the comparison between the two proposed models (Figure 1). Simulation exercises of this second model highlight the interactions with other features of the system that inhibit the company to achieve a sustained level of Organisational Flexibility and the dynamic propositions are validated.

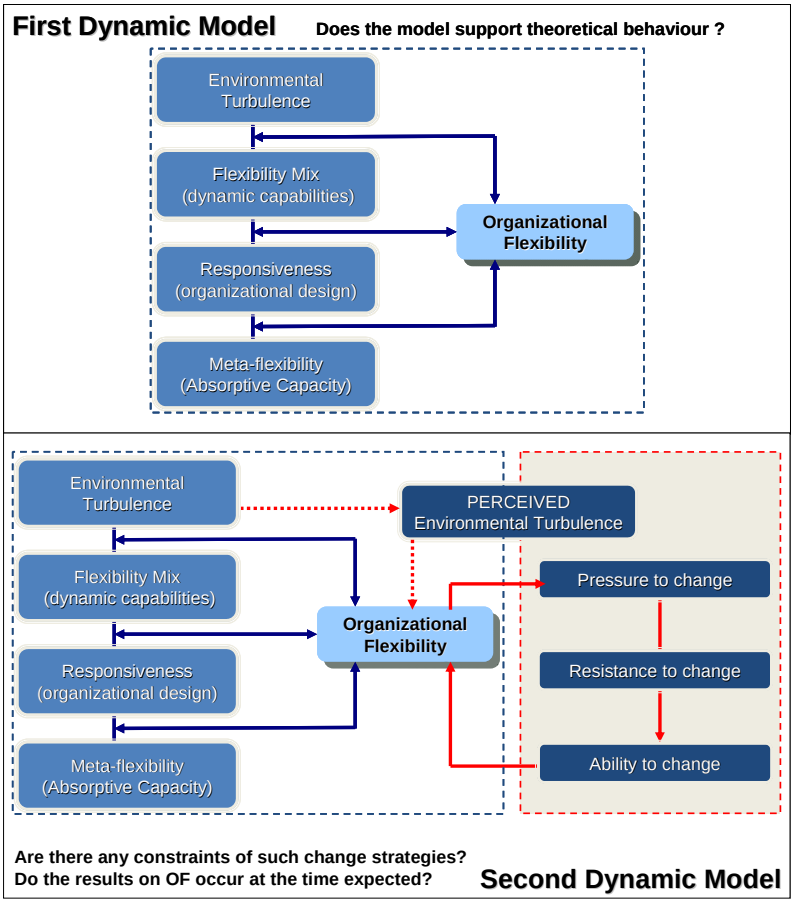

Figure 1: Overview of the two different perspectives on organisational flexibility and the relationships between variables

1.4. OUTLINE OF DISERTATION

In the following table (Table 2), the main objective and the expected results of the present research are shown.

Table 2: Thesis' research questions and proposed objectives

RESEARCH QUESTIONS	OBJECTIVE	EXPECTED RESULTS
Does System Dynamics, as a modelling method, allow creating a micro-world where space and time can be compressed so we can learn, understand and assess the change processes to adapt the required level of flexibility to environmental characteristics?	*To expand the Organisational Flexibility theory through a robust causal explanation of organisational adaptation to changing environments.*	*A more robust Organisational Flexibility theory will be generated by evaluating the time path of organisational change strategies aimed to achieve the different levels of Organisational Flexibility while identifying the main barriers that arise when those processes are implemented along the enterprise lifecycle.*
Does the developed system dynamic model accurately represent the expected behavior that the theory defines?		
Are there any constraints of such change strategies that the company should confront during the transformation journey?		
Does the extended model allow understanding and representing those constraints as well as if the expected results on organisational flexibility change occur at the time required or expected?		

The stages of the research methodology proposed in this thesis are depicted in Figure 2 below. The thesis is organised into seven chapters. In addition to the Introduction and Conclusions chapters, the other five chapters are portrayed below in order to provide the reader with a clear picture of the structure of this research, a brief outline of each of these chapters and how they fit together.

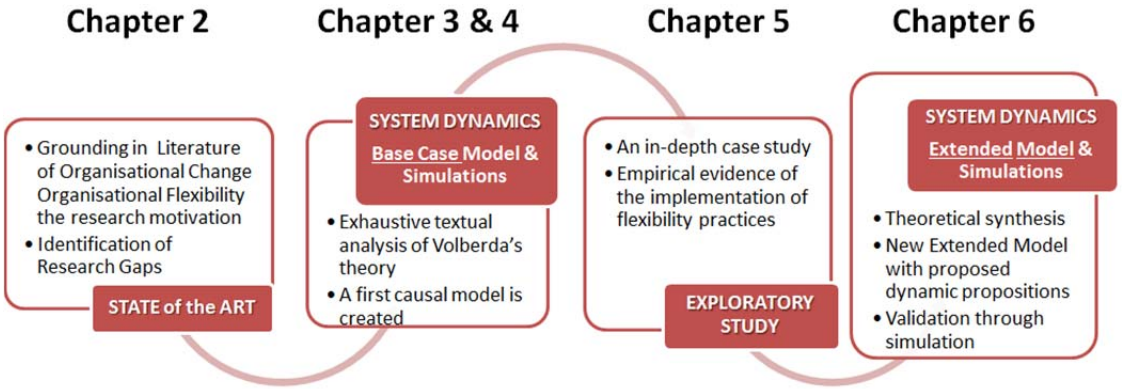

Figure 2: Overview of Research Methodology

The structure of the thesis (Table 3) follows the sequence of the proposed research methodology to achieve the proposed research objectives.

Table 3: Structure of the thesis and main objectives

RESEARCH OBJECTIVES	SUB-OBJECTIVES	RESEARCH METHODOLOGY	SECTION IN THE THESIS
Build a dynamic model of Organisational Flexibility **to enhance the understanding of the OF's theory -** by modelling the dynamic relationships of its components.	1.1 Evaluate the progress made regarding the complex nature of Organisational Flexibility	An intensive literature review of theoretical and empirical studies with a fundamental focus on Organisational Flexibility	Section 2
	1.2 Assess if empirical data justifies the necessity of time variable consideration as a pre-requisite for achieving required level of flexibility along the enterprise lifecycle.	An intensive literature review of theoretical and empirical studies with a fundamental focus on Organisational Flexibility	Section 2
	1.3 Explore the significance of all the concepts in Volberda's framework by identifying the key variables, their relationships and the subsequent dynamic behaviour	Conducting an exhaustive textual analysis of his theoretical assertions	Section 3
	1.4 Illustrate the evolution of dimensions of organisational flexibility over time	System Dynamics modelling: a first causal model is created. The formalization of this model and the subsequent simulation exercises help us to obtain prior qualitative insights	Section 4
To **refine and expand academic knowledge** around Organisational Flexibility by exploring and testing moderating factors which arise along the entire corporate lifecycle when a company implements flexibility initiatives looking for stability or change.	2.1 Develop a qualitative research exploration of flexibility practices in an organisational environment and Formulate relevant managerial implications for a specific context.	A qualitative research exploration was developed in a large cooperative industrial group with, in some extend, a longitudinal perspective during the period 2007-2011. The data gathering process was based on the Quick Scan Flexibility distributed in the cooperative group in 2007 and 2011 Semi-structured interviews with the R&D manager of the cooperative group	Section 5
	2.2 Explore theoretical insights that will serve to extend the Base Case model.	A theoretical synthesis of the main literature references that will serve to complement the empirical evidence from the exploratory study.	Section 6

	2.3 Create the Extended Model which explores other potential behaviour modes considering the constraints discovered in previous steps. To support a new approach to examine dynamic feedbacks when change processes are implemented if the company looks for getting closer to the desired level of Organisational Flexibility	Giving the Base Case as a benchmark, new variables are included and the behaviour of the new system is explored Through the simulation exercises of an extension of the basic model: three new constructs characterize the dynamics of organisational flexibility strategies. Formulation of the dynamic propositions	Section 6
	2.4 Explore why and how the dynamic approach outperforms the static one and reveals important relevant insights of the dynamic behaviour of dynamic organisational flexibility strategies through the Extended Model.	Simulation exercises of this second extended model highlight the interactions with other features of the system that inhibit the company to achieve a sustained level of Organisational Flexibility. Validation of dynamic propositions including relevant implications for management practice.	Section 6

The thesis begins with this introductory chapter in which the objectives and research methodology are presented and ends with Chapter 7 that provides a number of conclusions drawn from the research's results, main limitations and future lines for research.

2. THEORETICAL BACKGROUND

2.1. Introduction

It is widely accepted that, organisations today are facing the issue of responding continually to an environment, which is increasingly dynamic, complex and uncertain because of demographic changes, a more global economy, the "hyper-competition", or knowledge-based competition (Daft and Lewin, 1993). Research on topics of organisational change has enjoyed an extended and prosperous history (e.g. Levinthal & March, 1993; Armenakis & Bedeian, 1999; Pettigrew, Woodman & Cameron, 2001). It attempts to understand the processes that lead to changes in organisational knowledge and subsequent changes in organisational behaviour and outcomes (Jansen, 2005). The literature on organisational change has long argued that the survival of organisations strongly depends on addressing the challenge of fitting organisational design with the environment (Anand & Ward, 2004).

In such an alignment process, organisations capable of pursuing exploration and exploitation simultaneously obtain superior performance and enhance their long-term survival (Jansen, 2005). A company's competitiveness will depend not only on being efficient in its organisational routines, but also on its ability in innovating at the same time (Abernathy, 1978; Hayes and Abernathy, 1980). The notion of balance between exploration (be innovative – radical change) and exploitation (be efficient in organisational routines – incremental change) has been a common topic in most of the research works about developing methodologies related to organisational adaptation (Benner and Tushman, 2001). On the other hand, traditional bureaucratic forms of organizing worked well within an environment that was relatively benign and predictable, but they were no longer enough in a complex and highly competitive environment (Graetz and Smith, 2008).

The concept of competitive advantage has to be redefined in terms of organisational speed and flexibility (Sommer, 2003). During the last two decades, a proliferation of literature on new forms of organizing emerged; organisational forms that foster innovation and adaptation capacity to the current environment. Between others, some examples are: 'Flexible Organization' (Volberda, 1998), 'Ambidextrous Organization' (Tushman and O'Reilly 1996), 'Modular Organization' (Sanchez and Mahoney, 1996).

Within the theory of organisational adaptation, organisational flexibility – as the ability to adapt quickly to new or changing environments - is a necessary condition

for accomplish this balance (Sommer, 2003; Dreyer and Grønhaug, 2004; Sherehiy et al. 2007; Verdú-Jover and Gomez-Gras, 2009).

This chapter reviews various literatures on organisational change and their research approaches in addressing systems and time perspectives respectively. Based on the emerging new forms of organizing, the Flexible Organisation has been selected to develop a system dynamic view of its foundations. Our review resulted in the development of a framework (see Figure 3) that integrates the antecedents of the so cited paradox, the exploitation vs exploration dilemma, flexible organisation and moderators of organisational flexibility. In this Chapter 2, we address the aspects of the right side of the figure. The dimensions that affect Organisational Flexibility (left side of the figure) will be explored and discussed in next two chapters (Chapter 3 and 4).

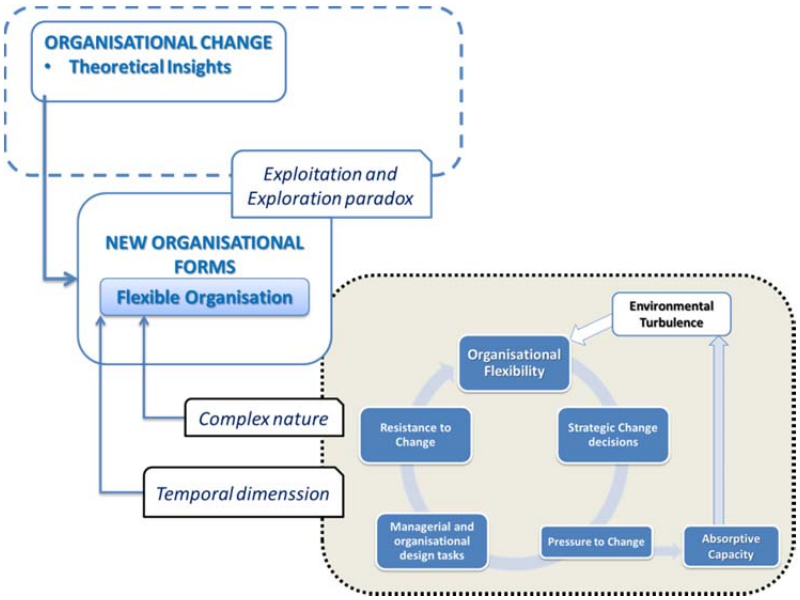

Figure 3: Framework for understanding the focus of the literature review

First, a comprehensive overview of organisational change is given with the aim of providing generic theoretical insights and recent progress on how the paradox of balancing exploration and exploitation is solved by new organisational forms is briefly described. Next, research on organisational flexibility in general and on dealing with paradoxes such as temporal condition and complexity are discussed. A multilevel analysis is conducted in this chapter and it examines whether flexible organisation is able to endure along the enterprise lifecycle the balance between exploration and exploitation while it copes with potentially conflicting pressures from the implementation of change strategies. In other words, do successful flexible organisations combine both a system and time lens for sustaining competitive advantage? Finally, an overview of the main issues provided in this chapter will be provided in the conclusion section.

Commencing this section, it is worthy to note that its purpose is not to offer a comprehensive review of the evolution of theoretical frameworks in organisational change literature. Neither is it to explore how new organisational forms have emerged coping with organisational change by achieving the required balance between exploration and exploitation. Key studies on these subjects published in leading management journals such as the Academy of Management Journal, Academy of Management Review, Administrative Science Quarterly, Journal of Management, Journal of Management Studies, Organization Science, and Strategic Management Journal have been reviewed from 1993 to 2013.

2.2. Organisational Change Theory

Having established the starting point of this literature review, the following paragraphs offer a brief review of the different theoretical frameworks that provide a guide on organisational change. The focus will not be comprehensiveness but rather a practical selection will be made: a summary of the main theoretical and empirical data/studies on the main characteristics of Organisational Change.

Over the past two decades (1990-2010), organisational change research has broadly addressed contexts, content and the process of change (Pettigrew, et al, 2001). Armenakis and Bedeian provide a comprehensive review of theories and research in the 90s on organisational change (Armenakis & Bedeian, 1999) and they aggregate all research studies reviewed in four major themes: content, contextual, process and criterion issues. The review of these authors is focused on publications particularly sensitive to the dynamics underlying organisational change through early 1998, focusing on work since 1990.

The first theme they explore, **content issues**, concerns factors that comprise the targets of both successful and unsuccessful change efforts and how these factors, such as strategic orientations, organisation structures, and performance-incentive systems, relate to organisational effectiveness. In this group, Burke and Litwin (1992) and Vollman (1996) model each focus on content factors (e.g., strategic orientation, organization structure, and organization-environment fit) that define an organization's overall character, mission, and direction, as well as underlying its long-term success. Armenakis and Bedeian summarized that both models are comprehensive in coverage, appropriate for conducting organisational diagnoses, as well as planning and evaluating the impact of an organisational change and, in some way, Vollman's model complements Burke-Litwin's one and it would seem ideal for laying out the details of a desired change in discussions with groups of organisational participants (Armenakis & Bedeian, 1999).

As far as **contextual theme** is concerned, it principally focuses on forces or conditions existing in an organization's external (governmental regulations, technological advances, and forces that shape marketplace competition) and internal environments (existing technology, level of organisational slack, and experiences with previous changes). They evaluated eight studies that relate to the success of various responses to changes in the internal and external components and that, they offer important insights for better understanding the contextual dynamics of organisational change. The first four studies deal with the collective responses taken by organisations in reacting to external environmental changes. Each is representative of numerous other studies on the internal and external forces or conditions that shape an organization's environment. The fifth study, Damanpour (1991), describes a meta-analysis of selected internal contextual, content, and process factors. Damanpour's (1991) analysis is that a successful change effort may depend more on the congruity or fit between content, contextual, and process considerations than the nature of an intended change. As such, Damanpour (1991) provides a starting point for researchers interested in investigating relationships among other key factors to minimize resistance to change. The final three studies (e.g. Sastry, 1997); describe the application of mathematical techniques for modelling organisational responses to environmental pressures. The three mathematical models reviewed, dealing with simulations of organisational-level responses to potential environmental events, are helpful in suggesting plausible alternative paths for strategic renewal, as well as understanding the effects of considerations such as design variables, inertia and stress, and strategic orientation on an organization's operating systems as it attempts to shift strategic frameworks. Although the practical application of such methods is less direct than other approaches, they are undeniably helpful in articulating theoretical arguments that might otherwise be overshadowed in more hands-on applications (Armenakis & Bedeian, 1999:5).

The advanced research on **change process issues** is organized into two groups. On the one hand, four models that recommend various phases for change agents to follow in implementing change are evaluated by Armenakis & Bedeian (1999). On the other hand, the authors describe two models that have been advanced for understanding how organisational members experience change as it unfolds. Two common characteristics in the two mentioned groups are highlighted by Armenakis & Bedeian: the change process typically occurs in multiple steps that take a considerable amount of time to unfold and efforts to bypass steps seldom yield a satisfactory result, and mistakes in any step can slow implementation, as well as negate hard-won progress. Nonetheless, as argued by Armenakis & Bedeian (1991), the second group, Isabella (1990) and Jaffe, Scott & Tobe's

(1994) models, offers practitioners guidance in what organisational members will likely experience during a change and offers insights into possible strategies and tactics for dealing with each stage in a change process.

This 'change process' perspective of organisational change has been broadly extended in the literature and has received reiterated attempts to evolve as management science progresses. Thus, the following figure portrays the main authors related to this topic taking into account Armenakis & Bedeian's analysis.

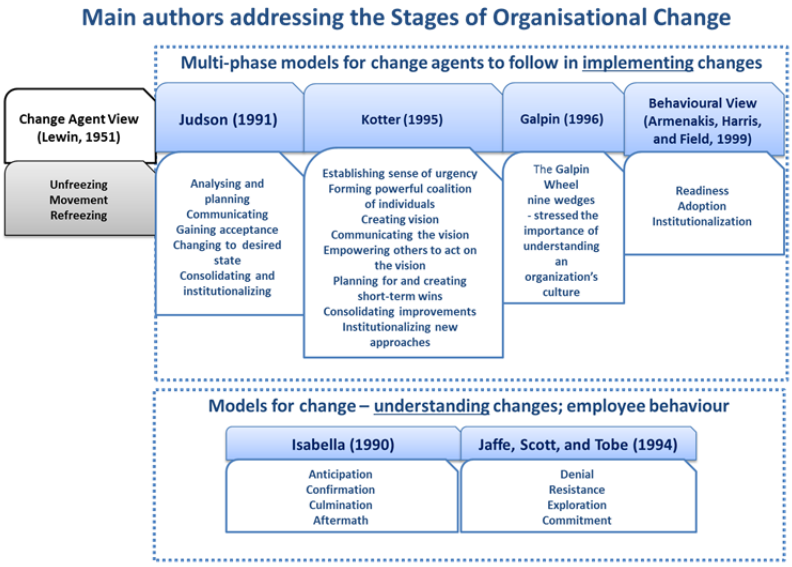

Figure 4: A literature review scheme concerning Stages of Organisational Change (Source: adapted from Armenakis & Bedeian, 1999)

In the form of a summary, and as a means of integrating the material that has been reviewed, Figure 4 combines the various models discussed in this section, as well as Lewin's three-phase change process. In doing so, it matches recommended phases/steps for change agents to follow in implementing change (i.e., phases within which change agents act) with stages in understanding change (i.e., stages through which change targets progress).

In different ways, most of these authors address the concept of Resistance to Change. Thus, predictable reactions to change and methods for minimizing resistance to change agent efforts are described such as:

- alternative media, reward programs, and bargaining and persuasion (Judson, 1991);
- creating readiness for change so that resistance is minimized by defining the basic change message being conveyed as well as the influence strategies useful for transmitting change messages (Armenakis, Harris, & Feild, 1999);

- resistance to change might be viewed, not as an obstacle to overcome, but as an inherent element of the cognitive transition occurring during change. If managers accept such a view, what becomes important is not overcoming these reactions, but acknowledging that such frames of reference exist and they will help to understand the change and accept it (Isabella, 1990); and,
- resistance is considered forming employees' behaviour, as evidenced by individuals withholding participation, attempting to postpone implementation, and endeavouring to convince decision makers that the proposed change is inappropriate (Jaffe et al, 1994).

The fourth theme explored (Armenakis and Bedeian, 1999) concerns **outcome or criterion variables**. They have primarily involved success/failure criteria such as profitability or market share. Likewise, the managerial actions described as being taken in response to contextual and content considerations were primarily intended to increase operational efficiency and effectiveness. After reviewing literature on this theme, Armenakis and Bedeian affirm that actions required to implement a desired change may evoke unintended responses like denial and resistance, and further result in employees experiencing feelings of stress and cynicism, as well as reduced organisational commitment. Receptivity, resistance, commitment, cynicism, stress, and related personal reactions are clearly relevant criterion variables to be considered in the framework of planning and implementing an organisational change. They assert that *"Both research and practical experience suggest that such responses can serve as complementary criteria or markers for tracking the likelihood of employees enacting behaviours necessary for achieving desired changes"* (1999: 7). They also add that such reactions can complement bottom-line measures (such as profitability) in assessing the likely success of contextual and content changes as the research reviewed suggests.

Armenakis and Bedeian conclude their research work identifying relevant and challenging opportunities for future developments in the field of organisational change. Among others, these authors reaffirm the assertion made by Van de Ven and Huber (1990): *"future research into the temporal sequence of events that unfolds as an organisational change occurs would provide a deeper understanding of the dynamics of change and permit the testing of current and new theories addressing "why" organizations change."* (Van de Ven & Huber, 1990). In this regard, they review several authors addressing such an issue: a comparative study of both defender and prospector banks' strategic adaptations to increasing regulatory pressure extended across seven years allowed Fox-Wolfgramm, Boal, & Hunt (1998) to advance propositions applicable across time relating to how and

why organisations exhibit different modes of change in response to environmental pressures by considering both immediate and more distant antecedents; Beer and Eisenstat's (1996) report on an organization-wide intervention covered a six-year period and they were able to offer a true picture of the intricacies inherent in the dynamic analysis of change: they concluded that, over the short term, the intervention seemingly achieved its intended objectives however, over the long term, the intervention had little sustained impact on the target organization; Orlikowski (1996) examines the use of new technology in a software company and downplays the strong assumptions of rationality that characterize existing change models: the author was able to show that successful change may involve moving away from patterns of bureaucracy and control to those of flexibility and self-organizing.

Pettigrew et al. (2001) point out that the organisational change literature had considerably evolved along the second half of 90's and some theorists acknowledged themes such as "context and action are inseparable, theories of change ought to explain continuity and time must be an essential part of investigations of change" (Pettigrew et al. 2001: 697). Additionally, the pace and sequencing of action in change processes have enhanced the curiosity of some authors (e.g. Weick & Quinn, 1999). However, as Pettigrew et al. (2001) assert, "the understating and effects of time, process, discontinuity and context is far from mature" and consequently, organisational change literature remains underdeveloped. Among the six interconnected analytical issues that they propose as future research lines, the inclusion of time, history, process, and action in organisational change research fits with the proposed objectives of the present thesis. In this context, there are still a small number of process studies of organisational change that offer a holistic and dynamic analysis of changing (George and Jones, 2000).

Thus far, in the preceding arguments we have selected the theoretical studies dealing with organisational change, which provide a general view of its uncovered research opportunities for organisational analysts. The temporal condition and the possible resistance to organisational changes have been highlighted in this schema mainly because they will be two of the roots of the research being developed in this thesis.

Table 4: Summary of the second section in literature review

Perspectives	Main developments
CONTENT issues Factors of successful and **unsuccessful change efforts** and how they relate to organisational	Models that are comprehensive in coverage, appropriate for **conducting organisational diagnoses**, as well as **planning** and **evaluating** the **impact of an organisational change**

effectiveness	
CONTEXTUAL issues Forces or conditions existing in an **organization's external and internal environments**	Studies on the success of various responses to changes: - the **collective responses** taken by organisations **in reacting to external environmental changes** - a **successful change effort may depend on the congruity or fit between content, contextual, and process** considerations and providing key factors to minimize resistance to change. - applying mathematical techniques for **modelling organisational responses to environmental pressures** that are undeniably helpful in articulating theoretical arguments
CHANGE PROCESS issues: **- implementing** change **- understanding** how organisational members experience change as it unfolds	Models based on: - the change process typically occurs in multiple steps that take a considerable **amount of time to unfold and efforts to bypass steps seldom yield a satisfactory result** - offering practitioners guidance in what organisational members will likely experience during a change and insights into possible strategies and tactics for dealing with each stage in a change process. In this perspective, the concept of Resistance to Change is addressed: **evaluating predictable reactions to change and providing methods for minimizing resistance to change** agent efforts are described such as: alternative media, reward programs, and bargaining and persuasion; creating readiness for change; considering resistance to change as an inherent element of the cognitive transition; considering resistance forming employees' behaviour (e.g. withholding participation, attempting to postpone implementation)
OUTCOME OR CRITERION issues: success/failure criteria	- actions required to implement a desired change may evoke **unintended responses like denial and resistance**, and further result in employees experiencing reduced organisational commitment. - research into the **temporal sequence** of events that unfolds as an organisational change occurs would provide a deeper understanding of the dynamics of change: ▪ *"context and action are inseparable, theories of change ought to explain continuity and time must be an essential part of investigations of change"* ▪ *"the understating and effects of time, process, discontinuity and context is far from mature"* and consequently, organisational change literature remains underdeveloped. ▪ *"there are still a small number of process studies of organisational change that offer a holistic and dynamic analysis of changing".*

From now on, the following paragraphs aim to describe one promising and broadly empirically evaluated research field: the occurrence of organisational change and how it has derived into several new organisational forms. More concretely, the rich debate about whether organisations can adapt and how organisations survive in the face of change is going to be analysed.

2.3. New Organisational Forms: Exploitation and Exploration Dilemma

O'Really & Tushman (2008) argument that a diversity of organisational theories have emerged around this debate (e.g. punctuated evolution (Tushman & Romanelli, 1985), the resource based view of the firm (Barney, 1991), dynamic capabilities (e.g., Eisenhardt & Martin, 2000; Teece et al, 1997)) and they select two major groups with regard to research on organisational change: "those that argue for adaptation (e.g., punctuated equilibrium, dynamic capabilities); and those that argue that firms are inert and change occurs through an evolutionary process of variation–selection–retention." (O'Really & Tushman (2008: 186). In this latter perspective, "*inertial incumbent organizations are replaced by new forms that better fit the changed context*" as long as environments shift (Barnett & Carroll, 1995). Tushman and O'Reilly in 1996 proposed that organisational ambidexterity—defined as *"The ability to simultaneously pursue both incremental and discontinuous innovation…from hosting multiple contradictory structures, processes, and cultures within the same firm (p. 24)*—was required for long tern firm survival. Since that time, there has been a proliferation of interest and research on the topic (e.g. empirical studies, theory papers, special issues of journals devoted to the topic, review articles).

After reviewing past research in organisational adaptation, O'Really & Tushman (2013) find the foundations in 60's decade. Based on the insight that different organisational forms are associated to different strategies and environmental conditions, Burns and Stalker (1961) noted that firms operating in stable environments developed what they referred to as "mechanistic management systems" and in contrast, firms operating in more turbulent environments developed more "organic" systems with a lack of formally defined tasks, more lateral coordination mechanisms, and less reliance on formalization and specialization. However, the seminal article of James March (1991) represents the catalyst for the current interest in the concept (Raisch & Birkinshaw, 2008). March proposes that exploitation and exploration are two fundamentally different learning activities and firms should divide their attention and resources on both activities. March (1991) notes that "The basic problem confronting an organization is to engage in sufficient exploitation to ensure its current viability and, at the same time, devote enough energy to exploration to ensure its future viability (1991: 105)." The mentioned ability will depend not only on being efficient in their organisational routines but also on being innovative at the same time (Abernathy, 1978; Hayes and Abernathy, 1980; Tushman & O'Reilly, 1996; Teece et al, 1997). This balance is related to developing new dynamic processes that enable a fast reconfiguration of the resource base (Teece et al. 1997, Eisenhardt and Martin 2000,

Helfat et al. 2007), or a transformation in the nature of activities (Aaker and Mascarenhas, 1984), or the dismantling of current strategies (Harrigan, 1985).

One difficulty highlighted by O'Really and Tushman (2013) when a firm tries to achieve this balance is that "there is a bias in favour of exploitation with its greater certainty of short-term success". Several authors assessed the consequences of a disproportionate allocation of resources to one activity against the other: a one-sided focus on exploitation may enhance short-term performance, but it can result in a competency trap because firms may not be able to respond adequately to environmental changes (e.g. Ahuja & Lampert, 2001); long-term survival and success depend on an organization's ability to "engage in enough exploitation to ensure the organization's current viability and to engage in enough exploration to ensure future viability" (e.g. Levinthal and March, 1993); conversely, too much exploration may enhance a firm's ability to renew its knowledge base but can trap organisations in an endless cycle of search and unrewarding change (Volberda & Lewin, 2003).

Apart from these studies, a broad range of scholars has followed the theoretical foundations coming from March's seminal paper and, generally speaking, they coincide in suggesting that for long-term survival organisations need to accommodate both. Among too many relevant studies in organisational change, some of them are connected to the aim of this section of literature review: the form in which firms managed to survive and change over decades. In this regard, Tushman and O'Reilly (1996) propose that organisations need to explore and exploit simultaneously, to be ambidextrous. Their observation "has led to a very large number of empirical studies exploring whether ambidexterity is associated with organisational performance and survival, is accomplished through architecturally separate units or via other means, under what conditions ambidexterity seems most useful, and how ambidexterity is achieved" (O'Really & Tushman, 2013:4). Some theoretical underpinnings have also been elaborated on using theories as disparate as absorptive capacity (e.g. Jansen, Van den Bosch & Volberda, 2005), dynamic capabilities (e.g. O'Reilly & Tushman, 2008), and organisational learning (Holmqvist, 2004; Kang & Snell, 2009; McGrath, 2001).

In this sense, the debate around organisational ambidexterity is prominently extensive and recently, Raisch and Birkinshaw (2008) describe the different contexts in which the need to reconcile the two orientations have been discussed such as organisational learning – exploitation and exploration are both associated with learning activities (e.g. Levinthal & March, 1993; Benner & Tushman, 2003; Mom, van den Bosch, and Volberda, 2007);

technological innovation – radical and incremental innovation (Benner & Tushman, 2003; Smith & Tushman, 2005); organisational adaptation – balance between continuity and change (e.g., Brown & Eisenhardt, 1997; Volberda, 1998); strategic management (Burgelman, 2002; Volberda, Baden-Fuller & van den Bosch, 2001), and organisational design – firms may resolve the paradox by combining mechanistic and organic features (Adler, Goldoftas, & Levine, 1999; Jansen et al. 2005). In contrast, some authors argument that the initial clarity of the concept and definition of organisational ambidexterity has been dismissed due to such a proliferation of interest (Nosella, Cantarello and Filippini, 2012).

As has been mentioned before, organisational adaptation, understood as the balance between continuity and change, is one of the research themes that the debate around organisational ambidexterity has encouraged. Near to the end of 80's, the reconsideration of existing organisational forms based on resolving the paradox boosted what has been broadly acknowledged as a new organisational forms field (e.g. Romanelli, 1991; Drucker, 1999; Knudsen & Eriksen, 2000; Lewin, 2002). Graetz & Smith (2008) affirm that, although a substantial body of literature on new forms of organizing forecasted the end of bureaucracy, some empirical studies, however, "indicate that high-performing organisations are adopting dual forms of organizing in which the controllability advantages associated with traditional forms work to complement and support the responsiveness attributes of new forms of organizing" (2008:2). From the field of duality theory, Graetz & Smith (2008; 2009) explore the concept of dualities and its salience in the management of organizing forms. Their underlying foundation is that the organisations' challenge lies in learning how to manage the tensions or dualities between traditional and new forms of organizing, a process demanding the arbitration of continuity and change. Based on that, they provide robust explanation about the nature of dualities, a set of characteristics, which describe the behaviour of dualities, and, lastly, they offer some suggestions for arbitrating the tensions that exist in organizing form dualities (Graetz & Smith, 2008). In regards to the key characteristics of duality thinking, they state "*organizations must wield them if they are to exploit and explore the bidirectional partnership between continuity (efficiency through operational capabilities) and change (flexibility and responsiveness through dynamic capabilities)*." (Graetz & Smith, 2008; p.11). Five characteristics of duality theory are portrayed by Graetz & Smith (2008): Simultaneity; Relational; Minimal thresholds; Dynamism; and Improvisation. Within the dynamic characteristic, they highlight the Volberda's empirical illustration of the connectivity between the dynamic characteristic of dualities and their relational properties. In this sense: *"Volberda (1998) contends that specialized, programmatic*

routines common to traditional forms of organizing are unsustainable when competing in complex and uncertain environments." (Graetz & Smith, 2008; p.9).

This section briefly detailed the evolution of theoretical and empirical studies underlying the dilemma of balancing exploration and exploitation (Figure 5 summaries the main insights).

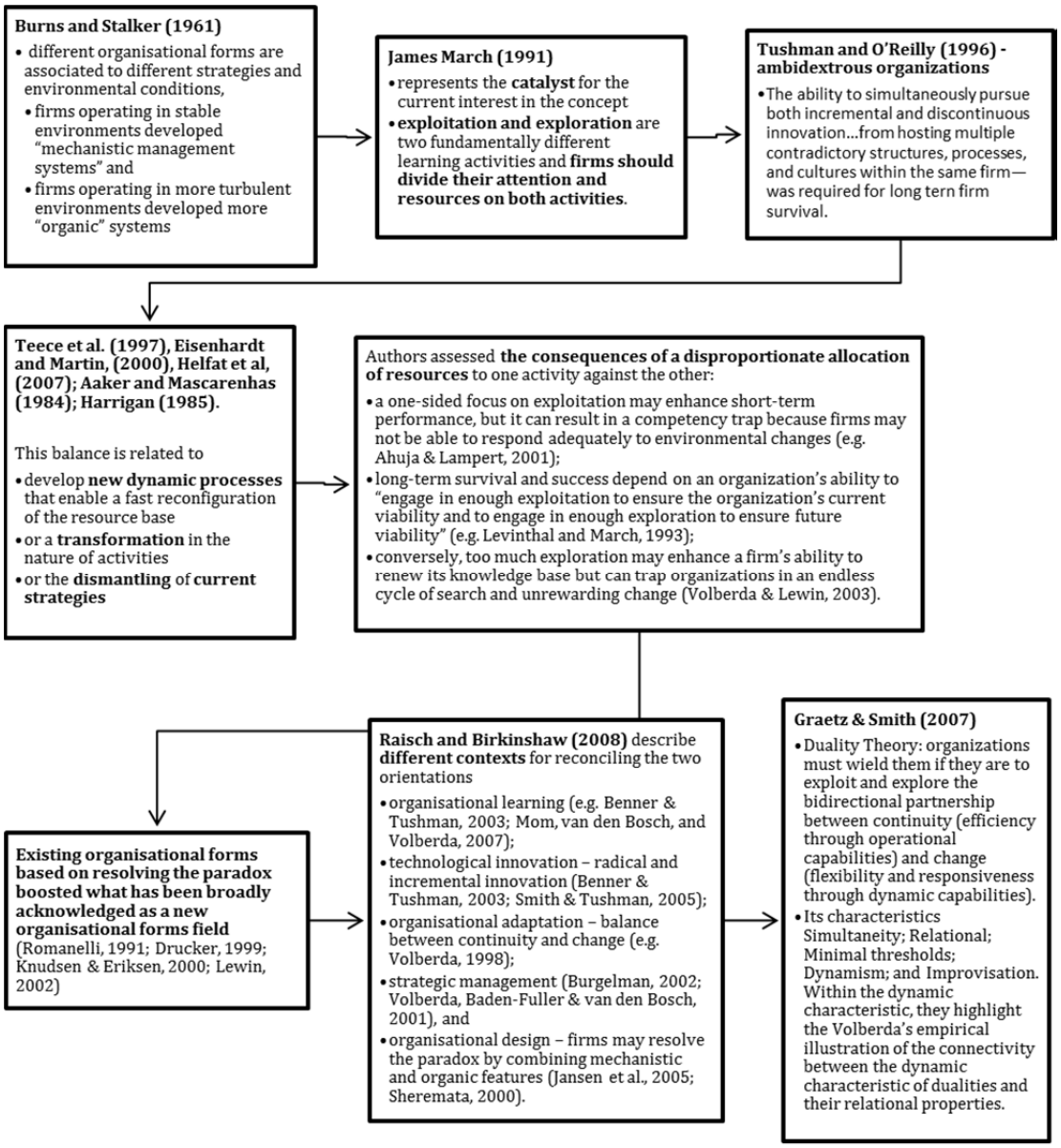

Figure 5: Summary of the third section in literature review

2.4. Flexible Organisation

Based on the insights from previous section, now we present main research developments in organisational flexibility. The literature around organisational flexibility has focused on how companies can gain and sustain competitive advantages, create capabilities to control

and influence their environment and manage chaos and adversity. Different approaches have emerged and empirically show the dimensionality of organisational flexibility (e.g. Hatum and Pettigrew, 2006), its interaction with firm size (e.g. Kraatz and Zajac, 2001), and the context specificity of flexible capabilities and organisational design (e.g. Volberda, 1998; Verdú-Jover et al. 2006; Martínez-Sánchez et al. 2009).

The concept of organisational flexibility has received wide attention in the management literature. It was out of the scope of this research work to make a comprehensive review of all theoretical and empirical studies developed in this field and to study the developed theories, models and concepts. The attempt of this section is made to identify in literature, theoretical and empirical studies addressing the complex nature of such concept and considering the temporal dimension.

2.4.1. Flexibility at Organisational Level – A Multidimensional Concept

Companies facing the pressures from unpredictable, dynamic, and constantly changing environments are being compelled to improve their ability of continuously adapting to new competitive scenarios. Among others, the most common pressures cited in literature have been demographic changes, a more global economy, the "hyper-competition" (D'Aveni, 1994) or knowledge-based competition (Daft and Lewin, 1993) which continue active in the competitive landscape and have been pushing the firms to develop new forms of organizing (Graetz and Smith, 2008). Such competitive pressures have prevailed in both industry and academia for a few decades and notions such as 'adaptive organization', 'flexible organization', and 'agile enterprise' have emerged, among other proposals, for dealing with an uncertain and unpredictable environment (Sherehiy et al. 2007). Although several approaches exist to define them, as Sherehiy et al. (2007) assert, all these concepts can be considered as possessing the ability to adjust and respond to change. In this context, organisational change initiatives grow when it is needed to create a new competitive advantage or to support a new or an improved aspect of the business (Englehardt and Simmons, 2002).

Looking through the term flexibility, it must be noted that it appears in a wide range of literature streams and as Saleh, Mark, and Jordan (2009) mention, *"it is a multi-disciplinary concept that means different things to different people"*. In their review, they find a common ground on which all disciplines agree: *"flexibility is needed in order to cope with uncertainty and change, and it implies an ease of modification and an absence of irreversible or rigid commitments."* (Saleh et al. 2009; p.307). The scope of this section is focused on organisational flexibility and its dimensions which have received growing attention from

both researchers and managers as a key driver for companies to survive and prosper in turbulent and unpredictable environments (Dreyer and Grønhaug, 2004) and it is becoming the new hallmark of organisational excellence (Volberda et al. 2007). Verdú-Jover and Gomez-Grass point out organisational flexibility as the main capability that enables companies to face environmental fluctuations, as it makes the organization more responsive to change (2009: 668). More recently, in their attempt to identify a set of questions to frame a discourse perspective on the use of "flexibility" as a rationale for organisational change, Dunford et al. (2013) point out that *addressing the concept flexibility from a discursive perspective is a key element of understanding its uses and effects* (2013; p. 92).

Within management literature, organisational flexibility has been described and analysed for several decades (Carlson, 1989; Volberda, 1998; Golden and Powell, 2000; Weiss, 2001; Charles and Simmons, 2002; Dreyer and Grønhaug, 2004; Jones, 2005). Some definitions have been selected from a broad sample of authors that focus their research on organisational flexibility such as:

> Volberda (1996: 361) "*Flexibility is the degree to which an organization has a variety of managerial capabilities and the speed at which they can be activated, to increase the control capacity of management and improve the controllability of the organization*."
>
> Lund (1998: 28) *"The ability of the firm to react upon a turbulent environment with new products and new technological processes on the basis of integrative organisational forms and a culture oriented towards renewal and learning."*

The term flexibility appears in a broad range of scientific disciplines since seven decades ago (Jones, 2005) such as economical view (e.g. Stigler, 1939), employment flexibility (Atkinson, 1984) or strategic management (Bahrami, 1992) among others. The broad utilisation of the term flexibility has led several researchers to argue the need for conceptual clarification (e.g. Golden and Powell, 2000; Volberda, 1998). More concretely, literature suggests that organisational flexibility can be associated to several managerial and organisational capacities (operational flexibility, external and internal flexibility, strategic fit, absorptive capacity, adaptability, responsiveness, etc.). In particular, it has been associated with various performance outcomes such as gaining and sustaining a competitive advantage (e.g. Hitt, Keats, & DeMarie, 1998), providing organisations with the power to control their environment (e.g. Anand and Ward, 2004), the ability to manage

chaos and adversity (e.g. Grewal and Tansuhaj, 2002) or, achieving innovative capacity (e.g. Verdú-Jover, Lloréns-Montes and Garcia-Morales, 2005). However, the most prolific area of studies with regards to flexibility has emerged addressing the broadly spectrum of flexibility's dimensions at organisational level. In this field, scholars have addressed and described several dimensions concerning organisational flexibility (such as, strategic flexibility, operational flexibility, manufacturing flexibility, etc.). The following table (Table 5) portrays main conceptual research works related to such a multidimensional nature of organisational flexibility.

Author	**Main contribution and research's scope**
Eppink (1978)	Proposes distinct types of flexibility (operational, competitive, strategic) for each type of change, which minimize the vulnerability of organisations and their ability to respond. Incorporates the business environment as the criterion to which organisational flexibility should be fitted. Strategic Flexibility
Evans (1991)	Defines two dimensions of flexibility: temporal and intentional. Strategic flexibility
Bahrami (1992)	Introduces the term "bi-modality" with regards to the trade-off between opposing tendencies: centralisation versus decentralisation, stability versus change, uniformity versus diversity Strategic flexibility
De Leeuw and Volberda (1996)	Flexibility is not only a management task, but it includes the organisational design Organisational flexibility
Volberda (1998)	Proposes a theoretical framework for addressing organisational flexibility - delineating the three tasks involved in creating flexibility which need to be balanced dealing with environmental changes. He proposes three essential dimensions based on those tasks: flexibility mix (management capabilities), responsiveness (organisation design) and metaflexibility (absorptive capacity). Additionally, he offers a toolbox for diagnosing where flexibility exists and is lacking within an organization and what change strategy is appropriate. Organisational flexibility
Golden and Powell (2000)	Extend Evan's framework in an information technology context and adds two new dimensions: temporal, range, focus and intention. Proposes measurement indicators of these four areas for flexibility measurement.

	Operationalisation of flexibility
Weiss (2001)	Investigates the determinants of — and the interrelationship between — two different dimensions of flexibility, tactical flexibility (the flexibility in adjusting aggregate output over time) and operational flexibility (the ability to switch quickly between products).
Englehardt and Simmons (2002)	Propose a two-level structure for having both control of execution and flexibility for change: organisations can maintain their operational structure at one level, while experimenting with a loosely bounded developmental organisational layer.
	Strategic flexibility
Dreyer and Grønhaug, (2004)	Their model illustrates that different aspects of flexibility developed at the level of the firm are suitable for responding to different factors of uncertainty at the industry level.
	Different types of flexibility (volume flexibility, product flexibility, labour flexibility, financial flexibility) and different balanced forms of flexibility are required to cope in uncertain turbulent environments.
	Organisational flexibility
Sanchez (2004)	Proposes five modes of competences that reflect hierarchy of flexible capabilities: cognitive flexibility to imagine alternative strategic logics; cognitive flexibility to imagine alternative management processes; coordination flexibility to identify, configure and deploy resources; resource flexibility to be used in alternative operations; and, operating flexibility in applying skills and capabilities to available resources.
	Each competence mode results from a distinctive kind of organisational flexibility to respond to changing and diverse environmental conditions, such as evolving market demands, technological change and competitive developments in an industry.
	Organisational flexibility
Hatum and Pettigrew (2006)	Propose a set of organisational and managerial capabilities that enable some firms to adapt quickly in a highly competitive environment – five determinants that are interconnected: heterogeneity of the dominant coalition, centralization and formalization of decision-making, low macro-culture embeddedness, environmental scanning, and, a strong organisational identity.
	Organisational Flexibility
Nadkarni and Narayanan (2007)	Their theoretical model explores the positive empirical relationship between strategic flexibility and performance in fast-clockspeed industries. More concretely, they empirically examined the complex linkages between industry clockspeed, strategic

	schemas, strategic action and performance. They show how strategic schemas can be operationalized using causal maps - measurement of two key facets of strategic schemas: complexity (complex strategic schemas foster strategic flexibility) and focus (negatively related to strategic flexibility). Strategic flexibility
Verdú-Jover and Garcia-Morales (2009)	Explore the nature of managerial flexibility and analyse its relationship to the organisational responsiveness of firms. Develop a methodology to measure flexibility in terms of fit –the co-alignment of some managerial flexibility practices and the environment. Offer a scale to measure as a tool for self-diagnosis. Propose organisational responsiveness as a strategic organisational capability achieved through managerial flexibility.
van der Weerdt (2009); van der Weerdt, Volberda, Verwaal & Stienstra et al. 2012)	Empirically explore the validity and comprehensiveness of organisational flexibility theory by structurally measuring and analysing the components of a comprehensive framework within a large sample of firms. Their theoretical framework specifies the linkages between types of flexibility and organization design characteristics - a hierarchical structure with increasing levels of flexibility and supporting organisational design is proposed. Organisational flexibility

Table 5: Research studies addressing multidimensional nature of organisational flexibility

Although multidimensional aspects of organisational flexibility have been addressed by a substantial body of literature (van der Weerdt et al. 2012), enough empirical evidence investigating such multidimensionality is limited (Dreyer and Grønhaug 2004). Based on said observation, the aim of the following section is focused on reviewing all those empirical studies that have been carried out in the last two decades in order to explore some limitations of these approaches.

2.4.2. Complex and Temporal Nature of the Organisational Flexibility

Some of these empirical studies and others more theoretically focused **have stressed the complex nature and multidimensional structure** of organisational flexibility (Volberda 1996, Teece et al. 1997, De Toni and Tonchia 2005), which is difficult to define satisfactorily. This could be the reason that explains the few empirical studies that account for such complexity (Dreyer and Grønhaug, 2004). According to Hatum and Pettigrew (2006), when managers face flexibility, the major difficulty they find is how to accomplish the change without losing stability and literature is still waiting for models explicating relationships between flexible capabilities, environmental turbulence and firm

performance (Suárez et al. 2003). Additionally, **the formula to accomplish organisational flexibility along the enterprise lifecycle** (with a temporal basis) **remains limited** (Volberda, 1998; Dreyer and Grønhaug, 2004; Verdú-Jover and Gomez-Grass, 2006). Within the context of organisational adaptation, some authors start to investigate such complexity and the temporal condition of that source of competitive advantage. In the following paragraphs, some relevant empirical studies are explained after observing how they address those two aspects. The following table (Table 6) summarizes a variety of empirical studies facing the complex nature and the interrelations between variables at organisational level and it highlights the main links with this thesis' objectives.

Table 6: Empirical Research – future challenges for organisational flexibility

Authors	Theoretical context	Empirical context	Links with thesis' focus
Eppink (1978)	Managerial Capabilities: Strategic Flexibility	3 firms' exploratory interviews	**Environment-strategic fit**; **multi-dimensionality** and hierarchical nature of flexibility.
Volberda (1996/1998)	Organisational Flexibility: Managerial Capabilities, Organisational Design (responsiveness) and metaflexibility (absorptive capacity).	3 empirical studies: Philips Semiconductors, the Dutch Postbank, and the Dutch National Gas Corporation	**Environment-strategic fit**; **multi-dimensionality** and hierarchical nature of flexibility. Proposes the inclusion of **time factor** for future research
Lund and Gjerding (1996); Lund (1998); Gjerding, (1999)	Internal and External Flexibility Flexible traits / Functional Flexibility	1900 Danish firms	**Environment-strategic fit**: Suggest a typology of flexible forms according to environmental characteristics
Dreyer and Grønhaug (2004)	Managerial capabilities: Flexibility from Resource-based view (volume flexibility, product flexibility, labour flexibility, financial flexibility, flexibility impact on performance)	35 companies that went bankrupt (''failures'') and the 35 most profitable companies (''survivors'') in the period 1977–1995.	Inclusion of **Time factor**: forecast the important challenge of creating knowledge around the relationship between change and time.
Anand and Ward (2004)	Strategic fit and Manufacturing Flexibility relationship between flexibility and performance	101 manufacturing firms	The moderator role of **environmental fit** in the relationship between flexibility and business performance
Verdú-Jover, Lloréns-Montes and Garcia-Morales (2005, 2006); Verdú-Jover and Gómez-Gras (2009)	Managerial capabilities: operational, structural and strategic flexibility Link between flexibility and innovation capacity	417 European firms	**Environment-strategic fit**: different levels of flexibility and fit between real flexibility and that required by the environment. Dimensionality of the concept of managerial flexibility. Inclusion of **Time factor**
Hatum and Pettigrew (2006)	Organisational Flexibility: Managerial capabilities and Organisational Design	2 highly flexible and 2 less-flexible firms	**Multi-dimensionality** of organisational flexibility.
Tan and Zeng (2009)	Flexibility related to exploration: managerial capabilities balance between exploitation and exploration (efficiency–flexibility)	Three periods, 1988, 1992, and 1996, and for each period, data over 10,000 to 15,000 large and medium firms in China.	**Inclusion of Time factor**: take a time-based view of organisational transformation, speculating that firm strategies will vary depending on the stage of economic transition.

According to Eppink (1978), several organisational design characteristics affect how strategic flexibility reduces the response time to unforeseen detrimental events such as, people involved, organisational values, structure, decision-making process, degree of formality, management technology, etc. (Eppink, 1978). In his review of strategic flexibility, Eppink proposes that strategic flexibility allows organisations to increase their response capacity to unforeseen environmental change. In his empirical study based on data from three firms' exploratory interviews, the multi-dimensionality and hierarchical nature of organisational flexibility are explored and this author already pointed out the need for comprehensive modelling of relationships.

On the organisational flexibility context, Volberda (1998) settles the possibility to address such adaptation process as a sequence of stages allowing the understanding of the key factors of organisational flexibility with different environmental turbulence levels. The FAR method (Flexibility Audit and Redesign) developed by Volberda assesses four dimensions and their constituting variables: environmental turbulence (e.g. uncertainty), flexible capabilities (e.g. operational flexibility), responsiveness (e.g. provided by cultural organisational design) and metaflexibility (absorptive capacity). After obtaining the resulting level of flexibility of each organisation and evaluating various indicators of performance, Volberda proposes strategic change options for each organisation. This measurement system is tested in three large organisations that represent three examples of the likely trajectories (routinization and revitalization) towards flexibility: Philips Semiconductors, the Dutch Postbank, and the Dutch National Gas Corporation (Volberda, 1996:370). Volberda (1998) anticipates the possibility of modelling the adaptation process from a dynamic point of view: "*Flexibility is not a static condition, but it is a dynamic process. Time is a very essential factor of organisational flexibility*." (Volberda, 1998:235).

Another interesting empirical study focused on organisational flexibility is found in the working papers developed by Lund and Gjerding (1996) and Lund (1998). In the first one, a survey data on 1,900 firms within the Danish private business sector, during the mid-1990s, is analysed in terms of an index, which classifies the surveyed firms according to smaller and higher degrees of flexibility. Their study analyses the flexibility of firms in terms of technical innovation, work organisation, human resource management and the firm's external relationships. They employed the following definition of flexibility: "*Flexibility is the capacity based on learning structures and processes to respond with new products and technology to a changing environment*"

Lund & Gjerding (1996:13). They operationalized such a definition into a flexibility measure that distinguishes between smaller and larger degrees of flexibility, where a firm is seen as more or less flexible based on its internal or external flexibility ratios. The result is an index on flexibility with values in the range of 0-14, and the distribution of the 1,900 respondents is close to the bell-shaped normal distribution. Among their interesting results (Lund and Gjerding, 1996: 28), the following may be highlighted: medium-sized and large firms tend to be more flexible than small firms, and manufacturing firms tend to be more flexible than nonmanufacturing firms; among the more flexible firms, routine work has decreased and intra-organisational co-operation increased in far more instances than among the less flexible firms; and, the firms' position at the flexibility continuum is strongly correlated with different competitive circumstances. These authors suggest analysing the firms as belonging to different typologies in a similar way that Volberda proposes (Volberda, 1998). They found that firms, which exist in a stable environment, experiment a certain monopoly position that does not promote major organisational changes. Other extreme groups of flexible firms they define is represented by a number of firms that are following a dynamic path while they experiment a much sharper competition; that means they combine new technology with product innovation and a modern type of organisation based on learning and decentralisation. In between these two extreme groups, some firms exist with medium level of flexibility and experience an intensification of competition (Lund and Gjerding, 1996: 28). A future research approach that is proposed by Lund and Gjerding is based on overcoming the static nature of their analysis by evaluating changes and directions of changes in innovation, technology, organisational structure, performance, and the interplay between those factors (1996: 29).

Based on the aforementioned study, Lund (1998) tends to operationalize flexibility as manifested in internal dimensions of structure, culture, processes, and external dimensions such as technology and product market innovation. Organisational flexibility was defined by Lund (1998) as *the ability of the firms of react upon a turbulent environment with new products and new technological processes on the basis of integrative organisational forms and a culture oriented towards renewal and learning* (Lund, 1998:3). This author empirically observed an organisation that had been identified in Lund and Gjerding (1996)'s study as 'highly flexible". After interviewing its managers and employees, his results showed that flexibility of those external and internal dimensions combined, are linked to the fulfilment of customer expectations, integration of new technology, the same output with less resources, multiskilling and product innovation. Similarly to what Lund and Gjerding (1996) envisioned about a typology of flexible

firms, Lund concludes that the dimensions of flexibility (internal, organisational and external, product/market and technological) gave the basis for constructing four types of firms called respectively static, flexible, innovative and dynamic (Lund, 1998:6). The static firm deploys small organisational and product/market and technology levels of flexibility while the dynamic firm represents larger levels on both flexibility scores.

In their empirical study, Dreyer and Grønhaug (2004) aim at studying the impact of flexibility on performance and develop a model that can help managers cope with two types of balancing problems: balancing different types of flexibility (sometimes in conflict such as, for instance, giving higher priority to financial flexibility than to volume and product flexibility) and balancing the need for flexibility with the need for continuity in order to utilise their firms' resources most efficiently (Dreyer and Grønhaug, 2004). These authors already pointed out that despite a wealth of conceptual articles dealing with the multidimensional aspects of organisational flexibility, the number of empirical studies investigating such multidimensionality remained limited (Dreyer and Grønhaug 2004:485). Consequently, the model they develop, based on integrating the resource-based view and contingency theory, was empirically tested in a sample of 35 companies that went bankrupt in the period 1977–1995, and the 35 most profitable companies in the population in the same period in Norway. Among their empirical findings, they demonstrate the ability of the model to identify relevant skills in the industrial context studied as well as they show that it is possible to achieve sustained competitive advantage in highly uncertain environments (Dreyer and Grønhaug 2004:492). Dreyer and Grønhaug (2004) forecast the important challenge of creating knowledge around the relationship between change and time concretely, understanding when to change to remain competitive.

Anand and Ward (2004), focusing on what has been largely missing, a practical advice on which types of flexibility best fit with the various dimensions of environmental instability and empirical evidence of such fit, decide to address the issue through identifying the manufacturing flexibility approach that will best help the firm to cope with those conditions. They focus on mobility – transitions in volumes and design- and on range – product variety and features that a plant is geared to offer- as part of manufacturing flexibility. The importance of environmental fit in moderating the relationship between flexibility and business performance is revealed through a survey of U.S. manufacturing firms conducted in 1994: 101 public and private manufacturing firms from three different sectors (fabricated metal products, electrical devices and electronic

controls). According to Anand and Ward, evidence about fit does indeed explain a significant amount of variance in performance is provided. In fact, fit as measured by moderation appears to account for more variance than flexibility itself (Anand and Ward, 2004:26).

A relevant empirical study in the field of organisational flexibility has been conducted by Verdú-Jover and their collaborators who have contributed to extend organisational flexibility research in management literature in terms of measurement with several papers. Verdú-Jover, Llórens-Montes and Garcia-Morales (2005), after compiling and overviewing the most relevant research studies that analyse the relation between flexibility and innovation, find that the taxonomy on flexibility is very extensive, due to the fact that this concept is widely applied to different areas of the organisation (Verdú-Jover et al. p.143). Then, their focus was on operative, structural and strategic flexibility. These authors were able to examine a large trans-national sample of firms, which has been the source of important ideas regarding certain determinants related to innovative capacity. They argue that innovative capacity and innovativeness, can be used as measures of the success in the fit of the levels of strategic flexibility. Based on the study of 417 European firms from three different sectors with a marked orientation towards manufacturing and technology management (chemicals, electronics and vehicles), they confirm that innovative capacity is usually contingently linked to the business capacity of interacting with the environment. Verdú-Jover et al. (2005: 138), taking the basis of previous research works as Volberda (1998) and Lund and Gjerding's studies, measure four aspects of organisational flexibility: flexibility mix, innovativeness, capacity to innovate and general company data. Concluding their research, they point out as future research to studying the relation of flexibility, as a dynamic capacity, with other factors such as learning and knowledge. The same authors address other aspects of flexibility in their following study one year after. With the same empirical database of the previous work, Verdú-Jover, Llórens-Montes and Garcia-Morales (2006), study the impact of the dimensions of business flexibility on the performance of large and small firms. They find that there are significant differences between large and small firms with regards to operative flexibility, strategic flexibility, financial flexibility, and performance: while large firms achieve a better co-alignment of their current flexibility with that required by the environment in their different dimensions (structural, operative, and strategic), small firms have higher levels of metaflexibility but align their flexibility mix to a lesser extent, which is, in turn, linked to a lower performance level. Verdú-Jover, et al. (2006) argue that such a greater co-alignment by the large firms may be mediated by a greater financial flexibility. A third research study led by the same author, Verdú-Jover and Gómez-Gras (2009), which uses the same sample

of European firms, attempts to overcome some of the previous limitations in the notion and dimensionality of the concept of managerial flexibility in organisations (2009:682). They provide a measurement scale for organisational responsiveness that allows managers to integrate contextual and internal variables in the same variable while simultaneously taking into account the range, cost and speed dimensions of flexibility. Verdú-Jover and Gómez-Gras (2009) state that despite that their findings capture the company behaviour at one moment of time, the overall construct of flexibility condition should be studied throughout time since the companies operate in turbulent environments.

In the context of searching for organisational flexibility determinants, Hatum and Pettigrew (2006) decide to address an uncovered research field in terms of empirical focus: research into adaptive processes in emerging countries (empirical literature on organisational innovativeness and flexibility has been mainly focused on cases or companies in developed countries). The companies under study are embedded in a particular national business environment: the Argentinian context in the period 1989/1999. The analysis of Hatum and Pettigrew (2006) provides insight into the process of adaptation in emerging countries, clarifies the process of organisational flexibility in family-owned businesses, and reveals some of the characteristics of flexibility's content and process. These authors took as theoretical basis three areas of literature: organisational flexibility, organisational innovativeness and institutional embeddedness.

Recently, Tan and Zeng (2009) examine the managerial implications of resource utilization in a historical context (based on a large sample of state-owned enterprises-SOEs) in China. They investigate whether the level of resource utilization contributes to or inhibits firm performance during the transition toward a market economy based on their purpose of extending the efficiency–flexibility debate to other environmental settings such as emerging market economies undergoing turbulent transitions (2009:571). Their research takes the basis of the positive role of flexibility on firm performance because it raises the firm's sensitivity and adaptability to environmental changes, and it facilitates organisational exploration. Tan and Zeng argue that such "*an adaptive process implies that the balance between exploitation and exploration (and the requirement for flexibility and efficiency) may be dependent on the stage of evolution of the organization, i.e., it is stage-dependent*" (2009: 570). Therefore, they propose a stage-dependent model of resource utilization which contributes to dynamic capabilities and consequently, to firm performance due to such "*time-varying dimension*" (Tan and Zeng, 2009; p.570). Their results consistently reveal that the way different resources and the levels of their utilization

affect firm performance depend on the stage of organisational transformation, which represents a major new insight.

There exist other empirical studies worthy to mention that have contributed to the understanding of organisational flexibility by providing empirical evidence. However, these studies adopted a different focus than the above studies. For example, Sak and Taymaz (2004) focus their study on small firms. They compare the degree of flexibility in small and large firms measuring four aspects/sources of flexibility (based on Weiss' work, 2001): in technology, in labour, systemic flexibility, and dynamic flexibility. By using the data on Turkish manufacturing firms, these authors identify the factors that determine the difference between small and large firms. After analysing a panel data on all manufacturing establishments (employing at least 10 people) in the period 1993-2001, Sak and Taimaz conclude (2004:12) that that there is no difference in manufacturing flexibility and there is almost no difference in labour flexibility between small and large firms (large firms could even have higher wage flexibility and intensive work arrangements). However, their analysis concludes that there are some differences in "external" aspects of flexibility. Large firms tend to benefit from subcontracting as being mostly "contractors", and small firms are more likely to be subcontractors. The most important difference between small and large firms is observed in the case of dynamic flexibility, i.e., the entry, exit and growth processes. Small firms enter to and exit from the market at much higher proportions, and those small firms that can survive achieve very high growth rates. This represents the dynamic flexibility in small firms and in this sense, SME-support policies should, as Sak and Taymaz mention, aim at making this process more efficient by providing resources for fast-growers and avoiding a good deal of support for firms doomed to fail. SME-support policies should encourage experimentation (entry) and entrepreneurship without stigmatizing business failures.

In collating the research in organisational flexibility, Jones (2005) identifies three characteristics defining it: proactivity, adaptability and resilience. Supported by literature review of main authors in the field of organisational flexibility (e.g. Volberda, 1998; Golden and Powell, 2000; Weiss, 2001), she aims to explore whether the components of flexibility vary in their relationship with performance outcomes (Jones, 2005:40). Jones also anticipates that these three characteristics are not equally recognised in the practical management or firms may place more emphasis on one of them than others may. The author points out that such a prevalence may limit the overall flexibility of an organisation. She suggests that "*a broader view of flexibility*

for managers could involve enhancing the organisation's ability to generate alternative scenarios for future events, the ability to respond and adapt structures and processes effectively to changes, and the ability of the organisation to withstand external shocks and stress." (Jones, 2005; p. 41).

In the same context, connecting flexibility to performance, the empirical study of Nadkarni and Narayanan (2007) suggests a positive empirical relationship between strategic flexibility and performance in fast-clock speed industries. As they uphold, their study represents one of the first empirical works integrating industry, cognition, strategic actions, and firm performance constructs. The research challenge faced by Xie and Ye (2008) addresses the exploration of the integration of the management strategic capacities (operational, structural and strategic flexibility) into the management functions and processes strengthening the company's dynamic capabilities to respond to the changes under the complexity environments. Their empirical study of 204 manufacturing firms in the Pearl River Delta in Guangdong Province (whose marketization is relatively higher and economy develops more rapidly) shows that, in the process of improving enterprise performance, special attention should be paid to the role of environment, operational flexibility and strategic flexibility on different levels of environmental dynamisms to promote improving enterprise performance. They confirm that operational and strategic flexibility are positively related to enterprise performance in static/medium and dynamic competitive environments respectively.

In the field of how flexibility influences innovation performance, Martínez-Sánchez, Vela-Jiménez, Pérez-Pérez, De Luis Carnicer (2009) focus on the influence of internal and external workplace flexibility (at strategic business unit level) on innovation performance and more concretely, on the moderator effect of inter-organisational cooperation in the characteristics that influence the innovation process. They choose workplace flexibility based on their belief that it *is more related to inter-organisational cooperation than flexibility dimensions*, and because *it constitutes a platform to build other levels of flexibility* (Martínez-Sánchez, et al. 2009:538). Among their findings, the impact of functional flexibility on innovation performance, greater in high-cooperative firms than in low-cooperative firms, reinforces the need to internalize some innovation activities even in cooperative environments.

Some authors have stressed the notion of strategic fit. There exist different levels of flexibility which depend on the fit between real flexibility and that required by the environment (e.g. Lund, 1998; Verdú-Jover et al. 2005). Zajac et al. (2000) used contingency theory in a multi-contingent environment-strategy fit defined as strategic fit. Organisational flexibility can be viewed as

strategic fit. Zajac et al. (2000) develop and test a dynamic perspective on strategic fit that relates organisational and environmental factors (e.g. distinctive competencies and resource advantages) with changes in a firm's strategy and the performance implications of such changes (Zajac et al. 2000:448). Their proposed view applies a dynamic perspective on the time frame, assumes a multivariate relationship, considers Organisational Strategy as the dependent variable and, Environmental Factors and Organisational Contingencies as the independent variables, and finally, assumes that fit is largely unique depending on differences in Organisational Contingencies (Zajac, et al. 2000:431).

As has been described above, several authors mention the importance of temporal dimension in future analysis of organisational flexibility. An important contribution of the temporal lens and, more specifically, the Ancona, Goodman, Lawrence and Tushman article (2001) is to refocus the attention on using time lens in addition to the broadly applied strategic design, political, and cultural lens. They point out to use the temporal lens in conducting organisational research. Within organisational behaviour literature, the strategic design lens focuses on designing strategies that "fit" the environment and the structure of the firm and on looking for further congruence among organisational components; the political lens focuses on power, influence, and conflict; the cultural lens focuses on norms, meaning, artifacts, and values. These authors argue and fundament that the new temporal lens helps to think not just about processes and practices but also about how fast they are moving (e.g. Huy, 2001), their trajectories over time (e.g. Lawrence, Winn, & Jennings, 2001), and the historical positions they take on the continuum of time (e.g. Blount & Janicik, 2001).

Ancona et al. (2001) address their exploration by focusing on planned organisational change. It means to explore when we might expect changes in outcomes if an organisational intervention is introduced. He states that in order to advance our understanding of when, two important challenges should be faced (2001:655): to build minitheories about the time lags in the observed research and to design the research under the framework of the "when" question. The first challenge is, to build "minitheories" about lags in the specific research concerns the use of tools such as the nature-of-work variables (e.g., visibility of results, constraints) and positive feedback cycles as examples of tools that can help explain lags in the organisational change (2001:653).

As a summary, Ancona et al. (2001) point out the advantages of using the temporal lens. First, by using the language of time in addition to other analytical methods will sharpen the contextual

understanding of the research. At a second level, throughout temporal lenses models of temporal research at the individual, group, and organisational can be seen.

2.4.3. Summary of Review in Section Four

This section briefly describes the main results coming from empirical studies addressing complex and multidimensional nature of organisational flexibility (Table 7 summaries the main insights and some research gaps that remain uncovered).

Table 7: Summary of fourth section in literature review

Research subject on Organisational Flexibility	Main insights and future research
A multidimensional concept	- It can be **associated to several managerial and organisational capacities** (e.g. operational flexibility, external and internal flexibility, etc.). - It has been **associated with various performance outcomes** (e.g. gaining and sustaining a competitive advantage providing organisations with the power to control their environment, the ability to manage chaos and adversity or, achieving innovative capacity). - The most prolific area of studies has emerged addressing the broadly spectrum of **flexibility's dimensions** at organisational level such as, strategic flexibility, operational flexibility, manufacturing flexibility, etc. ***Although multidimensional aspects of organisational flexibility have been addressed by a substantial body of literature, enough empirical evidence investigating such multidimensionality is limited.***
Complex nature of the organisational flexibility: multi-dimensionality and hierarchical nature of flexibility.	- When managers face flexibility, the major difficulty they find is how to accomplish the change without losing stability. Literature is **still waiting for models explicating relationships between flexible capabilities, environmental turbulence and firm performance**. - **Overcoming the static nature** by evaluating changes and directions of changes in innovation, technology, organisational structure, performance, and the interplay between those factors - The important challenge of creating knowledge around the **relationship between change and time** concretely, understanding when to change to remain competitive. - The addition of elements such as organizational structure and technology investments in explaining performance. - More important is to recognize the importance of environmental fit when considering flexibility. ***Comprehensive modelling of relationships is still lacking.***

The inclusion of time factor for future research: Some authors proposed the temporal condition of that source of competitive advantage.	- The possibility of modelling the adaptation process from a dynamic point of view: Flexibility is not a static condition, but it is **a dynamic process**. Time is a very essential factor of organisational flexibility. - A proposed view that applies **a dynamic perspective on the time frame,** assumes a multivariate relationship, considers Organisational Strategy as the dependent variable and, Environmental Factors and Organisational Contingencies as the independent variables, and finally, assumes that fit is largely unique depending on differences in Organisational Contingencies. - The overall construct of flexibility condition **should be studied throughout time** since the companies operate in turbulent environments. - Results consistently reveal that the way different resources and the levels of their utilization affect firm performance **depend on the stage of organisational transformation**, which represents a major new insight. - A broader view of flexibility for managers could involve enhancing **the organisation's ability to generate alternative scenarios for future events**, the ability to respond and adapt structures and processes effectively to changes, and the ability of the organisation to withstand external shocks and stress. ***The formula to accomplish organisational flexibility along the enterprise lifecycle*** *(with a temporal basis)* ***remains limited.***

2.5. Summary

The purpose of this chapter was to explore how new organisational forms have emerged coping with organisational change by achieving the required balance between exploration and exploitation. A brief review of several theoretical frameworks that guide on organisational change is the first step of this review process based on a practical selection. The selected theoretical studies dealing with organisational change have provided a general view of its uncovered research opportunities for organisational analysts. The temporal condition appeared in this schema as one of the approaches that still remain uncovered in organisational change literature (Pettigrew et al. 2001). Among the six interconnected analytical issues that they propose as future research lines, the inclusion of time, history, process, and action in organisational change research fits with the proposed objectives of the present thesis.

The following step aimed to describe one promising and broadly empirically evaluated research field: the occurrence of organisational change and how it has derived into several new organisational forms. More concretely, the rich debate about whether organisations can adapt and how organisations survive in the face of change is analysed. A singular remark is devoted to the main theoretical and empirical studies on the research paradigm of Organisational Ambidexterity. A broad range of scholars has followed the theoretical foundations coming from March's seminal paper (March, 1991) and they coincide in suggesting that for long-term survival organisations need to accommodate exploration and exploitation. Relevant studies in organisational change are explored with the aim of discovering the form in which firms managed to survive and change over decades. Within the theory of organisational adaptation, organisational flexibility – as the ability to adapt quickly to new or changing environments – appears as an optimal condition for accomplishing this balance.

The third review of literature concerns the organisational flexibility that has received wide attention in the management literature. The attempt is made to identify in literature, theoretical and empirical studies addressing the complex nature of said concept and considering the temporal dimension. Different approaches have emerged and empirically show the dimensionality of organisational flexibility (e.g. Hatum and Pettigrew, 2006); its interaction with firm size (e.g. Kraatz and Zajac, 2001; Sak and Taymaz, 2004); the context specificity of flexible capabilities and organisational design (e.g. Volberda, 1998; Verdú-Jover, et al. 2005; Martínez-Sánchez, et al. 2009); its interaction with innovation capacity (e.g. Verdú-Jover and Gómez-Gras, 2009); the need of strategic fit between environmental characteristics and organisational flexibility level (e.g. Anand and Ward 2004, van der Weerdt, 2009). As consequence of the review process, we were able to reveal that a substantial body of literature has addressed multidimensional aspect of organisational flexibility but empirical evidence investigating such multidimensionality remains limited. Based on such observation, several empirical studies were reviewed in order to explore the limitations of these approaches in addressing such complexity. First, some authors have stressed the complex nature of organisational flexibility and the lack of empirical studies accounting for such complexity (Dreyer and Grønhaug 2004). Addressing organisational flexibility requires discovering and defining the main variables that form the level of organisational flexibility and, the interrelationships between its components (e.g. Hatum and Pettigrew, 2006; van der Weerdt et al. 2012). Second, the review has identified some authors claiming that organisational flexibility is dependent on the temporal dimension (Volberda, 1998; Golden and Powell, 2000; Tan and Zeng, 2009). The temporal dimension of flexibility is the

ability of an organisation to adapt within a given time frame (Golden and Powell, 2000). For example, strategies that seem to provide dynamism may become sources of rigidity at another stage without a temporal dimension (Oliver, 1991). Literature is lacking the evaluation of the time path of organisational change strategies aimed to achieve the different levels of Organisational Flexibility.

We conclude this section with the following: organisational flexibility helps companies to effectively achieve the balance between change and stability, exploration and exploitation, thorough the implementation of change initiatives in its dimensions. Due to it being a multidimensional concept, it needs to be observed with systemic and time lens.

In the next chapter, the methodological approach proposed in this thesis to extend our understanding of organisational flexibility, will be explained in detail. My focus is Volberda's (1998) theory on organisational flexibility, in which organisations explore their deficit or surplus in flexibility level once the environment changes and set a new desired balance for the organization to achieve, undergoing routinization and revitalization strategies. We examine his theory in detail, formalizing it to investigate how well the theory accounts for the phenomena its authors set out to explain. This exercise will allow some constraints to be discovered.

3. A DYNAMIC MODEL ON ORGANISATIONAL FLEXIBILITY

3.1. Introduction

Based on the reviewed literature, two new dimensions seem to be crucial in order to overcome the aforementioned limitations: the temporal and the systemic dimension. This section aims to provide some guidance for addressing the research challenges that this thesis aims to cover.

Considering the complexity concerns and the lack of comprehensive modelling of the 'organisational flexibility' concept, this thesis employs system dynamics modelling (e.g. Sastry, 1997; Sterman, 2000; Repenning, 2002; Warren, 2005) to develop a more robust theoretical description of an extant theory. In order to improve the understanding of existing explanations of organisational flexibility, we adopted a similar approach to Sastry's research (1997). The objective of the model is to offer a more robust description of organisational adaptation to changing environments validated with selected simulations.

The selection of System Dynamics as a simulation technique to explore the theory whose results will help to validate dynamic propositions, is firstly explained. After that, the theoretical baseline of organisational flexibility proposed by Volberda are explored and translated to stock and flow variables of a causal diagram. The further formalization of the variables and their interactions is developed and presented thirdly. Finally, the validity tests are elaborated and explained in this chapter followed by the discussion section.

3.2. System Dynamics as Methodology for Modelling Organisational Flexibility

The selected research approach is based on systems modelling of organisational dynamics and the first steps are based on Sastry's research, as mentioned above. Although several approaches based on System Dynamics application have developed more robust theories (section 3.2.3), Sastry studies discontinuous or punctuated organizational change by modelling organizational change as a function of organization environment fit. In Volberda's framework, the environment fit is a key driver for the change strategies needed to achieve the desired flexibility level, or in other terms, to increase the adaptation capacity of organisation.

According to Sastry, this technique complements existing research methods for examining organisational change in several ways (Sastry, 1995:19). Her arguments justifying the utilisation of system dynamics for her research purposes furthermore form the basis to highlight that

System Dynamics is relevant for examining the theoretical insights concerning Organisational Flexibility:

- Sastry arguments that *"the exercise of formalizing and simulating the theories constitutes a test of those theories"* (1995:19). Volberda's theory has been selected for the present analysis, grounded in the original texts. The motivation lies on its relevance in the organisational change field, which, despite being largely cited in literature, the development and testing of the theory has been limited due to its complexity (Suarez et al, 2003; Dreyer and Grønhaug, 2004). The published explanation of a present theory is examined which *"presents an explicit causal argument about the forces that shape organisational evolution"* (Sastry, 1995; p. 19) – more concretely, organisational flexibility. In this thesis, formal modelling is used for exploring Volberda's theory on organisational flexibility instead of demonstrating my own theories; thus, an additional degree of rigor is ensured (Sastry, 1995). In the same context, Harrison, Lin, Carroll & Carley (2007) argument that by relying on formal modelling, simulation imposes theoretical rigor and promotes scientific progress.
- The formalization of Volberda's theory allows extending the understanding of the flexibility evolution at organisational level as long as the environment changes. We are applying formalization to causal arguments since *"when* [they] *are formalized, their assumptions are made more precise and less ambiguous"* (Sastry, 1995; p. 19)*;*
- Furthermore, such evolution depends on specific aspects of organisational decision making highlighted by Volberda that must be explored as continuous processes, rather than from a static perspective. The choice of SD simulation models is based on one of its benefits: it *"allow*[s] *dynamic causal theories to be depicted, showing patterns of human and organisational behaviour over time […]. In so doing, […] aspects of organisational decision-making, […], that are usually de-emphasized in discrete-time models"* can be explored (Sastry, 1995; p. 22).
- Last, but not least, Sastry states that a system dynamic model allows that findings from research on behavioural decision-making could be incorporated. Such as for instance, the **continuous-time approach** that captures cumulative pressures, thresholds required for future action, and varying time lags. Additionally, the model represents explicitly the time required for information to be gathered, decisions to be made, change to be implemented, and goals to be adjusted (Sastry, 1995:22). The model developed and

presented in this thesis offers several "*representations* [that] *are empirically testable hypotheses about organisational decision-making"*. Because they are based on existing behavioural decision research (Sterman, 1994), concerns about validity are mitigated.

Having explained the underlying argument of this thesis' approach, the following sub-sections aim to describe the strengths and weaknesses of SD as a simulation technique accompanied by detailed descriptions of several simulation models developed within a system dynamics framework as an attempt to create or extend existing theories.

3.2.1. Simulation Methods

"The specific advantages of model-driven experimentation are the possibility of examining the dynamics of a system of interconnected statements and to study its long-term implications in terms of the phenomena of interest." (Larsen and Lomi, 2002: 284)

"Simulation is now used routinely throughout the natural and social sciences, hailed as a 'third branch of science' [...]. Indeed, simulation is now essential to progress in many disciplines, from the dynamics of galaxy formation to the folding of proteins, from understanding how society can respond to pandemic influenza to policy design to mitigate global warming." (Sterman, 2007: 90)

"*Because organizations are complex systems and many of their characteristics and behaviours are often inaccessible to researchers, especially over time, simulation can be a particularly useful research tool for management theorists*" (Harrison, Lin, Carroll, & Carley, 2007).

In their attempt to encourage management scholars to use simulation methods, particularly in the theory development field, Harrison et al. (2007) provide an explanation and overview of simulation methodology including, among other aspects, benefits of formal models in general and benefits of simulation based work. These authors based their research on the following statement: *"Traditional approaches to theory development are limited in their ability to analyse multiple interdependent processes operating simultaneously."* (Harrison et al. 2007; p. 1229). As they explain, this is due to, on the one hand, "*processes involved may interact in complicated and unforeseen ways"* and on the other hand, "*the interactions typically produce nonlinear system behaviour with feedback".*

A variety of benefits that simulation analysis offers for developing theory and guiding empirical work are highlighted in Harrison et al.: it allows to explore the behaviour of complex systems and most importantly, it can examine the consequences of theoretical arguments and assumptions, generate alternative explanations and hypotheses, and test the validity of explanations (2007; p. 1243). In the same context, Davis, Eisenhardt & Bingham (2007a) also endorse that the simulation method appears as a powerful method for sharply specifying and extending extant theory in useful ways (Davis et al, 2007a:480). More concretely, researchers in favour of this type of method mention that "*simulation can provide superior insight into complex theoretical relationships among constructs, especially when challenging empirical data limitations exist*" (Zott, 2003); or "[it] *can provide an analytically precise means of specifying the assumptions and theoretical logic that lie at the heart of verbal theories"* (Carroll & Harrison, 1998; Kreps, 1990); or "[it] c*an clearly reveal the outcomes of the interactions among multiple underlying organisational and strategic processes, especially as they unfold over time"* (Repenning, 2002). Davis et al, (2007a) also note that there exist some researchers (e.g. Fine & Elsbach, 2000; Rivkin, 2000) who are not in favour of simulation methods mentioning that "*simulations are simply 'toy models' of actual phenomena*" and "[they] *often yield very little in terms of actual theory development*". This constitutes one of the research motivations for Davis et al.'s study. In their view, a lack of clarity about the simulation method and its related link to theory development causes limited understanding within the broad research community (Davis et al, 2007a:481).

Regardless of their benefits, it must be noted in which circumstances any simulation method is more suitable for the proposed research aims. Using simulation is particularly effective when the research question involves a fundamental tension or trade-off (e.g. temporal - such as short/long-run implications; structural - too much structure versus too little; or spatial - near versus far away (Davis et al. 2007a:485). Such tensions, as Davis et al. explain, "*often result in nonlinear relationships* (e.g. *tipping point transitions and steep thresholds*), *which are difficult to discover using inductive case methods and difficult to explore with traditional statistical techniques"*.

Based on these findings, the present research aims to evaluate the consequences of how companies solve the fundamental 'structural' and 'temporal' tensions that organisational flexibility implies (change versus preservation). Therefore, the simulation method perfectly fits

into this thesis' objectives since it allows it to reveal the outcomes of the interactions among multiple underlying organisational and strategic processes, especially as they unfold over time.

When looking at simulation methods, **agent-based modelling** appears probably as the most cited in many current simulations in management theory. In their research paper, Harrison et al. (2007) point out three commonly used types of simulation models: (1) agent-based models, (2) systems dynamics models, and (3) cellular automata models. Harrison et al.'s typology fits into the classification made by Davis et al. (2007a). The latter provide their own typology - a fine-grained mapping that accurately relates to the major approaches that are used in the organisations and strategy literature - which reflects the most frequently used categorization in the relevant extant research (2007a: 485). In the following table (Table 8), a comparison of simulation approaches is presented based on Harrison et al. and Davis et al.'s explorative studies. Given the scope of this thesis, we have decided to limit the provided description of these approaches up to subjects such as their focus or their common research question they address[2].

Harrison et al. (2007)	**Davis et al. (2007a)**	**Main authors**	**Focus**
System Dynamics		Sastry (1997), Sterman, Repenning, & Kofman (1997), Repenning (2002), Rudolph & Repenning (2002)	Behaviour of a system with complex causality and timing.
Cellular automata		Lomi & Larsen (1996)	Emergence of macro patterns from micro interactions via spatial processes (e.g., competition, diffusion) in a population of agents
Agent-based models	**NK fitness landscapes**	Levinthal (1997), Gavetti & Levinthal (2000), Rivkin (2000), Rivkin & Siggelkow (2003)	Speed and effectiveness of adaptation of modular systems with tight versus loose coupling to an optimal point
	Genetic algorithms	Bruderer & Singh (1996), Zott (2002)	Adaptation of a population of agents (e.g., organisations) via simple learning to an optimal agent form
	Stochastic processes	March (1991), Carroll & Harrison (1998), Zott (2003), Davis,	Flexible approach to a wide variety of research questions, assumptions, and theoretical logics.

[2] For more information, please check the literature sources.

		Eisenhardt, & Bingham (2007b)

Table 8: Comparison of simulation approaches (adapted from Davis et al. (2007a) and Harrison et al. (2007)

In addition to what has been mentioned at the beginning of this Chapter 3.2, System Dynamics has been selected, among the approaches listed above, as an optimal approach for achieving the purposes of this thesis: to model organisational flexibility as a system in which a series of simple processes with circular causality intervene (e.g., variable A influences variable B, which influences variable A) and to understand the contradictory forces that those processes deploy and that they are represented by positive or negative causal loops whose feedback is self-reinforcing and amplifying or dampening accordingly (Sterman, 2000).

Several uses for simulations research have been identified. Harrison et al. (2007) extend Axelrod's list (Axelrod, 1997) to seven research purposes: prediction, proof, discovery, explanation, critique, prescription and empirical guidance. All of them illustrate a variety of ways in which simulations can be applied, however, they could be overlapped depending upon the purposes of specific simulation studies (Harrison et al, 2007: 1240). Sastry (1997)[3] made a significant improvement through the application of simulation in System Dynamics. In her attempt to verify her computational representation of the punctuated equilibrium theory, she found shortcomings in the theoretical logic. Sastry returned to the original theory and discovered that Tushman and Romanelli (1985) had failed to account for some aspects of reorientation. This unexpected logical flaw led Sastry to reformulate the theory by adding assumptions and a negative feedback process (Davis et al. 2007a: 492).

The present research proposes utilising SD as a simulation modelling technique for providing explanation and prescription. On the one hand, this thesis aims to observe the behaviour and the processes that produce the behaviours when organisation change is implemented looking for flexibility; simulation allows the model to produce certain outcomes and to illuminate the conditions under which such outcomes are produced (Harrison et al, 2007). On the other hand, we aim at providing some prescriptions concerning the form in which organisations intervene on the processes that endorse flexibility and provide them with specific managerial guidelines.

3.2.2. Modelling Techniques: System Dynamics

[3] See more detail of Sastry's contribution in Chapter 3.3.3

In the previous section, we provided rationalisations for choosing System Dynamics as the research methodology that fits into this thesis' purposes in terms of systems modelling and simulation of organisational dynamics. In this section, we turn to a detailed description of the methodology. This section offers a brief description of System Dynamics as a modelling and simulation technique providing a description of its main characteristics. Findings in management literature within the System Dynamics' research field provide various examples of organisational studies with a similar approach than the proposed one in this thesis.

System Dynamics is a construct that has been used to define a simulation methodology, computational based and originally created and applied by Forrester (Forrester, 1961) to develop and analyse models of systems and their behaviour. The focus is on modelling the behaviour of the system as a whole, rather than modelling the behaviours of actors within the system (see Forrester, 1961).

> *"During the past century, the frontier of human advancement has been the exploration of science and technology. Science and technology are no longer frontiers; they have receded into the fabric of everyday activity.* ***I believe that we are now embarking on the next great frontier, which will be to explore a much deeper understanding of social and economic behaviour****."* (Forrester, 2007: 356)

On the occasion of the 50th anniversary of System Dynamics, a special issue in 'System Dynamics Review' journal was released in 2007, which included some relevant discussions provided by Forrester (2007) and Sterman (2007); relevant authors in the field.

> *"The field of system dynamics today is healthy and growing.* [It] *is increasingly used in corporations, government and other organizations. It is taught in a growing number of universities and schools, including secondary, middle, and even primary schools. It is applied to issues from organisational change to climate change, physiology to fiscal policy."* (Sterman, 2007: 90)

> *"*[…] *system dynamics is far more than a method for computer simulation. Indeed, the tools and applications of system dynamics have become so diverse and appear in so many contexts that it is often difficult to define the field"* (Sterman, 2007: 90).

> *"*[it] *is more than the construction and analysis of mathematical models. It is also a practical tool policy makers can use to help solve important problems. It is qualitative and quantitative, hard and soft, a theoretical discipline and a pragmatic approach for group modeling and policy design."* (Sterman, 2007: 90).
>
> *"As we make our way in the 21st century, the greatest challenges facing system dynamics are related to education. The first challenge involves education of system dynamics experts. The second challenge is to use system dynamics as an organizing philosophy for a new kind of management education in the 21st century. The third challenge is to make system dynamics a common foundation under most of what is taught in pre-college education, from kindergarten through high school."* (Forrester, 2007: 356)
>
> *"It is time to start working toward an integrated educational process based on an understanding of systems that is more effective, more appropriate to a world of increasing complexity, and more compatible with unity in life."* (Forrester, 2007: 356)
>
> *"Science and technology are no longer frontiers; they have receded into the fabric of everyday activity. I believe that we are now embarking on the next great frontier, which will be to explore a much deeper understanding of social and economic behavior."* (Forrester, 2007: 356)

System dynamics modelling is based on discovering and representing the feedback processes, which, along with stock and flow structures, time delays, and nonlinearities, determine the dynamics of a system and as Sterman states, they are now completely integrated into the discourse of management, social theory and everyday life (Sterman, 2002: 90). Those basic characteristics are briefly described as follows:

- **Nonlinearity in the interrelations between variables**: System Dynamics is based on abandoning the common linear vision of cause-effect that is usually applied to organisational problems in favour of circular vision. Intuition is inappropriate to carry out any analysis or forecast on the overall behaviour of the organization, so commonly used by most managers.

- **Causal feedback loops**: From a systemic focus, the organisations are observed as interrelated groups of agents, actions and resources. The modeller might imagine that the system to be modelled is integrated by an immense range of different feedback processes and other structures to be mastered in order to understand the dynamics of complex systems (Sterman, 2002: 12). As this author highlights, the most complex behaviours usually arise from the interactions (feedbacks) among the components of the system, not from the complexity of the components themselves (Sterman, 2002).

  In this context, the causal loop diagrams are flexible and useful tools for diagramming the feedback structure of systems in any domain (2002:12).

  As the following figures show (Figure 6), causal diagrams are simply maps showing the causal links among variables with arrows from a cause to an effect. The positive polarity denotes an increasing change over the independent variable after the influence of a dependent variable. On the contrary, the negative polarity represents a decreasing change.

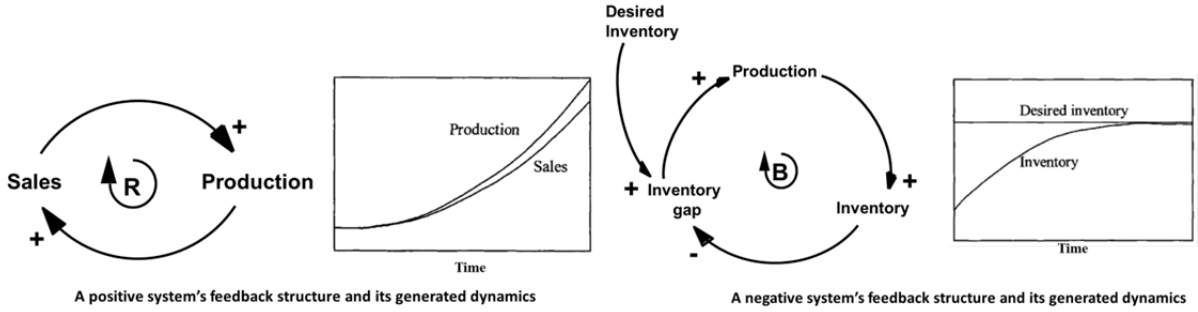

Figure 6: Positive and Negative Feedback Loop Diagram (Lizeo, 2000)

The left side of the figure above illustrates a positive feedback loop, denoted by **'R' - self-reinforcing loop**. It means that if this loop were the only one operating, production and sales would both grow exponentially; more product availability will lead to potential sales or the lower the production level is, the lower potential sales will be. A negative feedback loop is illustrated on the right side of the figure above, denoted by **'B' – balancing loop**. The production level of a product affects the level of inventory of such a product. In this negative loop, as the inventory level changes (decreases or increases), the gap between the current and desired level of inventory also changes. Production will depend on the size of the gap and consequently the company should increase or decrease it according to such difference.

The dynamics of a system arise from the interaction of networks of these two types of feedback loops: positive or reinforcing loops and negative and balancing loops. Intuition may enable us to infer the dynamics of isolated loops such as those shown in Figure 6. However, when multiple loops interact, it is not so easy to determine what the dynamics will be. When intuition fails, we usually turn to computer simulation to deduce the behaviour of our models (e.g. some software are available such as VENSIM).

- Variables typology - **stocks and flows**: Stocks represent the accumulation of resources in a system while flows represent the rates of change that alter those resources (Sterman, 2002: 34). Sterman explains in detail its distinctive features (Sterman, 2002: 192):
  - Stocks characterize the state of the system and generate the information upon which decisions and actions are based (e.g. the inventory of a manufacturing firm is the stock of product; the number of people employed by a business is a stock);
  - Stocks are altered by inflows and outflows (flows variables) and they create delays by accumulating the difference between the inflow to a process and its outflow (e.g. a firm's inventory is increased by the flow of production and decreased by the flow of shipments);
  - Failure to understand the difference between stocks and flows often leads to underestimation of time delays, a short-term focus, and policy resistance.
- **Delays**: there exists a discrepancy between causes and effects in a system. The consequences of specific actions are not immediately produced (Forrester, 1961). It takes time for decisions to affect the state of a system (Sterman, 2002). Modellers need to understand how delays behave, how to represent them, how to choose among various types of delays in any modelling situation, and how to estimate their duration. Sterman defines two categories of delays: material and information delays.
  - The *material* delay captures the physical flow of material through a delay process (e.g. the flow of product through a supply chain, the construction of buildings, or the progression of design tasks through a product development process). *"In each there are physical units (e.g. engineering drawings) moving through the process."* (Sterman, 2002: 411).
  - The *information* delay represents the gradual adjustment of perceptions or beliefs (e.g. the delay between a change in the order rate of a company's products and the manager's belief about the likely future order; a delay exists between the receipt of

new information and the updating of manager's beliefs). *"Though there is no physical flow of material, information delays still involve stocks. In general, any belief or perception involves an information delay because we cannot instantaneously update our mental models as new information is received."* (Sterman, 2002: 412).

3.2.3. System Dynamics Applications in Organisational Change

There is no doubt that System Dynamics emerges from "the system movement", often referred to as 'systemic'. As Schwaninger mentions, *"the Development of the System Dynamics methodology, and the worldwide community that applies System Dynamics to the modeling and simulation in the most different contexts, suggest it is a 'systems approach' on its own"* (Schwaninger, 2006: 1).

"The field of system dynamics today is healthy and growing". (Sterman, 2007: 90)

As Sterman asserts, system dynamics is increasingly used in corporations, government and other organisations, a growing number of universities and schools teach it as well as, it is applied to issues from organisational change to climate change, physiology to fiscal policy (Sterman, 2007: 90). A large body of work concerning the application to various disciplines has emerged in the past five decades. One of its oldest applications was to management (Coyle, 1977) specifically focusing on production, operations, and human resources and it has then gradually been extended to cover an entire company (Lyneis, 1980). A varied number of books [Coyle, 1996; Ford, 1999; Katsuhiko, 1998; Maani & Cavan, 2000; Sterman, 2000] and a huge range of journal articles and conference proceedings showing various applications of System Dynamics have been published within the last few years, for instance to micro-economics, management, business decision making and macro-economics. However, the prevalence of System Dynamics modelling in strategic management remains surprisingly low (Warren, 2005; Sharif, 2005; Bradl, 2003). Only few publications deal with System Dynamics in management explicitly (Bradl, 2003) and System Dynamics approaches that appear in management literature during the last decade (Maani & Cavan, 2000: 4) have mainly addressed a certain field or operational area (e.g. Total Quality Management, Business Process Reengineering). Several studies have tried to show the advantages of this modelling technique in organisational dimensions for instance, in the balanced scored card (Todd, 2000; Akkermans y Oorschot, 2002), knowledge management (Bradl, 2003), strategic management (Warren, 2002), process improvement (Repenning & Sterman 2001).

Different causes of such scarce or limited utilisation of SD in strategic management can be found in literature that is mainly based on the misunderstanding about what it does address to and how it may be applied:

- People understand organisations as local, static and linear systems when in reality they are complex, dynamic and non-linear systems (Senge, 1990).
- Additionally, human perception and knowledge are limited. Managers usually operate from the basis of their mental models, which are a simplification, an abstraction, a selection, thus they are inevitably incomplete, incorrect (Sterman, 2002: 525).
- Several studies illustrate the non-systemic behaviour of individuals in dealing with a complex problem (Maani and Maharaj, 2001). Sterman develops a case study on the behaviour of decision-makers when faced with a problem and they discover an "open-loop" conception of the origin of dynamics thus, as opposed to the following explanation: *"[...] which change is seen as arising from the endogenous interactions of decision makers with their environment."* (Sterman, 1989: 336).
- Following the aforementioned author's work, Sterman highlights a certain lack of awareness of participants to "*the presence of feedback from their decisions to the environment"* underestimating "*the time lag between actions"* (Sterman, 1989:337).
- System Dynamics can be considered a difficult modelling technique to understand intuitively (compared with the BSC for example) (Bradl, 2003). Representations of flows and levels, that are simple systems for System Dynamics experts, can intimidate those who are starting in the subject. To some extent, because experts automatically filter the visual complexity associated to those flow and level charts (Richmond, 1993). On the other hand, as Sterman points out, expert modellers also need the clients to become partners with them in the modelling process; mainly because one implementation success will require changing the clients' mental models. The success rate would be greater when modellers work with their clients because it allows them to find the flaws in their mental and formal models (Sterman, 2002). Thus, modellers and clients *"gradually develop a deeper understanding of the system and the confidence to use that understanding to take action*". (Sterman, 2002:522)

Following the argument of limited utilisation of system dynamics, several criticisms have emerged around System Dynamics at different levels (paradigm, simulation technique or method) which can affect to its application's reliability. Featherston and Doolan (2012) develop

a review of the criticisms to system dynamics and assess the validity of these against recent findings in the field. They classified the criticisms into five groups: those related to its application, related to the mimicry historical data and its inherent complexity, related to its deterministic nature in the sense of dehumanising, aspiring to be some 'grand' theory of systems and operationally austere and, related to the question of hierarchy in system dynamics.

Some authors argue that system dynamics was applied to the wrong situation or was applied to the wrong 'type' of problem. The arguments that Featherston and Doolan (2012) use to address this criticism lay, first, on the fact that some modellers misuse and mismanage the tools and techniques that System dynamics provides to apply to the appropriate problems and second, on the tendency to build unnecessarily large models to address 'big' problems.

A second group of criticisms highlight the inabilities of models to mimic reality and predict the future are common criticisms levelled at system dynamics. These criticisms affirm that models not mimicking reality, comparisons of models and reality, model verification and the dependence of the paradigm on data. It is relatively widely accepted within the field of system dynamics that models are not designed to and cannot perfectly imitate the real world (e.g. Sterman, 2000). The goal of modelling in system dynamics is not to get a model that reflects the actual system perfectly. Instead, the goal is to assist people to understand the internal systemic structure of a system that drives behaviour.

The third group of criticisms that Featherston and Doolan (2012) reviewed is related to the complexity. They find arguments from a 'soft' systems perspective related to the dependence of system dynamics on quantitative data and explicit relationships which does not allow system dynamics to deal with the complexity of the real world and reduces the richness of analysis it can conduct. It must be noted, as Featherston and Doolan (2012) emphasise, that the model itself is only a portion of what the system dynamics proposes it can do and they add that system dynamics is essentially a learning tool and the 'process' of modelling is often seen as more important than the model itself. Moreover, it assists the field to deal with increasingly complex situations, similar to those addressed by 'soft' systems thinking.

Fourthly, some authors believe system dynamics is deterministic. Many instances of such criticisms view system dynamics making the assumption that laws operate outside of human subjectivity and of dehumanising its topic. In this sense, Forrester's view is that system

dynamics takes the perspective that 'decisions are not entirely "free will" but are strongly conditioned by the environment' (Forrester, 1961, p.17).

Finally, one of the criticisms is with regards to the consideration of hierarchy in system dynamics. Hierarchy is the relationship sub-systems have to each other. The hierarchy that forms in a system defines a set of rules, obligations, controls, regulations and limitations that exist within the system. To address these criticisms, system dynamics should have a clear picture of how its techniques consider and inform users of these features of hierarchy.

In summary, to perform effectively, System Dynamics must both be well-informed and used correctly (Wyatt, 2005). Wyatt states that System Dynamics is best applied as a strategic tool and it is not the most appropriate approach for operational issues which lack repeatability. She mentions three aspects for it to work well:

- defined issues which have proved resilient to more conventional approaches a motivated and consistent management team composed of both issue experts and modellers;
- an openness to radical change and data sharing;
- a minimisation of defensive attitudes and a willingness to challenge the status quo.

After exposing several reasons of the reticence to use System Dynamics in specific areas or the organisational context, the attempt in this section is to briefly summarize the solutions proposed by relevant authors in the System Dynamics field. Decisions makers sometimes are exposed to make decisions with incomplete information that can only be explained by using the best available models (Sharif, 2005). In this sense, achieving a modelling technique that represents the real world in the most complete way and taking into account the increasing complexity is a difficult mission that can affect the appropriate selection of a modelling technique (Sharif, 2005). Therefore, any technique that helps to uncover and relate tangible and intangible factors seems to be necessary and should be pursued. Sterman (2002) proposes helping managers to *"open up a new perspective, a new model, and change deeply entrenched behaviours"*, that is, to help people see the limitations of their mental models. In consequence, it is necessary to help people "*see through a new lens, improve their mental models, and thus make better decisions"*. However this is not enough, it is also recommendable in helping people to "*develop the critical thinking skills and confidence to continually challenge their own models, to uncover their own biases*." (Sterman, 2002: 526). Both authors (Sterman and Sharif) agree on the System Dynamics potential for

solving the aforementioned constraints with its modelling tools. In this context, Sharif possesses the question that can help us to determine whether or not systems dynamics is useful and appropriate for modelling dynamic business systems: what is the level of detail and accuracy necessary for such systems being modelled as the most realistic representation? (Sharif, 2005: 613). His perspective to respond comes from the following: *"any level of detail and accuracy will be sufficient as long as it is a representation that can be used as a vehicle for communication and disseminating knowledge and understanding about the business system being analysed"*. (Sharif, 2005: 613). Warren's motivation in his work *"Improving strategic management with the fundamental principles of system dynamics"* (2005) is closest to that of Repenning (2003) in "*attempting to bring the power of System Dynamics approach to communities other than system dynamics specialists, albeit via instructional materials rather than academic articles."* Warren's approach introduces to management important principles of theory, which enhance the understanding of organisations' performance (Warren, 2005: 329). They are briefly summarised as follows: to retain a focus on quantitative behaviour, over time, not only for the key performance indicator, but also for all other significant factors involved (to keep the audience connected to information with which they are familiar); to prioritize the identification of accumulating stocks and their associated flows before encountering feedback processes (rather than seek plausible feedback loops first, and then identify and model the stocks and flows); factors flowing in from, or out to, the environment are very common in practice and often highly influential (2005:347).

One argument that is increasingly appearing in management literature is related to the combination of System Dynamics with other techniques or System Dynamics as a complementary method to other forms of modelling (such as cognitive mapping, strategic planning, agent-based modelling, etc.) (e.g. Sharif, 2002; Schwaninger, 2006). Many developments in the 'hard' methods and technologies (mathematics, statistics, logic, and informatics-based) appear as being apt to enrich the System Dynamics methodology, namely in terms of modelling and decision support (Schwaninger, 2006). He points out that the integration of complementary methodologies definitely "*mark a new phase in the history of the Systems Movement".*

System dynamics has been successfully applied to provide more robust explanations to organisational theories, through their representation and specification. The selection we made here attempts to select and describe those System Dynamics simulation models within the small

but growing literature on simulation of second-order models in organization science (Larsen & Lomi, 2002). While first-order models are specifications of empirical processes developed for the main purpose of theory testing, the second-order models, as Larsen & Lomi explain (2002: 273), are *abstract representations based on a plausible reconstruction (or integration) of an underlying theoretical narrative, as an aid to the process of theory-building (e.g. Hannan, 1998; Lomi & Larsen, 2001; Sastry, 1995)*. Some simulation-based examples of second-order models, among others, have addressed organisational ecology (Peli, Bruggerman, Masuch, & O'Nualláin, 1994); punctuated organisational change (Sastry, 1995); age dependence in organisational mortality rate (Hannan, 1998); organisational theory related to the emergence, permanence, and dissolution of hierarchical macrostructures (Lomi & Larsen, 2001); the dynamics of organisational populations (Barron, 2001).

This section aims to offer a description of those research works in the system dynamics literature that have used simulation modelling to test, create or extend any organisational theory. The following table (Table 9) shows precedent works that appear in the literature within the Systems Dynamic field:

Author	Application's Field	Findings
Sastry (1995, 1997)	Punctuated Change (Tushman & Romanelli's theory, 1985): modelling **organisational change** as a function of organization **environment fit and of trial periods** following reorientations during which the change process is suspended	The first model, based on T&R theory, was incapable of producing punctuated change in a range of environments Her findings suggest a number of ways in which organisations can fail to manage strategic change successfully.
Repenning (2002)	Examines **organisational implementation of innovations** by modelling the process whereby participants collectively develop commitment to newly adopted innovations.	The analysis suggests three new constructs-reversion, regeneration, and the motivation threshold characterizing the dynamics of implementation.
Larsen & Lomi (2002)	These authors take the theory of structural inertia proposed by Hannan and Freeman (1984) to develop a dynamic feedback model of organisational inertia and change. We use system dynamics (SD) methods to simulate the model,	Organisational inertia (defined as the tendency of formal organisations to resist change) and organisational capabilities (defined as the ability of organisations to innovate and reconfigure their internal resources) **should be represented as paired concepts, each understandable only in terms of the other**

	test its internal consistency, and explore the full dynamic implications of a theory that relates the dynamics of organisational inertia to the accumulation of organisational capabilities.	
Romme, Zollo & Berends (2010)	**Development of knowledge**, operating routines and dynamic capability in organisations at varying levels of environmental dynamism	The simulation experiments conducted with the model suggest that **the impact of deliberate learning on dynamic capability is non-linear, complex, and in some instances counter-intuitive**. The simulation experiments suggest that organisational history matters, in the sense that initial conditions determine to a large extent the effectiveness of particular responses to increasing ED.
Rahmandad, (2012)	Resource based view - this study examines firm-level capability development trade-offs in the context of a firm's market-level competition and growth.	His results expand on the predictions in the RBV literature by providing new testable propositions regarding variations in capability investment across different firms and markets. Path dependency is created because in the presence of increasing returns, investing in long-term capabilities, enhances the viability of further investment in these capabilities

Table 9: Simulation models based on SD modelling of organisational dimensions

Sastry's research (Sastry, 1997) has been cited several times in literature within the strategy and organisational change field and it appears as one of the reference examples in simulation modelling with System Dynamics (Harrison et al, 2007; Davis et al, 2007a). She analyses Tushman and Romanelli's theory of punctuated change (Tushman and Romanelli, 1985) and develops a theory by modelling organisational change as a function of organization environment fit and trial periods following reorientations during which the change process is suspended. Her findings suggest a number of ways in which organisations can fail to manage strategic change successfully. In order to extend the understanding of organisational change, Sastry takes an alternative approach: examining existing theory in detail, formalizing it to investigate how well the theory accounts for the phenomena its authors (Tushman & Romanelli, 1985) set out to explain. She used System Dynamics as a method to formalize verbal descriptions of causal

relationships, because action is central to theories of organisational change. Through her simulation exercises, she was able to identify six causes of failure of the organisational change: (1) when the new strategic orientation selected by the organization does not match the requirements of its environment, (2) biases or inattention skew the organization's perception of fit and performance, (3) the organization is overly responsive to performance pressures and neglects organization-environment fit, (4) the organization is too slow in updating perceptions of its strategic fit, or (5) the organization is not responsive enough (or is too responsive) in adjusting strategic orientation, or (6) the organization fails to use a trial-period routine in a rapidly changing environment (Sastry, 1997: 265).

Other examples of System Dynamics application as simulation modelling is represented by Repenning's (2002) research study. His research motivation was mainly based on two themes:

1. [Innovation] implementation is a dynamic process that involves complex interaction of multiple factors
2. There is a lack of integrative approaches that clearly capture those dynamic interactions

He studies the process of innovation implementation using simulation models. Working from existing theoretical frameworks, he develops a model that describes the process through which participants in an organization develop commitment to using a newly adopted innovation. After creating such a model, it is translated into a formal model in order to analyse it using computer simulation. The analysis made using systems dynamics highlights and clarifies the complex interactions between the elements common to existing frameworks. Derived from such analysis, three new constructs are depicted that characterize the dynamics of implementation: reversion, regeneration, and the motivation threshold. *"Taken together, these constructs provide an internally consistent theory of how seemingly rational decision rules can create the apparent paradox of innovations that generate early results but fail to produce sustained benefit"* (Repenning, 2002:109). Through his theoretical framework, Repenning is able to provide understanding of failed efforts to improve organisational effectiveness when innovation is adopted and implemented (Repenning, 2002). Some relevant findings can be extracted from Repenning's theoretical framework. Repenning recommends firstly, "*that managers should be prepared to be fully committed to the effort and be patient in the temporal dimension of* [the process from] *adopting the innovation up to crossing the motivation threshold*". Secondly, this author suggests managers should focus on achieving the motivation threshold instead on the

generation of early results at any cost. In Repenning's model, *"less aggressive goals are unequivocally better because a given level of performance is evaluated more favourably"* while goal setting provides the benchmark from which people assess whether or not the innovation is producing value appropriately. Finally, this author emphasizes, "*A focus on generating early results does not always contribute to long-term success"*. In Repenning's model, "*performance is better if the experts allocate their resources without regard to results".* (Repenning, 2002:126).

A third remarkable approach on System Dynamics simulation is endorsed by Lomi & Larsen (2002) who selected 'moving parts' of an idealized organisational system as representing the dynamic duality between organisational inertia and the evolution of capabilities (2002: 291). These authors highlighted that empirical studies that have attempted to test the theory directly have been forced to ignore the complex feedback structure linking individual propositions for the purpose of specifying estimable statistical models. Based on that observation, they were motivated for translating the ecological theory of structural inertia into a System Dynamics model. The ecological theory of organisations was selected because of the clarity of its original formulation, which makes it particularly suitable to formalization (2002: 292). Their focus lies on structural inertia as central to the understanding of organisational dynamics. Since the dynamics of organisational inertia and change can be observed through a different lens, Lomi & Larsen (2002) decided to explore the possibility of representing organisational inertia and capabilities as dynamic accumulation processes in the context of a unified model. Thus, these authors, grounding on the fragment of population ecology theories of organisations that deal more directly with organisational inertia and change, reformulated some of the central assumptions and propositions in System Dynamics terms (2002: 291).

Romme, Zollo and Berends's study (2010) on dynamic capabilities constitutes the fourth example. They present a simulation model of the development of knowledge, operating routines and dynamic capability in organisations at varying levels of environmental dynamism. Through system dynamics modeling these authors are able to explore *"trade-offs and ambiguities in the decision to invest in* ***deliberate learning processes*** *to enhance the development of dynamic capabilities" (*Romme et al. 2010). The motivation of their study lies on the following question: to what extent and how does **the degree of dynamism in environmental change** influence the **development of the firm's ability to adapt its operating processes** to the new demands and conditions of their environment? Grounded in robust theoretical statements (Zott, 2003; Zollo and Winter, 2002; Hansen et al. 2005), they adopt a dynamic and **path-dependent view** of

dynamic capability development. Firstly, they distinguish between the effects of articulation and codification processes in a formal model. They consider explicitly, and jointly, the non-linear dynamics of the positive as well as negative effects of deliberate learning on the evolution of dynamic capabilities in a second step. Through this approach, they are able to explore "*how variations in investments in deliberate learning strategies may lead to different patterns of dynamic capability development and experience accumulation at varying levels of ED"*, (Romme et al. 2010). Their conclusion from a managerial point of view emerging from the study's results is that *"it is crucial for any firm to understand how to adapt its deliberate learning approach to the environmental conditions it is facing"* (Romme et al. 2010: 1291).

We conclude the aforementioned list with another example within dynamic capabilities, Rahmandad' study (2012). Rahmandad (2012) examines firm-level capability development trade-offs in the context of a firm's market-level competition and growth through simulations exercises. This author examines the contribution to firms' survival and growth production of operational capabilities (e.g. production) and dynamic capabilities (e.g. research and development). These capabilities pay off with different delays; consequently, allocating a limited investment flow among them leads to intertemporal trade-offs. From his simulation experiments, relevant theoretical insights have arisen:

1. His analysis complements why short-term-focused firm behaviour persists. He shows that "*what is considered short-termism with constant investment flow may be a reasonable investment plan when opportunities for growth or competitive pressures are considered"*.
2. His study shows how growth opportunities and competition can lead to the dominance of short-term investment policies in the market.
3. His results expand on the predictions in the RBV literature. The author provides new testable propositions regarding variations in capability investment across different firms and markets
4. An extension of these results to alternative firm and market characteristics may reveal avenues through which firms can invest in long-term capabilities without losing in the competition
5. *"The path dependency is created because in the presence of increasing returns, investing in long-term capabilities, by increasing these capabilities, enhances the viability of further investment in these capabilities. In contrast, once a firm is in a poor capability position, market forces leave the firm with few options other than to further ignore long-term capabilities*."

As was mentioned at the beginning of this section 3.2, the foundations of a System Dynamics' choice as the suitable methodology that fits to explore Volberda's theory have been outlined. It can be concluded that this technique complements existing research methods for examining organisational change in several ways: additional degree of rigor is ensured through formal modelling, extending the understanding of theories, depicting dynamic causal theories and showing patterns of human and organisational behaviour over time, findings from research on behavioural decision making could be incorporated, and models represent empirically testable hypotheses about organisational decision making.

Additionally System Dynamics represents one of the existing simulation methods and simulation can be a particularly useful research tool for management theorists (Sterman, 2007). It allows the outcomes of the interactions among multiple underlying organisational and strategic processes to be revealed, especially as they unfold over time. Finally, simulation allows the model to produce certain outcomes and to illuminate the conditions under which such outcomes are produced.

Once the methodological research of this thesis has been described and some reference examples have been provided, the following section aims to describe the methodological steps that have been followed to translate theoretical insights from Volberda's framework into causal diagrams that represent Organisational Flexibility as well as the corresponding formulation of the system dynamics model that has been created.

3.3. Causal Loop Diagrams to Represent Organisational Change Behaviour: A Dynamic Model of Volberda's Theory

Organisational flexibility, their components and their interrelations are analysed in this thesis and the time-scale is incorporated in the analysis that means to consider flexibility as a continuous path along the enterprise lifecycle. Therefore, System Dynamics as a modelling technique and simulation method is applied for extending Volberda's theory of organisational flexibility. According to that theory, organisations struggle to achieve the suitable balance between change and preservation through the implementation of change strategies (routinization or revitalization) in terms of dynamic capabilities, responsiveness and absorptive capacity of the organisation to overcome changes in the environment and set a new course for the organization to follow. We selected this theory based on three main reasons: first, Volberda's theory allows several dimensions and their interrelations to be explored from a comprehensive

perspective; second, Volberda highlights that Flexibility requires an inherent paradox – accommodating change and stability simultaneously, which fits with the balance exploration vs exploitation; and third, the multidimensionality of his framework opens the opportunity to explore the theory under a systemic perspective as well as, to explore it including the dynamic nature of the flexibility level, evolving over time. This theory of organizational change proposes organisations to undergo opposite change strategies to overcome a misfit with the environment requirements and set a new course for the organization to follow appropriate for the environment's requirements. This section aims, firstly, at developing a systematic exploration of Volberda's theory (Volberda, 1998). The objective is to explore the significance of all the concepts in Volberda's framework by identifying the key variables, their relationships and the subsequent dynamic behaviour following Sastry's (1995) reference work. An exhaustive textual analysis of his theoretical assertions (following the Volberda´s theoretical framework foundation) is conducted.

Having established a common understanding of the components and their dynamic relationships, a first causal model based on a systemic view is developed in a second step in order to illustrate the dimensions of organisational flexibility. Sterman asserts that "Causal loop diagrams are excellent for quickly capturing [one's] hypotheses about the causes of dynamics; eliciting and capturing the mental models of individuals or responsible for a problem" (Sterman, 2002). The causal loop diagrams that are shown in this chapter seek to capture the dynamics of organisational behaviour that are designed to express the central feedback structure. By applying System Dynamics modelling, the dynamic behaviour of the system when transformation strategies are implemented towards the required level of organisational flexibility will be analysed.

As mentioned in the preceding section, System Dynamics suggests that any kind of capability can be modelled as a stock, or a set of related stocks, that accumulates or depletes over time as a result of inflows and outflows of the stock (Sterman, 2000). As such, the model developed in this section serves to bridge and integrate the stock versus flow conceptualization of the processes that generate organisational flexibility. In a third step, the formalization of this model is described and the subsequent validation tests are presented.

3.3.1. Brief Introduction to the Volberda's Theory: General Description

Volberda (1998) studies Organisational Flexibility as a two dimensional concept: the managerial task of controlling the organisation and the managerial task of organisational design (both also known as *Extensiveness of flexibility mix* and *Responsiveness* respectively*)* (Volberda, 1998: 97).

Figure 7 displays the core constructs and their relationships in Volberda's Organisational Flexibility theory: *"This two-dimensional conception of flexibility creates a paradox. The challenge for management is to develop dynamic capabilities* [which can accommodate variety and speed] *that enhance flexibility and to have an adequate design* [technology, structure and culture] *to utilise those capabilities."* (Volberda and Rutges, 1999: 101). Flexibility then requires an inherent paradox – accommodating change and stability simultaneously[4]. The way in which both tasks fit in with the level of turbulence in the environment[5] determines how the paradox is resolved, resulting in different organisational forms, which Volberda defines as *flexible forms* along the enterprise lifecycle. When the firm is deploying the managerial task efficiently, the firm has a *"sufficient flexibility mix"* and when the organisational design task is well developed, it has an *"adequate organisational design"* (Volberda, 1998: 81). In addition to this argument, he also identifies another type of managerial flexibility, called *'metaflexibility'*. 'Metaflexibility' represents the organisation's support monitoring or learning system (Volberda, 1998: 121). It involves the processing of information to facilitate or promote the continual adjustment of the composition of the management's flexibility mix and organisational conditions in line with changes in the environment. The level of a company's 'Metaflexibility' determines the ability to access new knowledge from outside the boundaries of the firm – absorptive capacity – to scan the environment and evaluate the implications for the organisation. These activities can be grouped together as Environmental Scanning (Ansoff, 1980).

[4] Volberda (1998: 103) says."a flexible organization must possess some capabilities which enhance its flexibility to avoid becoming rigid, but it must also be anchored in some way in order to avoid chaos."
[5] Volberda (1998: 211) also suggests "…the sufficiency of the flexibility mix (managerial task) and the design adequacy of organizational conditions (design task) must be continuously matched with the degree of the environment turbulence to achieve effective flexibility."

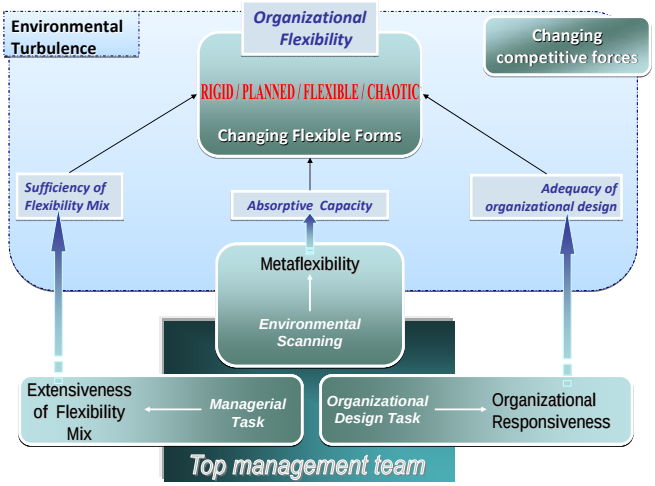

Figure 7: Components of organisational flexibility (adapted from Volberda, 1998)

Volberda differentiates between three categories of flexible capabilities depending on their influence in changing operational functions (operational flexibility), structural conditions (structural flexibility), or the firm's strategy (strategic flexibility). Thus, the Extensiveness of flexibility mix can offer different values (limited or broad) depending on the range of capabilities in the organisation and the speed at which the firm can apply them in each combination, as indicated in Table 10.

Table 10: Several dimensions of Extensiveness of flexibility mix (adapted from Volberda, 1998)

Extensiveness of Flex. Mix	Definition
Limited	The firm has developed a large ability to change the volume and mix of business activities but it has low levels in the other two categories. The firm dominates the *operational flexibility* (this preponderance of Operational Flexibility is also known as *'routine manoeuvring capacity'* (Volberda, 1998:117)). This limited level of Extensiveness of flexibility mix implies the firm can easily change production volumes. However, its structural and strategic flexibility remain low.
Medium	The firm has a good level of operational flexibility and the ability to change the organisation structure, decision-making and communication processes. The firm dominates the *structural flexibility* (the preponderance of structural flexibility is also known as *'adaptive manoeuvring capacity'* (Volberda, 1998:117)). This level of Extensiveness of flexibility mix relates, for instance, to the application of the horizontal extension of responsibilities (job enlargement, job rotation, increased inter-changeability of positions).
Broad	The firm manages operational and structural flexibility and it has the ability to change its corporate strategy and the nature of its business activities. The firm dominates the *strategic flexibility* (the preponderance of strategic flexibility is also known as *'strategic manoeuvring capacity'* (Volberda, 1998:117)). This broad level of Extensiveness of flexibility mix implies higher skills to change the current strategy when market conditions or competition so require it, renewal of product portfolio, creation of new product-market combinations, or engaging in political activities to counteract trade regulations.

The organisational responsiveness, or organisational manoeuvrability, depends on the creation of the right conditions to foster organisational flexibility. For example, it relates to identifying the type of technological, structural or cultural changes that are required to ensure the effective use of managerial capabilities (Zelenovic, 1982). This concept can obtain different values (from low to high) depending on the limits of the organisational conditions and represents the firm's architecture (Table 11).

Table 11: Several dimensions of responsiveness (adapted from Volberda, 1998)

Responsiveness	Definition
Low	The firm has a very restricted response capacity to confront changes in the environmental turbulence. It does not allow potential for flexibility and results in a fragile and vulnerable organisation. The organisation has mature technology, a mechanistic structure and conservative culture. (Volberda, 1998: 119)
Medium	As long as the organisation does not encounter any unexpected changes, its controllability is high. However, when confronting unforeseen changes, the firm manages incremental changes that do not necessarily keep pace with environmental changes. Rigidity, in this case, is a result of the mechanistic structure and conservative culture. (Volberda, 1998: 119)
High	The response capacity of the firm allows change to be implemented easily through adaptations within the current non-routine technology, organic structure and innovative culture (Volberda, 1998: 120).

When the 'Metaflexibility' allows environmental changes to be assessed in order to adapt the configuration of the flexibility mix and responsiveness, four ideal types of organisations are defined: *rigid*, *planned*, *flexible*, and *chaotic* configurations (Volberda, 1998). These types of flexible forms enable firms to initiate or respond successfully to different levels of environmental turbulence in order to sustain their competitive advantage[6] (Table 12).

Table 12: Volberda's Typology of Flexible Forms (adapted from Volberda, 1998)

Flexible Form	Environmental Turbulence	Extensiveness of Flex. Mix	Responsiveness	Metaflexibility
RIGID form	Non-Competitive: Static, simple and predictable	Limited: Steady-state flexibility	Low potential: Routine Technology, Mechanistic Structure and Conservative Culture	Elementary absorptive-capacity

[6] "In this typology, each ideal type is a result of a deliberate or emergent configuration strategy of management regarding the composition of the flexibility mix and the design of the organizational conditions" (Volberda, 1998: 211).

PLANNED form	Moderately turbulent: Dynamic and/or complex, but not unpredictable.	Dominated by operational flexibility	A more non-routine technology, a relatively mechanistic structure, and a conservative culture	Very extensive absorptive-capacity
FLEXIBLE form	Unpredictable environment: Dynamic and/or complex but, most of all, unpredictable.	Dominated by structural and strategic flexibility	High potential: Non-routine technology, organic structure, and innovative culture	Unlearning and receptiveness to new environments
CHAOTIC form	Very dynamic and/or complex, and fundamentally unpredictable.	Dominated by strategic flexibility	Extreme potential: No distinct technology, no stable administrative structures, or basic 'shared values' in organisational culture	Uncontrolled capacity

Each type represents a particular way of addressing the flexibility paradox of change versus preservation, and some types are more effective than others (Volberda, 1998: 211). By combining the two central dimensions of organisational flexibility, the composition of the flexibility mix (preponderance of operational, structural, or strategic flexibility) and the manoeuvrability or design adequacy of the organisational conditions (low or high controllability of organisational conditions), the four ideal types are compared to the environmental conditions and two types of trajectories of change are proposed in order to be aligned with the flexibility required by the environment (see Figure 8). Those change strategies are further explained in the next section as part of the processes that originate the dynamic behaviour of the system.

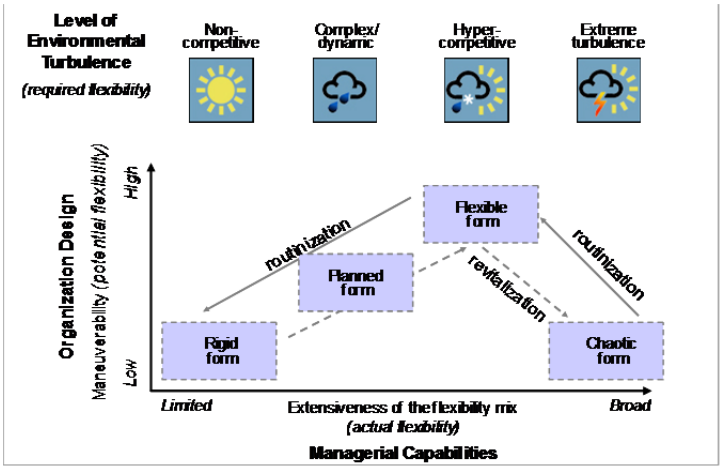

Figure 8: Volberda´s typology of Strategic Configurations (Van Der Weerdt & Volberda, 2006)

Exploring the interactions of key variables within the dynamic adaptation processes towards the desired adjustment is one of the areas that Organisational Flexibility has not identified in detail. The lack of identification of dynamic adaptation processes can affect the implementation of Organisational Flexibility strategies and organisational changes. The following section presents a dynamic model representing the interactions between the previously explained theoretical arguments.

3.3.2. Representing the Causal Structure of Volberda's Theory: Model Description

Table 13 presents the relevant variables of our proposed dynamic model of organisational flexibility. The table contains two data entries for each variable defined in the Organisational Flexibility theory: qualitative descriptions of the pattern of behaviour for each variable and their structure and relationships with the other variables.

Table 13: Textual categorisation of Organisational Flexibility statements (based on Volberda, 1998)

Variable	Definition	Structure/Relationship
Organisational Flexibility	It measures how well the organisation matches the current flexible form with the flexibility levels required by its environment	It changes to adapt the organisational form to the environment. When the OF is unbalanced (surplus or deficit flexibility), the pressure to change the managerial and organisational design task increases.

Environmental turbulence	Level of turbulence in the environment which affects the sufficiency of the OF level	It represents the level of environment changes (changes in competitive forces). This variable is categorized as exogenous to the model.
Metaflexibility	It represents the range of activities in the information gathering process or absorptive capacity.	The change path may come from varying firstly how the firm performs its "absorptive capacity" activities. When OF is not optimal, pressure to change boosts 'Metaflexibility' to understand the magnitude of environment variability.
Flexible form	It represents the organisational type based on Volberda's typology.	'Flexible form' is determined by the combination of two variables: 'Extensiveness of Flexibility mix' and 'Responsiveness' and it changes when this combination varies over time. Variations in this variable can reduce the shortfall with respect to environment turbulence and the OF will be closer to the optimal value.
Extensiveness of Flexibility Mix	It represents how the firm performs its managerial task related to flexible capabilities.	When a surplus or deficit in the flexible capabilities appears, it boosts a pressure to change the volume and variety of dynamic capabilities or the flexibility mix.
Responsiveness	It represents the adequacy of organisational design conditions to effectively exploit the flexibility mix	Whenever a surplus or deficit in the responsiveness appears, it boosts a pressure to change technological, structural and cultural conditions in the organisation.

The interactions between the variables described above, will determine the dynamic behaviour: how the firm combines Extensiveness of Flexibility Mix and Responsiveness in line with the Environmental Turbulence. It will determine the position of the firm along different flexible modes of the Volberda typology in its enterprise lifecycle. Figure 9 presents the feedback interactions and overall dynamics of the key variables that intervene in the dynamic process for adjusting the Organisational Flexibility level according to Volberda's theoretical statements (1998).

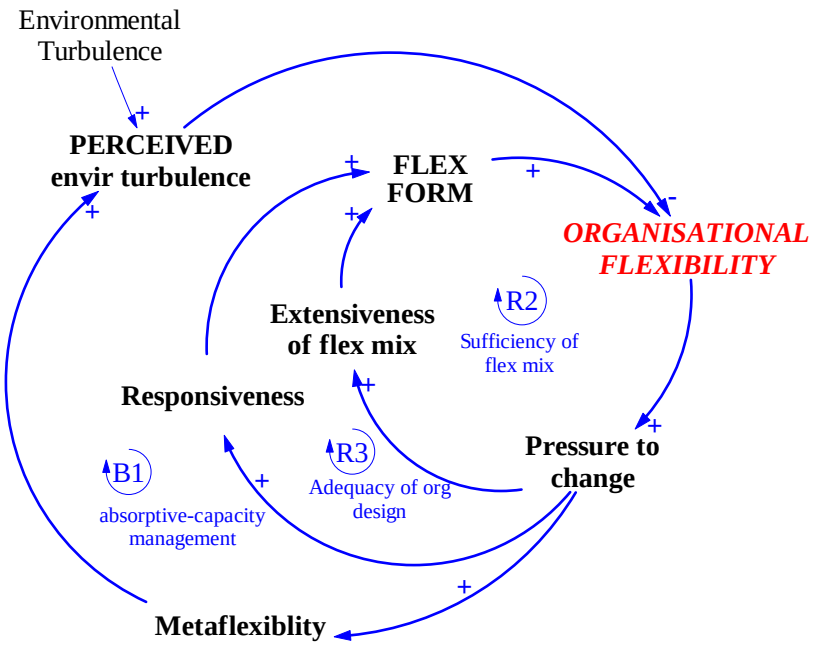

Figure 9: Causal Model of Organisational Flexibility according to Volberda's Theory

The dynamics of a system arise from the interaction between positive (or reinforcing) feedback loops[7] and negative (or balancing) feedback loops. The suitable combination of Extensiveness of flexibility mix and the adequate organisational conditions (responsiveness) considering the environmental characteristics determines the 'Flexible Form', which is continuously compared to the environmental requirements. When a gap appears between those two variables, the company is not achieving an optimal level in its organisational flexibility level therefore a change strategy is required.

In order to resolve paradox flexibility, Volberda proposes two types of change strategies that adjust the Flexible Form, allowing the firm to achieve its optimal Organisational Flexibility level. When stability is needed, a ***routinization strategy*** is the most appropriate strategy in moderately competitive environments where the firm faces decreasing levels of environmental turbulence (the exogenous variable in the model) and stability needs to be introduced (Volberda, 1998: 265). The company suffers a surplus of its 'extensiveness of flexibility mix' and the firm's 'responsiveness' level is superior to what is needed with respect to the environment. Decreasing environmental turbulence relates to periods in which the firm's leadership in its market is strong and the market is mature. A routinization strategy, when a flexibility surplus

[7] See Chapter 3, section 3.2.2.

appears (the Organisational Flexibility level is above the optimal one), implies a joint action of several decision policies according to Volberda's theory:

- Adjust the absorptive-capacity level by reducing levels in 'Metaflexibility' (Absorptive capacity management loop (B1). A more formalised set of information gathering and processing programmes is needed. By coding its limited and basic scanning procedures, the resulting increased 'Metaflexibility' facilitates the development of dynamic capabilities, which boosts the flexibility mix and makes the firm more responsive to new market forces.

- Reduce the 'Extensiveness of flexibility mix' (Flexibility Gap loop (R2)): to concentrate the company's efforts on adapting new competitive advantages in order to prepare for the entry of competition. It generally implies refining existing core competencies and establishing more control over new flexible capabilities that allows the strategy to be focused in one direction.

- Close the Flexibility Gap (R3) by adapting the organisational conditions, 'Responsiveness' to the new combination of the flexibility mix. It generally implies the tendency to greater standardisation and professionalization of processes and the institutionalisation of information processing and decision-making (more mechanistic structure). Furthermore, the varieties of cultures that exist in the organisation focus on avoiding deviations from the firm's vision.

On the other hand, if the organisation requires change, a ***revitalization strategy*** allows the transition to be controlled towards increasingly competitive markets (Volberda, 1998:219). Generally speaking, this type of transition is initiated when the firm wants to address new market tendencies, new business models, new competitive advantages and it will be more effective under hyper-competition. A revitalization strategy, when a flexibility deficit appears (the Organisational Flexibility level is below the optimal one), implies the joint action of several decision policies according to Volberda's theory:

- Adjust the absorptive-capacity level by increasing 'Metaflexibility' levels (Absorptive capacity management loop (B1)). This strategy implies increasing the absorptive-capacity level (meta-flexibility). Confronting a flexibility deficit, the firm's information processing capacity is activated when market needs or new opportunities clearly appear.

When 'Environmental Turbulence' increases, this capacity must be directed towards enhancing the receptiveness to new environments, for instance by using strategic planning processes.

- Increase the 'Extensiveness of flexibility mix' (Flexibility Gap loop (R2)). This strategy is related to creating new capacities or activating those that may be unexploited. It implies unlearning 'old' routines, developing new core competencies, extending the firm's ability to change decision-making and communication processes and changing corporate strategy and/or the nature of business activities.

- Close the flexibility gap (R3) by adjusting the firm's responsiveness in order to provide the new managerial capabilities with the required architecture. This strategy means less process regulation (e.g. less formalisation and specialisation), to lose the basic organisation form (more organic structure) and, a more open external orientation and a more innovative culture.

Having explained in detail Volberda's theoretical statements by taking the perspective of a System Dynamics causal diagram, a detailed description of the three feedback loops integrating the whole model is included in the next section.

A. Absorptive Capacity Management

According to Volberda (1998: 198) the adaptation process, starts identifying whether the firm must adapt to change or has to influence the change. This identification process is facilitated by its absorptive capacity and reflective learning ability (so called *"deuteron-learning abilities by which management accumulates and dissipates flexible capabilities"* – (Volberda, 1998: 201)). The process starts with the **'absorptive-capacity management' (B1),** which implies modifying the absorptive capacity the firm develops[8], represented in the first loop of Figure 10.

[8] In order to facilitate the understanding of the theory, this representation of the causal model reduces the causal diagram in Figure 9 in two feedback loops instead of three. But it shows the same structure.

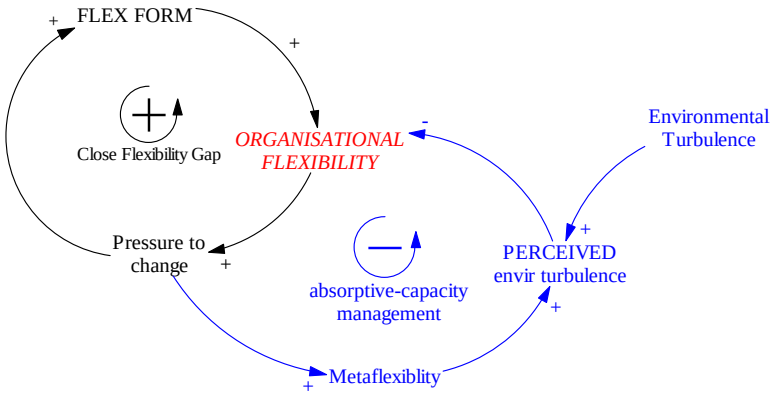

Figure 10: Simplified Causal Model of Organisational Flexibility

Managers need to assure that the perceived turbulence is as far as it concerns (represented by the loop B1) before deciding to implement a change strategy (represented by the loop 'Close flexibility gap'). The structure forms two important feedback loops, which represent Volberda's statement: *"At a higher level of the organization there must therefore be a reflective capacity to effectuate an appropriate composition of the flexibility mix and design of the organization"* (1998: 198). When the necessity of change arises due to an unsuitable organisational flexibility level, managers should start by correctly interpreting whether such necessity exists and which change strategy should be implemented. That means, if the organisation is deploying more or less flexibility than the environment is requiring, the adjustment process starts from the 'absorptive-capacity management' loop, a balancing loop through which managers endeavour to increase their knowledge about the source of the necessity to change by influencing the information gathering activities.

'Metaflexibility' represents the range of activities in the information gathering process relevant to the firm in order to better understand the environmental turbulence the firm is facing. The variable 'Metaflexibility' mediates between the environmental turbulence perception and the pressure originated by a positive or negative gap in Organisational Flexibility level. In this context, changes in metaflexibility will allow the managers to adjust the perceived environmental turbulence and to appreciate the real divergence in organisational flexibility. According to Volberda (1998: 198): *"This so-called metaflexibility can be viewed as management's supporting monitoring system or learning system, which engages in deuteron-learning".* Sometimes, the enough change path might come from varying firstly how the firm performs "deuteron-learning" activities which implies scanning the environment and trying to influence on it (1998: 239). When a need to improve organisational flexibility appears, 'Pressure to

change' will rise and boost 'metaflexibility' allowing the firm to control the magnitude of environment variability. A higher level of metaflexility in this context and, taking into account Volberda's theoretical framework, is related to developing an absorptive capacity aimed at exploration, with low efficiency, a broad scope, and much flexibility when the knowledge environment is turbulent. While in a stable environment, firms tend to develop absorptive capacity aimed at exploitation, with high efficiency, a narrow scope and little flexibility (Dijksterhuis, Van den Bosch & Volberda, 1999).

The changes on the 'Metaflexibility' level will allow for a better understanding of the dimension of environmental changes and consequently the perceived turbulence environment will change. The form in which managers interpret the dynamism, complexity and uncertainty of its environment (named as Environmental Turbulence'), will influence the management decision regarding a transformation process. 'Environmental Turbulence' is treated as an exogenous variable to the model since managers have no control over those characteristics of the environment. We decided to incorporate 'Perceived ET' to the model, which represents managers' understanding of the characteristics of the environment that the firm regularly faces. Volberda's following statement supports such a decision: *"Many organizations perceive their environment as highly turbulent, while in fact they are confronted with a great number of small changes which are largely predictable."* (Volberda, 1998:186-187). Thus, 'Environmental turbulence', positively influences the level of 'Perceived Environmental turbulence' since managers usually interpret the dimension of the changes more than the reality of the environmental turbulence. This circumstance occurs, for example, when the firm perceives a more dynamic, complex and unpredictable environment than the real situation, there is no need to change the flexible form; it might be enough to adjust the perceived environmental turbulence managers are confronting.

If 'Perceived Environmental turbulence' rises (and the current Flexible Form does not vary), the 'Organisational flexibility' will decrease due to a positive gap between the current 'Flexible form' and what the environment requires. Conversely, if the perception of ET decreases without variation over the Flexible Form, the level of organisational flexibility increases and it represents a negative gap. Subsequently, managers will activate the corresponding strategy to move the 'Flexible Form' (the reinforcing loop 'Close Flexibility Gap'). Such a step of the process is explained in the following section.

B. Sufficiency of Flexibility Mix: Managerial Task

The positive loop 'Close Flexibility Gap' (see Figure 10) that represents the adjustment to move the firm towards the desired Flexible Form is going to be divided in the two corresponding organisational tasks of Volberda's framework: managerial task and organisational design task. In this subsection, the dynamic behaviour that the managerial task produces is described in detail and represented by the reinforcing loop 'Sufficiency of Flexibility Mix' (R2) (Figure 11).

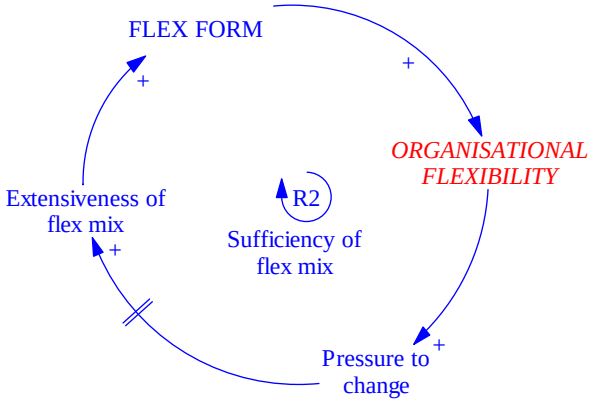

Figure 11: 'Sufficiency of Flexibility Mix' Reinforcing Feedback Loop

First, the managerial task shapes the **'Sufficiency of Flexibility Mix' loop** (R**2**), a reinforcing loop that balances the organisational flexibility level through the adjustment of 'Extensiveness of Flexibility Mix' when the firm confronts a surplus or deficit of flexibility due to remaining environmental turbulence.

In order to '*neutralize this part of the remaining environmental turbulence*' (Volberda, 1998: 240), which implies that the firm may become less vulnerable to changes, the firm can actively influence the competitive forces by creating the adequate combination of flexible capabilities (preponderance of operational, structural or strategic flexibility). Variations in firm's extensiveness of flexible mix will lead the firm to be closer to the desired flexible form demanded by the environment and consequently, achieve the optimal organisational flexibility level.

'Extensiveness Flexibility Mix' represents how the firm performs its managerial task of its flexible capabilities. When the Flexible Form does not fit into the environmental needs, the organisational flexibility level is not optimal due to a surplus or deficit in the flexible capabilities. The necessity of a change strategy appears *"In deciding which capabilities the organization*

should develop or unlearn, the management has to compare the flexibility mix of the new flexible form with that of the actual form. …management has to vary its flexibility mix for the remaining environmental turbulence …" (Volberda, 1998: 239). The change strategy will influence the extensiveness of flexibility mix and this movement (referred to change the volume and variety of dynamic capabilities) comes from 'Pressure to change' and positively affects 'Flexible form'. In that way, the organisational flexibility level will achieve the optimal value and the pressure to change will experiment a decrease. This positive or reinforcing loop represents the search for the equilibrium between what the environment is requiring and what the firm is deploying in terms of managerial tasks or flexible capabilities.

However, this process does not start immediately, it can suffer a delay. According to Volberda, there is a time lag between the moment of perceiving the gap between flexible capabilities (*actual flexibility*) and competitive forces (*required flexibility*) and, the moment of reacting. It is called 'Implementation Time' - *"the reaction or implementation time of these capabilities is a factor which management has to take into account. … the time which elapses between confronting the discontinuity and responding to discontinuity…. The organisational barriers in technology, structure and culture can influence this implementation time (Volberda, 1998: 201)".*

Since changes in flexibility mix may not be sufficient, the next stage to be considered is the redesign or adequacy of organisational design.

C. Adequacy of Organisational Design: Organisational Design Task

In parallel to the previous stage, the firm must also check if the organisational design characteristics match the new extensiveness of flexibility mix and consequently, they fit for what the environment is demanding. The third balancing loop '**Adequacy of Organisational Design'** (**R3**) represents the second movement of change towards the desired flexible form (FIGURE 12).

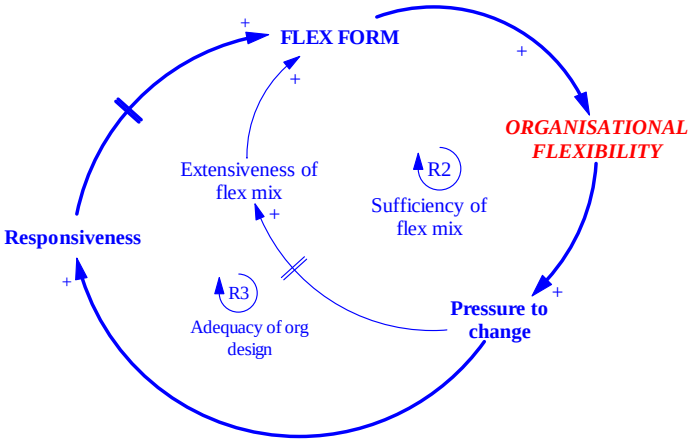

Figure 12: 'Adequacy of Organisational Design' Reinforced Feedback Loop

It represents the organisational redesign process and implies the selection of adequate design conditions for the actual composition of flexibility mix as Volberda mentions: *"*[...] *to activate a sufficient flexibility mix, the design of the organisational conditions must provide adequate potential for flexibility"* (Volberda, 1998: 204). According to Volberda, organisational redesign is related to developing new technologies, transforming structures and intervening in organisational cultures. When these changes are implemented, the organisational flexibility will be adjusted due to the movement of the flexible form. The adequate organisational design conditions are termed as 'Responsiveness'. Responsiveness concerns the manoeuvrability of the organization, which depends on the creation of the right conditions to foster flexibility; that is, appropriately effectively exploit the flexibility mix as Volberda explains *"Designing the appropriate organisational conditions requires identifying the type of technological, structural or cultural changes necessary to ensure effective utilization of managerial capabilities."* (1998: 240).

Whenever a surplus or deficit appears in the responsiveness level, the organisational flexibility level is not optimal. A change strategy is needed to adequate the responsiveness level which positively or negatively changes (referred to change technological, structural and cultural conditions) comes from 'Pressure to change'. Responsiveness positively affects the 'Flexible Form', therefore, its changes evolve towards achieving the optimal level organisational flexibility by altering any surplus or deficit of flexibility. The positive loop (R3) thus ensures that an increase or a reduction in organisational flexibility, which causes positive or negative changes in

Pressure to Change, is addressed by a change in responsiveness and therefore, the level of Flexible Form will approach the flexibility level that the environment is requiring.

This process can be implemented effectively in a time lag. To redesign organisational conditions such as, tightening structural conditions (standardization and professionalization of processes and institutionalization of information processing and decision making) or loosening cultural conditions (a more open, external orientation and increased tolerance for ambiguity), may suffer a delay.

The combination of the balancing loop, B1-absorptive capacity management and the two reinforcing loops R2-managerial task and R3-organisational design task, provides equilibrium to the model. The perceived environmental turbulence and absorptive capacity limit the reinforcing loops going up and down forever.

The diagram is useful to tell the story of how these interrelationships evolve but a formal model is essential to explore the dynamic implications of such a trade-off like this (Sastry, 1997:246). Most of the time, the conceptual model is so complex that its dynamic implications are unclear (Sterman, 2000). Therefore, the next step is to develop the formal model that enables us to investigate the longitudinal interaction between the processes that illustrate the dimensions of organisational flexibility and their evolution over time. Formalization implies moving from the conceptual realm of diagrams to a fully specified formal model, complete with equations, parameters, and initial conditions (Sterman, 2000: 103).

3.4. Formalization of the System Dynamics Model

Sterman (2000) explains that formalizing a conceptual model often generates important insight before it is ready to be simulated. This author outlines that formalization helps recognize vague concepts and resolve contradictions that went unnoticed or undiscussed during the conceptual phase (2000: 103). Harrison, et al. (2007) define a formal model as *"a precise formulation of the relationships among variables, including the formulation of the processes through which the values of variables change over time, based on theoretical reasoning"* (2007: 1232). System dynamics practice includes a large variety of tests one can apply during the formulation stage to identify flaws in proposed formulations and improve one's understanding of the system.

In this section, a step-by-step discussion about the dynamic representation of the organisational model is presented. Sastry (1997) suggests that a number of criteria should provide guidelines

for specifying the model since it must be noted that the model's formulations and output are to be evaluated. In the model we are formalizing, the translation of the theory into the formal model is based on the following criteria:

- Where the theory provides endogenous explanations, the model should too, as Sastry points out (1997). Our simulation model should depict Volberda's theory of the organisational flexibility descriptive model and provide endogenous explanations whenever the theory did so. Further theoretical insights of organisational flexibility should be analysed and explored in order to identify possible endogenous and exogenous determinants of the organisational behaviour when looking for balancing between change and preservation.
- The simulation model should attempt to accurately represent real-world situations[9], therefore, variables should have real meanings that could be measured. Units of measurement, even for such soft variables, must be included in the model. Sastry explains that it helps to enforce dimensional consistency, or equivalence of units on each side of the equation (Sastry, 1997).

The mathematical equations have been elaborated through a computer-based simulation programme, VENSIM DSS32 v5.3. The formalization process is explained in this section following four dimensions of the model: flexible form, absorptive capacity, extensiveness of flexibility mix and responsiveness. Each dimension includes several equations that govern the behaviour of a state variable.

The following figure (Figure 13) shows a stock and flow diagram that indicates flow variables as pipes with valves (Sterman, 2000).

[9] "Modeling takes place in the context of real world problem solving, with all its messiness, ambiguity, time pressure, politics, and interpersonal conflict." (Sterman, 2000: 83)

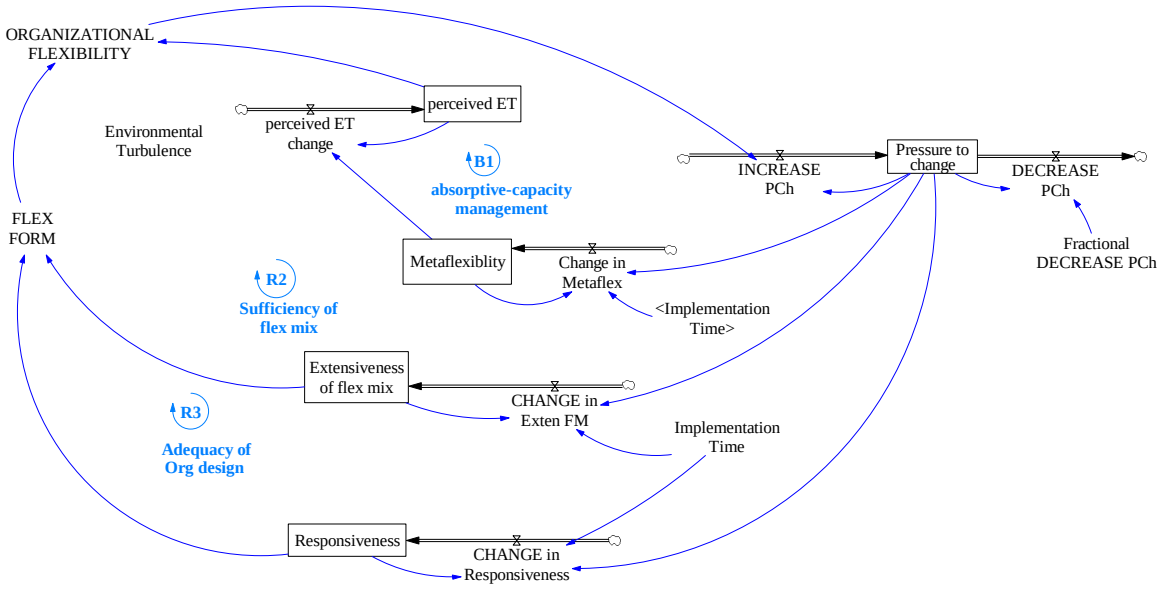

Figure 13: Organisational Flexibility Formal Model

In the following paragraphs the stock and flow diagram is going to be decomposed into the different variables (levels, flow, parameters, and auxiliaries) that intervene and the mathematical equations that conform their interrelations.

3.4.1. The Flexible Form

In the model, ***Organisational Flexibility*** (Equation 1) represents how well the organisation matches the current *'Flexible Form'* with the flexibility levels that the environment is requiring. When both concepts coincide, the company is achieving the optimal level in Organisational Flexibility that is referenced by cero. When Organisational Flexibility takes positive values, that is, it is included in the interval [0, 1], means that a flexibility surplus exists. On the contrary, if Organisational Flexibility takes negative values that is, it ranges in the interval [0, -1], it means that there exists a deficit in flexibility[10]. Every time the Organisational Flexibility level enters an unbalanced state, it activates the pressure to change managerial and organisational design tasks. This equation represents the balanced feedback loop named as the "Close Flexibility Gap" in Figure 10.

$$ORGANIZATIONAL\ FLEXIBILITY(t) = FLEX\ FORM(t) - perceived\ ET(t) \quad [1]$$

Unit: Dmnl

[10] For additional information, please see chapter 3.4.2 (Table 13)

The ***Flexible Form*** is formed as the combination of the managerial task and organisational design task, i.e. the level of *Extensiveness of Flexibility Mix* and *Responsiveness* in the same proportion, and it changes as long as this combination varies over time (the reinforced feedback loops R2 and R3 in Figure 12). It represents the organisational type based on Volberda's typology[11]. Variations in this variable allow reducing the shortfall with respect to *Environment Turbulence* and consequently, the system will reach an *Organisational Flexibility* level closer to the optimal value.

$$FLEX\ FORM(t) = (Extensiveness\ of\ flex\ mix(t) + Responsiveness(t))/2 \quad [2]$$

Unit: Dmnl

When managers face changing levels of *Environmental Turbulence*, they may not be able to identify the changes or correctly interpret the threats arising from those changes. Many organisations perceive their environment as highly turbulent, while in fact they are confronted with a great number of small changes, which are mainly predictable (Volberda, 1998: 186-187). The ***Perceived ET*** (Equation 3), a stock variable, represents the form in which managers interpret the turbulence of the environment or understand the current characteristics of the environment to which the firm is facing (the balanced feedback loop of absorptive-capacity management in Figure 10). It has one inflow determining its change rate (accumulation and depletion over time) named as *Perceived ET Change* that refers to the corresponding changes in managers' perception of the environment turbulence.

$$Perceived\ ET(t) = Perceived\ ET(0) + \int_0^t perceived\ ET\ change\ (s)ds \quad [3]$$

Perceived ET(0)= 3; Unit: Dmnl

The change rate of this stock, *Perceived ET*, represents an inflow variable that is named as 'perceived ET change' and it derives from the comparison between real *Environmental Turbulence* and the analysis that results from environmental scanning activities (*Metaflexibility*). Its variation does not only depend on the changes suffered by the *Environmental Turbulence* but also depends on the influence of *Metaflexibility*. It implies that the level of perceived ET change will vary to the extent that the firm uses its absorptive capacity.

[11] See Table 12

$$Perceived\ ET\ change(t) = (Environmental\ Turbulence(t) - perceived\ ET(t))/Metaflexibility\ (t) \quad [4]$$

Unit: Dmnl

Pressure to change is the stock that represents the accumulated level of pressure to change on the *Flexible Form* when Organisational Flexibility is not at the optimal level. The larger the gap between the *Flexible Form* and the *Perceived ET*, the greater the level of this stock will be. It is the result of an increasing rate minus the outflow of a deceasing rate. There exist several references to pressure to change in literature that could be originated by performance pressures (Sastry, 1997: 243). Barr and Huff's study (1997) focuses on the timing of strategic responses. They study six pharmaceutical firms and show that strategic changes are not predominately achieved in a timely way, as the pressure to change builds only gradually while firms struggle to align the different beliefs and mental models about cause and effect of alternative strategic adaptations (Barr and Huff 1997).

$$Pressure\ to\ Change\ (t) = Pressure\ to\ Change\ (0) + \int_0^t INCREASE\ PCh\ (s)ds - DECREASE\ PCh(s) \quad [5]$$

Pressure to Change (0) = 0 ; Unit: Dmnl

Equation 5 decomposes *Pressure to Change* into two elements: increasing and decreasing rates. The decreasing rate (*DECREASE PCh*) represents the rate at which the system succeeds in approaching the *Flexible Form* towards the required level of flexibility during the period of changes. It will depend on the variation rate over the pressures imposed by managers to change. The fractional change takes the basis of the current surplus or deficit in Organisational Flexibility. In that model, it is assumed that the fractional rate of the decrease in pressure will be proportional to the current magnitude in Organisational Flexibility. Such a fractional rate takes value 1 when no change is needed, that is, Organisational Flexibility takes the optimal value (zero) and therefore, there is no pressure to reduce it. On the contrary, as the value of organisational flexibility approaches, in absolute terms, the value two (it means, the flexible form is very far from the required flexibility) the managers' efforts on reducing the pressure are increasingly lower achieving a threshold of 70% (0.701).

*DECREASE PCh = Fractional DECREASE PCh*Pressure to change*

Fractional DECREASE PCh = GRAPH (ABS(OF))

GRAPH:[(0,0)-(2,1)], (0,1), (0.25,0.87), (0.5,0.8), (0.75,0.76), (1,0.73), (1.25,0.72), (1.5,0.71), (1.75,0.705), (2,0.701)

The increasing rate (*INCREASE PCh*) represents the rate at which the variables of *Flexible Form* need to be modified in a following period.

INCREASE PCh = IF THEN ELSE (ORGANIZATIONAL FLEXIBILITY<0, (–1(ORGANIZATIONAL FLEXIBILITY)), MAX ((Pressure to change– ORGANIZATIONAL FLEXIBILITY), (–1*ORGANIZATIONAL FLEXIBILITY)))*

This inflow variable, may take positive or negative values. We assume that a negative value of this variable represents that there exists a surplus in flexibility and the appropriate correction will come from a Routinization Strategy (Volberda, 1998: 215). Such a strategy implies reducing the *Extensiveness of Flexibility Mix* – for example, because it is needed to concentrate the company's efforts on adapting new competitive advantages in order to prepare for the entry of competition- and *Responsiveness* – for example, because a greater standardisation and professionalization of processes is needed (more mechanistic structure). On the contrary, positive values of this variable (INCREASE PCh) imply that there exists a deficit in flexibility and consequently, a revitalization strategy is needed. Therefore, the system will address an extension of both stocks, *Extensiveness of Flexibility Mix* and *Responsiveness*.

3.4.2. Metaflexibility

When pressure builds up (Pressure to change takes positive or negative values), managers may have several choices to get the firm closer to the desired form depending on the evolution of the changes in the environmental turbulence. *'Environmental Turbulence'* is the exogenous variable of the model. It is analysed by evaluating its dynamism, complexity and uncertainty level (define the dynamic nature of the competitive forces). A key causal relationship exists between *'Environmental Turbulence'* and the perception of such turbulence.

According to Volberda, every process of increasing flexibility starts by influencing the *'Metaflexibility'* level (1998: 198) -whether a real divergence in the Organisational Flexibility level exists- before altering the other two main variables. This stock represents the range of activities in the information gathering process. When speaking about *'Metaflexibility'*, Volberda refers to "*meta-capabilities*", "*management's absorptive capacity*" or "*high-order learning ability*" (1998: 197). For this research, the adopted concept to represent such capability is what is named as environmental scanning (1998: 198). Variations in *Metaflexibility* will reduce the

shortfall with respect to *Environmental Turbulence* due to the *Perceived ET* is adjusted to a better interpretation of turbulence. It means that the divergence in *Organisational Flexibility* is more accurate thus, *Metaflexibility* allows managers to recognise and respond to the need for an organisational change with the appropriate change strategy: routinization or revitalization. The assumption as far as *Metaflexibility* is concerned for this research deals with how the firm carries out an extensive competitor analysis, monitors technological developments concerning our products/services and the production/service process or, systematically registers customers' needs and complaints.

$$Metaflexibility(t) = Metaflexibility(0) + \int_0^t CHANGE\ in\ Metaflexibility\ (s)ds \quad [6]$$

$Metaflexibility(0) = 3$; Unit: Dmnl

The Equation 6 shows that this stock variable has a unique inflow: '*CHANGE in Metaflexility*'. The rate of change in this case is affected by the *pressure to change* and *implementation time*. This inflow variable represents the changes to be implemented in *Metaflexibility* or absorptive capacity as a result of, on the one hand, a routinization strategy (confronting a flexibility surplus): the firm's information processing capacity is directed towards enhancing the receptiveness to new environments, for instance by using strategic planning processes. On the other hand, this inflow variable varies when the firm implements a revitalization strategy (confronting a flexibility deficit): by coding its limited and basic scanning procedures, the resulting increased *'Metaflexibility'* facilitates the development of dynamic capabilities which boosts the flexibility mix and makes the firm more responsive to new market forces. The changes will not be immediately implemented due to a common delay that any strategy's implementation needs time to be effective.

$$CHANGE\ in\ Metaflexibility\ (t) = (Metaflexibility\ (t) * Pressure\ to\ change(t))\ /\ Implementation\ Time(t) \quad [7]$$

Unit: Dmnl

3.4.3. Extensiveness of Flexibility Mix

Once managers have a more accurate perception of the changes in the environment, the Organisational Flexibility shortfall may still exist. The processes that bring the organisation back to the optimal level of Organisational Flexibility are represented by balancing loop B1 & B2: after

adapting *Extensiveness of Flexibility Mix* and *Responsiveness,* the organisation achieves a Flexible Form that is well-suited to its environment.

Extensiveness of Flexibility Mix represents how the firm performs its managerial task related to flexible capabilities. A negative value of Pressure to change (a surplus in the Organisational Flexibility exists due to a lower level of '*Environmental Turbulence'*) knocks the change rate of this variable. Whereas Pressure to Change is positive (a flexibility deficit exists), the change rate of this variable is positive due to the fact that an increase of dynamic capabilities is needed.

$$Extensiveness\ of\ Flex\ Mix(t) = Extensiveness\ of\ Flex\ Mix(0) + \int_0^t CHANGE\ in\ Extensiveness\ of\ Flex\ Mix(s)ds \quad [8]$$

$Extensiveness\ of\ Flex\ Mix(0) = 3$; Unit: Dmnl

In a Routinization strategy, to reduce the *Extensiveness of Flexibility Mix* represents to concentrate the company's efforts on adapting new competitive advantages in order to prepare for the entry of competition. It generally implies refining existing core competencies and establishing more control over new flexible capabilities that allows the strategy to be focused in one direction. On the other hand, in a revitalization strategy, it is related to creating new capacities or activating those which may be unexploited. It implies unlearning 'old' routines, developing new core competencies, extending the firm's ability to change decision-making and communication processes and changing the corporate strategy and/or the nature of business activities.

$$CHANGE\ in\ Extensiveness\ of\ Flex\ Mix(t) = (Extensiveness\ of\ Flex\ Mix(t) * Pressure\ to\ change(t)) \ /\ Implementation\ Time(t) \quad [9]$$

Unit: Dmnl

Therefore, any change strategy will affect the rate of *Change in Extensiveness of Flex Mix*. This inflow variable will take positive or negative values depending on Pressure to Change's values.

3.4.4. Responsiveness

Once the adequate mix of flexible capabilities (*Extensiveness of Flexibility Mix*) has been achieved and established, the Organisational Flexibility level still remains far from the optimal level so, the third stage of this change trajectory is related *Responsiveness* which represents the adequacy

of organisational design conditions to effectively exploit the flexibility mix ('Adequacy of Organisational Design' (B3).

In a routinization strategy, the *Pressure to Change* will take negative values and will reduce the *Responsiveness* level, which generally implies the tendency to greater standardisation and professionalization of processes and the institutionalisation of information processing and decision-making (a more mechanistic structure). Furthermore, due to the varieties of cultures that exist in the organisation, it is usually focused on avoiding deviations from the firm's vision. On the other hand, the Pressure to Change will take positive values in a revitalization strategy and will boost the *Responsiveness* level. It implies less process regulation (e.g. less formalisation and specialisation), losing the basic organisation form (more organic structure) and, a more open external orientation and a more innovative culture.

$$Responsiveness(t) = Responsiveness(0) + \int_0^t CHANGE\ in\ Responsiveness(s)ds \quad [10]$$

$Responsiveness(0) = 3$; Unit: Dmnl

$$CHANGE\ in\ Responsiveness(t) = (Responsiveness(t) * Pressure\ to\ change(t)) / Implementation\ Time(t) \quad [11]$$

Unit: Dmnl

However, as was explained in section 3.4.2.b, the output on both tasks (managerial and organisational design tasks) because of *Pressure to change* variations is not immediate; there is a time lag between the moment at which managers realise the need to implement a change strategy and the moment in which the strategy is effectively implemented. Volberda (1998) points out that there is a time lag between the time of perceiving the gap between current flexible form (*current flexibility*) and the flexible form that the competitive forces are demanding (*required flexibility*) and, the moment of reacting. It is called 'Implementation Time' - *"the reaction or implementation time of these capabilities is a factor which management has to take into account. … the time which elapses between confronting the discontinuity and responding to discontinuity…. The organisational barriers in technology, structure and culture can influence this implementation time (Volberda, 1998: 201)".*

As far as the three variables that represent the three dimensions of Volberda's framework are concerned: metaflexibility, extensiveness of flexibility mix and responsiveness; the estimated value for this parameter has been established in 12 months. This will vary within the simulation exercises.

Implementation Time: 12

Unit: months

As one of the causes for this delay, he identifies the organisational barriers in technology, structure and culture which can influence this implementation time. Such strategies explained above imply different levels of complexity which will affect the period in adjusting the flexibility mix and the organisational conditions. In the simulation chapter (Chapter 4) variations of this variable will be explored.

3.5. Validation and Model Testing

Following the System Dynamics guidelines of simulation modelling, the validation is the previous stage to simulation exercises. Sterman (2000: 850) explains that the System Dynamics modeller must recognize that a mental or formal-model will be used to make important decisions. The relevant choice should be related to which model to use instead of whether to use a model. The responsibility lies on using the best model available for the purpose at hand despite its inevitable limitations. "*Experienced modellers likewise recognize that the goal is to help their clients make better decisions, decisions informed by the best available model*." (2000: 850). In the System dynamics practice, modellers have developed a wide variety of specific tests to uncover flaws and improve models (e.g. Forrester and Senge, 1980; Barlas, 1996). While modelling, it is important to think of what you are trying to demonstrate with your model, and how you can show this through your model. As Barlas (1996) explains, one of the main objectives of System Dynamics as far as model validation is concerned, is to establish the validity of the structure of the model. There is no doubt that the accuracy of the model behaviour's reproduction of real behaviour is also evaluated, but this is meaningful only if the confidence in the structure of the model is sufficient.

Barlas (1996) mentions firstly, the *direct structure tests*, which assess the validity of the model structure by direct comparison with knowledge about real system structure. They do not imply any simulation exercise. They can be classified as empirical or theoretical depending on the object to be compared: comparing the model structure with information (quantitative or qualitative) obtained directly from the real system being modelled or comparing the model structure with generalized knowledge about the system that exists in the literature (Barlas, 1996: 189). Secondly, this author describes the *indirect structure tests* or *structure confirmation*

test, which are used to indirectly determine the validation of the model's structure. Structure confirmation tests are perhaps most difficult to formalize and quantify, as they attempt to compare the form of the equations of the model, directly with the form of the relationships that exist in the real system. The information needed for this type of comparison is highly qualitative in nature; it cannot be captured simply by a set of numerical data (Barlas, 1996: 190).

Lastly, the *behaviour patterns tests* are mentioned in the list of System Dynamics validation tests. Sterman (2000) states that among many tools that are available to assess a model's ability to reproduce the behavior of a system, the most common are descriptive statistics to assess the point-by-point fit. Point-by-point metrics compute some measure of the error between a data series Xd and the model output X, at every point for which data exist and then report some sort of average over the relevant time horizon. Several measures are commonly used: the coefficient of determination [R^2], the most widely reported measure[12]; the mean absolute error [MAE]; mean absolute percent error [MAPE]; mean absolute error as a percent of the mean [MAE/Mean]; and (root) mean square error [(R)MSE] all provide measures of the average error between the simulated and actual series[13].

A list of the validation tests proposed by Sterman (2000) is presented in the figure below and grouped based on Barlas's classification (Barlas, 1996):

[12] "R2 measures the fraction of the variance in the data "explained" by the model. If the model exactly replicates the actual series, R2 = 1; if the model output is constant, R2 = 0. R2 is the square of the correlation coefficient, r, which measures the degree to which two series covary." (Sterman, 2000: 874)

[13] MAE weights all errors linearly; RMSE weights large errors much more heavily than small ones. Both measure the error in the same units as the variable itself. MAPE should not be used, of course, if the data series includes any points close to zero. In such a case, the MAE divided by the mean of the data provides a more robust dimensionless measure.

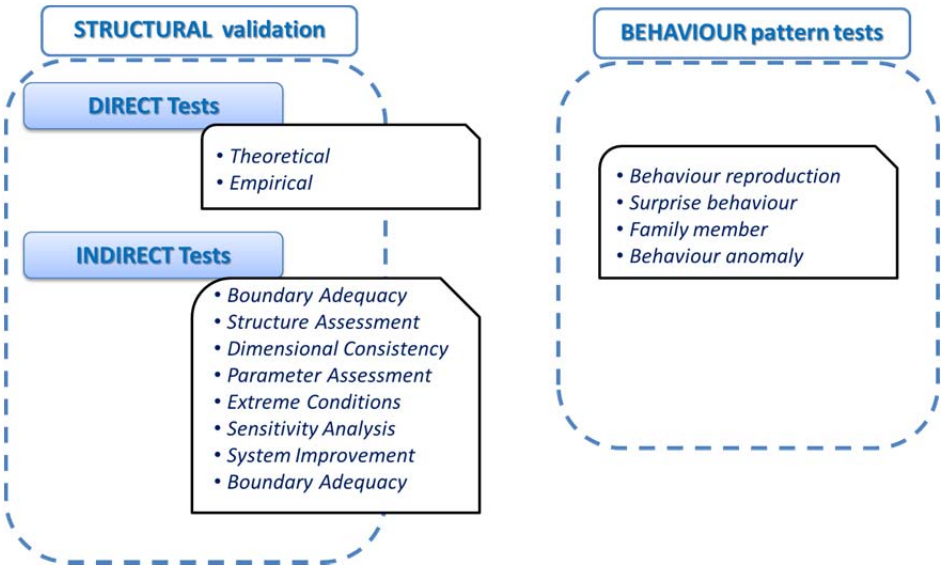

Figure 14: Validation Tests in System Dynamics (Adapted from Barlas (1996) & Sterman (2000))

In the following sections, the validation tests that have been applied to the model developed in the previous section are explained in detail. The results of the "Reality Check" (Extreme condition test), the sensitivity analysis and the statistical test (Behaviour Reproduction Tests) are exposed and analysed.

3.5.1. Extreme Conditions: Reality-Check

Extreme condition tests can be carried out in two main ways: by direct inspection of the model equations and by simulation. Each decision rule (rate equation) can be examined in the model and asked whether the output of the rule is feasible and reasonable even when each input to the equation takes on its maximum and minimum values (Sterman, 2000: 870). Additionally, it is possible to impose extreme conditions as policies in simulations of the model. Such tests, termed "reality checks" by Peterson and Eberlein (1994), quickly uncover flaws, a great advantage in a large model. The whole model extreme condition tests may reveal subtle flaws that direct inspection may miss.

Through this validation tool, we will be able to structurally test the model and see if it reproduces the observed behaviour in a real system. The results that have been obtained after applying the Reality-Check in order to validate the model's structure are exposed in this section based on the following conditions:

1. If the managers' perception coincides with the level of turbulence in the environment, the need of implementing change might remain.
2. When the 'Implementation Time' is superior to the simulation observed period, the Organisational Flexibility level, in a revitalization scenario, will take negative values along the period.
3. When a radical transformation is needed or proposed (e.g. from the Rigid state to Chaotic state), Organisational Flexibility does not achieve the optimal level.

In the following figure, the results from the Reality Check test are shown:

```
Starting testing of Constraint- IMPLEMENTATION TIME SUPERIOR
Test inputs :
   Implementation Time>48
. . . testing - IMPLEMENTATION TIME SUPERIOR
--------------

Starting testing of Constraint- MANAGERS' PERCEPTION OK
Test inputs :
   INITIAL value perceived ET=Environmental Turbulence
. . . testing - MANAGERS' PERCEPTION OK
The constraint -MANAGERS' PERCEPTION OK- violated at time 0.0625
--------------

Starting testing of Constraint- RADICAL TRAYECTORIES
Test inputs :
   INITIAL value Extensiveness=1
   INITIAL value Metaflexibility=1
   INITIAL value perceived ET=1
   INITIAL value Responsiveness=1
   Environmental Turbulence=1+STEP(3,12)
. . . testing - RADICAL TRAYECTORIES
The constraint -RADICAL TRAYECTORIES- violated at time 0
The constraint -RADICAL TRAYECTORIES- not violated at time 20.875
The constraint -RADICAL TRAYECTORIES- violated at time 30.6875
--------------

**********
1 successes and 2 failures testing 3 Reality Check equations
The Reality Check Index as run is 0.00277778
Closeness score is 84.9% on 3 measurements
```

Figure 15: Reality Check of the Base Case

The results show that one of the three statements surpasses the testing exercise and the other two fail. On the one hand, a radical trajectory causes a collapse that is shown in the figure below. As Volberda mentions, a radical trajectory can originate non-expected results and chaos.

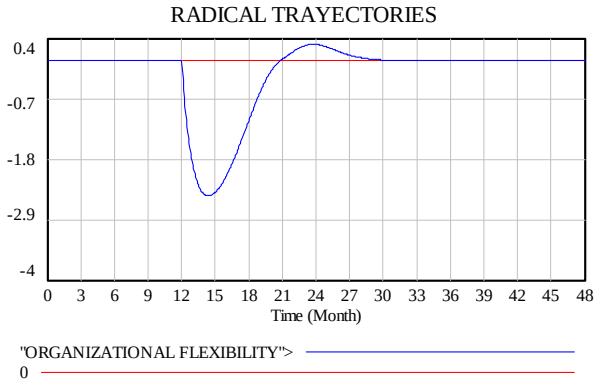

Figure 16: Results of the Reality Check in the Base Case when a Radical Transformation is implemented

On the other hand, if the managers' perception coincides with the level of turbulence in the environment, there is no need to implement any change. This assumption fails, as it was expected, mainly because the need for change should not only come from managers' perception but also from the Responsiveness and Extensiveness of Flexibility Mix. They influence pressure to change through the deficit or surplus in the Flexible Form.

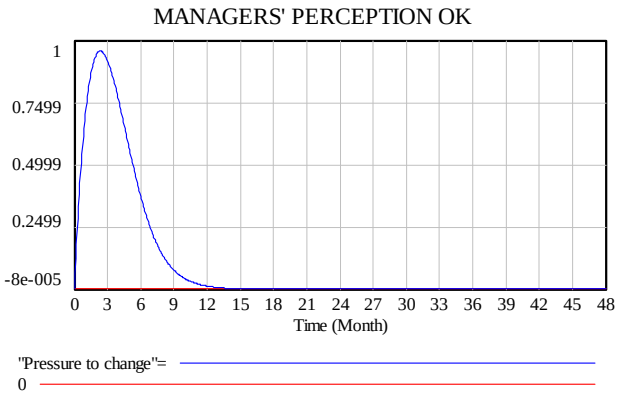

Figure 17: Results of the Reality Check in the Base Case when a Radical Transformation is implemented

3.5.2. Initial Equilibrium Tests

Another standard step in validating simulation models is the equilibrium tests. Such a standard step is applied to the model and aims at examining whether the model behaviour followed the predicted pattern when the *Organisational Flexibility* level required by the environment matches the *Organisational Flexibility* level that the company deploys, which means that the *Environmental Turbulence* is unchanging (i.e. 'Environmental Turbulence' remains constant alongside the simulation period). We would expect in this case that the organization is reaching and maintaining equilibrium since there should not be *Pressure to Change*.

In all simulation experiments, the system begins in a balanced state in which the net rate change of the stocks must be zero, implying that the rate of inflow is equal to the rate of outflow. In the case of the stocks *'Extensiveness of Flexibility Mix'*, *'Responsiveness'* and *'Metaflexibility'*, in an equilibrium state, their initial value is equal to the value in the *'Environmental Turbulence'*; that is, the firm accurately perceives the real value of *Environmental Turbulence* and the change rate is zero due to no pressure to change appearing. In this situation, a change strategy is not needed. The same case applies to the stock *'Pressure to Change'* that takes zero value because *Organisational Flexibility* has the optimal level and consequently, there is no need for a change in any of the three dimensions of Organisational Flexibility.

The first set of simulations examined on whether the model behaviour followed the predicted pattern when the environment was unchanging, i.e. *'Environmental Turbulence'* was constant. We expected the organization to reach and conserve equilibrium regarding Organisational Flexibility that means, *Organisational Flexibility* is situated at the level zero. Since no pressure to change arises due to unchanging conditions in the *'Environmental Turbulence'*, the current *Flexible Form* deployed by the organisation is appropriately aligned to the required *Flexible Form* by the environment. In that situation, the organisation continues to remain balance between exploration and exploitation and there is no need for change.

The initial conditions for equilibrium are shown in Appendix 1. To be able to capture short-term as well as long-term patterns, the model is simulated over a period of 48 units of time. The equilibrium tests simulated in this first step represent two of the extreme scenarios that Volberda's framework considers. First, the *Rigid* form which is the appropriate type of organisation in a non-competitive environment and secondly, the *Chaotic* form which is characteristic of an environment with extreme turbulence. In both cases, there is no *Pressure to Change* and managers' perception of environmental turbulence (*Perceived ET*) matches the real level of environmental turbulence so, the *Organisational Flexibility* variable represents the optimal level (=0).

The first equilibrium test (Figure 18) captures a *RIGID* form, which resembles what is commonly known as 'bureaucratic organisation'. This form is characterised by a large, inefficient, role-bound organisation, constrained by 'red tape' and fixed procedures (Volberda, 1998:211). In this case, the *Flexible Form* that is resembled by *Extensiveness of Flexibility Mix* and *Responsiveness*, coincides with 'Environmental Turbulence' in level 1. Both stock variables initiate the period in the value one, which represents: a very restricted flexibility mix ('*Extensiveness of Flexibility Mix'*) that is dominated by simple procedures and *Responsiveness* or the controllability of the organization is low due to a mature technology (routine), a functionalized and centralised structure with many hierarchical layers (mechanistic) and a monotonous and narrow-minded culture (conservative). Altogether, they do not allow potential for flexibility and result in a fragile and vulnerable organization.

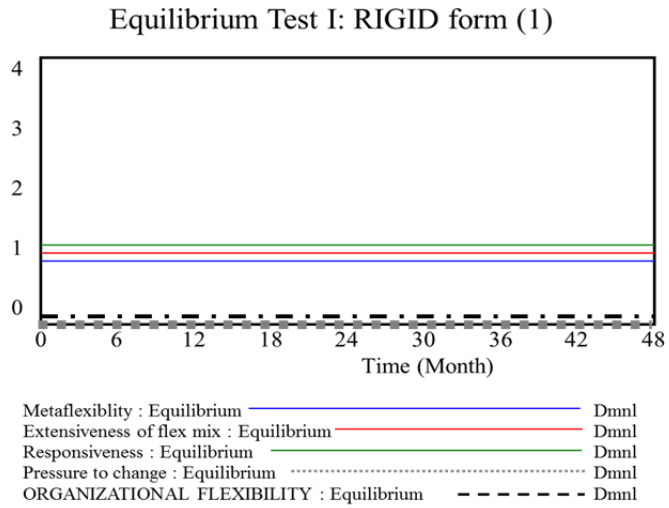

Figure 18 Equilibrium tests for RIGID form – base case

The second equilibrium test (Figure 19) captures the *CHAOTIC* form that matches up to the highest level of 'Environmental Turbulence', the variable takes the value four (4). As in the case of the aforementioned RIGID form, the stock variables *Extensiveness of Flexibility Mix*, *Responsiveness* and *Metaflexibility* represent the value four also. The CHAOTIC form is characteristic of, for example, entrepreneurial companies in their first period of enterprise lifecycle. This type of organisation has a very extensive flexibility mix dominated by strategic flexibility, but is totally uncontrollable. In organisations with this form, the possibilities for variation are unlimited because there is no anchorage within a set of basic organisational conditions. The innumerable initiatives for change are impossible to implement. As far as its Responsiveness level, this form has not a distinct technology, stable administrative structure or basic shared values in their organisational culture.

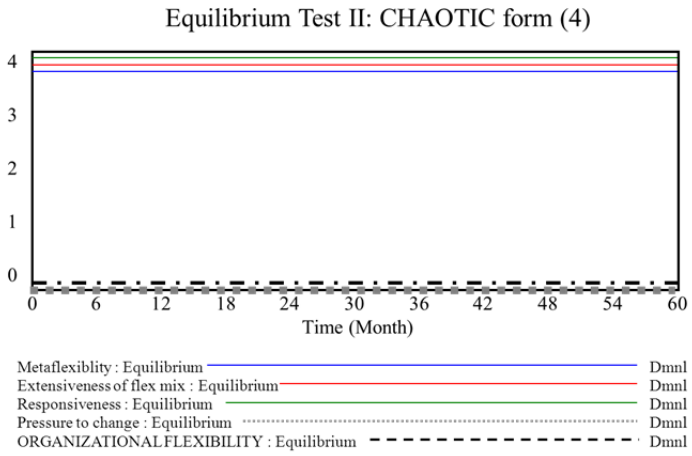

Figure 19: Equilibrium tests in CHAOTIC form – base case

3.5.3. Sensitivity Analysis

Another test that is commonly used is the sensitivity analysis. Sensitivity analysis is a procedure to determine the sensitivity of the outcomes of an alternative to changes in its parameters (Dhawan, 2006). Among others, Dhawan highlights some benefits from sensitivity analysis (2006: 4): they reveal structural flaws in the model; they improve the understanding of the model, help in narrowing down the areas where more data gathering would be useful and help identify pressure points in the model; furthermore, these tests become more important as the model becomes more important within an organisation.

Sterman (2000) mentions that through sensitivity analysis the modeller can test the robustness of the conclusions to uncertainty in the assumptions and differentiates between three types of sensitivity:

- **Numerical sensitivity:** it exists when a change in assumptions changes the numerical values of the results.
- **Behaviour mode sensitivity:** it exists when a change in assumptions changes the patterns of behaviour generated by the model.
- **Policy sensitivity**: it exists when a change in assumptions reverses the impacts or desirability of a proposed policy.

The decision of which type of sensitivity analysis to choose, depends on the purpose of the model. According to Sterman (2000: 884) the purpose of most business models, for instance, is not to predict what the profits will be next quarter but to design policies to help the firm become profitable. For most purposes, what counts is behaviour mode sensitivity and especially policy sensitivity. Thus, for this thesis' model, we are conducting behaviour mode sensitivity.

Sensitivity analysis is used to determine how "sensitive" a model is to changes in the value of the parameters of the model and to changes in the structure of the model. In this section, we have focused on parameter sensitivity. Parameter sensitivity is usually performed as a series of tests in which the modeller sets different parameter values to see how a change in the parameter causes a change in the dynamic behaviour of the stocks. By showing how the model behaviour

responds to changes in parameter values, sensitivity analysis is a useful tool in model building as well as in model evaluation[14].

Among others benefits, a sensitivity analysis can help to build confidence in the model by studying the uncertainties that are often associated with parameters in models. When developing a System Dynamics model, the uncertainty about the parameter values chosen is higher and we must use estimations. When looking at the results, if the tests reveal that the model is insensitive, it may be possible to use an estimate rather than a value with greater precision. When the model behaves as expected from real world observations, we can justify that the parameter values reflect, at least in part, the "real world."

Sterman suggests, "Since most models are significantly nonlinear the impact of combinations of assumptions may not be the sum of the impacts of the assumptions in isolation. Comprehensive sensitivity analysis would require testing all combinations of assumptions over their plausible range of uncertainty" (Sterman, 2000: 884).

In order to analyse the impacts of changes in parameters over the model results, the Monte Carlo simulation has been carried out with a random uniform distribution and with 200 simulations. Three exploratory exercises demonstrating the effects of various parameters and initial value changes on system behaviour have been developed. In the following table (Table 14) the parameters that have been selected for the sensitivity analysis are detailed.

Table 14: Policy Drivers used in the Simulation-Sensitivity Analysis

Policy drivers	*Value range*	*Notes*
Implementation Time	From 6 to 24 months (estimated value 12)	The implementation time of the change strategies should oscillate between 6 and 24 months
Initial Value of the Perceived ET	From 1 to 4 (estimated value 2)	The initial value of the stock variable that determines the managers perception oscillates between the four types of turbulence in the environment
Environmental Turbulence	From 1 to 4 (estimated value 3)	The environmental turbulence oscillates between the four types that Volberda considers

[14] 'System Dynamics Roadmaps 8': http://ocw.mit.edu/courses/sloan-school-of-management/15-988-system-dynamics-self-study-fall-1998-spring-1999/readings/sensitivityanalysis.pdf

The following figures show the results of the sensitivity tests in the Revitalization option. The results of the simulations have been portrayed with two main variables of the model: Organisation Flexibility and Pressure to Change. Separate simulations have been developed in order to observe the results from each of the parameters.

If we analyse the influence of the Implementation Time we can observe that both variables show higher levels of variability (Figure 20). The simulation runs show that the model is highly sensitive to changes in the Implementation Time at the beginning of the simulation period. As soon as the model mends the equilibrium due to the implemented change strategy, the confidence limits are narrower; the confidence limits of 95% are closer to the estimated values.

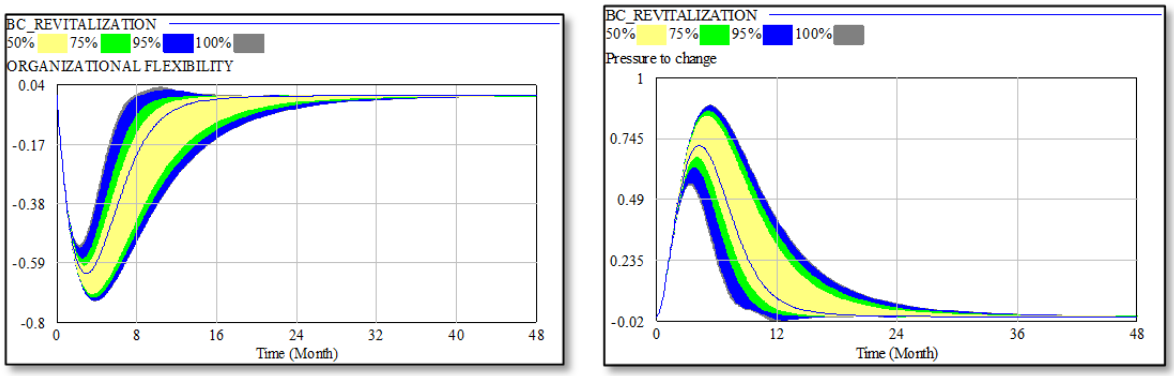

Figure 20: Sensitivity Analysis (Base Case) when *Implementation Time* oscillates in a range [6, 24]

Both variables, the Organisational Flexibility and Pressure to Change show a significant sensitivity to the changes in the Environment Turbulence as was expected (Figure 21). In the case of Organisational Flexibility the confidence limits of 95% overcome the value -1 as is expected with a higher flexibility deficit, which means that the gap between the current situation (value of Flexible Form: 2) and the required one (e.g. Environmental Turbulence closer to the value four) exceeds two points.

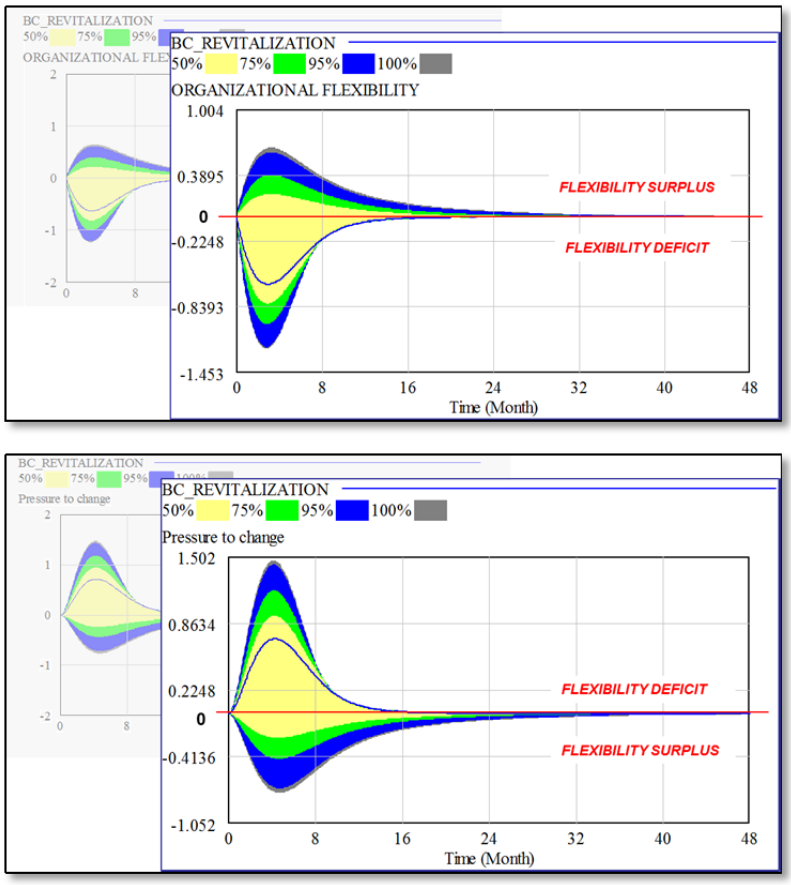

Figure 21: Sensitivity Analysis (Base Case) when *Environmental Turbulence* oscillates in a range [1, 4]

As can be seen in the figure above, in a flexibility deficit scenario, (revitalization is required, Organisational Flexibility takes negatives values and Pressure to Change takes positive values), the confidence limits of 100% are equal to the estimated value earlier than in a routinization scenario.

In the following figure (Figure 22) the sensitivity of the aforementioned variables as the initial manager's perception oscillates, is evaluated. At the beginning of the simulation period, the sensitivity is higher. When the managers' perception is different than the real scenario, the model tends to recover the equilibrium, being close to the required flexibility level before implementing the appropriate change strategy.

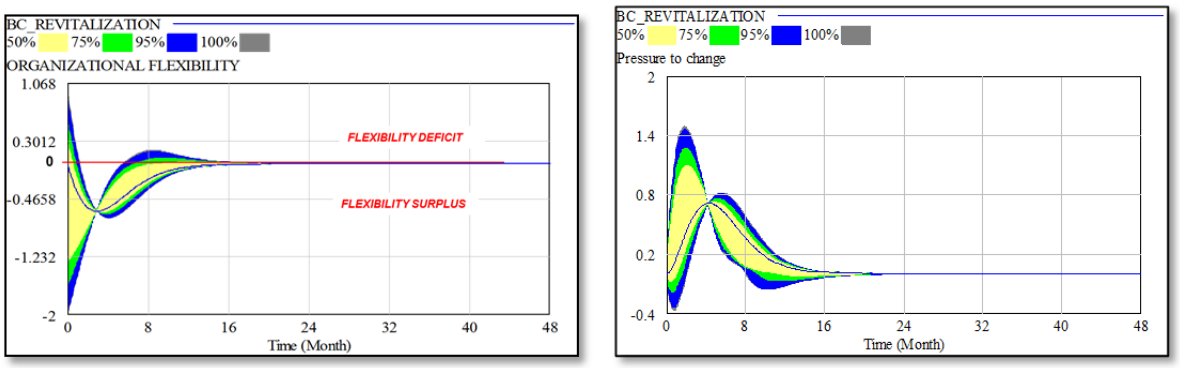

Figure 22: Sensitivity Analysis (Base Case) when initial value of *Perceived ET* oscillates in a range [1, 4]

Sterman asserts that people tend to be overconfident in their judgmental parameter estimates which are likely to be more uncertain than people's intuitive confidence bounds suggest (Sterman, 2000:884). Accordingly, in assessing sensitivity to parametric assumptions, Sterman gives advice on "*identify the plausible range of uncertainty in the values of each parameter or nonlinear relationship"* and "*then test the sensitivity to those parameters over a much wider range"* (Sterman, 2000:884). In addition to the sensitivity analysis of the parameters, according to Sterman, it is important to test the sensitivity of the results for uncertainty in the assumed shape and values of all nonlinear functions. Thus, we have explored the responsiveness of the model to the changes in the fractional decrease of the Pressure to Change whose values have been estimated in a table function. Following Sterman's advice, we have estimated the flat and steep cases that vary the fractional decrease of pressure to change as organisational flexibility varies. Such a variation is based on original data of the base case (Figure 23).

Organisational Flexibility	Fractional decrease		
	Flat Case	Base Case	Steep Case
0	1	**1**	1
0,25	0,94	**0,87**	0,75
0,5	0,92	**0,8**	0,6
0,75	0,89	**0,76**	0,495
1	0,87	**0,73**	0,45
1,25	0,865	**0,72**	0,4
1,5	0,855	**0,71**	0,35
1,75	0,845	**0,705**	0,325
2	0,844	**0,701**	0,3

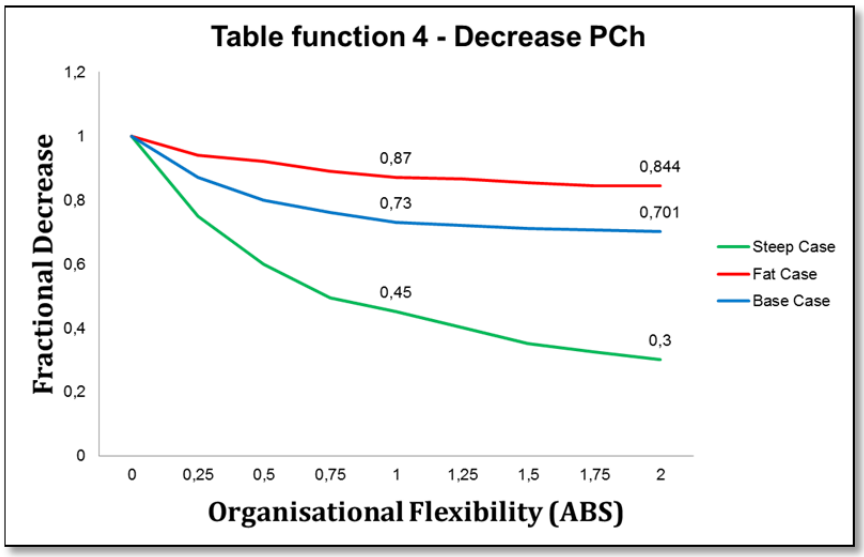

Figure 23: Variations in the assumed *Fractional Decrease* of *Pressure to Change* Functions for sensitivity analysis

The variable 'Organisational Flexibility' show no significant sensitivity to the changes in the Fractional decrease of Pressure to Change (Figure 24).

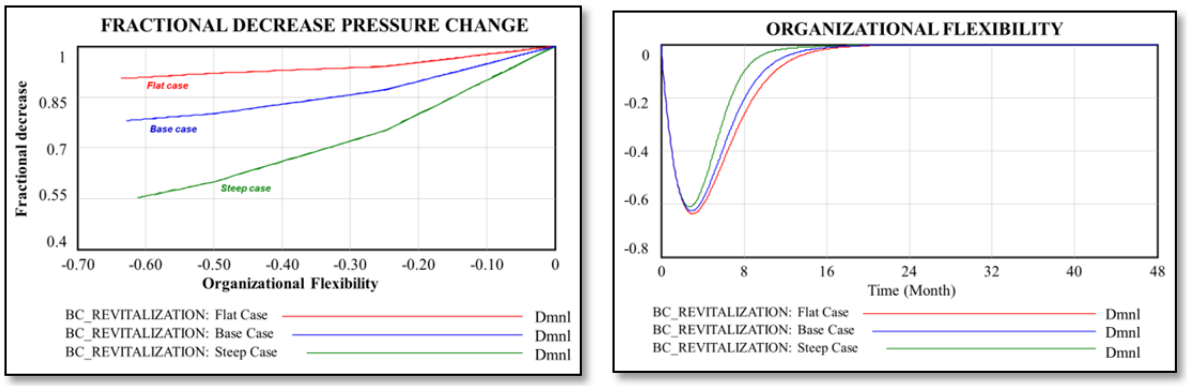

Figure 24: Behavior of the Organisational Flexibility with different *Fractional Decrease* of *Pressure to Change* Functions

3.6. DISCUSSION

Throughout this chapter, we have attempted to show a dynamic representation and formalization of Volberda's theory through the application of the System Dynamics methodological approach. System Dynamics has been explained and presented as the appropriate methodology that is able to make explicit the causal relationships that exist between the variables of the system, in this case, of the Organisational Flexibility system. Additionally, it

allows us to predict through the simulation process, the impact that the decision made will have in the short and long term.

In order to provide an additional understanding of Volberda's theory on Organisational Flexibility and to analyse the dynamic relationships of its components, a first causal model was formalized and several validation tests were developed. More concretely, the sensitivity analysis has shown the significance of the implementation time of change strategies, the managers' perception of the environmental turbulence and the extent that the pressure to change has over the success of any change strategy that searches for an optimal level of organisational flexibility. By translating an existing theory into a system dynamics model, new understanding as well as new questions about the original theory could be generated (Sastry, 1995). As has been explained in this chapter 3, if system dynamics models allow patterns of behaviours to be analysed, we propose to evaluate the following two research questions:

> ***Research question 1:*** *Does System Dynamics, as a modelling method, allow creating a micro-world where space and time can be compressed so we can learn, understand and assess the change processes to adapt the required level of flexibility to environmental characteristics?*
>
> ***Research question 2:*** *Does the developed system dynamic model accurately represent the expected behavior that the theory defines?*

In that sense, the next stage is to capture changes over time by simulating the evolving behaviour of interrelated variables during the implementation of change strategies towards the required flexibility.

4. MODEL BEHAVIOUR AND ANALYSIS: SIMULATION FINDINGS

"Formalization and simulation often uncover flaws in conceptual maps and lead to improved understanding. The results of simulation experiments inform conceptual understanding and help build confidence in the results. Early results provide immediate value to clients and justify continued investment of their time." (Sterman, 2000: 81)[15].

In the preceding chapter, the causal diagram has been explained in detail showing the interrelations of positive and negative feedback loops. The diagram is useful to tell the story of how these interrelationships evolve but a formal model is essential to explore the dynamic implications of such a trade-off like this (Sastry, 1997: 246). Now, such formalization will allow us to deploy several simulation exercises whose results will portray relevant insights to build the dynamic propositions of the present thesis.

In this chapter, we aim at investigating the longitudinal interaction between the processes that illustrate changes in the dimensions of organisational flexibility and their evolution over time. In other terms, the model depicted in Chapter 3.3.2 is simulated to highlight the role of key constructs such as the organisational flexibility, flexible form and perceived environmental turbulence when the organization endeavours to solve the fundamental tension originated by the deficit or surplus of flexibility level as the environment evolves.

The objective of this chapter is based on the exploration of some of the implications of the qualitative arguments that lay on Volberda's theory by using computer simulation. The main advantage that can be highlighted from a computer-based simulation model is that it offers the researcher the possibility of examining the dynamics of a system and to study its long-term implications in terms of the observed phenomena (Prietula, 1998). Computer-based simulation also offers, as Prietula, Carley and Gasser (1998) assert, the possibility to design and run virtual experiments that aid qualitative reasoning. Sterman (Sterman, 2000) states that "*in many situations, especially human systems, it is difficult, dangerous, unethical, or simply impossible to conduct the real world experiments that might reveal the flaws in a dynamic hypothesis. In those cases, these experiments must be conducted in a virtual world".* In a virtual experiment the simulation model is used as a mechanism to generate observations.

[15] Sterman (2000) proposes a guideline with the 'PRINCIPLES FOR SUCCESSFUL USE OF SYSTEM DYNAMICS', principles that guide the modeller for effective development and implementation of system dynamics models (2000: 80-819

A systematic approach is used to test and explore the simulation model. First, the objective is to examine whether the model depicts Volberda's theoretical model and provides endogenous explanations of the theory. Here, the model has been named as '**Base Case'**. The effects of one-time shift in the required organisational flexibility and the organization's response to a sudden shift in the 'Environmental Turbulence' have been explored. More complex scenarios in which the environment changes over time are examined secondly. For every scenario, we tested many combinations of model parameters to understand how assumptions built into the model affected simulation results and to identify problems when transition from one type towards the required flexible form is forced. Further tests established the organization's response to a continually changing environment, modelled as a constantly increasing or decreasing 'Environmental Turbulence'. Parameter values that have been used to simulate the Base Case are shown in Appendix 1. Selected model outputs are reproduced in this chapter through a complete set of graphs.

4.1. Base Case

Once the Base Case model testing has been surpassed, the next stage includes the simulation of the model to understand the dynamic implications of the organisational flexibility theory outlined earlier in this thesis (3.3.1). The model was simulated to highlight the role of key constructs such as the level of Organisational Flexibility, Flexible Form, Pressure to Change and Perceived Environmental Turbulence.

The simulation moves them from actors in the business to spectators of their strategies. We discuss here the decision-making processes and their effects on the success of the strategic initiative.

The Base Case simulates a scenario in which the Organisational Flexibility starts out with the optimal level, that is, the current Flexible Form – portrayed by a specific combination of Extensiveness of Flexibility Mix and Responsiveness – is suitable to the Flexible Form that the 'Environmental Turbulence' is requiring. It must be noted that, the following scenarios of simulations represent the different combinations that are possible based on Volberda's framework (see Figure 8).

Two scenarios have been selected to represent the dynamic behaviour of the Base Case when changes in environmental conditions appear and afterwards every change strategy is

implemented according to Volberda's recommendations in order to achieve the optimal level in Organisational Flexibility. Both possible situations in scenario (A) are equivalent to circumstances in which the deficit or the surplus of flexibility may be addressed only with one trajectory of transition (see FIGURE 8):

- from Flexible state towards Chaotic state (in the case of revitalization) or,
- from Flexible state towards Planned state (in the case of routinization)

The situation is similar in the case of scenario (B), both possible situations are equivalent to circumstances in which the deficit or the surplus of flexibility need to be addressed. However, the main difference comes from the fact that the changes in environmental conditions are so severe that two trajectories of transition are needed to recover the optimal level in organisational flexibility (see FIGURE 8):

- from Flexible state towards Chaotic state (in the case of revitalization) or,
- from Flexible state towards Planned state (in the case of routinization)

They are summarized in the following table (Table 15). The initial values of the variables and parameters are shown in the Appendix 1.

Table 15: Scenarios proposed for the Base Case

Scenarios	Revitalization (flexibility deficit)		Routinization (flexibility surplus)	
A) One transition	Flexible Form (*Flexible* type)	3	Flexible Form (*Flexible* type)	3
	Environmental Turbulence (*Chaotic* type)	4	Environmental Turbulence (*Planned* type)	2
	Implementation Time	12 months	Implementation Time	12 months
B) Two transitions	Flexible Form (*Planned* type)	2	Flexible Form (*Flexible* type)	3
	Environmental Turbulence (*Chaotic* type)	4	Environmental Turbulence (*Rigid* type)	1
	Implementation Time	12 months	Implementation Time	12 months

4.1.1. Simulation Findings in One Transition Strategy

The 'one transition' base case scenario illustrates the example when the environment is requiring the organisation to move the Flexible Form one-step along the typology that Volberda proposes. This transition could be originated due to a surplus or a deficit of flexibility. In those cases, a Routinization or Revitalization strategy would need to be applied.

The example of Revitalization starts when the organisation matches to the so-called '*Flexible*' state (level 3 in Volberda's typology – see Table 12), which is characteristic of a hyper-competitive environment. As the 'Environmental Turbulence' increases (i.e. it raises value 4, Extreme Turbulence), it is expected that the Organisational Flexibility does not reach the optimal level due to a flexibility-deficit. It means that Organisational Flexibility takes negative values in the interval [0, -1]. A **flexibility-deficit** scenario implies that the firm's 'Extensiveness of Flexibility Mix', 'Responsiveness' and 'Metaflexibility' are inferior to what the environment requires (Figure 25a). One transition could also be needed when, for instance, the starting point is the 'Flexible' type (level 3) in a hyper-competitive environment (level 3) and the 'Environment Turbulence' decreases (i.e. towards a dynamic environment). Then, a Routinization strategy is needed. Certainly, it is expected that the Organisational Flexibility does not reach the optimal level due to a **flexibility-surplus**, which means that Organisational Flexibility takes positive values in the interval [0, 1]. A flexibility-surplus denotes that the firm's 'Extensiveness of Flexibility Mix', 'Responsiveness' and 'Metaflexibility' are superior to what environment requires (Figure 25b).

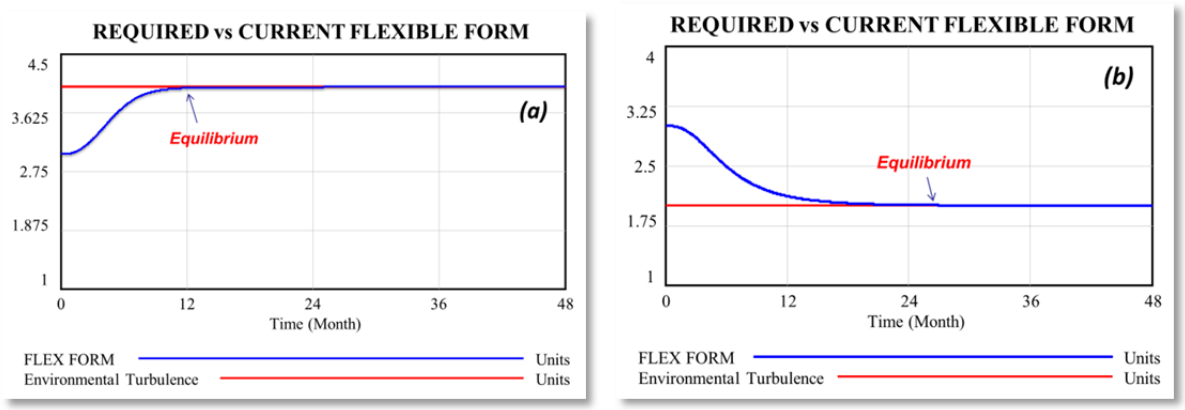

Figure 25: BASE CASE simulation – one transition in Revitalization *(a)* and Routinization strategy *(b)*

A revitalization strategy is required to initiate a transition towards the *'Chaotic'* state and it allows the transition to be controlled when the firm is facing increasingly competitive markets. As was explained in detail in section 3.3.2, this type of transition is commonly applied to address new market tendencies, new business models, new competitive advantages and it is more effective under hyper-competition. This type of transition significantly alters existing structures and cultures, and violates the established operational capabilities and specialized routines in an organisation (Volberda, 1998: 222). An empirical example of this type of transition is

represented by the R&D department of the Dutch National Gas Corporation that had unlimited potential for flexibility, but managers could not capitalize it (Volberda, 1992). The department was too flexible and had many initiatives for new research, but it could not implement them because it had no clear administrative structures or shared values stemming from its culture. Nor did it have adequate information about person-hours, costs or technical progress per project. Managers were not able to make appropriate decisions based on accurate or truthful information. Consequently, various environment forces (board, internal clients) could force the department in any direction. In this context, Volberda points out the requisite of anchoring the revitalization strategy in stability based on Kanter's statement "creating change requires some stability" (Kanter, 1988: 195). Organisational structures and cultures must allow continuity and preserve the organisation in the midst of change. In particular, Kanter proposed that strong social ties and strong beliefs in fundamental values create stability for the organisation.

A routinization strategy is required to settle a transition towards the *'Planned'* state and it allows the transition to be controlled when in moderately competitive environments, where the firm faces decreasing levels of environmental turbulence and stability needs to be introduced. As was explained in detail in section 3.3.2, this type of transition is commonly applied to address periods in which the firm's leadership in its market is strong and the market is mature. Volberda explains that such a transition creates a greater need for the firm to professionalize and institutionalize its absorptive capacity and to integrate efforts of its decision-makers by formal means (process regulation) (1998: 218). It means that the firm must focus its metaflexibility on setting up systems and departments to gather certain types of information routinely and to disseminate this information to appropriate decision-makers (extensive metaflexibility). If the organisation is able to codify its metaflexibility appropriately, that is, to improve its capacity to plan, monitor and control its environment, and to implement decisions, it will be able to reduce the level of environmental turbulence (1998: 218). In terms of extensiveness of flexibility mix, this *Planned* form will be able to alertly exploit existing knowledge and opportunities because it has the appropriate (conservative) culture, (mechanistic) structure and a high level of operational flexibility that have been adapted to match the needs of the situation. Finally, it has a moderately high degree of controllability, which permits it to pursue the opportunities still emanating from the moderate level of competition by undertaking further adaptations in its technology, structure and culture (Volberda, 1998: 218). An empirical example is shown through Richardson's study of the fashion apparel industry, where the vertically integrated firm gained more competitive advantage from current technological opportunities (CAD/CAM, EDI) than the

more flexible de-integrated firms due to exploitation of time and response opportunities resulting in further integration of firms.

The Organisational Flexibility level (Figure 26) represents the S-shaped effect caused by the flexibility excess or deficit. When a revitalization strategy (red line) is needed, the level of this variable decreases (under the optimal value (zero)) representing the flexibility gap to be surpassed, until the trajectory changes it starts an increasing trajectory until the strategy achieves the desired effect into Organisational Flexibility. In the same figure, the S-shaped increasing effect and further decline of the Organisational Flexibility level when a routinization strategy (blue line) is needed, is portrayed. As the figure shows, the simulation test surpassed the expected trajectory.

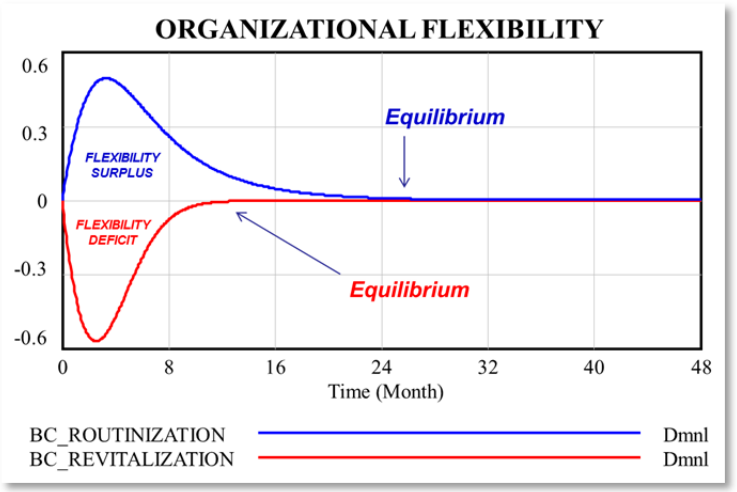

Figure 26: ORGANISATIONAL FLEXIBILITY in the Base Case (BC) - one transition of both strategies (Routinization and Revitalization)

The point in which the equilibrium is achieved depends on the level of 'Pressure to Change'. This variable is activated and takes positive or negative values in harmony with the required strategy, increasing the flexibility potential (Figure 27). Initially, the stock 'Pressure to Change' descends or increases rapidly into the maximum level at which the strategy begins to influence in the Organisational Flexibility level, which is subsequently closer to the optimal level. 'Pressure to change' starts building up by month 4 and continues at an increasing rate until the Organisational Flexibility achieves the optimal level by month 27.

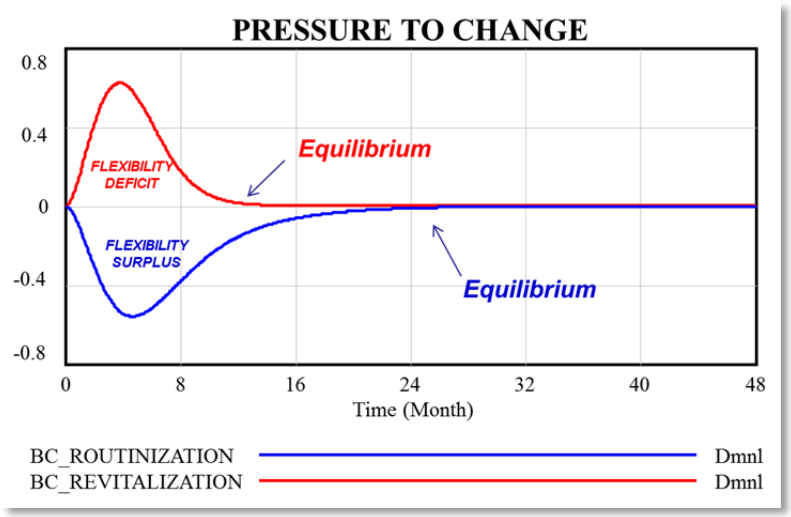

Figure 27: PRESSURE TO CHANGE in the Base Case (BC) - one transition of both strategies (Routinization and Revitalization)

In this base case, the 'Implementation Time' parameter has been estimated in 12 months and it has not varied in the simulation. It is the estimated time by the company for representing the time spent in implementing changes in managerial capabilities as well as in organisational design. We have selected 12 months for representing this period in which the changes are expected to be implemented. This variable is a parameter of the model that managers should estimate at the beginning of the process of revitalization. In this sense, Zajac et al. (2000) point out that *"the timing, direction and magnitude of strategic changes can be predicted based on changes in the general and competitive environment of the firm and its organisational resources."* (2009: 448).

In both scenarios, the 'Flexible Form' follows the predicted path of an "S-shaped growth" – growth is exponential at first and gradually slows until the state of the system reaches the equilibrium level (Figure 25). At the beginning of the change strategy initiative, the joint effect of the balancing loop (Absorptive Capacity management-B1) and the reinforcing loops (Sufficiency of Flexibility Mix-R2 and Adequacy of the Organisational Design-R3) drive the behaviour of the system.

On the one hand, 'Metaflexibility' forced the 'Perceived ET' towards the real 'Environmental Turbulence' which starts to reduce the gap in Organisational Flexibility (Figure 26). Commencing by information-gathering and processing programmes, the adjustment of absorptive-capacity is deployed and 'Metaflexibility' level decreases or increases in alignment to

which the environment requires[16]. In routinization for instance, confronting a flexibility surplus, a more formalised set of information-gathering and processing programmes is needed. By coding its limited and basic scanning procedures, the resulting increased 'Metaflexibility' facilitates the development of dynamic capabilities which boost the flexibility mix and makes the firm more responsive to new market forces. When a deficit of flexibility appears and the revitalization strategy is needed, the firm's information processing capacity is activated when market needs or new opportunities clearly appear. When 'Environmental Turbulence' increases, this capacity must be directed towards enhancing the receptiveness to new environments, for instance by using strategic planning processes.

The reinforcing loops (R2 & R3) are the drivers to boost Flexible Form towards equilibrium through lower or higher levels of 'Extensiveness of Flexibility Mix' and 'Responsiveness' and closing the Organisational Flexibility gap.

In contrary to what it would be expected, the routinization strategy has not had any effect over the Organisational Flexibility's level until month 24. In a routinization strategy, the effects of inertia are not as strong as in the scenario of revitalization in which old routines must be unlearnt, etc. However, the introduction of new regulation and professionalization process when staff is experimenting a certain type of freedom to operate in the *Flexible* state with a more innovative culture more innovative, also will affect to the delay of effective implementation of the change strategy. This variable will be further studied and analysed in Chapter 6. In the revitalization case, the equilibrium is achieved in a shorter period, by month 12. This could be justified due to as Hintt, et al (2012) explain, strategic flexibility should to be developed in all areas of their operations and it involves coping with uncertainty and its accompanying risks. However, firms striving to implement any strategic flexibility should understand that the task is not an easy one, largely because of inertia that can build up over time and, on the other hand, a firm's focus and past core competencies may actually slow change (Nadkarni & Narayanan, 2007).

4.1.2. Simulation Findings: Two Transitions Strategy

What would happen if the 'Environmental Turbulence' evolved quickly and the needed steps of change were superior to one movement? It would mean that the 'Environmental Turbulence'

[16] See chapter 3.3.2

would increase or decrease two levels (or more) from the initial one. The 'two transitions' base case scenario illustrates the example when the environment is requiring the organisation to move the *Flexible Form* two steps along the typology that Volberda proposes. This transition could be originated due to a surplus or a deficit of flexibility. In those cases, a Routinization or Revitalization strategy would need to be applied.

Volberda exposes the case of KLM Cargo company as an example of a more radical way to transform the firm besides the sequential trajectories of Routinization and Revitalization (Volberda, 1998:265). KLM Cargo represents a scenario in which the desired trajectory was to move from extreme rigidity (Flexible Form=1) towards a flexible state and, actually, a highly chaotic state was provoked. Such a radical transformation is adequate for firms under substantial time pressure. In 1989, the company had to be reconfigured due to the KLM programme Vision '93 that implied the creation of two divisions. It suffered the unlearning of its old strategic schema and relearning of a new one ('Metaflexibility'), it was necessary to heavily invest in flexible capabilities to provide new services and a fundamental redesign of the organisation was implemented. The obvious reason for this structural change was to get closer to customers, cutting down the bureaucracy, and empowering people to act innovatively and swiftly. It took less than one year for such a transformation that also caused some major problems, among others, there was too much resistance from lower-level managers who were not involved in the change process (cultural values).

When is it appropriate for management to choose a sequential revitalization from *Rigid* to a *Planned* to a *Flexible* mode, and when should it choose to radically transform the organization from *Rigid* to a *Chaotic* to a *Flexible* mode? Data showed by Volberda suggest that a radical transformation is less time-consuming, but more risky because the scope of change is large and the content of change is more difficult (Volberda, 1998:267). Sequential revitalization is more effective when firms are not concerned with speedy reaction. By contrast, radical transformation is more effective when there is a pressing need for the organization to respond collectively. The following scenarios of the base case represent radical transitions.

On the one hand, a **Routinization strategy** moving the 'Flexible Form' from *Flexible* towards *Rigid* state is shown (Figure 28). The Base Case model behaves as a sequential transition. The gap in Organisational Flexibility is much higher than in a simple transition and more time is needed for the Flexible Form to reach the desired form.

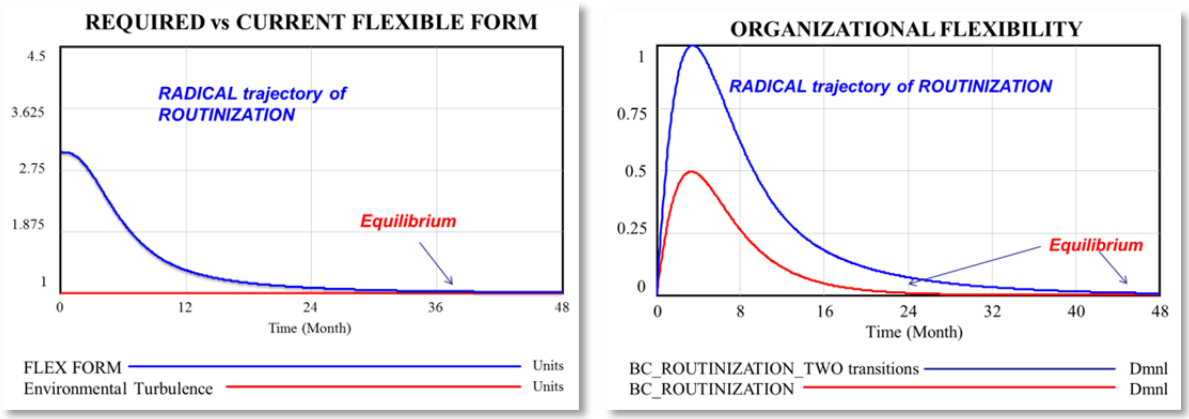

Figure 28: A radical Routinization strategy – from *Flexible* to *Rigid* form

On the other hand, a Revitalization strategy moving the 'Flexible Form' from Planned towards Chaotic mode is shown in Figure 29.

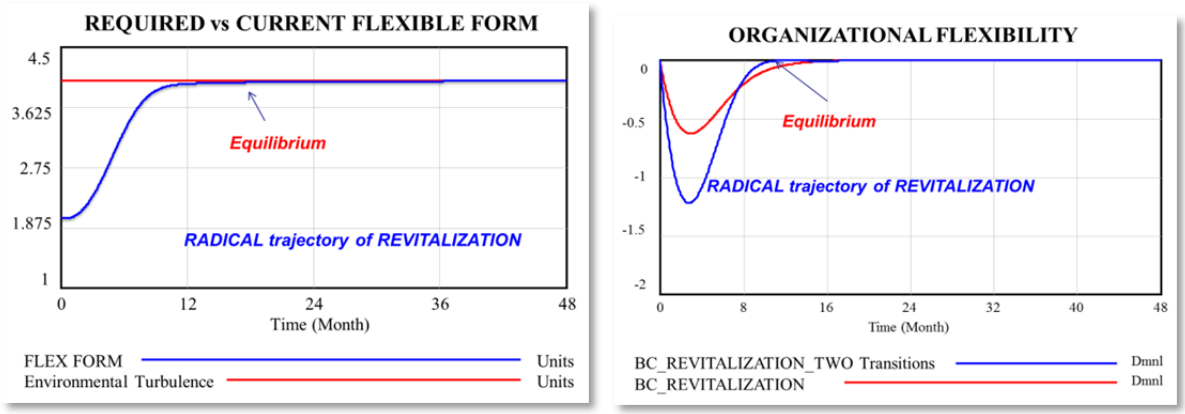

Figure 29: A radical revitalization strategy - from *Flexible* to *Rigid* form

Both these radical transitions could imply considerable efforts for the organisation. In those situations, Volberda suggests evaluating the best option of change (Volberda, 1996: 267):

- to choose a **sequential revitalization** from a rigid to a planned to a flexible model – it is most effective when the firm is not concerned with speedy reaction.
- to choose to **radically transform** the organization from rigid to a flexible mode or chaotic – more effective when there is a pressing need for the organisation to respond collectively.

The author mentions that a radical transformation is less time-consuming but more risky because the scope of change is large and the content of change is more difficult (Volberda, 1998: 267). It requires the organization to transform quickly and in a holistic manner, which entails severe changes. There is a risk that the organisation will disintegrate into chaos.

Some managerial implications have emerged from this first analysis of the Dynamic Model of Organisational Flexibility of Volberda (1998) which allows us to propose some significant research questions to be explored in the further stage.

4.2. Discussion

The base case is important for interpreting what would happen in 'generic' scenarios that are envisaged in Volberda's theory. By using the model in this way, *"creates 'memories' of the future'"*, managers are able to adjust the strategy if it appears unlikely to fulfil company objectives, or to adjust the objectives themselves (Kunc & Morecroft, 2007).

Apparently, the simulation exercises of the base case have allowed us to discover that the model depicts the traditional trajectories proposed by Volberda and some insights may be highlighted:

Table 16: Summary of simulation results

Simulation	*Main insights*
Base Case – one transition	In both change strategies, the system retrieves the equilibrium when the Flexible Form achieves the level of flexibility that the environment is requiring. Such equilibrium is achieved earlier in a revitalization strategy than in a routinization strategy. In revitalization the equilibrium is achieved in the expected implementation time while, in routinization, there exists a longer delay (24 months are needed)
Base Case – radical transition	Simulation results show a similar behaviour to that in a simple transition. The unique difference is that the gap in organisational flexibility is much higher.

Some defaults have appeared as the simulation progressed, such as for instance, the timing or duration of strategy implementation or the possible resistance to change that may emerge during the implementation of the strategy. Issues that Volberda has previously anticipated and that, some researchers, have addressed due to their relevance in the organisational change field. Empirical research and literature on Organisational Change has shown that the effectiveness of change strategies depends upon several factors that Volberda has partially previously observed, but he does not incorporate them into his framework.

Although conceptually rather refined, van der Weerdt (2009) justifies that the theory of organisational flexibility goes untested at large and empirical research has mainly focused on its dimensionality nature (see Chapter 2). The theory of organisational flexibility has not been evaluated from the complex dimension that emerges from its variables relationships and the possible constraints that hamper the success of the change strategy in the organisational flexibility level, and therefore, limiting its application at an organisational level. Based on that gap, the third research question that guides this study is proposed as follows:

> ***Research question 3:*** *Are there any constraints of such change strategies that the company should confront during the transformation journey? For example: inertia or resistance to change; managers' perception of the environmental changes; and, some delays suffered as the change strategies are implemented.*

Looking at the competitive strategy literature, several authors have stressed that competitive strategy is not a static phenomenon, but a sequence of interconnected actions and reactions unfolding over time and such dynamic perspective can be seen in a variety of practical observations (Hutzschenreuter and Israel, 2009). For instance, Porsche and its superior competitive positioning in the automotive industry due to a steady adaptation process that has spanned almost a decade; the behaviour of firms during periods of intense competitive rivalry (Ketchen, Snow and Hoover, 2004), in their responses to environmental changes (Lee and Grewal 2004), and in their attempts to modify their industry positions or reach new ones (Nair and Filer 2003). In this field, Hutzschenreuter and Israel (2009) highlight the importance of the timing and duration of strategic actions although it has not received enough attention from scholars as should have been expected. For instance, Lee and Grewal (2004) explicitly incorporate response speed as an independent variable. They study technological change and find that both the type and speed of response positively affect performance, suggesting that adaptation speed remains a promising variable for future contingency studies. Glen and Hambrick (1995) investigate the impact of organisational size on the timing of strategic adaptation, finding that small firms tend to be faster in executing their own competitive moves, but slower in responding to those of their rivals.

In summary, those constraints that can have an effect in the appropriate selection of the change strategy and its consequent successful outcomes are to be evaluated. In order to analyse possible answers to the aforementioned research question, an exploratory study has been developed in a large cooperative industrial group. In the next chapter, Chapter 5, a qualitative research

exploration is described in detail. It is aimed at exploring the evolution of the processes involved in the theory of Organisational Flexibility, defined by Volberda (1998) and formulating relevant managerial implications to organisational flexibility theory.

5. A QUALITATIVE RESEARCH EXPLORATION – MONDRAGÓN COMPONENTS

Aiming at providing an answer to the third research question of this thesis, introduced in the previous chapter, related to discovering some constraints of such change strategies that the company should confront during the transformation journey, we focus on a **qualitative research exploration** in this thesis.

The main objective of using a qualitative research exploration is to qualitative explore significant evidence of a theory application, that is, to explore the process of Organisational Flexibility, defined by Volberda (1998) as the alignment of managerial capabilities and organisational design with the external environment[17]. Case study research would have been particularly useful when the relationship between the phenomenon and the context is not evident (Yin, 2009). Due to several limitations (explained in Chapter 7), the case study methodology was not possible to be applied and the qualitative research exploration was proposed for accomplishing the objective above mentioned, however, relevant managerial implications derived from this qualitative study will support the extension of the Base Case Model (Chapter 4).

This chapter is structured as follows. First, a general description of the company, Mondragón Components, and the evolution of its main economic variables during the 2007-2011 period are portrayed. Secondly, the suitability of this qualitative exploration for the thesis' purposes is illustrated. The protocol for data collection and Volberda's method (QSF-Quick Scan Flexibility) for evaluating the organisational level of flexibility are described in the third section. The fourth section is devoted to illustrate the results from the two evaluations (2007's evaluation and 2011's evaluation) following Volberda's framework of Organisational Flexibility (which has been illustrated in section 3.4.1). The R&D manager of the company to be observed trough a qualitative study has shed light on the results obtained by providing several arguments in a set of interviews. Finally, main conclusions of this qualitative study for the thesis are included in this chapter. The exploratory study has served to derive significant empirical evidence for illustrating a set of managerial implications in the cooperative context within the industrial components sector and during a specific context.

[17] "An enduring perspective in strategy research is that to survive over time, organizations need to be aligned with their environment (Venkatraman and Camillus, 1984; Venkatraman and Prescott, 1990; Cohen and Levinthal, 1990; Zajac et al. 2000)." In Ben-Menahem (2013)

5.1. A Brief Description of Mondragón Components

5.1.1. Company Description

Mondragón Components is a division of the Industrial Area within the Mondragón Corporation, a business group involving more than 210 companies and which employs more than 89,000 people[18] in the Basque country (north of Spain). Mondragón Corporation is the largest business group of the Basque Country (as well as the seventh largest in Spain) in terms of sales and employment. Moreover, five of the ten largest individual cooperatives in Spain belong to the Mondragón group. At an international level, Mondragón Group was the ninth largest group of co-ops in the world in 2008 according to the list assembled by the ICA (www.global300.coop), that ranking has moved up one place since the list was first compiled in 2004 (Arando, Freundlich, Gago, Jones & Kato, 2010).

Its structure (see Figure 30) is configured into three areas: FINANCE INDUSTRY DISTRIBUTION operating autonomously and within a set structure. Mondragón has major technological backing and many of its resources are earmarked for research and development. Education and in-service training are also one of MONDRAGÓN's objectives and have led to the setting up of University campuses and the University of Mondragón itself.

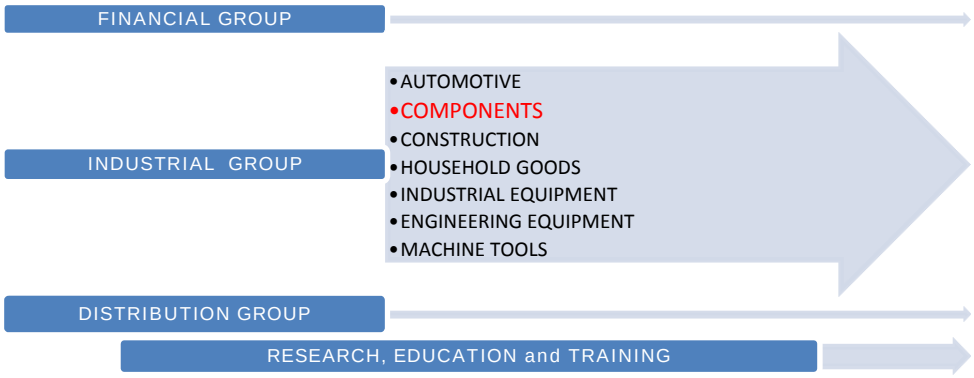

Figure 30: Mondragón Corporation

Mondragón Components[19] was created in 1991 with the aim of bringing together the experience and know-how of eight co-operative companies firmly established in the sector of domestic appliance components and electronics components into one single group. Those companies combine their command of different technologies in order to provide an exceptional offer of

[18] http://www.mondragoncomponentes.com/eng/quienes_somos.html
[19] Source: http://www.mondragoncomponentes.com/quienes_somos.html

technological and integral service. Mondragón Components has 24 production plants[20], a headcount of over 5,000 people and its turnover exceeds 550 million euros, of which 65% is generated in markets abroad[21]. To take part in the Components Division's development and innovation strategy in those research activities with the highest risk. The following activities form the scope of the division:

- Agreement with the MONDRAGÓN Corporation's Components Division to drive research and innovation in components for domestic appliances.
- Research laboratory shared between the Stirling Centre (the Division's R&D&I unit) and Mondragón University, located on MU's premises and staffed by the Division's technicians.
- Commitment to finance projects in research, knowledge transfer and product development.
- Shared equipment for the undertaking of research activities, also used as teaching materials.
- Organisation of lifelong learning schemes for enabling the renewal of knowledge.

Mondragón Components is structured into three clearly differentiated Business Units (Figure 31) concerned with technologies, applications and markets, but all three have one single object:

> *"To develop an internationally competitive cooperative group with worldwide presence and providing innovative solutions to customers' needs, in the sectors of White Goods, Home Comfort and Electronics" (www.Mondragóncomponentes.com)*

Components for *White goods* appliances	**Gas cooking**
	Electric cooking
	Electronics' for cooking
	Washing
Components for *home confort*	**Water heating**
	Air heating
	Heating and Plumbing

[20] The data refers to 2013 and it is obtained from http://www.mondragoncomponentes.com/quienes_somos.html

[21] http://www.mondragon.edu/es/campus-de-excelencia-internacional/resumen-de-agregaciones-y-objetivos/empresas-y-asociaciones/division-componentes-de-mondragon

Electronic Components	Semiconductors
	Signal Processing
	Electronic manufacturing
	Services

Figure 31: Business Areas in Mondragón Components

Mondragón Components places all its capacity for Innovation at the service of its customers, and earmarks many of the resources to research and development in all fields. The result of this has been the creation of the Centre for Research, Development & innovation of Mondragón Components named 'CS Centro Stirling'[22]. The technological centre is dedicated to sustainable energy in the home environment.

Since its foundation, in September 2009, participated by 9 cooperatives, Ceramat, Copreci, Consonni, Eika, Embega, Fagor Electronica, Matz-Erreka, Orkli and Tajo, it emerges to provide a coordinated response to R & D and to take advantage of synergies in the areas of renewable energy and its efficient use in the home environment.

> *"CS Centro Stirling was created to support companies in the development and optimization of their products and to strongly promote the most ambitious and risky projects of Mondragón Components. Its activity will result in the incorporation of new technologies, new products, new industries and new companies to our industry."*

CS has a wide network of national and international technology partnerships that complement their own capabilities to provide comprehensive solutions to their customers.

5.1.2. General Economic Context of the Company in the Observed Period

The year 2007 was a profitable return point throughout the first decade of the XXI century. The following figure (Figure 32) shows the position of the Basque Country (CAPV) compared with European countries and the US in terms of GDP, employment rate and productivity. The 2007 period seemed to be prosperous and was doing well.

[22] http://www.mondragoncomponentes.com/eng/innovacion.html "CS Centro Stirling is accredited as a Science and Technology Centre by the Basque Government and integrated into the Basque Science, Technology and Innovation Net."

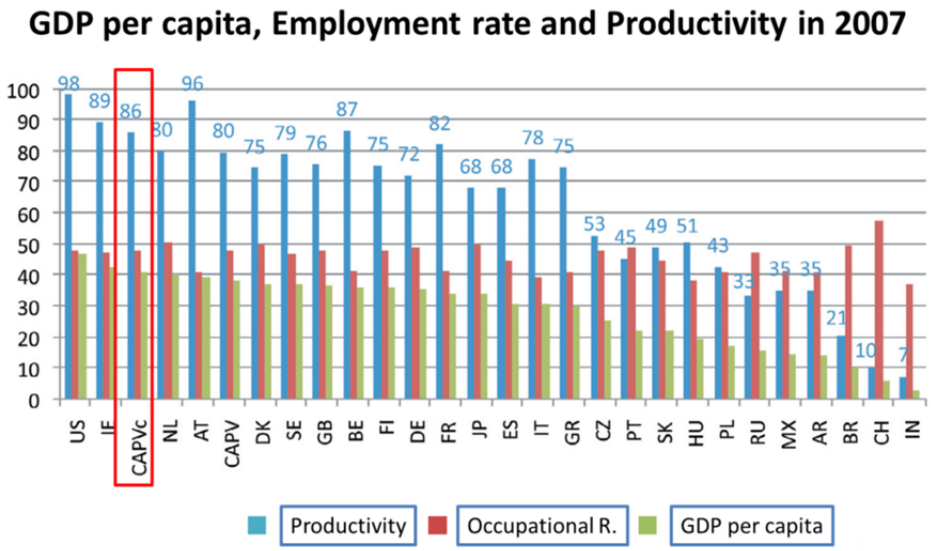

Figure 32: Economic performance in the Basque Country (CAPV) in 2007[23]

Observing the evolution of the variables over the period 2007-2012 now, it can be seen how the global economic crisis also affected the economy of the Basque Country (Figure 33).

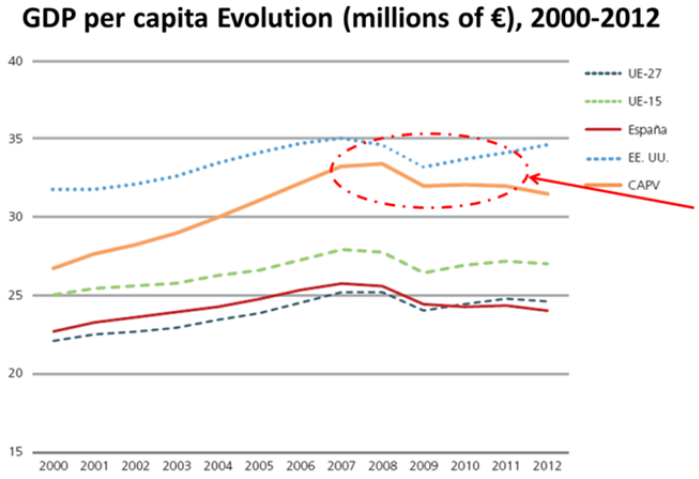

Figure 33: GDP per capita evolution, 2000-2012. Source[24]

The economic crisis dominated the two years after 2007 and clearly meant a turning point (Orkestra, 2009). One of the main strategic lines of the Government of the Basque Country in

[23] II Competitiveness report of the Basque Country: towards a competitive stage of innovation (2009) Orkestra, Basque Institute for Competitiveness.

[24] AMECO & Eustat (Basque Statistics System) in II Competitiveness Report of the Basque Country: towards a competitive stage of innovation (2013) Orkestra, Basque Institute of Competitiveness. (http://www.orkestra.deusto.es/images/publicaciones/archivos/000399_II%20Informe%20digital.pdf)

that period was characterized by the tendency to evolve from an "investment-based economy" towards "an innovation-based economy". The Basque Country competitiveness report of 2007 stated that *"When an economy makes the transition to a new stage, the features of the previous stage do not simply disappear but the main features of the new phase are dominant."* (Orkestra, 2007). As a result, any strategy to progress towards an innovation-based stage of competition must be complemented with sub-strategies for the broad spectrum of stakeholders. During 2009-2011 the GDP trend was characterized by stability but returned to find another, milder, fall in 2012.

As far as the macroeconomic data are concerned, the information about those sectors to which Mondragón Components supply (four sectors have been selected as principal), the results of the GVA (Gross Value Added) of these sectors are shown below (Figure 34) and they show a decreasing trend in this period.

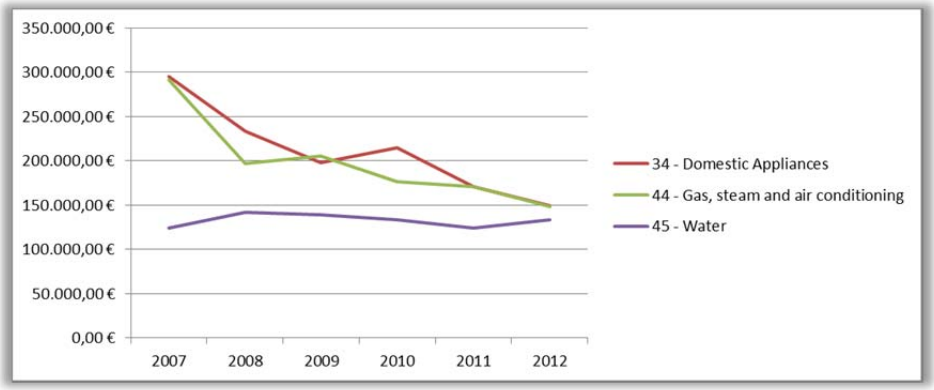

Figure 34: GVA's evolution (Gross Value Added at factor cost, 2007-2012).
Source: EUSTAT – Basque Statistics System (www.eustat.es)

With regards to the information that the Annual Reports of Mondragón Group provides each year, during the observed period, the Industrial Area suffered the same consequences of the crisis that the global group did. The trajectory followed by total sales and employment, in the period 2007-2011, has undergone a dramatic decrease (Figure 35; Figure 36).

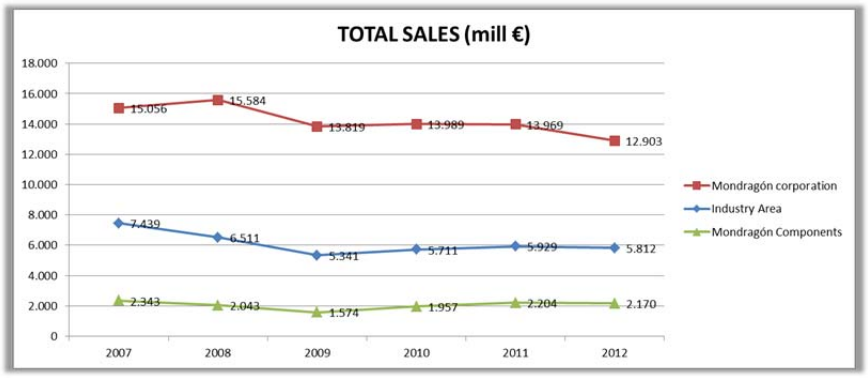

Figure 35: Total Sales – Mondragón Corporation, Industrial Area and, Components Division. Source: Mondragón Annual Reports (2007-2012)

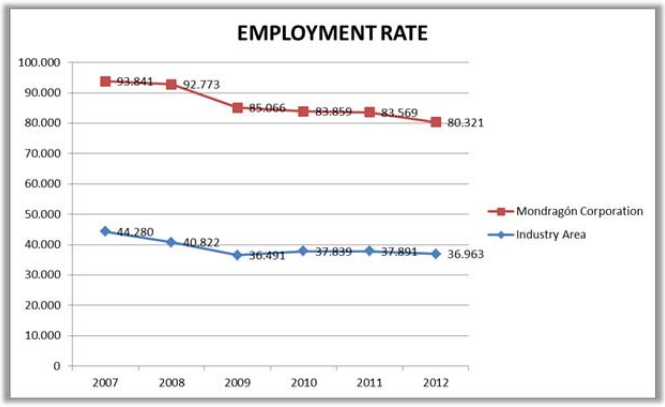

Figure 36: Employment rate in Mondragon Corporation and Industrial area. Source: Mondragón Annual Reports (2007-2012)

Even though the decline in the case of the industrial area, as well as in the case of Mondragón Components, the trend changed from 2009 onwards and the indicators began to increase. The driver of this growth tendency was, and still remains, the export market. It was in 2009 when, according to the global strategy of the whole group, the industrial area reacted implementing a series of actions to conform to the crisis scenario. That year began implementing major adjustment, structural and strategic efforts, to improve the competitiveness of the cooperatives and their general conditions.

These efforts and preventive measures show a distinct demonstration that the principles and values that drove the development of the Corporation, especially in terms of solidarity and inter-cooperation, are in still full force and have been essential to effectively manage the readiness process for the future. Throughout the year 2011 a new and slow economic downturn occurred

and it activated a new negative growth. In this difficult scenario, the main challenge of Mondragón Components has been the business transformation.

The guidelines followed were based on the consolidation of businesses with clear leadership positions in the global market, the disinvestment in business models whose future is sensed to be not feasible, more focus on those businesses with expanding perspectives through new investments, alliances as well as acquisitions, and responding to the opportunities arising from new demands and technologies.

5.2. Suitability of the Exploratory Study for Thesis' Purposes

In this section, we attempt to illustrate the main reasons for this qualitative research exploration proposed for helping us to understand the process of organisational change. The basis for the review will be to gain understanding as to what extent the company's change strategies over dynamic capabilities, organisational responsiveness and absorptive capacity are likely to have an impact on its organisational flexibility level when it endeavours to achieve the alignment with their environment within a large cooperative group. Some limitations to achieve the desired flexibility level will be considered to provide evidence on how the theory could be improved or extended.

Two main considerations have been the foundation for choosing Mondragón Components, in the components industry sector, during the 2007-2011 period as the research setting.

First of all, that period represented a good example of changes in the environmental turbulence and it matched the aim of this research. The business environment of the industrial sector began to suffer an important deceleration towards the end of 2007 although, in general, the period had been very profitable. As was mentioned in the Mondragón Annual Report (2007), a positive international scenario, accompanied by a favourable performance by the domestic market (Spain's GDP grew by 3.8%), drove the Mondragón Industrial Area towards a positive economic performance[25]. However, by the beginning of 2008, the situation drastically changed due to a widespread downturn in the world economy, resulting in a global recession in

[25] Mondragon Annual Report, 2007. http://www.mondragon-corporation.com/wp-content/themes/builder/informe-anual-2013/pdf/en/annual-report-2007.pdf

the developed countries[26]. Mondragon's Industry Division suffered a sharp fall in demand, more pronounced in the domestic market than the international market that became more acute by the end of the year.

Since Mondragón Components is part of the Industry Division, it suffered the same consequences: the crisis largely affected the components sector and more concretely the automotive and domestic appliance components. **The following years represented a big challenge for organisational flexibility in terms of strategic decision-making.** While in 2009 the recession continued to have an impact on all the industrialised nations and the Industry Division of Mondragón Corporation was affected by the general economic slump, it reacted by introducing a series of measures designed to adapt to the new situation[27] and by diversifying internationally increasing its presence in countries that had barely suffered the crisis, as in Asia for example. "*A significant contribution […] has been made by the flexibility inherent to our cooperative status and by the responsibility […] cooperative members have accepted the efforts and sacrifices required in a situation of such adversity as that experienced last year*." (Mondragón Annual Report, 2009: 16). The years 2010 and 2011 meant the transition to a weak economic recovery. The first signals of a slow exit from the recession started in 2010 although, in financial terms, a slight shrinking of the economy with respect to 2009 was registered. Throughout that year, the international market, more satisfactory than the domestic market, provided a certain level of relief in terms of industrial activity while the Mondragón Industry Division continued applying measures aimed at adjusting to the situation. For 2011 as a whole a slight increase of economic growth started compared to 2010. Once again, the foreign sector was the main driver of the economic activity in general and industrial activity in particular.

Correspondingly, **the selected period represents a turbulent period during which the home appliance and automotive sectors were forced to implement decisive strategic actions for Basque cooperatives**. The selection of the period 2007-2011 is primarily motivated by the aim of our study, which is concerned in providing insight into how Mondragón Components adjusts

[26] Mondragon Annual Report, 2008. http://www.mondragon-corporation.com/wp-content/themes/builder/informe-anual-2013/pdf/en/annual-report-2008.pdf
[27] Mondragon Annual Report, 2009. http://www.mondragon-corporation.com/wp-content/themes/builder/informe-anual-2013/pdf/en/annual-report-2009.pdf

its current and potential level of flexibility in response to external rates of change in the components industry (and the role of potential absorptive capacity herein).

Secondly, Mondragón Components represents a well-known example of being able to **sustain high levels of performance** without sacrificing essential cooperative features when facing a fast-changing environment. Arando et al. state that *"Some of the institutional arrangements that distinguish Mondragón both from conventional firms and other PCs* [producer cooperatives], *and which facilitate the* ***high degree of adaptability and flexibility*** *in the Mondragón corporation and its member cooperatives, are reasonably well known* […]." (Arando et al. 2010: 23). Arando et al. (2010) state that Mondragón group is one of the best-known examples of "real-world" cooperatives. One of its main characteristics has been linked to employee ownership (all workers are members). Other distinguishing features at Mondragón include provision for profit pooling and a rich set of institutions to support primary firms (Arando et al. 2010: 2). In their study, Arando et al. (2010) show that the **Mondragón experience has long attracted the interest of different scholars on a varied range of issues**, among others: Mondragón's capacity to be institutionally adaptive (Moye, 1993; Whyte, 1999); the remaining employment rates or fewer job losses in the Mondragón group (Bradley and Gelb, 1982); how co-ops located in Northern Spain are able to respond to the numerous challenges confronting them (Cheney, 1999); the Mondragón group chosen by Dow (Dow, 2003) as an example of workers' control in modern economies; and, sometimes the Mondragón group has been presented as a kind of "exemplary model" as regards **feasible alternative enterprise forms in today's globalized economy** (Charles et al. 2008).

As such, the importance of flexibility, in general terms, for Mondragón Components' strategic planning process provides **a suitable context for investigating the extent to which change strategies over dynamic capabilities, organisational responsiveness and absorptive capacity are likely to have an impact on its organisational flexibility level.**

5.3. Process followed to develop the qualitative research exploration

Our dependent variable is the level of Organisational Flexibility, which is defined as the difference between the current and the required level of organisational flexibility that the company is deploying and the environment demands correspondingly. To assess this, **we analysed the evolution of the Organisational Flexibility's variables** over the 2007-2011 period in the selected industrial cooperative group.

At the beginning of the process, in 2007, six cooperatives' managers and the R&D manager participated in the data gathering process answering the first version of the QSF questionnaire. However, four years later, those six managers were replaced and the new managers could not participate in the qualitative exploration. We decided to continue with the process in 2011 with the R&D manager who has been followed the changes experimented by all the cooperatives of the Mondragon Components. He contributed to discovering relevant insights to be taken into account nonetheless the study did not provide the required rigor to the analysis as a case study research. Thus, the assertions of the R&D manager could not be considered generic to the cooperative context. He showed having a global vision of the operative functioning of the cooperatives whose innovation strategy he is leading in the large industrial group. The general managers of the six cooperatives would have provided more specific information but isolated facts from each cooperative.

In the following figure (Figure 37), we aim to show the data gathering process that has been followed with the industrial cooperative group.

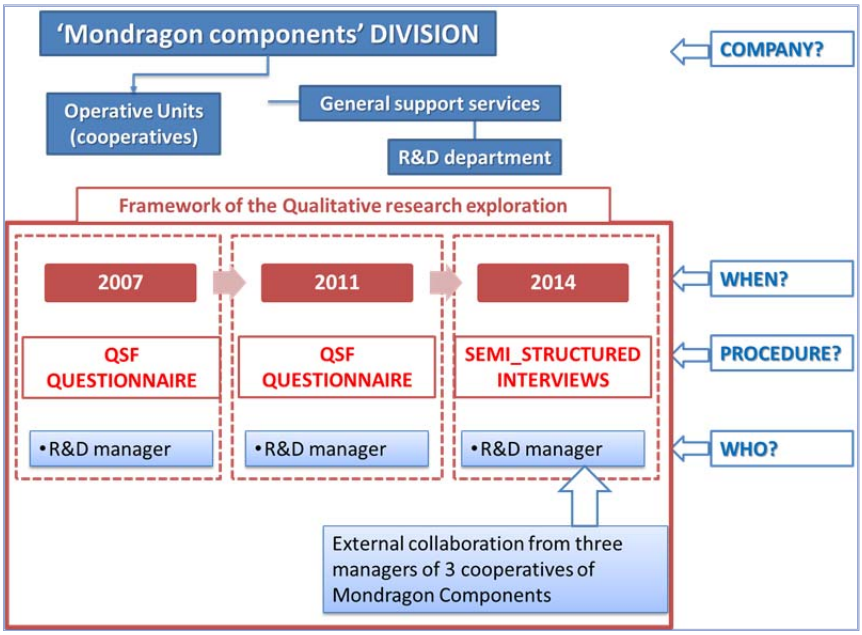

Figure 37: Timetable of data gathering process

The data collection protocol was based on the main characteristics of the industrial cooperative group (Mondragon Components). First of all, the results from the questionnaires derived from Volberda's QSF method were obtained. The QSF method was provided to the R&D manager (see Annex I-QSF questionnaire). In 2011, the same QSF questionnaire including additional questions (see Annex II-Adapted QSF questionnaire) was distributed to the R&D manager. Secondly,

several semi-structured interviews (four interviews in four months) were developed with the involvement of the R&D manager[28] in order to complete the data gathering process (it was held and documented on July-October 2014). During the four face-to-face interviews[29], the results from the two questionnaires were compared and verified with the R&D manager. He also contributed to check some arguments with the three cooperatives' managers, in order to assess and highlight the main causes of the evolution that the variables studied have followed.

5.3.1. Data gathering from theoretical framework (Quick Scan Flexibility-QSF)

Although traditional organisational forms have worked well in relatively stable environments in the past, globalization of markets, rapid technological change, the "shortening" in the products' life cycles and the increasing aggressiveness of competitors have radically altered the rules to compete in the current decade. This creates new demands in the repertoire of capabilities for anticipation and reaction and, in organisational design.

Often the flexibility level of the organization must adjust to a changing competitive environment. The 'Quick Scan Flexibility' method allows, through a questionnaire, placing the environmental turbulence, the managerial capabilities and the organisational design in a comprehensive framework and also allows determining the current, potential and required flexibility levels of the organization that is being assessed.

The proposed framework as a theoretical basis of the questionnaire is based on the renowned research work on flexible organisations conducted by Henk Volberda (Volberda, 1998). It has been developed at the RSM Erasmus University (Netherlands) by Prof. dr. Henk W. Volberda and drs. Niels P. van der Weerdt. Both professors have collaborated in the analysis and evaluation of results of this qualitative explorative study. This questionnaire and its calculation model have been validated statistically and used in academia[30]. Recently, it has been applied in studies on

[28] Javier Aranceta, R&D manager of Mondragon Components (industrial group) and manager of the a new recently created R&D unit, CS Centre Stirling, specialized on the development and optimization of products and services for the generation and effective use of energy (http://www.centrostirling.com/ing/empresa.html) (http://www.tulankide.com/es/javier-aranceta-director-gerente-de-centro-stirling-201casistiran-los-investigadores-mas-reputados-en-tecnologia-stirling201d)

[29] See Annex III – interview guide

[30] "Searching for synergies in teaching and research, Niels developed the Quick Scan Flexibility (QSF) with Henk Volberda and had students apply the QSF and analyze the flexibility of thousands of organisations in the Netherlands and abroad. Applying the QSF on such a broad scale has resulted in wide dissemination of

the ideal balance between organization and environment, the characteristics of strategic flexibility and the differences between large and small companies concerning organisational flexibility.

The first QSF questionnaire (Annex I) was distributed by email in 2007 (in word format). After obtaining the completed questionnaire, the responses were sent through a web support tool to the RSM University[31] (Figure 38) and the 'Department of Strategy and Business Environment' treated the information and developed a customized report of results. They were shown through a personal meeting to the person who participated in the study and other relevant management members. During the said interview, additional information regarding economic context and strategic plans of the company in the long term was captured and it facilitated new insights for continuing the evaluation of the same variables in a time horizon of 4 years.

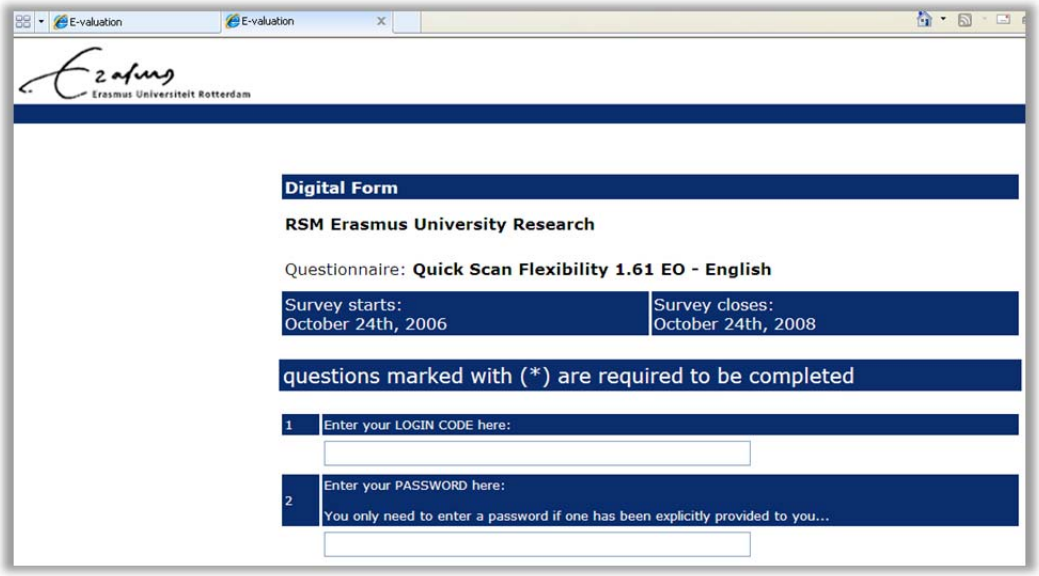

Figure 38: Home Page of the QSF (source: http://www.evaluation-erasmus.nl/cgi-bin/react_tool.pl?md5obj=4766f48d3dfb5de5ba85d18b614e209d)

The second QSF questionnaire (Annex II) was distributed by email at the beginning of 2011 (in word format). The questionnaire was improved by adding two news questions in order to know

managerial knowledge within the business community and a vast database with rich information on the flexibility of a diverse set of organisations." (van der Weerdt, 2009)

[31] Based on a web-based questionnaire (http://www.evaluation-erasmus.nl/cgi-bin/react_tool.pl?md5obj=4766f48d3dfb5de5ba85d18b614e209d) that the Department Strategy & Business Environment developed. The digital form of the questionnaire titled "Quick Scan Flexibility"(version 1.61 EO – English) was active during the period October 24th, 2006 – October, 24th, 2008.

which type of change strategies were implemented by Mondragón Components in the 2007-2011 period (Routinization or revitalization strategies) and whether any barriers to change emerged during the implementation. The same process as in 2007 was followed and the report on Organisational Flexibility of 2011 was provided by Erasmus University accordingly.

The resultant report, in both periods, aims to provide the company with clear clues about the application of theory in regards to organisational flexibility. However, the final decision on how the company should deploy flexible strategies requires a thorough knowledge of the subject. According to the theoretical framework of Volberda (Volberda, 1998), the diagnosis provides the result of four main indicators and determinants of organisational flexibility (Figure 39) and the trajectory of change proposed to achieve the level of flexibility required by the environment.

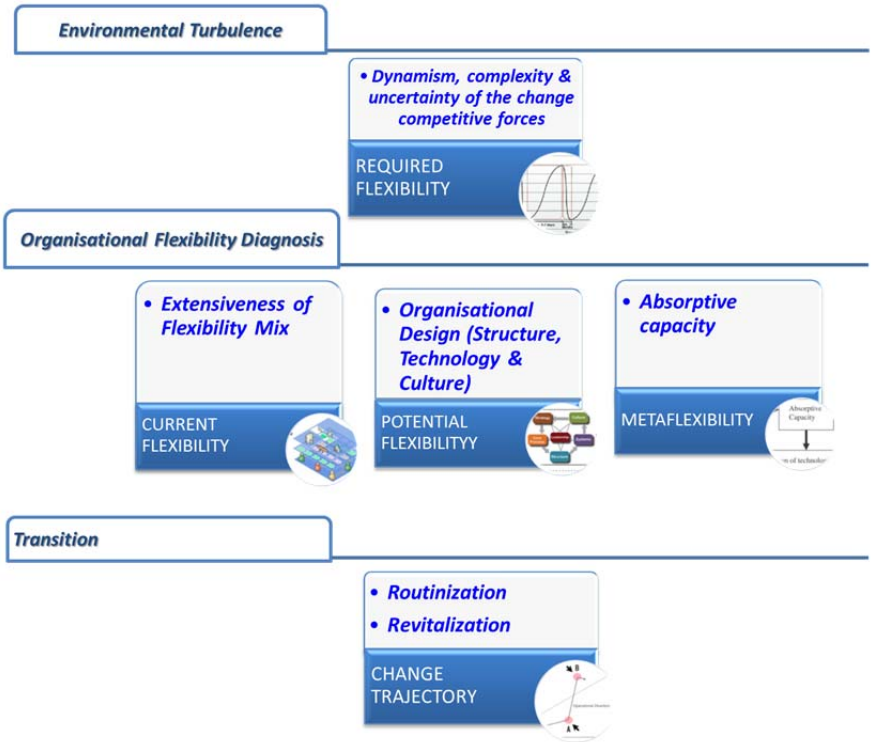

Figure 39: Volberda's framework main elements *(adapted from Volberda, 1998)*

In four steps, the Quick Scan Flexibility determines the organization's ability to deal with changes in the environment and the actions needed to optimize flexibility. The model is made up of three elements: the *required* level of flexibility, the *current* level of flexibility and the *potential* for flexibility (see Figure 40). When the current and/or potential do not meet the required level, a change trajectory is proposed, e.g. routinization or revitalization.

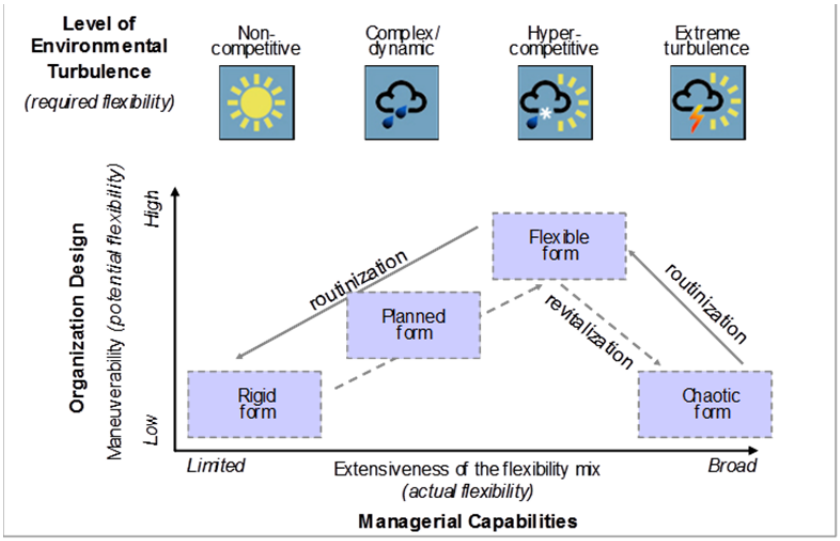

Figure 40: The framework 'organisational flexibility' with four levels of environmental turbulence (required flexibility) and four matching ideal types of organisational flexibility (*Source: QSF report*).

The main variables that the QSF method measures, their corresponding elements and the likely values they can take are provided in the following table (Table 17).

Table 17: QSF VARIABLES AND MEASURES

QSF DIMENSSION	VARIABLE	ELEMENTS	MEASURES
REQUIRED FLEXIBILITY	**Environmental Turbulence**	Dynamism Complexity Uncertainty	1 – Non-competitive environment 2 – Complex/Dynamic 3 – Hyper-Competitive 4 – Extreme Turbulence
CURRENT FLEXIBILITY	**Extensiveness of Flexibility Mix**	Operational Flexibility Structural Flexibility Strategic Flexibility	1 – RIGID 2 – PLANNED 3 – FLEXIBLE 4 – CHAOTIC
POTENTIAL FLEXIBILITY	**Responsiveness**	Structure Technology Culture	1 – RIGID 2 – PLANNED 3 – FLEXIBLE 4 – CHAOTIC
META-FLEXIBILITY	**Metaflexibility**	Absorptive capacity	1 – RIGID 2 – PLANNED 3 – FLEXIBLE 4 – CHAOTIC
CHANGE STRATEGY			**MEASURES**
Current Flexibility	**...HIGHER than...**	***Required Flexibility***	ROUTINIZATION
Potential Flexibility	**...HIGHER than...**		
META-Flexibility	**...HIGHER than...**		
Current Flexibility	**...LOWER than...**	***Required Flexibility***	REVITALIZATION
Potential Flexibility	**...LOWER than...**		
META-Flexibility	**...LOWER than...**		

Once we have obtained the results from the two questionnaires, the objective within this explorative study is to compare the evolution that the variables have followed in the observed period and to analyse the strategic changes that the organisation has implemented and their consequences over the measured variables. In order to validate the results, the R&D manager participated in several semi-structured interviews and three managers of the cooperatives that belong to the Mondragon Components endorsed his assertions. His assertions, in this thesis, have not been considered as generic for the cooperative context however, it must be noted that his long professional trajectory leading the R&D management department (since it was created) together with his previous experience as manager of one cooperative, guaranteed (in some extent) a more holistic view of the large cooperative group than could have been provided by general managers.

Based on the aforementioned research objectives, we present the results obtained in the two periods complemented with additional explanations obtained from the interviews in the following section. We aim to evaluate the causes of the Organisational Flexibility evolution. Lastly, we briefly summarize the comparison of the results in the exploratory study with Volberda's theoretical statements and some managerial implications are derived from each of the four dimensions that have been explored.

5.4. Organisational Flexibility on Mondragón Components

In this section the results from both reports are depicted in several building blocks, following the sequence of the analysis proposed by the QSF report, providing the comparison between the two periods. Said comparison was shown to the R&D manager of Mondragón Components who agreed on the obtained results, provided insights about his answers and clarified some of the circumstances behind the evolution of the variables of Organisational Flexibility. During the interviews, some managers also participated.

Mondragón Components industrial cooperative group created its R&D department in 2003 and its main role within the cooperative group is mainly focused on: coordinating the R&D activities of the cooperatives, individually or jointly; enhancing the creation of new business models, accompanying coops during the first years of a new activity launch from a strategic perspective

and providing technological support. The R&D department's role within the cooperative industrial group can be seen more clearly in the following comment from the R&D manager:

"This department has not an executive capacity. Any adjustment measure taken, have autonomous initiative, that is, the cooperatives are companies who make the decision by themselves."

From 1980, the group decided a new reorganization based on two main features: (1) the establishment of central structures for overall governance, strategic coordination, and the provision of management services; and (2) the creation of subgroups of firms and the groups/divisions by industrial sector instead of by region (Arando et al. 2010). Such structural changes represent the corporation's *"attempts to solve the dilemma of how best to provide for a high degree of democracy and autonomy in individual firms and yet also allow central bodies to promote changes, economies of scale, and sustained efficiency in the whole group"* (Arando et al. 2010:24). However, the basic organizing principles at Mondragón remain largely intact, seeking to balance autonomy for individual co-ops with strategic coordination and common governance (Arando et al. 2010:26).

It is worth noting that, the participation of the R&D manager following the results and contrasting the information thorough the period of the research analysis has guaranteed a continuity vision since he participates in the process before, during and after the decision is made. In that sense, according to the objectives of the research, the information provided by the R&D manager covers the trajectory of the whole coops group in these 4 years. The R&D manager has a complete knowledge of the coops' activity in terms of organisational flexibility and he answered based on the global evolution of the cooperatives that constitute Mondragón Components. The R&D manager of Mondragón Components perfectly knows the cooperatives' needs for balancing exploitation and exploration activities. All his arguments have been supported by real examples from cooperatives of the industrial group and by three managers that confirmed the information to be contrasted.

5.4.1. Environmental Turbulence (*Required* Flexibility)

In this section, the results obtained regarding the level of turbulence in the environment are depicted for the observed period. They determine the ***required*** level of organisational flexibility. Environmental turbulence is measured by the dynamism, complexity and unpredictability of

changes in the environment in which the organization operates[32]. Four levels of turbulence can be distinguished:

- Non-competitive: static, simple and predictable.
- Complex/Dynamic (moderately competitive): dynamic and/or complex, but not unpredictable.
- Hypercompetitive: dynamic and/or complex, but most of all unpredictable.
- Extreme turbulence: very dynamic and/or complex, and fundamentally unpredictable.

Figure 41 shows the scores of the organization in the two years analysed and they are compiled to determine the level of environmental turbulence. The combination of scores in each variable within Environmental Turbulence results on its resemblance with one of the ideal types.

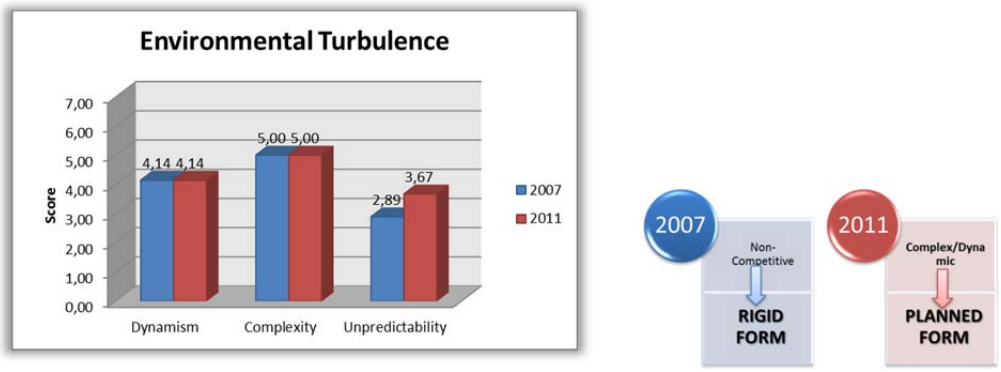

Figure 41: Environmental Turbulence results in Mondragón Components (2007-2001)

In 2007 the environmental turbulence score was 'Non-Competitive' – which corresponds to a *Rigid Form* - while in 2011, the same dimension had evolved towards the second level, 'Complex-Dynamic' – which fits into a *Planned Form*. In 2007 **the level of uncertainty coming from the changes in competitive forces was a bit lower than in 2011.** The higher level of uncertainty is mainly due to difficulties in the access to information: getting trustworthy information from the market is more difficult. In general terms, the market remains highly predictable but the access to competitors and consumers' information is more difficult.

For the cooperative group (Mondragón Components) the greatest difficulty comes from, particularly in its sector, the tendency of customers to take part in large alliances. In the new global crisis environment, greater efforts are needed to gain the trust of its customers to enter

[32] For more information see Section 3.3

into such partnerships. Not only the number of customers has been reduced due to the economic crisis but also the competitors. Since the costumers are more concentrated, the opportunity to enter into those markets is considerably reduced due to the greater required volume of information. However, once the company enters into that market, it provides a better market position.

Having clarified this concept, the first aspect to explore within this dimension is related with knowing whether the manager's perception has differed from the real situation to a greater or lesser extent. Generally speaking, *"our error margin could be higher than in other companies with a different organisational structure than a cooperative group".* According to Aranceta, the R&D manager, the main limitation is the type of information to which cooperatives and R&D departments can access. In Mondragón Components the R&D department can access future exploration insights with the appropriate resources to process the data gathered. He always participates in R&D forums organized by Mondragón Corporation and its associated coops, among others events. Oppositely, "*the operational part of cooperatives has more information about those circumstances that affect exploitation activities but they have no overall resources to process this information and make it useful in decision making"*.

For example, during the observed period some organisational change options were conducted by some cooperatives, which were opposite to or not suitable to what the 'competitive forces' required at that time (misperceptions of the managers). As has mentioned above, the role of R&D department is focused on advising proposals for appropriate changes into new markets and new business models, however, the decision-making and implementation capacity concerning such changes lies in the governing boards of the cooperative that may or not proceed with these proposals. The R&D department proposed alternatives of change to some cooperatives greatly affected by the crisis in order to avoid closure. In some cases, the recommendations were followed and not in others. Two coops which didn't follow the recommendations provided by the R&D department, closed. The individual cooperatives' autonomy affects those rare cases of co-op closures, and to the firms' decisions to enter and/or leave the Mondragón group. In this sense, in anticipation of shifting market opportunities, Mondragón might take the initiative in suggesting concrete ways in which individual co-ops could shift their product mixes and even give advice on new plant locations. But final decisions rest with the individual cooperatives (Arando et al. 2010:25).

Last but not least, the manager stated that, in Mondragón Components, measuring or assessing the evolution of competitive forces in their environment (customers, suppliers, competitors, partners, etc.) is not currently used as a best practice[33] or even used for decision-making. It is quite common to manage the information coming from the R&D forums in which he participated. Therefore, change decisions are not taken on the basis of a thorough study of the environment and the forces operating in it. It is assumed (and commonly accepted) that the environment is fairly predictable.

5.4.2. Extensiveness of Flexibility Mix (*Current* Flexibility)

The questionnaire in this section aims at defining the form in which the managerial task is developed by Mondragón Components. This task is named 'Extensiveness of Flexibility Mix' (Volberda, 1998) and it results from the combination of two aspects: variety of dynamic capacities and the reaction speed on activating such capabilities when the environment changes. This combination results on three groups of flexible capabilities:

- Operational flexibility: the ability to change the volume and mix of business activities.
- Structural flexibility: the ability to change the organization structure and decision-making and communication processes.
- Strategic flexibility: the ability to change corporate strategy and the nature of business activities.

Figure 42 shows the scores of the organization in the two years analysed that have been compiled to determine the level of current flexibility. The combination of scores in each variable within Extensiveness of Flexibility Mix results in its resemblance with one of the ideal types.

[33] This will be further explained in Metaflexibility section (Section 4.4)

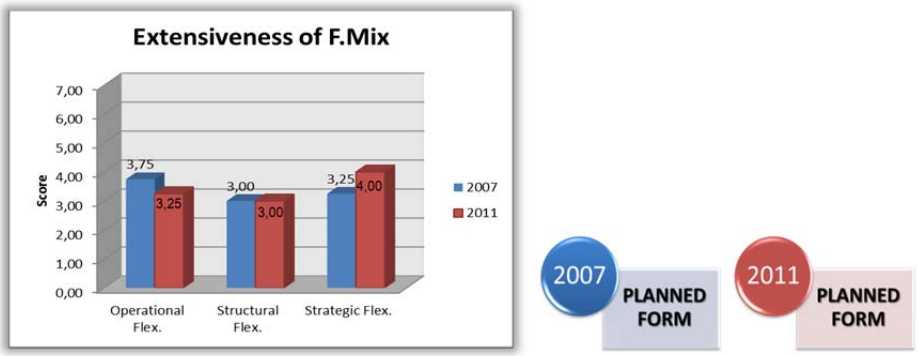

Figure 42: Extensiveness of Flexibility Mix results in Mondragón Components (2007-2001)

The global score of this dimension scarcely varied in 2011 in comparison to 2007. However, by looking in detail at the assessed variables, some differences can be highlighted. On the one hand, **the operational flexibility decreased** mainly due to the reduced flexibility of changing workforce, activities and suppliers in manufacturing processes. On the other hand, along the four-year period the **strategic flexibility slightly improved** due to the increase of the development of new products and services and, to a lesser extent of new business models.

Aranceta seeks to clarify that despite the critical situation mentioned in the previous subsection; this did not significantly affect the turnover of the cooperatives in Mondragón Components. In his opinion *"the cooperative model in times of crisis finds an opportunity. During the recession some competitors leave the market clearing the way for the entry of others, this can provide greater confidence to large customers. Also in the cooperative model cost reduction is much easier* [to implement]". The cooperative members are the owners of the company; they approve all salary or dividends reduction measures. He adds, "*Such a financial solvency makes new customers or new market segments to trust in the organization*." Linking to this aspect, Arando et al. mention, *"Membership has always been closely linked with employee ownership and, in the early decades, essentially only and all workers were members. Membership provides a guarantee of employment, relocation or 80% of salary during times of slack demand as well as the right to participate in the firm's General Assembly, vote for and serve on electoral bodies, and receive a share of profits."* (Arando et al. 2010).

With this basis, the first aspect to explore within the 'Extensiveness of Flexibility Mix' dimension is related to knowing the main strengths of Mondragón Components in the field of managerial task throughout the observed period. The QSF's results in both years show that, despite the

great level of human resources flexibility which the particular characteristics of co-ops allow, the level of Operational and Structural Flexibility do not take high scores. It is unavoidable that the absorption of other co-ops' staff and debts affects the characteristics covered by such dimensions of Organisational Flexibility. As for the operational flexibility, Aranceta makes this aspect clearer, *"the crisis period that spans from 2007 influenced the trend of increasing internal operational efficiency however, the participation in international networks make us to risk finding new innovations although they are very weak bets*". It is mainly due to the tendency of using their own resources, *"We are terribly inbred both in ways of doing, in capital and even people."* This peculiarity of cooperatives can dial another constraint to achieve the desired Organisational Flexibility. In Mondragón Components, the exploitation activities prevail over the exploration ones: from the top management there is an aversion to risk, there is a tendency to devote time to scan the environment, avoiding surprises, and a cautious attitude when there is much uncertainty in decision-making.

On the opposite side of things, the increase level of Strategic Flexibility is justified, to some extent, by the general efforts of cooperatives (in Mondragón Components) in the internationalization process and their commitment to innovation. This issue is clarified by Aranceta, when he specifies: *"the strengthening of the Strategic Flexibility has not been driven by increased exports. It has helped but it has not been crucial; the growth in international sales by a higher participation in international markets was already significant before 2007. Rather, the efforts of R&D to adapt its products to these new markets have been crucial both to improve its position in flexibility and prevent the entry of competitors*." Such arguments are clearly endorsed by taking the basis of the Mondragón group's annual reports as far as the observed period is concerned: the increase of the international market share of almost all cooperatives (the average of the international sales over the total has increased 9.31% in the period) and the tendency of some cooperatives to becoming a global supplier in the emergent economies promoting innovation. Most of cooperatives in the industrial group participating in this study (Mondragón Components) have addressed the business transformation focusing efforts on the aforementioned objectives in the Automotive Components sector where the widespread slowdown in all businesses was not as sharp as in the Domestic Appliance components sector.

Cooperatives of Domestic Appliance sector in 2008[34] were aware of the need to adapt businesses to the new market situation, and they actively worked to remodel the area and to provide more value by **developing new activities and vigorously promoting innovation and new developments**. For example, a Research, Development and Innovation Centre was set up, specialised in Stirling technology, with the participation of nine of the Division's co-operatives and, the start-up of a joint-venture with the New Zealand company Meridian Energy (e.g. EHE-Efficient Home Energy). 2009 was *a hard, difficult year in which the global market for components has accelerated its fall*[35]. Nonetheless, by the end of 2009 a positive trend in sales in some co-ops' businesses is appreciated due to the disappearance of certain competitors as well as due to businesses being adapted and resized to deal with the new circumstances of the global market, the strategic commitment to new activities that may provide alternatives for the creation of wealth remains fully effective (e.g. the Stirling Centre, systems for analytical control based on Surface Plasmon Resonance (SPR) technology, and a new mixed cooperative, Isoleika S.Coop. which will sell super thermal insulation panels in 2010). 2010 *was characterized by an upward trend in terms of turnover and with the export market playing the starring role*[36] due to the increase in new businesses and new demand from emergent economies. In terms of new projects, in the components business the focus remains on new options for growth. As the Annual report of 2011 clarifies, in the Industrial Components group the directives followed (mainly in those sectors mostly affected by the global crisis, such us domestic appliances components) have been based on the consolidation of businesses with clear leadership positions in the world market, divestment in those with no apparent viable future, the securing of those that may have a future through investment, partnerships and even takeovers as well as responding to opportunities derived from new demands and technologies.

As for the Automotive Components, in 2008 the strategy of most of the cooperatives were based on their commitment to innovation and the generation of skilled, co-operative employment in order to reinforce their global competitive position and the profitability of its businesses (such as in the example of Fagor Ederlan). Other examples were the investment in new technologies which put the company at the forefront of its sector in Europe, significantly increasing its flexibility and competitiveness (e.g. Mapsa) or the international expansion by setting up

[34] Mondragon Annual Report (2008)
[35] Mondragon Annual Report (2009)
[36] Mondragon Annual Report (2010)

production plants abroad and by partnership with relevant clients which guarantee being global suppliers (e.g. Batz Sistemas) or the development of design centres gaining access to the initial stages of the value chain (e.g. Maier). The cooperatives of the automotive sector suffered significant difficulties over the years 2009 and 2010 although most of them maintained their business in such difficult years. Exceptions are represented by two cooperatives which, in spite of these adverse circumstances, ended the year 2009 with extremely positive earnings through becoming an undisputed market reference worldwide (through its plants in Europe, and of manufacturing alliances in Asia and the USA such as Fagor Ederlan) or consolidating its strategy of customer diversification (e.g. Batz Sistemas) expanding production towards international markets. In 2010 the Automotive Components sector recovered figures came close to those recorded in 2007 mainly due to the **reinforcement of inter-cooperation** (between coops of MCC) and to a decisive development **of international expansion projects** and, in some cases **its entry into new sectors.** 2011 was characterized by significant increases in activity and growth compared to the previous year and it was a very active year on the international stage (e.g. 5 new plants were opened). The main drivers were: **the repositioning in the market of some co-ops has enabled the increase in the trust of its main customers; the basic pillar to consolidate theirs position is the firm's global presence; significant deployment in terms of product innovation took place; new set ups, developing a globalization process, helped the cooperatives' position as global suppliers; as well as, inter-cooperation projects**.

The second aspect to be considered is related to exploring the causes that originated such changes in the three dimensions, this means, whether any revitalization or routinization strategy has been implemented at any time in the observed period. As has been described above, revitalization strategies were implemented during the four years observed. During 2008 and 2009, despite the recession scenario, cooperatives focused their efforts on internationalisation and innovation activities and the recorded scores of performance[37] before the crisis were recovered. However, the Mondragón Components industrial group also implemented routinization strategies at the level of each cooperative mainly due to the crisis scenario as Aranceta stated. Revitalization has not been the only strategy considered and, implemented along the observed period. As has been mentioned in the Environmental Turbulence section, the global economic crisis forced all cooperatives to cost reduction measures in order to maintain

[37] We are not including employment rate. We are considering market share and sales.

employment and, more concretely, to absorb staff from the cooperatives in bankruptcy. In spite of this fact the level of flexibility through managerial tasks in 2011 remains invariable.

Finally, it is worth to note that the delay in implementing the recommended change strategy appears as a new constraint that must be taken into consideration. One of the R&D department's functions is to provide recommendations to cooperatives concerning how to refine their core competencies (revitalization strategy) when the environment is requiring it. However, not all the forces of change are driven internally (in this case from the R&D department which forces towards making strategic decisions), they also arise from what Aranceta termed as "external forces" that are difficult to control or balance with the above recommendations. These external forces come from the top-manager, who is also owner of the co-op and a radical change in their strategic direction could be made if he is replaced. Aranceta mentioned that during the observed period, some change recommendations to cooperatives were made that they did not implement at all. For example, the R&D manager suggested developing a new activity within its product offer and the cooperative decided to reduce staff. Four years after and with the decrease in performance, they have changed the strategy and have opted for this new activity. The top-management of cooperatives plays a central role in decision-making concerning routinization or revitalization strategies. Therefore, it may be concluded that the R&D department can influence how cooperatives are facing the redefinition of their core activities provided that the external forces of change allow it or, put another way, that resistance to change coming from top-management is not strong enough or it can be controlled to some extent.

5.4.3. Responsiveness (*Potential* Flexibility)

The questionnaire in this section aims at defining the form in which the organisational design task is developed by Mondragón Components. This task is named 'Responsiveness' (or manoeuvrability) (Volberda, 1998) and it results from the combination of three aspects: technology, structure and culture. This task is also relevant for the organisational flexibility level due to the utilization of the repertoire of managerial capabilities depending upon the design of the organization. The responsiveness level portrays the 'potential flexibility' of the company. The three organization design variables[38] that are considered here are the following:

[38] For more information see Chapter 3, section 3.3.1

- **Technology**: it concerns the hardware and the software (knowledge) and ranges from routine (low potential) to non-routine (high potential).

- **Structure**: it concerns the basic organization form, planning- and control systems and process regulation, and ranges from mechanistic (low potential) to organic (high potential).

- **Culture**: concerns the beliefs and values that are present within the organization, and ranges from conservative (low potential) to innovative (high potential).

Figure 43 shows the scores of the organization in the two years analysed that have been compiled to determine the level of potential flexibility. The combination of scores in each variable within Responsiveness results in its resemblance to one of the ideal types.

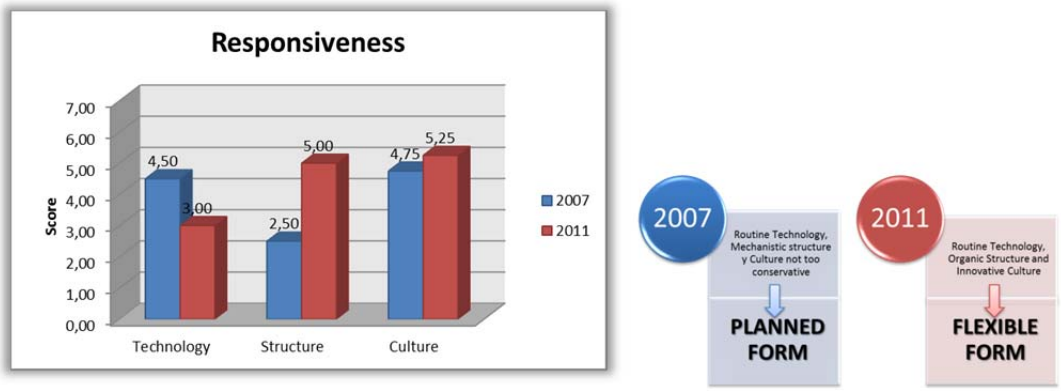

Figure 43: Responsiveness results in Mondragón Components (2007-2001)

The potential flexibility level that technology could offer has decreased in terms of processes composition and organization, employees' mobility through several production methods and functions and information systems. The update level of the company in terms of know-how has remained throughout the observed period.

As far as **structural conditions** are concerned, the experimented changes have been more intense: **higher level of potential flexibility** comes from structural conditions. Mondragón Components deploys in 2011 a more organic structure (or less mechanistic) as regards to:

- Reduction of planning and control systems
- Fewer tasks descriptions and roles in order to define work plans
- Fewer established rules and queries to management levels

Last but not least, the **cultural dimension** of organisational design has changed in 2011. The organisational culture **is closer to the 'innovative' category**. This dimension has improved mainly due to increased support from management to accept and/or consider opinions or ideas that, although they stay away from the identity of the company, may promote innovation.

The first aspect to be explored within the dimension 'Responsiveness' is related to knowing the main strengths of Mondragón Components in the field of organisational design tasks. Aranceta stated that there exist no great strengths for organisational flexibility coming from these dimensions. Concerning the operative level of co-ops, the technological characteristics (production layouts, employee's rotation, etc.) can offer high levels of flexibility but to some extent, they have been affected by the restrictions or constraints that some structural conditions may occasion. Such as the Cooperative members' dual condition of worker and owner— as members that participate in management, in the ownership, and in the company's results— which makes the human factor an even more key element in cooperative enterprises than in capitalist companies (Basterretxea, 2011:137). It differs from the most capitalist enterprises and constitutes a distinctive element that could generate sustainable competitive advantages as well as relevant constraints in terms of strategies implementation.

All cooperatives in the Mondragón Corporation have the same corporate structure (Figure 44). Their organisational structure and governance involve the following bodies: General Assembly (meeting of members convened to discuss and reach agreements on matters within its powers); Governing Council (responsible for the cooperative's management and representation); Management body (the cooperative's Manager or Director is the Chief Executive Officer); Monitoring Committee (it upholds transparency in management and veracity in reporting); and, the Social Council (the working community's permanent body for participation in the cooperative's administration). It should be noted that with the exception of Management, all the other members of these bodies are elected on an unpaid basis and for a specific term of office (4 years).

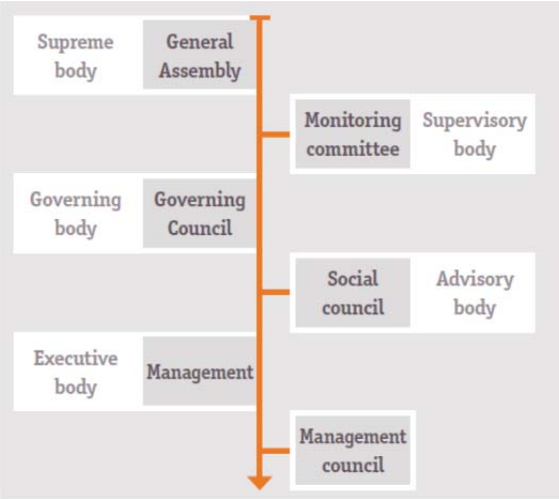

Figure 44: Corporate governance structure

The cooperatives' managers are elected by the Governing Council, whose 50% of members are replaced every 2 years. As a consequence, the manager can also be replaced. Aranceta wants to highlight how such a structural feature (i.e. Organisational design characteristic) influences the role and power of decision making of the cooperatives' managers. If there is a new manager, the strategic plans will remain or not depending on the desired strategic direction of this new manager. He mentions that the particularity (or disadvantage) here is that the choice of that manager cannot be based on an objective criteria of business development, either due to lack of business capacities and knowledge of the Governing Council's members or due to the employees' needs being best met by a new manager. The process of change management primarily affects businesses continuity in early stages whose success or failure need more time to be proven.

As a result, though *"the decisions of change in organisational design in a cooperative depend more on the Executive Board and not on the Governing Council",* changes in structure, technology and culture will be indirectly influenced by *"external forces of change",* that is, coming from the Governing Council.

Secondly, the causes that originated changes in the three dimensions of Responsiveness were explored; it means whether any revitalization or routinization strategy has been implemented throughout the observed period. Both structure and culture have suffered an improvement (according to the scope and basis of this study) due to revitalization strategic initiatives although some aspects of the processes' organization (technology) have been affected by routinization actions. However, their final result has not inhibited that the responsiveness of most cooperatives grows (greater manoeuvrability).

With regards to technological characteristics, the decrease in the potential flexibility level that technology could offer has decreased mainly due to higher difficulties in introduce changes in terms of processes composition and organization and, fewer levels of employees' mobility through several production methods and functions.

As far as structural characteristics are concerned, even before the crisis (until 2007), the social influence of members of the Governing Council took precedence over strategic decisions. The crisis changed the focus and the need for adaptation: rather than routinize and establish mechanistic structures, the environment and the trend to internationalisation has caused higher flexibility in structural design characteristics because more organic structure is needed. In sum, consultative bodies, functions and jobs descriptions and, planning and control systems have been considerably reduced. In this sense, the literature about Basque Cooperativism evidences that a new knowledge management system was implemented and the cooperatives are being benefited from its results. "A new cohesion with the business project and a new involvement of human intelligence in the production process was required to be in line with the potential of the new technological paradigm" asserted Mendizabal (Mendizabal, 2011:208). Such a new management system was based "*on teamwork, the creation of 'knowledge cores', the use of these cores as "forums for discussion" on specific issues, and, the implementation of an intensive internal training process for continuous improvement in management."* (Mendizabal, 2011:208). Another key aspect that Mendizabal (2011) highlights concerning the changes in management is "*the replacement of the old Taylorist management system (in which one person was responsible for one task and/or one workstation) with a new relationship in which groups of workers look after one area of activity*. *Each member of the team is therefore obliged to develop his/her multi-skilling productive abilities. As in other technologically advanced companies, a work organization system has thus been established based on flexible production, socio-professional multi-skilling, job rotation, worker communication, and corporate cohesion*." (Mendizabal, 2011:208)

Similarly, the trend of moving away from a more conservative culture towards greater flexibility afforded by innovation culture dimension has been in line with the cooperatives' strategy to enter new markets and businesses. This dimension has improved mainly due to increased support from management to accept and/or consider opinions or ideas that, although they stay away from the identity of the company, may promote innovation and creativity coming from employees is well valued. Mendizabal shows that, in line with the new management system, "*the acceptance of a charter of values"* was a fundamental step forward (Mendizabal, 2011:209). A set

of internalized and agreed values has been established and became the backbone of the new management system. Three are the core topics around which this set of values is created (by a reflection process participated by employees and managers of co-ops), one of them provides concern for the company's uneven stability, and the other two provide some balance. These three topics considered and encouraged are the following: *the company as an entity in a permanent state of unstable equilibrium; all people are considered capable of generating value*; and, *the concept of the participatory system as creating a greater competitive edge*.

Similarly to the previous variables (technology and structure), the particularity of the Governing Council affects the growth of an innovative culture since, as Aranceta mentioned *"the legal change of the Governing Council's members every two years also threatens the continuity of any R&D strategy"*. This statement is also contrasted by Mendizabal when he asserts that "*the application of this new management system raises difficulties. Specifically, the socio-productive involvement of human intelligence and the collective identification of the company's objectives do not always take root*". Mendizabal suggests that a sufficient critical mass must exist at the corporate management level and thereafter must be achieved at the workers' collective level for making a strategy like this feasible[39] (Mendizabal, 2011:202).

5.4.4. Metaflexibility (Absorptive Capacity)

Not enough to reconfigure the 'mix of flexibility' but it may also be necessary to redesign the organisational conditions in line with future competitive changes. As a result, management has to face a constructive tension, because if there is no balance between the two dimensions described above, flexibility efforts will fail. Volberda names such activity as 'metaflexibility': to continuously coordinate the above two tasks with the degree of environmental turbulence (Volberda, 1998).

Metaflexibility is related to **absorptive capacity**[40]: ability to access new knowledge from outside the company's boundaries and the assessment of the environment about the probable technological changes or changes in market preferences in the industrial environment. It is

[39] "Successful experiences in this field suggest that a critical mass at the corporate management level must be rather high (always higher than 50 percent), while a lower critical mass at the worker's collective level (always higher than 20 percent) would still make an important implementation process feasible." (Mendizabal, 2011)
[40] "The ability of a firm to recognize the value of new information, assimilate it and apply it to commercial ends". (Volberda, 1998)

therefore necessary to develop 'meta-skills', the ability to 'unlearn' and 'relearn' (access to new knowledge from outside the boundaries of the firm).

Figure 45 shows the scores of the organization in the two years analysed that have been compiled to determine the level of metaflexibility. The final result in Metaflexibility is resembles with one of the ideal types.

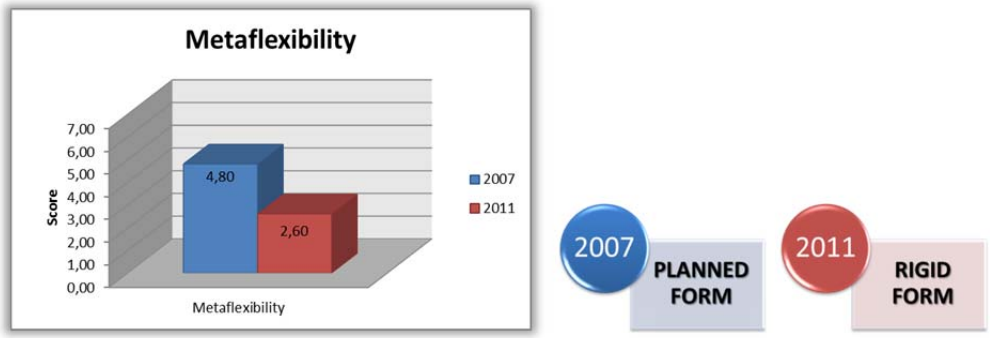

Figure 45: Metaflexibility results in Mondragón Components (2007-2001)

The metaflexibility level or absorptive capacity of Mondragón Components **has considerably declined**. The most significant decrease is concerned with the continuous monitoring and systematic analysis of competitors, technology and costumers. The efforts and resources dedicated to the analysis of the competitors and the changes in the sector have also been reduced.

In Mondragón Components the absorptive capacity has been reduced mainly due to the global crisis and consequently to the particular crisis in the Mondragón group. Aranceta stated that both the time and workforce dedicated to the technological or strategic vigilance as well as the infrastructures have been reduced as far as Mondragón Components is concerned. The crisis and the market share reduction caused deviating resources from the strategic and technological vigilance due to other financial needs. Although the reduction has been general, in the global corporative group, it has been more intense in the Domestic Appliances components sector. Innovative activity, both in incremental and radical innovations, has not been very prominent (although slightly higher in the latter one). The 'management commitment' on innovations has slightly improved. The information provided in the Mondragón annual reports reinforced such statements. The total funds earmarked by the industrial cooperatives in 2011 were 157 million euros, which is 55% up on 2007 (amounted to €101m). However, with regards to the workforce

dedicated to research in different technologies, it has suffered relevant fluctuation in these 4 years (Table 18). However, some new R&D centres have been created since 2007 in the components industrial group, for example, the Stirling Centre - specialised in Stirling technology; the start-up of EHE (Efficient Home Energy) - a joint-venture with the New Zealand company Meridian Energy; Maier Technology Centre - innovation in finishes and trims for a wide range of exterior and interior products in the automotive sector. They represent a specialisation of the R&D activities and move towards collecting information on the needs of new product development with companies in this industrial group.

R&D indicators	2007	2008	2009	2010	2011
Cooperatives' investment in R&D (mill €)	101	133	132	144	157
Workforce dedicated to R&D activities (persons per year)	950	1.284	1.263	1.293	822

Table 18: Evolution of the R&D Workforce in the Industrial group of Mondragón Corporation[41].

One important aspect to be explored concerns whether the strategic change decisions were made based on the results provided by the environmental scanning, analysis and evaluation of change forces. Aranceta explains that it is worthy to note the nature of basic characteristics of the product in the components industrial sector, mainly at domestic appliance components level; they have traditionally not required too much vigilance. Additionally, Aranceta adds *"the main motivation of Mondragón Components when it decides to search for* [and to successfully enter] *new international markets is not due to introducing new innovations but to start selling there what we do well here."* That is, in this case exploitation activities take precedence over exploration activities. This is confirmed when he also added that in terms of monitoring or absorption capacity, the coops of Mondragón Components are more interested in *"the analysis of their most competitive capabilities and, based on the results, assessing in which new business areas they can enter".* Aranceta's argument is clarified in the Mondragón group's annual reports. The automotive sector has suffered similar consequences due to the economic crisis to those in the home appliance sector: a significant drop in production and sales by the last quarter of 2008 until the end of 2010. Nevertheless, the strategic orientation of cooperatives that belong to the

[41] Information about the evolution of workforce and investment in R&D is provided at Industrial Group level, to which Mondragon Components belongs.

automotive components group has been slightly different in terms of innovation and internationalization.

In the former, the cooperatives with higher robustness have concentrated resources on their internationalization process which has been mainly influenced by the strategic objective of meeting customers' requirements globally, by means of setting up production plants abroad and consequently, becoming global suppliers (e.g. Batz Sistemas, Fagor Ederlan, Cikautxo). Additionally, some cooperatives have also tried to recover a growth path by improving its productivity capacity through new production processes. Innovation activities have run in parallel but not with the same intensity in all cooperatives. For instance in 2011 the boom in new technology and the eruption of electrification in the market created new challenges for companies such as Fagor Ederlan, which has established a collaboration project with a relevant international company for the design, development, market launch and production of a new engine (they will manufacture prototypes of the new generation of this engine).

On the other hand, the internationalization process in cooperatives of the home appliance sector has not concentrated the same level of resources as in the sector aforementioned. Early in 2008 they were aware of the need to adapt businesses to the new market situation. They started to actively work in remodelling the area, providing more value and developing new activities to help overcome the possible loss of jobs, vigorously promoting innovation and new developments (Mondragón Annual report, 2008: 21). After 3 years, 2011 broke the upward trend of the previous year (2010) in terms of turnover (Mondragón Annual report, 2011: 27). In terms of markets, that year was characterised by ups and downs: the ups came from the emerging markets and the timid recovery in the US market, and the downs from Europe, in a state of paralysis and with no sign of any recovery. In order to face such a difficult scenario, components manufacturers' directives were based on the consolidation of businesses with clear leadership positions in the world market, divestment in those with no apparent viable future, the securing of those that may have a future through investment, partnerships and even takeovers, and responding to opportunities derived from new demands and technologies.

The R&D manager added to the previous arguments that in terms of business units and within the cooperatives the perspective is slightly different. Incremental innovations had been based on monitoring capabilities or absorptive capacity due to the highest concentration of resources in observation or absorption capacity that exists at the operative level. In contrast, from the research and development point of view, the lack of interest on the absorptive capacity or

environmental scanning capacity by top management could have been influenced by the preference in exploitation activities.

5.4.5. Routinization and Revitalization Strategies

Following Volberda's recommendations, the organization's flexibility needs to be aligned with the degree of environmental turbulence and therefore its dimensions accordingly. Now that the required, current and potential flexibility levels have been obtained, the organisational flexibility level of Mondragón Components is positioned in Volberda's framework (following **Figure 40**) and the appropriate change trajectory is hence identified.

In 2007, the proposed trajectory was ***routinization*** due to less flexibility being required by the environment; the ET inclined towards Non-Competitive environment.

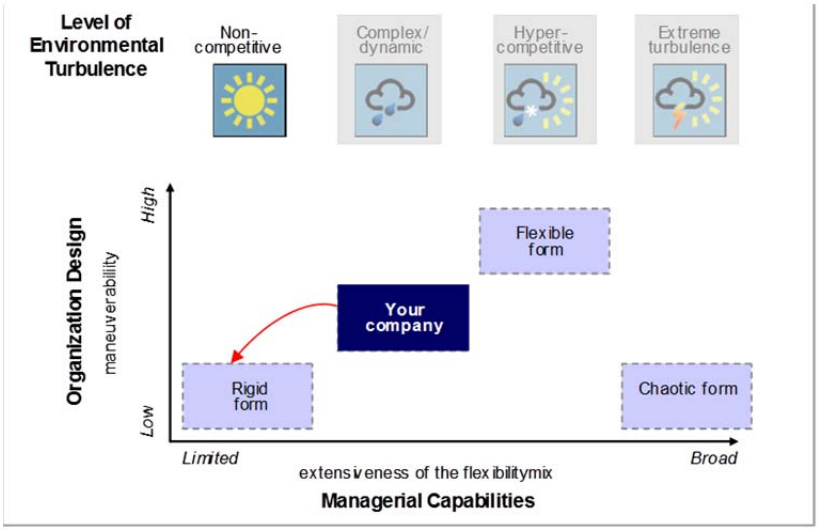

Figure 46: Mondragón Components positioned in the 'organisational flexibility' framework (2007). *Source: QSF report*

The required trajectory of change is presented in Figure 47; with the efforts needed to reach the ideal position on the vertical axis (organization design) and the horizontal axis (managerial capabilities). The total number efforts required are measured by the number of 'steps' that the company needs to take to move over these two axes.

RE-POSITIONING IN THE FLEXIBILITY FRAMEWORK (2007)			
Renewal trajectory:	**Routinization Strategy (become a Rigid organization)** *Refinement of existing core competencies, increasing strategic focus, standardization and professionalization of processes and institutionalization of information processing and decision-making.*		
	Current flexibility	**Required flexibility**	**Required movements**
Managerial Capabilities	PLANNED organization	RIGID organization	0
Organisation Design	PLANNED organization	RIGID organization	-1

Figure 47: Re-Positioning in the Flexibility Framework (2007). *Source: QSF report*

Displaying the results provided by the QSF, the starting point reflects the existence of a positive gap in Organisational Flexibility, that is, there exists ***a flexibility surplus***, both in managerial capabilities as well as in responsiveness. Volberda's theoretical framework suggests covering such a gap (or to reduce the surplus) by implementing a routinization change strategy. In that period, 2007, it didn't seem reasonable to reduce both dimensions of Organisational Flexibility. There could exist a misperception of a real Turbulence Environment, which reflects a lower required flexibility when in reality future changes in the contrary direction can be identified.

After receiving the results from the same questionnaire of Mondragón Components in 2011, the evolution of the variables observed was very different to that of the predicted path four years before, as the previous sections have described. The proposed trajectory in 2011 was again routinization. In that period, the environment was requiring less organisational flexibility than the level depicted by Mondragón Components in the responsiveness dimension (Figure 48).

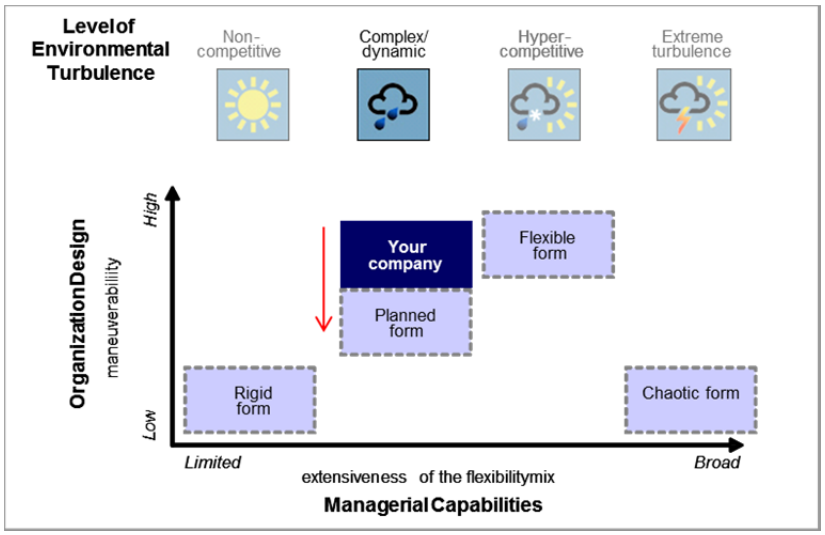

Figure 48: Mondragón Components positioned in the 'organisational flexibility' framework (2011). *Source: QSF report*

More details about the required change trajectory are presented in Figure 49; with the efforts needed to reach the ideal position on the vertical axis (organization design). The report did not provide change strategies for the horizontal axis (managerial capabilities) due to the level portrayed by Mondragón Components in said dimension matching those required by the environment. The effort is measured by the number of 'steps' that the company needs to move over these two axes.

RE-POSITIONING IN THE FLEXIBILITY FRAMEWORK (2011)			
Renewal trajectory:	**Routinization Strategy (become a Planned organization)** *Refinement of existing core competencies, increasing strategic focus, standardization and professionalization of processes and institutionalization of information processing and decision-making.*		
	Current flexibility	**Required flexibility**	**Required movements**
Managerial Capabilities	PLANNED organization	PLANNED organization	0
Organisation Design	FLEXIBLE organization	PLANNED organization	-1

Figure 49: Re-Positioning in the Flexibility Framework (2011). *Source: QSF report*

According to Volberda, Hybrid forms (Rigid-Planned; Planned-Flexible; Flexible-Chaotic) are also considered as deploying organisational flexibility. The QSF's results in 2011, show that the hybrid form is mixed with characteristics of the Planned and Flexible Form. Mondragón Components resembles a Planned Form in its Extensiveness of Flexibility Mix and the Flexible Form in its Responsiveness. Its extensiveness of flexibility mix is narrow: it consists mainly of specific rules and detailed procedures, which are sophisticated and complex and require an extensive information-processing capacity. The rigidity of this organisational form is a result of strong process regulations such as standardization, formalization and specialization, and very detailed planning and control systems. As Volberda & Rutges mention, (Volberda & Rutges, 1999:108) as long as the organization encounters no unexpected changes, its controllability is high. However, if changes occur that are not anticipated in the planning repertoire and are threatening to the ideal system shared by its members, the result is a situation known as 'strategic drift' in which consciously managed incremental changes do not necessarily keep pace with environmental changes. The incremental changes result only in further attempts by the firm to perfect its process regulations and basic beliefs and assumptions, which are the very sources of inertia. Accordingly, slowness of response is characteristic of the 'planned configuration.' On the other hand, Mondragón Components' responsiveness level resembles the Flexible Form whose ability to change its organisational conditions is reasonably high. It adapts

effectively to disturbances without the organization losing its distinctiveness. It implements change easily through adaptations within the current (no-routine) technology and (organic) structure. At the same time, it develops some dominance over its environment to preserve its identity, and effects a balance between change and preservation (Volberda & Rutges, 1999).

In summary, both recommendations (2007 and 2011) were not fully accepted by the R&D manager mainly due to two reasons. On the one hand, the expected evolution of the environmental turbulence in 2007 concerns evolving towards more complexity and dynamism although the uncertainty level will remain. In such a situation, the suggested change trajectory (routinization) would not fit well with the future trends of competitive forces. On the other hand, the R&D manager believes that the results provided by QSF are good for having a global overview of the current situation with regards to organisational flexibility. It could be used for decision-making and this analysis is valid from an 'assessment' perspective. However, from the 'action' perspective, it provides routinization and revitalization strategies that are extremely general. He adds that some specific guidelines are missed. For example, if the routinization strategy suggests creating new capabilities, the framework may provide guidelines about the type of capabilities that should be created.

After the R&D manager having explained such a relevant aspect, it is important to know within this dimension whether the company, Mondragón Components, really implemented some change strategy throughout those four years. In this case, it is also important to identify if the strategy is a global strategic line coming from the Mondragón Components division or if it has come from a particular decision of cooperatives' managers. From 2007 a revitalization strategy was implemented. It was a period of volatility, of changes and uncertainty in which the new business opportunities identified needed the deregulation of processes, changes in basic organisational forms, new values, openness and a more innovative culture (processes of internationalization, merger or acquisition, etc.). Such a strategy has not been encouraged by the general management of the group. As mentioned above, the R&D usually advises about how to address new challenges however the cooperatives' managers make the final decision about the change strategy to be implemented.

Another aspect to be explored within this dimension concerns the expected time for the strategy to be active and whether the desired effect is achieved. This variable is critical for this qualitative study. As Aranceta states, for this type of cooperatives revitalization strategies are more related to changes at an operational level and they have had a character of continuity (they have

suffered some interruptions but not too many) while, revitalization strategies more focused on differentiation or at strategic level have suffered a long break due to the crisis' effects. Most of the managers want or are interested in significant decisions for change but they could be replaced before their implementation. This is supported by Arando et al (2010) in their search for empirical evidence about stability and managed change in Mondragón; after interviewing more than twenty key actors at Mondragón (between 2007 and 2010), most people interviewed reported that strategic decisions typically reflected standard business criteria with a focus on generating sustained sales and profits. Several interviewees stressed that during economic crises, the paramount concern of managers' shifts to maintaining employment for members (Arando et al. 2010:27).

As has been explained above, certain change initiatives which are proposed by the R&D department receive management support, however, when the replacement of half of Governing Council occurs every two years, it could affect the continuity of these proposals since the continuity of the cooperatives' managers also could be interrupted and consequently, the change strategies are not implemented. The time variable, therefore, is critical in the sense that "the *control over the time spent on implementing the strategy should be strong enough to ensure that changes are implemented before managers could be replaced.*" Some change strategies usually cannot be implemented due to some circumstances coming from change resistance. The R&D manager was questioned about that aspect and he asserted that too much resistance appeared among not only the employees, but also the top managers showed a lot of resistance and organisational inertia appeared.

5.4.6. Summary of the results

Mondragón Components is one of the leading cooperative groups in its field. While managers' perception of the environmental turbulence required lower level of organisational flexibility in both periods, the cooperative group did not follow the suggested change trajectories. However, its configuration of extensiveness of flexibility and responsiveness served well for dealing with the incremental change that the competitive forces experimented. At a high level, Mondragón Components' organisational flexibility can be described using the processes described in Table 19 below.

Table 19: Mondragón Components' processes that characterize Organisational Flexibility

Dimensions	Volberda (1998)	Mondragón Components
Environmental Turbulence	The form in which managers interpret Environmental Turbulence will influence the management decision regarding a transformation process.	There exist different practises to observe the environment: the operative units of cooperatives have more information about circumstances that affect to exploitation activities but they have no overall resources to process this information and make it useful in decision-making and R&D department's awareness of the changes in the environment is more related to exploration of new market opportunities.
Managers' perception of the Environmental Turbulence	*"Many organizations perceive their environment as highly turbulent, while in fact they are confronted with a great number of small changes which are largely predictable."* (Volberda, 1998:186-187).	The company perceives their environment as less turbulent than it is which delays the decision to implement strategic changes.
Flexible Form	The FF is determined by the combination of two tasks: managerial and organisational design. Volberda anticipates the possibility of Hybrid Forms. In these forms, the two mentioned tasks are deployed in different manner but they are effective in terms of organisational flexibility	Extensiveness of Flexibility Mix and Responsiveness are combined according to the evolution of the environment. This dimension has evolved towards the hybrid planned-flexible form in which the variables have different weightiness according to the evolution of the environment, but, they proportionate the company a certain organisational flexibility level.
Metaflexibility	It represents the organisation's support monitoring or learning system (Volberda, 1998: 121). It involves the processing of information to facilitate or promote the continual adjustment of the composition of the management's flexibility mix and organisational conditions in line with changes in the environment.	The efforts of the company in absorptive capacity are not aligned to the previous two tasks. According to managers' perception of the environmental turbulence, they decided to reduce and concentrate the efforts towards more specialization.

Change Strategies	In order to resolve paradox flexibility, Volberda proposes two types of change strategies: when stability is needed, a ***routinization strategy*** is the most appropriate strategy in moderately competitive environments where the firm faces decreasing levels of environmental turbulence (Volberda, 1998: 265); a ***revitalization strategy*** allows the transition to be controlled towards increasingly competitive markets (Volberda, 1998:219).	In times of economic crisis, and within a cooperative framework, routinization and revitalization strategies have been combined. The change strategies were not largely planned; they were implemented in a reactive way, when the environment drastically or unexpectedly changed.
Delays	Volberda identifies a relevant delay *"the reaction or implementation time of these capabilities is a factor which management has to take into account. … the time which elapses between confronting the discontinuity and responding to discontinuity…. The organisational barriers in technology, structure and culture can influence this implementation time"* (Volberda, 1998: 201).	The effectiveness of the implementation of change strategies depends on the managerial structure and governance rules. If structural changes are implemented while implementing any routinization or revitalization strategy, organisational flexibility will experiment relevant delays.
Resistance to Change	Volberda anticipates that the implementation of a change trajectory towards more flexibility at organisational level can create dissatisfaction. He assures that organization members have to express their complaints with current state if they are to lose their inertia (1998:242-243).	Change strategies boost r resistance to change from the vast majority of the staff, from employees and from managers. Top managers' resistance appears when new managers are nominated and disagree on strategies implemented by previous managers. No control measures are implemented to avoid or constraint the emergence of resistance to change.

How Mondragon Components strives for the organisational flexibility as the environment evolves over time is based on the aspects described above. When the top management decides to pursue a routinization or revitalization strategy, the ability of Mondragon Components in

achieving the balance between change and preservation (i.e. the appropriate organisational flexibility) will depend not only on the alternative combination of dynamic capabilities and design characteristics but also on its capacity to control the resistance to change and the delays. This situation will trigger different modifications at organization level, such as for instance, to guarantee the continuity of change strategic initiatives despite the structural changes on the management board, in the cooperative case, the human resources flexibility facilitates dealing with the crisis periods, etc…

It is important to note that the qualitative explorative studyand the interview with R&D manager provided with important insights regarding some constraints when a cooperative group is managing to achieve organisational flexibility in an economic crisis period. First, resistance to change may appear as consequence of the pressure to change however, the periodic changes in the management board influence in major extent over constraining or fostering the strategic changes. The R&D manager acknowledges that one of the most important factors that Mondragón Components failed to account for was the organisational structure required to support the change triggered by the new strategic direction of coping with environmental evolution.

Second, the qualitative explorative study helped to highlight the relevance of managers' perception concerning the changes in the environmental turbulence that they are facing and its influence over the delay in obtaining the expected results. The R&D manager confirmed that cooperatives might have higher error margin than other type of organisational forms. Nevertheless, the most important aspect to take into consideration concerns the underlined differentiation between R&D department and operational units in terms of environment scanning or awareness. It confirms that perceptions of the company managers are not usually aligned to the required flexibility level. As Beal asserts, for small firms environmental scanning seems to pay off (Beal, 2000). In general terms, the market of Mondragón Components is not complex enough and the changes are not quick enough for giving relevance to the environmental scanning. As appreciated in management literature, the need for a systematic environmental scanning increases with the level of complexity (large firms) and the level of uncertainty perceived by top managers (e.g. Jain, 1984; Sawyer, 1993).

In order to shed some light about how large multiunit firms reconcile the conflicting forces for change and stability or how they promote order and control, while having to respond, renew, and learn, Volberda (1998; p. 268) states that such a type of "*organisations needs properties of*

the flexible, planned, or even chaotic forms at the same time or in different portions of the corporation". As has been described in the qualitative explorative study, Mondragon Components responses to the flexibility paradox of change and preservation through the hybrid form "planned-flexible" type. Volberda names this typology as "the balanced corporation" (Volberda, 1998; 274), that is, an innovative form that balances flexible with planned organisational modes. A balanced corporation can choose, for instance, to compensate for its mechanistic structure by encouraging and promoting cultural heterogeneity. In this case, the firm will experience a constructive tension between strategic chance (strategic flexibility) and structural preservation.

The collaborative approach developed with the industrial cooperative group has enabled an active role in the implementation of the flexibility framework and theory as well as in the impact analysis of this research. We conclude that, the qualitative research exploration described in this Chapter provides empirical evidence that will allow us to extent Volberda's theory. Significant managerial implications have been adapted to the specific context of this exploratory study:

- In a cooperative group, most important aspect to take into consideration concerns the differentiation between R&D department and operational units in terms of environment scanning or awareness.
- In a cooperative group, when managers trigger change strategies, they can find resistance to change from employees because of the pressure to change as well as from top-managers that causes a relevant delay on the desired results.
- In a cooperative group, it is very difficult to control Resistance to Change when change strategies are implemented due to the structural characteristics of the management board.
- In a cooperative group, alternative combinations of flexible capabilities (extensiveness of flexibility mix) and organisational characteristics will result on an appropriate level of organisational flexibility.

5.5. Managerial Implications

As an exploratory study, there exist some important insights that could be expanded in future research. To begin with, it was found that, **the organisational-environment fit is achieved without the balanced combination of extensiveness of flexibility mix and responsiveness**; it means that the hybrid form (planned-flexible) represents an appropriate combination for

sustaining competitive advantage in a cooperative industrial group. In Mondragon Components, the strategic chance that, for instance, the internationalization provides to the company is reinforced by an organic structure defined to deal with projects through replication of processes and procedures. However, the structural and operational flexibility that local projects require is compensated by encouraging a more routine technology and promoting cultural heterogeneity.

Furthermore, **the notions of resistance to change and managers' perception as well as their association with organisational flexibility may constraint the effectiveness of strategic change interventions** in at least two ways. On the one hand, in Mondragon Components, the implementation of change strategies can suffer a significant delay or they can be suspended. In the cooperative group, employees elect the management board. Every two years this board can suffer changes and it may imply new strategic orientation. As it was pointed out by Pardo del Val and Martínez Fuentes (2003), resistance to change is an essential factor to be considered in any change process, since a proper management of resistance is the key for change success or failure. They identified specific sources of resistance to change during the implementation stage such as, among others, leadership inaction, sometimes because leaders are afraid of uncertainty, sometimes for fear of changing the status quo. Managers and R&D professionals in the cooperative industrial group should be able to isolate the scope of interventions in flexibility mix or responsiveness from periodical changes in the management board.

On the other hand, we noted and the R&D manager pointed it out too, a considerable deviation between the long and the short-term orientation in balancing knowledge exploration and exploitation. According to Volberda's framework, the perception of the environmental turbulence should be managed through metaflexibility or absorptive capacity and the in-depth study confirmed that such capability suffered a considerable reduction; this fact was confirmed by the interview with the R&D manager. **In order to avoid misperception of the competitive forces and, subsequently, considerable delays in achieving the expected results, managers should pay in particular attention to the focus of absorptive capacity efforts**; **explorative activities conducted by more specialised R&D units balanced to exploitation learning and observations reinforce organisational flexibility.**

All these insights, in the domain of managerial decision-making, contribute on creating a corporate orientation towards organisational flexibility that minimizes the temporal latencies and contributes to react swiftly to changes.

Within Volberda's framework, the consideration of the timing and the path dependency of the strategic decisions of change have not been explicitly considered. The strategic actions covered by both routinization and revitalization strategies would imply different delays because they can affect a variety of organisational dimensions. Therefore, the fourth research question that has also been proposed to guide this research is the following:

> ***Research question 4:*** *Does the extended model allow understanding and representing those constraints as well as evaluating if the expected results on organisational flexibility change occur at the time required or expected?*

A proposed extension of the theory, with new variables based upon theoretical findings will be translated to the system dynamic model that was described in Chapter 4. In the next chapter, Chapter 6, the new proposed model will lead to a number of dynamic propositions with respect to the research questions and through its resultant new simulation scenarios, these dynamic propositions will be dynamically investigated. Additional simulations of the future time paths can offer several views of the strategic initiatives that look for Organisational Flexibility when managers control the parameters of change. This study allows us to explore, through the simulation of an extension of the base case model, why and how the dynamic approach outperforms the static one, and reveals important insights of the behaviour of dynamic organisational flexibility strategies providing robustness to Volberda's theory assertions.

6. AN EXTENDED DYNAMIC MODEL OF ORGANISATIONAL FLEXIBILITY

> *"Several principles of simulation modelling are important for obtaining interpretable results. Units of measurement, even for such soft variables as inertia, must be included in the model. This helps to enforce dimensional consistency, or equivalence of units on each side of the equation. Variables must relate to real-world phenomena that can be perceived and measured, and state variables representing quantities that accumulate over time must be distinguished from other variables that may change instantaneously".* (Sastry, 1995:247)

The results shown in Chapter 4.1.2 seem to represent Volberda's behaviour patterns. Although the base case seems to represent the dynamic behaviour of the system in an appropriate way under several scenarios, some questions arise at this moment of the simulation related to the form in which such transformations are implemented in the companies and their results. As the qualitative explorative study has revealed in the previous chapter, different circumstances may characterize the evolution of flexibility capacities of different companies. For instance, one company can suffer the pressure to evolve towards the required state by the 'Environmental Turbulence' but it may be performing better if it does not change. Another company may find some resistance to change, coming from managers or staff, when a transition is imposed and the final result is that not all the variables of Flexible Form have suffered the required change. Finally, what would happen if the transition is practically finished in a larger period than expected? It may affect the performance of the company. The insights that stem from the research questions of this thesis (see section 4.2) and from the qualitative explorative study have forced the base case to be extended by adding new variables and relationships and, furthermore, the dynamic behaviour of the new extended model to be explored.

Based on the results of the previous chapters, it is crucial to propose other types of situations/scenarios in which routinization and revitalization strategies are required and the system dynamics model should assist organisations to succeed. Given the base case as a benchmark, the next step is to explore other potential behaviour modes and focus on how well the simulations match the predictions from the theory and from the original descriptive model. In addition, we will focus on which factors may inhibit or drive the pathway of Flexible Form when both types of change strategies are implemented. Those factors that have been anticipated at the end of Chapter 4 and empirically explored in the previous chapter, Chapter 5, will be

incorporated into Volberda's framework under the system dynamics perspective. Basically those factors are three: delays that are originated as consequence of the nature of the proposed change strategies, managers' decisions taken based on misperception of real turbulence in the environment, and the resistance to change that comes from managers and staff.

For such a purpose, the research has been moved to identify moderating factors from the Organisational Change literature and to analyse their position in driving the transformation. The search strategy was developed by identifying a broad selection of databases covering journals, conference proceedings, books, trade journals and articles, which included Scopus, Emerald, Science Direct, Web of Knowledge - traditional library cataloguing systems. A number of relevant keywords were selected, and to restrict the search to more recent publications, the time frame was set, from 2007 to 2013. The search contained a total of 9 keywords; some directly associated with the research topic whilst others could be considered beneficial to cover the scope.

- Volberda-Author cited
- Organisational Flexibility - Org. Transformation
- Flexibility Mix (from the year 2000) = Strategic flexibility
- Responsiveness & organisational transformation
- Absorptive Capacity
- Environmental Turbulence
- Strategy implementation (Routinization strategy & Revitalization strategy)
- Resistance to organisational change
- System Dynamics & Organisational Change

After illustrating the theoretical and empirical findings that lay the foundation for incorporating new variables into the model described in Chapter 4, the formalization of the 'Extended model' is developed and described. This extended model represents the evolution of flexible capabilities and responsiveness when change strategies are implemented and some constraints are anticipated. Three different effects, namely the resistance to change (positive) effect, the perception of environmental turbulence (negative) effect as well as the delay on effective implementation of change strategies on organisational flexibility are considered that drive us towards the elaboration of the dynamic propositions. Different sets of simulations are conducted with the Extended Model in order to explore the conditions under which a particular structure

plays a key role in determining the dynamics of the system and the dynamic propositions are evaluated. The simulation results show differing levels of effectiveness as environmental dynamism evolves (increasing or decreasing turbulence). In this chapter, we attempt to contribute through a set of dynamic propositions to complement the guidelines to achieve different levels of Organisational Flexibility within the diverse environment scenarios proposed by Volberda (1998). Chapter 6 finalizes with relevant outcomes for theorists and practitioners of the organisational flexibility field in the form of managerial implications.

6.1. New Theoretical Insights: Main Constraints for Implementing Change Strategies

As has been explained in Section 4.2, the first research question of this thesis is related to the probable constraints that can affect the success in the change strategy to be implemented. Focusing on how the firm endeavours to achieve the optimal level of flexibility or, in other terms, to align the flexible form – the combination of managerial capabilities and organisational design – to the environmental changes, the ability to implement the change passes through effectively controlling: (a) the resistance coming from staff; and (b) the manager's perception of the changes in the 'Environmental Turbulence' (Sastry, 1997; Volberda, 1998; Armenakis & Bedeian, 1999; Pardo del Val and Martínez Fuentes, 2003; Vakola and Nikolau, 2005; Gilley, Gilley & McMillan, 2009).

As far as the second research question is concerned, the consideration of the timing of the strategic decisions of change needs to be addressed in the new model. The strategic actions covered by both routinization or revitalization strategies would imply different delays since they can affect a variety of organisational dimensions. This research aims at shedding some light on the temporal dimension of the expected results in organisational flexibility change. Authors claiming that organisational flexibility is dependent on the temporal dimension (Volberda, 1998; Golden and Powell, 2000; Tan and Zeng, 2009) relate it to the ability of an organisation to adapt to the environment within a given time frame (Golden and Powell, 2000) as well as, show that strategies that seem to provide dynamism may become sources of rigidity at another stage without a temporal dimension (Oliver, 1991).

6.1.1. Resistance to Change

Volberda anticipates that the implementation of a change trajectory towards more flexibility at organisational level can create dissatisfaction. He assures that organization members have to express their complaints with the current state if they are to lose their inertia (1998:242-243). In line with this argument and within organisational change literature, there exists a huge variety of research studies that have stressed 'resistance to change' as one of the main reasons for the failure of many change initiatives (e.g. Armenakis & Bedeian, 1999 or more recently Gilley, Gilley & McMillan, 2009).

Gilley et al. (2009) state that there exists current evidence showing that between 30% and 60% of all change initiatives within organisations fails. Change is complex and often unpredictable. Even a well-planned organisational change strategy may have unintended consequences (Jian, 2007). It is widely assumed that resistance to change impedes the development of successful change strategies (Gilley et al. 2009).

> *"In the context of change management research, the issue of resistance occupies a crucial place. Organizations should be aware of the human element and its implications for the success of all change management decisions."* (Bateh, Castaneda & Farah, 2013)

Before addressing the theoretical analysis of this variable, we should fix the definition of the resistance to change, which is adopted for the purposes of the present thesis. Many studies have suggested that organisational change efforts can be very stressful experiences for individuals (Elrod and Tippett, 2002; Grant, 1996). Based on the comprehensive review made by Vakola and Nikolau (2005), the definition that matches up to the objectives of adding this new variable is the following: resistance to change originated as stress appears from any initiative of organisational change. This subject, resistance to change, has been largely explored in the literature and considered as a critical success or failure factor as it is directly related with positive or negative attitudes to change (e.g. Trader-Leigh, 2001; Kotter, 1996).

Damanpour (1991) found that a successful change effort might depend more on the congruency or fit between content, contextual, and process considerations than the nature of an intended change. Sastry describes the negative relation between inertia (one of the sources of resistance to change) and ability to change: when inertia is high enough, organisational managers are less able to recognize and respond to the need for a change (1997: 244). Sastry's (1997) findings

suggest various insights into how organisations may fail in attempting to introduce change. In closing, Sastry (1997) does propose additional explanations for the success of varying organisational change processes (such as allowing time to elapse before initiating subsequent changes).

Among other causes of employees' resistance, Vakola and Nikolaou focused on the **stress caused by organisational change as an inhibitor of change since it can create negative attitudes toward change** (Vakola and Nikolau, 2005: 163). From their study[42], they conclude, "*a negative relationship exists between stress level sources and attitudes towards organisational change*". The two main objectives that guided their study were: to explore how stress at an individual level has an impact on change at an organisational level and to explore the role of **organisational commitment** as a moderator between stress and attitudes to organisational change. Among their findings, we would like to mention the following aspects:

- Their study's results confirm a relationship between occupational stress and attitudes (positive and negative) towards organisational change. Almost all occupational stressors were related to negative attitudes to change. Stress can be created, for example, by bad work relationships; or due to lack of a socially supportive environment; or by job insecurity; or by inappropriate administration of human resource functions, such as training.
- Their findings also demonstrated a positive relationship between **organisational commitment and positive attitudes to change**. It was confirmed by the evidence from the literature showing that organisational commitment is one of the most important determinants of successful organisational change, that is, organisational commitment will result in the willingness to accept organisational change.

These authors underline several practical implications for managers and organisations facing organisational change (Vakola and Nikolau, 2005: 170). For instance, to build supportive work relationships, communicating effectively will result in positive attitudes to change. Additionally, if organisations plan the change carefully while creating a well-structured work environment and a well-balanced work schedule will result in reducing stress and uncertainty.

[42] A total of 292 participants completed ASSET, a new "Organizational Screening Tool", which, among other things, measures workplace stress and organizational commitment and a measure assessing attitudes towards organizational change.

In their comprehensive literature review about the sources of resistance to change, Pardo del Val and Martínez Fuentes (2003) highlighted embedded routines and lack of the necessary capabilities to implement change – capabilities gap – as the most important. They attempted to check if the sources of resistance resulting from the literature review agree with the ones observed in business practice and to analyse the relationship between the types of changes, more concretely, to test if resistance to change is higher in strategic than in evolutionary changes. They found empirical evidence highly relevant to the present study in the following assertions:

- Resistance to change exists but it is generally not too strong to seriously affect the change process. Hence, changes always carried resistance, but no single source was pointed out as a severe difficulty to achieve the change goals. (Pardo del Val and Martínez Fuentes, 2003:10)
- Among the sources of resistance to change: the highest mean is related to the difficulties created by the existence of deeply rooted values; it is followed by the lack of the capabilities needed to implement the change process and by change costs and to incommensurable beliefs. (Pardo del Val and Martínez Fuentes, 2003:10)
- As a result of their second descriptive analysis[43] they found that resistance to change seems to be always more powerful in strategic changes than in evolutionary ones[44]. Then, data suggest that the more radical and transformational change is, the more powerful resistance to change is (Pardo del Val and Martínez Fuentes, 2003:11).

In order to provide leaders with insights on how to deal with those sources of resistance, Pardo del Val and Martínez Fuentes (2003) advise managers to pay special attention to:

[43] "[…] in order to check if the differences are significant, we will run a typical deviation analysis, being the mean of the sources of resistance the dependent variable Since strategic changes are just 22.4%, this figure is too small to support significant results; however, the analysis shows some interesting findings that we would like to stress and that encourage further research to expand on them." (Pardo del Val and Martínez Fuentes, 2003)

[44] These authors found empirical evidence of their study's purposes after carrying out a quantitative research at Spanish companies with more than fifty employees that had undergone a change process recently: 58.8% of the respondents consider the type of change faced by their institution as evolutionary, while 22.4% state it was more strategic and 18.8% of the companies express an intermediate situation.

- Employees' deep-rooted values: *"how much organisational culture fits with change objectives and what could be done to improve such fit before the change process starts in order to reduce resistance caused by deep-rooted values."*
- Training: *"Training would be a good tool to surpass communication difficulties and thus avoid resistance caused by communication barriers, as well as to help reduce the gap between the present situation and the capabilities required for the change process*."

On the basis of the preceding arguments, and aiming to answer the first research question (see Chapter 4.2), **we first assume that resistance to change will appear as a consequence of the pressure to change that managers will create when they are looking for the balance between change and preservation and, secondly, it will have an effect over the organisational ability to implement the organisational change strategy, therefore, it will be a constraint to be included in the resulting development of the new model**.

6.1.2. Managers' Perception of Environmental Turbulence

Just as is mentioned in Chapter 3.3.2, Volberda suggests, *"Many organizations perceive their environment as highly turbulent, while in fact they are confronted with a great number of small changes which are largely predictable."* (Volberda, 1998:186-187). Therefore, one relevant variable to be considered and explored in this new model concerns the perception that managers usually have of their environmental characteristics in which the firm is operating, such as Volberda stresses, its dynamic, complex and uncertain nature. In line with this assumption by Volberda, "*many organisational practices assume that managers have accurate perceptions of their organizations or their organizations' environments*." (Mezias, Grinyer and Guth, 2001). Several research studies suggest that most managers have quite different perceptions and that many managers have inaccurate perceptions. For instance, Mezias, Grinyer and Guth (2001) conclude that higher-level managers see fewer, milder deficiencies in their organisations than do managers lower down. Other authors affirm that formal information systems focus on variables that have appeared to be more relevant in the past, with the result that they tend to overlook new trends and variables that might become relevant in the future (Starbuck, Greve and Hedberg, 1978). Harris and Moran (1996) point out that societal and organisational cultures focus attention on certain phenomena and de-emphasize others and shared perceptual frameworks may make it easy to discuss some events and impossible to discuss others. Mezias & Starbuck (2006), with their study, report a stream of research about

managers' perceptions of the variables that, in the academic literature, are relevant when managers strategize or design organisations. These authors empirically observe managers' perception through two case studies over four periods. As for managers' perception, Mezias and Starbuck interpret "everything that goes into managers' understanding of their work situations" (2006: 3). At this stage of the thesis, the aim is not to provide an exhaustive review of the different situations that can affect the accuracy of managers' perception[45]; as an alternative, we attempt to explore empirical evidence and theoretical foundation to support the translation of this variable into the extended model. One of the studies they undertook involves 47 experienced managers of a large, multi-divisional firm and the observed variables that were relevant and important to them[46]. The main conclusion of this study forced the authors to reconsider their assumptions about the importance of accurate perceptions, "*we had been assuming that people needed to perceive problems accurately in order to solve them. The prevalence of large perception errors made us aware of this assumption*." (Mezias & Starbuck, 2006). Managers of the study were aware that perceptual errors were causing prevalent serious problems and that the companies would surely have the resources to eliminate them.

On the basis on the previous arguments, and aiming to answer the first research question (see Chapter 4.2), **we assume that managers' perception will have an effect over taking appropriate decisions concerning the organisational change strategy. Therefore, it will be a constraint to be evaluated in the resulting development of the new model**.

6.1.3. Temporal Dimension in striving for organisational flexibility

In the review developed in Chapter 2.4.2, some authors were identified claiming that organisational flexibility is dependent on the temporal dimension (Volberda, 1998; Golden and Powell, 2000; Tan and Zeng, 2009). The temporal dimension of flexibility is the ability of an organisation to adapt within a given time frame (Golden and Powell, 2000). For example, strategies that seem to provide dynamism may become sources of rigidity at another stage without a temporal dimension (Oliver, 1991).

[45] For adittional information please see the review done by Mezias & Starbuck (2006)

[46] Mezias & Starbuck observed that the relevance of variables such as centralization, environmental dynamism and resource availability is less important for managers than for theorists probably because they may not have concrete effects in the short term and managers are more focused on solving current problems (2006:3).

A summary of the literature contributions to this issue has been displayed in section 2.4.2. In this section, we attempt to find theoretical evidence about the fact that strategies like routinization and revitalization will imply delays in being implemented effectively.

Looking at the competitive strategy literature, several authors have stressed that competitive strategy is not a static phenomenon, but a sequence of interconnected actions and reactions unfolding over time (Hutzschenreuter and Israel, 2009). Such a dynamic perspective can be seen in a variety of practical observations (Hutzschenreuter and Israel, 2009). For instance, Porsche and its superior competitive positioning in the automotive industry due to a steady adaptation process that has spanned almost a decade; the behaviour of firms during periods of intense competitive rivalry (Ketchen et al. 2004), in their responses to environmental changes (Lee and Grewal 2004), and in their attempts to modify their industry positions or reach new ones (Nair and Filer 2003). Based on that, Hutzschenreuter and Israel (2009) motivated by the relevant aspects that form the dynamic nature of competitive strategy, develop a literature review in order to gain insights into: (1) the antecedents and outcomes of a firm's competitive strategy; (2) **the importance of the timing and duration of strategic actions**; and (3) the long-term path characteristics of strategic activity as well as the path dependencies that result from strategic choices. With respect to this thesis' objectives, the second aspect evaluated by these authors has the highest relevance. In their literature review, Hutzschenreuter and Israel (2009) notice few findings that were focused on path dependency or the timing of strategic actions such as for instance, Barr and Huff's study (1997). It does focus on the timing of strategic responses. That study of six pharmaceutical firms showed that strategic changes are not predominately achieved in a timely way, as the pressure to change builds only gradually while firms struggle to align the different beliefs and mental models about cause and effect of alternative strategic adaptations. Another example in this context is Glen and Hambrick's study (1995) who investigate the impact of organisational size on the timing of strategic adaptation, finding that small firms tend to be faster in executing their own competitive moves, but slower in responding to those of their rivals. Hutzschenreuter and Israel (2009) conclude, *"[…] no other study we know of has extended the findings with respect to the timing of strategic actions. Furthermore, none of the studies we identify has focused on the influence exerted by long-term structural development on competitive strategy decisions*." (2009: 442). These authors summarize that *"short-term timing of strategic actions and long-term pacing of strategic adaptations both still offer significant potential for an analysis of the shape of resource accumulation and depletion processes."* (2009: 445).

Finally they suggest that there are still significant opportunities for extending the understanding of timing and path characteristics (2009: 445).

On the basis on the preceding arguments, and aiming to answer the second research question (see Chapter 4.2), **the simulation of the new extended model will lead to contrast the time duration of the implementation strategies and the temporal evolution of the main variables of the SD model will be portrayed**. *"The measures we used for our constructs are perceptual, except for the size measure which is based on archival data. Our preference for perceptual data reflects our choice to operationalize the strategic flexibility construct and its underlying dimensions in terms of managerial perceptions because perceptual measures are more appropriate for explaining managerial behaviour than archival measures (Bourgeois 1980)."*

6.2. Extended Model of Organisational Flexibility: Structure and Formalization

The following figures (Figure 50; Figure 51) represent the Extended Model in two types of diagrams, causal diagram and flow-stock diagrams. This model represents the continuous process to achieve the desired form while the environment evolves, which is produced by one balancing and two reinforcing feedback loops. However, resistance to change hinders the firm's efforts to change as a result of a self-reinforcing process generated by the organisational reaction to changes (feedback loop R4).

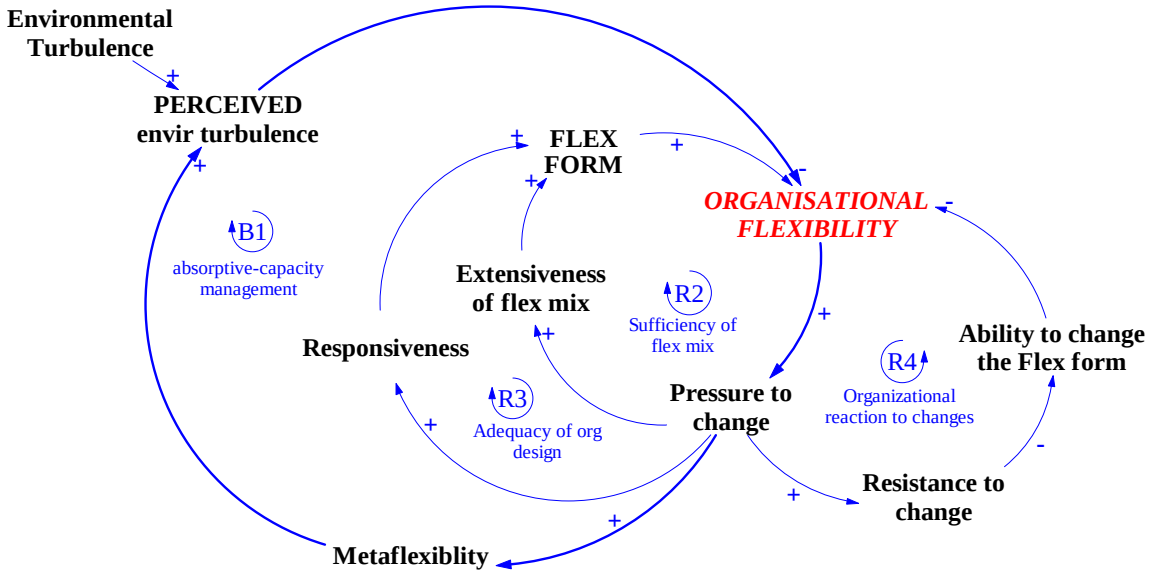

Figure 50: The Extended Model – a causal diagram for Organisational Flexibility

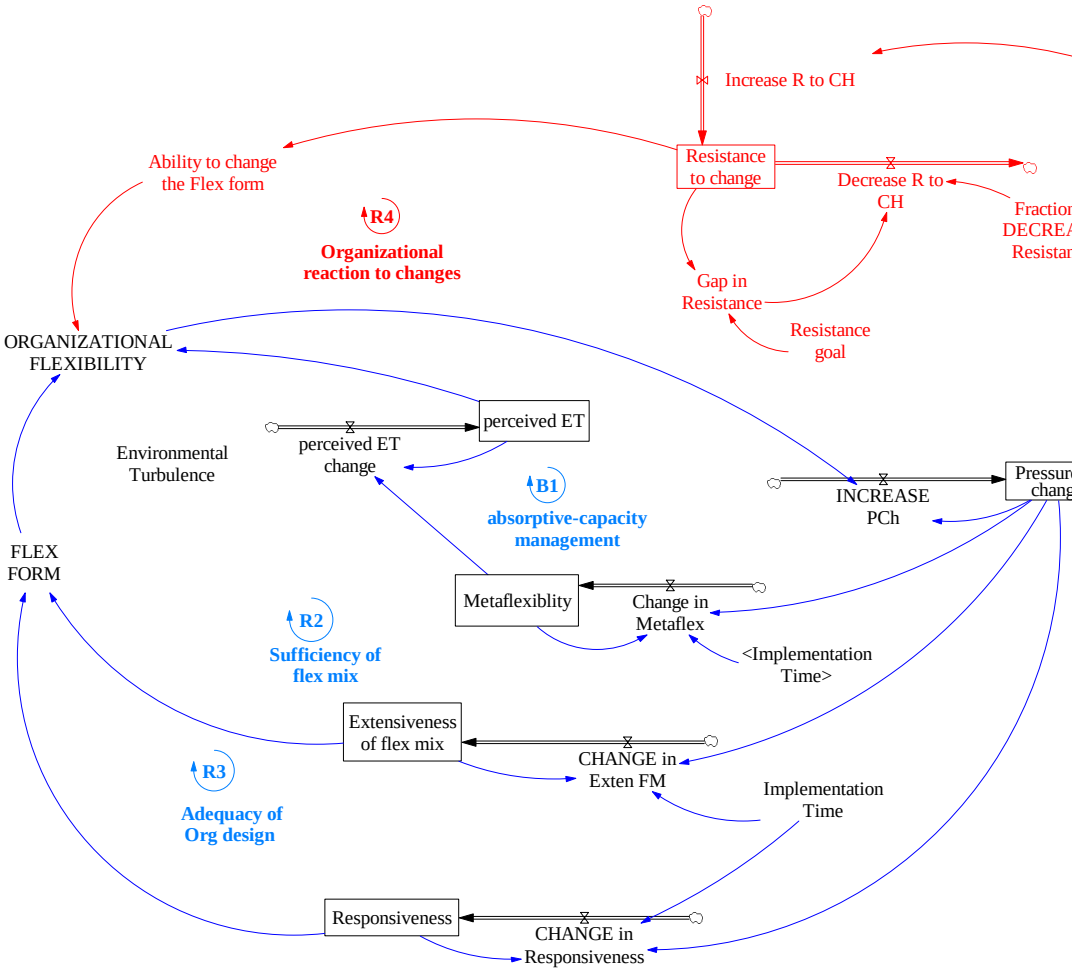

Figure 51: The Extended Model – the flow-level diagram

According to the research proposal of this thesis, new variables have been added to Volberda's framework and the simulation model will help us to underlie or reject the dynamic propositions of this research work. In this section, the extended model is going to be described according to each of the feedback loops that have been extended.

6.2.1. Organisational Reaction to Changes

The effectiveness of the strategies to recover the optimal Organisational Flexibility level by moving the Flexible Form to the desired level, will also depend on how the firm fosters the need for the proposed changes in the company, represented in the reinforcing loop 'Organisational reaction to changes' (R4) (Figure 52).

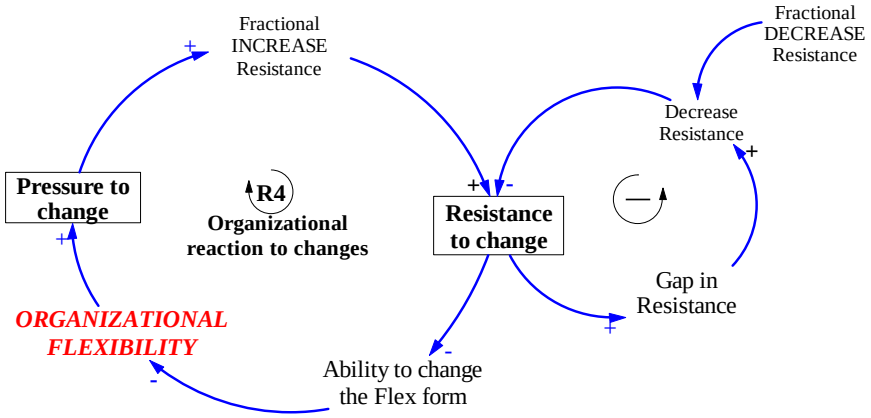

Figure 52: Organisational reaction to changes (R4) – Extended model

When 'Pressure to Change' has built up to a level high enough to activate the implementation of a change strategy, managers relieve the pressure by changing the Flexible Form but, in parallel, the accumulated levels of 'Pressure to change' rises 'Resistance to change'. Some complaints from an organisation's members should be expected when the firm is proposing new changes. As the resistance to change becomes higher, the 'Ability to change' falls and limits the efforts of the strategies implemented. The Organisational Flexibility level achieved through the dominant reinforcing loops may be far from optimal due to the unintended effect of the reinforcing loop R4, which acts as a vicious cycle to undercut the effect of adapting the firm's Extensiveness of flexibility mix and responsiveness. Although the increase level of this reinforcing loop will be constraint by the managers' control of Resistance to Change that will be activated when the level of resistance surpasses the level of resistance that they are willing to accept (gap in resistance).

They will be able to decrease the resistance activating several control mechanisms. Here, we present the new changes originated by the addition of the new two constructs.

The rate of change in the level of Organisational Flexibility is given by the difference between 'Perceived ET' and the current Flexible Form plus the ability of the firm to change the Flexible Form. Thus, change in organisational flexibility is determined by two factors. First, the need to change results from the pressure originated when Organisational Flexibility has not achieved the optimal level (zero) due to a deficit or a surplus of flexibility "*…sufficiency of the flexibility mix and the design adequacy of the organisational conditions must be continuously matched with the degree of environmental turbulence."* (Volberda, 1998: 204). Second, the effect of this need of change is counteracted by the organization's ability to implement effectively such decisions of change (variable '*Ability to change the flex form'*).

$$ORGANIZATIONAL\ FLEXIBILITY(t) = \big(FLEX\ FORM(t) - perceived\ ET(t)\big) * Ability\ to\ change\ the\ Flex\ form$$

Unit: Dmnl

The component 'Ability to Change the Flexible Form', represents the firm's ability to achieve the optimal Organisational Flexibility through the control of emerging opposing forces to impose the new changes in organisational conditions or in the management of flexibility capacities efficiently. Thus, this variable is represented by a function of the resistance to change. This variable has a positive impact in the Organisational Flexibility level, in the sense of, higher values on this variable will make the Organisational Flexibility level closer to the optimal value (zero). 'Ability to change' is inversely related to 'Resistance to Change'.

$$Ability\ to\ change\ the\ Flex\ Form\ (A) = f(Resistance\ to\ change)$$

Unit: Dmnl

$$f_A(1) = f_A^{min} > 0;\ f_A(0) = f_A^{max} = 1$$

GRAPH: [(0,0)-(1,1)],(0,1),(0.45,1),(0.5,0.9),(1,0.1)

When resistance to change is at low levels or equal to zero, the ability to change has the maximum level 1. When resistance to change is high enough, organisational managers are less able to implement effectively the change strategies so, ability to change decreases and Organisational Flexibility remains far from the optimal value. The minimum level of 'Ability to

change' is not zero due to the assumption that the highest level of inertia is not enough to preclude the desired change.

'Resistance to Change' represents the extent to which the organisation's participants disagree with incremental or radical changes (which alter their current working conditions in the organisation). It is a state variable that is modified over time by the difference between 'Increase Resistance to Change' and 'Decrease Resistance to Change'. At the beginning of the simulation, it is equal to zero due to the 'Organisational Flexibility' being in the optimal level and no pressures to change exist. It affects the firm's ability to implement the change strategies chosen by the managers.

$$Resistance\ to\ Change(t) = Resistance\ to\ Change(0) + \int_0^t INCREASE\ R\ to\ CH\ (s)ds - DECREASE\ R\ to\ CH(s)ds$$

$$Resistance\ to\ Change(0) = 0;\ Unit:\ Dmnl$$

'Resistance to change' is increased as a result of a 'Fractional Increase Rate', which is determined by the 'Pressure of Change'. According to Volberda, the levels of resistance with revitalization strategies will be higher than in routinization strategies due to totally new values and norms being required and past experience may not provide any advantage (1998:242). The effect of a high level of pressure, coming from higher gap in flexibility, modifies the inflow into the 'Resistance to Change' stock. If 'Pressure to change' achieves the highest value (2) the trajectory of change implies moving the Flexible Form twice so too many efforts will be required by the staff and the resistance will achieve the highest level.

Increase R to CH = Fractional INCREASE Resistance

Fractional INCREASE Resistance = GRAPH (ABS (Pressure to Change))

GRAPH: [(0,0)-(2,2)], (0,0), (0.1,0.1), (0.2,0.2), (0.3,0.3), (0.4,0.4), (0.5,0.5), (0.6,0.6), (0.7,0.7), (0.8,0.8), (0.9,0.9), (1,1),(2,1)

The decrease in *Resistance to Change* is the result of the firm's ability to control or manage such resistance by, for example, the effective communication of the necessity of change and its consequences. The '*Fractional Decrease Resistance'* and the value of the '*Gap in Resistance'* set the outflow to the stock. If the difference between desired and real resistance (positive gap) is positive, the firm will influence over the resistance of change. A negative gap indicates low levels in resistance to change and therefore no efforts are needed to reduce it. Here the assumption is that the 'Resistance goal' is 0.1 as it represents the minimum level of resistance that managers

are willing to accept when change strategies are implemented. The managers could modify this parameter.

*Decrease R to CH = Gap in Resistance*Fractional DECREASE Resistance*
Resistance goal= 0.1
Fractional DECREASE Resistance= 0.5

The '*Fractional Decrease Resistance*' rate represents how the firm is following the recommendations from Volberda in the transition process. For this model, this variable is a parameter that the manager can use to control the resistance to change. We assume that this parameter may increase up to 0,8 or reduce to 0,25 depending on how the managers use methods and tools to push any type of control over the employees' resistance. It is fundamental to note that resistance to change is as important as the means or tools that the organisation can manage in order to control any emergent resistance, thus, for succeeding in the implementation of its change strategy. In this sense, some authors working on the research field of resistance to change have stressed this aspect: "*Organisational change is not preordained to produce distress and resistance. In order to prevent distress and resistance, organizations can adopt methods and actions that help employees believe they have ability, skill, power, or knowledge to cope with the situation.*" (Tavakoli, 2010: 1797). Vakola and Nikolau (2005) underline several practical implications for managers and organisations facing organisational change (2005: 170). For instance, to build supportive work relationships, communicating effectively will result in positive attitudes to change. Additionally, if organisations plan the change carefully while creating a well-structured work environment and a well-balanced work schedule will result in reducing stress and uncertainty. They also explore evidence of the role of organisational commitment as a moderator between stress and attitudes to organisational change and identify a variety of research studies that define its role in a change context: it plays an important role in employee's acceptance of change; a highly committed employee is more willing to accept organisational change if it is perceived to be beneficial; employees with high organisational commitment are more willing to put more effort in a change project and, therefore, it is more likely to develop positive attitudes towards organisational change; organisational commitment mediates the total causal effects of positive affectivity, job security, job satisfaction, job motivation and environmental opportunity on organisational change (Vakola and Nikolau, 2005).

In the same context, Pardo Del Val and Martinez Fuentes (2003) propose leaders insights on how to deal with the sources of resistance of change and affirm that managers should pay special attention to the following topics:

- to reduce resistance caused by deep-rooted values, managers should consider how much organisational culture fits with change objectives, and
- training would be a good tool to surpass communication difficulties and thus avoid resistance caused by communication barriers, as well as to help reduce the gap between the present situation and the capabilities required for the change process.

Therefore, we accept the assumption of a positive relationship between organisational commitment and attitudes to change. Additionally, the firm will be able to reduce the resistance to change by controlling the organisational commitment of employees, by aligning organisational culture to change objectives and by training to overcome communication barriers. The joint efforts of the firm in these three aspects, is represented by the parameter *"Fractional DECREASE Resistance".*

6.2.2. Perception time

In the initial version of the model (Base Case) change in the managers' perception of the managers depended on the metaflexibility level without any delay. That means, as the absorptive capacity was used, the real interpretation of the changes in the environment appeared immediately. Decision makers use their perceptions of organization-environment fit in deciding how much to change the flexible form in response to non-desired levels of organisational flexibility and such perceptions usually suffer a delay. The extended model incorporates the consideration of delays in the perception of the changes by the managers (Figure 54; Figure 54). That means, *Perceived ET* will also depend on an estimated *Perception Time*.

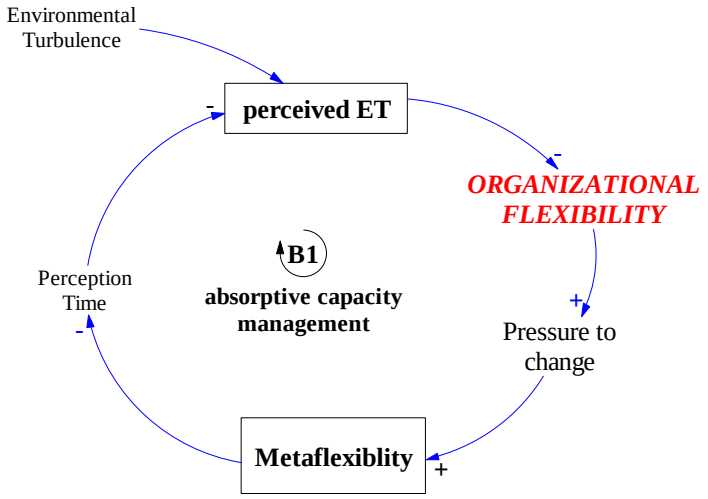

Figure 53: CAUSAL DIAGRAM - *Perceived Environmental Turbulence* (Extended model)

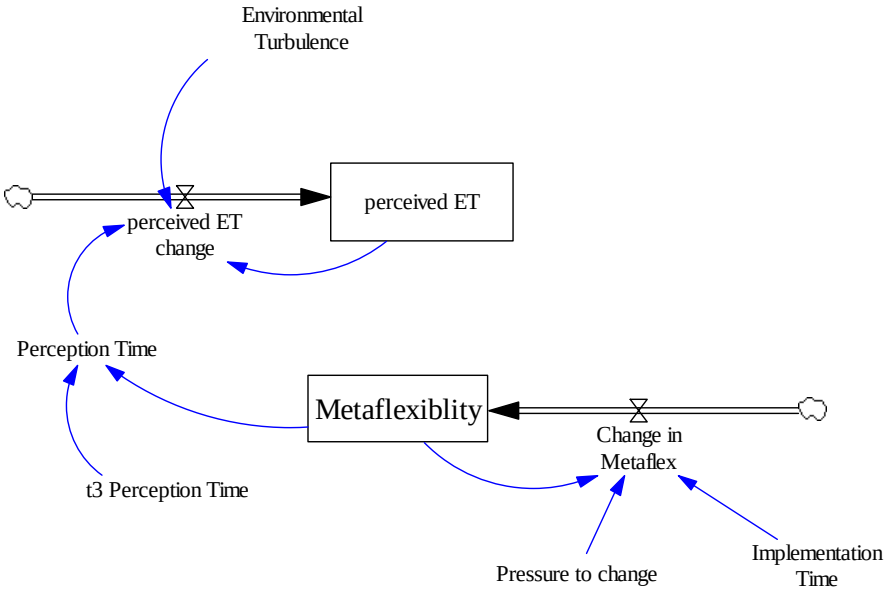

Figure 54: *Perceived Environmental Turbulence* – Extended model

The variable '*Perceived ET change'* is proportional to the difference between the current value of '*Perceived ET*' and the current *'Environmental Turbulence'*. The greater the difference, the more distant will be managers' perceptions of the reality of their competitive environment. Each quarter, a fraction of this difference is added to the *'Perceived ET'* average. Thus, the updating process is modelled as a change every time period equal to a given fraction of the difference

between current 'Perceived ET' and current 'Environmental Turbulence'; it is an exponential adjustment process. The smoothing out is necessary to capture the effects of perception and measurement delays.

$perceived\ ET\ change\ (t) = (Environmental\ Turbulence\ (t) - perceived\ ET(t))\ /\ Perception\ Time(t)$
Unit: Dmnl
$Perception\ Time(t) =$ *GRAPH Perception Time (Metaflexiblity)*
Unit: months

GRAPH Perception Time = [(1,0)-(4,12)],(1,12),(2,9),(3,6),(4,3)

The perception time has been estimated depending upon the level of metaflexibility. As the metaflexibility is closer to the level 4, that is, the maximum level of the absorptive capacity-optimal in a scenario of extreme turbulence, we estimate the delay in perceiving the environmental changes in 3 months. Jansen, van den Bosch, and Volberda (2006) empirically determined that pursuing exploratory innovation is more effective in dynamic environments, whereas pursuing exploitative innovation is more beneficial to a unit's financial performance in more competitive environments. We assume in this thesis that levels of metaflexibility closer to level four, are related to exploration and consequently, the manager's perception of the need of change could appear before (3 months). Conversely, when metaflexibility levels are closer to level one, the delay will be higher (12 months); for instance, mature organisations that are more concentrated on effectiveness. We decided to use perceptual measures for our parameters of time. Perceptual measures are more appropriate for explaining managerial behaviour than archival measures according to Bourgeois (1980).

In summary, while the original theory of Volberda appears to explain how pressure to change builds up, leading to the initiation of several change attempts on the flexible form, it does not account for those factors that inhibit to effectively implement those change strategies. In particular, we explore how resistance to change contributes to, or undermines, the ability to change Organisational Flexibility in response to increasing or decreasing Environmental Turbulence and the effect of managers' lack of perception.

we turn to additional assumptions that may be essential to fully explain observed data on change strategies towards organisational flexibility. Firstly, we assume that the development of dynamic capabilities (extensiveness of flexibility mix & metaflexibility) are not influenced in a significant way by external pressures but they are indirectly influenced by the exogenous

variable 'Environmental Turbulence". They are also directly influenced by internal pressures, which represent that the organisational level of Organisational Flexibility doesn't fit with what the environment is requiring. And secondly, we assume the effectiveness of the actions over resistance to change, which underlies the evolution of the ability to change, is independent from external circumstances[47]. It will only be dependent on managers controlling actions over the organisational commitment, training and sharing culture of change.

Once the research questions aforementioned have been addressed, some factors that allow the organization to control the achievement of organisational flexibility can be explored by experimenting with the simulation of the new extended model.

6.2.3. Sensitivity Analysis of the Extended Model: The relevance of controlling variables in the successful implementation of change strategies

The sensitivity analysis was developed following similar scenarios as in Section 3.5.3 with the addition of changes in the parameters of Resistance to Change, such as Resistance goal and Fractional decrease in Resistance. The sensitivity analysis that is shown in the following figures (Figure 55) portrays a higher range of the confidence limits (if we compare it to the Base Case). The three observed variables show higher levels of variability to the changes of the Implementation Time within a range that oscillates between 6 and 24 months. Thus, if the IT is halved or doubled (estimated Implementation Time: 12 months), the variables show higher levels of variability.

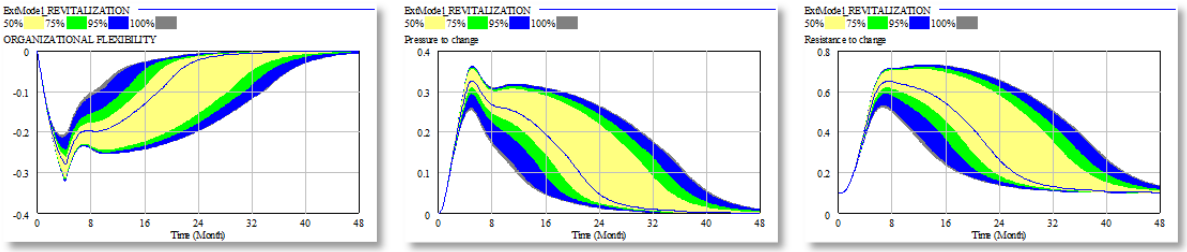

Figure 55: Sensitivity Analysis (Extended Model) when *Implementation Time* oscillates in a range [6, 24]

In the following figure (Figure 56) the sensitivity of the aforementioned variables as the initial manager's perception oscillates, is evaluated. At the beginning of the simulation period, the

[47] Han, C. C. (2001). Organizational size, Flexibility, and Performance: A System Dynamic Approach. Proceedings of the 19th International Conference of the System Dynamic Society, 23-27 July 2001, Atlanta, Georgia, USA.

sensitivity is higher and up to month eight, the confidence limits in the Organisational Flexibility variable are closer to the estimated value. Pressure to Change shows similar sensitivity results, showing lower levels of variability to changes in the initial value of Perceived ET. In the case of Resistance to Change the sensitivity levels are higher.

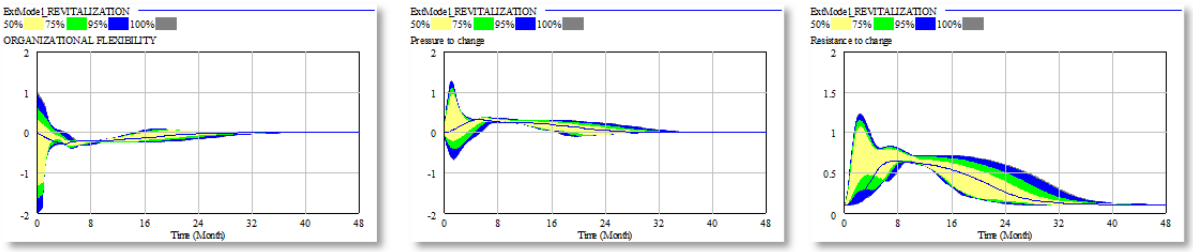

Figure 56: Sensitivity Analysis (Extended Model) when *Perceived ET* oscillates in a range [6, 24]

The sensitivity analysis (see Figure 57) shows that resistance control policies (varying Fractional Decrease from 0.25 to 0.8 and the Resistance Goal from 0.1 to 0.5) accompanying the change strategy, can generate differences of approximately 0.5 over the value of the Resistance Goal (0.1). The confidence limits of 95% and 75% are very far from the estimated value. In Figure 58, the sensitivity results on Organisational Flexibility and Pressure Change are shown.

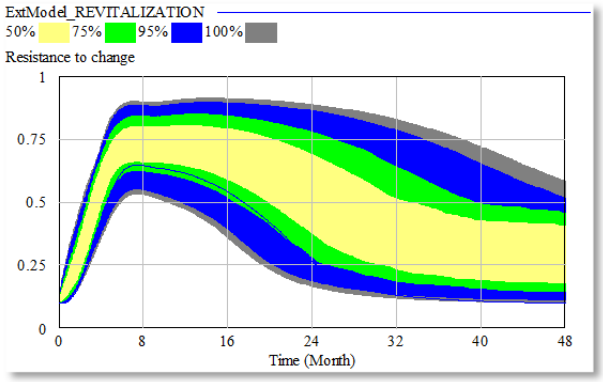

Figure 57: Sensitivity Analysis (Extended Model) when *Fractional decrease resistance* oscillates in a range [0.25, 0.8] and *Resistance Goal* oscillates in a range [0.1, 0.5]

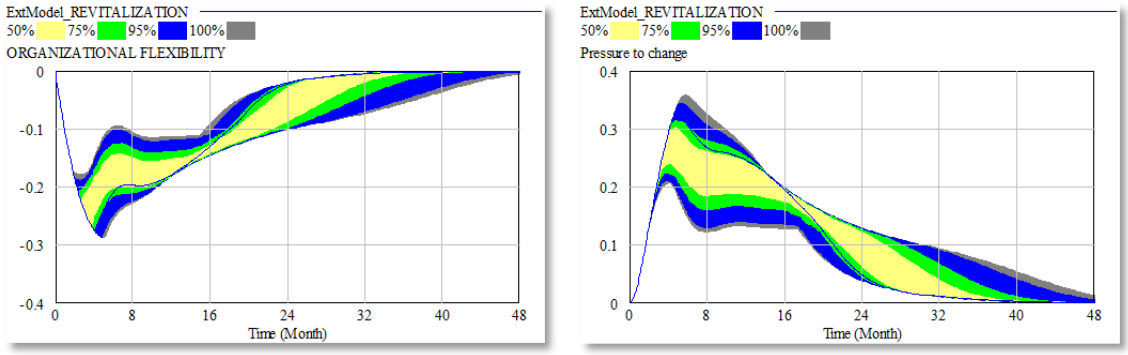

Figure 58: Sensitivity Analysis (Extended Model) when *Fractional decrease resistance* oscillates in a range [0.25, 0.8] and *Resistance Goal* oscillates in a range [0.1, 0.5]

Results confirm that the model shows higher levels of variability to changes on parameters that are related to the time dedicated to the implementation of change strategies and to policies of resistance control.

As explained in section 3.5.3, table functions need to be observed under the sensitivity analysis. We have developed the same exercises developed in the mentioned section with the tables used in the Extended Model. Following Sterman's advice, we have estimated the flat and steep cases for the three table functions in a Revitalization scenario.

The following figure shows different values of the "Ability to Change" as the Resistance to Change varies. Such a variation is based on original data of the base case (Figure 59).

Resistance to Change	Ability to Change		
	Flat Case	Base Case	Steep Case
0	1	1	1
0,45	1	1	0,8
0,5	0,95	0,9	0,6
1	0,5	0,1	0,1

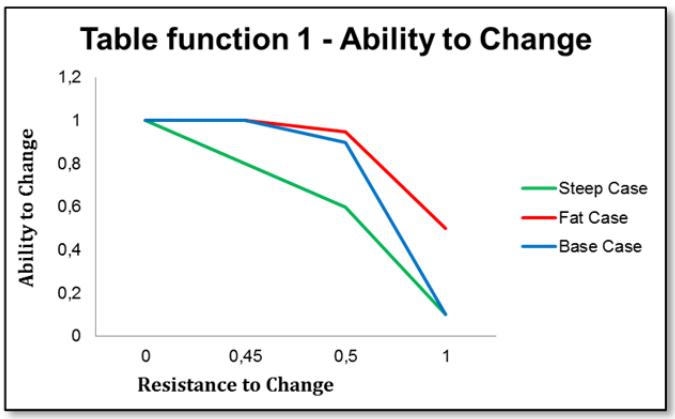

Figure 59: Variations in the assumed *Ability to Change* function for sensitivity analysis

The variable 'Organisational Flexibility' shows lower levels of variability to the changes in the Ability to Change (Figure 60). As expected, the steep case that represents lower levels of ability to change shows a higher delay in achieving the equilibrium (see the figure of Organisational Flexibility).

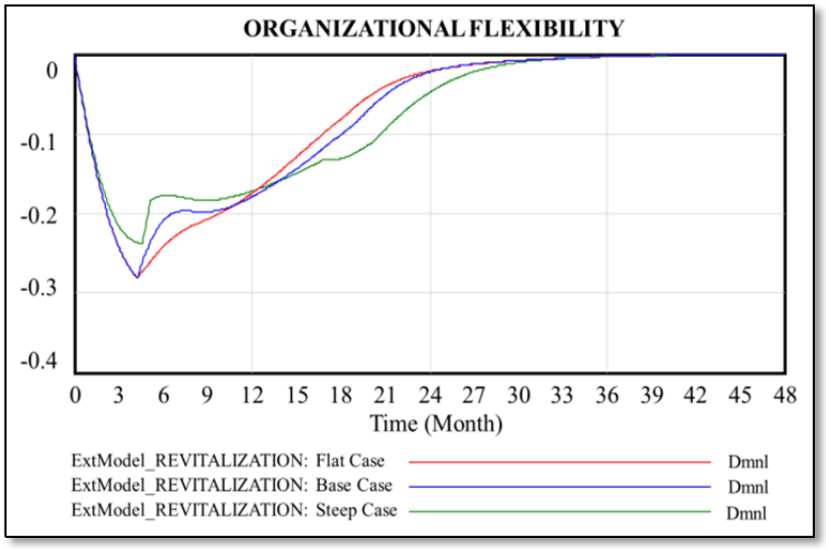

Figure 60: *Organisational Flexibility* with different *Ability to Change* Functions in a Revitalization Strategy

Now we turn to show different values of the "Fractional Increase of Resistance to Change" as the Pressure to Change evolves and their impact over the evolution of Organisational Flexibility. Such a variation is based on original data of the base case (Figure 65).

Pressure to Change	Fractional Increase Resistance		
	Flat Case	Base Case	Steep Case
0	0	**0**	0
0,1	0,1	**0,1**	0,3
0,2	0,15	**0,2**	0,5
0,3	0,2	**0,3**	0,65
0,4	0,25	**0,4**	0,8
0,5	0,3	**0,5**	0,9
0,6	0,35	**0,6**	1
0,7	0,45	**0,7**	1,1
0,8	0,55	**0,8**	1,2
0,9	0,65	**0,9**	1,3
1	0,7	**1**	1,4

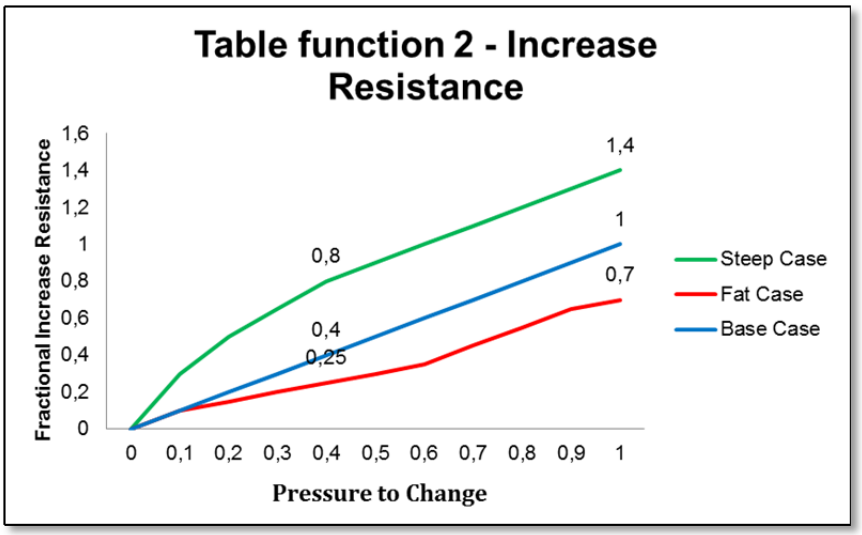

Figure 61: Variations in the assumed *Fractional Increase Resistance* function for sensitivity analysis

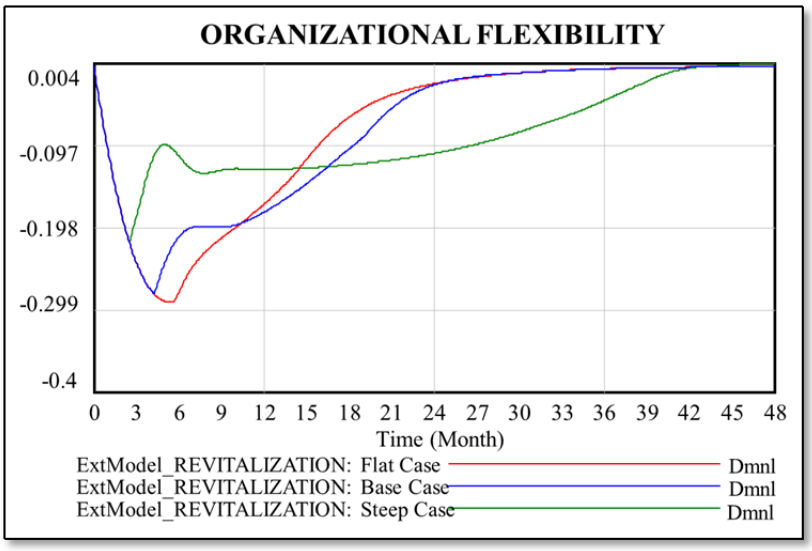

Figure 62: *Organisational Flexibility* with different *Increase Resistance* Functions in a Revitalization Strategy

As the figure of the evolution of the variable 'Organisational Flexibility' portrays (Figure 62). As expected, the steep case that represents higher levels on the increase resistance function shows a higher delay in achieving the equilibrium.

The last function to be evaluated is the Perception Time. In the following figures (Figure 63, Figure 64) we show alternative variations of this function as the Metaflexibility level varies and their consequences on the Organisational Flexibility level.

Metaflexibility	Perception Time		
	Flat Case	Base Case	Steep Case
1	12	12	12
2	10	9	6
3	9	6	3
4	8,5	3	1

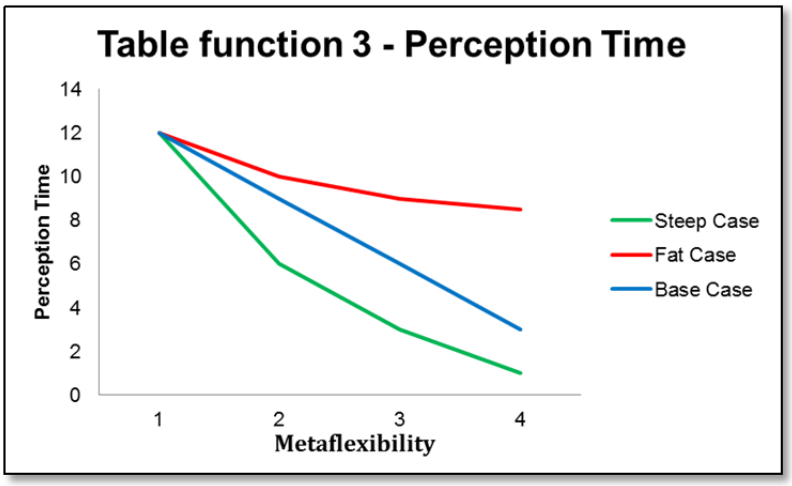

Figure 63: Variations in the assumed *Perception Time* function for sensitivity analysis

As expected, lower values of perception time (the Steep Case) allows the equilibrium to be achieved earlier although in that case, the perceived flexibility gap achieves slightly higher limits (the Base Case and Flat Case both are closer to a flexibility deficit of 0.3 and the flexibility deficit that the Steep Case portrays is closer to 0.4).

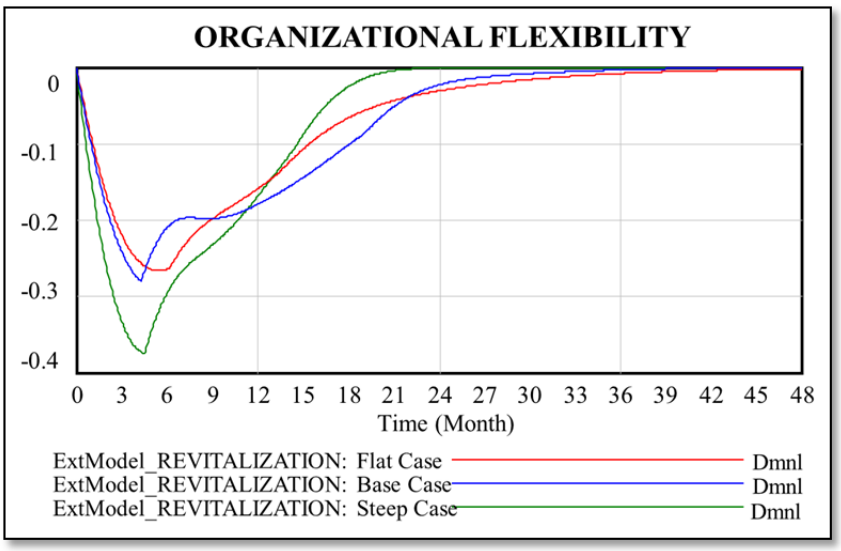

Figure 64: *Organisational Flexibility* with different *Perception Time* Functions in a Revitalization Strategy

6.3. Simulating Controlled Scenarios for Helping in Managerial Decision Making

Once dynamic elements that are left implicit in the original theory (Larsen and Lomi, 2002) of organisational flexibility have been identified and represented, we now turn to a variety of simulation exercises for understanding the dynamics of organisational systems. The advantages of simulation models in extending theories have been explained in Chapter 3.2.

One of the objectives in this section is to interpret the findings of a series of virtual experiments to develop a set of dynamic propositions that are consistent with the underlying process being modelled and can be used by managers in the decision making process.

Firstly, we show in this section, the results of several simulation experiments that have been run with both models. In order to understand the behaviour of the system when the comparison between Base Case and Extended Model is done, the model was tested in the same scenarios that have been proposed to describe the base case (Table 15 in section 4.1). We have used the same parameter values used to simulate the Base Cade model (see Appendix 1). The effects of routinization and revitalization strategies between both formal models are distinguished when one or two movements for transitions are needed (Table 15).

Theoretical findings and prior insights of the dynamic behaviour of the dimensions of *Organisational Flexibility* allow us to settle down the dynamic propositions that will be tested through additional simulations scenarios in the new extended dynamic model. Thus in a second section, the system's behaviour is illustrated under both types of change strategies showing: the effects of a different manager's perception of the 'Environmental Turbulence' and the system is exposed to several changes in the manager's control of resistance to change.

The non-linear dynamics of both positive and negative effects of those strategies on the evolution of *Organisational Flexibility*, *Flexible Form*, *Pressure to Change*, *Resistance to Change* are evaluated. Finally, we conclude with relevant interpretations for management practice.

6.3.1. Comparing two models

Based on the theoretical insights that have been exposed in Chapter 6.1, the following dynamic propositions have been proposed to be validated through a variety of simulation scenarios.

Dynamic Proposition 1: *Resistance to change appears as a consequence of the pressure to change when managers trigger change strategies and cause a relevant delay on the desired results.*

Dynamic Proposition 2: *Managers' perception of the environmental turbulence changes and the consequent need for change, delays the desired results on organisational flexibility*

We propose a comparison of the dynamic behaviour of the two models when routinization and revitalization strategies are implemented, if one or two movements for transitions would be needed.

The first simulations run represent a **Routinization strategy** implemented (Figure 65b) as the *Flexible Form* surpasses the required level (*Planned form*). The results show that the system needs more time for the success of the change strategies in the Extended Model than in the Base Case.

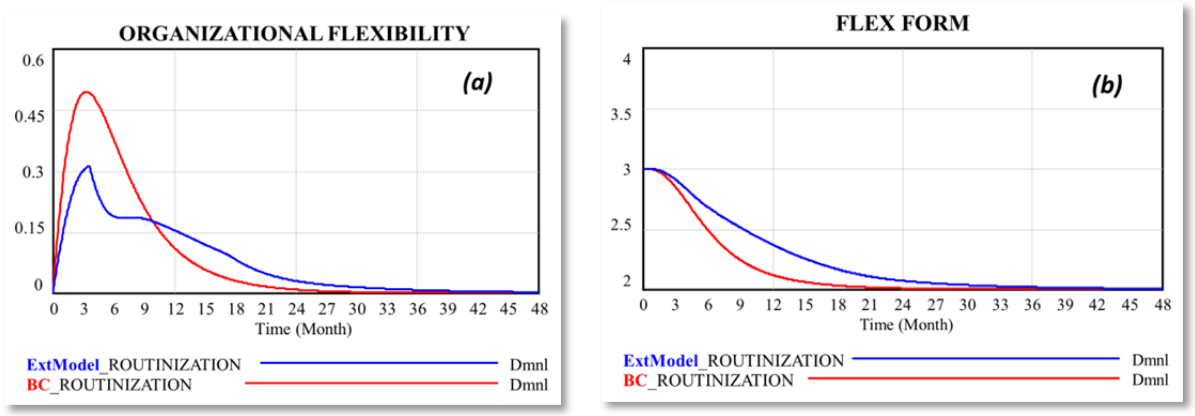

Figure 65: ORGANISATIONAL FLEXIBILITY & FLEXIBLE FORM - Extended Model vs Base Case; one transition of Routinization Strategy

We can observe how *Organisational Flexibility* starts moving away from the optimal level until month 4 in the Base Case and Extended Model (Figure 65a); in that time the effects of the change strategy implemented starts. The decreasing rate starting from those months corresponds to a marginally successful ´routinization' change strategy, originated by (negative) increases in the pressure for change. As a consequence of such strategy, the *Flexible Form* (Figure 65b) starts the desired trajectory: approaching the 'Planned Form'. As can be appreciated, the GAP is previously more reduced in the base case than in the extended model. Small variations in Flexible Form

correspond to marginally successful change attempts, originated by increases in the Pressure to Change.

Change attempts start when the *Pressure to Change* reaches an accumulated value that is the threshold for change originated by positive values in *Organisational Flexibility*. Once the change strategy has started, the objective is to reduce the level of the stock pressure for change. *Pressure to Change* starts to accumulate faster and the threshold is higher (Figure 66a) in the Base Case than in the Extended Model. It achieves the sufficient level for activating the change in the variables of Extensiveness of Flexibility Mix, Responsiveness and Meta-flexibility however it changes their trajectory towards the desired level (zero) at a much lower decrease rate.

The direct effect of routinization strategy is to reduce the level of the stock *Pressure to change* and it starts from matching the *Perceived ET* to the real values (Figure 66b). Again, the accumulated values of managers' perception achieve the real state in the base case faster than in Extended model.

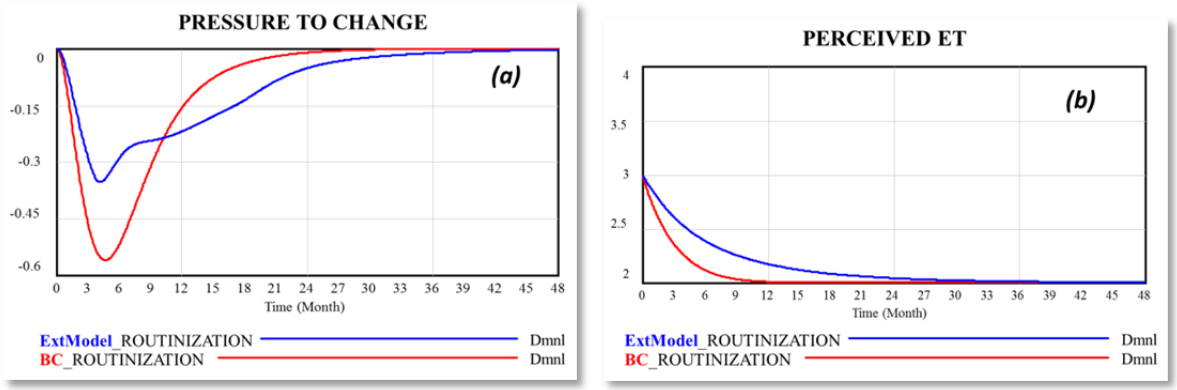

Figure 66: PRESSURE TO CHANGE & PERCEIVED ET (Extended Model vs Base Case; one transition of Routinization Strategy)

How often the routinization strategy takes place depends on the accumulated values in Pressure to Change. In the case that Figure 65 and Figure 66 are describing, routinization strategy is only needed once throughout the simulation period. Figure 65 shows the performance of the implemented strategy, Routinization, through observing data in the main variables of both models.

In the Extended Model, the perception of managers concerning the environmental turbulence in the Extended Model is based on how the company develops its Metaflexibility task (data gathering and processing). Therefore, the observed GAP between what the environment is

requiring and the current situation is inferior than in the base case, however, the optimal level is much later achieved. The dominant feedback loop ('Organisational reaction to changes'-R4) is constraining the efforts represented through the balancing loops 'Sufficiency of Flex. Mix'-R2 and 'Adequacy of Org. Design'-R3.

With the new model, we can observe that until month 33, the Flexible Form does not match the required level (Figure 65b). A lower performance may be originated due to *Resistance to Change* which directly disturbs the organisation's ability to effectively implement the required change attempt. When *Resistance to Change* accumulates and takes a superior value than managers would accept, the organisational ability to implement the change effectively on the organisational flexibility level decreases under the value 1 and it slows down the process to achieve the optimal level (Figure 67).

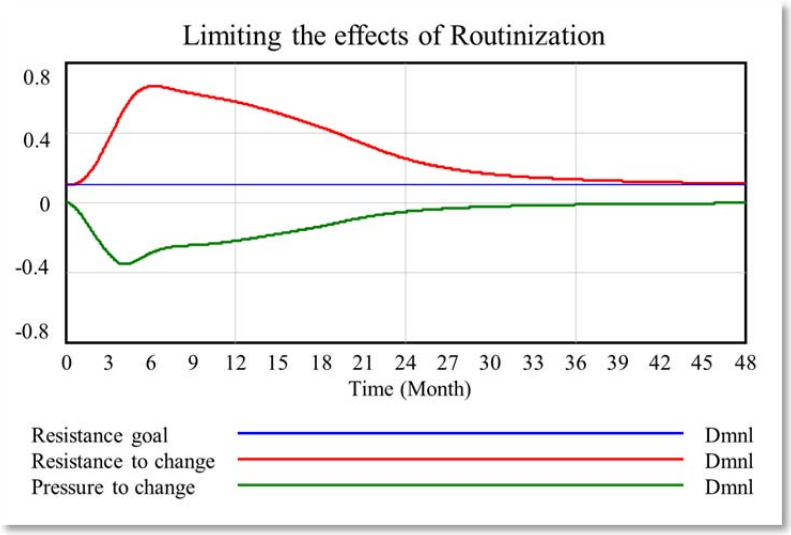

Figure 67: Resistance to change in Routinization Strategy

The new dynamic representation of the system confirms that the delays originated by managers' perception of the need for change accumulate less pressure to change but that such pressure is more distended over the time period. It also confirms that the optimal level in the organisational flexibility level is not achieved in the observed period because of the resistance to change that is originated.

A similar simulation exercise is provided in the following analysis when a **Revitalization strategy** is implemented, as the Flexible Form is lower than the required level (transition from *Flexible* state towards *Chaotic* state). The results show that the system needs more time for the success of the change strategies in the Extended Model than in the Base Case.

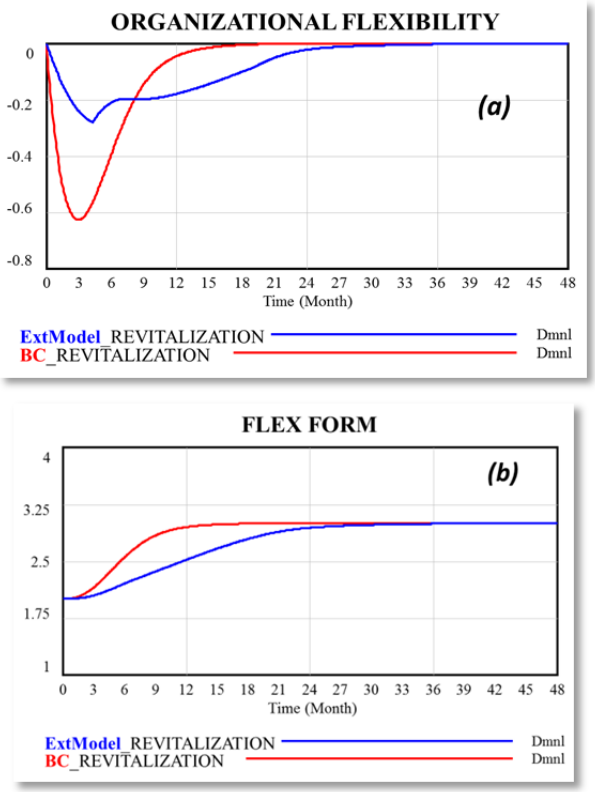

Figure 68: ORGANISATIONAL FLEXIBILITY & FLEXIBLE FORM (Extended Model vs Base Case; one transition of Revitalization Strategy)

We can observe how *Organisational Flexibility* is moving away from the optimal level until month 3 in the Base Case and, month 5 in the Extended Model (Figure 68a). The growing rate of this variable starting from those months corresponds to a marginally successful 'revitalization' change strategy, originated by (positive) increases in the pressure for change. As a consequence of such strategy, the *Flexible Form* (Figure 68b) starts the desired trajectory: approaching the '*Chaotic Form*'.

The dynamic behaviour of the Pressure to Change starts to accumulate in the base case faster than in the extended model (Figure 69a). The direct effect of the revitalization strategy is to reduce the level of the stock Pressure to change (in absolute terms) and it starts from matching the Perceived ET to the real values (Figure 69b).

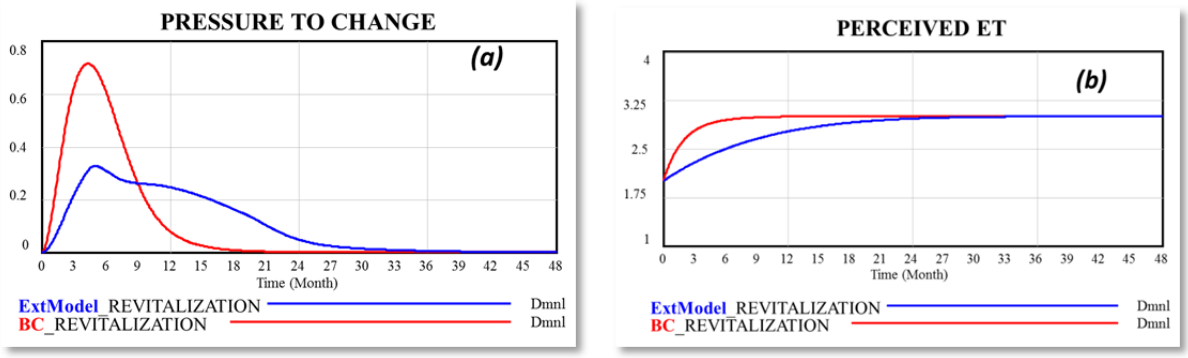

Figure 69: PRESSURE TO CHANGE & PERCEIVED ET (Extended Model vs Base Case; one transition of Revitalization Strategy)

With the new model, we can observe that by month 33 the Flexible Form matches the required level (Figure 68b). A lower performance may be originated due to *Resistance to Change* which directly disturbs the organisation's ability to effectively implement the required change attempt. When *Resistance to Change* accumulates and takes a superior value than managers would accept, the organisational ability to implement effectively the change on the organisational flexibility level decreases under the value 1 and it slows down the process to achieve the optimal level (Figure 70).

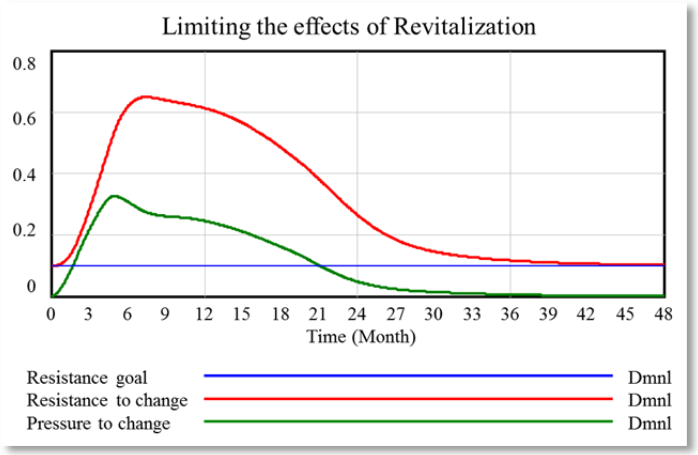

Figure 70: Resistance to change in Revitalization Strategy

In summary, the results obtained from this first simulation are similar in both strategies, routinization and revitalization:

- The GAP between the required and the current form is previously more reduced in the base case than in the extended model.

- *Pressure to Change* starts to accumulate faster and the threshold is higher in the Base Case than in the Extended Model. It achieves the sufficient level for activating the change in the variables of Extensiveness of Flexibility Mix, Responsiveness and Meta-flexibility however, it changes their trajectory towards the desired level (zero) at a much lower decrease rate.
- The accumulated values of managers' perception achieve the real state in the base case faster than in the Extended model (Figure 69b).
- *Resistance to Change* accumulates and takes a superior value than what managers would accept and it slows down the process to achieve the optimal level.

The new dynamic representation of the system confirms that the delays originated by manager's perception of the need for change accumulate less pressure to change but that such pressure is more distended over the time period. It also confirms that the optimal level in the organisational flexibility is not achieved in the observed period because of the resistance to change that is originated.

The provided data confirm the expectations of much of the literature concerning relevant delays that can be observed in achieving the desired level of Organisational Flexibility. As mentioned at the beginning of this chapter, focusing on how the firm endeavours to align the combination of managerial capabilities and organisational design to the environmental changes, the ability to implement the change passes through effectively controlling: (a) the resistance coming from staff resistance to change as one of the main reasons for the failure of many change initiatives (e.g. Armenakis & Bedeian, 1999, Gilley, et al. 2009); and (b) the manager's perception of the changes in the 'Environmental Turbulence' (e.g. Sastry, 1997; Volberda, 1998; Armenakis & Bedeian, 1999; Pardo del Val and Martínez Fuentes, 2003; Vakola and Nikolau, 2005).

Simulation findings match the predictions from the theory and the two dynamic propositions have been tested. The managerial implication derived from the previous analysis is the following:

When routinization or revitalization strategies are implemented by focusing the company's efforts on decreasing/increasing the extensiveness of flexibility mix and/or decreasing/increasing the responsiveness level, ***extra time will be needed to transmit the need to change*** *and re-design the organisational conditions efficiently to the organisation's members.*

6.3.2. Radical Trajectories

What would happen if the surplus or deficit of flexibility represents strong changes in the dimensions of Organisational Flexibility? Radical or sequential transformations were observed by Volberda (1998: 265) when managers needed, for example, to achieve the Flexible type when the starting point was a Rigid type or vice versa. Volberda states "[...] *radical transformation is less time-consuming, but more risky because the scope of change is large and the content of change is more difficult.*" (Volberda, 1998: 267). In this sense, Flyvbjerg (2006) asserts that extreme cases are not intended to be representative of a broader population, but help to illuminate previously ignored variables and their relationship to broader phenomena. *"Atypical or extreme cases often reveal more information because they activate more actors and more basic mechanisms in the situation studied."* (Flyvbjerg, 2006:229).

In this section, we shall show the results of simulation comparing two models under the conditions of the second scenario (see Table 15): the trajectory followed when two steps are needed for the required transition. In order to avoid duplicities a summary of results are presented. The following figures (Figure 71 and Figure 72) show the evolution of *Organisational Flexibility* and *Flexible Form* under the two likely trajectories: routinization and revitalization.

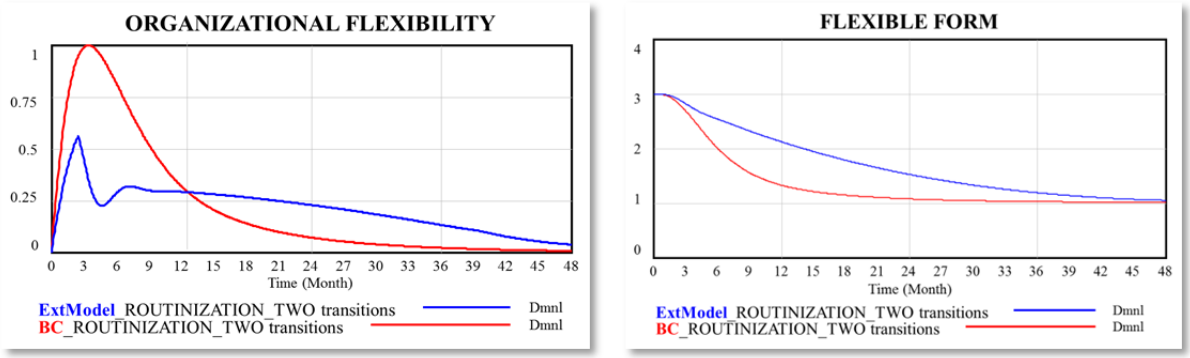

Figure 71: Simulations results (Extended Model vs Base Case) - two transitions of Routinization Strategy

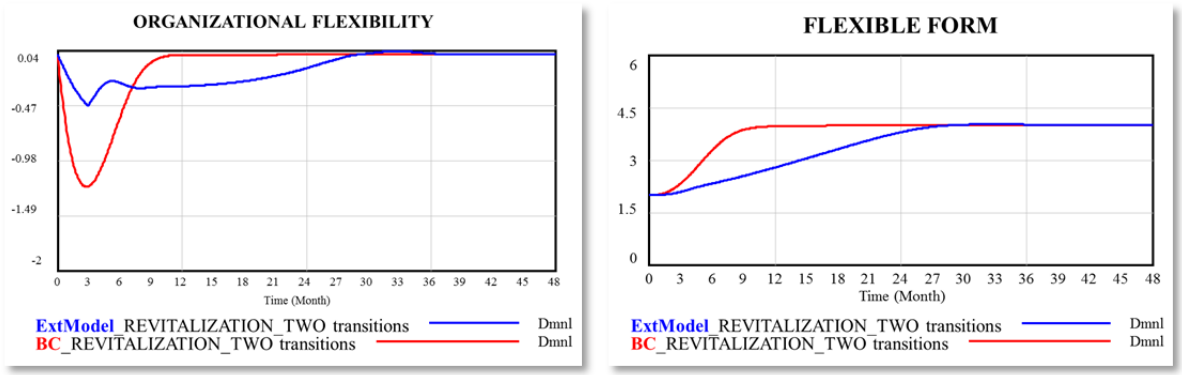

Figure 72: Simulations results (Extended Model vs Base Case) - two transitions of Revitalization Strategy

From a global perspective, the results confirm the same conclusion as in the previous section: relevant delays impede achieving the optimal level of organisational flexibility after the implementation of change strategies. The effect that *Resistance to Change* has over such results must be noted and described here. In both cases, Figure 73 and Figure 74 show how a relatively slower process of transition follows a severe rise in resistance to change. The accumulation of resistance is rapid during the first 12 months, but as pressure to change decreases after the implementation of strategies, the rate of decrease starts to drop until it stops and stabilizes at the level that managers allow (0,1).

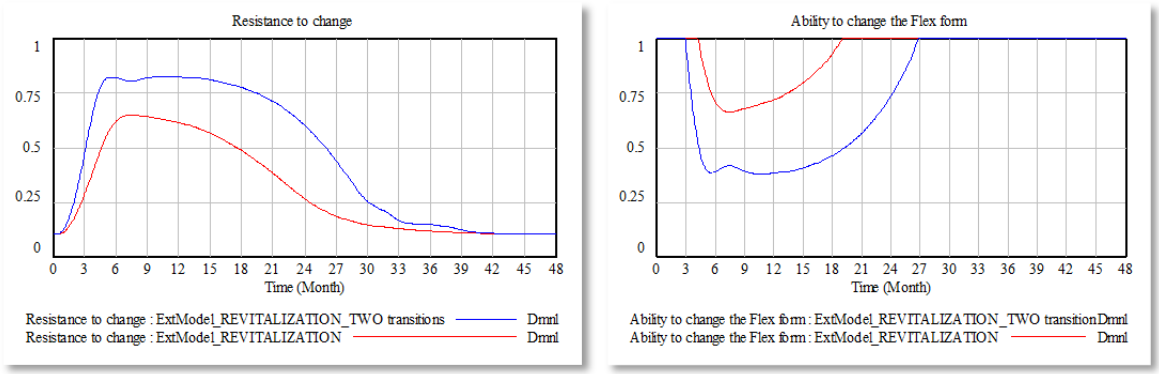

Figure 73: RESISTANCE TO CHANGE & ABILITY TO CHANGE (Extended Model; two transitions of Revitalization Strategy)

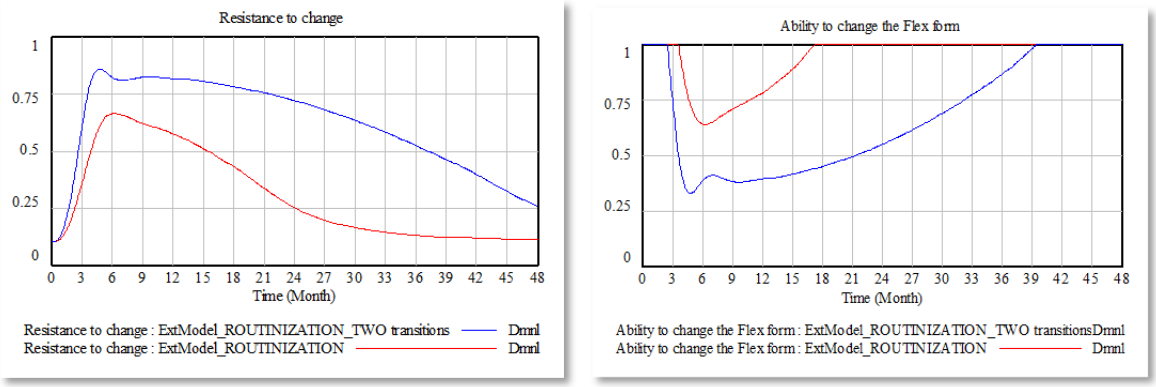

Figure 74: RESISTANCE TO CHANGE & ABILITY TO CHANGE (Extended Model; two transitions of Routinization Strategy)

This behaviour has many characteristics in common with the observations made by Englehardt and Simmons (2002) in their theoretical discussion on how to achieve flexibility including several approaches. They observe a number of views of the conflict between execution and flexibility that are discussed in the literature. For instance they noted that restrictions to adaptation can be part of locked-in organisational patterns that facilitate connectivity and coordination through the formation of structures and standards. Thus, this confirms an overarching dilemma, "[…] *as a consequence of success, organisational flexibility disappears and resistance to change increases with growth in size of and the hardening of processes over time*." (Englehardt and Simmons, 2002; p. 115). Snull (1999) presented a similar conclusion: on the one hand, as firms become successful, the elements of their winning system become embedded in processes, and these patterns often become strategic frames of reference; on the other hand, although these locked-in frames can help focus the organization and raise effectiveness and efficiency during periods of stability, the repetitive focus often blinds the organization to the needs of the future. Lastly, White et al. (1997) suggested that organisations may become too large to adapt, regardless of the selective pressures of the environment. This crisis can originate from an overemphasis on control mechanisms, combined with a failure to act at the necessary time.

Based on his empirical observations, Volberda suggests two recommendations for radical trajectories. A sequential revitalization will be most effective when the firm is not concerned with speedy reaction and, while radical transformation is more appropriate when there is a pressing need for the organisation to respond collectively (1998: 268).

One possible implication of these observations is that it might be desirable for the organization to have a certain level of control over the *Resistance to Change* as well as to be able to establish the extent of resistance (Resistance Goal) that would accepted for any type of change strategy. Thus, the Ability to implement required changes would be also controlled.

We might conclude that, based on the results obtained from the comparison of the two models shown above, managers in charge of implementing change strategies in favour of balancing change and preservation (organisational flexibility) would need a specific decision making tool for the processes involved in organisational flexibility. Kunc and Morecroft (2007: 188) reveal that system dynamics modelling can support the process of strategic development. They also state that "*Modelling is fundamentally the art and science of interpreting complexity, and there is always a choice about how much detail to include, depending on the purpose*." (2007: 188). The small-scale models' purpose is to reflect entrepreneurial intuition and rehearse the implications, and the more sophisticated models' purpose is related to facilitating strategic change by developing a shared understanding of complex situations and by testing the effect of specific business policies.

In the next section, we aim to provide insights upon how the Extended Model can help managers to better approach routinization and revitalization strategies and its elements by testing the effect of specific organisational policies.

6.4. Additional Simulations

So far, the Extended Model has been tested in comparison to the Base Case through simulating the same conditions. Following Volberda's recommendations, firms need to find the appropriate balance between managerial and organisational tasks, but how are firms able to reconcile the conflicting forces for change and stability when the adaptation is required? We describe in this section three new scenarios whose simulation results can help to elaborate relevant managerial implications for organisational change theory. A variety of organisational policies have been evaluated that govern: managerial perception of the competitive forces, control of resistance to change and alternative combinations of the properties of the flexible, planned or even chaotic forms. In this sense, the extended model of organisational flexibility may be used to investigate organisational responses and dynamics of decision-making with various what-if scenarios.

6.4.1. Importance of Managers' Perception of Environmental Turbulence for Succeeding In the Chosen Trajectory

The role of Absorptive Capacity (Metaflexibility) has been largely recognized by international business studies as highly relevant (e.g. Zahra and George, 2002; Jansen, Van Den Bosch, & Volberda, 2005; Volberda, Foss, & Lyles, 2009), a large sample of empirical studies reveal such relevance as Zahra and George (2002) observe (e.g. more recently, Ben-Menahem, Kwee, Volberda, & Van Den Bosch, 2013), and some authors have even conducted an exploratory research based on a system dynamics model and explore the dynamics of managing firm's product portfolio (e.g. Mäkinen & Vilkko, 2014).

In their literature review of absorptive capacity, Zahra and George (2002) described the evolution of this concept from the Cohen and Levinthal's first incursion into the management of literature (1990). They also provide a reconceptualization of the construct that distinguishes between a firm's potential and realized absorptive capacity (named as PACAP and RACAP) (2002: 185). The potential nature is related to the acquisition of knowledge and realized nature is related to the transformation of knowledge. In this thesis we follow the definition of Zahra and George (2002) when reconceptualising the Absorptive Capacity, "*ACAP is a set of organisational routines and strategic processes by which firms acquire, assimilate, transform and exploit knowledge for purpose of value creation. Emphasis on dynamic capabilities geared toward strategic change and flexibility wherein firms create and exploit new knowledge by transforming acquired knowledge*" (2002: 198). These authors, among others, shed some light on future research, concerning the need to recognize the temporal aspects of such a capability development as well as the need to measure the potential and realized absorptive capacity and investigate possible combinations over time (2002: 199).

With a similar purpose to that of Zahra and George (2002), Volberda et al. (2009) identify main literature findings related to managerial cognition, which is related to Absorptive Capacity. It is suggested that managers perceive things through their own cognitive lenses, which means: managers reduce the complexity they face by developing mental maps that result in a "*dominant management logic*" (e.g. Bettis and Prahalad, 1995). It is probable that this dominant logic evolves over time and influences the organisational form directly and the Absorptive Capacity's level indirectly (Volberda, et at., 2009: 5). There exist examples of managers who when applying a classical management logic do not consider the environment as a source of valuable knowledge

to be absorbed (Dijksterhuis et al. 1999: 560). Volberda et al. conclude that these managers will seriously limit the level of absorptive capacity of the firm (2009).

In line with this argument, they find literature evidence as regards to how the characteristics of the knowledge environment influence the nature of a firm's absorptive capacity (Volberda et al. 2009:17). They assert that when the knowledge environment is turbulent, firms tend to develop absorptive capacity aimed at exploration, with low efficiency, a broad scope, and much flexibility. While in a stable environment, firms tend to develop absorptive capacity aimed at exploitation, with high efficiency, a narrow scope and little flexibility (Dijksterhuis et al. 1999).

What would happen if the managers' perception of the evolution of the competitive forces were not aligned to its real evolution? How long will it take to be closer? Based on literature findings and the managerial implications we derived in section 6.3.1 with respect to managers' perception, we aim at evaluating the system's behaviour and the results over the desired results over Organisational Flexibility when the Environmental Turbulence's evolution is far from managers' perception.

The following dynamic proposition has been proposed in order for it to be validated through a variety of simulation scenarios.

Dynamic Proposition 3: Managers' perception may force the firm to choose an inappropriate trajectory of change and to implement changes that are not needed.

Some scenarios for simulation are proposed when the '*Perceived Environmental Turbulence*' is far from the real situation. In this simulation, two different scenarios have been taken into account and we have incorporated a STEP function in the values of ET: (A) The starting point of the *Perceived ET* is lower than the real level of the *Environmental Turbulence* that increases in month 12 thus, a *revitalization* strategy is needed; and, (B) the starting point of the *Perceived ET* is higher than the real level of the *Environmental Turbulence* that decreases in month 12 thus, a *routinization* strategy is needed. The values of the variables are listed in Table 23 (Appendix 2).

In the aforementioned scenarios, the variable '*Perceived ET*' takes inferior or superior values than the exogenous variable ('*Environmental Turbulence*'). We aim at representing what would happen with the system if the environment changes and both change strategies were needed. We introduced a STEP function in the expected values of the Environmental Turbulence and its changes after the first 12 months.

The 'Absorptive Capacity' balancing loop (B1) dominates the system and tends to re-orientate it firstly to achieve the *Flexible Form* that the managers perceive as the required one. In scenario A (Figure 75) –Perceived ET lower than the real Environmental Turbulence– the variable '*Perceived ET*', starts on the perception of required form as the *Planned* type (level 2) but the firm is deploying the Flexible type (what the environment is requiring). The evolution of this variable (blue line) follows a gradual increase up to the *Flexible* state (level 3) by month 30. However, as the green line shows, the current Flexible Form starts to change, it decreases towards the Planned form (level 2).

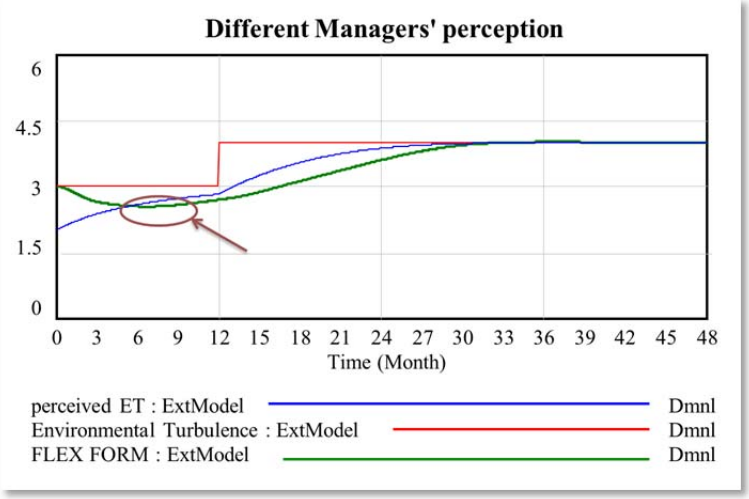

Figure 75: Lower 'Perceived ET' than 'Environmental Turbulence' in REVITALIZATION

In scenario B –Perceived ET higher than the real Environmental Turbulence– the results are similar: the managers' perception tends to be aligned to the requirements of the environment but originates a side effect over the Flexible Form, that is, over the Extensiveness of Flexibility Mix and Responsiveness. Figure 76 portrays the behaviour of the system when the '*Perceived ET*' is superior to the real one at the beginning of the simulation period in a Routinization strategy.

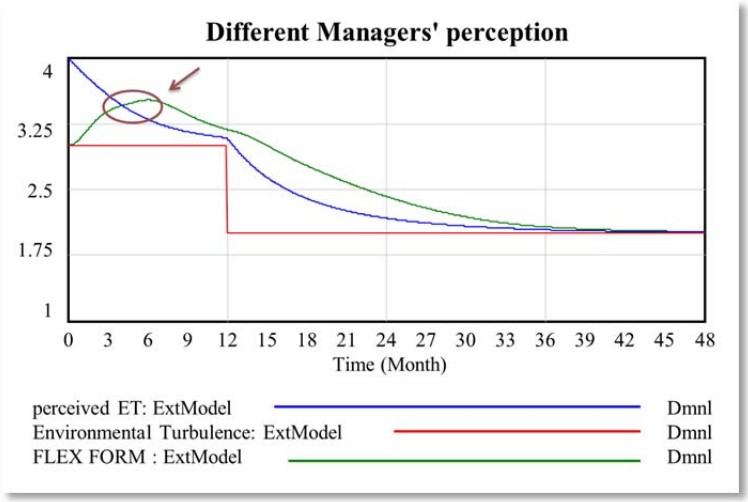

Figure 76: Higher 'Perceived ET' than 'Environmental Turbulence' in RUTINIZATIN

Firstly, the system forces the evolution in Organisational Flexibility during the first 12 months that aims at adjusting the Perceived ET to the real 'Environmental Turbulence' level (Figure 77). When managers are forced by the gap in Organisational Flexibility, the reinforcing loops (R2 & R3) are dominant and force the *Flexible Form* towards the required one.

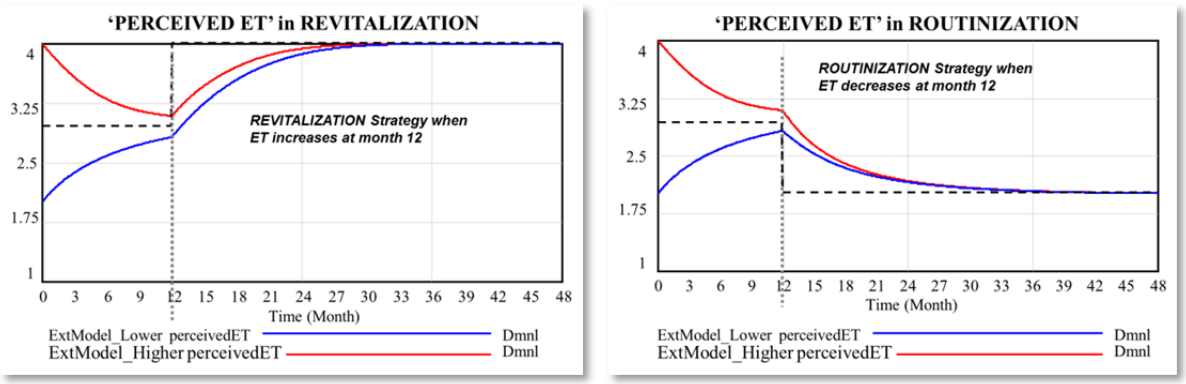

Figure 77: Different 'Perceived ET' to 'Environmental Turbulence'

Organisational Flexibility moves from a positive value, which represents a surplus of flexibility, as the Flexible Form is modified according to the GAP (Figure 78). By month 12, the environmental turbulence changes and two possibilities are shown: a revitalization strategy is required since the 'Environmental Turbulence' is increasing or a routinization strategy due to a decrease in the 'Environmental Turbulence'. In both scenarios of change strategies, the equilibrium is achieved in a higher period of time if the managers' perception is higher than that required by the environment. The optimal level of Organisational Flexibility is achieved in a certain time within months 32 and 40 if the perception is lower. On the contrary,, if managers' perception is higher, the optimal level is not achieved in the simulation period.

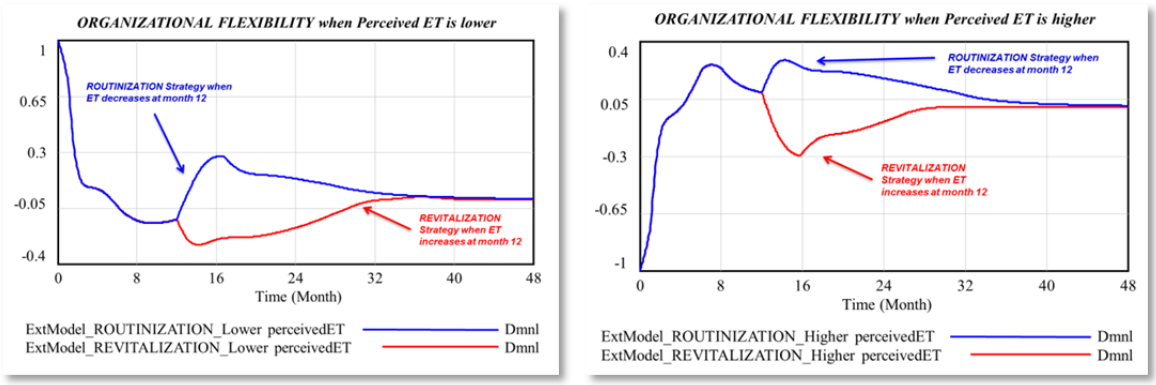

Figure 78: ORGANISATIONAL FLEXIBILITY (managers' perception different to 'Environmental Turbulence' (STEP in month 12))

However, during the first 12 months, the *Pressure to Change* grows upwards (in negative values) due to Perceived ET is being fitted to the real 'Environmental Turbulence'. Thus, Organisational Flexibility takes negative value that represents a flexibility deficit or surplus.

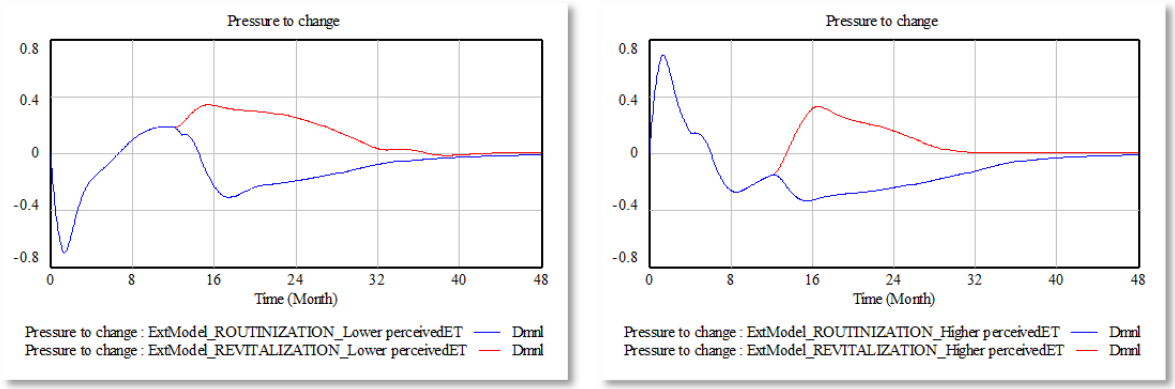

Figure 79: PRESSURE TO CHANGE (managers' perception different to 'Environmental Turbulence' (STEP in month 12))

As a consequence and as can be observed, the trajectory implemented by the managers is not appropriate whether their perception of the competitive forces is different than the current flexibility mix developed by the firm and the required one (*Environmental Turbulence*). Inappropriate change strategies can be implemented and overestimated efforts can be planned that affect to the organisational performance.

Therefore, the simulations highlight the fact that managers' perception functions as a motivation for inappropriate change strategies. As the literature reinforces, the relevance of absorptive capacity is increasing in organisational change and it is an important driver in organisational flexibility since it can avoid inappropriate managerial decisions. Simulation findings match the

third dynamic proposition and the derived managerial implication from the previous analysis is the following:

The perception of the managers may force the firm to choose an inappropriate trajectory of change and to implement changes that are not needed. Therefore, the firm can be exposed to a weak state when new changes need to be addressed originating a significant delay. Managers should start the process by focusing efforts on adjusting (reduce/increase) the ***absorptive capacity*** *('Metaflexibility') guaranteeing the change strategies to be based on the existing environmental turbulence to which the firm faces.*

6.4.2. Controlling 'Resistance to Change' Level

Volberda anticipates that the implementation of a change trajectory towards more flexibility at organisational level can create dissatisfaction. He assures that organization members have to express their complaints with the current state if they are to lose their inertia (1998:242-243). In line with this argument and within organisational change literature, there exists a huge variety of research studies that have stressed 'resistance to change' as one of the main reasons for the failure of many change initiatives (e.g. Armenakis & Bedeian, 1999 or more recently Gilley et al. 2009). As highlighted in the Chapter 6.1.1, a number of literatures consider it as a critical success or failure factor as it is directly related to positive or negative attitudes to change (e.g. Trader-Leigh, 2001; Kotter, 1996).

The literature also includes discussions about the processes that facilitate the effectiveness of change strategies such as, for instance, organisational commitment and positive attitudes to change (Vakola and Nikolau, 2005) or analysing the employees' deep-rooted values and training as a good tool to overcome communication difficulties (Pardo del Val and Martínez Fuentes, 2003).

In this section, the aim is to develop some controlled simulations scenarios. It will allow us to explore how variations in managerial control of resistance to change may lead to different patterns of Organisational Flexibility's evolution under different contingencies related to environmental turbulence. The entry data of the model's variables are detailed in Appendix 2.

In this section, the following dynamic proposition has been proposed in order for it to be validated through a variety of simulation scenarios:

Dynamic Proposition 4: *The organisation that establishes any type of control over the Resistance to Change when change strategies are implemented, will achieve better performance.*

Two scenarios for simulation have been taken into account (A) managers combine a revitalization strategy with a high control over the resistance that appears as a consequence of the strategy implementation; and, (B) managers combine a routinization strategy when the level of control over resistance to change is relatively low. In both scenarios, as an initial stage, the Flexible Form represents the *Flexible* type but *Environmental Turbulence* is modified at month 12. The values of the variables are listed in Table 24(Appendix 2). Additional explanation for the success of the change strategy is proposed: an established control and communication process. Actions such as building supportive work relationships and communicating effectively will result in positive attitudes to change. Additionally, if organisations plan the change carefully while creating a well-structured work environment and a well-balanced work schedule, it will result in reducing stress and uncertainty (Vakola and Nikolau, 2005) and allowing time to elapse before initiating subsequent changes (Sastry, 1997).

The first simulation's scenario captures an attempt to implement **a routinization strategy with the possibility of having a low level of control over the Resistance to Change**. In this scenario, the low level of control over the resistance to change is represented by a fractional decrease rate of 0.2 and the implementation time established is 20 months. The representation of the system's behaviour can be seen in the following figures and it is compared to the simulation of a Routinization strategy in the Extended Model with the original parameters (Figure 80).

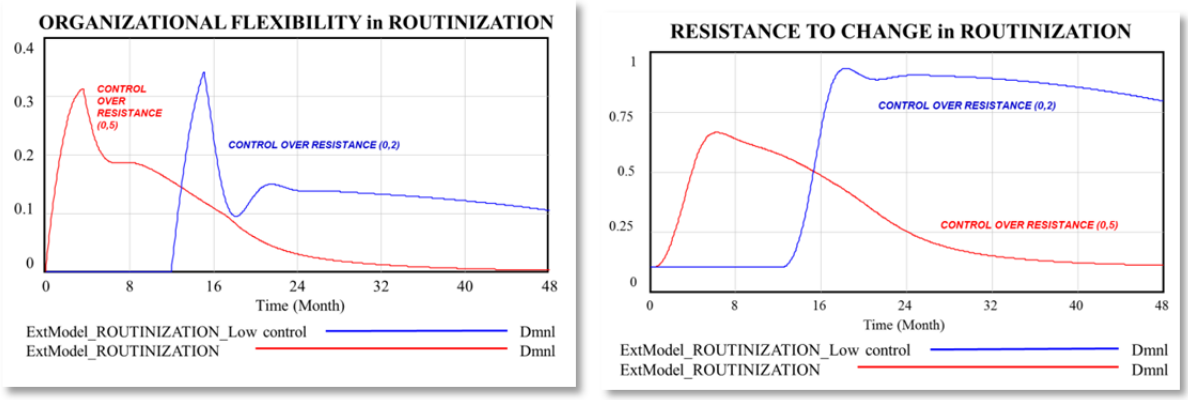

Figure 80: Simulation results in Routinization with low control

As it was expected, the optimal level of Organisational Flexibility is not achieved in the simulation period. The level of resistance to change quickly rises up to a value of 0.8 in month 25 and remains accumulated at values superior to 0.75 until the end of the simulation period. Notice that the system reaches equilibrium as the two flows of resistance to change approach similar values; it means that far from month 25 the inflow 'Increase of resistance to change' is equal to the outflow 'Decrease of resistance to change'. By month 30, Resistance to change starts to decrease slowly.

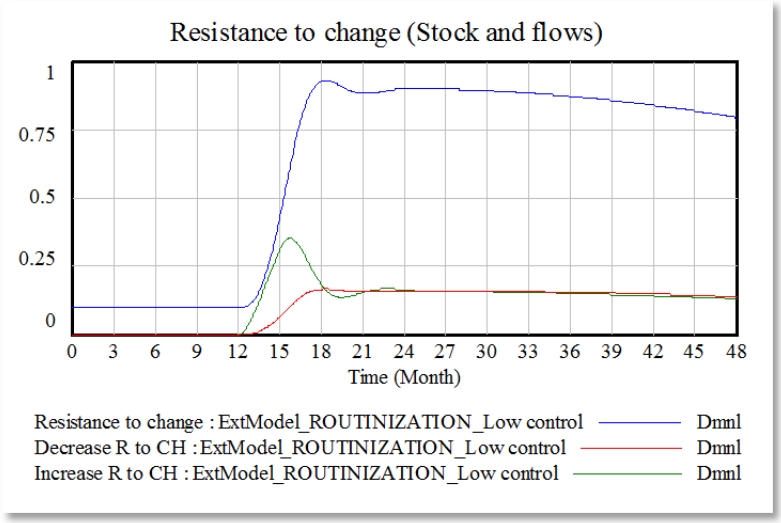

Figure 81: Simulation results in Routinization with low control

The second simulation's scenario captures an attempt to implement **a revitalization strategy with the possibility of having a high level of control over Resistance to Change**. In this scenario, the high level of control over resistance to change is represented by a fractional decrease rate of 0.8 and the implementation time established is 6 months. The representation of

the system's behaviour can be seen in the following figures and it is compared to the simulation of a Revitalization strategy in the Extended Model with the original parameters (Figure 82).

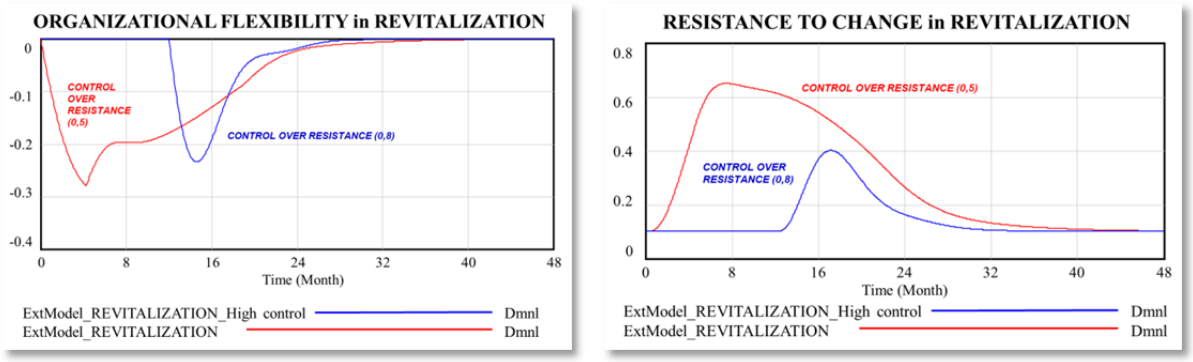

Figure 82: Simulation results in Revitalization with high control

In this transition trajectory from the Planned towards the Flexible state, Volberda points out that such type of transition could originate much resistance to efforts to transform the organization and it could lead to failure when there is hyper-competition. On the contrary, if the organisation successfully transforms the dimensions, it faces the opposite danger of overshooting its target and becoming chaotic (Volberda, 1998: 213). As it was expected, the system achieves the optimal level of Organisational Flexibility within the simulation period in month 31. The level of resistance to change is significantly lower than in the simulation of a revitalization strategy with 50% of control and 12 months for implementing the change strategy and the equilibrium is achieved (the resistance recovers a 10% value) before, by month 33 instead of month 43. It quickly rises until the 0.4 value in month 17 and starts to decline until month 33. In this case, the two flows of resistance to change approach the value zero by month 33 (Figure 83).

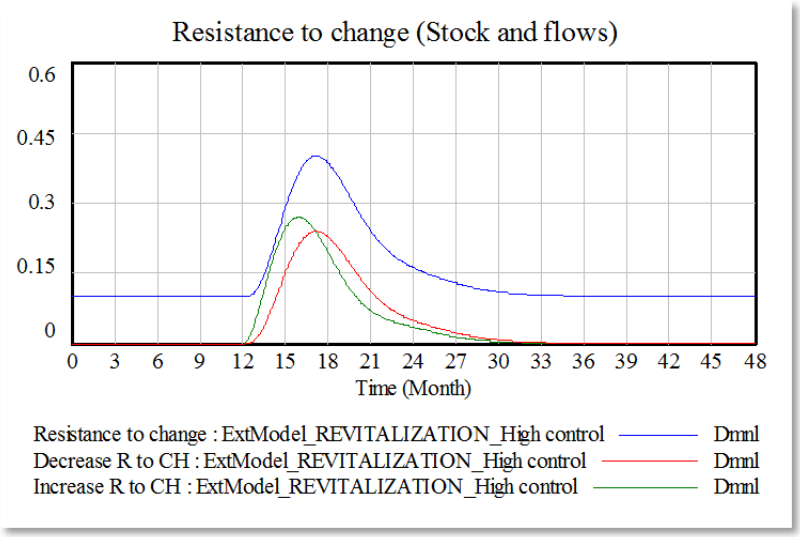

Figure 83: Simulation results in Revitalization with high control

Therefore, results from simulations confirm the theoretical insights related to resistance to change and the possibility to control it. The managers' control over resistance to change can be considered as a key driver for achieving the expected trajectory of a change strategy. As the literature reinforces, the implementation of a change trajectory towards more flexibility at organisational level can create dissatisfaction and resistance to change is one of the main reasons for the failure of many change initiatives. If managers evaluate and consider the proposed improvements based on the control over resistance to change, that is, implementing processes such as, for instance, organisational commitment and positive attitudes to change, the effectiveness of change strategies will be higher. The firm may lose its competitive advantage due to an excess of administrative structures or due to totally new values and norms that are required and past experience may not provide any advantage.

Simulation findings match the fourth dynamic proposition and the derived managerial implication from the previous analysis is the following:

Through routinization or revitalization strategies, a company's efforts on achieving the Organisational Flexibility's optimal level generates ***resistance to change,*** *which may stop the adaptation process. The organisation that establishes any type of control over the Resistance to Change when change strategies are implemented, will achieve better performance.*

6.5. Discussion and Conclusions

The initial version of the model ('Base Case'), formulated according to Volberda's (1985) theory, did not consider the key drivers or constraints for succeeding in the change strategies. New variables that usually affect the success of change strategies at organisational level have been introduced in the 'Extended Model' to analyse the organisational flexibility evolution in a range of environments.

Firstly, we explore the delays that are originated as consequence of the nature of the proposed change strategies. Both change strategies that could be implemented by focusing the company's efforts on decreasing/increasing the extensiveness of flexibility mix and/or decreasing/increasing the responsiveness level will need extra time to transmit the need to change and re-design the organisational conditions efficiently to the organisation's members. The second consideration is the manager's perception. The manager's decisions are usually based on the misperception of real turbulence in the environment and it may force the firm to choose an inappropriate trajectory of change and to implement undesired changes. Therefore, the firm can be exposed to a weak state when new changes need to be addressed originating a significant delay. Managers should start the process by focusing efforts on adjusting (reduce/increase) the absorptive capacity ('Metaflexibility') guaranteeing that the change strategies will be based on the existing environmental turbulence the firm is facing. In addition, the third one is the resistance to change that comes from managers and staff. Through routinization or revitalization strategies, company efforts on achieving the Organisational Flexibility's optimal level generates resistance to change that may stop the adaptation process. The organisation that establishes any type of control over the Resistance to Change when change strategies are implemented, will achieve better performance.

Simulation findings also suggest a number of circumstances in which organisations can fail to manage change successfully in order to obtain the desired level of Organisational Flexibility. Organisational flexibility may not be achieved if managers fail in attempting to obtain an accurate enough perception of the competitive forces, if the organization is too slow in updating perceptions of the required adjustment, if the change strategy selected by the organization does not match the requirements of its environment, and, if the organization fails to impose the appropriate control over the implementation time and over resistance to change reduction according to rapidly changing environments.

In this chapter, we have shown through the simulation technique, relevant contributions to the Organisational Flexibility theory. We began this chapter by noting the relevance of theory explaining how the firm endeavours to achieve the optimal level of flexibility or, in other terms, to align the flexible form to the environmental changes. Organisational change theory postulates that the ability to implement the change passes through effectively controlling: (a) the resistance coming from staff; and (b) the manager's perception of the changes in the 'Environmental Turbulence' (Sastry, 1997; Volberda, 1998; Armenakis & Bedeian, 1999; Pardo del Val and Martínez Fuentes, 2003; Vakola and Nikolau, 2005; Gilley, Gilley & McMillan, 2009). In addition, theorists have claimed that organisational flexibility is dependent on the temporal dimension (Volberda, 1998; Golden and Powell, 2000; Tan and Zeng, 2009) and relate it to the ability of an organisation to adapt to the environment within a given time frame (Golden and Powell, 2000). Other theorists have shown that strategies that seem to provide dynamism may become sources of rigidity at another stage without a temporal dimension (e.g. Oliver, 1991). A dynamic perspective supporting those assertions is limited. This chapter aims at advancing the theoretical and empirical evidence by shedding some light on the temporal dimension of the expected results in flexibility changes at organisational level using data obtained from the simulation exercises.

There are several contributions in this research. As the simulation's results show, they have supported some managerial implications and contributed to extend Volberda's theory:

Table 20: Summary of simulation's results

Theoretical basis	Contributions	Managerial implications
Consistent with the competitive strategy literature, several authors stressed that competitive strategy is not a static phenomenon, but a sequence of interconnected actions and reactions unfolding over time (e.g. Hutzschenreuter and Israel, 2009), …	… the comparison of the two SD models, through first simulations (see section 6.3) developed in this thesis has provided dynamic evidence of the temporal evolution of the main variables of Organisational Flexibility theory as the change strategies are implemented.	Relevant delays impede achieving the optimal level of organisational flexibility after the implementation of change strategies (showing higher delays in routinization strategies). Those delays are higher in radical transformations and should be anticipated and carefully evaluated by decision makers.
Consistent with change literature about the 'resistance to change' (see section 6.1.1) as one of the main reasons for the failure of many change initiatives (e.g. Armenakis & Bedeian, 1999; Gilley, Gilley & McMillan, 2009), …	…our simulation results prove a positive relationship between the level of resistance of change and the pressure to change when managers trigger change strategies and cause a relevant delay on the desired results (**Dynamic proposition 1**).	When routinization or revitalization strategies are implemented by focusing the company's efforts on decreasing/increasing the extensiveness of flexibility mix and/or decreasing/increasing the responsiveness level, extra time will be needed to transmit the need to change and re-design the organisational conditions efficiently to the organisation's members.
Consistent with the notion of inaccurate perceptions that managers usually have of their environmental characteristics in which the firm is operating (see 6.1.2), managers' perception has an effect over taking appropriate decisions concerning the organisational change strategy (e.g. Zahra and George (2002), Volberda, Foss and Lyles (2009)), …	…our simulation results prove that, first, the managers' perception of the environmental turbulence changes and the consequent need for change, delays the desired results on organisational flexibility (**Dynamic proposition 2**) and second, the managers' perception may force the firm to choose an inappropriate trajectory of change and to implement changes that are not needed. (**Dynamic proposition 3**).	The perception of the managers may force the firm to choose an inappropriate trajectory of change and to implement changes that are not needed. Therefore, the firm can be exposed to a weak state when new changes need to be addressed originating a significant delay. Managers should start the process by focusing efforts on adjusting (reduce/increase) the absorptive capacity ('Metaflexibility') guaranteeing the change strategies to be based on the existing environmental turbulence to which the firm faces.

Consistent with the literature on resistance that also includes discussions on the processes facilitating the effectiveness of change strategies such as, for instance, organisational commitment and positive attitudes to change (Vakola and Nikolau, 2005) or analysing the employees' deep-rooted values and training as a good tool to overcome communication difficulties (Pardo del Val and Martínez Fuentes, 2003), …	…our simulation results show that the organisation that establishes any type of control over the Resistance to Change when change strategies are implemented, achieves better performance over the flexibility level at organisational level. (**Dynamic proposition 4**).	Through routinization or revitalization strategies, a company's efforts on achieving the Organisational Flexibility's optimal level generates resistance to change, which may stop the adaptation process. The organisation that establishes any type of control over the Resistance to Change when change strategies are implemented, will achieve better performance.

7. CONCLUSIONS, CONTRIBUTIONS, LIMITATIONS AND FUTURE RESEARCH

7.1. Introduction

This final chapter begins with a brief summary of this research. The first section outlines the **major issues** addressed by this research describing its key features and the **conclusions** reached (7.2). The second section addresses the **contributions** that this research has made, with particular reference to theoretical, practical and managerial implications of the dynamic perspective of Organisational Flexibility (7.3). The third section summarises the **limitations** of the research. These limitations are based on **participant resource availability** and the **scope of the research** (7.4). The chapter concludes with an outline of **future research** possibilities (7.5). The exploratory nature of the research leads to a number of opportunities for further research into the dynamic and systemic perspective of Organisational Flexibility in different sectorial context as well as other likely components.

7.2. Conclusions

Organisational Flexibility is a fundamental dynamic process. This thesis has developed a deeper understanding of what makes organisations fit their managerial capabilities and organisational design with its environment and the processes that lead to such alignment which is difficult at the best of times, let alone in the current turbulent and constantly changing business environment. Expanding the Organisational Flexibility theory through a robust causal explanation of organisational adaptation to changing environments has provided an evaluation of the time path of organisational change strategies aimed to achieve the different levels of Organisational Flexibility while some barriers that arise when those processes are implemented along the enterprise lifecycle were identified.

A comprehensive review of the literature on organisational flexibility confirmed its multidimensional and complex nature and showed the limitations of some empirical studies in addressing such complexity such as:

1. addressing organisational flexibility requires discovering and defining its main variables and, the interrelationships between its components and;
2. organisational flexibility is dependent on the temporal dimension as the ability of an organisation to adapt within a given time frame.

System Dynamics, as a simulation technique, complements existing research methods for examining organisational change and allows the outcomes of the interactions among multiple underlying organisational and strategic processes to be revealed, especially as they unfold over time. Thus, the design process of the first dynamic model of Organisational Flexibility (named Base Case) provided deeper understanding of the significance of all the concepts in Volberda's framework, its key variables and their relationships that were modelled afterwards. After checking, through simulation scenarios, the evolution of organisational flexibility's dimensions over time, the model depicted the traditional trajectories that the explored theory proposes and some shortcomings were discovered such as the duration of the strategy implementation.

The exploratory study revealed a practical application of Volberda's framework, allowed exploring the evolution of the processes involved in change strategies and set out to develop and validate a number of dynamic propositions. Significant managerial implications to organisational flexibility theory for a specific context (a cooperative group of the industrial components sector and for certain period of time) were formulated with regards to the implementation time of change strategies, the managers' perception of the environmental turbulence and the extent that the pressure to change has over the success of any change strategy that searches for an optimal level of organisational flexibility.

Based on empirical evidence from the qualitative explorative study, findings from the theoretical analysis complemented the extension of the theory that the Extended Model depicts. The Extended Model, which explores other potential behavioural tendencies considering the constraints discovered in previous steps, revealed some insights of the dynamic behaviour of organisational flexibility strategies. Simulation findings suggested a number of circumstances in which organisations may be unsuccessful in managing change strategies (routinization and revitalization) addressed to obtain the desired level of Organisational Flexibility: if managers fail in attempting to obtain an accurate enough perception of the competitive forces, if the organisation is too slow in updating perceptions of the required adjustment, if the change strategy selected by the organization does not match the requirements of its environment, and if the organisation fails to impose the appropriate control over the implementation time and over resistance to change reduction according to rapidly changing environments.

The process of model definition and development is based on:

1. The original texts of a well-known theory on Organisational Flexibility with high relevance in the organisational change field;
2. The applicability of System Dynamics in the dynamic model design and the benefits of the approach over traditional construction techniques;
3. Formal modelling is used for exploring the theory and an additional degree of rigor is ensured. Through applying formalization to causal arguments, guarantee more precise and less ambiguous assumptions.

The validity of the Extended model in the future is based on its high levels of current and future viability and its ability to perform the task that it was designed to do. While its representation allows:

1. Supporting key phases of the modelling life cycle including: model formulation, instantiation, modification, execution, storage, and termination;
2. Performing the what-if analysis;
3. Using multiple levels of abstraction;
4. Supporting the decision making capacity

Finally, it must be noted that the research has validated the viability of the Organisational Flexibility's Dynamic Model and that it is a well-founded and valuable notion. The research into the dynamic perspective of flexibility at organisational level led to a better, deeper and complete understanding of what is involved within it. The applicability of the model can become the basis of further research and some of these further research possibilities are discussed in Section 7.5 below.

7.3. Contributions

This research makes several contributions from theoretical, practical as well as managerial perspectives.

Theoretical Perspective

The Organisational Flexibility's Dynamic Model provides evidence that justifies the request for dynamic flexibility systems at organisational level. Chapter 3 argues the integration of System Dynamics and Organisational Flexibility. The positive outcomes of this research point to the contribution of such integration towards providing a more robust theory and opening new

research fields of improvement. As a result, both models developed by this research fill a gap in the theory around dynamic flexibility, providing an example that overcomes the traditional static analysis of the consequences of organisational change in organisational flexibility and isolated evaluation of the interactions between some dimensions of organisational flexibility.

The simulation results have proven the theoretical insights from literature, highlighted in this thesis:

- The simulation results prove a positive relationship between the level of resistance of change and the pressure to change when managers trigger change strategies and cause a relevant delay on the desired results.
- The simulation results prove that, first, the managers' perception of the environmental turbulence changes and the consequent need for change, delays the desired results on organisational flexibility and second, the managers' perception may force the firm to choose an inappropriate trajectory of change and to implement changes that are not needed.
- The simulation results show that the organisation that establishes any type of control over the Resistance to Change when change strategies are implemented, achieves better performance over the flexibility level at an organisational level.

Managerial perspective

From a practical perspective, the research firstly has proven through the design, implementation and evaluation process, that the Organisational Flexibility's Dynamic Model is valid and practical for exploring the consequences of the change strategies over the system. As mentioned before, the Organisational Flexibility's Dynamic Model is able to resolve a number of deficiencies related to the static nature of organisational flexibility frameworks in general.

Apart from the theoretical implications that this thesis provides, relevant managerial implications can be also derived:

- When routinization or revitalization strategies are implemented by focusing the company's efforts on decreasing/increasing the extensiveness of flexibility mix and/or decreasing/increasing the responsiveness level, **extra time will be needed to transmit the need to change** and re-design the organisational conditions efficiently to the organisation's members.

- The perception of the managers may force the firm to choose an inappropriate trajectory of change and to implement changes that are not needed. Therefore, the firm can be exposed to a weak state when new changes need to be addressed originating a significant delay. Managers should start the process by focusing their efforts on adjusting (reduce/increase) the **absorptive capacity** ('Metaflexibility') and guaranteeing the change strategies are based on the existing environmental turbulence to which the firm faces.
- Through routinization or revitalization strategies, a company's efforts on achieving the Organisational Flexibility's optimal level generates resistance to change, which may stop the adaptation process. The organisation that establishes any type of control over the **Resistance to Change** when change strategies are implemented, will achieve better performance.

7.4. Limitations

The Organisational Flexibility's Dynamic Model presented in this thesis is a simplification, it was developed to represent a specific context: managing organisational flexibility. The revised model could be extended by adding new variables that determine Responsiveness, Meta-flexibility or Flexibility Mix in more detail. In that sense, some new constraints or new drivers of Organisational Flexibility would be discovered and evaluated. For instance, it does not account for the cost of certain change strategies whether the decision makers select an inappropriate orientation; if these were added to the model, longer intervals of low performance in the flexibility level could emerge.

Other limitation of this research is that, although the Organisational Flexibility's Dynamic Model was evaluated on a number of important issues, the evaluation remained subjective. The focus of this research has been on examining the worth of the model through its design and use. For instance, the evaluation lacks of a practical implementation of the model in a company context, which would have provided relevant outcomes from such evaluation.

Important limitations appeared with the exploratory study. On the one hand, the scope of the qualitative exploration was at the beginning of the study, wider than it finally was. Initially, the managers of six cooperatives in the large cooperative group participated in the diagnosis of flexibility level through Volberda's questionnaire (QSF). However, four years later, those managers were replaced by new managers who declined the invitation to participate in this

study. The R&D manager of the large industrial group showed high interest in continuing with the study and we decided to include the results of the explorative approach based one person's judgements, with a qualitative and longitudinal nature, because he has followed the progress of the cooperatives since 2002. He contributed to discover relevant insights to be taken into account nonetheless the study didn't provide the required rigor to the analysis as case study research. Thus, the assertions of the R&D manager could not be considered as generic to the cooperative context. He showed to have a global vision of the operative functioning of the cooperatives of the large cooperative group of which he leads the innovation strategy. The general managers of the six cooperatives would have provided more specific information but isolated facts from each cooperative. Finally, although the structure has been empirically supported with managers' opinions and insights from a cooperative context, the involvement of other typology of companies within the empirical exploratory phase of the model is also a limitation of this research. In future developments, the model may be adapted to different organisational forms such as, for instance, a multinational business group or an entrepreneurial business. In the same line, the involvement of the potential users of the Organisational Flexibility's Dynamic Model on the data gathering process for the parameters and functions values also limited this research's results.

Another limitation related to the empirical observation concerns the absence of other scenarios within the typology of alternatives of Flexible Firms. The exploratory study provides the evolution of flexibility at organisational level in a certain period of time taking as a starting point the Planned Form and in a context of increasing environmental turbulence. By exploring the huge range of alternatives combinations that the Volberda's framework provides, new constraints and drivers of changes strategies would have been discovered.

Finally, it is worthy to note that simulation research also suffers from problems and limitations (Harrison et al. 2007). Some of them fit the present research:

- The value of simulation findings can rest on the validity of the simulation model if it is constructed with little guidance from previous work. Problems of misspecification can emerge.
- It is common that the data generated by simulations do not represent real observations, and techniques for their analysis are limited.

- It is risky to attempt generalizing simulation findings to other circumstances in which the parameters are different than those examined in the simulation.

7.5. Future Research

As a first idea, the development of the Organisational Flexibility's Dynamic Model presented in this thesis could be defined as a starting point for future developments with the final objective to define formal tools to analyse change within organizational settings. For example measuring resistance to change and real managers' perceptions could be defined as constraints for an organisation's ability to change, but further research is required in order to empirically obtain the non-linear relationships deductively defined in the model presented in this thesis.

Secondly, future research within the same cooperative group would be useful. A longitudinal study such as this could be used to study other relevant drivers and constraints of strategic change interventions in a cooperative context that can come about, including:

- The organisational-environment fit can be achieved without the balanced combination of extensiveness of flexibility mix and responsiveness; it means that the hybrid form (planned-flexible) represents an appropriate combination for sustaining competitive advantage in a cooperative industrial group.
- The implementation of change strategies can suffer a significant delay or it can be suspended. Thus, managers and R&D professionals in the cooperative industrial group should be able to isolate the scope of interventions in flexibility mix or responsiveness from periodical changes in the management board;
- A considerable deviation between the long and the short-term orientation in balancing knowledge exploration and exploitation. Thus, managers should pay in particular attention to the focus of absorptive capacity efforts, it means that explorative activities conducted by more specialised R&D units well-balanced to exploitation learning and observations will reinforce organisational flexibility.

Thirdly, future research into the design of the Organisational Flexibility's Dynamic Model by adding new variables and relationships within different environmental settings would be useful. This could include further examples of the use of System Dynamics in the design of organisational flexibility frameworks.

Fourthly, it seems from this research that perfect dynamics in organisational flexibility has just begun. The global dynamism of organisational flexibility has not been reached in this research, although progress was made. It would be interesting to track this progress in 'real-time' and explore the simulations results more closely. A question to assess is whether managers will find this information useful and use the model more frequently.

Finally, the limitations described previously highlight two specific research questions that require further investigation. These are:

1. How do you boost managers to use the sophisticated tools available to them?
2. How can techniques such as the Organisational Flexibility's Dynamic Model be used to enhance and accelerate the learning process on flexibility?

APPENDIX 1: INITIAL VALUES FOR SIMULATIONS

Table 21: Parameter values for Equilibrium Tests & BASE CASE

PARAMETER	EXPLANATION	DEFAULT VALUE
ET_0	Environmental Turbulence = Required Flexible Form	Test input
IT	Implementation Time: Time to adjust changes in Organisational Flexibility's dimensions (extensiveness of FMix, Responsiveness and Metaflexibility)	12 months
$EFMx_0$	Initial value of Extensiveness of Flex Mix	3 (Dmnl)
R_0	Initial value of Responsiveness	3 (Dmnl)
$Metaflex_0$	Initial value of Metaflexibility	3 (Dmnl)
PET_0	Initial value of how the managers perceived ET	3 (Dmnl)
PCh_0	Initial value of Pressure to Change	0 (Dmnl)

LOOKUP	EXPLANATION	DEFAULT VALUE
t4 Decrease PCh (Organisational Flexibility)	Decrease in Pressure to Change when absolute value of Organisational Flexibility varies	[(0,0)-(2,1)], (0,1), (0.25,0.87), (0.5,0.8), (0.75,0.76), (1,0.73), (1.25,0.72), (1.5,0.71), (1.75,0.705), (2,0.701)

Parameter values for simulations of Base Case

PARAMETER	DEFAULT VALUE IN ROUTINIZATION	DEFAULT VALUE IN REVITALIZATION
ET_0	2	4
IT	12 months	12 months
$EFMx_0$	3 (Dmnl)	3 (Dmnl)
R_0	3 (Dmnl)	3 (Dmnl)
$Metaflex_0$	3 (Dmnl)	3 (Dmnl)
PET_0	3 (Dmnl)	3 (Dmnl)
PCh_0	0 (Dmnl)	0 (Dmnl)

LOOKUP	EXPLANATION	DEFAULT VALUE
t4 Decrease PCh (Organisational Flexibility)	Decrease in Pressure to Change when absolute value of OF varies	[(0,0)-(2,1)], (0,1), (0.25,0.87), (0.5,0.8), (0.75,0.76), (1,0.73), (1.25,0.72), (1.5,0.71), (1.75,0.705), (2,0.701)

Table 22: Parameter values for Equilibrium Tests IN EXTENDED MODEL

PARAMETER	DEFAULT VALUE IN ROUTINIZATION	DEFAULT VALUE IN REVITALIZATION
ET_0	2	4
IT	12 months	12 months
$EFMx_0$	3 (Dmnl)	3 (Dmnl)
R_0	3 (Dmnl)	3 (Dmnl)
$Metaflex_0$	3 (Dmnl)	3 (Dmnl)
PET_0	3 (Dmnl)	3 (Dmnl)
PCh_0	0 (Dmnl)	0 (Dmnl)
Resistance Goal	0.1 (Dmnl)	0.1 (Dmnl)
Fractional DECREASE Resistance	0.1 (Dmnl)	0.1 (Dmnl)

LOOKUP	Explanation	Default value
t1 Ability (RCh)	The fractional effect of Resistance to Change in the ability of the managers to implement change strategies	[(0,0)-(1,1)], (0,1), (0.45,1), (0.5,0.9), (1,0.1)
t2 Increase RCh (PCh)	The fractional effect of Pressure to Change in the inflow rate of Resistance to Change	[(0,0)-(2,2)], (0,0), (0.1,0.1), (0.2,0.2), (0.3,0.3), (0.4,0.4), (0.5,0.5), (0.6,0.6), (0.7,0.7), (0.8,0.8), (0.9,0.9), (1,1), (2,1)
t3 Perception Time	The fractional effect of Metaflexibility values in the time that the managers need to perceive changes in ET	[(1,0)-(4,12)], (1,12),(2,9),(3,6),(4,3)
t4 Decrease PCh (OF)	Decrease in Pressure to Change when Organisational Flexibility's absolute values varies	[(0,0)-(2,1)], (0,1), (0.25,0.87), (0.5,0.8), (0.75,0.76), (1,0.73), (1.25,0.72), (1.5,0.71), (1.75,0.705), (2,0.701)

APPENDIX 2: SIMULATIONS SCENARIOS

Table 23: Scenarios proposed for Managers' perception of 'Environmental Turbulence'

SCENARIOS	REVITALIZATION (FLEXIBILITY DEFICIT)		ROUTINIZATION (FLEXIBILITY SURPLUS)	
(A) Lower than ET	Flexible Form	3	Flexible Form	3
	Environmental Turbulence	3+STEP(1,12)	Environmental Turbulence	3+STEP(-1,12)
	Implementation Time	12 months	Implementation Time	12 months
	Perceived ET	2	Perceived ET	2
(B) Higher than ET	Flexible Form	3	Flexible Form	3
	Environmental Turbulence	3+STEP(1,12)	Environmental Turbulence	3+STEP(-1,12)

Implementation Time	12 months	Implementation Time	12 months
Perceived ET	4	Perceived ET	4

Table 24: Scenarios proposed for controlling resistance to change

SCENARIOS	LOW CONTROL AND ROUTINIZATION (FLEXIBILITY SURPLUS)	HIGH CONTROL AND REVITALIZATION (FLEXIBILITY DEFICIT)
Flexible Form	3	3
Environmental Turbulence	3+STEP(-1,12)	3+STEP(1,12)
Implementation Time	20 months	6 months
Resistance Goal	0.1	0.1
Fractional DECREASE Resistance	0.2	0.8

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Annex I: QSF Questionnaire in 2007

CUESTIONARIO: RÁPIDO EXAMEN DE FLEXIBILIDAD

IKERLAN, Centro de Investigaciones Tecnológicas, en colaboración con la universidad "RSM Erasmus"(Rotterdam, Países Bajos)

INTRODUCCIÓN

Aunque las formas organizativas tradicionales han trabajado bien en entornos relativamente estables en el pasado, la globalización de los mercados, la rapidez de los cambios tecnológicos, el "acortamiento" en los ciclos de vida de los productos y el incremento de la agresividad de los competidores han alterado radicalmente las reglas para competir en la década actual. Esto origina nuevas demandas en el repertorio de capacidades para la anticipación y reacción y, para el diseño organizativo. A menudo el grado de flexibilidad de la organización debe ajustarse a un entorno competitivo cambiante.

Este cuestionario permite situar el entorno, las capacidades de gestión y el diseño de la organización en un marco integral y además, determinar el grado de flexibilidad disponible y necesario de dicha organización.

Fundamentos Teóricos y Objetivo

El marco propuesto como base teórica del cuestionario, se basa en el destacado trabajo sobre organizaciones flexibles llevado a cabo por Henk Volberda (1998)[48] profesor en la Universidad *RSM Erasmus* de Rotterdam. El análisis y evaluación de los resultados se realizará en colaboración con dicha universidad.

Este cuestionario y su modelo de cálculo han sido validados estadísticamente y se utilizan a nivel académico. Recientemente, se ha aplicado en estudios sobre el equilibrio ideal entre la organización y su entorno, sobre las características de la flexibilidad estratégica y, sobre las diferencias en cuanto a flexibilidad entre empresas grandes y pequeñas.

Con los resultados obtenidos de los cuestionarios completados se pretende **elaborar un estudio de campo sobre las prácticas actuales de las organizaciones** en el País Vasco, relacionadas con la forma de enfrentarse a ese importante desafío que supone mejorar la capacidad de adaptación a un entorno complejo, dinámico e impredecible.

CUESTIONARIO

Se presentan a continuación un número de proposiciones sobre su organización y las circunstancias bajo las cuales opera. "Su organización" se refiere a la organización como un todo en caso de ser una PYME, o se refiere a un departamento o unidad de negocio en la que Vd. desempeña sus funciones en el caso de una gran empresa (más de 250 empleados).
Para cada proposición, pedimos indicar el grado al que Vd. está de acuerdo con esas proposiciones (escala del 1 al 7). Si una proposición no es aplicable del todo en su organización, puede saltar a la siguiente. Las cuestiones con (*) deben ser completadas.

1	***Describa brevemente su organización/unidad/departamento sobre la que va a contestar las preguntas (industria, productos/servicios, independiente o parte de un grupo, etc.). En caso de formar parte de una organización mayor, por favor, especifíquelo de la forma más exacta posible.***

Nombre de la Empresa: **División de Componentes**

[48] Volberda, H.W. (1998). Building the Flexible Firm. Oxford: Oxford University Press

Persona que contesta y cargo que ocupa en la organización: Javier Aranceta, Dtor I+D

Población - Código Postal – Provincia – País: Aretxabaleta, Gipuzkoa, Spain

Dirección de correo electrónico donde remitir el informe: jaranceta@componentes.mcc.es

En este apartado se pretende obtener información básica de la organización sobre el entorno en el que opera la organización y sobre cómo reacciona ante los cambios en el mismo.

2	**INTENSIDAD DE CAMBIOS**							
	1=Totalmente en Desacuerdo / 7= Totalmente de Acuerdo	***1***	***2***	***3***	***4***	***5***	***6***	***7***
	Los cambios en nuestro mercado son muy intensos							
	En nuestro mercado, los clientes frecuentemente demandan productos/servicios completamente nuevos							
3	**FRECUENCIA DE CAMBIOS**							
	1=Totalmente en Desacuerdo / 7= Totalmente de Acuerdo	***1***	***2***	***3***	***4***	***5***	***6***	***7***
	En el mercado en el que operamos, los cambios ocurren continuamente							
	En nuestro mercado, no ha cambiado nada desde hace un año							
	Nuestra oferta de productos/servicios a nuestros consumidores cambia constantemente							
	En nuestro mercado, la cantidad de productos y/o servicios que nos suministran cambia a menudo y rápidamente							
	En el mercado en el que operamos, cada día cambia algo							
4	**NUMERO DE ELEMENTOS QUE CAMBIA EN EL ENTORNO**							
	1=Totalmente en Desacuerdo / 7= Totalmente de Acuerdo	***1***	***2***	***3***	***4***	***5***	***6***	***7***
	En nuestro mercado, muchos factores necesitan tenerse en cuenta cuando tomamos decisiones							
	En nuestro mercado, los nuevos desarrollos vienen desde varias direcciones							
5	**RELACION / DEPENDENCIA ENTRE LOS ELEMENTOS DEL ENTORNO**							
	1=Totalmente en Desacuerdo / 7= Totalmente de Acuerdo	***1***	***2***	***3***	***4***	***5***	***6***	***7***
	En nuestro mercado, todo esta interrelacionado							
	En nuestro mercado, una decisión tiene efectos sobre numerosos aspectos							
6	**DISPONIBILIDAD DE LA INFORMACION RELACIONADA CON LOS CAMBIOS**							
	1=Totalmente en Desacuerdo / 7= Totalmente de Acuerdo	***1***	***2***	***3***	***4***	***5***	***6***	***7***
	Nada de todo lo que ocurre en nuestro mercado permanece desconocido para nosotros.							
	Estamos limitados a conseguir la información que necesitamos relativa a nuestro mercado							
	En nuestro mercado, es difícil tomar decisiones basadas en información de confianza							
	Disponemos de suficiente información sobre nuestros competidores							
	Tenemos suficiente comprensión e información de nuestros consumidores							
7	**PREVISIBILIDAD DE LOS CAMBIOS EN EL ENTORNO**							
	1=Totalmente en Desacuerdo / 7= Totalmente de Acuerdo	***1***	***2***	***3***	***4***	***5***	***6***	***7***
	Se puede detectar una clara tendencia en los cambios de nuestro mercado							
	Nuestro mercado es completamente impredecible							
	Es muy difícil determinar qué ocurre en nuestro mercado							
	En nuestro mercado ocurren muchas cosas, pero siempre se puede ver un patrón en esos cambios.							
8	**TECNOLOGIA**							
	1=Totalmente en Desacuerdo / 7= Totalmente de Acuerdo	***1***	***2***	***3***	***4***	***5***	***6***	***7***

	La composición y organización de nuestro proceso principal se pueden cambiar fácilmente.							
	Nuestros equipos y sistemas de información puede utilizarse para múltiples propósitos							
	Nuestros empleados dominan varios métodos de producción y operaciones							
	Nuestra organización está actualizada con respecto al 'know-how'							
9	**ESTRUCTURA**							
	1=Totalmente en Desacuerdo / 7= Totalmente de Acuerdo	***1***	***2***	***3***	***4***	***5***	***6***	***7***
	Nuestra organización utiliza amplios y estructurados sistemas de planificación y control							
	En nuestra organización, la división del trabajo se define en descripciones detalladas de las tareas y del puesto de trabajo							
	En nuestra organización, todo está establecido mediante reglas.							
	En nuestra organización, hay muchos cuerpos de consulta							
10	**CULTURA**							
	1=Totalmente en Desacuerdo / 7= Totalmente de Acuerdo	***1***	***2***	***3***	***4***	***5***	***6***	***7***
	Para nuestra organización: *"Las reglas no se pueden romper, incluso aunque alguien piense que es en beneficio de la compañía"*							
	En nuestra organización no se toleran opiniones desviadas en lo que se refiere a mentalidad, identidad y misión							
	En nuestra organización, la creatividad se valora bastante							
	Aquella persona que introduce una idea poco exitosa en nuestra organización, puede olvidarse de su carrera							
11	**FLEXIBILIDAD OPERACIONAL** *(habilidad de modificar el volumen y el mix de las actividades de negocio)*							
	1=Totalmente en Desacuerdo / 7= Totalmente de Acuerdo	***1***	***2***	***3***	***4***	***5***	***6***	***7***
	En nuestra organización podemos variar fácilmente la capacidad de producción y / o servicio cuando cambia la demanda							
	Nuestra organización, puede subcontratar fácilmente las actividades del proceso de fabricación principal							
	Nuestra organización, puede contratar fácilmente empleados temporales para anticiparse a las fluctuaciones de la demanda							
	Nuestra organización, puede cambiar fácilmente entre proveedores							
12	**FLEXIBILIDAD ESTRUCTURAL** *(habilidad de cambiar la estructura de la organización)*							
	1=Totalmente en Desacuerdo / 7= Totalmente de Acuerdo	***1***	***2***	***3***	***4***	***5***	***6***	***7***
	En nuestra organización, las tareas y funciones, pueden modificarse fácilmente							
	Nuestra estructura organizacional no es fija y puede modificarse fácilmente							
	En nuestra organización, los sistemas de control se modifican a menudo							
	Las personas en nuestra organización no tienen una posición fija, pero a menudo realizan varios trabajos							
13	**FLEXIBILIDAD ESTRATEGICA** *(habilidad de cambiar la estrategia corporativa)*							
	1=Totalmente en Desacuerdo / 7= Totalmente de Acuerdo	***1***	***2***	***3***	***4***	***5***	***6***	***7***
	Nuestra organización, puede añadir fácilmente nuevos productos / servicios al catalogo actual.							
	En nuestra organización, aplicamos nuevas tecnologías muy a menudo.							
	Nuestra organización, es muy activa en la creación de nuevas combinaciones producto-mercado.							
	En nuestra organización, intentamos reducir riesgos asegurando tener productos /							

	servicios en diferentes fases de su ciclo de vida.							
14	**META FLEXIBILIDAD** *(determinar la combinación apropiada del mix de flexibilidad y el diseño organizativo)*							
	1=Totalmente en Desacuerdo / 7= Totalmente de Acuerdo	***1***	***2***	***3***	***4***	***5***	***6***	***7***
	En nuestra organización, realizamos a menudo un completo análisis de la competencia.							
	Los competidores no tienen secretos para nuestra organización.							
	En nuestra organización, supervisamos sistemáticamente todos los desarrollos tecnológicos relacionados con nuestros productos / servicios y con el proceso de fabricación / servicio.							
	Las necesidades y reclamaciones de los consumidores se registran sistemáticamente en nuestra organización.							
	En nuestra industria, siempre somos los primeros en conocer lo que está ocurriendo.							
15	**RENDIMIENTO**							
	1=Totalmente en Desacuerdo / 7= Totalmente de Acuerdo	***1***	***2***	***3***	***4***	***5***	***6***	***7***
	Nuestra organización es muy rentable.							
	En comparación con organizaciones similares, somos muy Buenos en lo que hacemos.							
	Nuestra competencia puede estar celosa de nuestro rendimiento.							
	Podemos estar orgullosos de los éxitos de nuestra organización.							

Las nueve cuestiones siguientes muestran dos proposiciones opuestas sobre la organización. Por favor, indique, en que medida, dichas proposiciones se aplican en su organización.

Si Vd. selecciona "1", significa que la proposición 1) se aplica completamente en su organización y, la selección "7" significa que no se aplica en absoluto. Su respuesta puede matizarse seleccionando por ejemplo "2", "3", etc.

16	**En general, la alta gerencia de mi organización favorece …**							
	1) Un fuerte énfasis en marketing de productos / servicios probados y de confianza.							
	...							
	7) Fuerte énfasis en I+D, liderazgo tecnológico e innovaciones.							
	1=De acuerdo con la proposición 1); 7=De acuerdo con la proposición 7)	***1***	***2***	***3***	***4***	***5***	***6***	***7***
17	**¿Cuántas nuevas líneas de productos / servicios ha comercializado la organización en los últimos 5 años?**							
	1) Ninguna							
	...							
	7) Bastantes							
	1=De acuerdo con la proposición 1); 7=De acuerdo con la proposición 7)	***1***	***2***	***3***	***4***	***5***	***6***	***7***
18	**Cambios en líneas de producto / servicio …**							
	1) Los cambios en las líneas de producto / servicio han sido, sobre todo, de menor importancia							
	...							
	7) Los cambios en las líneas de producto / servicio han sido, en general, bastante radicales							
	1=De acuerdo con la proposición 1); 7=De acuerdo con la proposición 7)	***1***	***2***	***3***	***4***	***5***	***6***	***7***
19	**En general, en mi organización la alta gerencia tiene ...**							
	1) Una fuerte tendencia hacia proyectos de bajo riesgo (con unas tasas de retorno normales y ciertas)							
	...							

7) Una fuerte tendencia hacia proyectos de alto riesgo (con oportunidades de tasas de retorno muy altas)

1=De acuerdo con la proposición 1); 7=De acuerdo con la proposición 7) ***1 2 3 4 5 6 7***

20 **En general, los gerentes de mi organización creen ...**

1) Debido a la naturaleza del entorno, es mejor explorarlo gradualmente con cuidado y poco a poco

...

7) Debido a la naturaleza del entorno, son necesarias acciones audaces y de gran alcance para conseguir los objetivos de la firma

1=De acuerdo con la proposición 1); 7=De acuerdo con la proposición 7) ***1 2 3 4 5 6 7***

21 **Cuando nos enfrentamos a situaciones de toma de decisión que implican incertidumbre, mi organización**

1) Adopta una postura cautelosa, "en espera", para minimizar la probabilidad de tomar decisiones potenciales de alto coste.

...

7) Adopta una postura agresiva, audaz, para maximizar la probabilidad de explotar oportunidades

1=De acuerdo con la proposición 1); 7=De acuerdo con la proposición 7) ***1 2 3 4 5 6 7***

22 **Para enfrentarse con sus competidores, mi organización ...**

1) Típicamente responde a las acciones que inician los competidores

...

7) Típicamente inicia acciones a las que después responden los competidores

1=De acuerdo con la proposición 1); 7=De acuerdo con la proposición 7) ***1 2 3 4 5 6 7***

23 **Para enfrentarse con sus competidores, mi organización ...**

1) Raramente es el primera en introducir nuevos productos/servicios, tecnologías, etc.

...

7) Muy a menudo es la primera en introducir nuevos productos/servicios, técnicas administrativas, tecnologías, etc.

1=De acuerdo con la proposición 1); 7=De acuerdo con la proposición 7) ***1 2 3 4 5 6 7***

24 **En general, los gerentes de mi organización tienen ...**

1) Una fuerte tendencia a "seguir al líder" en la introducción de nuevos productos o ideas

...

7) Una fuerte tendencia a "ser el líder" en la introducción de nuevos productos o ideas

1=De acuerdo con la proposición 1); 7=De acuerdo con la proposición 7) ***1 2 3 4 5 6 7***

25 **(*) ¿En qué sector industrial opera su organización?**

En caso de operar en más de una, seleccione la más activa de todas y la que tuvo en mente cuando respondió a las cuestiones anteriores.

Agricultura, caza y forestal	
Pesca	
Minería	
Producción industrial	
Producción, distribución y comercialización de electricidad, gas y agua	
Construcción	
Reparación de bienes de consumo	
Hoteles, restaurantes y bares	
Transporte, almacenamiento y comunicación	
Finanzas y seguros	
Alquiler y comercialización de activos no fijos (bienes muebles)	

	Otros	

26	**Selecciona cuál de las siguientes definiciones de ORIENTACION GEOGRAFICA (Europa, EEUU o Asia) se aplica en su organización:**	
	Orientación regional: al menos el 50% de nuestras ventas se generan en la región.	
	Orientación bi-regional: entre el 20% y el 50% de nuestras ventas se genera en dos regiones.	
	Orientación en otra región: al menos el 50% de nuestras ventas se genera en otra región diferente de la local.	
	Global: entre el 20% y el 50% de las ventas se genera en cada una de las tres regiones.	
27	**(*) ¿Cuántas personas están empleadas en la organización o unidad de negocio sobre la que ha respondido las preguntas?**	
	> 4000	
28	**En el caso que su organización forme parte de otra organización mayor, ¿cuántas personas están empleadas en total?**	
	> 70.000	
29	**¿Cuándo se fundó, aproximadamente, su organización?**	
	1959	

Annex II: QSF Questionnaire in 2011

2ª Evaluación sobre FLEXIBILIDAD ORGANIZATIVA

IKERLAN, Centro de Investigaciones Tecnológicas, en colaboración con la universidad "RSM Erasmus"(Rotterdam, Países Bajos)

INTRODUCCIÓN: contenido y objetivos

Aunque las formas organizativas tradicionales han trabajado bien en entornos relativamente estables en el pasado, la globalización de los mercados, la rapidez de los cambios tecnológicos, el "acortamiento" en los ciclos de vida de los productos y el incremento de la agresividad de los competidores han alterado radicalmente las reglas para competir en la década actual. Esto origina **nuevas demandas en el repertorio de capacidades y diseño organizacionales** que faciliten la anticipación y reacción a los nuevos escenarios de competitividad.

El grado de flexibilidad organizativo se ha convertido en uno de los principales facilitadores en la consecución de ventaja competitiva sostenible y de capacidad innovadora mientras se incrementa su capacidad de adaptación y respuesta a la volatilidad y riesgo existente en los mercados y en la propia organización.

Este cuestionario permite determinar el grado actual de flexibilidad de dicha organización así como el requerido según las características del entorno, las capacidades de gestión y el diseño de la organización.

Fundamentos Teóricos y Objetivo

El marco propuesto como base teórica del cuestionario, se basa en el destacado trabajo sobre organizaciones flexibles llevado a cabo por Henk Volberda (1998)[49]. El análisis y evaluación de los resultados se realizará en colaboración con la Universidad RSM Erasmus de Rotterdam.

Este cuestionario y su modelo de cálculo se utilizan exclusivamente a nivel académico. Con los resultados obtenidos de los cuestionarios completados se pretende **elaborar un estudio de campo sobre las prácticas actuales de las organizaciones** en el País Vasco, relacionadas con la forma de gestionar la flexibilidad organizativa. Todos los datos serán tratados confidencialmente, y serán sólo utilizados para este estudio de investigación. No se hará pública ninguna información sobre las empresas.

Participación

La participación es voluntaria y tan sólo se requiere responder a este cuestionario que puede ser completado en + / - 20 minutos.

Las empresas que completen el cuestionario recibirán un **informe individual detallado de los resultados**, en el que se incluirá un diagnostico sobre la **flexibilidad actual** de la organización desde la perspectiva de efectividad que incluye:

1. especificación sobre aquéllas **áreas** en las que la gerencia debe centrar su atención para **incrementar el potencial de flexibilidad** en sus capacidades de gestión actuales o tal vez, crear otras nuevas,
2. posibles **esquemas de transformación** relativas al diseño organizativo cuando el nivel de flexibilidad actual y/o potencial no se corresponda con el nivel requerido para esas condiciones del entorno en el que opera la organización,

[49] Volberda, H.W. (1998). Building the Flexible Firm. Oxford: Oxford University Press. http://www.rsm.nl/home/faculty/academic_departments/strategic_management/faculty/faculty/volberda_henk

3. un exhaustivo análisis de la evolución de los parámetros anteriormente mencionados para un periodo de cuatro años (2007-2011) que proporcione visibilidad de la **efectividad de los procesos de cambio implementados por la organización durante ese periodo** (p.e. proceso de fusión, implementación de nuevos programas de gestión de procesos (*ERP*, *CRM*, *Lean Manufacturing*), creación de nuevos modelos/unidades de negocio, etc.) y,
4. **recomendaciones estratégicas de cambio** para alcanzar el grado de flexibilidad requerido por el entorno en el que opera actualmente la empresa

CUESTIONARIO

El cuestionario se ha divido en tres apartados:

- ***PARTE A: Información general de la organización***
- ***PARTE B: Estrategias de cambio implementadas en la empresa durante el periodo (2007-2011)***
- ***PARTE C: Análisis del entorno, capacidades flexibles y diseño organizativo***

PARTE A: Información general de la organización

Describa brevemente su organización/unidad/departamento sobre la que va a contestar las preguntas (industria, productos/servicios, independiente o parte de un grupo, etc.). En caso de formar parte de una organización mayor, por favor, especifíquelo de la forma más exacta posible.

Mondragon Componentes S.Coop.

Nombre de la Empresa: Mondragon Componentes

Persona que contesta y cargo que ocupa en la organización: Javier Aranceta, Dtor. I+D

Población - Código Postal – Provincia – País: Aretxabaleta, Gipuzkoa

Dirección de correo electrónico donde remitir el informe: jaranceta@mondragoncomponentes.com

PARTE B: Estrategias de cambio implementadas en la empresa durante el periodo (2007-2011)

En este apartado se pretende obtener información sobre aquellos procesos de cambio organizacionales que han podido afectar a capacidades y diseño organizativos. Igualmente se pretende analizar qué tipos de barreras organizacionales se han identificado en ese proceso de cambio y que han frenado la consecución de los objetivos previstos de esa transformación.

Seleccione entre las opciones planteadas qué tipo de estrategia de cambio (del grupo A ó B) se ha implementado en su organización, departamento o unidad de negocio y, finalmente qué tipo de barreras considera relevantes.

A. Estrategias de rutinización, enfrentando el incremento en niveles de competencia (implementación de rutinas organizacionales en búsqueda de estabilidad):

Periodo de caos organizacional debido a reciente introducción de un nuevo modelo de negocio/penetración en un nuevo segmento de mercado/creación de nueva línea de investigación, etc. El grado de flexibilidad es excesivo y se necesita orden y estabilidad.	
El ritmo de entrada de competidores crece y se requiere salvaguardar la ventaja competitiva alcanzada a través de una mayor regulación de procesos (estandarización y profesionalización de procesos, institucionalización de funciones de decisión y funciones de recogida y análisis de información)	
El mercado es muy maduro pero se mantiene cuota de mercado; la rigidez y burocracias en esta etapa del ciclo de	

vida del producto o de la empresa es garantía de continuidad.	
B. Estrategias de *revitalización, escalando niveles de competencia* (renovación del sistema ante amenaza real de supervivencia):	
Organizaciones/productos o servicios maduros que necesitan explorar nuevas oportunidades de negocio y eso ha implicado un movimiento global y drástico: desde tradiciones, conservatismo y rigidez hacia adaptación, vigilancia y diversificación	
Periodo de volatilidad de cambios y de incertidumbre mayores en el que las nuevas oportunidades de negocio detectadas necesitaban de: des-regulación de procesos, cambio en las formas organizacionales básicas, nuevos valores, apertura al exterior, cultura mas innovadora (procesos de internacionalización, de fusión o adquisición, etc.)	
La organización/unidad de negocio/departamento ha entrado en un caos organizativo que, fomenta un ritmo de innovaciones constantes a falta de estabilidad en los procesos (esto es mas común en empresas de servicios con un ritmo elevado de iniciativas de innovación)	
Barreras organizacionales - seleccione (máximo de tres opciones) aquellas circunstancias que considere como limitadoras a la consecución de los objetivos previstos de las estrategias de cambio implementadas por su organización/departamento/unidad de negocio seleccionadas en la pregunta anterior.	
Mucha resistencia al cambio entre el personal directivo y ejecutivo	
Mucha resistencia al cambio entre el personal técnico y operativo	
Anclaje a culturas, costumbres y valores organizacionales	
Inercia organizacional	
Procesos de cambio que han implicado un largo periodo de tiempo	
Exceso de estructuras y regulaciones administrativas	
Carencia de un proceso de gestión de información y análisis del negocio (condiciones del entorno y su volatilidad)	
Existe un proceso de análisis y control de información pero no se ha utilizado eficazmente durante la trayectoria de cambio implementada.	
Deficiencia en los canales de comunicación para informar del proceso de cambio a toda la organización	
Otras (por favor, explique):	

PARTE C: Análisis del entorno, capacidades flexibles y diseño organizativo

En este apartado se pretende obtener información básica de la organización sobre el entorno en el que opera la organización y sobre cómo reacciona ante los cambios en el mismo.

Se presentan a continuación un número de proposiciones sobre su organización y las circunstancias bajo las cuales opera. "Su organización" se refiere a la organización como un todo en caso de ser una PYME, o se refiere a un departamento o unidad de negocio en la que Vd. desempeña sus funciones en el caso de una gran empresa (más de 250 empleados).

Para cada proposición, pedimos indicar el grado al que Vd. está de acuerdo con esas proposiciones (escala del 1 al 7). Si una proposición no es aplicable del todo en su organización, puede saltar a la siguiente. Las cuestiones con (*) deben ser completadas.

2 INTENSIDAD DE CAMBIOS

1=Totalmente en Desacuerdo / 7= Totalmente de Acuerdo	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Los cambios en nuestro mercado son muy intensos							

	En nuestro mercado, los clientes frecuentemente demandan productos/servicios completamente nuevos							
3	**FRECUENCIA DE CAMBIOS**							
	1=Totalmente en Desacuerdo / 7= Totalmente de Acuerdo	***1***	***2***	***3***	***4***	***5***	***6***	***7***
	En el mercado en el que operamos, los cambios ocurren continuamente							
	En nuestro mercado, no ha cambiado nada desde hace un año							
	Nuestra oferta de productos/servicios a nuestros consumidores cambia constantemente							
	En nuestro mercado, la cantidad de productos y/o servicios que nos suministran cambia a menudo y rápidamente							
	En el mercado en el que operamos, cada día cambia algo							
4	**NUMERO DE ELEMENTOS QUE CAMBIA EN EL ENTORNO**							
	1=Totalmente en Desacuerdo / 7= Totalmente de Acuerdo	***1***	***2***	***3***	***4***	***5***	***6***	***7***
	En nuestro mercado, muchos factores necesitan tenerse en cuenta cuando tomamos decisiones							
	En nuestro mercado, los nuevos desarrollos vienen desde varias direcciones							
5	**RELACION / DEPENDENCIA ENTRE LOS ELEMENTOS DEL ENTORNO**							
	1=Totalmente en Desacuerdo / 7= Totalmente de Acuerdo	***1***	***2***	***3***	***4***	***5***	***6***	***7***
	En nuestro mercado, todo esta interrelacionado							
	En nuestro mercado, una decisión tiene efectos sobre numerosos aspectos							
6	**DISPONIBILIDAD DE LA INFORMACION RELACIONADA CON LOS CAMBIOS**							
	1=Totalmente en Desacuerdo / 7= Totalmente de Acuerdo	***1***	***2***	***3***	***4***	***5***	***6***	***7***
	Nada de todo lo que ocurre en nuestro mercado permanece desconocido para nosotros.							
	Estamos limitados a conseguir la información que necesitamos relativa a nuestro mercado							
	En nuestro mercado, es difícil tomar decisiones basadas en información de confianza							
	Disponemos de suficiente información sobre nuestros competidores							
	Tenemos suficiente comprensión e información de nuestros consumidores							
7	**PREVISIBILIDAD DE LOS CAMBIOS EN EL ENTORNO**							
	1=Totalmente en Desacuerdo / 7= Totalmente de Acuerdo	***1***	***2***	***3***	***4***	***5***	***6***	***7***
	Se puede detectar una clara tendencia en los cambios de nuestro mercado							
	Nuestro mercado es completamente impredecible							
	Es muy difícil determinar qué ocurre en nuestro mercado							
	En nuestro mercado ocurren muchas cosas, pero siempre se puede ver un patrón en esos cambios.							
8	**TECNOLOGIA**							
	1=Totalmente en Desacuerdo / 7= Totalmente de Acuerdo	***1***	***2***	***3***	***4***	***5***	***6***	***7***
	La composición y organización de nuestro proceso principal se pueden cambiar fácilmente.							
	Nuestros equipos y sistemas de información puede utilizarse para múltiples propósitos							
	Nuestros empleados dominan varios métodos de producción y operaciones							
	Nuestra organización está actualizada con respecto al 'know-how'							
9	**ESTRUCTURA**							
	1=Totalmente en Desacuerdo / 7= Totalmente de Acuerdo	***1***	***2***	***3***	***4***	***5***	***6***	***7***
	Nuestra organización utiliza amplios y estructurados sistemas de planificación y control							
	En nuestra organización, la división del trabajo se define en descripciones detalladas de las tareas y del puesto de trabajo							

	En nuestra organización, todo está establecido mediante reglas.							
	En nuestra organización, hay muchos cuerpos de consulta							
10	**CULTURA**							
	1=Totalmente en Desacuerdo / 7= Totalmente de Acuerdo	***1***	***2***	***3***	***4***	***5***	***6***	***7***
	Para nuestra organización: *"Las reglas no se pueden romper, incluso aunque alguien piense que es en beneficio de la compañía"*							
	En nuestra organización no se toleran opiniones desviadas en lo que se refiere a mentalidad, identidad y misión							
	En nuestra organización, la creatividad se valora bastante							
	Aquella persona que introduce una idea poco exitosa en nuestra organización, puede olvidarse de su carrera							
11	**FLEXIBILIDAD OPERACIONAL** *(habilidad de modificar el volumen y el mix de las actividades de negocio)*							
	1=Totalmente en Desacuerdo / 7= Totalmente de Acuerdo	***1***	***2***	***3***	***4***	***5***	***6***	***7***
	En nuestra organización podemos variar fácilmente la capacidad de producción y / o servicio cuando cambia la demanda							
	Nuestra organización, puede subcontratar fácilmente las actividades del proceso de fabricación principal							
	Nuestra organización, puede contratar fácilmente empleados temporales para anticiparse a las fluctuaciones de la demanda							
	Nuestra organización, puede cambiar fácilmente entre proveedores							
12	**FLEXIBILIDAD ESTRUCTURAL** *(habilidad de cambiar la estructura de la organización)*							
	1=Totalmente en Desacuerdo / 7= Totalmente de Acuerdo	***1***	***2***	***3***	***4***	***5***	***6***	***7***
	En nuestra organización, las tareas y funciones, pueden modificarse fácilmente							
	Nuestra estructura organizacional no es fija y puede modificarse fácilmente							
	En nuestra organización, los sistemas de control se modifican a menudo							
	Las personas en nuestra organización no tienen una posición fija, pero a menudo realizan varios trabajos							
13	**FLEXIBILIDAD ESTRATEGICA** *(habilidad de cambiar la estrategia corporativa)*							
	1=Totalmente en Desacuerdo / 7= Totalmente de Acuerdo	***1***	***2***	***3***	***4***	***5***	***6***	***7***
	Nuestra organización, puede añadir fácilmente nuevos productos / servicios al catalogo actual.							
	En nuestra organización, aplicamos nuevas tecnologías muy a menudo.							
	Nuestra organización, es muy activa en la creación de nuevas combinaciones producto-mercado.							
	En nuestra organización, intentamos reducir riesgos asegurando tener productos / servicios en diferentes fases de su ciclo de vida.							
14	**META FLEXIBILIDAD** *(determinar la combinación apropiada del mix de flexibilidad y el diseño organizativo)*							
	1=Totalmente en Desacuerdo / 7= Totalmente de Acuerdo	***1***	***2***	***3***	***4***	***5***	***6***	***7***
	En nuestra organización, realizamos a menudo un completo análisis de la competencia.							
	Los competidores no tienen secretos para nuestra organización.							
	En nuestra organización, supervisamos sistemáticamente todos los desarrollos tecnológicos relacionados con nuestros productos / servicios y con el proceso de fabricación / servicio.							
	Las necesidades y reclamaciones de los consumidores se registran sistemáticamente en nuestra organización.							
	En nuestra industria, siempre somos los primeros en conocer lo que está ocurriendo.							

15 RENDIMIENTO

1=Totalmente en Desacuerdo / 7= Totalmente de Acuerdo	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Nuestra organización es muy rentable.							
En comparación con organizaciones similares, somos muy Buenos en lo que hacemos.							
Nuestra competencia puede estar celosa de nuestro rendimiento.							
Podemos estar orgullosos de los éxitos de nuestra organización.							

Las nueve cuestiones siguientes muestran dos proposiciones opuestas sobre la organización. Por favor, indique, en que medida, dichas proposiciones se aplican en su organización.

Si Vd. selecciona "1", significa que la proposición 1) se aplica completamente en su organización y, la selección "7" significa que no se aplica en absoluto. Su respuesta puede matizarse seleccionando por ejemplo "2", "3", etc.

16 En general, la alta gerencia de mi organización favorece …

1) Un fuerte énfasis en marketing de productos / servicios probados y de confianza.
...
7) Fuerte énfasis en I+D, liderazgo tecnológico e innovaciones.

1=De acuerdo con la proposición 1); 7=De acuerdo con la proposición 7)	*1*	*2*	*3*	*4*	*5*	*6*	*7*

17 ¿Cuántas nuevas líneas de productos / servicios ha comercializado la organización en los últimos 5 años?

1) Ninguna
...
7) Bastantes

1=De acuerdo con la proposición 1); 7=De acuerdo con la proposición 7)	*1*	*2*	*3*	*4*	*5*	*6*	*7*

18 Cambios en líneas de producto / servicio …

1) Los cambios en las líneas de producto / servicio han sido, sobre todo, de menor importancia
...
7) Los cambios en las líneas de producto / servicio han sido, en general, bastante radicales

1=De acuerdo con la proposición 1); 7=De acuerdo con la proposición 7)	*1*	*2*	*3*	*4*	*5*	*6*	*7*

19 En general, en mi organización la alta gerencia tiene ...

1) Una fuerte tendencia hacia proyectos de bajo riesgo (con unas tasas de retorno normales y ciertas)
...
7) Una fuerte tendencia hacia proyectos de alto riesgo (con oportunidades de tasas de retorno muy altas)

1=De acuerdo con la proposición 1); 7=De acuerdo con la proposición 7)	*1*	*2*	*3*	*4*	*5*	*6*	*7*

20 En general, los gerentes de mi organización creen ...

1) Debido a la naturaleza del entorno, es mejor explorarlo gradualmente con cuidado y poco a poco
...
7) Debido a la naturaleza del entorno, son necesarias acciones audaces y de gran alcance para conseguir los objetivos de la firma

1=De acuerdo con la proposición 1); 7=De acuerdo con la proposición 7)	*1*	*2*	*3*	*4*	*5*	*6*	*7*

21 Cuando nos enfrentamos a situaciones de toma de decisión que implican incertidumbre, mi organización

1) Adopta una postura cautelosa, "en espera", para minimizar la probabilidad de tomar decisiones potenciales de alto coste.
...

7) Adopta una postura agresiva, audaz, para maximizar la probabilidad de explotar oportunidades

1=De acuerdo con la proposición 1); 7=De acuerdo con la proposición 7)	*1*	*2*	*3*	*4*	*5*	*6*	*7*

22 **Para enfrentarse con sus competidores, mi organización ...**

1) Típicamente responde a las acciones que inician los competidores

...

7) Típicamente inicia acciones a las que después responden los competidores

1=De acuerdo con la proposición 1); 7=De acuerdo con la proposición 7)	*1*	*2*	*3*	*4*	*5*	*6*	*7*

23 **Para enfrentarse con sus competidores, mi organización ...**

1) Raramente es el primera en introducir nuevos productos/servicios, tecnologías, etc.

...

7) Muy a menudo es la primera en introducir nuevos productos/servicios, técnicas administrativas, tecnologías, etc.

1=De acuerdo con la proposición 1); 7=De acuerdo con la proposición 7)	*1*	*2*	*3*	*4*	*5*	*6*	*7*

24 **En general, los gerentes de mi organización tienen ...**

1) Una fuerte tendencia a "seguir al líder" en la introducción de nuevos productos o ideas

...

7) Una fuerte tendencia a "ser el líder" en la introducción de nuevos productos o ideas

1=De acuerdo con la proposición 1); 7=De acuerdo con la proposición 7)	*1*	*2*	*3*	*4*	*5*	*6*	*7*

Annex III: Interview guideline

ENTREVISTA EN PROFUNDIDAD:

Análisis comparativo de flexibilidad organizativa entre 2007 y 2011 en División Componentes

El presente estudio pretende mostrar cual ha sido la evolución de Flexibilidad Organizativa y sus variables determinantes a lo largo de estos 4 años así como encontrar las principales causas de variación en los resultados esperados.

Se organiza este estudio de la forma siguiente:

1. Una primera sección que describe la metodología seguida para realizar el estudio de Flexibilidad Organizativa (cuestionario-QSF[50])
2. Presentamos los resultados del estudio comparando ambos periodos. Se complementa el análisis de Flexibilidad Organizativa con una entrevista en profundidad al director de I+D.

DIAGNOSTICO RAPIDO DE FLEXIBILIDAD ORGANIZATIVA (QSF)

Aunque las formas organizativas tradicionales han trabajado bien en entornos relativamente estables en el pasado, la globalización de los mercados, la rapidez de los cambios tecnológicos, el "acortamiento" en los ciclos de vida de los productos y el incremento de la agresividad de los competidores han alterado radicalmente las reglas para competir en la década actual. Esto origina nuevas demandas en el repertorio de capacidades para la anticipación y reacción y, para el diseño organizativo.

A menudo el grado de flexibilidad de la organización debe ajustarse a un entorno competitivo cambiante. El método de 'Quick Scan Flexibility' permite, a través de un cuestionario, situar el entorno, las capacidades de gestión y el diseño de la organización en un marco integral y además, determinar el grado de flexibilidad actual y necesaria de dicha organización.

Fundamentos Teóricos y Objetivo

El marco propuesto como base teórica del cuestionario, se basa en el destacado trabajo sobre organizaciones flexibles llevado a cabo por Henk Volberda (1998). Este cuestionario y su modelo de cálculo han sido validados estadísticamente y se utilizan a nivel académico. Recientemente, se ha aplicado en estudios sobre el equilibrio ideal entre la organización y el entorno, sobre las características de la flexibilidad estratégica y, sobre las diferencias entre empresas grandes y pequeñas.

[50] Based on a web-based questionnaire (http://www.evaluation-erasmus.nl/cgi-bin/react_tool.pl?md5obj=4766f48d3dfb5de5ba85d18b614e209d) that the Department Strategy & Business Environment developed. The digital form of the questionnaire titled "Quick Scan Flexibility"(version 1.61 EO – English) was active during the period October 24th, 2006 – October, 24th, 2008.

Ha sido desarrollado en *RSM Erasmus University* (Netherlands) por el Prof. dr. Henk W. Volberda and drs. Niels P. van der Weerdt[51]. Ambos profesores han colaborado en el análisis y evaluación de los resultados.

Análisis de Datos

El cuestionario QSF fue distribuido por email en dos periodos diferentes, en 2007 y en 2011. Una vez obtenidos los resultados, a través de una entrevista personal, se mostraron los resultados a la persona que participo en el estudio. Durante esas entrevistas se pudo recoger información adicional con respecto a contexto económico y planes estratégicos de la compañía a largo plazo.

Una vez obtenidos los cuestionarios cumplimentados[52], las respuestas fueron enviadas a través de un soporte web a la Universidad RSM y el departamento de Estrategia y Entorno Empresarial proceso la información y elaboró un informe personalizado de los resultados.

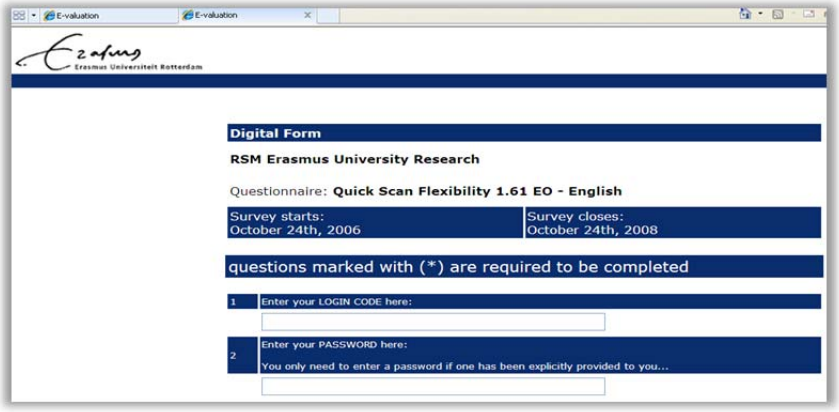


Figura: Página de inicio del QSF

RESUMEN DE LOS RESULTADOS

El informe tiene como objetivo proporcionar a la empresa pistas claras acerca de la aplicación de la teoría en lo que respecta a flexibilidad organizativa. Sin embargo, la decisión final sobre cómo la compañía debería desplegar la estrategia de flexibilidad requiere de un profundo conocimiento sobre el tema.

De acuerdo con el marco teórico de Volberda (Volberda, 1998), el diagnóstico ofrece el resultado de cuatro principales indicadores o determinantes de flexibilidad organizativa (siguiente figura) y de la trayectoria de cambio propuesta para alcanzar el nivel de flexibilidad requerida por el entorno.

[51] Drs. N.P. van der Weerdt, RSM Erasmus University. Department Strategy & Business Environment. E-mail: n.weerdt@rsm.nl. www.strategyaterasmus.nl.

[52] Based on a web-based questionnaire (http://www.evaluation-erasmus.nl/cgi-bin/react_tool.pl?md5obj=4766f48d3dfb5de5ba85d18b614e209d) that the Department Strategy & Business Environment developed. The digital form of the questionnaire titled "Quick Scan Flexibility"(version 1.61 EO – English) was active during the period October 24th, 2006 – October, 24th, 2008.

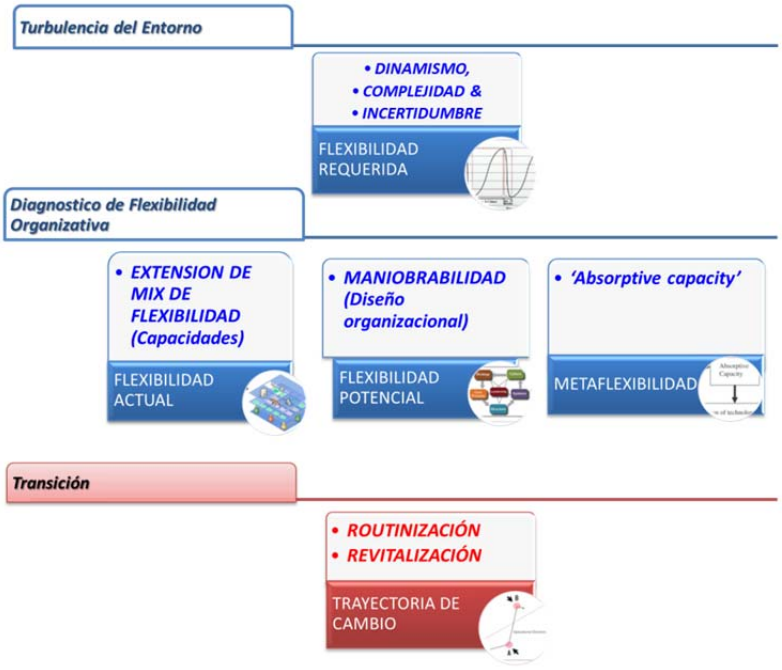


Figura: Principales elementos del marco teórico de Volberda.

La combinación de cuatro primeros componentes dará lugar a una de las cuatro formas flexibles que han sido definidas según la Teoría de Volberda.

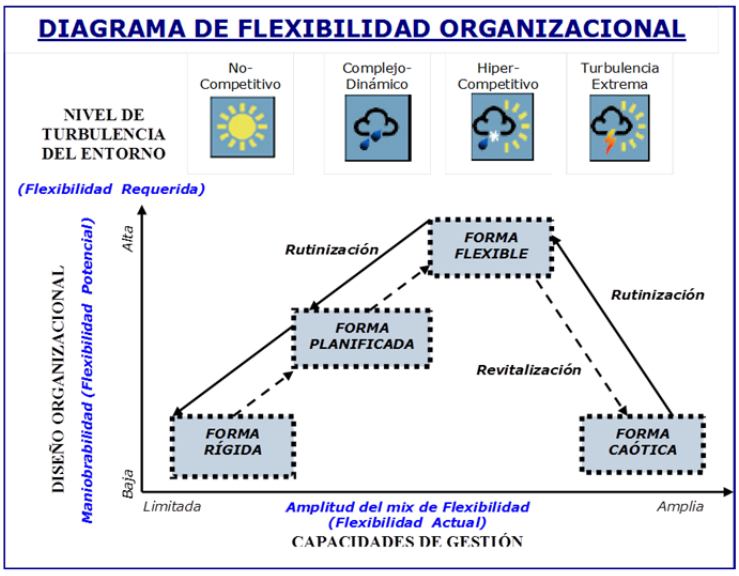


Figura1: Formas organizativas flexibles (Volberda. 1998)

A continuación se detallan los resultados presentando la comparación entre los dos años objeto de estudio.

Turbulencia del entorno (Flexibilidad Requerida)

Esta variable es el resultado de la combinación del grado de **dinamismo**, **complejidad** e **incertidumbre** del entorno en el que opera la organización.

- El nivel de dinamismo viene determinado por la *intensidad* y *frecuencia* de los cambios
- El nivel de complejidad lo determina el *número* de *elementos* que cambia en el entorno y su *relación de dependencia*
- El nivel de incertidumbre se obtiene midiendo la *disponibilidad* de la *información* relacionada con los cambios y la *previsibilidad* de los *cambios*

La suma de esas tres dimensiones da lugar a cuatro niveles de turbulencia en el entorno:

- **No-competitivo**: estático, simple y predecible.
- **Complejo/Dinámico** (moderadamente competitivo): dinámico y/o complejo pero predecible.
- **Hiper-competitivo**: dinámico y/o complejo pero sobre todo, impredecible.
- **Turbulencia extrema**: muy dinámico y/o complejo, y fundamentalmente impredecible.

La siguiente gráfica muestra la comparación de los resultados de los periodos:

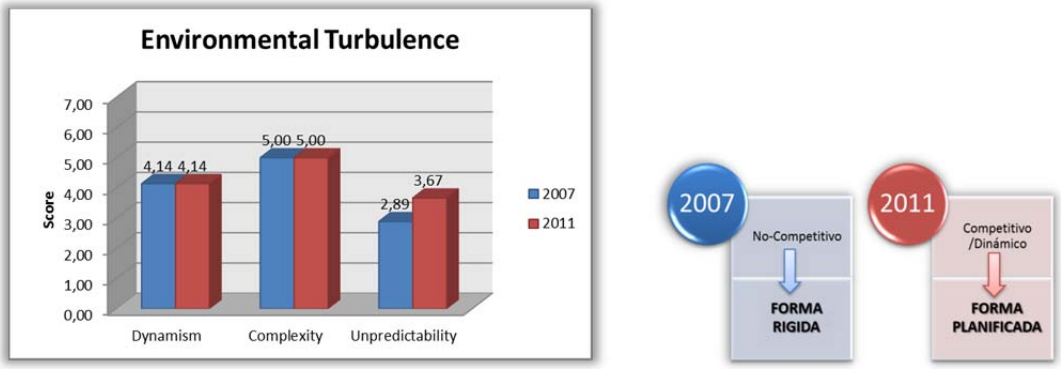


Figura2: Resultados de Turbulencia del Entorno

En 2011 se aprecia un mayor nivel de incertidumbre. Principalmente debido a que en ese periodo (2011) es más difícil acceder y conseguir información de confianza de su mercado. Aunque ha aumentado la información que recibe la gerencia de competidores y consumidores, el mercado sigue siendo igual de previsible.

Preguntas Bloque 1:

A. *¿Es posible que esa percepción del Director de I+D con respecto al entorno en el que la empresa opera, difiere de la realidad?*
B. *Durante ese periodo, ¿puede afirmar si se han llevado a cabo opciones de cambio organizacional contrarias a lo que 'las fuerzas competitivas' requerían en ese momento (erróneas percepciones de los gerentes)? Es decir, ¿se tomaron decisiones de cambio que no eran las adecuadas?*
C. *¿Podría afirmar si en su organización se utiliza la buena práctica de medir la evolución de las fuerzas competitivas de su entorno (clientes, proveedores, competidores, aliados, etc.)? Y, si es utilizado ese análisis para la toma de decisiones?*

Extensión del Mix de Flexibilidad (Flexibilidad Actual)

En esta sección del cuestionario intentamos determinar la forma en que la organización desempeña la tarea de **Gestión de Capacidades Dinámicas**. A esa tarea de gestión la vamos a denominar a partir de ahora 'mix de flexibilidad' y es el resultado de combinar

- variedad de capacidades dinámicas y
- la velocidad de reacción en activar dichas capacidades a los cambios en el entorno

Para determinar la extensión del mix de flexibilidad se estudia la forma de gestionar las capacidades a 3 niveles:

- **Flexibilidad Operacional** (baja variedad de capacidades y una alta velocidad de respuesta): habilidad de cambiar el volumen y el mix de las actividades de negocio.
- **Flexibilidad Estructural** (alta variedad de capacidades y baja velocidad de respuesta): habilidad de cambiar la estructura de la organización y los procesos de comunicación y de toma de decisiones.
- **Flexibilidad Estratégica** (alta variedad de capacidades y alta velocidad de respuesta): habilidad de cambiar la estrategia corporativa y la naturaleza de las actividades de negocio.

La siguiente gráfica muestra los resultados de los periodos:

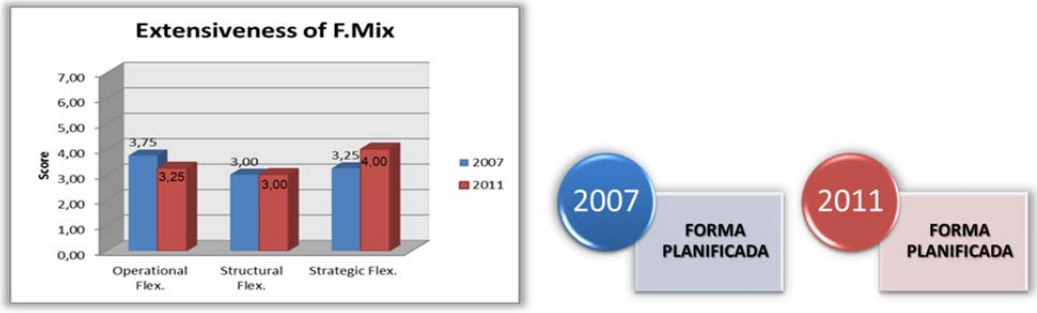


Figura: Resultados de Mix de Flexibilidad

Ligera disminución de flexibilidad operacional. Principalmente debido a una menor flexibilidad de cambio de recursos, actividades y/o proveedores en los procesos de fabricación. Se puede apreciar que en ese periodo de cuatro años **la flexibilidad estratégica ha mejorado levemente**. Principalmente por incremento en desarrollo de nuevos productos y servicios y en menor medida de nuevos modelos de negocio.

Preguntas Bloque 2:

A. *¿Qué fortaleza destacaría de su organización en cuanto a capacidades dinámicas? Nota: ¿Es posible que haya sido por la tendencia creciente de las ventas internacionales? o ¿por los esfuerzos de I+D?*
B. *Según los resultados parece que la forma de gestionar las capacidades dinámicas no ha variado en estos cuatro años. Sin embargo, la situación de crisis que se vivió en ese periodo pudo influir en algunas decisiones de cambio. Por ejemplo,*

    - *¿Se tomaron medidas relacionadas con redefinir competencias clave o establecer mayor control en determinadas actividades que favoreciesen enfocar la estrategia marcada por la dirección? O en cambio…*

- *¿Se tomaron medidas relacionadas con rutinizar algunas tareas, especificar funciones y asignar personal específico a esas funciones (en definitiva, mayor control de actividades sin posibilidad de cambio entre funciones)?*

Capacidad de Adaptación o Maniobrabilidad (Flexibilidad Potencial)

En la sección anterior hacíamos referencia a la forma en que la organiza gestiona la variedad y velocidad de las capacidades dinámicas. Esa tarea solo puede realizarse eficientemente si la jerarquía de capacidades se corresponde con la arquitectura de la firma. Es decir, flexibilidad organizacional también está relacionada con la tarea de **diseño de aquellas condiciones organizacionales apropiadas** necesarias para explotar efectivamente el 'mix de flexibilidad'.

Diseñar las condiciones organizacionales apropiadas requiere identificar el tipo de cambios **tecnológicos**, **estructurales** o **culturales** que aseguren la utilización efectiva de las capacidades de gestión. Esas condiciones determinan ***la maniobrabilidad*** de la organización, o su capacidad de respuesta.

Nos vamos a centrar en tres variables de diseño de organización, cuya configuración de estas variables determina la maniobrabilidad de la organización:

- **Tecnología**: nuestro concepto de tecnología se refiere tanto a maquinaria y equipamiento como a conocimientos, técnicas y habilidades utilizados en la transformación de entradas de material o de información en salidas (bienes o servicios). Puede calificarse de ***rutinaria*** o ***no-rutinaria***. Las variables de diseño tecnológico que consideramos y que pueden suponer posibles barreras a la flexibilidad son: modo de producción, layout de producción, método de transformación y repertorio operacional.
- **Estructura**: nuestro concepto de estructura incluye aquellas relaciones que realmente existen en la organización, incluyendo la estructura informal. Puede calificarse desde ***mecanicista*** hasta ***orgánica***. Para distinguir entre un tipo de estructura y otro, las características que consideramos son: la forma organizacional, los sistemas de control y planificación, la regulación de tareas, conducta y proceso de toma de decisiones.
- **Cultura**: se refiere a las creencias y valores que están presentes en la organización, y puede calificarse desde ***conservadora*** hasta ***innovadora***. Ese grupo de ideas se desarrolla y se mantiene en función de cómo se caracterice en cuanto a las siguientes variables: la identidad de la organización; el liderazgo, las reglas informales y la orientación externa.

La configuración de estas variables determina ***la maniobrabilidad*** de la organización y se muestran los resultados de los periodos en la siguiente gráfica:

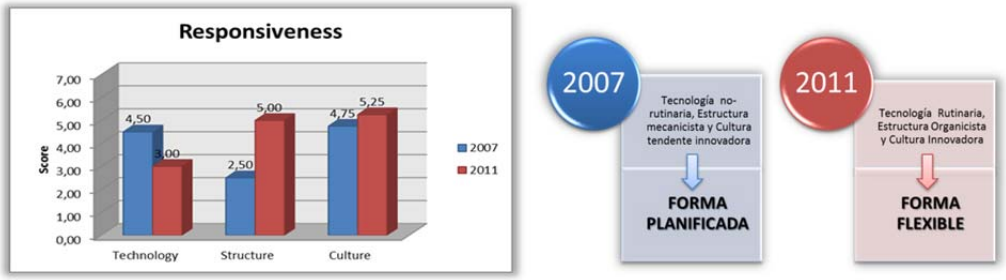


Figura3: Resultados de Capacidad de Adaptación

El grado de flexibilidad potencial que podría ofrecer la tecnología ha disminuido en cuanto a composición y organización de procesos, a la flexibilidad de los empleados y sistemas de información. Se ha mantenido el nivel de actualización de la empresa en cuanto a su know-how.

Por el lado 'estructural' el cambio ha sido más drástico, **ha mejorado la flexibilidad potencial que ofrece la estructura**. Ahora es más organicista (o menos mecanicista) en cuanto a:

- Disminución de los sistemas de planificación y control
- Menores descripciones de tareas y del puesto de trabajo para definir la división del trabajo.
- Menos reglas establecidas y menores cuerpos de consulta

En 2011, las características de la **cultura organizacional** son más cercanas a una calificación **'innovadora'**. Ha mejorado sobre todo debido a un mayor apoyo de la dirección a aceptar y/o considerar opiniones o ideas que, aunque se alejen de la identidad de la compañía, pueden favorecer la innovación.

Preguntas Bloque 3:

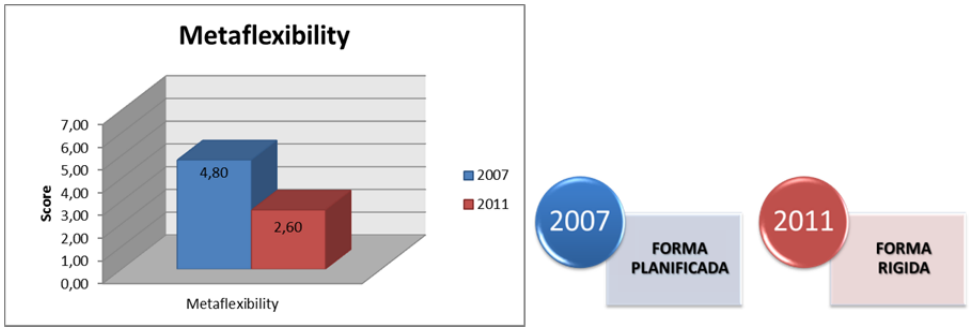
A. *¿Qué fortaleza destacaría de su organización en cuanto a diseño organizacional?*
B. *En este periodo 2007-2011, ¿su ventaja competitiva decrecía, la organización se enfrentó a etapas de crisis, debía centrarse en conseguir un mayor grado de equilibrio interno, estabilidad, ser más eficiente en sus operaciones (explotación) y sacar provecho de su conocimiento y oportunidades actuales?*
   Nota: se tomaron medidas con respecto a rutinizar procesos de producción, o a establecer mayor estandarización de procesos de toma de decisión o a no permitir nuevas ideas o culturas que se desvíen de la visión de la organización
C. *O por el contrario, ¿en ese periodo se inicia la transición hacia nuevos mercados, nuevos modelos de negocio o nuevas ventajas competitivas?*
   Nota: fueron medidas encaminadas a des-rutinizar los procesos productivos, a flexibilizar los sistemas de control y planificación y a fomentar la cultura de innovación?.

Meta-flexibilidad (Capacidad de Absorción)

No basta con reconfigurar el 'mix de flexibilidad' sino también puede que sea necesario rediseñar las condiciones organizacionales en línea con los futuros cambios competitivos. Como consecuencia, la gerencia tiene que enfrentarse a una tensión constructiva, ya que si no hay equilibrio entre las dos dimensiones, los esfuerzos de flexibilidad fallaran. Eso es lo que denominamos meta flexibilidad: coordinar continuamente las dos tareas anteriores con el grado de turbulencia del entorno.

Meta flexibilidad está relacionado con la **capacidad de absorción**[53] **y aprendizaje** de alto orden: habilidad de acceder a nuevo conocimiento desde fuera de los límites de la empresa y estudio del entorno de los posibles cambios tecnológicos o cambios en las preferencias de los mercados en el entorno industrial. Para ello, es necesario desarrollar 'meta-capacidades', habilidad de 'desaprender' (olvidar lo aprendido) y 'reaprender' (acceder a nuevo conocimiento desde fuera de los límites de la empresa).

La siguiente gráfica muestra los resultados de Meta-flexibilidad de los 2 periodos:



El nivel de meta-flexibilidad o capacidad de absorción de información que la empresa tiene **ha disminuido considerablemente**. Quizás los aspectos más destacados hayan sido el **descenso notable en la supervisión continuada y análisis sistemático de competidores, vigilancia tecnológica y de consumidores.**

Pregunta Bloque IV:

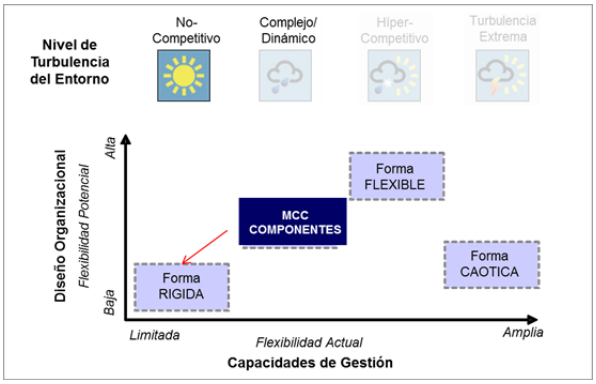
A. *¿Podría afirmar que realmente se ha dado esta situación?*
B. *Y, ¿es una circunstancia que pueda extenderse al resto de compañías del grupo?*
C. *Durante ese periodo, ¿puede afirmar si las decisiones de cambio se tomaron en base a la observación, análisis y evaluación de la información proveniente de vigilancia estratégica?*

[53] Se ha definido como "la capacidad de una empresa para reconocer el valor de la nueva información, asimilarla y aplicarla a fines comerciales".

Trayectoria de cambio propuesta por el modelo QSF

En 2007, el informe de Quick Scan Flexibility (QSF) exponía que la trayectoria de cambio más adecuada era una estrategia de rutinización:

RE-POSICIONAMIENTO EN EL MARCO DE FLEXIBILIDAD (2007)			
Trayectoria de Renovación	**RUTINIZACIÓN**	**(Transición hacia la forma Rígida)**	
Rutinización: refinar o rectificar las competencias clave, incrementar el enfoque estrategico, estandarizacion y profesionalización de los procesos e intitucionalizacion de los procesos de informacion y de toma de decisiones.			
	Flexibilidad Actual	**Flexibilidad Requerida**	**Pasos**
Capacidades de gestión	**Organización Planificada**	**Organización Rigida**	-1
Diseño Organizacional	**Organización Planificada**	**Organización Rigida**	-1



La situación de partida refleja la existencia de un gap POSITIVO de Flexibilidad Organizativa, es decir, **un exceso de flexibilidad**, tanto en Capacidades flexibles como en Capacidad de adaptación. Ese gap/exceso puede considerarse originario de la **percepción de los gerentes** en cuanto a Turbulencia del Entorno, el cual refleja una flexibilidad requerida menor.

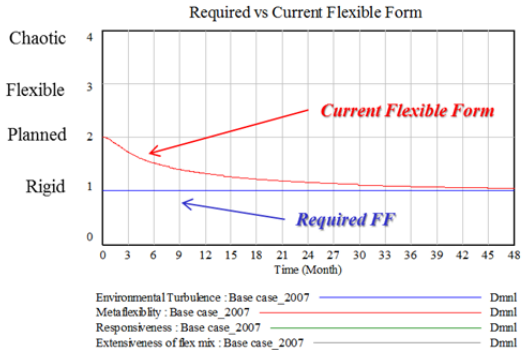
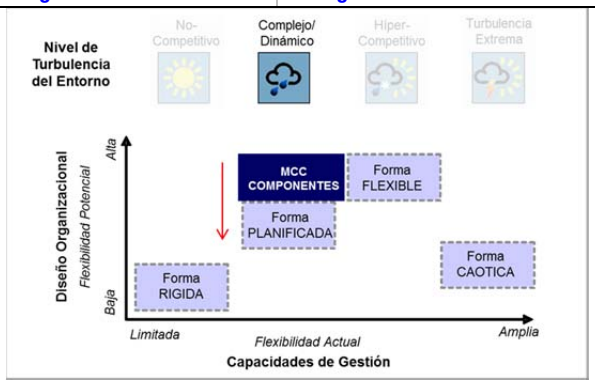


Figura: Base case en 2007 – Forma Flexible REQUERIDA vs ACTUAL

En 2011, el informe de Quick Scan Flexibility (QSF) exponía que la trayectoria de cambio más adecuada volvía a ser una estrategia de rutinización:

RE-POSICIONAMIENTO EN EL MARCO DE FLEXIBILIDAD (2011)			
Trayectoria de Renovación	**RUTINIZACIÓN**	**(Transición hacia la forma Planificada)**	
Rutinización: refinar o rectificar las competencias clave, incrementar el enfoque estrategico, estandarizacion y profesionalización de los procesos e intitucionalizacion de los procesos de informacion y de toma de decisiones.			
	Flexibilidad Actual	**Flexibilidad Requerida**	**Pasos**
Capacidades de gestión	**Organización Planificada**	**Organización Planificada**	**0**
Diseño Organizacional	**Organización Flexible**	**Organización Planificada**	-1



Pregunta Bloque V:

A. En 2007 la estrategia implementada no ha sido la propuesta por Volberda sino que, según la respuesta en el cuestionario de 2011 se había implementado una estrategia de revitalización.

> *"Estrategia de Revitalización: Periodo de volatilidad de cambios y de incertidumbre mayores en el que las nuevas oportunidades de negocio detectadas necesitaban de: des-regulación de procesos, cambio en las formas organizacionales básicas, nuevos valores, apertura al exterior, cultura mas innovadora (procesos de internacionalización, de fusión o adquisición, etc.)"*

¿Ha sido una estrategia individual o viene marcada esta tendencia por la estrategia del grupo?

B. ¿Sería capaz de estimar el tiempo en que los cambios de una estrategia de revitalización fueron efectivos y si se consiguieron los efectos deseados?

C. ¿Se produjo alguna circunstancia que retrasara la efectividad del cambio? Mencionó en el cuestionario de 2011:

> *"Mucha resistencia al cambio entre el personal directivo y ejecutivo y mucha inercia organizacional"*

¿Alguna otra circunstancia que se pueda mencionar?

¿Fue posible controlarlo? Es decir, utilizó la gerencia alguna buena práctica de gestión del cambio que ayudase a controlar esa resistencia?