UNDERSTANDING OF THE BEHAVIOUR OF ORGANISATIONAL COMMITMENT USING A SYSTEM DYNAMICS MODEL

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STATEMENT OF ORIGINALITY

I hereby declare that the research recorded in this document and the document itself, were developed entirely by myself at the Organisation and Industrial Management Area, Department of Mechanical and Manufacturing, at the University of Mondragon.

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ABSTRACT

In our increasingly globalised economy, managing continuous change whilst remaining competitive and dynamic, has become a central issue for organisations in the industrial sector. Organisations which defend a people "commitment" approach feature multiple practices which includes collections of organisation-wide human resource policies and procedures that have an effect on employee commitment level and motivation. When workers respond with higher commitment, better employee outcomes are obtained, which in turn has a significant effect on their productivity. Due to this effect is very important to understand organisational commitment over time. As a result, the main objective of this thesis is to understand the behaviour of organisational commitment using a system dynamics model. The final outcome of this research is a conceptual and a computational model. For the definition of the conceptual model three different input sources were used: the literature, the results from 11 Group Model Building (GMB) sessions and empirical evidence from Bateratzen (prior research). These multiple input sources provide the validation and robustness of the model. The variety of sources and phases makes the process more complex, but at the same time involves the necessity of being more accurate with the identification, definition, and interrelationships of the variables involved. Thus, it offers a holistic understanding of the system that explains the behaviour of organisational commitment. The Computational model developed in System Dynamics (SD) fulfils the objective of dynamically representing the behaviour of organisational commitment. Validation was achieved through different methods, creation of scenarios with evidence supplied by the database, among others. Therefore, this research makes a contribution on both the literature about Strategic Human Resource Management (SHRM) and SD. The most notable contribution for the literature of SHRM is the fact of combining more than one input source (Literature + 11 GMB + Bateratzen database). Decision makers can obtain understanding of the system through a unique model based on three validated input sources. The principal theoretical implication of this research for the field of SHRM is the integration of 7 narratives into a unique model. The whole system defined in the model is understood as the sum of three wide-ranging theories: High Performance Working Systems (HPWS), leadership and trust. Finally, this research has a significant practical implication for decision makers. The use of SD simulation modelling for decision making will enhance the managerial learning process and lead to more effective decisions.

LABURPENA

Gaur eguneko ekonomia globalizatuan, aldaketetara moldatzeko gaitasuna edukitzea, eta lehiakorra zein dinamikoa izatea sektore industrialeko antolakuntzen ardurarik garrantzitsuena bihurtu da. Konpromezu estrategia lantzeak pertsonekin lotutako hainbat praktika ejekutatzea dakar. Praktika hauek pertsonen konpromezu eta motibazio maila handitzen laguntzen dute. Langileak euren antolakuntzarekin konprometituta daudenean, euren emaitzak hobeak dira eta produktibitatea igotzen da. Konpromezuaren efektu hau dela eta, oso garrantzitusa da ulertzea zelan funatzionatzen duen. Ondorioz, tesi honen helbururik nagusiena antolakuntzako konpromezuaren eboluzioa ulertzea da System Dynamics (SD) modelo bat erabilita. Modelo kontzeptual eta konputazional bat lortu dira ikerkuntzaren emaitza bezala. Kontzeptualaren definiziorako hiru informazio iturri desberdin erabili dira: literatura, 11 Group Model Building (GMB) eta datu enpirikoak Bateratzen datu basetik (aurreko ikerkuntza). Informazio iturri barietateak ziurtatzen du modeloaren balidazioa. Modu berean, prozesua konplexuagoa bihurtzen du, baina aldi berean aldagai definizio eta identifikazio zehatzagoaren premia areagotzen du. Horrela, antolakuntzako konpromezu sistemaren ulermen holistikoago bat eskaintzen du. SD-n garatutako modelo konputazioanala konpromezuaren eboluzioa dinamikoki adierazteko helburua betetzen du. Balidazioa metodo desberdinen bitartez burutu da, Bateratzen datubasetik ateratako eszenarioekin, besteak beste. Erabakitze prozesuaren arduradunek sistemaren ulermena lor dezakete hiru informazio iturri biltzen duen model bakar batekin. Horrez gain, informazio iturrien konbinaketak berrikuntza eta balio gehitua suposatzen du SD simulazioaren esparrurako. Inplikazio teorikorik garrantzitsuena Strategic Human Resource Management (SHRM) esparrurako 7 narratibak modelo bakar batean elkartu izana da. Modeloa bere osotasunean hiru teorien bakuntza bezala ulertu da: High Performance Working Systems (HPWS), lidergoa eta konfiantza. Bukatzeko, ikerkuntza honek inplikazio praktikoa dauka erabakitze prozesuen arduradunentzako. SD simulazioaren erabilerak arduradunen ikaste prozesua aregaotuko du, erabaki eraginkorragoak har daitezen.

RESUMEN

En la sociedad globalizada en la que vivimos, gestionar el cambio a la vez que mantenerse competitivas y dinámicas es el foco central de interés de las organizaciones del sector industrial. Las organizaciones que trabajan la estrategia de "compromiso" ejecutan prácticas de personas que influyen en el compromiso y la motivación. Cuando las personas están comprometidas con su organización, su rendimiento es mayor, y por lo tanto la productividad aumenta. Debido a este efecto resulta clave comprender el comportamiento del compromiso organizacional. Por ello, el objetivo principal de esta tesis en comprender el comportamiento del compromiso organizacional utilizando un modelo de Dinámica de Sistemas. Se han obtenido un modelo conceptual y otro computacional como resultados finales de la investigación. Para la definición del modelo conceptual se utilizaron tres fuentes de información diferentes: Literatura, 11 Group Model Building (GMB), y datos empíricos de la base de datos Bateratzen (investigación previa). El hecho de haber utilizado múltiples fuentes de información asegura la validación y robustez del modelo. Por otro lado, aunque la variedad de fuentes de información hace el proceso más complejo, también implica la necesidad de ser más exactos con la identificación y definición de las interrelaciones de las variables. Por lo tanto, esto ofrece una visión holística del sistema que analiza y representa el comportamiento del compromiso organizacional. El modelo computacional desarrollado con Dinámica de Sistemas (DS) responde al objetivo de representación dinámica del comportamiento del compromiso organizacional. La validación fue obtenida mediante diferentes métodos, como la creación de escenarios en base a los datos empíricos obtenidos en Bateratzen. Por lo tanto, esta investigación tiene un impacto significativo tanto para la literatura sobre Strategic Human Resource Management (SHRM) como para la DS. Además, dicha variedad es novedosa y añade valor al ámbito de la simulación. Esta investigación ofrece una visión de pensamiento sistémico al ámbito de SHRM. Los responsables de la toma de decisiones pueden obtener comprensión del sistema mediante un modelo único alimentado por tres fuentes. La implicación teórica más relevante para el campo del SHRM es la integración de 7 narrativas en un modelo único. El sistema completo definido en el modelo se entiende como la suma de tres teorías: prácticas de Alto Rendimiento, liderazgo y confianza. Finalmente, la utilización de la técnica de simulación DS facilitará el aprendizaje de los responsables de la toma de decisiones para así tomar decisiones más eficientes.

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Chapter 1

Introduction

1. INTRODUCTION

1.1. THE NEED FOR A SUSTAINABLE COMPETITIVE ADVANTAGE

In our increasingly globalised economy, managing continuous change whilst remaining competitive and dynamic, has become a central issue for organisations in the industrial sector (Priem & Butler, 2001; Hallee, Tasking, & Vincent, 2018). For the purpose of obtaining competitive advantage organisational commitment is a key variable. This hypothesis is supported by the Resource Based View (RBV) which posits people as a key factor for competitiveness (Barney, Wright, & Ketchen, 2001; Wright, McMahan, & MacWilliams, 1994).

It is necessary to understand how organisational commitment and key variables that influence it, behave over time so as to facilitate knowledge acquisition by management and obtain more competitive organisations. As a result, the main objective of this thesis is to understand the behaviour of organisational commitment using a system dynamics model.

The future of many companies in developed economies is under threat from the growing number of countries which produce low cost products in this global and competitive scenario. Traditional strategies are rapidly becoming dated. The effect of this is a greater necessity for strategic change oriented towards higher added value products and services. Successful companies in this context are characterised by a strategy of differentiated and personalised service parameters (Elorza, 2008).

This differentiating strategy enhances the necessity of more flexible, creative and resilient workers (with capacity to face changes in the organisation). It is important that employees who have historically worked in a traditional way based on passive behaviours understand the necessity of proactivity and initiative. They must embrace continuous learning to obtain success resulting from such differentiating strategies. As a consequence, the success of a company will be dependant on the skills of the workers, their capacity for learning, and adapting to evolving client necessities. In general terms, the changing role of workers is the key to achieve a higher level of commitment to organisational objectives (Elorza, 2008).

Historically most companies have been working following a Tayloristic philosophy with the principal aim of increasing productivity. This implies unenriched workplace design performed by low qualified workers. In the current socio-economic context, the strategic reflexion of many companies has highlighted the necessity of organisational transformation to obtain more committed and more proactive workers. Such workers take an active role in achieving the strategic goals of their organisations. This transformation implies continuous dynamic learning, especially at a management level. Management has the power to implement changes and make them effective for the achievement of new value added strategies. What is still unknown however, is how proactive workers can be encouraged and motivated to obtain a more competitive organisation (Elorza, 2008).

The direct consequence is that organisational interventions in the field of people management are strongly motivated by intuitions (or inaccurate data), and management fashions which result in isolated and short-term initiatives with no coherence and no consistency. As a result, in the majority, these approaches are not successful or show very limited outcomes, generating frustration on people and lowering commitment. This does not help achieving a sustainable competitiveness. So, necessity of understanding organisational commitment exists (Elorza, 2008).

Therefore, the key to successful changes resulting in improved competitiveness is based on the development of capacities, values, aptitudes and people behaviour rather than on the technical domain (Gowen, Mcfadden, Hoobler, & Tallon, 2006). Strategic Human Resource Management (SHRM) has presented evidence about the relationship between people commitment and organisational performance (Becker, Huselid, Pickus, & Spratt, 1997; Delery & Shaw, 2001). The majority of studies of SHRM analyse the relationship between people management practices and organisational performance. However, as it is shown in Figure 1 evidences show that high performance people management practices do not have a direct influence on competitiveness, rather they influence the capacities, knowledge, and behaviours of workers, which in turn leads to competitiveness (Elorza, Aritzeta, & Ayestarán, 2011).

In spite of the logic of this statement, there is still a lack of knowledge about how people contribute to organisational performance (Fletcher, 2017).

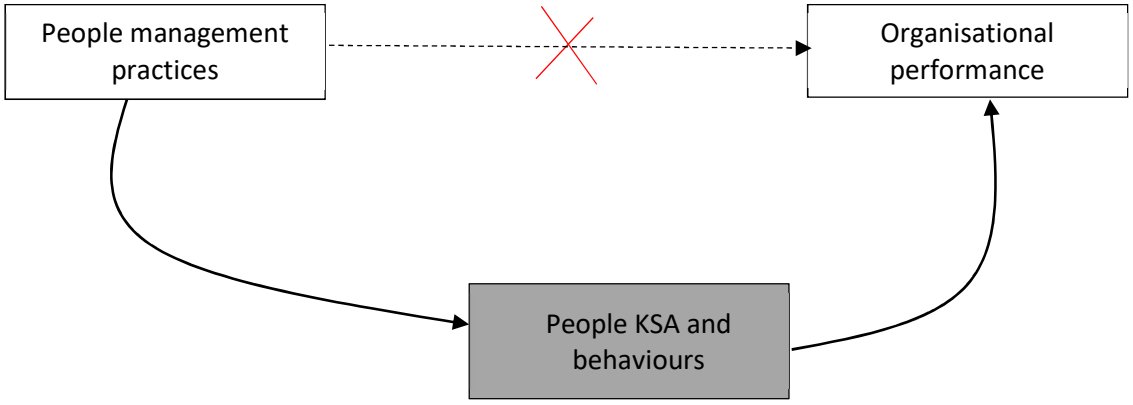

Figure 1: People influence on organisational performance

1.2. THE SHRM FIELD

SHRM has its origin in the theory of Resource Based View (RBV) (Barney, Wright, & Ketchen, 2001; Wright, McMahan, & MacWilliams, 1994). It posits that the Knowledge, Skills, Abilities (KSA) and behaviours can be a key factor for organisational competitiveness (Martin-Alcazar, Romero-Fernandez, & Sanchez-Gardey, 2005).

It is important to highlight three significant differences between SHRM and traditional Human Resource Management (HRM). First, HRM traditionally tackles people management practices in an isolated way. SHRM, on the other hand, argues the necessity of implementing people management practices as an interconnected set of practices (not isolated). These set of practices seek to foster positive synergies multiplying the effect on

people (Becker & Huselid, 1998; Delery, 1998). SHRM is based on the idea that people behaviour responds more to a set (system) of practices rather than just to an individual practice (Evans & Davis, 2005; Wright, Dunford, & Snell, 2001).

Second, HRM aims to influence specific people outcomes such as satisfaction and job performance. SHRM, in contrast, seeks to align people's KSA and behaviour with organisational strategic challenges. The design and implementation of a unique and inimitable system of practices is the mean through which SHRM seeks to achieve such an alignment. A competitive advantage is expected to gain as a result of the alignment between people and strategic needs (Becker & Huselid, 2006; Delery & Shaw, 2001).

Finally, HRM is mostly focused on individual level of analysis; e.g. job performance, and burnout (Becker & Huselid, 2006). On the other hand, SHRM is more focused on organisational level of analysis; e.g. organisational performance, organisational absenteeism and turnover.

In conclusion, SHRM is understood as the management of people related practices such as autonomy, training, and information to align people KSA and behaviour with strategic needs of the company. Central to SHRM is organisational commitment, which belongs to the black box of "people KSA and behaviours" represented in Figure 1.

1.3. Organisational Commitment as an strategic lever

The most common definition of organisational commitment refers to it as a psychological force that connects employees to their organisation (Meyer, Allen, & Smith, 1993; Temiz, 2013). Mowday et al. (1974) understood that characteristics of commitment are the following: (i) high level identification with the objectives and values of the organisation, (ii) readiness to make extra effort for the benefit of the organisation and (iii) strong ambition to maintain membership in the organisation (Temiz, 2013).

Organisational commitment is a reflection of the acceptance of and belief in the aims and values of an organisation, a desire to use efforts in support of the organisation, and a strong wish to maintain employed in the organisation (Mowday & Porter, 1979).

Organisational commitment is a three component construct: (i) affective organisational commitment (AOC) refers to the emotional attachment of the employee to the organisation, and it emerges from positive social exchanges between the employee and the organisation (Meyer , & Allen, 1991; Mowday, Steers, & Porter, 1979), (ii) normative organisational commitment (NOC) refers to commitment related to rule based systems, and (iii) continuance organisational commitment (COC) involves the perceived cost of leaving the organisation, loss of desired investments and few job alternatives (Meyer et al., 2002).

The type of commitment studied in the present thesis is AOC. This type of organisational commitment is of particular interest due to its strong relationship with workplace outcomes such as job performance. It is argued that individuals with high levels of commitment are more inclined to dedicate greater efforts to achieve the aims and

objectives of their organisation (Avolio et al., 2004; Farndale, Hope-hailey, & Kelliher, 2011; Guest, 1999).

Due to the complexity of organisational commitment, system of interrelated variables that influence commitment needs evidence and empirical tools for decision making processes in this field.

1.4. THE IMPORTANCE OF SIMULATION FOR DECISION MAKING PROCESSES

The most important occurrences, systems and challenges in organisations are characterised by dynamic complexity (heterogeneous agents, behaviours and rules). Dynamic complexity makes it difficult to understand these factors in their context, and consequently management and decision making is hindered (Antunes & Respício 2008; Janssen, Maria, & Wimmer, 2015). One of the factors which drives this complexity is the lack of organisational commitment. How to increase organisational commitment in the organisation is a complex topic determined by the large amount of variables that could be involved in the system, and the different effects that influence the system in the short and long term.

Due to this complexity a systemic view is required, that is, an holistic view of the whole system. This systemic view enables the understanding of the interrelationships between organisational commitment and the variety of variables by which these SHRM systems are composed. These interrelationships are not linear, they are circular, defined by feedback loops. Thus, it is not convenient to be managed just with traditional views, they require systems thinking. The short and long term perspective of organisational commitment helps to predict and define more consistent organisational strategies. Both the qualitative and quantitative analysis of the variables (measurable and non measurable) are required for obtaining the most accurate understanding of such a complex issue as organisational commitment.

As a result of this systemic understanding, managers will likely make decisions based on evidence rather than intuitions and personal experiences, as they understand how the whole system works. Decision making is one of the most vital processes to achieve the objectives of an organisation, however many decisions are made without evidence based management. To compound the problem, future decision makers are often not able to take advantage of the experience of their predecessors (Schalk, Timmerman, & den Heuvel, 2013). It is clear that the most effective organisations of the future will be those which make decisions focusing on evidence based predictions (DeGregorio, 1999). When decisions are made with no evidence, ineffective practices and experiences in the workplace are dominant. These negative feelings drive the lack of committed workers.

The increasingly competitive nature of the global economy has left many organisations searching for new strategies to build capacity and sustainable competitive advantage. Key to achieving this result is an effective decision making process. Computational tools show great potential to assist decision makers, due to the speed and efficiency with which they are able to identify emergent behaviours (Antunes & Respício 2008; Janssen, Maria, & Wimmer, 2015).

With the purpose of developing a more effective decision making processes, it is necessary to: (i) to conceptualise the system of causes and effects related to organisational commitment in order to achieve a full understanding, and (ii) to model it using simulation to facilitate the interactive manipulation and generation of real scenarios.

The final aim of (i) conceptualisation and, (ii) modelling is: to define a systemic and real perspective of organisational commitment so as to facilitate a learning process for more effective decision making. The resulting benefits of this conceptualisation and modelling could be more effective decisions that would help to foster organisational commitment and improve company sustainability.

1.5. THESIS ORGANISATION

The structure of this thesis is shown in Figure 2. Chapter 1 presents an introduction explaining the gap.

Chapter 2 develops the aim of this research and the expected outcomes.

Chapter 3 describes the literature review of the System Dynamics simulation technique. It gives a comprehensive overview of the usefulness and fit of the technique to the research objectives.

Chapter 4 develops the three different input sources of the model: the literature, the GMBs, and the empirical evidence from the database.

Chapter 5 explains and justifies the methodology applied in the research. In this section the different phases for the construction of the conceptual and simulation models is developed.

The conclusions are set out in Chapter 6, together with the contribution, limitations, and future research.

Finally, references can be found in Chapter 7, and Chapter 8 is dedicated to the annexes.

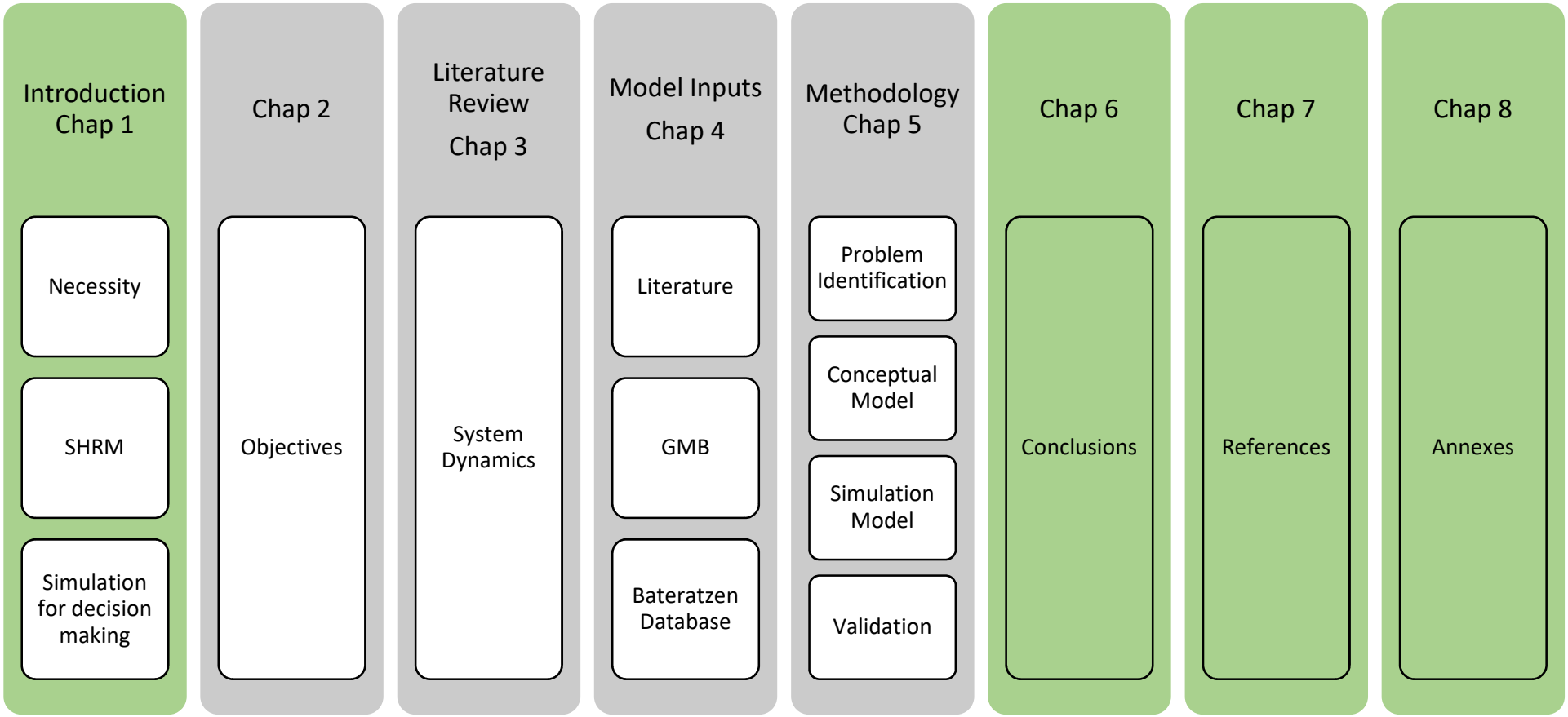

Figure 2: Thesis organisation

Chapter 2

Objectives

2. OBJECTIVES

Organisations need a competitive advantage to survive in the changeable global marketplace. Committed workers are the key to success due to their effect on organisational performance. This statement is argued by Resource Based View (RBV) which identifies people as a key factor for competitiveness. The phenomena of organisational commitment is complex, the wide number of variables and interrelationships involved in the system defines the heterogeneity which makes difficult to understand these HR factors in their context. As a result, decision making processes in this field become difficult to manage. Traditionally decisions are made based on experiences and intuitions, which generates lack of effectiveness. In consequence, the main objective of this thesis is:

To understand the behaviour of organisational commitment using a system dynamics model.

For the purpose of this thesis the explanation of each of the key elements of this objective is:

- Understanding of Organisational Commitment: Understanding will be obtained through representing a behaviour pattern of organisational commitment over time. This facilitates the understanding of its evolution, the variables that affect commitment and are influenced by it, are identified and dynamically visualised through a conceptual model.

  For this objective an SD model will be built. The model will be based on Systems Thinking, this stream refers to a formal, abstract, and structured cognitive endeavour (Chen, 2016). As a result, its methods can be classified as systemic approaches to obtain understanding of a studied system (Flood, 1999; Linnéusson, 2009). These systems of interrelated elements cannot be managed by reduction to smaller factors. This perspective is commonly described by the expression: “The whole is more than the sum of its parts” (Chen, 2016).

- Organisational Commitment: Organisational commitment is a reflection of the acceptance of and belief in the aims and values of an organisation, a desire to use efforts in support of the organisation, and a strong wish to remain employed in the organisation (Mowday & Porter, 1979). It is argued that individuals with high levels of commitment are more inclined to dedicate greater efforts to achieve the aims and objectives of their organisation (Avolio et al., 2004; Farndale et al., 2011; Guest, 1999).

  This research focuses on the organisational level of affective commitment, referred in the research as affective organisational commitment or organisational commitment. This is an organisational level construct rather than an individual level.

- System Dynamics Model: System Dynamics is an approach that can assist in the resolution of top-management challenges. It can fulfil the aim of decision makers of setting management policies and organisational structures that could lead to improve organisational commitment and therefore organisational performance (Forrester, 1961). This simulation technique (SD) has been used to transform the Systems Thinking conceptual model into a computational.

The expected outcomes that will respond to the objective of the research are the following:

Table 1: Objectives and expected outcomes

OBJECTIVE	EXPECTED OUTCOME
Understanding the behaviour of organisational commitment	A conceptual model that will explain the main antecedents and consequences of organisational commitment.
Dynamic representation of behaviour of organisational commitment	A computational model that will enable to simulate different scenarios and understand organisational commitment patterns of behaviour.

Chapter 3

Literature Review On Simulation

3. LITERATURE REVIEW ON SIMULATION

Simulation is a modelling technique well suited to strategic decision making (Eisenhardt & Zbaracki, 1992). How do people - whether they are leaders, advisers or commentators - make sense of organisations, industries and societies, explain them to others, and predict outcomes well enough to structure and communicate intelligent strategy and policy? Simulation of organisational processes can help with such complex tasks and is powerful enough to facilitate effective strategy and policy design (Morecroft, 2015). The management of a complex world can be improved by visualising and simulating it (Brien & Dyson, 2007).

Simulation models in the field of social sciences (the basis of this research) evolved into a new scientific movement for social and humanistic disciplines. A generation of simulation models which include both modelling and simulation has given rise to a new cultural opening for social researchers in terms of language and disciplines. Simulation modelling in social sciences is understood as an strategy to deal with social complexity, and simulation models are the tools (Zoya & Roggero, 2014). Experts believe that social simulation captures the types of complex, dynamic, and interactive processes which are prevalent in the social world (Smith & Conrey, 2007). For systems in which complex behaviour and decision making are involved, multiple agents need to be distinguished and social simulation is considered the best fit option (Janssen, 2005).

Compared to traditional techniques such as statistics and mathematics, social simulation is often characterised by factors with greater magnitude, more events, actors, entities and periods (Carley, 2009). Regarding decision making processes, traditional methodologies have limitations in terms of capturing rich details related to the dynamism of variables. Simulation could provide the solution for this gap, as it responds to problems in a context of complex behaviours and systems in which multiple interdependent processes interact (Harrison, Carroll, & Carley, 2007). Simulation techniques are appropriate for simulating dynamic systems where the structure changes during the simulation process (Van Dam, 2009).

Smith and Conrey (2007) argued that the most commonly known techniques (statistics and mathematics) are insufficient for the study of social fields due to the highlighting complexity of these fields. In some contexts, such as logistics, however, traditional statistical approaches can be enough for evaluation and making effective decisions (Fisher, 1936). Everything depends on the type of questions the decision maker is interested in responding to.

3.1. TYPES OF SIMULATION

According to Bauer, Beauchemin and Perelson (2009) the most common types of simulation techniques for decision making are Agent Based Modeling (ABM), System Dynamics (SD) and Discrete Event Simulation (DES). One example of ABM is the model of "Colonist household decision making and land-use change in the Amazon Rainforest: an agent-based simulation" (Deadman, Robinson, Moran, & Brondizio, 2004). The

"Automobile Leasing Strategy" case is an example of System Dynamics (Sterman, 2002). Finally, examples of DES related to social fields, are mostly focused on the operational activities of organisations. Jun et al. (1999) used DES in health care clinics and systems of clinics such as, hospitals, outpatient clinics, emergency departments, and pharmacies to optimise the service in terms of speed of attention and resources.

The following section presents the main features of these three simulation techniques, and evaluates the best fit for the present project.

Discrete Event Simulation

Discrete Event Simulation (DES) focuses on the modelling of concept based entities and describes flows and share sources (Brailsford, Sally,& Churilov, 2014). Its scope is typically service, production and logistics. These entities of the system are passive objects that represent people, stock, documents, and messages, among others. Moreover, these entities constitute a flow in which they can stay in a queue, they are delayed, they are processed, divided and combined to optimise productivity (Borshchev & Filippov, 2004).

A good example of the application of DES is asset out by Jun et al. (1999, p. 110) and based on Fetter and Thompson (1965):

"They presented results of one of the earliest simulation studies conducted in the area of individual clinical facility operations for outpatient clinics. They analysed the physician utilisation rate with respect to patient waiting time by using different input variables (such as patient load, patient early or late arrival patterns, no show rates, walk-in rates, appointment scheduling intervals, physician service times, interruptions, and physician lunch and coffee breaks). They determined that if the physician appointments increase from 60% to 90% (capacity), the physician idle time decreases by 160 hours and patient waiting time increases by 1600 hours (over a fifty day period). If this capacity increase were to be implemented, the simulation study suggested that the physician's time would have to be worth ten times the patient's time to justify such a shift in patient scheduling and admission policies".

As DES entities are passive (e.g., common place objects, functions, stocks, conveyor) and represent discrete, rather than continuous events, it would not be the best fit option for this research. In the case of systems related to Strategic Human Resource Management (SHRM), active entities play a crucial role (e.g., active objects with internal threads of control, processes, feelings, information, emotions) (Siekmann, Hartmanis & Leeuwen, 2002). This is the reason for not choosing DES for the development of this research.

Agent Based Modelling

Bonabeau (2002, pp 7280-7289) defined ABM in the following terms: "*ABM is modelled as a collection of autonomous decision-making entities called agents. Each agent individually assesses its situation and makes decisions on the basis of a set of rules. Agents may execute various behaviours appropriate for the system they represent*". An (2012) supported this theory stating that, ABM covers multiple interrelated agents and institutions which act responding to established rules. These agents are trained to learn

and adapt to modifications in the modelled environment. Heckbert , Baynes and Reeson (2010) defined ABM as a representation of autonomous entities, with specific characteristics such as heterogeneity (composition from dissimilar characteristics and qualities) and dynamism (force, power, and capacity for continuous change). The activities of these entities have macro scale effects to obtain quantitative studies of complex systems. The main objective is to understand the macro scale effect of the individual entities. Thorne et al. (2007) highlighted that ABM enables the observation of phenomena that are not easily tested in the laboratory.

One such case is that of the IMSHED (Integrated Model for Simulating Household and Ecosystem Dynamics) generated to research the effect of a growing rural population on forests and giant panda habitats in China (An, Linderman, Qi, Shortridge, & Liu, 2005a). *"Agents represented households, with fuel-wood demand being modelled as a function of household size, the presence of older people, and cropped area of maize and potatoes. Agents could also switch to using electricity rather than fuel-wood depending on a range of factors. Forests in the landscape were able to grow and die in the absence of human interference, with their volume being reduced when fuel-wood was harvested from them. Results showed that implementing policies that encouraged family planning, out-migration, or increased use of electricity could result in preserving panda habitats to various degrees*" (Matthews, Gilbert, Roach, Polhill, & Gotts, 2007, p.1454).

As we are focused on the organisational commitment rather than the individual level of commitment, ABM would not be the best fit option for this research. The aim of this research is the organisation as a whole, so, collective organisational commitment is considered central for this thesis.

System Dynamics

System Dynamics (SD) is the study of the characteristics of feedback information in relation to problem solving and decision making. Van Merriënboer (2013) considered that it is usually applied in urban, social and ecological challenges. This author defined SD as a holistic technique which assumes a higher level view of the whole system of analysis. It offers an inherent flexibility which enables modellers to incorporate a wide range of influences specific to particular scenarios. Saeed (2002) visualised a need for addressing developmental problems of organisations, and he identified SD as a powerful alternative approach to facilitate the learning and problem solving process within organisations. Using this technique the behavioural patterns of a problem are analysed and understood using computer models.

One application of System Dynamics is a model called Virtual Design Team (VDT) which simulates the micro-level information processing, communication, and coordination behaviour of participants in a project organisation. It predicts several measures of participant and project-level performance by Levitt et al. (1999).

The main objective of this research is to understand:

(i) The influence of organisational affective commitment, and its effects on the whole organisational system.

(ii) How organisational commitment is influenced by other variables, with the final aim of improving organisational decision making processes in the field of SHRM (Strategic Human Resource Management).

Taking these objectives into account SD was selected as its Systems Thinking approach (explained in Chapter 3.2.1) facilitates the understanding of existing interrelationships in organisational systems. It enhance the understanding of the big picture, it provides the short and long term perspective of the challenge, the analysis of measurable and non measurable factors, and it helps to resolve problems caused by circular interrelationships.

See Annex 8.1 for more information about case study classification (ABM, SD, and DES). It shows a classification of 130 articles depending on the simulation technique they used, and the application of the simulation. The main conclusion from this study is that System Dynamics has not been widely used in the field of SHRM. Due to the limiting use of SD in this field results in a novelty. In addition, the systemic quality of SD is the characteristic needed for representing and understanding complex systems such as SHRM is.

3.2. WHY SYSTEM DYNAMICS?

System Dynamics is an approach that can assist in the understanding of top-management challenges (Forrester, 1961), by an understanding of the behaviour of the problem (object of analysis).

Learning about complex dynamic systems requires something more than technical tools to create mathematical models. System dynamics is principally interdisciplinary. Its tools are applied to understand a set of interrelated variables that are influenced by the problem object of analysis. SD fits adequately to cognitive and social psychology, economics and other social sciences (Ormazabal, 2013).

3.2.1. A SYSTEMS THINKING METHOD

Systems Thinking is the theoretical base of System Dynamics. A system can generally be described as a "complex whole of related parts". It defines a set of bounded interrelated elements with emergent properties and is represented within the context of a paradigm. Systems thinking is understood to be related to the skill of interpreting the world as a complex system, in which "everything is connected to everything else" (Sterman, 2002). As a result, systems thinking, is both complex and conceptual (Chen, 2016). According to Richmond and Peterson (2001) systems thinking is a philosophy that helps us to better understand and work with systems to influence the quality of daily tasks. It also features a specific way for describing systemic behaviour, and thus can be thought of as a language.

One of the characteristics of Systems Thinking is its feedback property. The system attempts to maintain its stability through feedback. The interrelationships among the variables are connected by a cause and effect feedback loop, and consequently the status

of one or more variables, affects the status of the rest of the variables (Assaraf & Orion, 2005). Senge (1997) described feedback systems thinking as a "shift of mind", a new approach for understanding the business and social world. The typical thinking style here is circular beginning from an issue, moving to a solution and then back to the issue (Morecroft, 2015).

Most languages are linear, "x causes y". This causes people to focus on linear relationships. Nowadays organisational and managerial problems are complex and are caused by sets of interconnected and circular relationships. Such relationships are "closed interdependencies", where x influences y, y influences z, and z comes back to influence x. Causal loop diagrams are the tools to represent these interconnections (Johnson, 1997). Systems thinking provides us tools (feedback and causal loop diagrams) to better understand the problem of analysis. These methods have been used for over thirty years (Forrester, 1961) and are now well established (Kirkwood, 2013).

Systems thinking has specific and beneficial qualities that make it a positive tool for discussing complex systemic concerns (Johnson, 1997):

(i) It focuses on the whole rather than parts, and stresses the role of cause and effect relationships.
(ii) It is a circular rather than linear path. It is focused on "closed interdependencies", where all the variables influence the rest.
(iii) It offers visual tools, such as causal loop diagrams and behaviour over time graphs (graphic tools to measure continuously changing systems, explained in depth in Chapter 3.2.2). These diagrams provide a wealth of implications and knowledge, and foster learning. They facilitate problem management because they focus on the dynamics of a problem.
(iv) It opens a window into our mental models, converting perceptions into explicit pictures that can reveal deep yet essential differences in viewpoints.

3.2.2. TOOLS FOR SYSTEMS THINKING

Challenges to be analysed with SD are represented through feedback and causal loop diagrams (CLD). They are a standard code to represent the structure of the issue of analysis. When an element of a system indirectly influences itself it is called a feedback loop or a causal loop. More explicitly, a feedback loop is a closed sequence of causes and effects, that is, a closed path of action and information (Richardson & Pugh, 1981).

Such diagrams are useful to analyse relationships that are difficult to describe and understand because of the circular character of the system. In addition, these diagrams can show the cause and effect circularities (Kirkwood,1998).

Causal loop diagrams (CLDs) are relevant effective tools to represent the feedback structure of systems. They are particularly useful for (Kirkwood,1998) : (i) quickly defining hypotheses about the causes of dynamics, (ii) obtaining the mental models of individuals or teams, and (iii) communicating the important feedback to be considered in the problem. An example of a CLD is set out in Figure 3. It consists of variables connected by

arrows denoting the causal influences among the variables. Variables are related by causal links, shown by arrows.

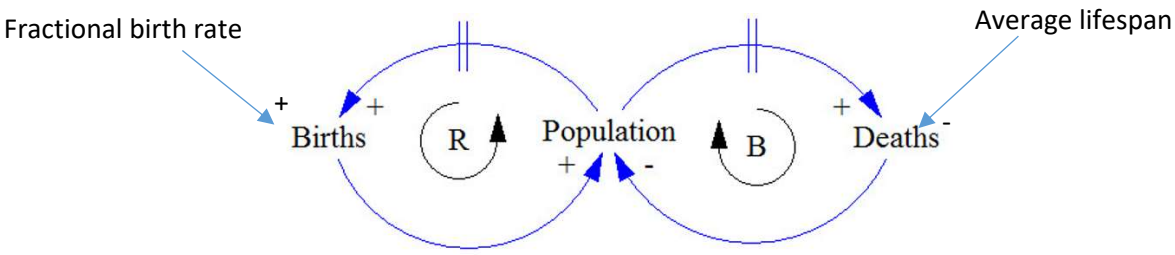

Figure 3: Example of causal loop diagram (Sterman, 2000)

In Figure 3 the birth rate is determined by both the population and the fractional birth rate. Each causal link is assigned a polarity, either positive (+) or negative (-) to show how the dependent variable changes when the interdependent variable changes. The important loops are highlighted by a loop identifier which shows if the loop is a positive (reinforcing) or negative (balancing) feedback. In Figure 3, the positive feedback relating births and population is counterclockwise (as is its loop identifier) and the negative death rate loop is clockwise together with its corresponding identifier.

A positive link means that if the cause increases, the effect increases above what it would otherwise have been, and if the cause decreases, the effect decreases below what it would otherwise have been. In Figure 3 an increase in the fractional birth rate means the birth rate will increase above what it would have been.

A negative link means that if the cause increases, the effect decreases below what it would otherwise have been, and if the cause decreases, the effect increases above what it would otherwise have been. In Figure 3, an increase in the average lifespan of the population means the death rate will fall below what it would have been, and a decrease in the average lifespan means the death rate will rise above what it would have been. Namely, if lifespan increases, the number of deaths will fall; and if lifespan falls, the death rate will rise. Two line pairs on the two circles represent a delay in time, that is, they represent the time spend between the happening of the cause and the effect.

It is required to research into how one or more variables change over time to understand dynamic systems, these changes in time are represented through patterns of behaviour. Consequently, it could be stated that systems thinking identifies a pattern of behaviour of a challenge, seeks the system structures that cause these patterns, and then, helps to identify and modify this system structure through policy design. Thus it is considered a method of solution seeking (Kirkwood,1998).

Therefore it can be concluded that the feedback structure of a system generates its behaviour. Dynamics observed in the real world are the reflection of a collection of basic patterns or modes of behaviour. The principle that the structure of a system produces its behaviour becomes a guide to help modellers discover the feedback loop structure.

For the construction of the conceptual model CLDs were used. The conceptual model is defined by variables, arrows and polarities. These language helps to represent in a graphical, understandable and systemic way the variables and interrelationships which influence organisational commitment and are influenced by it.

After conceptualisation, the model is transferred to a computational model. Stock and flow diagrams are used for computerisation of models under system dynamics. Stocks are accumulations. They characterise the state of the system and produce the information upon which decisions and actions are based. Stocks give systems inertia and provide them with memory. Stocks create delays by accumulating the difference between inflow to a process and their outflow. By decoupling rates of flow, stocks are the source of disequilibrium dynamics in systems (Sterman, 2000). Three examples of stock are as follows: the inventory of a manufacturing firm is the stock of product in its warehouses, the number of people employed by a business is a stock, or the balance of checking account is a stock. In Figure 4 the Population is represented through a stock. Flows, on the other hand, are the elements which modify stocks. The inventory of a firm is increased by the flow of production and decreased by the flow of shipments (and possibly other outflows due to spoilage or shrinkage). In Figure 4, births are represented using an inflow (entrance flow) and deaths using an outflow (exit flow), it refers to the example developed in Figure 3 as a conceptual model.

The characteristic particularities of stock and flow structures are the following: (i) stocks are represented by rectangles, (ii) inflows represented by a pipe pointing into the stock, (iii) outflows are represented by pipes pointing out of the stock, (iv) valves are reported by two inward pointing triangles and control the flows by opening or closing them, and (v) clouds represent the sources and sinks for the flows, see Figure 4 (Sterman, 2000).

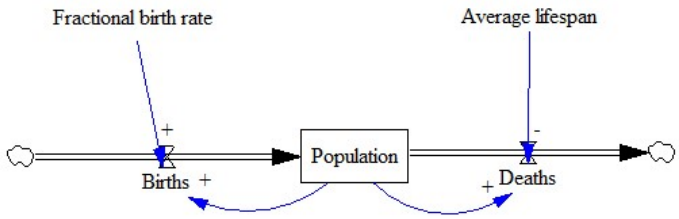

Figure 4: Stock and Flow diagram, Figure 3 example

Stocks and flows are the elements used in the computational model of this research. Stocks for the variables that must be measured, such as organisational commitment and implemented high performance people management practices. Flows for representing the variability of the system using the variables which change the measured stocks, such increase in organisational commitment, or decrease in organisational commitment.

3.2.3. Modelling

Modelling is essentially creative, and is not a standardised process (Morecroft, 2015). At the same time, however, it is a disciplined, scientific and rigorous procedure that involves observing dynamic phenomena in the real world, analysing hypotheses, collecting data

and improving the model to obtain a better understanding of the issue of analysis. Modelling is iterative, it begins with a concern about dynamics (performance over time) and preliminary ideas about feedback structure (Morecroft, 2015). Some examples of modelling processes are presented by Morecroft (2015), Sterman (2000), and Warren (2002).

The purpose is not to create a perfect model that replicates the real world situation in every detail. It is to engage in a learning process using the model as a tool for research, clarification, and discovery. The real value of modelling becomes evident when models are used to support organisational redesign. The final goal should be to design management policies and organisational structures that lead to greater success (Sterman, 2000).

The structure of modelling is based on two different points: i) hypotheses about the physical and institutional environment, and ii) hypotheses about the decision processes of the agents who act in those structures (Sterman, 2000). A description of these hypotheses is set out below.

The physical and institutional environment of a model includes the model boundary and stock and flow structures of people, material, money, information, and so forth that characterise the system. One of the examples that showed this environment in the literature, was presented by Sterman (2000), who used Forrester's (1969) Urban Dynamics to understand why America's large cities continued to decay despite massive amounts of aid and numerous renewal programs. Factors describing the physical and institutional setting were included in the model, such as, size, quality of the housing stock, and attributes of population.

Decision processes refer to the decision rules that determine the behaviour of the agents in the system. These rules are represented through behavioural hypotheses. These hypotheses of a simulation model describe the way in which the system evolves over time. The most important value of simulation is to identify both observed behaviours and future possible circumstances (Sterman, 2002). The behavioural hypotheses of a simulation model describe the way in which people respond to different situations. Again, Sterman (2000) used the Urban Dynamics model as an example, which included decision rules, governing migration and construction. Essentially, the rule was to mark up the wholesale cost of the goods and the mark up was gradually reduced until the goods were sold.

Thus, it is not enough to model a particular decision. Modellers must also detect and represent "the guiding policy" that yields the stream of decisions (Forrester, 1961). Each detail and characteristic in the model related to stocks and flows creates a decision point, and the modeller must specify accurately the decision rule determining the variable of analysis (Sterman, 2000).

The activities that define the modelling process are: (1) articulating the problem to be addressed, (2) formulating a dynamic hypothesis or theory about the causes of the problem, (3) developing a simulation model to test the dynamic hypothesis (Formulation

of the simulation model), (4) testing the model until it suits the objectives of the modeller and (5) designing and evaluating policies for improvement. The iterative steps for modelling are defined by Sterman (2000), Figure 5 shows the iterative steps that are followed when modelling, the phases, sequence of steps, and interrelationship between them:

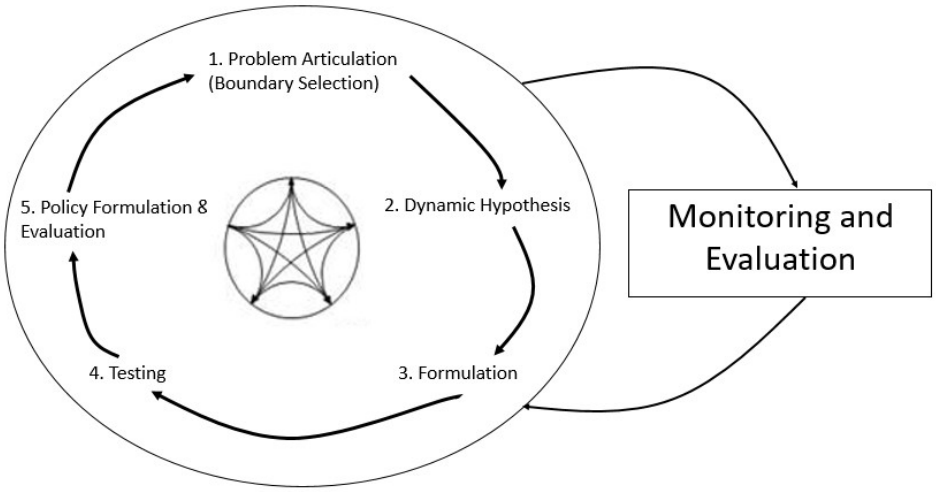

Figure 5: Modelling process (Sterman, 2000)

1. Problem articulation: This is the most relevant step and identifies the issue of concern, time frame, boundary and scope of factors involved. During this phase reference modes and time horizon should be defined.

   -Reference Modes definition: A set of graphs and other descriptive data showing the development of the problem over time.

   -Time horizon definition: The period of time to be analysed. It should start as far back in history as necessary to show how the problem emerged and describe its symptoms.

2. Dynamic Hypothesis: This is the hypothesis the modeller defines to represent the problem and focuses on specific structures. This hypothesis characterises the problem in terms of the underlying feedback loops and stock and flow structure of the system. It is not static, it is temporary and prone to revision. It is related to discussion of the problem and theories associated with causes of the problem (Morecroft, 2015).

3. Formulation: In most cases it is very difficult or almost impossible to conduct real world experiments that show the faults in a dynamic hypothesis. For this reason accurate and detailed simulation is vital. In this stage it is understood that causal loops, stock and flow diagrams and general policy structure are already defined. Causal loops are defined as the maps showing causal links among variables and contain arrows linking causes, effects, and stock and flow tracks.

Flow tracks contain accumulations of material and/or information. Stocks include different information, such as, commitment level, lack of in role level, workload intensification level, and performance level. Flows are the rates of increase and decrease in stocks. Policy structure drives causal diagrams showing the information inputs to a particular decision rule.

4. Testing: Every equation defined in the previous stages must be reviewed for dimensional consistency. In this step sensitivity of model behaviour and policy recommendations need to be evaluated in order to reduce uncertainty. During this stage a comparison of the simulated behaviour of the model to the real behaviour should be done. Policy instructions must be checked and models should be tested under extreme conditions.

5. Policy formulation and validation: Policy design is much more than changing the values of parameters involved in the model. Rather it is based on the creation of entirely new strategies, structures and decision rules. Policy design not only is based on value change of parameters, but it also combines the creation of entirely new strategies, structures and decision rules (e.g. changing feedback loops, eliminating time delays, defining new decision processes). According to Morecroft (2015), the principal interest of policy formulation is improving organisational activity. This question is directly linked to what-ifs. Policies can be tested through simulation (Morecroft, 2015). Yao et al. (2018) used System Dynamics to explore the influences of different recycling scenarios in China.

Figure 5 highlights the importance of iteration. During the phases of modelling the need for equations or new structures is identified. As simulations are not static, initial versions are changed because it is almost impossible to explain original dynamic hypotheses that generate observed or expected behaviours at the first approach (Sterman, 2000).

3.2.4. VALIDATION

The aim of system dynamics model validation is to verify the validity of the structure of the model. Once the structure is validated, behaviour accuracy (of the model) and reproduction of real behaviour through the model is guaranteed (Table 2). Direct Structure tests are the first to be developed in validation phase, structure-oriented behaviour tests secondly, and lastly behaviour pattern tests. This subsection (3.2.4) is focused on the methodology for SD model validation proposed by Barlas (1996).

Table 2 summarises the three stages of model validation as developed by Barlas (1996). The three cases are dependent on the objectives of the model, which is determined in the problem identification step (the first step) of system dynamics methodology.

Table 2: Validation methods (Barlas, 1996)

		TYPE	CHARACTERISTICS
Structure validity	1.-Direct Structure tests	1a) Empirical tests (1a.1) Structure Confirmation Tests (1a.2) Parameter Confirmation Tests	Compare the model structure to information (quantitative or qualitative) from the real system.
		1b)Theoretical tests	Compare the model structure of the system to general insights that exist in the literature. There are 4 types:
		(1b.1) Structure confirmation tests	Are especially qualitative, and therefore more difficult to use depending on the validation purpose.
		(1b.2) Parameter confirmation tests	Evaluate constant parameters against real experience, both conceptually and numerically.
		(1b.3) Direct extreme condition tests	Evaluate the validity of model equations under extreme conditions, by comparing them to prediction of what would happen in the same conditions in real life.
		(1b.4) Dimensional consistency test	Check the right hand side and left hand side of each equation for dimensional consistency.
	2.-Structure Oriented Behaviour	(2a) Extreme condition tests	Assign extreme values to selected parameters and compare the model-generated behaviour to that observed in reality under the same extreme conditions.
		(2b) Behaviour sensitivity tests	Consist of defining the parameters to which the model is especially sensitive. These parameters should show similar high sensitivity to the corresponding parameters in the real system.
		(2c) Modified behaviour prediction	Compares the modified observed pattern and the same modification in reality.
		(2d) Phase relationship tests	Use phase relationships between pairs of variables in the model, obtained as a result of simulations.
		(2e) Turing tests	Skilled agents in the field compare output behaviour patterns in the model with the same behaviours in reality.
Behaviour validity	3.-Behaviour Pattern tests		Focus on the phase of communicating the outcomes.

Direct Structure Tests (1)

Direct Structure tests (1) can be divided into empirical or theoretical. Empirical tests involve comparing the model structure with information (quantitative or qualitative) extracted from the real system being modelled. On the other hand, theoretical tests are focused on comparing the model structure with generalised knowledge about the system that exists in the literature.

The structure confirmation test (1a.1), applied as an empirical test, means comparing the form of the equations of the model with the relationships that exist in the real system.

The second Direct Structure tests, parameter confirmation tests (1a.2) is based on assessment of fixed parameters against knowledge of the real system, both conceptually and numerically. This could be applied as both empirical and theoretical validation (Forrester & Senge, 1979).

Structure confirmation tests (1b.1) are more difficult to formalise and quantify, they represent approaches to compare the form of the equations of the model, directly with the form of the relationships that exist in the real system. Parameter confirmation tests (1b.2) evaluate the constant parameters against knowledge of the real system, both conceptually and numerically (Forrester & Senge, 1980).

Another relevant Direct Structure test, direct extreme condition testing (1b.3) is based on the validity of model equations under extreme conditions, through the assessment of the plausibility of the resulting values against the knowledge of what would happen under a similar condition in real life. In the example of city modelling, if the population is 0, then there can be no births, no workers, no consumption, etc. If the pollution level is extremely high, then death rates must rise and migration to the city must decrease (Barlas, 1996).

Lastly in Direct Structure Tests, dimensional consistency (1b.4), is designed to check the right hand side and left hand side of each equation for dimensional consistency. It is classified as a theoretical test in the sense that it is an internal consistency test. This test requires that the model has no duplicated “scaling” parameters that have no meaning in real life, i.e. the model has already passed the conceptual parameters-confirmation test (1b.2) (Forrester & Senge, 1980).

Structure-oriented behaviour tests (2)

These tests are focused on evaluation of the validity of the causal loops diagrams in an indirect way, by applying certain behaviour tests on behaviour patterns generated by the model (Barlas 1989b; Forrester & Senge). The use of these tests involves the use of simulation, and can be applied to the whole model, or to isolated parts. Table 2 shows diverse types of validation in this group (Barlas, 1996).

Extreme-condition tests (2a) assign extreme values to selected parameters and compare the model-generated behaviour to the observed (or anticipated) behaviour of the real system under the same extreme condition. Behaviour sensitivity tests (2b) determine

those parameters to which the model is highly sensitive, and asks if the real system would exhibit similar high sensitivity to the corresponding parameters (Barlas, 1996).

Modified-behaviour prediction tests (2c) only can be applied in cases in which is possible to find data about the behaviour of a modified version of the real system. The model is validated if it can produce similar modified behaviour when simulation is run with structural modifications that reflect the structure of the "modified" real system (Barlas , 1989; Forrester & Senge, 1980).

Phase relationships tests (2d) take the phase relationships between pairs of variables in the model. When specific phase relationships achieved from the model are different to the phase relationships that are observed in the real system, this may reflect a structural flaw in the model (Barlas , 1989; Forrester & Senge, 1980).

In Turing tests (2e), stakeholders (final users of the model) are presented with a comprehensive set of real and simulated output behaviour patterns, and they are required to distinguish between the two types of patterns. If the final result shows that the simulated output behaviour is similar to the stakeholders' reality, the model is validated. On the contrary, if the patterns are distinguishable, they are interviewed to find the structural flaws in the model that cause the differences.

Structure-oriented behaviour tests (2) are powerful tests that can provide information on structural flaws. Their main benefit over Direct Structure tests is that they are easier to formalise and quantify. *Direct Structure tests* (1), have the disadvantage of being too qualitative and informal. *Structure-oriented behaviour tests* (2) combine the strength of structural orientation with the benefit of being quantifiable. One useful tool for such tests is VENSIM software which performs "unit checks" automatically.

Behaviour pattern tests (3)

The two test categories explained above are designed to evaluate the validity of the model. These *behaviour pattern tests* (3) are used for the obtaining of the major behaviour patterns exhibited by the real system. It is important to note that these tests highlight pattern prediction (periods, frequencies, trends, phase lags, amplitudes etc.), rather than point (event) prediction. This is a result of the long-term orientation of system dynamics models (Barlas,1996).

Thus, after this analysis could be stated that no validity test can be carried out in the absolute sense, without noting the specific objective of the model.

This research was focused on validation through different methods, *Direct Structure Tests*, and *Structure Oriented Tests*. Group Model Building sessions, the literature review about commitment and empirical evidence from the Bateratzen database were the methods used for the *Direct Structure Tests*. On the other hand, patterns of behaviour generated through the simulation of the scenarios (dynamic hypotheses based on patterns of behaviour of database), and the unit check option provided by Vensim are part of the *Structure Oriented Behaviour Tests*.

Chapter 4

Model Inputs

4. MODEL INPUTS

Data collected for the definition of the conceptual model was supplied by three different input sources: (i) literature about antecedents and consequences of organisational commitment, (ii) eleven Group Model Building (GMB) sessions with industrial companies, and (iii) empirical evidences from the Bateratzen database.

4.1. INPUT 1: ANTECEDENTS AND CONSEQUENCES

The first input source for the model was the literature review about organisational commitment. Variables related to HRM have been included principally due to their connection to organisational commitment in the literature.

4.1.1. ORGANISATIONAL COMMITMENT CONSEQUENCES

Organisations which defend a "commitment" approach feature multiple practices that mean a high commitment strategy including collections of organisation-wide human resource policies and procedures that alter employee commitment level and motivation.

When employees perceive an investment in practices that maximise "commitment approach", they respond with higher commitment to the organisational aims. For example, Elorza et al. (2011) found that high commitment practices were related to improvement in organisational commitment, absenteeism and productivity.

Employee affective commitment, characterised as the relative strength of individual identification with and involvement in organisation, has been demonstrated to be a direct influencer of job performance (Jaros, 1997; Meyer, Allen, & Smith, 1993; Whitener, 1997). The literature shows that individuals affectively committed to the organisation are represented by high-level involvement and devotion to the organisation, and that attitudes and behaviours are likely to result in better organisational performance (Meyer, Paunonen, Gellatly, Goffin, & Jackson, 1989). It is also argued that employees committed to organisational aims have the propensity to work harder and more in line with organisational expectations than the rest.

Mathieu et al. (1990) also identified job performance as a direct consequence of organisational commitment. He identified which the variables belonging to job performance are: ratings, measures, perceived job alternatives, intention to search, intention to leave, attendance, lateness and turnover. Due to this correlation between organisational commitment and job performance, this variable was included in the model developed in this research. Aggregated job performance in organisational level must result in organisational commitment (D'Innocenzo, Mathieu, & Kukenberger, 2016; Mathieu & Taylor, 2007; Mathieu & Chen, 2011).

4.1.2. ORGANISATIONAL COMMITMENT ANTECEDENTS

Methieu et al. (1990) developed a review about antecedents and consequences of organisational commitment. They divided antecedents in five different groups : personal characteristcis, job characteristics, group/leader relations, role states and organisational characteristics.

According to Mathieu et al. (1990), their variables are related to the HRM field of study, but since that time, variables identified as antecedents of commitment have been changed over time. In addition, variables proposed by this author refer to individual commitment, our research is focused on collective commitment.

According to Boxall and Macky (2009) understanding of models of HRM will be obtained when counting 'practices' are managed and identified the critical processes that connect intended practices to outcomes. This is the work of Vandenberg et al. (1999), which draws on Lawler's (e.g. 1986) writings. Vandenberg et al. (1999) specified a conceptual model, in which business or employer practices are related to organisational commitment and organisational performance, see Figure 6. They defined two paths: (i) a cognitive path in which high-involvement HR practices take 'greater advantage of the skills and abilities' employees possess and (ii) a motivational path in which involvement HR practices increase 'workers' satisfaction and other affective reactions' (Vandenberg et al., 1999). This parallels Batt's (2002) definition of a 'direct' path (enhancing employee skill levels and firm-specific knowledge) and an 'indirect' path (enhancing employee motivation and satisfaction, and lowering quit rates). The direct path is important for enabling workers (individually and collectively) to make more effective decisions and problem resolution, and the indirect path is relevant to ensuring what they want to do so and maintain this dynamic. The Vandenberg et al. (1999) framework used Lawler's (1986) 'PIRK' rubric: high-involvement HR practices encompass workplace power (P), information (I), rewards (R) and knowledge (K). These four variables are understood to be mutually reinforcing. In other words, high-involvement work HR practices empower workers to make more decisions, enhance the information and knowledge they need to do so, and reward them for doing so. As a result, this helps in the obtaining of a high-involvement model to work, it must positively affect employee abilities, motivations and opportunities to contribute. Improvements in knowledge enhance ability, while empowerment and information enhance the opportunity to contribute to the organisational goals. Rewards are a direct attempt to enhance motivation, which may also be improved through empowerment (enjoying more autonomous work), information (feeling better informed) and knowledge (enjoying a growth in skills).

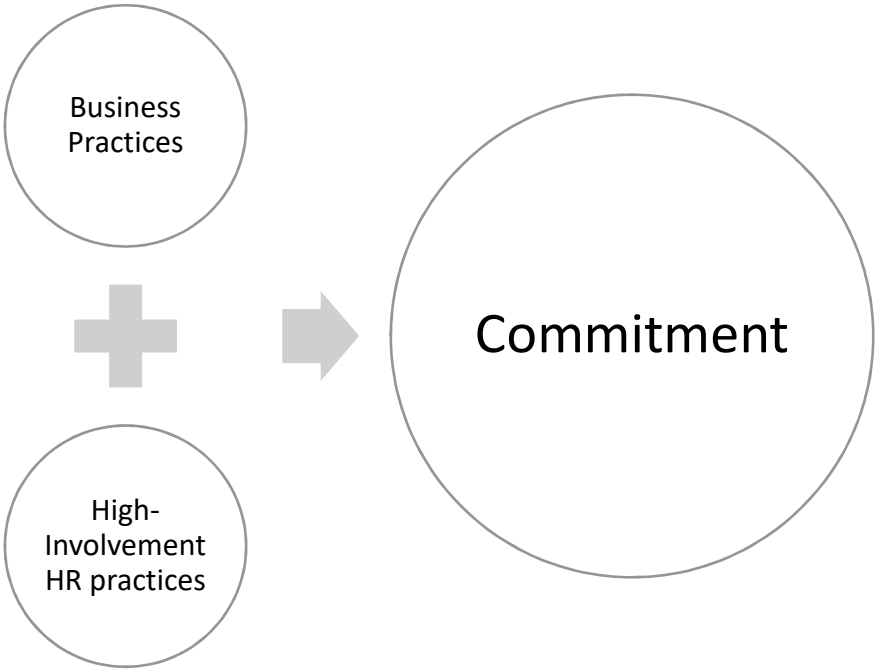

Figure 6: HR practices and outcomes connection (Vandenberg et al., 1999)

From all this list the variables selected for the conceptual model of this research were: High Performance Work Systems (HPWS), Leadership, and Trust (High-Involvement HR practices in Figure 6). It is important to include HPWS, as they refer to employee management practices which impact positively on the "bottom line". It is argued that effective human resource policies offer organisations their best avenue for establishing robust competitive advantages (Zhu, Liu, & Chen, 2018). Leadership was considered relevant for this research as it is related to the person who influences the rest. Leaders manage and facilitate relationships between a group or an organisation, which will be connected to organisational commitment in some points, in Methieu et al. (1990) it is identified in the individual level (i.e. leader consideration, leader communication). Finally, Trust is included due to the relationship it appears to have with organisational commitment. Following the Mayer et al. (1995) trust model, Dirks (2000) found trust in coaches to be related to the performance of basketball teams. Along similar lines, Davis et al. (2000) found trust in general managers of restaurant was related to the facilities' sales and profits.

The main aim of the literature of SHRM field is to understand the effect of the organisational context (HR practices and leadership) on people satisfaction and engagement, which, in turn, have an effect on organisational performance (Cappelli & Singh, 1992; Ostroff, & Bowen, 2000; Wright, & Boswell, 2002; Wright, & Snell, 1991).

SHRM suggested two different management strategies: control strategy, and commitment strategy (Arthur, 1994; Walton, 1985). The commitment strategy is investing on HR practices (such as autonomy, information, etc.) with the aim to engage people on organisational goals. In contrast, control strategy is based on narrowing the job, lowering wages, developing hierarchies in order to cut direct labour cost and increase

productivity (Arthur, 1994; Walton, 1985; Whitener, 2001; Wood, Van Veldhoven, & Croon, 2012).

In Table 3 are shown the specific characteristics of each of the strategies proposed by Arthur (1992). The control strategy was called "Cost Reduction" because the main objective of "control" strategy is to reduce direct labour costs and other employment-related expenditures (i.e. training and employee involvement activities).

People commitment strategy is key for these companies pursuing a differentiation business strategy. The logic behind posits that engaged people will be more flexible and more likely to adapt and make effects for the benefit of the business strategy. In this context, it is proposed that employees must have the skill and training to perform a variety of diverse tasks. Standardisation is reduced and decisions under conditions of high uncertainty aligned with the organisational goals are predominant (Galbraith, 1977; Organ, 1988; Schuler, Randall, Galante, & Jackson, 1987). In summary, offering skilled employees high levels of involvement, autonomy, and general training can be understood to be attractive and motivational for workers. In this way, the organisation will achieve qualified workers who are committed to their organisations.

Table 3: Cost and commitment strategies (Arthur, 1992)

Industrial Relations Functions	**Type Of System**	
	Cost Reduction	**People Commitment Maximizing**
Organisation of Work	Job Tasks narrowly defined	Broadly defined jobs
Employee Relations	Very little employee influence over "management" decisions	High Level of employee participation
	No formal employee complaint	Formal dispute resolution procedures
	Little communication efforts	Regularly share business information with employees
Staffing/ Supervision	Low Skill requirements	High percent of skilled workers
	Intense supervision/control	Self - managing teams
Training	Limited training efforts	More extensive, general skills training
Compensation	Limited benefits	More extensive benefits
	Relatively low wages	Regularly high wages
	incentive based	All salaried/stock ownership

4.1.2.1 HPWS

HR management systems which work a commitment strategy instead of a control strategy are called in different ways (Wood & Wall, 2007), i.e. "High Performance Work Systems", "High Commitment", "High Involvement" etc. All of them look for an improvement in the collective organisational commitment due to its effect on organisational performance. The majority of the studies in SHRM analyse to what extend

HPWS are related to organisational performance. This relationship defended that an internal coherent human practices system (horizontal adjustment) and aligned with business strategy is the foundation to develop capacities and encourage attitudes and behaviours which enhance an organisational performance (Becker & Huselid, 1998; Delaney, & Huselid, 1996; Delery & Shaw, 2001; Dyer & Reeves, 1995; Huselid, 1995; Ichniowski, Shaw & Prennushi, 1997).

There are multiple studies in different sectors which demonstrated empirically the positive relationship between HPWS and organisational performance (Arthur, 1994; Becker, Huselid, Becker, & Huselid, 1998; Spratt, 1997; Delery, 1998; Huselid, 1995; MacDuffie, 1995; Ostroff, 2000; Youndt, Snell, Dean, & Lepak, 1996). However, due to the different characteristics of each research, results of different studies can not be compared between them (Delaney & Huselid, 1996). Combs et al. (2006) developed a meta-analysis with 92 research to analyse the relationship between Human Resource practices system and organisational performance. As a result, it was demonstrated that exists a positive relationships between Human Resource practices and organisational performance (Guest, Michie, Sheehan & Conway, 2000).

The strategic HRM literature highlights the whole HRM system as the unit of analysis, in opposite to the traditional focus on individual policies or practices. This HR system of analysis level is consistent with the conceptual rationale for the presence of a strategic effect and is a relevant starting point from traditional work in the field. High Performance Work Systems (HPWS) are generally thought to include rigorous recruitment and selection procedures, performance-contingent incentive compensation systems, and management development and training activities linked to the needs of the business. Figure 7 shows the vital feature of these strategic HRM systems, that is, their connection to organisational strategic initiatives. The result is an HRM system that generates employee behaviours that are centralised on key business priorities, which in turn enhances profits, growth, and ultimately market value. Most of the researchers were based on the intermediate relationships represented in Figure 7 (highlighted in a black square). On the contrary, Becker et al. (1997) primary interest was the strategic impact of the HRM system, namely the ultimate effect of the HRM system on both market-based and accounting based measures of job performance (Delaney & Huselid, in press; Becker & Huselid, 1996; Huselid, 1995; Huselid & Becker, 1995, 1996; Huselid, Jackson, & Schuler, 1996). While there is no consensus measure of a HPWS in this emerging literature, based on responses to more than 30 specific questions from a sample of 740 firms, Huselid and Becker (1995) created an index of the HRM system of each organisation showing the degree to which a company had deployed a HPWS. Authors have found that organisations with higher values on this index, while other things are equal, have economically and statistically relevant higher levels of firm performance.

Figure 7: A model of the HR-shareholder value relationship (Becker et al., 1997)

Another example of this linearity was presented by Wright and Nishii (2006). Their model showed the positive effect of High Performance Working Systems (HPWS) on organisational commitment, which in turn was a direct effect on organisational performance. When managers perceived the increase of organisational performance, their interest for implementing more HPWS was also reinforced.

Intended HRM Practices. These practices represent the outcome of the development of an HR strategy that is focused on the design of an HRM system or practice. The decision makers of the organisation believe this practice will effectively arrange the employee desired outcomes. This may be oriented directly to the business strategy or determined by some other factors. However, the most relevant point is that the decision makers have analysed the situation. In addition, they defined that a certain collection of HR practices will best underpin all the affective, cognitive, and behavioural responses from employees desired organisational success.

Actual HRM Practices. Consistent with Truss and Gratton (1994) and Wright and Snell (1998), this part is called "Actual HR Practices." This recognises that not all intended HR practices are actually implemented, and those that are may often be implemented, in ways that differ from the initial intention.

Perceived HRM Practices. According to Wright's model, the actual HR practices exist objectively, but that does not necessarily mean that is perceived by people. As a result, the process then is focused in the level of the individual. At this level notable changes can happen due to both variation in the actual HR practices which would probably cause valid variety in perceived HR practices, and change in the schemas individuals generate when perceiving and interpreting HR-related data.

Employee Reactions. Based on the perceived HR practices, employees will behave in some specific ways. In theory, the goal of designing and implementing HR practices is to do so in a way that results in positive attitudinal behaviours, increased cognitive skills important to the job and/or organisation, and increased productive task and contextual behaviours of employees.

Organisation Performance. Dyer and Reeves (1995) classified the types of performance outcomes examined in SHRM research into employee, organisational, financial, and Market Value outcomes. Employee outcomes refer to variables as absenteeism and turnover. Organisational outcomes are based specially on operational performance measures such as productivity, quality, and customer satisfaction. Financial outcomes deal with accounting measures of performance such as profits or return on assets (ROA). Lastly, Market Value outcomes refer to measures of the value of an organisation according to the equity markets.

Although the authors of this chapter presented the model as linear, at the same time they identified an influence of performance on the implementation of HPWS. As it is assumed that they will have a cost. As a consequence, the most accurate representation of the model will be the following, Figure 8. Depending on the defined strategy of the organisation, management will plan to implement some specific practices in accordance

to that strategy. Then, the actual HR practices could differ from the intended, or although being the same, the perception of workers about those actual HR practices could not be in line with intended. The perception of workers about those HR practices is the focus for commitment level to their organisation. If they perceive that practices have been implemented with the aim of increasing workers well-being, their commitment will be higher, otherwise, if they perceive that the implementation of the practices is a result of a wish of increasing productivity, this perception will have a negative effect on their commitment to the organisation. As it is already mentioned, organisational commitment is likely to have an influence on organisational performance. Workers committed to their organisation make more efforts for the benefit of the company. Finally, depending on the organisational performance, the intended HR practices implemented by management might be reinforced (Ahmad & Schroeder, 2003; Bos-Nehles, Van Riemsdijk, Looise, & Kees Looise, 2013; Den Hartog, Boon, Verburg, & Croon, 2013).

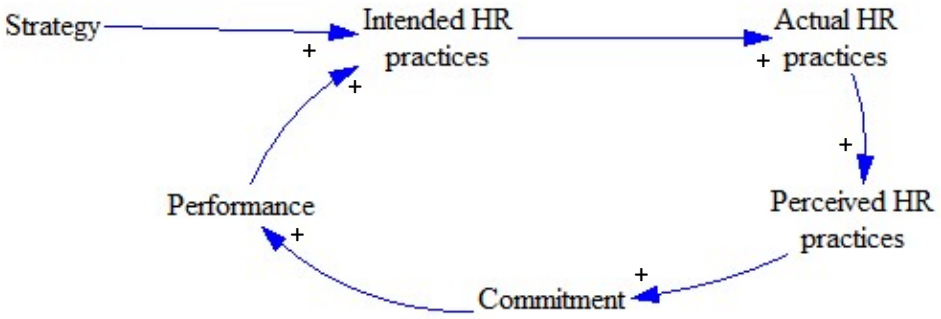

Figure 8: Circular interrelationship

An appropriate design and functioning of the management system, coherent and consistent in time, resulting from a robust people commitment strategy from management, will likely produce a "strong system" (Bowen & Ostroff, 2004; Ostroff & Bowen, 2000). A HR system of practices is considered "strong" when it communicates clearly to workers what it is expected from them. In contrast, "weak systems" send contradictory messages, not consistent in time and confusing. They result in different behaviour of workers and a decrease of organisational performance.

A system will be "strong" or "weak" depending on managers commitment strategy with people. A high level of commitment leads to a coherent and consistent design and functioning of the HR system of practices. A "strong" system will produce a positive perception of workers after a period over time. However, a clear and shared perception of the HR system by workers does not guarantee a positive effect on workers behaviours (Meyer & Smith, 2001).

The relationship between HR practices and attitudes and behaviour of workers is mediated by the attributions workers give to the perception of the reasons why these practices (Elorza, 2008) were implemented. Figure 9 shows the circularity of the model explained above. In this representation "coherence" and "consistency" variables are added, due to their influence on perception of workers, the variables represented in this

figure are included in the conceptual model of this research as the main focus of its structure.

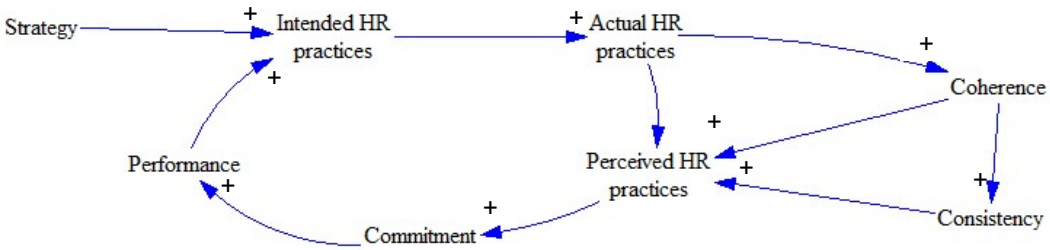

Figure 9: HR system coherence and consistency

4.1.2.2 LEADERSHIP

Leadership is considered a key organisational factor influencing organisational commitment (Mowday, Steers, & Porter, 1979). Specifically, in recent years, important research has become available suggesting that transformational leadership is positively connected with organisational commitment in a variety of organisational settings and cultures (Avolio et al., 2004; Bono & Judge, 2003; Dumdum, Lowe, & Avolio, 2002). There is a wide variety of evidence that suggests that transformational leadership is positively related to work attitudes and behaviours at both an individual and organisational level (Dumdum, Lowe, & Avolio, 2013; Lowe, Kroeck , & Sivasubramaniam, 1996).

Homans (1961) defined social exchange as the exchange of activity, tangible or intangible, and more or less rewarding or costly, between at least two persons. Cost referred to the alternative activities or opportunities developed by the actors involved. Homans explained social behaviour and the forms of social organisation generated by social interaction by showing how A's behaviour reinforced B's behaviour (in a two party relation between actors A and B), and how B's behaviour reinforced A's behaviour in return. The main aim of this research was the social behaviour that derived from the social processes of mutual reinforcement (and the lack of it). Relations could also end into a failure of reinforcement (Cook & Rice, 2008).

Results from Setton et al. (1996) showed that perceived organisational support is associated with organisational commitment. The concepts of social exchange (Blau, 1964) and the norm of reciprocity (Gouldner, 1960) have been useful to describe the motivational basis behind employee behaviours and the achievement of positive employee attitudes (Etzioni, 1961; Levinson, 1965; March & Simon, 1958). These concepts were taken for the explanation of why individuals express loyalty to the organisation (Eisenberger, Huntington, Hutchison, & Sowa, 1986; Scholl, 1981) and engage in behaviours that commonly are neither formally rewarded nor contractually enforceable (Organ, 1988). In general term, findings in the field of study suggested that positive and beneficial actions directed at employees by the organisation helped to the

establishment of high-quality exchange relationships (Dansereau, Graen, & Haga, 1975) that create obligations for employees to reciprocate in positive and beneficial aptitudes (Eisenberger,Huntington, Hutchison, & Sowa, 1986; Shore & Wayne, 1993).

Setton et al. (1996) examined the relative contribution of different exchange relationships to employee outcome variables. Organisational commitment was chosen as principal dependent variable, among others, for two reasons: First, organisational have been notable with respect to a variety of exchange relationships. For example, empirical research has found in-role behaviours, such as attendance (Eisenberger et al., 1986) and performance (Graen, Novak, & Sommerkamp, 1982; Wayne, & Ferris, 1990), citizenship behaviour (Konovsky & Pugh, 1994), and organisational commitment (Robinson, Kraatz, & Rousseau, 1994) to be associated with actions on the part of the organisation that needs reciprocity (e.g., support for employees or fair decision-making). Second, employees identified in-role behaviour, citizenship, and organisational commitment as acceptable commodities for exchange. For example, extra effort in performing required duties is one way employees can fulfill requirements to employers (Etzioni, 1961; Katz & Kahn, 1966). In the same way, citizenship behaviour has been viewed as a social resource that may be exchanged by individuals who received the social rewards (Moorman, 1991). The discretionary nature of extra-role behaviour such as citizenship means they may easily be given or withheld (Katz & Kahn, 1966; Organ, 1988); this makes them ideal wares for reciprocation. In addition, Scholl (1981) argued that reciprocity is a mechanism underlying commitment.

In organisations in which leaders are transformational, workers trust the leader, they show admiration, loyalty and respect for him. They feel motivated to do more than expected. According to Bass (1985), transformational leader encourages his workers (i) helping them to be conscious of the high importance of their tasks, (ii) helping them to understand the importance of the organisation and the group itself more than the individual, and (iii) helping them to activate their high level necessities. Transformational leadership increases the performance of their workers. In Figure 10 the characteristics of a transformational leader are shown, these conducts are the reason for the positive effect of these type of leaders on job performance through the mediating role of commitment:

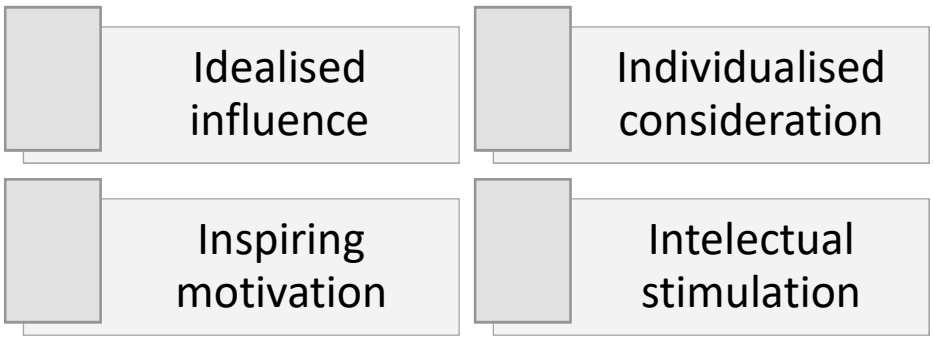

Figure 10: Transformational conduct (Yukl 2006, based on Bass)

Idealised influence is understood as behaviour that increases worker identification with the leader, such as an example to follow. *Individualised consideration* refers to providing support, encouragement, and coaching to the team members. *Inspirational motivation*, involves communicating an appealing vision, and using signals to subordinate effort. *Intellectual stimulation* is defined as behaviour that influences workers to understand problems from a new perspective and look for more solutions (Yukl, 2008).

According to Yukl (2008) a transformational leader has an effect on behaviours and motivation of followers. This type of leadership implies the strength of the relationship between the task and the values of the follower with a behaviour such as an inspired vision. Leaders can increase the level of intrinsic motivation increasing the perception of alignment between the objectives of the tasks workers developed, and their real interests and values (Bono & Judge, 2003; Charbonneau, Barling, & Kelloway, 2001). It has been identified a positive relationship between transformational leaders and job performance, this is due to the increase in motivation and its correlation with organisational commitment (McColl-Kennedy & Anderson, 2002).

The main goal of Avolio et al. (2004) was to define the underlying process through which transformational leaders influence the organisational commitment of employees through the mediating effect of psychological empowerment. In addition, they explored the role of structural distance (i.e., direct versus indirect reporting relationship to the leader), and its effect on the relationship between transformational leadership and organisational commitment.

Differences in employee levels of organisational commitment may be explained in part by the differences in the level of empowerment that is developed from senior and middle management to workers. Their study confirms prior research (Kanter, 1984; Wiley, 1999) in that empowered employees seem to be more inclined to reciprocate with higher levels of commitment to their organisation (Avolio et al., 2004). Figure 11 shows the summary of the interrelationships commented in this chapter. As already mentioned, Transformational leaders have a direct effect on their followers motivation level, this feeling of motivation is correlated with commitment. Finally, commitment influences positively performance, which at the same time reinforces transformational leaders conducts. Leadership is included in the conceptual model of this research.

Figure 11: Relationships between transformational leadership and commitment

4.1.2.3 TRUST

Lleó de Nalda (2011) cited Knox and Kee (1970) to define trust as "behavioural". In this context the individual must show its trust on the other person through its behaviour; and the second at the same time must show that he is trustworthy.

Several studies have analysed the relationship between trust and both "in-role" performance (defined as part of one's job responsibilities) and OCB (Organisational Citizenship Behaviour; employee's contributions to go beyond their job descriptions (Organ, 1988)). Multiple studies developed in work organisations have shown a positive relationship between trust and performance (Deluga, 1995; Earley, 1986; Farh, Tsui, Xin, & Cheng, 1998; Pettit Jr, Goris, & Vaught, 1997; Podsakoff, MacKenzie, & Bommer, 1996; Rich, 1997).

Firstly, according to Mayer and Gavin (2005), trust has long been assumed to be related to performance in organisations, yet the means through which it has effect are unclear. Their research provides empirical support for the hypothesis that trust in management allows employees to focus on the tasks that need to be done to add value to their organisations, i.e. those which directly influence performance.

In addition, it is argued that the relationship between trust and performance may function through employees engaging in discretionary behaviour. On a more macro level, a lack of trust in management may undercut attempts to direct attention of employees, especially when the desired behaviours fall outside the specified roles of employees (Mayer & Gavin, 2005). Trust level is directly related to group performance (Davis et al., 2000;Dirks, 2000), the effectiveness of leadership behaviours (Podsakoff, MacKenzie, & Bommer, 1996), managerial problem solving (Zand, 1972), and satisfaction.

A second theory related to trust is Leader member exchange (LMX). The formation of trust relationships between new leaders and workers are critical to determine the future quality of leader member exchange (LMX) relationships formed in the group (Bauer & Green, 1998), and in determining the performance of the group (Davis, Schoorman, Mayer, & Tan, 2000).

Leader–member exchange (LMX) is the theory that examines the relationship quality between superiors and subordinates (Bauer, Erdogan, Liden, & Wayne, 2006). Rather than thinking about a leader as having one set style, LMX theory suggest that leaders form unique relationships with each of the workers. As a result, high LMX employees receive greater personal and professional development opportunities (Graen & Scandura, 1987) and higher levels of support (Bauer, Erdogan, Liden, & Wayne, 2006; Kraimer, Wayne, & Jaworski, 2001).

Research on leader–member exchange (LMX) (Maslyn & Uhl-Bien, 2001) has shown the value of high-quality leader–member relationships in organisations (Graen, & Uhl-Bien, 1995; Liden, Sparrowe, & Wayne, 1997). Leaders and followers in these high-LMX relationships frequently show high levels of satisfaction and effectiveness, in addition to mutual influence, more open and honest communication, greater access to resources,

and more extra-role behaviours (Gerstner & Day, 1997). Low-quality relationships, on the contrary, seem to effect negatively on job benefits and career progress (Vecchio, 1997). In low-quality relationships, workers have less opportunities to have a close relationship with leader, fewer resources, and more restricted information, potentially resulting in dissatisfaction in the job, lower organisational commitment, and employee turnover (Gerstner & Day, 1997; Maslyn & Uhl-Bien, 2001).

Liden and Maslyn (1998) defended the multidimensionality of LMX (Liden & Maslyn, 1998), in which trust was identified as one of the antecedents. Trust is one of the antecedents selected to be included in the model of this research. According to Liden and Maslyn study, leaders test workers with different work assignments in different stages of the process. The degree to which workers fulfil task demands and show a worthiness to be trusted defines the resulting type of LMX relationship. As a consequence, the type of LMX limits the extent to which the leader reciprocates with work-related resources such as information, challenging task assignments, and autonomy (Graen & Scandura, 1987; Liden & Maslyn, 1998). So, trust is an inherent factor in an appropriate LMX.

Relationships with leaders included the contribution, loyalty, and affect dimensions identified by Dienesch and Liden (1986). Some participants in the case study of these authors also identified trust and professional respect as being key factors in their relationships with leaders. Thus, leaders and members may develop perceptions of professional respect and trust before working with or even meeting the other (Liden & Maslyn, 1998).

There are numerous studies about the relationship of LMX and trust, Sparrowe and Liden (1997) contended and empirically verified (Sparrowe & Liden, 2005) that high-LMX employees are more integrated into the leader's personal network. These researchers confirmed that being included into the leader's set of trusted contacts was connected to focal members being perceived by others as characters to be followed in the organisation (Green, 1998; Bauer, Erdogan, Liden, & Wayne, 2006).

Davis et al. (2000) found trust in general managers of restaurant was related to the facilities' sales and profits. Zaheer et al. (1998) found trust related to the performance of interorganisational relationships, which they measured as competitive price, delivery timeliness, supply quality, and supplier flexibility.

Figure 12 shows the summary of the influence of trust on commitment and in turn, job performance. When HRM practices are perceived positively, people trust on managers increases, which in turn help to foster employee commitment. So, trust was included in the conceptual model of this research due to the important effect it has on organisational commitment. A higher level of commitment fosters proactive extra role behaviours for the benefit of the organisation. This commitment and behaviours are perceived by managers strengthening their trust on people. This trust fosters a high quality LMX relationship which positively has an effect on higher investment of HR practices (such as information, autonomy, etc.).

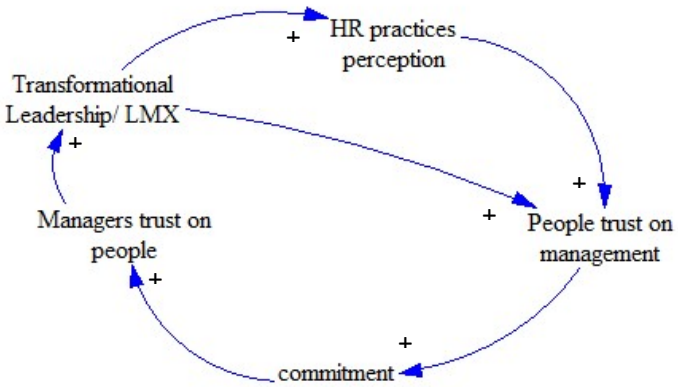

Figure 12: Trust correlation with commitment

4.2. INPUT 2: GROUP MODEL BUILDING (GMB)

The second input source for the model were the results from 11 Group Model Building (GMB) sessions with 11 industrial companies. The purpose of developing a considerable number of GMB sessions was to obtain the saturation point, that is, the point in which feedback loops (the narratives or stories to explain participants contribution and reasoning for their problem using Systems Thinking language) in the sessions were repeated. This procedure pursued a validity and robustness for the model. In addition, it must be noted that most of are also argued in the literature. Gooyert et al. (2016) used this methodology with the aim of obtaining rich data for the construction of an insightful model.

Firstly GMB definition will be presented, secondly the advantages of the technique, and finally, the steps that have been followed in each session. In Annex 8.3 each GMB session is shown, all the steps of the methodology followed in all the companies are represented, including all the loops developed in each company.

4.2.1. GROUP MODEL BUILDING DEFINITION AND ADVANTAGES

GMB is understood as a form of group decision support that involves stakeholders working as a team to solve a focused problem in a complex system. Group Model Building is one of the approaches that could be used for developing and simulating formal models of complex systems (Andersen & Richardson, 1997). GMB is a form of causal modelling based on system dynamics (Hoppenbrouwers & Rouwette, 2013). According to Andersen et al. (1997) GMB refers to a set of techniques used to build system dynamics models involving stakeholder groups. Luna-reyes et al. (2013) defined system dynamics GMB as a tool to underpin interdisciplinary theory building approaches.

Patrick (1995) states that dynamic simulation is useful to obtain a better understanding of theories and any unexpected outcome obtained from them. In addition, it contributes to the creation of a synthetic environment, which adds to our knowledge about a particular phenomenon.

One of the most important benefits of GMB is the issue of stakeholder involvement. When stakeholders are included in the process, the quality of the outcomes is improved,

they feel and understand the necessity of solving the problem and they reach a solution more easily, taking part in the whole reflection process. Moreover, GMB has also been introduced as a concept of "modelling as learning", a different consultancy methodology for system dynamists (Rouwette, Vennix, & Mullekom, 2002).

According to Andersen et al. (2000) the main value of GMB is its emphasis on face-to-face meetings to define model structure and to engage client teams in the whole process of modelling from conceptualization to decision making. One more strength is its reliance on feedback loops. The different feedback loop structures are defined through variables and causal relations (Hoppenbrouwers & Rouwette, 2013). Causal Loop Diagrams are explained in Chapter 3.2.2.

4.2.2. Group Model Building followed in this research

Regarding the steps to be followed in these sessions, Andersen and Richardson (1997) highlighted the importance of writing small group scripts to develop an effective GMB. According to them such sessions should be divided into three steps:

- Planning for GMB meetings. Is based on six different tasks: (i) objective setting, focused on interviews with key managers, (ii) audience selection, (iii) product definition, (iv) logistics, (v) types of group task structure, and (vi) presentations, based on one-to-many discussions with the stakeholder team.
- Scheduling the day. Consists of defining the public agenda for the day, which is composed of two topics: "stock and flow definition" and "feedback elicitation". Elements such as previously defined breaks, reflections after each phase and clarifying group products are considered key.
- Development of GMB scripts. Focused on defining the problem, model structure, feedback structure, equation writing and parametrisation, and policy development, which coincide with modelling phases explained in 3.2.3. The scripts are developed by Andersen and Richardson (1997).

Considering that the Development of GMB scripts also involves simulation modelling phases, GMB was used in this research for both data gathering and validation. The specific process followed in this research is presented in detail:

- Problem definition: this is the first stage where the challenge to be analysed in the session was presented to the participants with a clear and brief statement. An example of one of the companies that took part in this research is presented, facilitator presented the problem and together in consensus the challenge was stated as following:

A. Challenge/ problem: in all the GMB sessions, the problem to be analysed was formulated in the same way. This formulation was: improvement of workers COMMITMENT to achieve a win-win relationship between: (i) people, well-being and feeling as a part of the organisation, (ii) organisation sustainability or competitiveness.

- Time horizon definition: The period of time to be analysed was defined. It should start as far back in history as necessary to show how the problem emerged and describe its symptoms. In this research 100 months was selected as time framework for both the sessions and the simulation.
- Individual variable definition: Each participant listed the factors positively or negatively affect the challenge of analysis. Post-its were given to each participant, and they defined one variable on each. This phase seems to be a Brainstorming where participants could write in the post-it whatever came to their mind.
- Opinion exchange: Lists of all variables were shared and explained in the group. Post-its were stack in the wall, the window or the whiteboard to show them to all participants. Figure 13 shows an example of the opinion exchange phase.

Figure 13: Opinion exchange

- Final conceptual model definition: The facilitator of the session included the variables raised by the group in the final model, always in consensus. Polarities of each relationship between the variables, and connections using arrows are also defined. Figure 14 shows an example of a final conceptual model of one session. It must mentioned that the final diagrams were closed in the post- session phase, that is, the models were refined and optimised in the office by the modellers (some feedbacks that were not closed in the sessions were reworked afterwards). The sessions were developed in both Spanish and Basque. The icon of the circle represents a reinforcing feedback loop (+), and the balance represents a balancing loop (-). These are explained more in depth in the Methodology Chapter.

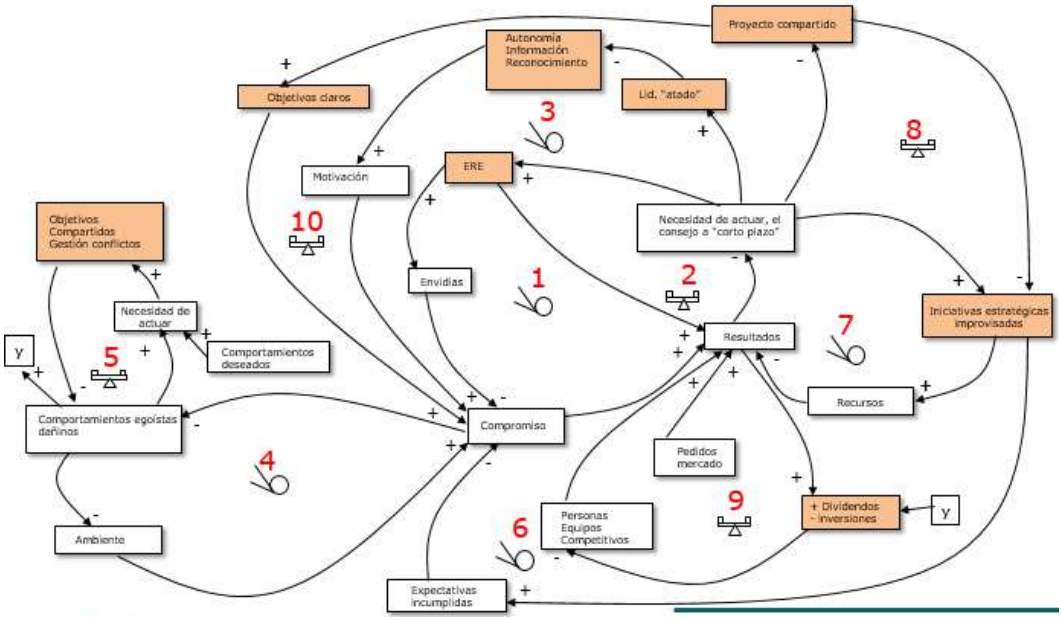

Figure 14: Final diagram of a GMB

- **Validation round:** 50% of the final diagrams were validated with the corresponding organisations. For this purpose, the facilitator met again participants of the session, and explained them each feedback loop initially and the whole in the end. Each relationship was commented and explained with them in order to validate or modify them.

4.2.3. RESULTING INPUTS

Table 4 presents the matrix that collects the most remarkable narratives identified in the eleven GMB sessions. Feedback loops are represented in the rows, and letters in the columns refer to the case studies (companies that took part in the GMB sessions). Highlighted squares represent the appearance of each loop in each session. In Annex 8.3, each Group Model Building session, loops, explanation of each loop and final conceptual model of each company is presented. Despite the existence of more narratives/feedback loops in the sessions, the ones that appear in the matrix represent levers or they are connected with levers. This means that this could be implemented or activated by management in order to obtain some desired effect.

Table 4: GMB feedback loops

	A	B	C	D	E	F	G	H	I	J	K
1.- Trust	■				■	■		■	■		■
2.- HPWS	■	■	■	■	■		■		■	■	■
3.- Taylorism	■	■				■					
4.- Outcomes		■	■				■				
5.- Intensification						■		■	■	■	■
6.- Size					■					■	

4.3. INPUT 3: EMPIRICAL EVIDENCES FROM BATERATZEN DATABASE

Bateratzen began in 2010 with the aim of helping managers to align people with the strategy of their organisations. This project is supported by the Regional Government of Gipuzkoa. The key activity in this project is being the gathering of surveys with the objective of obtaining empirical evidence to help managers. Bateratzen database is composed of 510 companies and 72000 surveys. Among the diverse variables measured are commitment and organisational performance. This database was helpful for the purpose of completing and/or confirming identified feedback loops from literature and GMB sessions. The main objective of using the database was to add factors that were not identified in GMBs either literature review, but empirical data showed they were significant.

Surveys for workers were designed and developed based on Cook et al. (1981), Motowidlo (2000), Rafferty and Griffin (2006), and Griffin et al. (2007). For more information see Annex 8.5 where the different items and constructs measured in the survey are presented.

This chapter is divided in two different parts, the first refers to inputs added to the final model, that is, the variables identified in the database as key, although some of them did not appear repeatedly in GMB sessions. In these cases, the participants of the organisations that took part in the GMBs did not identified these narratives repeatedly, but database (composed of 510 companies) showed the importance of these inputs. The second part refers to patterns of behaviour identified as different commitment patterns over time (scenarios).

4.3.1. INPUTS FROM BATERATZEN DATABASE

Inputs included in the model due to their significant correlation with commitment are presented in this chapter.

1) Relationship between the size of the organisation and organisational commitment.

The objective is to understand the relationship between the size of the organisation and organisational commitment. According to the database a higher size of the company results in worse organisational commitment. A negative relationship was found between size and organisational commitment. Small organisations (less than 50 workers) present higher organisational commitment outcomes than bigger organisations.

For this purpose, a correlation was developed. The Alpha Cronbach of organisational commitment variable was 0.89. The reliability is assured when Alpha is higher than 0.7. The correlation with size was negative and statistically significant, Pearson correlation between the size of the organisation and organisational commitment was - 0.248 and ($p < 0.01$). There were 422 organisations and 34707 surveys comprising the study sample.

Figure 15 shows the relationship between size and level of commitment to the organisation. Each circle represents an organisation. The graph shows a negative

relationship between size and organisational commitment. In the horizontal axis organisational commitment is measured (2.5-6.0). In the vertical axis, the size of the company (0-3.5).

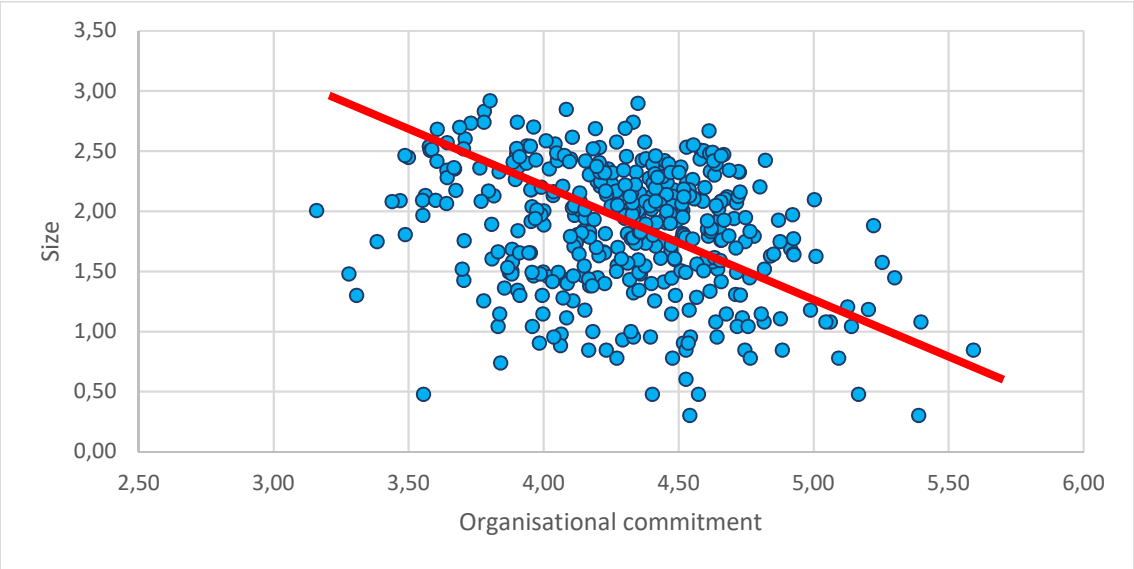

Figure 15: Relationship between size and commitment level

So, it could be stated that a negative correlation exists between size of the organisation and workers level of commitment. This variable, size of the organisation, was included in the conceptual model.

2) Job design

Job design was chosen as an input due to the proved influence on organisational commitment presented in the database.

For this purpose, two different analysis were developed. First, perceived HR practices were controlled in order to obtain a clear vision of the differences in commitment between direct and indirect labour. In this analysis perceived HR system of practices effect was neutralised to observe more clearly the importance of job design. For this aim, a weighted average was developed with no standardised residuals. After the comparison of the averages of the saved residuals, a comparison between direct and indirect labour was obtained through T-Student ($t = 6.23$; $p < 0.01$). Alpha Cronbach coefficient was 0.85 and reliability is assured, $\alpha > 0.7$.

Second, using these residual a second comparison was done to understand the differences between sectors (automation and machine tool), ($t = 7.05$; $p < 0.01$). It is understood that tasks in automation are repetitive and unenriched. Machine tool is characterised by more enriched tasks (they work with projects rather than repetitive activities).

There were 35 organisations and 5700 surveys comprising the study sample. The objective of this weighted average was to test the differences produced in organisational commitment due to job design.

Thus, job design appears to be a variable with considerable effect on organisational commitment, as it is shown in the study that people who work in unenriched workplaces are less committed to their organisation. As a result, this variable was included in the conceptual model of this research.

3) Relationship between workload intensification and organisational commitment

The main aim in this case was to analyse the correlation between productivity and organisational commitment. According to the database workload intensification has a negative effect on organisational commitment. As shown in Figure 16 the correlation between past productivity (measured as sales/employee) and current organisational commitment (data from 2011) is negative and statistically significant: -0.32 ($p < 0.01$).

There were 103 organisations and 5705 surveys comprising the study sample. All the companies are operating in Spain.

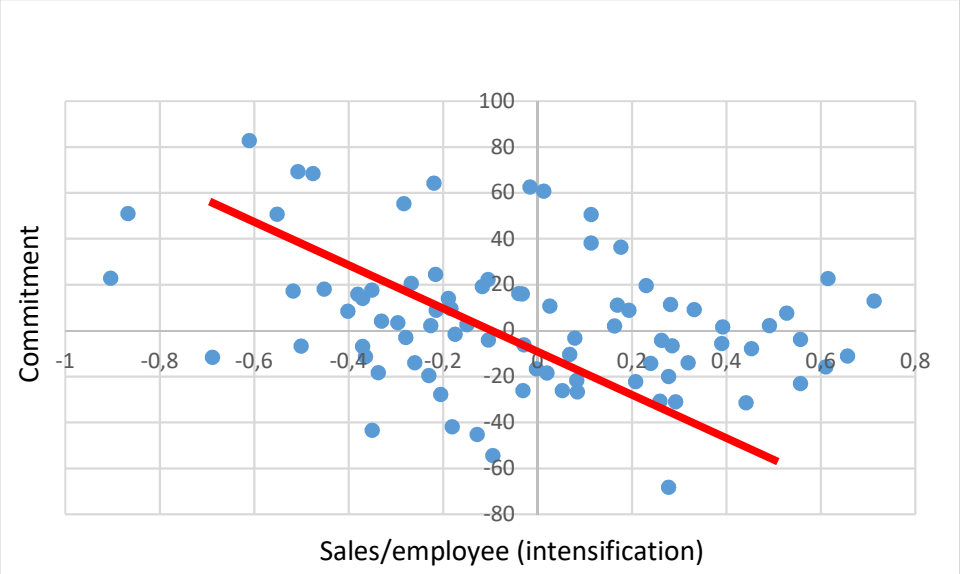

Figure 16: Correlation between productivity and organisational commitment

Consequently, intensification of workload is considered a significant variable before implementing any HR practice system, and it was included in the conceptual model of this research.

4.3.2. Dynamic hypotheses

This chapter presents the patterns of behaviour of commitment (v1) and implemented HR practices (v2) collected from the Bateratzen database. These patterns of behaviour represent the evolution over time of the behaviour of both v1 and v2. The time framework analysed for this patterns of behaviour goes from 2010 to 2017, but the number of measurements of each variables is not always yearly in that period of time, that is, in the case of some companies there are measurements of v1 in four points in

time, and in another company just 2 measurement. For more information see Annex 8.2 were the tables with the average measures of v1 and v2 are shown.

These patterns of behaviour are helpful for the validation of the computational model. These patterns have a correspondent dynamic hypotheses which gives a reasoning to the evolution of the pattern over time. These hypotheses are defined according to the explanation stakeholders gave us in both Bateratzen (surveys and interviews) and GMB sessions of this research. The questions of the surveys were based on seven different blocks: leadership, common project, system design, organisational culture, team, and outcomes. *Leadership*, the questions were defined according to Rafferty & Griffin (2004) and Cook et al. (1981) research. *Common project* was defined following Elorza (2008), refers to the point workers have interiorised organisational project. *System Design*, questions were defined following Elorza (2008) and Morgeson & Humphrey (2006). *Culture*, references for the construction of the survey was Schneider et al. (1998). *Team* was built basing on Aguilar and Hillier-Fry (2007). *Outcomes* was focused on the research of Rafferty and Griffin (2006), Griffin et al. (2007), Elorza (2008), Motowidlo (2000), and Watson et al. (1988). For more information see Annex 8.5 where the origin of the seven blocks, and the questions are presented, this questionnaire was designed for management, as it is related to implemented levers, one of the elements measured in the graphs beyond.

The way to validate the model using these hypotheses is the following: the model is manipulated to obtain the accurate representation of the situation described by the dynamic hypotheses, if the model represents exactly the same scenario described by the stakeholders, the hypothesis is verified. Otherwise, if the hypothesis does not replicate the same pattern of behaviour, there are two options, (i) the hypothesis was not correct, (ii) the model has any point to be corrected. In this chapter firstly patterns of behaviour and the scenarios corresponding to them are explained, and then their corresponding dynamic hypotheses are presented.

Scenario 1: companies with intensification of work and consequently organisational commitment worsens

The scales used for the measurement of both organisational commitment and implemented levers by management are the same for all the scenarios. In the case of the companies belonging to this scenario starting point of organisational commitment is high, 4.8 (Figure 17). In addition, the initial measurement of implemented levers is also high (4.27), with an increasing behaviour over time. Management makes efforts to improve commitment level. One dynamic hypothesis was defined for explaining this scenario, it referred to the common situation in companies in which management decides to intensify workload to increase organisational performance.

These companies worsen their organisational commitment outcomes. Figure 17 shows an example of a company which belong to this scenario. In the horizontal axis the years of which we have a measurement appeared, that is, as explained before, the time

framework of the measurement goes from 2010 to 2017, but not in all the cases we have a measurement per year. In the case of this company, we have measures between 2011 and 2016. As mentioned, intensification of workload helps to improve organizational performance in the short term, but it damages organizational commitment in the long term. As a result, organizational performance degree decreases again.

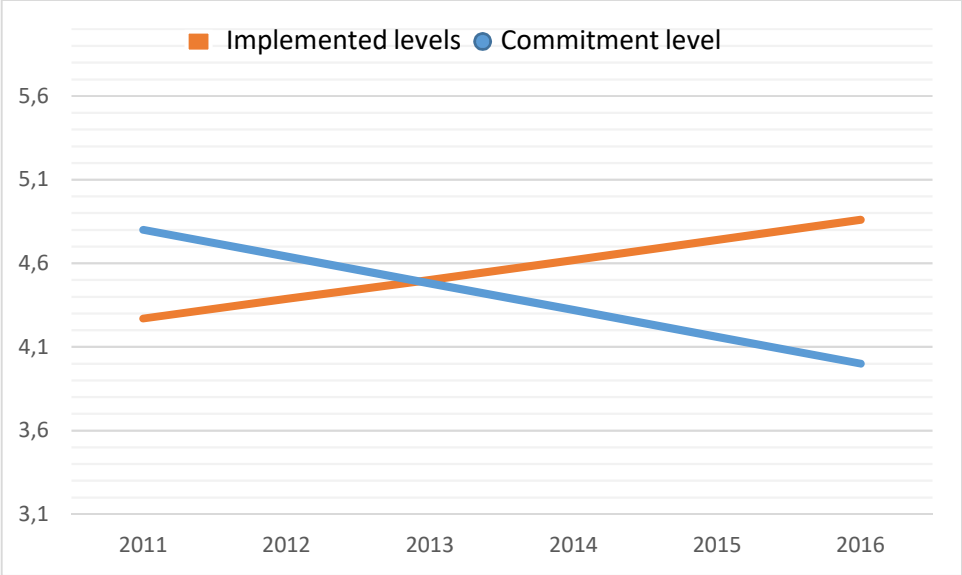

Figure 17: An example of scenario 1

Scenario 2: companies which implement levers but they do not obtain better results

In the case of the companies belonging to this scenario starting point of organisational commitment is high, 4.65 (Figure 18). However, the initial measurement of implemented levers is low (3.29), but with an increasing behaviour over time. Management makes efforts to improve commitment level.

One dynamic hypothesis was presented to understand the possible cause for this scenario. Firstly in this context, although HR levers were implemented, organisational commitment did not increase, the reasoning could be related to a lack of coherence and consistence in the implementation of the HR levers.

These companies do not obtain better outcomes regarding organisational commitment. Figure 18 shows an example of a company which belong to this scenario. In the horizontal axis the years of which we have a measurement appeared, that is, as explained before, the time framework of the measurement goes from 2010 to 2017, but not in all the cases we have a measurement per year. In the case of this company, we have measures of the last seven years. As mentioned, although they implemented more levers, they do not obtain better outcomes regarding organisational commitment.

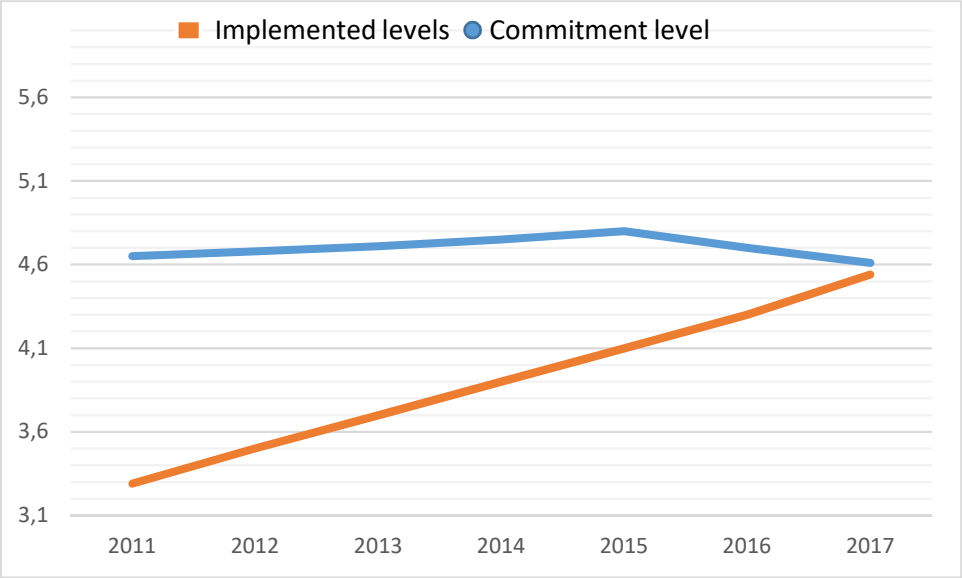

Figure 18: An example of scenario 2

Scenario 3: there is a positive evolution in implemented levers and having a positive effect on organisational commitment

The scales used for the measurement of both organisational commitment and implemented levers by management are the same for all the scenarios. In the case of the companies belonging to this scenario starting point of organisational commitment is low, 3.37 (Figure 19). In contrast, the initial measurement of implemented levers is medium (3.62), with an increasing behaviour over time. Management makes efforts to improve commitment level. One dynamic hypothesis was defined and simulated in Model Validation Chapter for this case, the typical cause for failing when implementing HR practices, is to implement them individually, instead of doing it coherently and consistently, the hypothesis is simulated in a context in which all the HR levers are implemented together and aligned with the strategy.

These companies obtained better organisational commitment outcomes. Figure 19 shows an example of a company which belong to this scenario. In the horizontal axis the years of which we have a measurement appeared, that is, as explained before, the time framework of the measurement goes from 2010 to 2017, but not in all the cases we have a measurement per year. In the case of this company, we have measures between 2011 and 2016. As mentioned, they implemented more levers and coherently they obtained better organisational commitment outcomes.

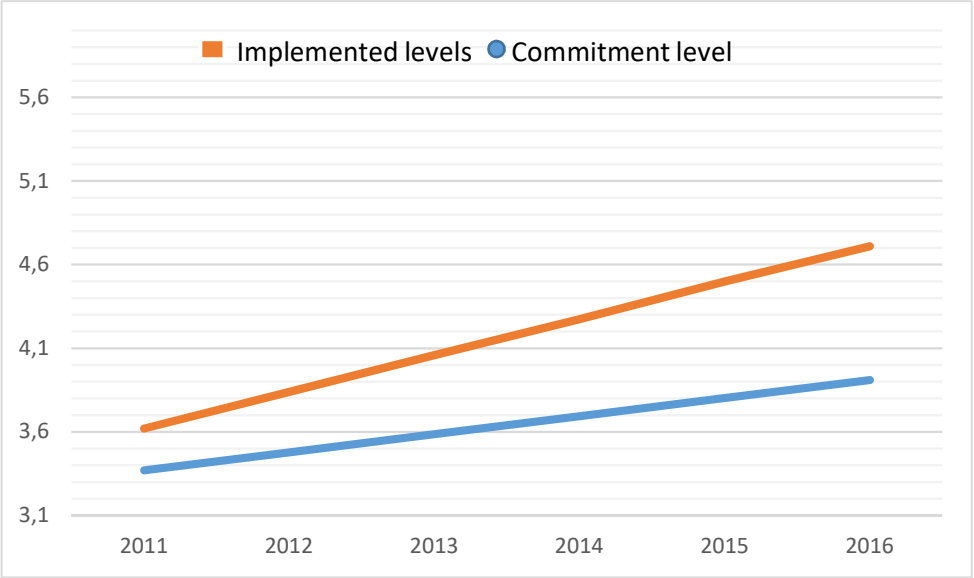

Figure 19: An example of scenario 3

Scenario 4: classic organisation with medium level of implemented levers (HR practices) and low organisational commitment stable over time

For the definition of these scenarios starting point of organisational commitment, and the level of implemented levers by managers was taken into account. Starting point referred to the measured initial average of "organisational commitment" in the case of each company. It is considered a low starting point when it is between 3.1 and 3.6. Medium is considered to be between 3.6 and 4.2, and a high starting point will be between 4.2 and 5.1. Implemented levers by managers referred to HR practices they implemented according to their strategy. The scale for the variables of "implemented levers by management" is the same. In this scenario 1 the starting point was considered low (3.35). Implemented levers were at a medium point in the initial stage (4.14). In the companies belonging to this scenario management do not make any effort to change the situation (there is no commitment strategy). The dynamic hypotheses were used to understand the causes of real scenarios in the company. These dynamic hypotheses will be simulated in the Model Validation Chapter. This scenarios respond to a hypothesis of an organisational context in which levers are implemented in a medium degree due to an unenriched objective to improve. As a result, management do not make all their efforts (just one lever). The organisational commitment behaviour does not increase, it ends into a stable low value.

Therefore, commitment is stable over time. Figure 20 shows an example of a company which belong to this scenario. The years of which there is a measurement are presented in the horizontal axis, as explained before, the time framework of the measurement goes from 2010 to 2017, but there is not a measurement available every year. In the case of the company of analysis, there are measures of three years, 2013, 2014, and 2015. As mentioned, although there is a stable but medium level of implementation of practices, the organisational commitment level is constant and low.

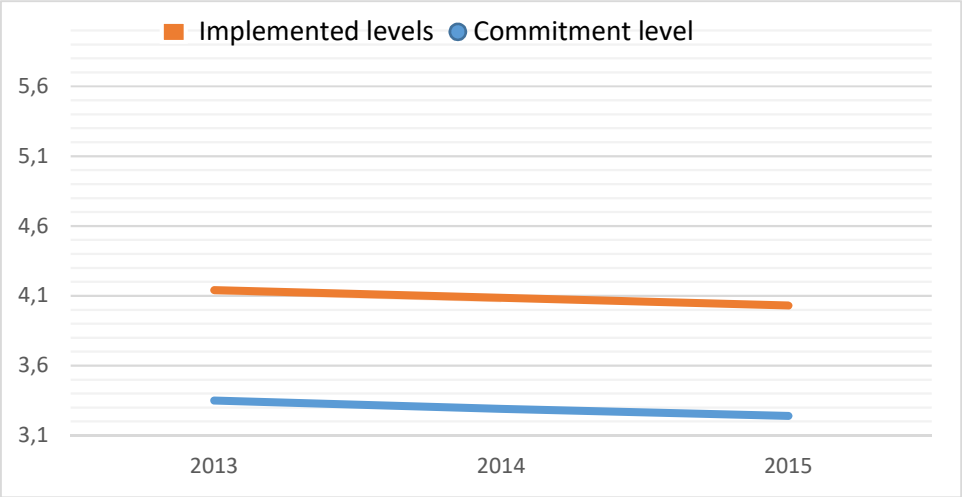

Figure 20: An example of scenario 4

Figure 21 shows the summary of the patterns of behaviour explained above. In the horizontal axis the level of implemented levers is represented (low, medium, or high). In the vertical axis, the commitment level is shown (low, medium or high). As can be seen in the graph, Scenario 1 represents a lowering in commitment level, although a positive evolution in implemented levers occurs. Scenario 2 represents an investment on people through levers (i.e. training, autonomy), however no changes in commitment level results, those efforts of implementation have no any visible positive effect on organisational commitment. Scenario 3 represents an improvement in implemented levers coinciding with an improvement commitment level result. Finally, Scenario 4 is stable in the different measurements done in the different companies belonging to this scenario, there are no changes in implemented levers nor in organisational commitment results. For more information about the scenarios see Annex 8.2, where the average of commitment and implemented levers is represented referring to both year and company to which they belong.

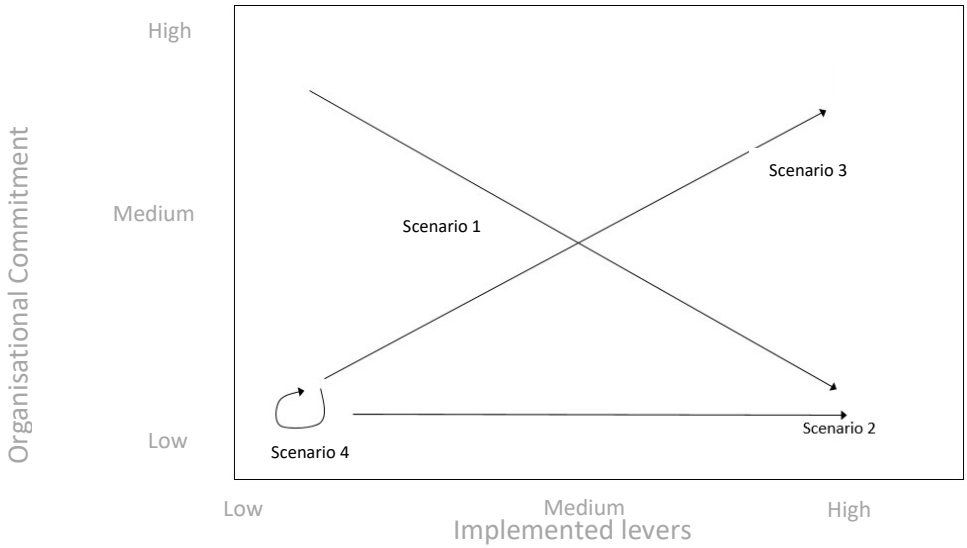

Figure 21: Summary of the behaviour pattern defined for each scenario

Table 5 summarises the explanation and possible causes for these scenarios by the dynamic hypotheses. These hypotheses (hypotheses= causes for explaining the evolution of the behaviour patterns) were developed following the explanations managers gave in the interviews (Bateratzen, prior research) and GMB sessions. These hypotheses were simulated for the validation of the computational model, see Chapter 5.6.

Table 5: Definition of dynamic hypotheses to be simulated

Scenarios	Dynamic Hypotheses
Scenario 1: companies that make workload intensification and consequently organisational commitment worsens.	1. When workload is intensified, organisational commitment is reduced.
Scenario 2: companies which implement levers but they do not obtain better results.	2. Levers are implemented, but organisational commitment result does not increase.
Scenario 3: there is a positive evolution in implemented levers and having a positive effect on organisational commitment.	3. Levers are implemented, and organisational commitment result increases.
Scenario 4: classic organisation with medium level of implemented levers (HR practices) and low organisational commitment stable over time.	4. Training is implemented, and a medium wished extra role is defined, organisational commitment behaves as a boomerang.

The dynamic hypotheses presented in Table 5 are listed in the following paragraphs.

1. When desired objective of organisational performance is higher than actual performance, workload is intensified to obtain the objective. As a result, actual performance increases. However, this lever implementation has some unintended consequences, the reduction of commitment level of workers. This is an effect of the pressure of intensification in the long term. Thus, the expected outcome is a deterioration of organisational commitment.

2. When levers are implemented in an inconsistent way (just one of them, instead of applying them consistently), incongruences appear because of the lack of consistence, and the final result is not an increase in commitment, it is an stable commitment level in a low initial value of commitment.

3. When levers are implemented in a consistent way (all of them implemented consistently), this action is perceived positively by the workers, and the final result is an increase in commitment, from the initial value to the stablished objective.

4. When levers are implemented in a consistent way (all of them implemented consistently), this action is perceived positively by the workers, and the final result is an increase in commitment, from the initial value to the established objective. However,

when there are implemented in an inconsistent way there is no positive effect on perception. In addition, the fact of stablishing just a medium wished extra role, it is perceived negatively, it seems to be not a real wished, it is just a fix to a problem, which has not a positive effect in the long term. Thus, the expected behaviour for organisational commitment, is similar to the boomerang effect, oscillations which final results in a constant low value.

Chapter 5

Methodology

5. METHODOLOGY

5.1 INTRODUCTION

This research uses modelling to understand the behaviour of organisational commitment using a system dynamics model. To this end methodology presented in Figure 22 was used. Firstly, the gap in the literature was defined (problem identification) to provide a clear focus for the subsequent phase.

Secondly, conceptual models were developed. For its definition three different input sources were used: the Literature review, Group Model Building (GMB) sessions with industrial companies and empirical evidences from Bateratzen database. Once the conceptual model was defined, the computational model was built and validated. This model was defined by 4 blocks: i) Commitment, ii) Performance and intensification, iii) Order and control, and iv) HPWS levers. The process was iterative based on Sterman (2000), his methodology was standardised and it was the mostly used for modelling.

Validation of the computational model was both Direct Structure and Structure Oriented. GMBs, literature review, and empirical evidence (Bateratzen database) helped for the Direct Structure Validation. On the other hand, Structure Oriented was done through the simulation of the dynamics hypotheses defined for the explanation of the pattern of behaviour identified in the database.

In the following section steps for the execution of the research are presented. This process was divided into different tasks: problem Identification, model inputs, conceptual model development, simulation model development, and validation.

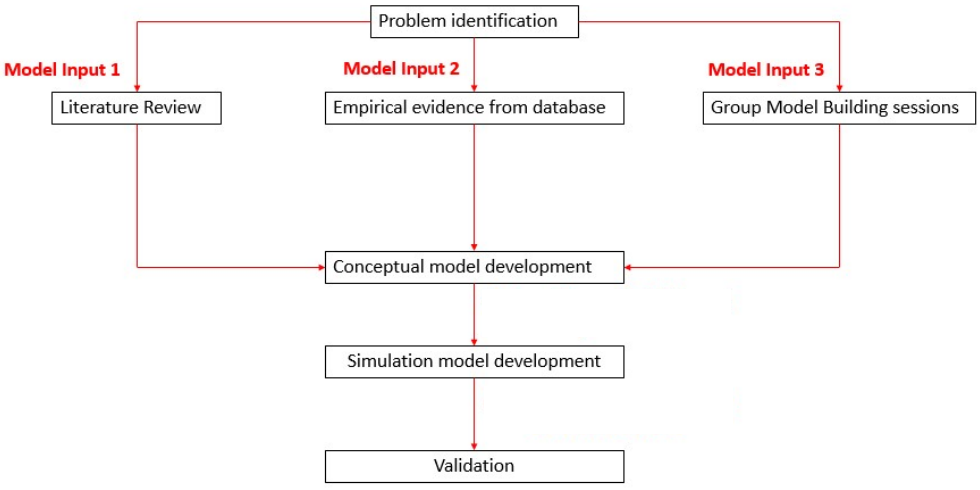

Figure 22: General Methodology

5.2 Problem Identification

As described in Chapter 1, maintaining competitive and dynamic has become a central issue for organisations in the industrial sector. Organisational commitment has been identified as a key factor for competitive companies. However, it is considered such a complex factor due to the multiple interrelated variables that it is still unknown how to increase this organisational commitment level.

Thus, a simulation tool was necessary to aid managers to understand evolution of organisational commitment over time. So, the problem identified for the development of the model was: the understanding of the behaviour of organisational commitment.

5.3 Model Inputs

Model inputs sources are three as it has been explained in Chapter 4 (Literature, GMB sessions with companies and empirical evidences from Bateratzen). In Table 6 each source of information is connected with the loop they have fed. 1) Each row in the table shows the loops that were included in the conceptual model and, 2) each column refers to the input source for the loops. These seven loops appear in both literature and GMB sessions. In addition, 5 of them are also supported by the information gathered from the database.

Table 6: Input source for each loop

	Literature	GMB	DDBB
LOOP 1: Extra-Role behaviour improvement necessity			
LOOP 2 : HPWS effect on organisational commitment			
LOOP 3: Managers vertigo to loss of control			
LOOP 4: Disaffection as a result of order and control			
LOOP 5: Order and control strategy to avoid lack of In Role			
LOOP 6: Intensification, relocation, and automation to improve organisational performance			
LOOP 7: Organisational commitment-performance relationship			

The next step is the definition of the conceptual model: Conceptual Model development. Seven loops are included and explained in the next section where the conceptual model is defined.

5.4 Conceptual Model Development

Archetype logic has been used for the construction of the model. The three archetypes identified for the construction of the model of this research are presented in the following paragraphs. According to different authors, such as Peter and Wolstenholme (1990) system archetypes are fundamental to modelling process. They can be used as solutions to complex issues (Peter, 1990; Wolstenholme, 1990) and as a support to quantitative

modelling (Wolstenholme, 2004; Wolstenholme, 1990). Table 7 shows the loops that compose each archetype.

Limits To Success: In a "Limits To Success" scenario, continued efforts initially lead to improved performance. Over time, however, the system encounters a limit which causes the performance to slow down or even decline, even as efforts to rise (Kim, 1995).

This archetype is most helpful when it is used well in advance of any problems, to see how the cumulative effects of continued success might lead to future problems. This archetype is typically used to explore questions such as "what kind of pressures are building up in the organisation as a result of the growth?". It searched ways to relieve pressures or remove limits before an organisational imbalance (Kim, 1995).

Fixes That Fail: In a "Fixes That Fail" situation, a problem symptom cries out for resolution. A solution is quickly implemented that alleviates the symptom, but at the same time, it generates unintended consequences that increases the problem in the long term. Over time, the problem symptom returns to its previous level or becomes worse (Kim, 1995).

Breaking a "Fixes That Fail" cycle usually requires acknowledging that the fix is merely alleviating a symptom, and making a commitment to solve the real problem immediately (Kim, 1995).

Table 7: Archetype loop composition

Loops	Archetypes
Loop 1-2	A1.-Limits To Success
Loop 4-5	A2.-Fixes That Fail
Loop 6-7	A3.-Fixes That Fail

The following section sets each individual loop of the conceptual model and its corresponding archetype. At the end of the section the conceptual model in its entirely is presented.

LOOP 1: Extra-role behaviour improvement necessity

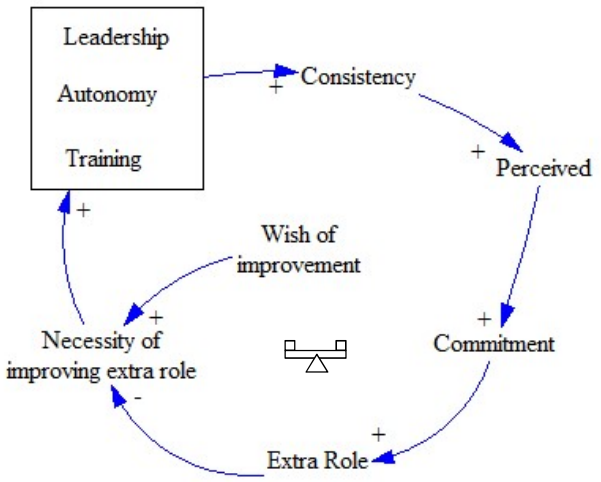

Figure 23: Extra role behaviour improvement necessity

This loop was supported by Literature review, GMB sessions (9 sessions), and Bateratzen database (job design input from the database = Autonomy). The loop is represented in Figure 23. When extra-role behaviours are highlighting, the necessity to improve those behaviours is reduced. The same happens in the opposite side, when extra-role behaviours are low, the necessity to improve it is increased. When the necessity is high, an increase is generated in autonomy, training, and leadership. When the implementation of HPWS practices is done in a consistent way, this effort is perceived as positive by workers. As a result, their organisational commitment level increases.

Extra-role behaviour improvement necessity depends on the culture and climate defined in the organisation. One of the key factors which underpins the analysed companies is the value placed on people and their contribution to the organisation. As a result, managers in these companies feel the collective pressure of the need of implementing HR practices. This necessity of improvement depends on the company typology, for example, in a cooperative, standard for extra role behaviour improvement necessity is higher than in an incorporated company (Katz, 1964; Van Dyne, & LePine, 1998).

LOOP 2: HPWS effect on organisational commitment

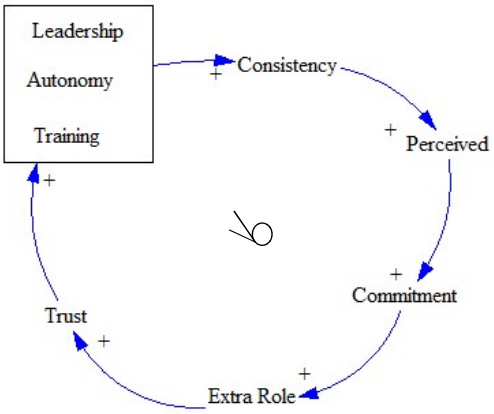

Figure 24: Trust, implemented levers and organisational commitment

This loop was supported by the literature, GMB (6 sessions) and Bateratzen database (job design input from the database = Autonomy). The loop is represented in Figure 24. According to the GMB sessions, a high level of organisational commitment encourages extra-role behaviours in workers. This extra-role behaviours result in trust.

Commitment strategy on people enhances autonomy, training, and leadership implementation (Wood & Wall, 2007). An effective implementation of these elements fosters people perception. The relationship between lever implementation and perceived levers (HPWS and transformational leadership) depends on the level of consistency in time (Becker & Huselid, 1998; Delaney & Huselid, 1996; Delery & Shaw, 2001; Dyer & Reeves, 1995; Huselid, 1995; Ichniowsky, Shaw & Prennushi, 1997). Coherence and consistency of the implemented practices generate a "strong" organisational context (Bowen & Ostroff, 2004).

The higher the "strength" of the system the more likely to perceive the HPWS practices and leadership. When this perception is increased, it is more likely to increase organisational commitment. A higher commitment will encourage an extra-role behaviour, which at the same time will reinforce management trust on people.

Trust theory suggests that extra-role helps to improve trust level which reinforces commitment strategy indirectly (Leadership-Consistency-Perceived-Commitment). HPWS implementation perception, and leadership contributes to better commitment level. All these relationships are shown in Becker et al. (1997) and Wright and Nishii (2006) explained in Chapter 4.

A1 archetype: Limits To Success (Loop 1+2)

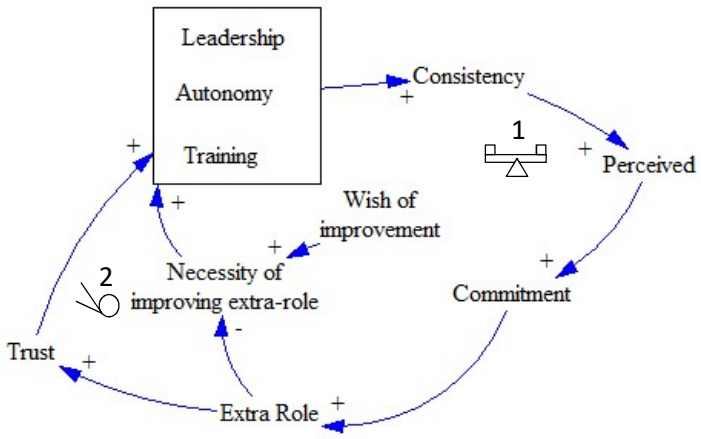

Figure 25: Limits To Success archetype

Archetype A1 is composed of Loops 1 and 2, see Figure 25. The reinforcing part is defined by LOOP 2 which generates pressure and reinforces the positive effect of the interrelated variables in this loop (extra-role behaviours, implemented HPWS practices, consistency, and perception). The resulting effect is reinforced due to the influence of extra-role behaviour in managers trust. As a consequence, HR practices are integrated consistently and workers perception is positive. On the other hand, balancing part is defined by LOOP 1 which balances the system and works as a brake of the reinforcing part. It limits the growing through the negative effect of extra role behaviour necessity. The key factor in this loop is the extra-role behaviour improvement necessity. The relationship between current extra-role behaviour and the necessity to improve it, is negative. This is the effect which balances the system.

LOOP 3: Managers vertigo to loss of control

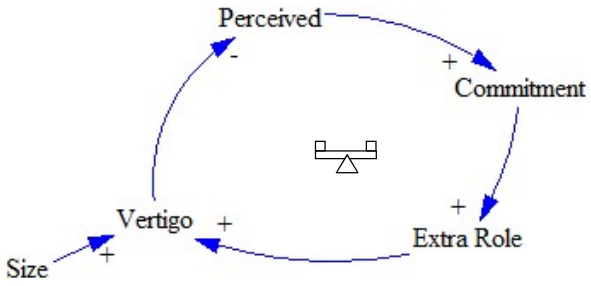

Figure 26: Managers vertigo to loss of control

This loop was supported by the three inputs: the literature review, GMB sessions repeated in 2 sessions, and Bateratzen database (company size input from the database=Size). The loop is represented in Figure 26.

As it is explained in Chapter 4.3.1. (Figure 15) the database shows that a higher size of the company results in worse organisational commitment. A negative relationship was

found between size and organisational commitment. Small organisations presented higher organisational commitment outcomes than bigger organisations.

When organisational commitment is higher, extra-role behaviours are increased. When extra-role behaviours are increased, organisational performance is also increased. As a result, the size of the company increases and middle management structure is reinforced. When empowerment of workers is reinforced, middle management's vertigo to loss of control is reinforced. This vertigo encourages behaviours of order and control of management (which is triggered as a negative perception by workers).

LOOP 4: Disaffection as a result of order and control

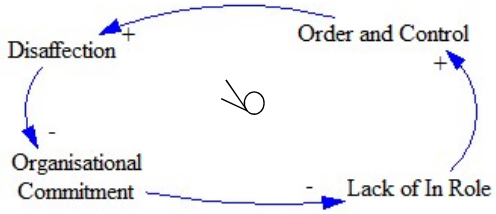

Figure 27: Order and Control strategy and its effects

This loop was collected from the literature review and the GMB sessions (3 sessions, concept related to Taylorism), see Figure 27. The increase of order and control strengthens disaffection feeling of workers, and consequently, organisational commitment is reduced. On the other hand, organisational commitment has a direct positive influence on In-Role behaviours (in the same way a negative effect on Lack of in role). The explanation literature gives to this loop is the following: When order and control is implemented, it has a positive effect in productivity in the short term. However, in the long term some unintended consequences (disaffection and lack of in role) appear, which finally results in a reduction of performance (Figure 33). As a result of Vertigo (explained in LOOP 3), management tend to implement Order and Control.

LOOP 5: Order and Control strategy to avoid lack of in-role

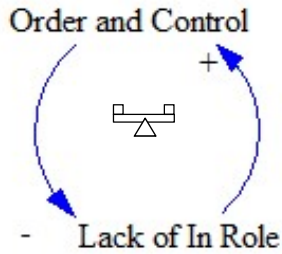

Figure 28: Order and control strategy

This loop was collected from the literature and the GMB sessions (3 sessions, concept related to Taylorism). The loop is represented in Figure 28. When "order and control" strategy is increased, less lack of in role exists (this is understood as more in role

behaviours). The more in-role behaviours, the less need for order and control. Control strategy is explained in Loop 4.

A2 archetype: Fixes That Fail (Loop 4-5)

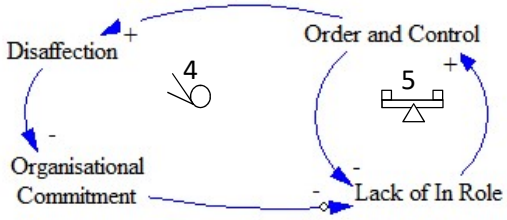

Figure 29: Order and control in the Fixes That Fail archetype

Archetype A2 is composed of loops 4 and 5, see Figure 29. This archetype represents the relationship between "order and control" strategy, and the resulting negative effect of disaffection on commitment. The reinforcing part is defined by LOOP 4 which generates tension and reinforces the positive effect of the interrelated variables in this loop (order and control management strategy, and In-Role behaviours). The reinforcing part is a result of the increase of lack of in-role behaviours and disaffection, and the positive influence of the combination of order and control and organisational commitment. On the other hand, balancing part is defined by LOOP 5 which balances the system and works as a brake of the reinforcing part. It limits the growing through the negative effect of order and control management strategy. In this case the positive effect of the loop derives from in-role behaviours and negative effect from order and control management strategy.

LOOP 6: Intensification, relocation, and automation to improve organisational performance

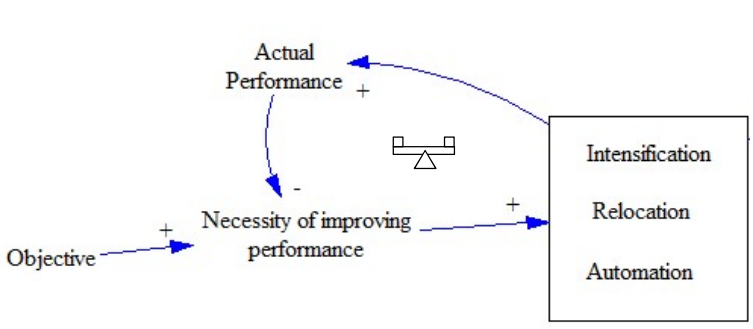

Figure 30: Necessity of improving performance

Loop 6 was collected from the GMB sessions (5 repetition), the literature review and Bateratzen database (intensification of workload input from the database=Intensification), see Figure 30.

Another typical option when necessity of performance improvement exists is the relocation of the manufacturing processes in other low cost countries. The previous experience in Bateratzen shows that in such cases restructuring is highly likely to occur,

which results in a decrease in people commitment levels (See Figure 33). Necessity of improving performance depends on the established objective by management, and the real level of actual performance, see Figure 33 for more information.

In the GMB sessions undertaken in this research, participants define relocation as one of the principal solutions for industrial organisations when they need to improve organisational performance. This necessity sometimes result from the need for continuous growth. The resulting restructuring has a negative effect on organisational commitment as it causes major disruption on workers.

Automation is the third strategy identified to solve outcome improvement necessity in the sessions. Participants of GMB sessions defined automation as a frequent solution when outcome improvement necessity appeared. In these cases, the direct effect of automation was restructuring which once again influenced commitment negatively.

LOOP 7: Organisational commitment-performance relationship

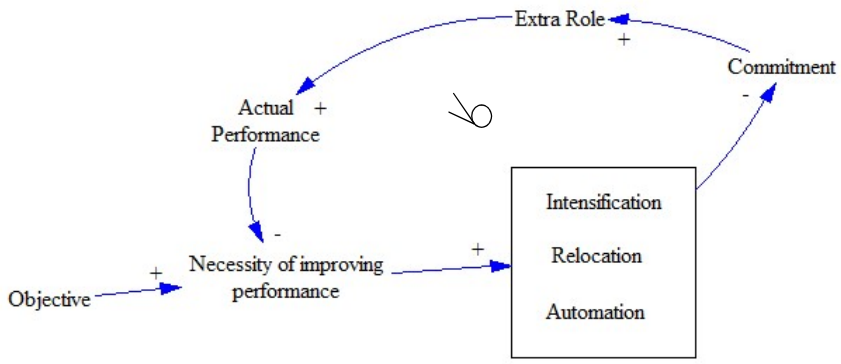

Figure 31: Effect of Organisational Commitment on Organisational Performance

This loop has been based on both literature review and GMB sessions (5 repetition) and Bateratzen database (intensification of workload input from the database=Intensification). The loop is represented in Figure 31. According to participants in the sessions, when commitment level is increased, both in-role and extra-role behaviours are activated. These behaviours are beneficial for organisational performance (this additional relationships could be seen in the whole representation of the conceptual model, Figure 33).

In-role behaviour refers to the required or expected behaviour and is the basis of the resultant job performance. In contrast, extra-role behaviour refers to the extra efforts workers make to obtain the established objectives. Extra-role (i) is not specified in advance by role prescriptions, (ii) is not recognised by formal reward systems, and (iii) is not a source of punitive consequences when not performed by job incumbents (Van Dyne & LePine, 1998). When workers feel committed to their organisation both behaviours of ongoing performance and discretionary are reinforced.

The increase of both behaviours contribute positively to organisational performance. When positive outcomes are achieved workers feel satisfied. Extra-role behaviour

theorists assume that extra-role behaviour leads to positive effect on performance (Katz, 1964; Van Dyne, & LePine, 1998).

As a result, necessity of improving it is reduced, and consequently it will not be necessary to intensify workload, relocate or implement more automation.

A3 archetype: Fixes That Fail (Loop 6-7)

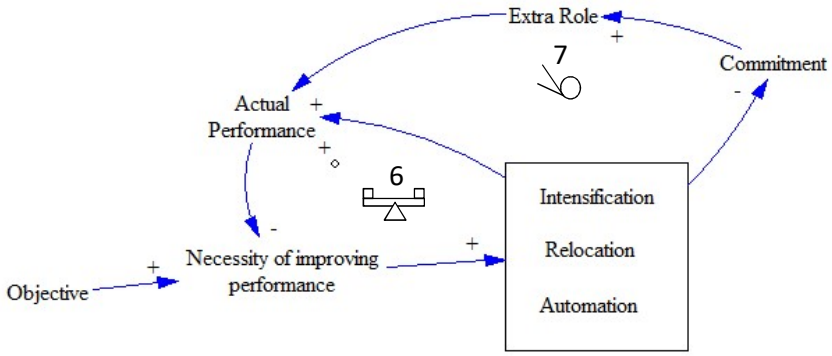

Figure 32: Actions for outcome improvement

Archetype A3 is composed of loops 6 and 7, see Figure 32. This archetype is a Fixes That Fail archetype. It represents the relationship between intensification of workload/relocation/automation and pressure to lower objectives. LOOP 7 is reinforcing, when there is a gap between current and desired organisational performance, it is necessary to implement other solutions, such as intensification, relocation and automation. Due to this necessity, managers intensify workload, and outcomes are improved in the short term. But at the same time, this has a negative effect on organisational commitment, due to the connection represented in LOOP 6 (balancing).

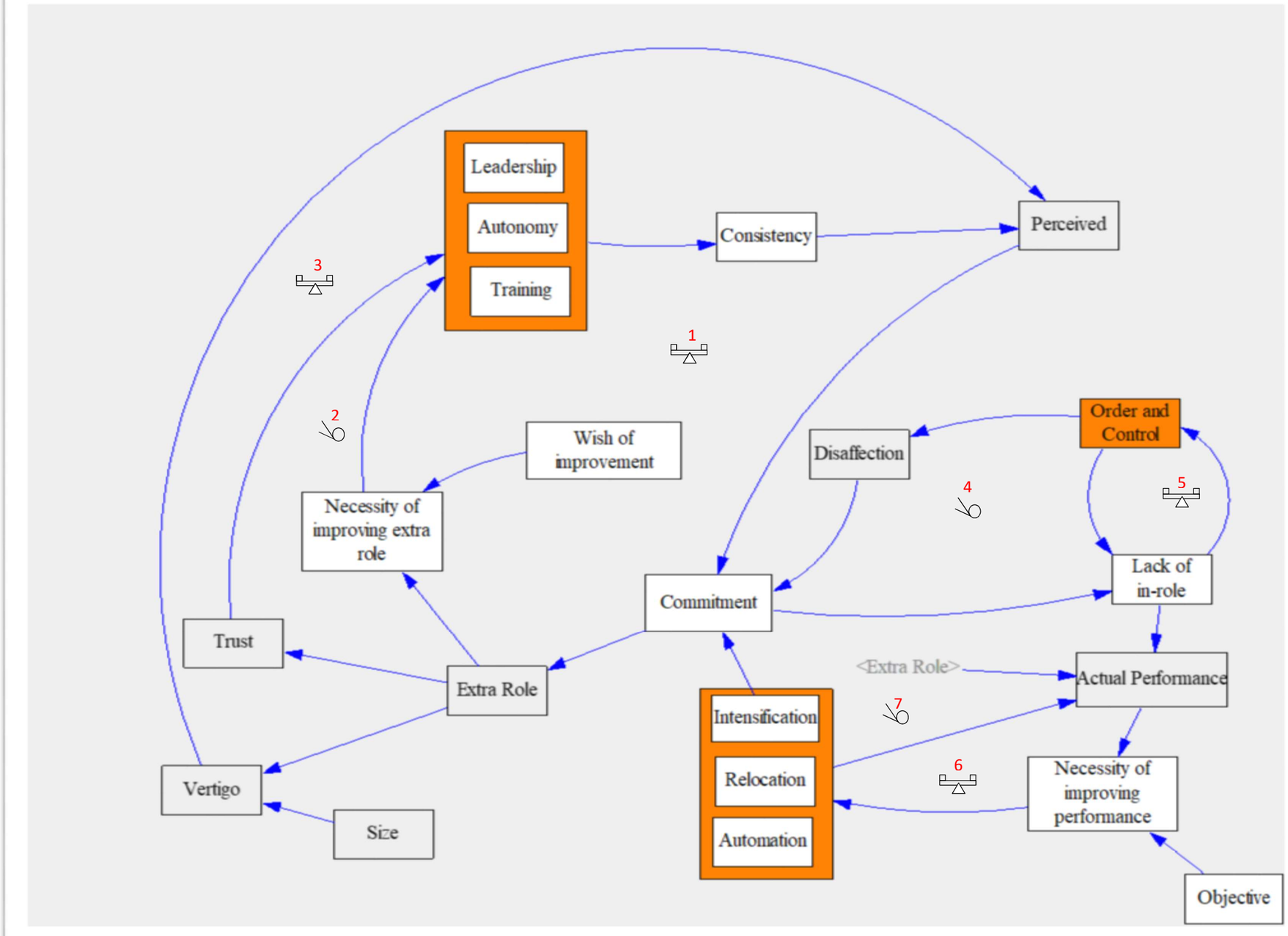

Figure 33: Conceptual model

5.5 COMMITMENT SIMULATION MODEL

In this section, the computational model construction is explained. GMBs were developed with eleven companies, this was the point in which feedback loops were repeated and no new information appeared, saturation point. This data together with the literature and evidences from Bateratzen database was the base to define the conceptual model through SD.

The computational model was built using archetypes. Once archetypes were identified, each block was built individually according to the structure and equations defined in the previous studies (Bourguet-díaz & Pérez-salazar, 2000). These archetypes define some of the blocks of the computational model, and blocks are defined according to conceptually related narratives (stories and variables that give explanation to the hidden cause-effect relationships in the model). These blocks were built independently and then they were put together. In the following page archetype construction is explained. The core of the model was built based on García (2017).

In Table 8 blocks of the computational model are connected to the archetypes identified in the conceptual model.

Table 8: Archetypes and loops which composed the computational model

Archetypes	Loops	Blocks
A1- Limits To Success	1-2	HPWS Levers
A2- Fixes That Fail	4-5	Order and control
A3- Fixes That Fail	6-7	Performance and intensification

Figure 34 presents the whole computational model appearance. It is defined by 4 stocks, 7 flows, and 42 variables. These blocks are: i) Commitment, ii) HPWS levers, iii) Order and control, and iv) Performance and intensification. As shown in Table 8 above the model was built using *Limits To Success* (LTS) to represent the implementation of each HPWS practice and each effect on perception and commitment, A2 as a *Fixes That Fail (*FTF*)*, stock represents the problem (Lack of In Role), and A3 is also a FTF in which Organisational Performance (OP) is the focus, and intensification is understood as a lever to improve OP.

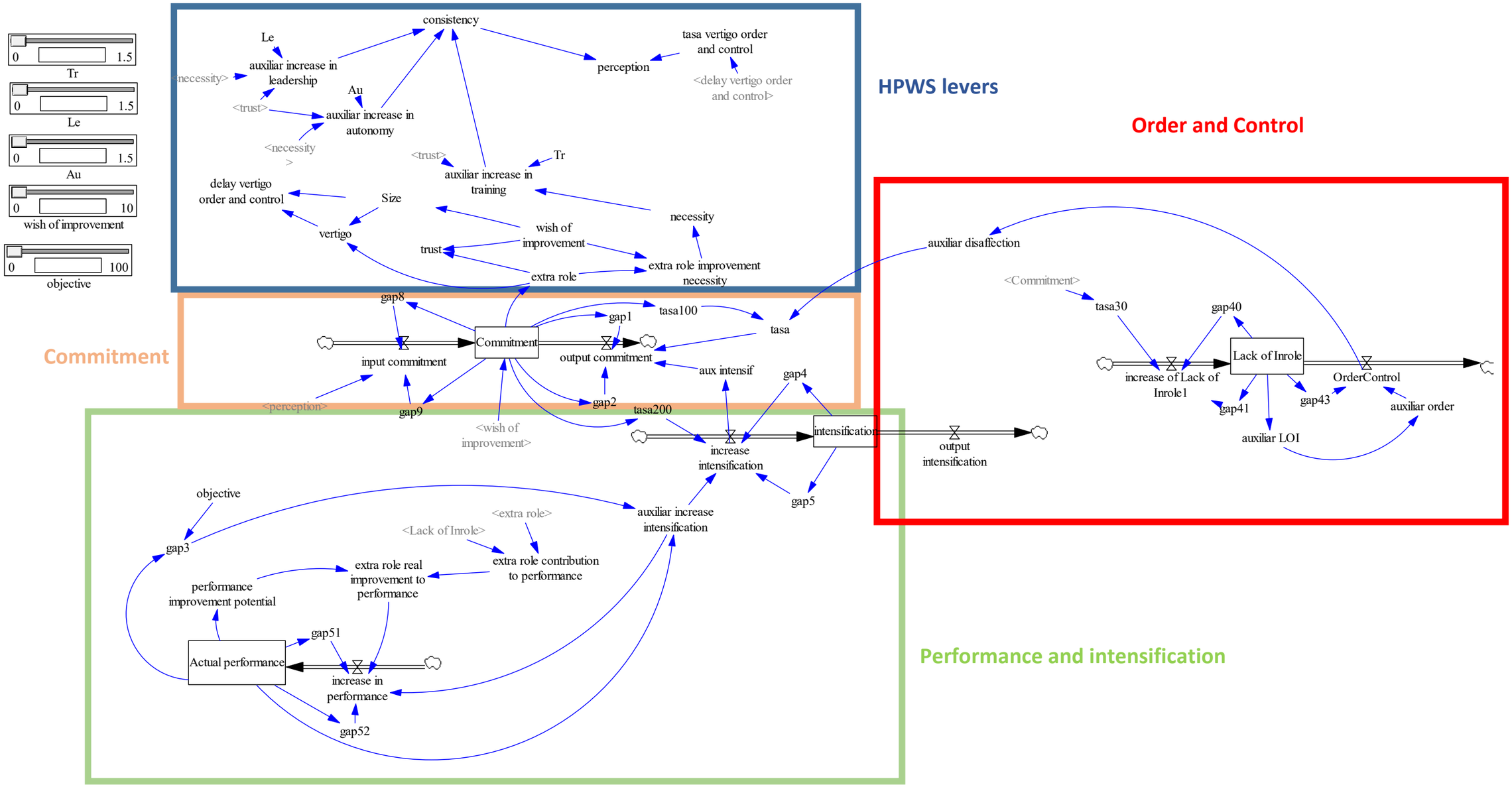

Figure 34: Computational model appearance

It is necessary to mention that the three levers defined in the conceptual model as intensification, relocation and automation are simplified to one in the computational named as "Intensification". The reason is their equal effect on Organisational Performance and Commitment.

Equations of the simulation model are presented in Annex 8.4. The stock and flow diagram of each block is shown in greater detail, together with the equations and units defined for each of the interrelationships in the computational model.

The construction of each archetype is explained in the following pages.

LIMITS TO SUCCESS

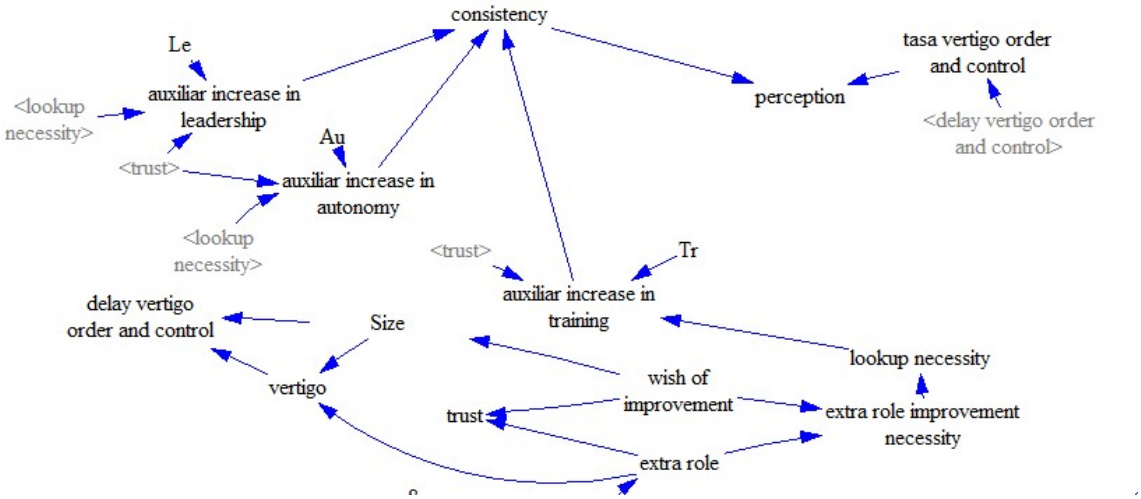

Figure 35: Limits To Success archetype of the levers loop (Bourguet-díaz & Pérez-salazar, 2000)

Figure 35 shows a *Limits To Success* archetype, the three levers are represented by three variables ("auxiliar increase in training", "auxiliar increase in autonomy", and "auxiliar increase in leadership"). These variables are activated depending on the "extra role improvement necessity" and the "trust level". At the same time, trust level is dependent of extra role level. On the other hand, when extra role level increases vertigo feeling increases in the middle management, big companies tend to have higher levels of vertigo (more middle management). Finally, perception of workers is determined by consistency of the implemented levers, and the negative effect of vertigo, which is represented as "tasa vertigo order and control" (more order and control).

Behind this archetype there are two loops, a reinforcing and a balancing loop. In our conceptual model the reinforcing is LOOP 2 (Extra-role behaviour improvement necessity) and the balancing is LOOP 1 (HPWS effect on organisational commitment). Information about equations in Annex 8.4.

FIXES THAT FAIL

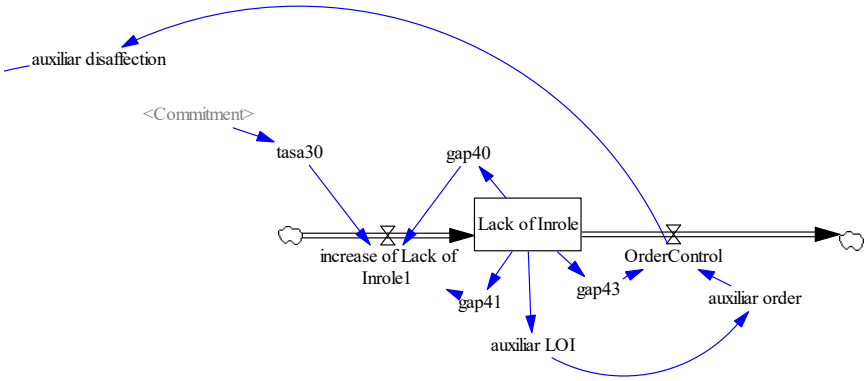

Figure 36: Fixes That Fail archetype of order and control (Bourguet-díaz & Pérez-salazar, 2000)

Figure 36 shows a *Fixes That Fail* archetype, there is one stock, Lack of In Role, and two flows, increase of Lack of In Role, and Order and Control. When the problem (Lack of In Role behaviours) is solved through a Fix (Order and Control), Unintended Consequences (auxiliar disaffection) increase. Commitment level reduces Lack of In Role (LOI).

Behind this archetype there are two loops, a balancing (LOOP 5: Order and control strategy to avoid lack of In Role) and a reinforcing loop (LOOP 4: Disaffection as a result of order and control). Information about equations in Annex 8.4

FIXES THAT FAIL

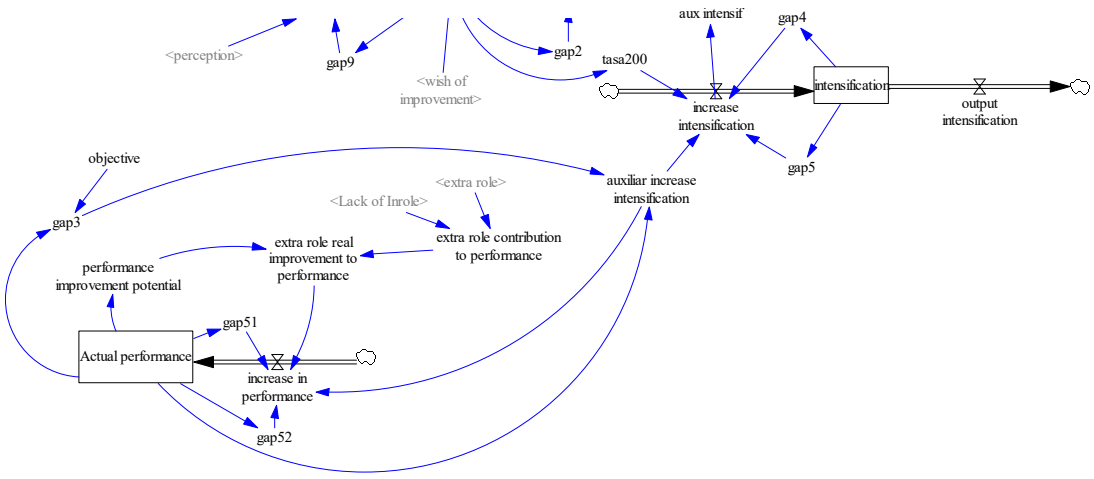

Figure 37: Fixes That Fail, Organisational Performance (Bourguet-díaz & Pérez-salazar, 2000)

In this archetype, Figure 37, a gap between the desired organisational performance (objective) and the current reality, actual organisational performance (stock), can be resolved by taking corrective actions (intensification stock). When Strategic plan review results in actions to improve conditions by ambitious objectives, the gap between necessity of improving and those objectives is increased. In the GMB sessions participants use commonly the term objectives to refer to actual organisational performance. Performance improvement potential refers to the initial point of organisational

performance. It is demonstrated that depending on the initial value, the starting situation, the same action could have different effect. In the case of organisations with high level of organisational performance perception of actions is lower than in the case of organisations with low initial organisational performance value. Organisations which need help perceived in a higher level any practice implementation than the ones which are already in a good situation. Extra role contribution to performance is the variable in which the effect of both extra role and in role behaviours of workers, and its contribution to organisational performance is converged. Extra role real improvement to performance, is the variable which shows the final contribution, taking into account the conversion of extra role and in role and the potential (the initial starting point of actual performance).

In this archetype there are two loops, a balancing (LOOP 6: Organisational commitment-performance relationship, and LOOP 7: Intensification, relocation, and automation to improve organisational performance). Information about equations in Annex 8.4

5.6 MODEL VALIDATION

The validation methods used in this research were Direct Structure and Structure Oriented. Direct structure validation was assured by the inputs themselves: GMB sessions with stakeholders, the literature review, and empirical evidences of Bateratzen database. Structure Oriented validation was done through VENSIM unit check, and simulation of dynamic hypotheses.

Direct Structure validation

Direct Structure Validation was made up by GMB sessions, literature review and empirical evidences from Bateratzen database. People who participated in the GMBs were workers of the companies. These workers had different roles: management, shop floor workers, middle structure managers, and administrative. Participants were responsible for defining the variables and cause-effect relationships. The parts in the model were defined in consensus with all the participants, who know in detail how their organisation works.

It can be stated that principle blocks of the model (explained in Chapter 5.1.4.) are supported by literature review, and thus the model has achieved theoretical validation. As it is already explained in-role and extra-role effect on job satisfaction and organisational commitment is supported by MacKenzie et al. (1998).

“Relationship between actual and perceived HR Practices” is explained by Wright and Nishii (2006); “order and control strategy” was supported by several authors (Arthur, 1994a; Farndale, Hope-hailey, & Kelliher, 2011; Guest, 1997; Mowday, Porter, 1979; Walton, 1985; Whitener, 2001; Wood, de Menezes, 1998). Finally, work intensification effect on commitment is argued by MacKenzie et al. (1998).

Structure Oriented behaviour

The SD model in this research was built using VENSIM PROFESSIONAL. This software checks the dimension of the equations added to the model. In this case positive result

with no errors was achieved due to the achievement of an oscillatory behaviour, which was in accordance with the behaviour defined in the sessions. Thus, the computational model was considered validated.

In addition, the dynamic hypotheses defined in Chapter 4.3.2 were simulated for further validation. The definition of these dynamic hypotheses was done basing on the information collected from interviews with managers and GMB sessions.

In all of them the expected outcome, that is, the expected organisational commitment in each of the situations according to the information gathered in the GMB sessions, and the evidences from the Bateratzen database is presented. After the expected outcome, results from the simulation are shown. Finally, an statement about the fulfilment or lack of fulfilment of the hypothesis is presented.

The simulation context of these dynamics hypotheses is an initial high or low value of organisational commitment. It is demonstrated that the same action could have different effect on the system, depending on the characteristics of the initial situation. In the case of initial high value, commitment started from 8 value, and organisational performance from 80. On the other hand, in the low initial point scenarios, organisational commitment had 1 value, and organisational performance 70. In addition, when simulating all the scenarios, stability of the system is simulated firstly and then, using game option necessary levers are modified. The time horizon selected for simulation were 100 months.

Dynamic Hypothesis 1= When workload is intensified, organisational commitment is reduced (initial high value).

Dynamic Hypothesis 2= Levers are implemented, but organisational commitment result does not increase (initial low value).

Dynamic Hypothesis 3= Levers are implemented, and organisational commitment result increases (initial low value).

Dynamic Hypothesis 4= Training is implemented, and a medium wished extra role is defined, organisational commitment behaves as a boomerang (initial low value).

Dynamic Hypothesis 1 = When workload is intensified, organisational commitment is reduced (initial high value).

Expected outcome: when desired objective of organisational performance is higher than actual performance, workload is intensified to obtain the objective. As a result, actual performance increases. However, this lever implementation has some unintended consequences, the reduction of commitment level of workers. This is an effect of the pressure of intensification in the long term. Thus, the expected outcome is a deterioration of organisational commitment.

Hypothesis simulation: objective of organisational performance is increased from 80 to 100, after 30 months.

Obtained outcome: this scenario shows the negative effect of intensification on organisational commitment, Figure 38. Intensification helps to increase organisational performance in the short term, but it has some unintended consequences on Organisational Commitment, due to the negative effect of pressure suffered by workers.

So, dynamic hypothesis was confirmed.

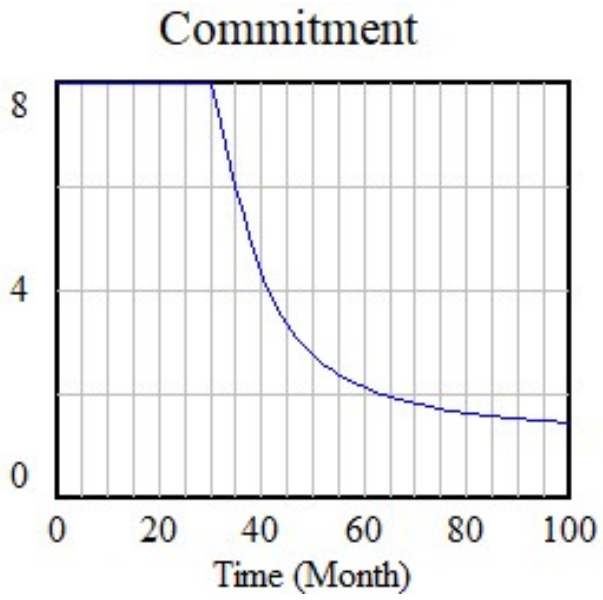

Figure 38: Commitment pattern after intensification

Organisational performance increases due to intensification of workload, see Figure 39. However, there is no perception of implemented HR levers (there is no implementation), because there is no necessity (at the beginning commitment is in high values), see Figure 40. Lack of In Role and Order and Control move in low values (Figure 41). Due to increase of organisational performance, managers do not perceive the necessity of implementing them, see Figure 40.

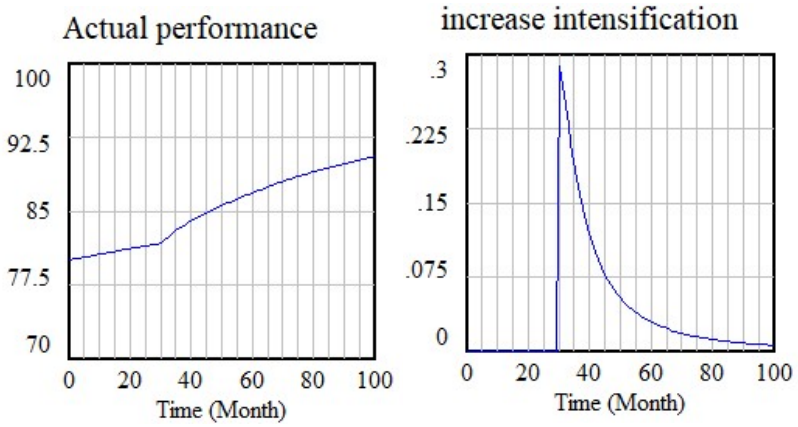

Figure 39: Results of Organisational perfomrance and intensification in DH1

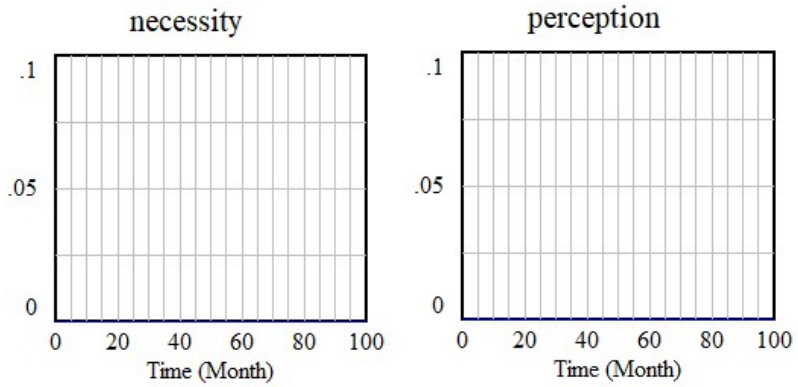

Figure 40: Results of necessity and perception in DH1

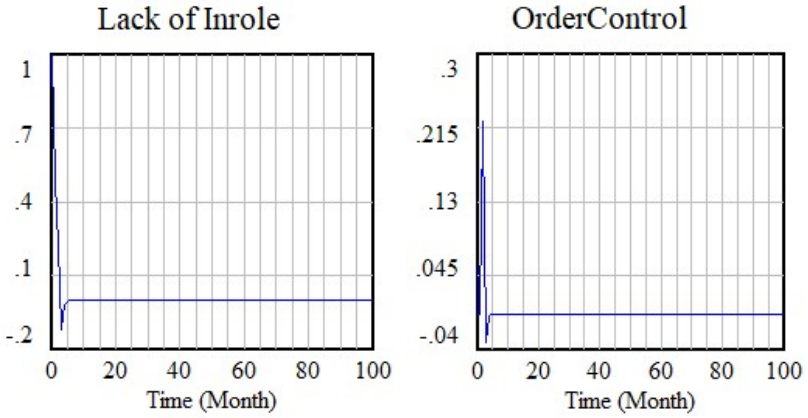

Figure 41: Results of lack of in role and order and control in DH1

Dynamic Hypothesis 2= Levers are implemented, but organisational commitment result does not increase (initial low value).

Expected outcome: when levers are implemented in an inconsistent way (just one of them, instead of applying them consistently), incongruences appear because of the lack of consistence, and the final result is not an increase in commitment, it is an stable commitment level in a low initial value of commitment.

Hypothesis simulation: the variables changed to obtain this hypothesis were: wish of improvement, and Au. "Wish of improvement" was increased to 10 (30th month), the wished level of extra role behaviours is the origin of implementing HPWS levers, and, Au was activated in its maximum level. The meaning of this implementation is a policy of autonomy development in the organisation.

Obtained Outcome: although HPWS practices are implemented, if they are not applied in a consistent way, the positive effects in commitment are not visible, Figure 42. Thus, final commitment is stable in a low value. So, hypothesis is confirmed.

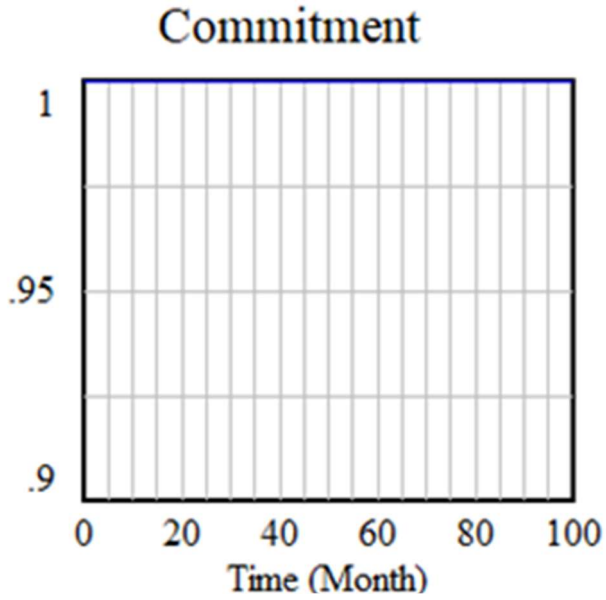

Figure 42: Commitment value in DH2

Organisational performance is damaged in this scenario, because there is no workload intensification, (Figure 43). Sometimes, lack of In Role is in its low values. This is due to two reasons, workers behaviour or order and control application, (Figure 45). Necessity is activated in the 30th month when wished extra role is increased by management, and one lever is implemented, but it has no effect in the long term due to inconsistency, (Figure 44). The implementation of just one lever, with no alignment with the strategy and individually is not perceived by management.

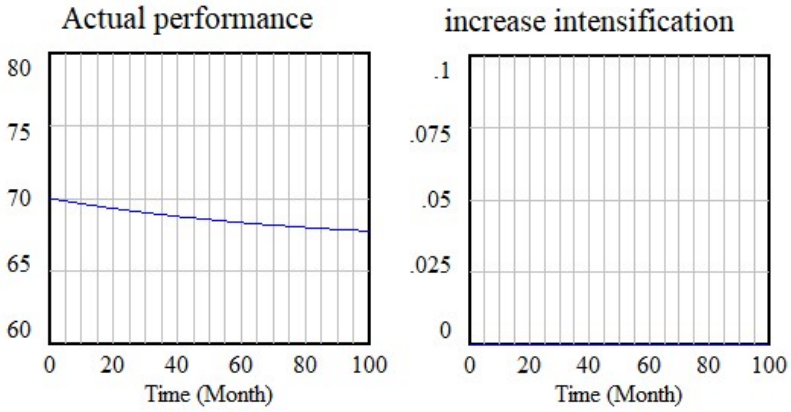

Figure 43: Results of Organisational performance and intensification in DH2

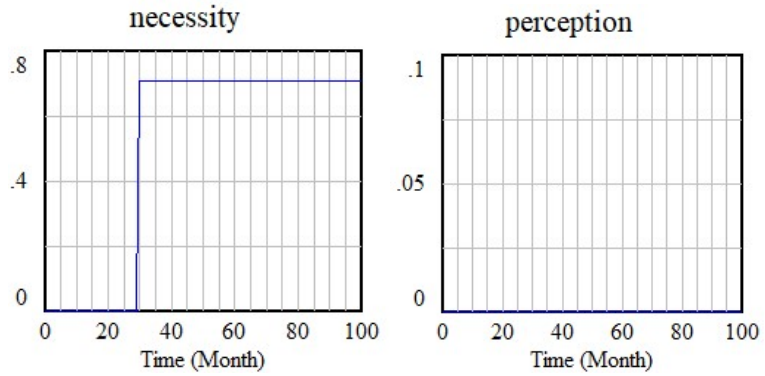

Figure 44: Results of necessity and perception in DH2

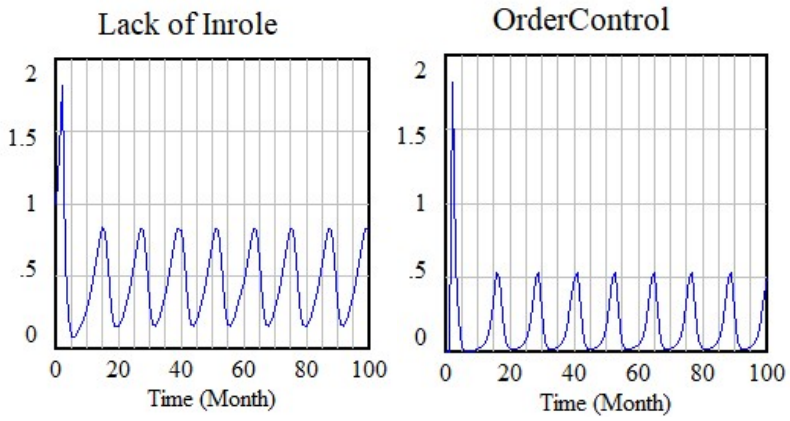

Figure 45: Results of Lack of In Role and Order and Control in DH3

Dynamic Hypothesis 3= Levers are implemented, and organisational commitment result increases (initial low value).

Expected outcome: when levers are implemented in a consistent way (all of them implemented consistently), this action is perceived positively by the workers, and the final result is an increase in commitment, from the initial value to the established objective.

Hypothesis simulation: the variables changed to obtain this hypothesis were: wish of improvement, and Tr. "Wish of improvement" was increased to 10 (30^{th} month), this is the origin of implementing HPWS levers, and, Au and Le were activated. The meaning of this implementation is an organisation in which they invest in autonomy and Transformational Leadership (it is consistent, a strong context is generated from the synergy, it is not an isolated practice implementation).

Obtained Outcome: when HPWS practices are implemented in a consistent way, the positive effects of levers is visible, Figure 46. Thus, final commitment is stable in a low value (1) and after the wished objective increased it rises to obtain the objective. So, hypothesis is confirmed.

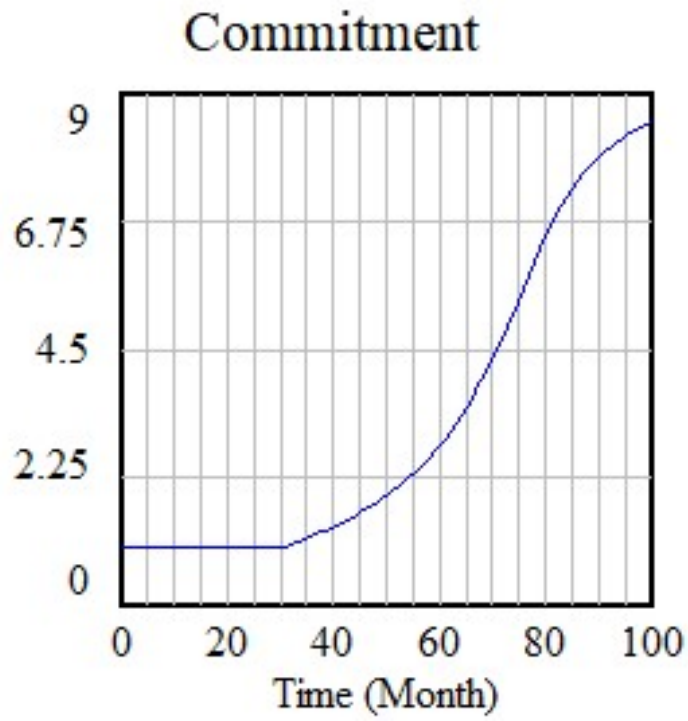

Figure 46: Commitment value in DH3

When commitment does not increase and it is maintained in a low value, actual performance decreases. However, when levers are implemented consistently due to a higher wished extra role by management, actual performance starts to increase, (Figure 47). This erosion is produced as a result of intensification. In addition, necessity of improvement and perception are increased when levers are implemented, (Figure 48); and order and control, and lack of in role are in low values, in Figure 49. When actual performance is increasing management do not feel the necessity of implementing order and control.

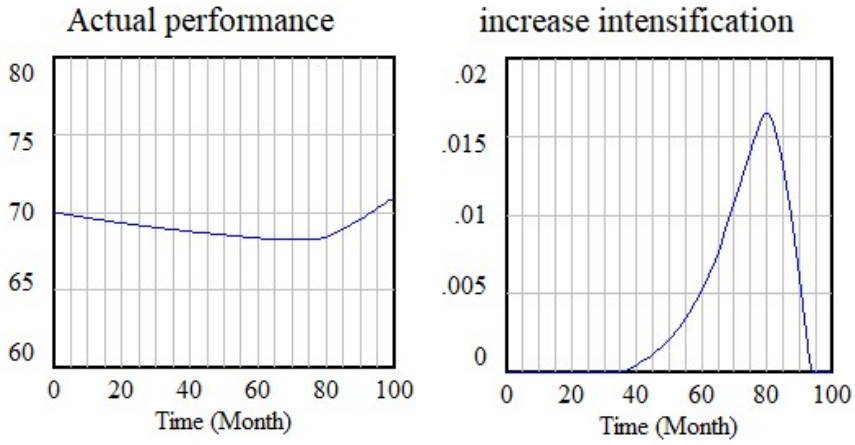

Figure 47: Results of organisational performance and intensification in DH3

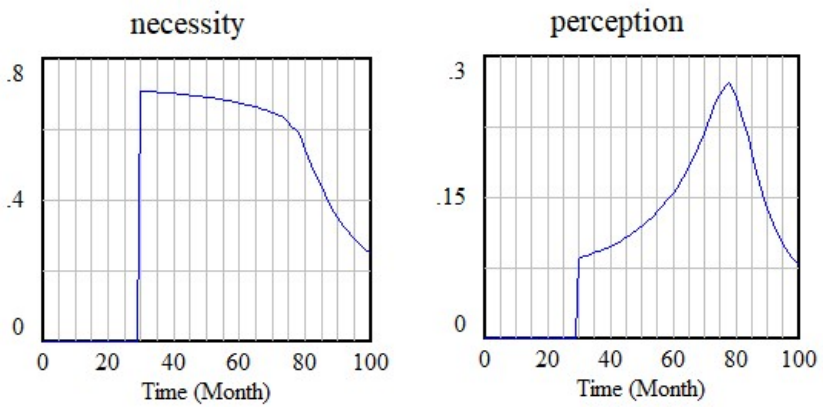

Figure 48: Results of necessity and perception in DH3

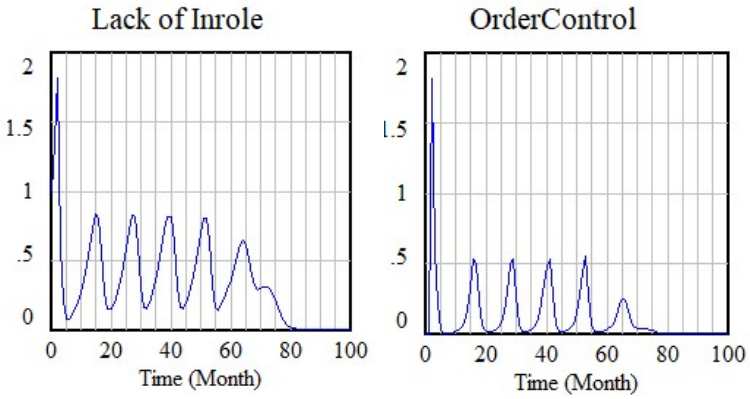

Figure 49: Results of Lack of In Role and Order and Control in DH3

Dynamic Hypothesis 4= Training is implemented, and a medium wished extra role is defined, organisational commitment behaves as a boomerang (initial low value).

Expected outcome: when levers are implemented in a consistent way (all of them implemented consistently), this action is perceived positively by the workers, and the final result is an increase in commitment, from the initial value to the established objective previously explained in dynamic hypothesis 3. However, when there are implemented in an inconsistent way there is no positive effect on perception. In addition, the fact of stablishing just a medium wished extra role, it is perceived negatively, it seems to be not a real wished, it is just a fix to a problem, which has not a positive effect in the long term. Thus, the expected behaviour for organisational commitment, is similar to the boomerang effect, oscillations which final results in a constant low value.

Hypothesis simulation: the variables changed to obtain this hypothesis were: wish of improvement, and Tr. "Wish of improvement" was increased to 5 (30^{th} month), this is the origin of implementing HPWS levers (a new objective), and, Tr, was activated in a medium value. The meaning of this implementation is a punctual investment in training.

Obtained Outcome: although HPWS practices are implemented, if they are not applied in a consistent way, the positive effects of levers are not visible, Figure 50. Thus, final commitment is stable in a low value (1) and after the wished objective was increased in

a medium value it rises to obtain the objective, and decreases again to a low value. This medium wished improvement damages commitment. So, hypothesis is confirmed.

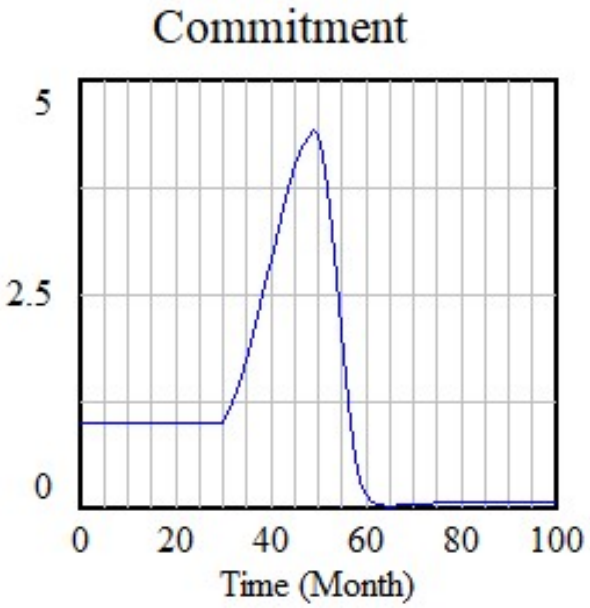

Figure 50: Commitment value in DH4

Actual performance decreases in this scenario, the reason in the inconsistency perceived by workers, (Figure 51). They want to improve (they also intensify in that moment), but they do not all their efforts, the wish is a medium value. So, the effect is not visible in the outcome of actual performance. Workload is intensified in the 30th month, when lever is implemented as a result of the increase of the wished extra role improvement. Perception follows the same pattern of necessity, which is a result of commitment boomerang effect, (Figure 52). Lack of In Role and Order and Control moved in the range of its maximum and minimum levels depending on the value commitment achieves in its curve, (Figure 53).

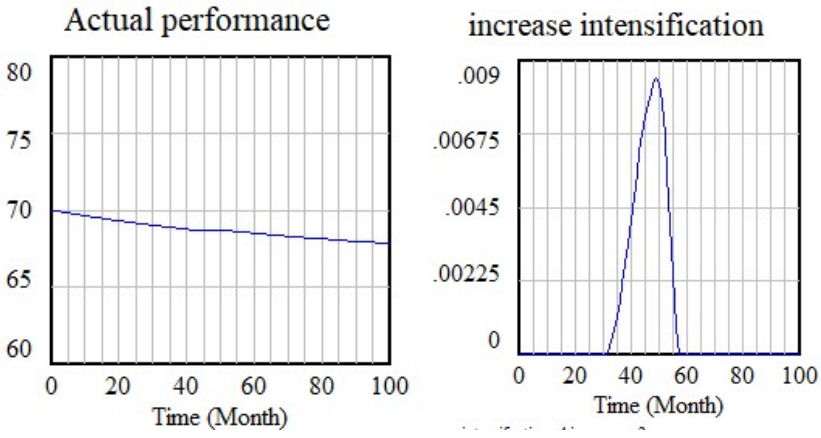

Figure 51: Results of organisational performance and intensification in DH4

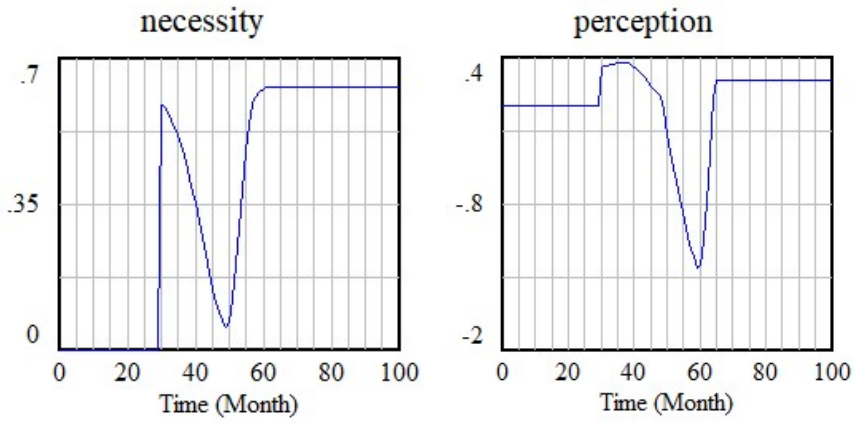

Figure 52: Results of necessity and perception in DH4

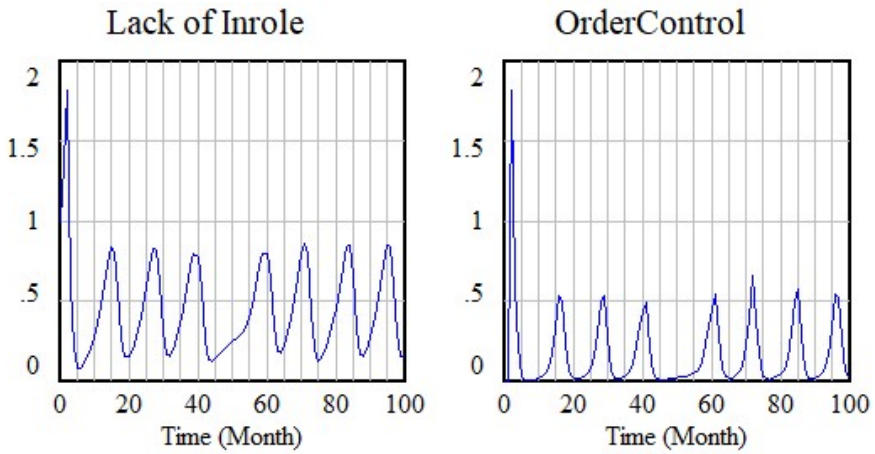

Figure 53: Results of lack on In Role and Order and Order and Control in DH4

Thus, four hypotheses were validated. As mentioned, there are two different scenarios depending on the starting point, and four hypothesis (scenarios observed in the past in the organisations). Starting from a high level of organisational commitment, when workload is intensified, commitment level decreases. The reason is the negative effect of feeling under pressure, this damages directly organisational commitment in the long term. This is a typical scenario in which they have high levels of organisational commitment, and they stablish ambitious objectives (organisational performance). This ambitiousness results in a damage for organisational commitment in the long term. On the other hand, i) consistency of implementing HPWS practices together, and aligned with the organisational strategy, and ii) inconsistency of not doing it in this way is analysed (this is typically implemented in scenarios of low commitment starting point, scenarios in which there is a necessity to improve). In both of them the wish of improving their actual situation is the lever to activate HPWS practices. The principal difference between these two situations is the consistency or lack of it when implementing HPWS practices. Finally, fourth hypotheses showed the boomerang effect produced in commitment, when wished extra role is established in a medium value, and levers are not fully activated. The resulting perception of workers is negative, they do not perceive lever implementation as real, just as a fix for the short term.

Chapter 6

Conclusions

6 CONCLUSIONS

Complexity of systems in which a variety of variables are involved is one of the main characteristics of organisational commitment systems. The short and long term perspectives of the variables even increase the complexity. Understanding of these systems is a difficult challenge which requires a systemic holistic view.

As a result of the lack of understanding, management commonly make decisions in the field related to organisational commitment based on personal experiences and intuitions, instead of using the required empirical tool for such a complex systems. The effect are no effective decisions and actions which have a negative influence on organisational performance.

Therefore, the main objective of this thesis is **to understand the behaviour of organisational commitment using a system dynamics model**. For its definition three different input sources were used: The Literature review, Group Model Building (GMB) sessions with industrial companies and the empirical evidences from Bateratzen database (explained in Chapter 4). The use of these multiple input sources aims to ensure the validation and robustness of the model. The model offers a holistic understanding of the system variables and interrelationships that explain the behaviour of the commitment level of workers.

The computational model is based on the presented conceptual model, and was built after the identification of archetypes. Validation was achieved through various methods what adds value to the model.

6.1. CONTRIBUTION

This research contributes to both SHRM and SD fields of study. The most notable contribution for SD is the fact of combining more than one input source (Literature + GMB + Bateratzen Database). The combination of these input sources for an SD model is not common in the scientific community. The fact of building a simulation model basing not only in Literature, also with the support of 11 GMB sessions and patterns of behaviour from a database supplied by 510 companies represents another step forward for SD.

CONTRIBUTION TO SIMULATION

The first input source was the **literature review**. Human resource practices can be divided into “control” or “commitment” practices (Arthur, 1994; Walton, 1985), and both concepts have been included in our model which is unusual. The “control” approach is based on increasing efficiency and cutting direct labour costs. The main pillars are strict work rules and output based reward procedures. In contrast, the “commitment” approach (explained in greater detail in Section 4.1), is focused more on trying to make people more committed to the organisation in order to increase organisational performance, and defends conditions that encourage workers to identify with the objectives of their organisation and work hard to achieve these goals (Arthur, 1994; Wood, Van Veldhoven & Croon, 2012; Walton, 1985; Whitener 2001).

The second input source came from **eleven GMB sessions in different industrial companies**, and the variables and feedback loops of which define the conceptual model. It is also considered a value adding as it is not common to arrange so many sessions. The variety of sessions gave us the opportunity to achieve different feedback loops related to organisational commitment, and also the assurance of obtaining the saturation point and including the most influential narratives in the final model.

Finally, the third source came from **empirical evidence from the Bateratzen database**. This evidence has contributed to some new narratives about commitment in the workplace including: size of the organisation, workplace design, and intensification of workload. In addition, dynamic hypotheses have been collected based on the patterns of behaviour identified in the database and these hypotheses have been simulated. Therefore, empirical evidence supplied by 510 companies and 72000 surveys fed the model and at the same time validate it, which ensures the robustness and reliability of the results.

Secondly, our insights and contribution according to the heuristic principles for model-based theory building (System Dynamics as Model-Based Theory Building) are also remarkable for System Dynamics (Schwaninger, & Groesser, 2008).

Issue Orientation: the Commitment Simulation Model obtained in this research aims to understand the behaviour of organisational commitment. This understanding appears to be very appropriate for obtaining middle-range theories, in this research the collection of interrelated 7 narratives belonging to the combination of three principal wide ranging theories (HPWS+ Leadership + Trust) can be considered a middle-range theory generation.

Validation: this refers to the quality and degree to which the model represents what it is supposed to represent. In this case, the base of the commitment simulation model were inputs collected from a 510 company database and 11 GMBs, so the model representation corresponded to companies' reality. One of the main principles of validation phase was the loyalty of the computational model to the conceptual. In the last phase, after multiple computational model versions, the decision was to give importance to this fact. In addition, simulated dynamic hypotheses were defined based on patterns of behaviour of the database. Thus, it could be stated that a robust validation was developed.

Explanation: the main objective of the model was to understand the behaviour of organisational commitment, and this understanding is achieved through a conceptual and a computational model. The conceptual model helps to represent and explain which are the interrelationships between the variables part of commitment system and how they work. The computational model represents and simulates the different scenarios (identified with database) related to commitment in the industrial companies.

Concept of learning: theory building is inherently an operation with the characteristics of a learning process. Learning is a progression of states with an even higher potential of effective action (Kim, 1993). Moreover, the model itself could be used as a tool for

managers learning, it can facilitate knowledge to make more effective decisions, as a result of the understanding of the system.

CONTRIBUTION TO SHRM

The insights and understanding obtained from the present research provide a **systems thinking view in the field of SHRM**. This perspective enhances the understanding of the big picture due to holistic view of the system it offers. It provides the short and long term perspective for the understanding of the behaviour of commitment and the representation of patterns of behaviour over time. The analysis of measurable and non measurable factors is enabled, which means that it ensures both the qualitative and quantitative analysis. It helps to resolve problems caused by circular interrelationships, that is, no linear interrelationships, as for example, *x* has an effect on *y*, but at the same time *y* is influenced by *z*, and *y* also influences *x* once again.

The **use of SD models in the field of SHRM** is very limited. Information found in the literature was mainly focused on fields such as, healthcare and project management. Analysis undertaken in the early stages of this research found that just the 2% of case studies used SD in the field of SHRM, see Annex 8.1 where 130 article classification is done. 25% were focused on project management and economy, and the 73% related to policy assessment and ecology. The principal explanation for this could be related to the difficulty of computerisation of "soft" and social variables. It is easier to translate quantifiable variables into mathematical equations rather than qualitative soft variables.

Finally, this research is amongst the first combining **three different and validated input sources for an SD model**. Moreover, the systemic view and understanding of such a complex issue as organisational commitment is, and the multiple interrelated variables in the system, is an appreciated novelty which aids more effective decision making for managers.

6.2. IMPLICATIONS

THEORETICAL IMPLICATION FOR THE FIELD OF SHRM

The principal theoretical implication of this research for the field of SHRM is the **integration of multiple narratives into a unique model**. This model contributes to more effective decision making. The whole system defined in the model is understood as the sum of three wide-ranging theories: HPWS, leadership and trust. The resulting computational model reproduces the interrelationships between these three concepts and commitment through arrows, polarities, and cause and effect relationships.

THEORETICAL IMPLICATION FOR SD

The use of **different input sources** (Literature+ GMB+ Bateratzen database) for the definition of the conceptual model is considered a novelty and adds value to SD simulation. The process of finding similarities and generalisations between the narratives lent validity to the model from the beginning, and thus validation was ensured from the initial phase of the data collection.

PRACTICAL IMPLICATION

Finally, this research has a significant **practical implication for decision makers**. The use of SD simulation modelling for decision making will enhance the managerial learning process and lead to more effective decisions when seeking to foster organisational commitment in order to improve company competitiveness. In addition, the model will generate understanding about the variables that have an effect on organisational commitment and performance.

The simulation of the hypotheses presented significant conclusions for decision makers. The intensification of work helps to increase organisational performance, but it has a negative effect on organisational commitment, confirming the patterns of behaviour collected from Bateratzen. This statement was taken from the behaviour patterns gathered from the database, and the simulation model reinforces this argument. This conclusion is considered general wisdom, when workers feel the pressure and negative tension of workload, it is evident that productivity will improve, but they do not feel committed and motivated by their daily activities, they can not enjoy in such a overwhelming atmosphere. As a result, in this context there is no positive perception of workers of implemented practices by management.

In addition, an important fact to take into account for managers is the consistency when implementing training, autonomy in their workplaces, and positive leadership (Meyer & Smith, 2001). This model demonstrates that an inconsistent implementation of these levers does not have any effect on organisational commitment. When management decides to implement just one of them, instead of implementing these actions together, and aligned with the strategy of the organisation, there are no visible positive effects on organisational commitment. As all facts in the world, when implementing an action just as a fix to short term solutions, they produce the opposite effect to that expected. When management wants and needs to improve organisational commitment of workers, they must define a robust strategy in which everything is aligned with their final objective, they can not play with individual and temporary fixes. These way of managing results in disaffection and frustration of workers.

However, the most effective way of improving organisational commitment is the implementation of a consistent commitment strategy (Meyer, Allen, & Smith, 1993; Meyer et al., 1989; Meyer & Smith, 2001). This type of strategy is the one in which every decision and action made by management is oriented to a global outcome, an outcome that is already known by all the workers and it is real, and achievable. When this type of strategy is dominant in the organisation, organisational climate is positive, workers put all their efforts to improve, and they feel proud of being part of their organisation.

Finally, it is highlighting the boomerang effect generated as a result of the establishment of a medium wished improvement. When management defines a medium improvement, and consequently they do not establish a robust organisational strategy, the increase of organisational commitment is not durable, continuous and persisting in time. This is a situation in which the message given by management and what they actually do is totally

different, it is not in accordance. This scenario is the one in which management says to workers that they want to improve, but actually they do not implement any real action or change to improve, they implement a “medium” improvement. As a consequence, at the beginning, a medium level improvement is perceived due to the message, and organisational commitment increases, but in the long term, workers realise that they are being deceived and their expectations would be frustrated.

6.3. LIMITATIONS

Two limitations are identified in this research. First, all the companies that have taken part in the GMB sessions are industrial. Although the objective was to build a generic model, it could be said that this commitment understanding might not transfer effectively to other sectors. Second, all the companies that have taken part in the GMB sessions are from the same cultural and geographical region. So, the generality of the model could be debatable, this commitment understanding might not transfer effectively to companies from another region.

6.4. FUTURE LINES

The principal future action to implement in the model is the combination of scenarios, that is, to understand the organisational commitment behaviour when several scenarios are applied at the same time. For their validation, case studies will be needed. These case studies to validate simulation results for scenario combinations will be organisations which have already implemented such combinations of scenarios. Expected behaviour patterns can be collected from the Bateratzen database, this will imply an extra work in the surveys, more specific questions redirected to the obtaining of the new expected behaviours (corresponding to the scenario combination).

In addition, the second line is related to the creation of a Serious Game, which can facilitate learning for managers in order to make more effective decisions, interacting with the model with the format of a game.

Chapter 7

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Chapter 8

Annexes

8 ANNEXES

8.1. ANNEX: STATE OF THE ART (SD, ABM, DES)

Table 9: Paper classification depending on technique

PAPER AND AUTHOR	DESCRIPTION OF THE MODEL
Agent-based land-use models: a review of applications (Matthews et al., 2007); **ABM** **POLICY/AGRICULTURE A1**	Model individual entities of decision making process and their interactions. Link micro scale decisions with macro scale phenomena. Explore cooperative relationships. Manage Complex systems. Provide new insight about the topic.
Investigating biocomplexity through the agent-based paradigm (Kaul & Ventikos, 2013) **ABM** **POPULATION/AGRICULTURE A2**	It discretizes the system being modelled into a collection of autonomous decision-making entities that act at each several discrete time steps based on their local information and rule-set attributed to them. Interaction-reliant methodology of the agent oriented approach, seemingly consistent with the mode of operation of biological systems. Simulate non-linear and dynamic behaviour.
Agent-Based Simulation Models in Organization Science (Fioretti, 2013) **ABM** **INNOVATION/ECOLOGY A3**	No background in mathematics is required. Technical hurdle: computer code. Reproduces transitive memory.

PAPER AND AUTHOR	DESCRIPTION OF THE MODEL
An agent-based approach to providing tourism planning support (P. A. Johnson & Sieber, 2011) **ABM** **TOURISM A4**	Study of processes that create a given system. Develop and experiment with different strategies, comparing their impact throughout a system, rather than at a fixed sample location or aggregate scale. Agents can be parameterized with behaviours to govern activity as well as spatial characteristics. Variety of temporal behaviours, allowing each component to operate at a different time scale.
Agent-Based Models as Policy Decision Tools: The Case of Smallpox Vaccination (Grune-Yanoff, 2010) **ABM** **HEALTH/POLICY A5**	Its objective was to make explicit the assumptions that are often hidden behind the appeal to intuitions.
Modelado de sistemas complejos mediante simulación basada en agentes y mediante dinámica de sistemas (Del, 2008) **SD/ABM** **HEALTH A6**	ABM systems' components' direct abstractions. SD analyses the whole system and the relationships inside the system. In ABM direct representations, in SD more hypotheses.

PAPER AND AUTHOR	DESCRIPTION OF THE MODEL
Health system modelling for policy development and evaluation: Using qualitative methods to capture the whole-system perspective (Esensoy & Carter, 2015) **SD** **HEALTH A7**	Policy option's potentiality is developed in this paper.
Colonist household decision making and land-use change in the Amazon Rainforest: an agent-based simulation (Deadman et al., 2004) **ABM** **AGRICULTURE A8**	This research is based on simulation as a methodology for building.
An antology for agent-based modeling and simulation (Christley, Xiang, & Madey, 2004) **ABM** **Theoretical A9**	This is an analysis of the simulation technique.

PAPER AND AUTHOR	DESCRIPTION OF THE MODEL
An agent-based model to simulate tsetse fly distribution and control techniques: a case study in Nguruman, Kenya (Lin, DeVisser, & Messina, 2015) **ABM** **POPULATION A10**	It is required less empirical mathematics by setting movement rules and survival rates for individuals under different circumstances such as variable climate regimes, land use/cover scenarios. Offers flexibility by allowing the user to treat an individual or a group of individuals as agents, depending on preferred details. ABM does not require a training dataset to fit experience mathematics functions. In an ABM each agent is reactive, pro-active, social and autonomous.
Agent-based Modeling, a new kind of research (Held, Wilkinson, Marks, & Young, 2014) **ABM** **Not part of our classification A11**	ABM provides a way to formalize such theories, explore the consequences of our assumptions through computational experiments and ultimately develop tests about the validity of our theories through comparison with empirical data. ABM facilitates the formal representation and analysis of phenomena in marketing and the social sciences. Models seek to capture the essential aspects of their original template and allow us to do something with them that is not possible with the original or let us understand more easily the causal relations in the original by highlighting only the most essential aspects without distracting details. ABMs can model the causal processes that bring about patterns in a population of interdependent entities.
Agent-Based Modeling and Organization Studies: A critical realist perspective (K. D. Miller, 2015) **ABM** **STRATEGY A12**	Suited for developing theories of interactively complex epistemologically-emergent phenomena. Limits to the method lie in the under determination and epistemic opacity of models, the cost of verifying models and correcting errors and restricting agents to rule-based and pseudorandom behaviours.

PAPER AND AUTHOR	DESCRIPTION OF THE MODEL
Agent-based Modeling: A new Approach for theory building in social psychology (Smith & Conrey, 2007) **ABM** **SOCIOLOGY A13**	ABM is perfect for capturing types of complex, dynamic, interactive processes so important in the social world. ABM does not restrict a theorist to a single level of analysis. ABMs are capable of describing the properties of such multilevel interactive systems and lending insights into their implications for the phenomena under study. ABM allows theoretical thinking to cross levels, as modellers seek to understand high level structures of low level agent interactions.
Agent-Based Modeling (Ma Janssen, 2005) **ABM** **SOCIOLOGY/ECOLOGY/AGRICULTURE A14**	Better understanding of the factors that stimulate self-governance (irrigation system). To restrict agent's behaviour. Includes more comprehensive decision rules, and the mismatch between spatial units and units of decision making. Agents to respond to the decisions of stakeholders in unexpected ways.
Agent Modeling of Hispanic Population Acculturation and Behavior (Wallis, Paich, & Borshchev, 2004) **ABM/SD** **SOCIOLOGY A15**	SD for the causal loop diagram of System Hypothesis. ABM for describing individual behaviour and life phases. SD facilitates insights into how the system evolves over time and produces emergent behaviours. SD provides several controls to allow the generation of alternative scenarios.

PAPER AND AUTHOR	DESCRIPTION OF THE MODEL
Agent-based simulation of organic farming conversion in Allier (Deffuant et al., 2002) **ABM** **POLICY-AGRICULTURE A16**	Knowledge of the process. Difficult to evaluate the robustness of the conclusions.
Agent-based spatial models applied to agriculture: a simulation tool for technology diffusion, resource use changes and policy analysis (Berger, 2001) **ABM** **POLICY/AGRICULTURE A17**	It allows the study of a wide range of price and trade policy options. They are robust and less demanding concerning the availability of aggregate data than econometric models. Weakness: They do not explicitly capture the interaction between actors. These models do not fully take into account the spatial dimension of agricultural activities and neglect the role of internal transport costs and the physical immobility of land. Pragmatic treatment of data. Predict the diffusion of specific innovations and assess the policy implications for agents. Able to capture the most important interactions between farm-households. Establish some rules concerning their dynamics.
The role of agent-based models in wildlife ecology and management (McLane, Semeniuk, McDermid, & Marceau, 2011) **ABM** **ECOLOGY A18**	It is distinguished animal densities from habitat quality, represent the environment and dynamism, accommodate spatial patterns and explore feedbacks and adaptations inherent the systems. Comprise autonomous, individual entities, each with dynamic, adaptive behaviours and heterogeneous characteristics. Cell-based environment representation is advantageous because it is computationally simple when compared to the object-based alternative. ABM can be useful to scientists, managers, decision-makers, and even the general public in providing a conceptual and computational framework to simulate the behaviour of environmental systems under various scenarios at multiple scale, to reproduce aspects of the human decision process and the feedback mechanism between natural and human systems, and to help identify appropriate management strategies.

PAPER AND AUTHOR	DESCRIPTION OF THE MODEL
System Dynamics Modeling: Tools for learning in a complex world (J.D. Sterman, 2001) **SD** **STRATEGY A19**	Theoretical performance of the construction of the model.
System dynamics applied to project management: a survey, assessment, and directions for future research (Capelo, Dias, & J, 2009) **SD** **PROJECT MANAGEMENT A20**	SD is used on a relatively small percentage of projects. Applied to individual projects. It is necessary to make system dynamics models easier and less costly to develop. It is necessary a better integration of SD models with traditional project management tools. Relatively few papers about SD in project management. SD is more strategic in nature than more traditional operational project management tools such as work breakdown structures, critical path modelling, and component cost estimating. Ability of SD to complement traditional project management tools by adding a strategic and tactical perspective can add value in combination with traditional tools, a common experience in SD project model applications. Iteration of SD with traditional project management tools might improve application, warrants further research on integration techniques, trial applications, and dissemination of successful approaches. Powerful to build theory and improve practice.
System Dynamics: System Thinking and Modelling for a Complex World (John D Sterman, 2002) **SD** **STRATEGY A21**	Modelling in a context of messiness, ambiguity, time pressure, politics, and interpersonal conflict. It is used to solve problems, no a system Models have boundaries to capture the feedbacks, time delays, and interactions unaccounted for in people mental models Modellers draw on the widest array of data, both quantitative and qualitative Other tools could be integrated in the process

PAPER AND AUTHOR	DESCRIPTION OF THE MODEL
Agent-Based Models (Page, 2005) **ABM** **THEORETICAL A22**	Agent based modelling allows us to consider richer environments with greater fidelity than do existing techniques. Allow us to focus on those aspects of the world that we believe most relevant. Its results can be understood analytically, even proved. Powerful engine for generating insights. They can include more realistic assumptions about behaviour, structure, and timing, that they have greater resonance. Feel more like real economies. Their objects interact according to rules.
An agent-based simulator driven by variants of Self-Organizing Maps (Resta, 2015) **ABM** **ECONOMY A23**	This paper introduces an agent-based simulator driven by variants of Self-Organizing Maps (SOMs), specifically designed to model agents learning in economic systems, as well as to render how they interact and the way such interaction can affect the system general behavior. As a consequence, we developed an environment with SOMs nodes treated as agents that are suitable to simulate economic systems and their evolution over time.
Exploratory Modelling and Analysis, an approach for model-based foresight under deep uncertainty (Kwakkel & Pruyt, 2013) **SD-ABM** **STRATEGY A24**	SD to gain knowledge about the way of working of complex dynamics. SD for testing structural policies. SD for uncertainty, large periods of time, and high dynamical complexity. Causal loop diagrams are often used to communicate feedback loop structures included in System Dynamics models. Objectives of SD, explore plausible dynamics of mineral/metal abundance/scarcity, and (ii) to identify, describe and visualize interesting scarcity scenarios for the client. Using a conjugant gradient optimization algorithm A sensible redesign of the plan would be to make it dynamically adaptive. The hybrid one, non-linear optimization techniques a performance bandwidth could be established across all the uncertainties.

PAPER AND AUTHOR	DESCRIPTION OF THE MODEL
Mnemonic Structure and Sociality: A Computational Agent-Based Simulation Model (Cioffi-revilla, Paus, & Olds, 2004) **ABM** **HEALTH A25**	Explanation of the methodology to develop the model.
Using agent models and data farming **To explore network centric operations (Macal, 2005)** **ABM** **POPULATION/SOCIOLOGY A26**	The number of qualities on the information variables was assumed to be relatively limited and the main interest of this study was to discover network behaviours. Generate simple scenarios in which key relations between dots are described. Each component in the model could be given different settings (sensor, effecting, and hovering at- tributes. Qualities such as latency, communication range, communication capacity, links, information age, sensor range, broadcast range, different leadership styles, and obedience to orders or tactics. Ability to quickly run multiple scenarios as well as scenario variants that represent the area of interest. Can be used to explore Information Age questions and the Network Centric Operational Approach.
Adjustment Costs of Agri-Environmental Policy Switchings A Multi-Agent-Approach (Balmann, Happe, Kellermann, & Kleingarn, 2002) **ABM** **POLICY/AGRICULTURE A27**	Agent's characteristics are described in this research: reactive (responds in a timely fashion to changes in the environment) Autonomous (exercises control over its own actions),goal-oriented (does not simply act in response to the environment), temporally continuous (is a continuously running process), communicative (communicates with other agents, perhaps including people), learning (adaptive) (changes its behaviour based on its previous experience), mobile (able to transport itself from one machine to another), flexible (actions are not scripted) character (believable "personality" and emotional state).

PAPER AND AUTHOR	DESCRIPTION OF THE MODEL
Agent based simulation of a small catchment water management in northern Thailand (Becu, Perez, Walker, Barreteau, & Page, 2003) **ABM** **ECOLOGY A28**	It enables us to simulate the whole catchment features as well as farmer's individual decisions. The social dynamics are described as a set of resource management processes. Decision making process, irrigation management, sequences.
Agent-based integrated assessment modeling: the example (Scott Moss, Pahl-Wostl, & Downing, 2001) **ABM** **SOCIOLOGY A29**	The advantage of agent-based social simulation is that it can combine the problem orientation and commitment to observation of the sociologist and anthropologist with more formal approaches and arguably more careful methodology of the natural scientist. New methodology that itself provides a suitable framework within which to collect observations of the social and physical systems, to generalize from those observations and to identify relationships and processes that must be understood before policies to deal with climate change and its effects can usefully be formulated.
Agent based modeling: methods and techniques for simulating human systems (Bonabeau, 2002) **ABM** **SOCIOLOGY-ECONOMY A30**	It is a system modelled as a collection of autonomous decision-making entities called agents. Individually assesses its situation and makes decisions on the basis of a set of rules. Execute various behaviours appropriate for the system they represent. ABM is a mindset more than a technology. The ABM mindset consists of describing a system from the perspective of its constituent units. Although ABM is technically simple, it is also conceptually deep. This unusual combination often leads to improper use of ABM.

PAPER AND AUTHOR	DESCRIPTION OF THE MODEL
Agent-based modelling of host–pathogen systems: The successes and challenges (Bauer et al., 2009) . **ABM** **HEALTH A31**	Stochastic models used to describe populations of interacting agents, such as insects and people, using simple rules that dictate their behaviours. Ability to generate surprisingly complex and emergent behaviour from very simple rules, including periodic behaviours or intricate spatial and temporal patterns. Agents respond dynamically and independently to changing environmental or discrete event cues. Consequently, nonlinearities and time-delays are not difficult to treat empirically since they can be incorporated into the agent's rules or they may even emerge naturally as a consequence of the system's collective dynamics.
Agent-based modeling of Stem Cell organization in a Niche (Inverno, M., & Saunders, 2005) . **ABM** **HEALTH A32**	An agent-based approach provides more flexibility than other more limited approaches and so delivers greater potential for modelling more sophisticated, glob- ally emergent, behaviour both on the individual cell and on the cell population level. We can explicitly represent an environment. An agent-based approach provides more biological plausibility than existing approaches such as cellular automata and other mathematical approaches. One of the main reasons that biological plausibility is important is to attract biologists to use and work with any models and simulations that are created.
Agent-based spatial models applied to agriculture: **a simulation tool for technology diffusion, resource use changes and policy analysis (Manson et al., 2015).** **ABM** **AGRICULTURE-ECOLOGY A33**	Fish banks, in general animal groups which behave according to some general rules.

PAPER AND AUTHOR	DESCRIPTION OF THE MODEL
An adaptive agent model for analyzing co-evolution of management and policies in a complex rangeland system (Marco a. Janssen, Walker, Langridge, & Abel, 2000) . **ABM** **ECOLOGY-ECONOMY-POLICY A34**	Adaptive agent models show that effective learning and effective ecosystem management do not necessarily coincide and can suggest potentially useful alternatives to the design of policies and institutions. Study patterns and emergent properties arising from interactions between the simple decision. Track and explain the evolution of simulated. Contribute to the development of general principles
An Agent-Based Model for the Investigation of Neovascularization Within Porous Scaffolds (Artel, Mehdizadeh, Chiu, Brey, & Cinar, 2011). **ABM** **HEALTH A35**	The model developed incorporates rules that govern the behaviour of sprouting vessels.
Combining experiments with multi-cell agent-based modeling to study biological tissue patterning (Thorne et al., 2007). **ABM** **HEALTH A36**	Agent-based modeling (ABM), also termed 'Individual-based modelling (IBM)', is a computational approach that simulates the interactions of autonomous entities (agents, or individual cells) with each other and their local environment to predict higher level emergent patterns. A literature-derived rule set governs the actions of each individual agent.

PAPER AND AUTHOR	DESCRIPTION OF THE MODEL
Exploring Complexity in a Human–Environment System: An Agent-Based Spatial Model for Multidisciplinary and Multi scale Integration (An, Linderman, Qi, Shortridge, & Liu, 2005b) . **ABM-** **EALTH A37**	It is based on the construction of the model. Complexity in: -Incorporation of substantial local and individual characteristics -Recognition of the stochastic nature of complex systems. -Explicit characterization of the impact activities at one scale have on patterns at another. -Deeply analysis of the person.
High performance cellular level agent-based simulation with flame for the GPU (Richmond, Walker, Coakley, & Romano, 2010). **ABM** **HEALTH A38**	Cellular level simulations. Creation of an ABM environment. Efficient algorithms for inter-agent communication and birth and death allocation ensure high simulation performance. Flame GPU is a modelling environment allowing high-performance agent-based modelling on computer graphics card hardware.
Introduction to Agent Based Modeling and Simulation (Mann, 2006). ABM-SOCIOLOGY A39	It explains when ABM is necessary, its characteristics, types, and topology.

PAPER AND AUTHOR	DESCRIPTION OF THE MODEL
Measuring pattern outcomes in an agent-based model of edge-effect externalities using spatial metrics (Parker & Meretsky, 2004). **ABM** **POPULATION/SOCIOLOGY A40**	Agent-based models are simulation models in which decision makers are represented as goal-oriented entities capable of responding to their environment and taking autonomous action. Although simulation models may not be formally inductive, through sensitivity analysis modellers can come quite close to a complete understanding of the dynamic system under study (Judd, 1997). Although it is true that a complex system may have a multitude of possible outcomes at a micro scale, outcomes that differ substantially at a micro scale may be quite similar in terms of macro scale, or emergent, properties. ABMs generally incorporate complex dynamic relationships, implying that many possible outcomes are possible, and that small changes in parameter values and initial conditions may result in large changes in model outcomes.
Multi-agent simulations and ecosystem management: a review (Bousquet & Le Page, 2004). **ABM** **SOCIOLOGY A41**	This systemic research uses the tools and methods of the mathematicians who developed that methodology: system dynamics. Interdisciplinary interactions. The notion of the individual in their models of dynamics to gain a clearer understanding of how ecosystems work.
Multi-cell Agent-based Simulation of the Microvasculature to Study the Dynamics of Circulating Inflammatory Cell Trafficking (Bailey, Thorne, & Peirce, 2007). **ABM** **HEALTH A42**	A set of autonomous agents acting according to relatively simple rules give rise to predict “emergent” phenomena that could not be discovered by probing the actions of one agent alone. Individual agents make decisions about which behaviours to exe-cute based on their states and those of their neighbours. In that case, the outcome is not a validation; the model simply outputs exactly what it was programmed to output.

PAPER AND AUTHOR	DESCRIPTION OF THE MODEL
The epitheliome project: multiscale agent-based modelling of Epithelial cells (Smallwood, R., & Holcombe, 2006) **ABM** **HEALTH A43**	This approach was based on the use an individual-based model of the cell which contains the instruction set, and to have no external imposition of behaviour.
Trade-offs, efficiency gains and technical Change-Modelling water management and land use within a multiple-agent framework (Berger & Ringler, 2002) . **SD** **THEORETICAL A44**	In the neighbouring field of agricultural economics, multiple-agent models that represent farmers' decision-making processes and direct interactions have been used to analyse technical and structural change (BALMANN, 1997; BERGER, 2000).
A behavioural approach to feedback loop dominance analysis (D. Ford, 1999) **SD TH** **EORETICAL A44_2**	Feedback loops' characteristics. A direct comparison between method's validity and how the method of loops works.
A fresh look at a policy sciences methodology: **collaborative modelling for more effective policy (Cockerill, Daniel, Malczynski, & Tidwell, 2009).** **SD** **POLICY A45**	The authors have participated in several projects of this type, including one to better understand. Decision makers developed a model that will be the one tool among several to help make a water-resource management decision in south western New Mexico.
Agent based simulation in the study of social dilemma (Wanke, Bruckner, Dreibus, Rieder, & Ryabchikov, 2001). **ABM** **SOCIAL A46**	The assumption that agents act as if they have a consistent set of preferences requires that any single agents' payoffs can be expressed and compared in numerical terms. Real world agents do not in general appear to be guided by the straightforward egotism of classical game theory players. Complexity on assembling the model. Different empirical methods.
Agent-based computational economics: modeling economies as complex adaptive systems (Tesfatsion, 2003). **ABM-** **ECONOMY A47**	Decentralized market economies are complex adaptive systems, consisting. These local interactions give rise to macroeconomic regularities such as shared market protocols and behavioural norms which in turn feed back into the de- termination of local interactions.

PAPER AND AUTHOR	DESCRIPTION OF THE MODEL
Agent-Based Modeling and the Fallacies of Individualism (Epstein, 2011) **ABM** **THEORETICAL A48**	In the social sciences, as in the natural sciences, most mathematical models are “analytical” models rather than computational ones. Agent-based models have the resources to avoid the naïve fallacies of individualism, by incorporating heterogeneous ontologies of agents. But the nonlocal and cross-level dependence of social objects and properties is often overlooked entirely, so they do not even avoid the fallacies in naïve forms.
Agent-based modeling in ecological economics **Scott (Heckbert et al., 2010)** **ABM-SD** **ECOLOGY A49**	Agent-based modelling (ABM) represents autonomous entities, each with dynamic behaviour and heterogeneous characteristics. Agents interact with each other and their environment, resulting in emergent outcomes at the macro scale that can be used to quantitatively analyse complex systems. Dynamic behaviour of heterogeneous agents is represented by decision-making functions, using both rule based and analytical functions as appropriate for the decision-making situation. Various definitions of ABM include perspectives from the particular research context, including individual- based models (IBM), ACE, multi agent systems, and others. ABM in its different guises has two defining features: (1) interactions leading to emergent outcomes; and (2) explicit representation of dynamic behaviour of heterogeneous agents.
Agent-based models and individualism: is the world agent-based? (O'Sullivan & Haklay, 2000) **ABM** **THEORETICAL A50**	Agent-based models (ABM) are an increasingly popular tool in the social sciences. This trend seems likely to continue, so that they will become widely used in geography and urban and regional planning. Life sciences, economics, planning, sociology, and archaeology. We conclude that agent-based models strongly tend towards an individualist view of the social world.

PAPER AND AUTHOR	DESCRIPTION OF THE MODEL
Agent-Based Models Of Land-Use and Land-Cover Change Proceedings(Manson et al., 2015) **ABM** **AGRICULTURE A51**	This document is based on presentations and discussions that occurred at the Special Workshop on Agent-Based Models of Land-Use/Land-Cover Change, held October 4–7, 2001, in Irvine, California. The first paper developed a formal model of a way- finding agent operating within a complex building where other similar agents also were present. The objective there was to express a sequence of models of human decisions of increasing complexity in terms of the formal hierarchy of systems specifications developed by Zeigler (1976).
An agent-based model of sleeping sickness: simulation trials of a forest focus in southern Cameroon (Muller, Grébaut, & Gouteux, 2004) **ABM** **HEALTH A52**	For modelling sleeping sickness, the ABM appears appropriate, for two principal reasons. In this disease, (1) the transmission depends greatly on stochastic events and, (2) geographical locations are deciding factors. The aim is to develop an ABM that would evaluate trypanosomiasis risks in areas following their ecological and human specificities and which serves as a tool for the search for strategies of optimum control.
An individual-based model for traditional Foraging behavior: investigating effects Of environmental fluctuation (Kanarek, Lamberson, & Black, 2008) **ABM** **ECOLOGY A53**	The model is based on discrete dynamic governing equations and state dependent procedures that optimize behaviour at each time step as a result of an individual's current fitness. The Net- Logo programming environment provides a useful agent-based modelling platform in which the simulated system can be implemented (Wilensky [1999]).

PAPER AND AUTHOR	DESCRIPTION OF THE MODEL
An individual-based model of canid populations: modeling territoriality and social structure (Pitt, Box, & Knowlton, 2003) **ABM** **POPULATION A54**	The sensitivity analysis revealed that the model was largely insensitive to individual parameter estimates and could be used to guide management of territorial animal populations with social structure (Bart, 1995). The calibration results suggest that the model structure and parameters accurately portray a real population. This modeling exercise highlighted the importance of litter size and juvenile mortality on population dynamics in canids. The litter size parameters in the model had a significant influence on most of the output variables.
Analysis of habitat-selection rules using an individual-based model (Railsback & Harvey, 2002) **MATH** **ECOLOGICAL A55**	This analysis of alternative habitat-selection rules provides an example of how individual-based models (IBMs) can be used to draw conclusions about theoretical issues in ecology, using methods similar to those applied to other complex natural and human systems (Auyang 1998). Evaluating an IBM's ability to reproduce a range of observed patterns, while varying the assumptions made in the IBM, appears to be a productive way to conduct such analyses.
Beyond dyadic interdependence: Actor-oriented models for co-evolving social networks and individual behaviors (Burk, Steglich, & Snijders, 2007) **MATH** **SOCIOLOGY A56**	An empirical example investigating the co-evolution of friendship networks and delinquent behaviours in a longitudinal sample of Swedish adolescents with the goal of simultaneously assessing selection and influence processes. Findings suggest both processes play a substantive role in the observed dynamics of delinquent behaviours, with influence having a relatively stronger role than selection (especially in reciprocated friendships).

PAPER AND AUTHOR	DESCRIPTION OF THE MODEL
A dynamic model of the systemic causes for patient treatment delays in emergency departments (Cooke, Rohleder, & Rogers, 2010) . **SD** **HEALTH A57**	This model shows that the resolution to the problem is not simple. The relationships and dynamics in the system are interrelated and complex. Addressing where ED patient demand is coming from (including patients who may not be able to access primary care) and what blocks patients from getting out of the ED (including access to hospital beds, specialists, and alternative forms of care) shows the breadth of the problem. Simple policy changes like giving priority of access to ED patients may also not provide any long-term relief due to the feedback loops within the wider system.
An evaluation of the applicability of system dynamics to patient flow modelling (Vanderby & Carter, 2010). **SD-DES** **HEALTH A58**	Systems Dynamics (SD) models do not typically incorporate variability, which has led to the conclusion that it is ill-suited for such applications. Hence discrete event simulation (DES) has been a common vehicle for patient flow analysis, and, as found by Jun et al (1999), has been applied to many settings, including emergency departments (EDs) and outpatient clinics, for objectives such as scheduling patients and staff or determining bed requirements.
Dynamic modeling of product development processes (D. N. Ford & Sterman, 1998) **SD** **STRATEGY A59**	Successful development projects are critical to success in many industries. To improve project performance managers must understand the dynamic concurrence relationships that constrain the sequencing of tasks as well as the effects of and interactions with resources (such as labor), project scope and targets (such as delivery dates). This article describes a multiple-phase project model which explicitly models process, resources, scope, and targets.

PAPER AND AUTHOR	DESCRIPTION OF THE MODEL
Efetividade Do Processo De Comunicação Com Base Na Teoria Do Comportamento Informacional: O Caso De Um Organismo Internacional Da Área Da Saúde Pública Sediado No Brasil(Simonette et al., 2008) **SD** **PROJECT MANAGEMENT A60**	The model represents workflows through a project as a value chain of alternating backlogs and development activities with a rework cycle. The rework cycle is inherent in development projects and has been modeled and used extensively to explain and improve project management (Taylor and Ford, 2006; Lyneis et al., 2001; Ford and Sterman, 1998; Cooper and Mullen, 1993; Cooper, 1980, 1993a, b, c, 1994).
Embracing Complexity and Uncertainty: The Potential of Agent-Based Modeling for Environmental Planning and Policy (Zellner, 2008) **ABM** **ECOLOGY/POLICY A61**	Agent-based modelling, widely used in the study of complexity, natural sciences and increasingly social sciences, is an alternative method that explicitly represents complexity and treats uncertainty in our analyses. These models are typically object-oriented computer programs, where the objects are actors operating at various scales (e.g., residents, farmers, businesses, units of government) making rule-based decisions in an environment characterized by various attributes.
Large Complex Modeling System (S C Brailsford, Lattimer, Tarnaras, & Turnbull, 2012) **SD** **HEALTH A62**	The SD model they constructed has the potential to evaluate the impact of the real system developments that are now envisaged in Nottingham.

PAPER AND AUTHOR	DESCRIPTION OF THE MODEL
Evaluating coyote management strategies using a spatially explicit, individual-based, (Conner, Ebinger, & Knowlton, 2008) . **ABM** **POLICY A63**	This model is a direct descendant of an individual-based stochastic coyote population model that incorporated social structure that was constructed by Pitt et al. (2003).
An agent-based approach for software systems building complex (Jennings, 2001). **ABM** **THEORETICAL A64**	Agent-oriented concepts and techniques are both well suited to developing complex, distributed systems and an extension of those currently available in other paradigms.
Experiences Creating Three Implementations of the Repast Agent Modelling Toolkit (North, Collier, & Vos, 2006). **ABM** **THEORETICAL A65**	Implementation of simulation architectures rather than agent communications languages.
Exploratory modeling for policy analysis (Bankes, 1993). **ABM** **POLICY A66**	Exploratory modeling is using computational experiments to assist in reasoning about systems where there is significant uncertainty. NOT TOOK INTO ACCOUNT
Exploring Complexity in a Human-Environment System: An Agent-Based Spatial Model for Multidisciplinary and Multiscale Integration (An et al., 2005b) **ABM+GIS** **POPULATION A67**	Addresses important issues such as integrating socioeconomics, ecology, and demography.
How to Build and Use Agent-Based Models in Social Science Nigel(Gilbert & Terna, 2000) **ABM** **THEORETICAL A68**	A scheme for structuring a simulation program into agents. NOT TOOK INTO ACCOUNT

PAPER AND AUTHOR	DESCRIPTION OF THE MODEL
Incorporating human behavior in healthcare simulation models (Sally C Brailsford & Harper, 2006) **MATH** **HEALTHCARE A69**	It discusses some of the issues involved in incorporating human factors in simulation models, and we describe two models for screening for different diseases which have at- tempted to include behavioural factors. MATH, NOT TOOK INTO ACCOUNT
Individual-based Computational Modeling of Smallpox Epidemic Control Strategies(Burke et al., 2006) **ABM-HEALTHCARE A70**	The objective of this modeling exercise was to evaluate the potential effectiveness of epidemic control strategies that might be deployed in response to a bioterrorist attack.
Individual-based modeling of ecological and evolutionary processes (DeAngelis & Mooij, 2005) **ABM** **ECOLOGY A71**	These models are effective at projecting the influence of environmental factors on forest productivity and species composition. IBMs are efficient at modelling populations in which the factors of spatial heterogeneity, behavioural complexity, and small population-size effects are important.
Individual-based models as tools for ecological theory and application: Understanding the emergence of organizational properties in ecological systems (Breckling, Middelhoff, & Reuter, 2006). **ABM** **ECOLOGY A72**	Application examples from different fields of ecology are explicated. Plants and animals, active in terrestrial or aquatic environments, exhibit interaction types, which lead to self-organized structural–functional networks resulting from single organism interactions.
Influencing and Interpreting Health and Social Care Policy in the UK (E. Wolstenholme, Monk, McKelvie, & Smith, 2008) **SD** **HEALTHCARE A73**	There is evidence of a willingness to engage in the (often demanding) process of externalizing mental models and also a strong recognition that performance improvement will not come through collecting ever-increasing amounts of data. Indeed there is recognition that the modelling process of itself assists the definition of appropriate data.
Integrating System Dynamics and Enterprise Modeling to Address Dynamic and Structural Complexities of Choice Situations (Golnam & Ackere, 2010) **SD** **STRATEGY A74**	Methods developed to assist managers in the analysis of choice scenarios address these two types of complexities in separation.

PAPER AND AUTHOR	DESCRIPTION OF THE MODEL
Investigating Ontologies for Simulation Modelling (J. a. Miller, Baramidze, Sheth, & Fishwick, 2004) **Not in our classification A75**	Many fields have or are developing ontologies for their subdomains. The gene ontology (GO) is now considered to be a great success in biology, a field that has already developed several extensive ontologies. Similar advantages could accrue to the simulation and modeling community.
Key Challenges in Agent-Based Modelling for Geo-Spatial Simulation (Centre, Advanced, & Analysis, 2008) **ABM** **POPULATION A76**	The models apply different theories and concepts, highlighting how ideas pertaining to urban phenomena can easily be abstracted within agent-based models, helping further our understanding of how cities operate.
Levels of emergence in individual based models: Coping with scarcity of data and pattern redundancy (Latombe, Parrott, & Fortin, 2011) **ABM** **ECOLOGY A77**	Steps in the construction of IBM's.
Modeling Real Options to Switch Among Alternatives in Product Development (D. N. Ford & Sobek, 2003) **SD** **STRATEGY A78**	It uses a system dynamics model of automobile system development at Toyota to: 1) test the hypothesis that Toyota uses real options to switch among alternatives to operationalize set-based development and 2) propose and test a hypothesis of how real options at Toyota add value.
Modeling Farmer Household Decision-making and Its Effects on Land use/cover Change in the Altamira Region, Pará, Brazil (Robinson & Robinson, 2003) **ABM** **AGRICULTURE A79**	A model to better understand how the changing composition and age structures of households in Altamira, Pará, Brazil, effect the land use/cover within each household plot and collectively across the landscape of the region. Results show labour to be the constraining factor in the deforestation of household plots and amount of initial capital to be a factor in deforestation levels for households with no children
Pattern-Oriented Modeling of Agent-Based Complex Systems: Lessons from Ecology(Grimm et al., n.d.) **ABM** **ECOLOGY A80**	It is described here how observed patterns can be used to optimize model structure, test and contrast theories for agent behaviour, and reduce parameter uncertainty.

PAPER AND AUTHOR	DESCRIPTION OF THE MODEL
Reducing Moose–Vehicle Collisions through Salt Pool Removal andDisplacement: an Agent-Based Modeling Approach (Grosman, Jaeger, Biron, Dussault, & Ouellet, 2009). **ABM** **OTHERS A81**	This study investigated whether salt pool removal and displacement, i.e., a compensatory salt pool set up 100 to 1500 m away from the road shoulder, would reduce the number of moose–vehicle collisions. Moose road crossings were used as a proxy measure. The results also highlight a strong potential for the use of ABM in road mitigation planning and wildlife management. It is useful to road ecologists, wildlife biologists, and transportation planners seeking ways to reduce wildlife–vehicle collisions. Models could thus be used to help determine the best locations for mitigation measures such as wildlife underpasses. Changes to habitat composition by human or natural disturbance such as clear-cutting, fires, and climate change could also be introduced into the model to evaluate potential changes to the animal movement behaviour.
Simulating Sleeping Sickness: a two host agent-based model (Alderton, Noble, & Atkinson, 2013) . **ABM** **HEALTH A82**	Agent-based modelling appears to be a tool which can aid this mitigation, particularly as a significant amount of focus has been given to controlling the spread and density of the disease vector.
Structural holes in social networks (Goyal & Vega-Redondo, 2007) **ABM** **POPULATION A83**	How to build economical and social networks is explained.

PAPER AND AUTHOR	DESCRIPTION OF THE MODEL
System Dynamics Mapping of Acute Patient Flows (Lane & Husemann, 2008) **SD** **HEALTHCARE A84**	Department of Health staff wished to use systems modelling to discuss acute patient flows with groups of NHS staff. The aim was to assess the usefulness of system dynamics (SD) in a healthcare context and to elicit proposals concerning ways of improving patient experience. Since time restrictions excluded simulation modelling, a hybrid approach using stock/flow symbols from SD was created. Initial interviews and hospital site visits generated a series of stock/flow map.
The Explanatory Power of Models and Simulations (Weirich, 2011) **ABM** **INNOVATION A85**	Strategic reasoning not only applies within a game but also guides the selection of games to play. Strategic reasoners may anticipate the results of the game that they are playing and may alter the game to achieve better results. Humans may change the context of their interactions by changing their social institutions. Simulations of cooperation gain explanatory power by attending to strategic reasoning. Although humans have only bounded rationality, their strategic reasoning moves them rapidly toward efficient equilibrium and toward beneficial changes in social structure. Strategic reasoning is an important factor behind their behaviour in games of strategy
System Dynamics Mapping of Acute Patient Flows (Lane & Husemann, 2008) **SD** **HEALTHCARE A86**	Department of Health staff wished to use systems modelling to discuss acute patient flows with groups of NHS staff. The aim was to assess the usefulness of system dynamics (SD) in a healthcare context and to elicit proposals concerning ways of improving patient experience.

PAPER AND AUTHOR	DESCRIPTION OF THE MODEL
The Explanatory Power of Models and Simulations (Weirich, 2011) **ABM** **INNOVATION A87**	Strategic reasoning not only applies within a game but also guides the selection of games to play. Strategic reasons may anticipate the results of the game that they are playing and may alter the game to achieve better results. Humans may change the context of their interactions by changing their social institutions. Simulations of cooperation gain explanatory power by attending to strategic reasoning. Although humans have only bounded rationality, their strategic reasoning moves them rapidly toward efficient equilibrium and toward beneficial changes in social structure. Strategic reasoning is an important factor behind their behaviour in games of strategy
The uncertain future of copper (Sauvageau, 2012) **SD** **OTHERS A88**	The global copper system is examined from the perspective of the development of supply and demand and the effects structural and parametric uncertainties in the system have on the development of behaviour in this system.
Using system dynamics principles for conceptual modeling of publicly funded hospital (Wong, Morra, Wu, Caesar, & Abrams, 2012) **SD** **HEALTH A89**	Conceptual model that provides a roadmap to create sustainable improvements in ED (EMERGENCY DEP) waiting times. The conceptual model is built using system dynamics methodology, and illustrates the use of system archetypes, a set of common causal feedback loops that illustrate how well-intended decisions have unintentional side effects

PAPER AND AUTHOR	DESCRIPTION OF THE MODEL
Using System Dynamics to Extend Real Options Use: Insights from the Oil & Gas Industry (S. Johnson, Taylor, & Ford, 2006) **SD** **OTHERS A90**	The work shows that the use of systems dynamics in real option development and valuation can 1) address key challenges facing the real options community and increase the use of real options in the oil and gas industry 2) allow system dynamicity to offer increased value in developing and valuing flexibility and 3) open system dynamics to new markets of research collaboration and potential clients.
Will It Spread or Not? The Effects of Social Influences and Network Topology on Innovation Diffusion. (S. A. Delre, Jager, Bijmolt, & Janssen, 2010) **ABM** **INNOVATION A91**	Innovation diffusion theory suggests that consumers differ concerning the number of contacts they have and the degree and the direction to which social influences determine their choice to adopt. To test the impacts of these factors on innovation diffusion, in particular the occurrence of hits and flops, a new agent-based model for innovation diffusion is introduced.
Boosting the productivity and profitability of northern Australian beef enterprises: Exploring innovation options using simulation modeling and systems analysis (Ash et al., 2015) **MATH** **INNOVATION A92**	Simulation as an innovative teaching method for nurses is presented.

PAPER AND AUTHOR	DESCRIPTION OF THE MODEL
Diffusion dynamics in small-world networks with heterogeneous consumers (Sebastiano a. Delre, Jager, & Janssen, 2007) **MATH** **INNOVATION/STRATEGY A93**	It proposes a diffusion model that explicitly includes consumer decision-making affected by social influences and word-of-mouth processes.
Dynamic Networks and Behavior: Separating Selection from Influence(Steglich, Snijders, & Pearson, 2010)) **MATH** **SOCIOLOGY A94**	A recurrent problem in the analysis of behavioural dynamics, given a simultaneously evolving social network, is the difficulty of separating effects of partner selection from effects of social influence. Because misattribution of selection effects to social influence, or vice versa, suggests wrong conclusions about the social mechanisms underlying the observed dynamics, special diligence in data analysis is advisable.
Dynamic optimal control of process–product innovation with learning by doing (Pan & Li, 2016) **MATH** **INNOVATION A95**	It is presented a dynamic optimal control model of process–product innovation with learning by doing, and extend the model of Chenavaz (2012) to an even more general model in which the firm's cost functions of product and process innovation depend on both the innovation investments and the knowledge accumulations of product and process innovation;
Extended producer responsibility instruments and innovation in eco-design: An exploration through a simulation model (Brouillat & Oltra, 2012) **ABM** **INNOVATION/ECONOMY A96**	Model that models both economical and physical relations between firms, recyclers and consumers. This framework allows an investigation into the connection between physical environmental variables (waste flows, virgin material flows) and economic decisions of agents in the product.
Income distribution inequality, globalization, and innovation: A general equilibrium simulation (Fukiharu, 2012) **MATH** **INNOVATION A97**	Utilizing simulation approach, this paper examines if the income distribution inequality of a country expands through globalization and/or innovation, somewhat modifying the traditional Heckscher–Ohlin model.
Linking public support, R&D, innovation and productivity: New evidence from the Spanish food industry(Acosta, Coronado, & Romero, 2015)) **MATH** **INNOVATION A98**	This research provides novel empirical evidence of the relationship between public support for R&D, firms' R&D expenditure, innovation and productivity in the Food and Beverage (F&B) industry. The empirical framework relies on a modified version of the Crépon–Duguet–Mairesse (CDM) model.

PAPER AND AUTHOR	DESCRIPTION OF THE MODEL
Modeling social influence through network autocorrelation: constructing the weight matrix (Leenders, 2002) **MATH** **SOCIAL A99**	Theories of social influence center around 'communication' and 'comparison'; it is discussed how these can be operationalized in a network analysis context.
Neural Network Modeling, Simulation and Prediction of Innovation Growth in United Arab Emirates (UAE) (Nair, Kumar, & Ahmed, 2014) **MATH** **INNOVATION/POLICY A100**	General Regression Neural Network or GRNN is used in modeling and forecasting Global Innovation Output. Global Innovation Index (GII) provides a detailed analysis of underlying factors influencing year-on-year changes in rankings; identifies the strengths and weaknesses of each country's profile; computes and provides the national indicators based on the certain input and output indicators.
Targeting and timing promotional activities: An agent-based model for the takeoff of new products (S. a. Delre, Jager, Bijmolt, & Janssen, 2007) **ABM** **INNOVATION A101**	Many marketing efforts focus on promotional activities that support the launch of new products. This paper proposes an agent-based model to simulate the efficacy of different promotional strategies that support the launch of a product.

PAPER AND AUTHOR	DESCRIPTION OF THE MODEL
The trade-off between innovation and defense industrial policy: A simulation model analysis of the Norwegian defense industry (Blom, Castellacci, & Fevolden, 2013) **ABM** **INNOVATION A102**	The paper investigates the trade-off between innovation and defense industrial policy. It presents an agent-based simulation model calibrated for the Norwegian defense industry that compares different policy scenarios and examines the effects of a pending EU market liberalization process.
Uses of Agent-Based Modeling in Innovation/New Product Development Research(Garcia, 2005) **ABM** **INNOVATION A103**	This article is an introduction to the ABM methodology and its possible uses for innovation and new product development researchers.
Using online textual data, principal component analysis and artificial neural networks to study business and innovation practices in technology-driven firm (Di Tollo, Tanev, Liotta, & March, 2015) **MATH** **OTHERS A104**	Method that combines principal component analysis, correlation analysis, K-means clustering and self organizing maps for the quantitative semantic analysis of textual data focusing on the relationship between firms' co-creation activities, the perception of their innovation and the articulation of the attributes of their product-enabled services.
Development of a System Dynamics Based Management Flight Simulator for New Product Development (MacInnis, 2004) **SD** **PROJECT MANAGEMENT A105**	This thesis provides an overview of the system dynamics of project management in new product development and insight into the correct policies, procedures, and behaviours that lead to success.
Managing and Modeling Project Risk Dynamics A System Dynamics-based Framework (Rodrigues, 2001) **SD-** **PROJECT MANAGEMENT A106**	A methodology to integrate the use of SD within the established project management process has been proposed by the author.
Trends and Advances in Risk Management (Hillson, 2011) **SD** **PROJECT MANAGEMENT A107**	In order to accommodate and address risk they built a variety of mechanisms, approaches and structures that they are utilized in different levels and situations. This special issue brings together a collection of reflections, insights and experiences from leading experts working at the forefront of risk assessment, analysis, evaluation, management and communication.

PAPER AND AUTHOR	DESCRIPTION OF THE MODEL
System Dynamics in Project Management: Assessing the Impacts of Client Behaviour on Project Performance (Rodrigues, 1999) **SD** **PROJECT MANGEMENT A108**	This approach dispenses with much of the detail required by the traditional tools, but enables modeling of the systemic effects which traditional tools cannot model.
Strategic management of complex projects: a case study using system dynamics (Lyneis, Cooper, & Els, 2001) **SD** **PROJECT MANAGEMENT A109**	The model was used to support the project bid, to identify and manage risks, and to assess the benefit of several process and organization changes which were implemented on the project.
Agent based modeling for simulating taxi services(Grau & Romeu, 2015) **ABM** **PROJECT MANAGEMENT A110**	This paper presents an agent based model for simulating taxi services in urban areas. Taxi models presented in the literature can be grouped into aggregated, equilibrium and simulation models, with the latter having been studied to a lesser extent.
Sustainable revenue management: A smart card enabled agent-based modeling approach(Lovrić, Li, & Vervest, 2013) **SD** **PROJECT MANGEMENT A111**	They developed a decision support tool using an agent-based modeling and simulation approach. The advantage of this microscopic method is its ability to capture the detailed operational and commercial aspects of transportation networks, as well as the heterogeneous consumer preferences relating to product price and service quality.
Agent-based modeling of the energy network for hybrid cars(Gonzalez de Durana, Barambones, Kremers, & Varga, 2015) **ABM** **PROJECT MANAGEMENT A112**	Studies in complex energy networks devoted to the modeling of electrical power grids were extended in previous work, where a computational multi-layered ontology, implemented using agent-based methods, was adopted.
Modeling the diffusion of residential photovoltaic systems in Italy: An agent-based simulation(Palmer, Sorda, & Madlener, 2015) **ABM** **PROJECT MANAGEMENT A113**	It is proposed an agent-based model to simulate how changes to the Italian support scheme will affect the diffusion of PV systems among single or two family homes.

PAPER AND AUTHOR	DESCRIPTION OF THE MODEL
A dynamic feasibility analysis of public investment projects: An integrated approach using system dynamics and agent-based modeling (Jo, Lee, Suh, Kim, & Park, 2015) **ABM+SD** **PROJECT MANAGEMENT A114**	This paper suggests a new approach to dynamic feasibility analysis for public investment projects through an integrated simulation model using SD and ABM. The former SD part elucidates the relationships among system elements that constitute project's benefits and costs, while the latter ABM part depicts users' emergent behaviour with their heterogeneity. A bridge construction case study demonstrates the applicability of the proposed approach.
A framework for model integration and holistic modeling of socio-technical systems (Wu, Fookes, Pitchforth, & Mengersen, 2015) **ABM** **SOCIAL A115**	This paper presents a layered framework for the purposes of integrating different socio-technical systems (STS) models and perspectives into a whole-of-systems model. Holistic modelling plays a critical role in the engineering of STS due to the interplay between social and technical elements within these systems and resulting emergent behaviour.
A systems approach to healthcare: Agent-based modeling, community mental health, and population well-being(Silverman, Hanrahan, Bharathy, Gordon, & Johnson, 2015) **ABM** **SOCIAL A116**	Methods: The study explores the utility of translating an existing (prize winning) software for modelling complex societal systems and agent's daily life activities (like a Sim City style of software), into a desired decision support system. A case study tests if the 3 levels of system modelling approach is feasible, valid, and useful. The case study involves an urban population with serious mental health and Philadelphia's Medicaid population (n = 527,056), in particular.

PAPER AND AUTHOR	DESCRIPTION OF THE MODEL
Agent-based modeling of consumer decision making process based on power distance and personality (Roozmand et al., 2011) **ABM** **SOCIAL A117**	It is proposed an agent-based conceptual and computational model of consumer decision-making based on culture, personality and human needs. It serves as a model for individual behaviour in models that investigate system-level resulting behaviour.
Complex agent networks: An emerging approach for modeling complex systems (Mei, Zarrabi, Lees, & Sloot, 2015) **ABM** **SOCIAL A118**	They look at the combination of these two methods and identify "Complex Agent Networks", as a new emerging computational paradigm for complex system modelling.
Fashions, Habits and Changing Preferences: Simulation of Psychological Factors Affecting Market Dynamics (Janssen & Jager, 2001) **ABM** **SOCIAL A119**	Dynamics of markets from a psychological perspective using a multi agent simulation model. The behavioural rules of the artificial consumers are based on a conceptual meta theory from psychology.
Impacts of knowledge on online brand success: an agent-based model for online market share enhancement (Jiang, Tadikamalla, Shang, & Zhao, 2015) **ABM/SD** **PROJECT MANAGEMENT A120**	The agent-based simulation is a methodology that is well suited for modelling collective diffusion dynamics. Using optimal pricing mechanism and industry data, we introduce an agent-based model to replicate the evolution process of market share for multiple brands competing online.
Leadership emergence in face-to-face and virtual teams: A multi-level model with agent-based simulations, quasi-experimental and experimental tests (Serban et al., 2015) **ABM** **SOCIAL A121**	They offer a multi-level model analysing the roles of degree of team virtually and density of social network ties as boundary conditions on leadership emergence, viewed as a fundamentally social–cognitive process.
Modeling human decisions in coupled human and natural systems: Review of agent-based models (An, 2012) **ABM** **SOCIAL A122**	This paper reviews various decision models used in agent based simulations of CHANS dynamics, discussing their strengths and weaknesses.

PAPER AND AUTHOR	DESCRIPTION OF THE MODEL
Modelos basados en agentes: aportes epistemológicos y teóricos para la investigación social (Rodríguez Zoya & Roggero, 2015) **ABM** **SOCIAL/POLICIES A123**	The use of ABM constitutes a methodological tendency expanding in contemporary social sciences. The purpose of this work is to introduce social scientists to the main ideas of the agent-based models as they are articulated with certain theoretical and methodological problems of the social sciences.
I'm Game! (Smith & Conrey, 2007) **ABM** **SOCIAL A124**	They discuss agent-based models as research tools for developmental and social psychology. "Agents" are computer-based entities, e.g., individual people or animals. To construct an agent-based model, the modeler assigns the agents real-world roles and rules, and then studies the model through conducting simulation experiments in which the agents follow their rules, and observes real-time data. Agent-based models are dynamic, expressive, and afford immediate feedback.
Social Theory and Agent Architectures (Sallach, 2003) **ABM** **SOCIAL A125**	The second theme uses a relatively specialized epistemological focus, the social situation as a focus of attention and action, to illustrate how agent architectures based on that focus may contribute to scientific progress and, in particular, how they may need to evolve. Agent research innovation.

PAPER AND AUTHOR	DESCRIPTION OF THE MODEL
Sociology and simulation: Statistical and qualitative cross-validation (S. Moss & Edmonds, 2005). **ABM** **SOCIAL A126**	The core of this article is an agent-based simulation model that relates some aspects of social influence between households to their aggregate water demand patterns.
Stochastic Collusion and the Power Law of Learning: A General Reinforcement Learning Model of Cooperation (Flache & Macy, 2002). **ABM** **SOCIAL A127**	Two prominent examples, the Bush-Mosteller stochastic learning model and the Roth- Erev payoff-matching model, are aligned and integrated as special cases of a general reinforcement learning model. Both models predict stochastic collusion as a backward-looking solution to the problem of COOPERATION IN SOCIAL DILEMMAS based on a random walk into a self-reinforcing cooperative equilibrium.
Testing the impact of social forces on the evolution of Sahelian farming systems: A combined agent-based modeling and anthropological approach (Saqalli, Gérard, Bielders, & Defourny, 2010). **ABM** **SOCIAL A128**	This article presents the results of a methodology based on an extensive sociological fieldwork in three different sites settled along a gradient of aridity in Nigerien Sahel. This fieldwork led to build a set of rules for the behaviour of individuals in non-pastoralist villages. We implemented these rules into an agent-based model simulating three village archetypes.
The logic of social sharing: an evolutionary game analysis of adaptive norm development.(Tatsuya, Takezawa, & Hastie, 2003) **MATH** **SOCIAL A129**	Based on anthropological findings, they developed a theory about how the communal-sharing norm emerges and is maintained. Then, using evolutionary computer simulations, we test several hypotheses about the conditions under which the norm will dominate social resource sharing.
Application of discrete-event simulation in health care clinics: A survey (Jun et al., 1999) **DES** **HEALTH A130**	The rapid growth in simulation software technology has created numerous new application opportunities, including more sophisticated implementations, as well as combining optimization and simulation for complex integrated facilities. This paper surveys the application of discrete-event simulation modelling to health care clinics and systems of clinics (for example, hospitals, outpatient clinics, emergency departments, and pharmacies). Future directions of research and applications are also discussed.

Table 10: Article classification

	Policy	Agriculture	Innovation	Tourism	Health Sciences	Popul.	Sociology	Ecology	Project m.	Civil, etc.	Strategy	Economy
AB	A1,A16, A17,A27, A29,A34, A63,A61, A5	A1,A8, A14,A16, A17,A27, A28,A44, A51,A79,A33	A3, A94,A99, A100,A101, A85, A87, A91,A96, A102,A103	A4	A5, A25, A31, A32, A35, A36, A37, A38, A39, A42, A43, A52, A57,A70, A82,A76	A10, A40, A54, A56, A63, A67, A2, A72, A76, A82, A15, A26	A13,A14, A15,A29, A30, A113,A115, A116,A117, A118, A46, A122,A123, A124,A125, A126, A119, A121,A37, A56, A54,A41, A40,A39, A26,A128, A127	A3,A14, A18, A33,A49, A55, A61,A71, A77,A80, A28,A2, A34,A44, A53,A72	A110, A111, A112, A113, A114, A120	A24, A64,A81	A12, A53, A94, A118	A23, A30, A34, A47,A94
SD	A7,A21, A45				A7,A58, A62,A73, A84, A57,130, A86, A89	A41, A15	A15	A49	A20, A60, A104, A105, A106, A107, A109, A112, A108	A21, A24, A88, A78, A90	A19, A21, A24, A59, A74, A78	

This analysis was developed and presented in the research plan on June, 2016. The reason for just presenting SD and ABM applications was the limiting amount of DES simulation models in the field of SHRM. As could be seen the use of SD in HRM (Sociology) was a 2%. 25% were focused on project management and economy, and the 73% related to policy assessment and ecology.

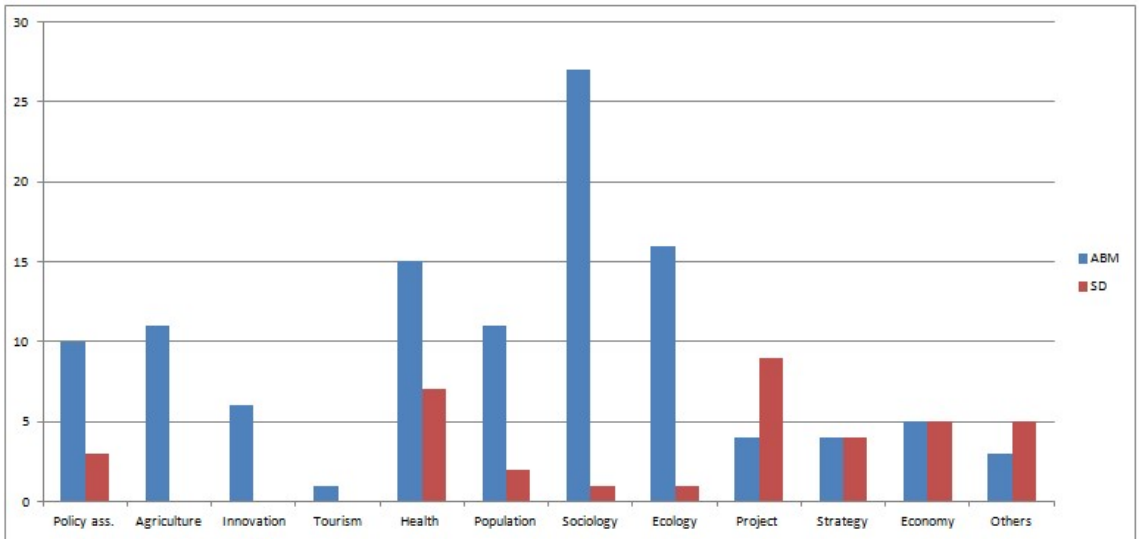


Figure 54: State of the art of simulation techniques

8.2. ANNEX: SCENARIOS AND DYNAMIC HYPOTHESES

This annex shows the commitment average per year measured of each of the industrial companies of analysis. These measures were used to define the patterns of behaviour (Chapter 4.3) of commitment and implemented HR system of practices.

Table 11: Companies of which commitment average was measured

Company	2010	2011	2012	2013	2014	2015	2016	2017
1C					4,63			4,5
2C				4,56				4,74
3C				3,35		3,24		
4C			4,34		4,81			4,92
5C		4,65				4,8		4,61
6C				4,57		4,3		4,03
7C	3,37			4,03				3,88
8C	4,28			4,26		3,79		3,85
9C			3,67				3,81	
10C		4,09		4,64			4,55	
11C		4,11		4,05		4,53		3,97
12C		4,8					4	
13C		3,37					3,91	
14C		3,21					3,25	
15C	3,57					3,94		
16C	3,8			3,49			3,56	
17C		3,35		4,49			4,37	
18C		4,28		4,06		4,51		
19C		4,26					3,89	
20C			3,66				4,3	
21C			4,74				4,31	
22C	2,92		3,32				3,4	
23C	4,09			4,42			4,53	
24C						3,61		3,09

Table 12: Companies of which Implemented HR system of practices was measured

Company	2010	2011	2012	2013	2014	2015	2016	2017
1C					4,44			5,52
2C				4,66				5
3C				4,14		4,03		
4C			4,55		5,05			4,7
5C		3,29						4,54
6C				4,6		4,78		4,58
7C				4,42				4,64
8C				4,71		5,07		5,09
9C			4,47				4,86	
10C				4,72			4,71	
11C		4		4,36		4,51		4,37
12C		4,27					4,86	
13C		3,62					4,71	
14C		3,1					3,98	
15C	3,3			4,29		4,51		
16C	4,18						4,79	
17C		4,65		4,55			5,1	
18C		3,62		4,87		5,12		
19C		5		4,28			4,18	
20C	4,63					5,17		
21C			4,26				4,3	
22C			3,92				4,47	
23C	4,19			5,09			5,24	
24C						3,55		3,57

8.3. ANNEX: GROUP MODEL BUILDING SESSIONS

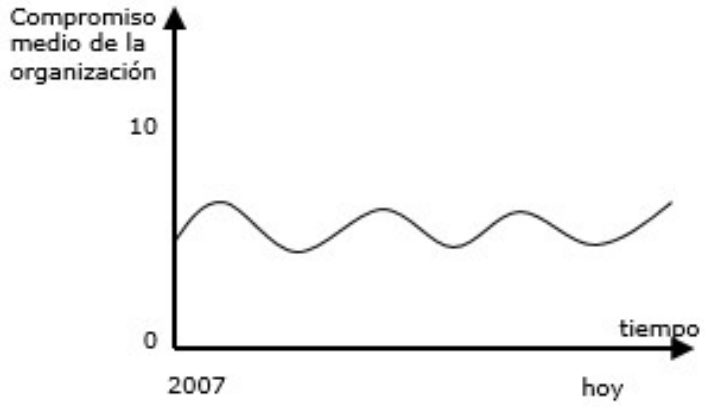
These sessions were developed in both Basque and Spanish, so the following cases are reproduced as in the reality were done.

GROUP MODEL BUILDING ONE

1. NAME: A

2. CHALLENGE/PROBLEM: Improvement of workers COMMITMENT to achieve a win-win relationship between: (i) People, well-being and feeling as a part of the organisation, (ii) organisation, better sustainability or competitiveness.

3.TIME HORIZON:



4. EXCHANGE OF VARIABLES:

-Cambio estilo vida

-Desconfianza

-Lana behera, esfortzua ez bada

rekonpentsatzen ekonomikoki

-Falta de reconocimiento

-Falta de llamadas de atención

-Arazo garrantzitsuen falta

-Emaitza onak azken urteetan

-Salmentak gora

-Jardunaldiak gora

-Beti berdin

-Ilusión proyecto

-Pausoz pauso aurrera

-Danok batera lana

-Jende asko

-Zatiketa organoen artean

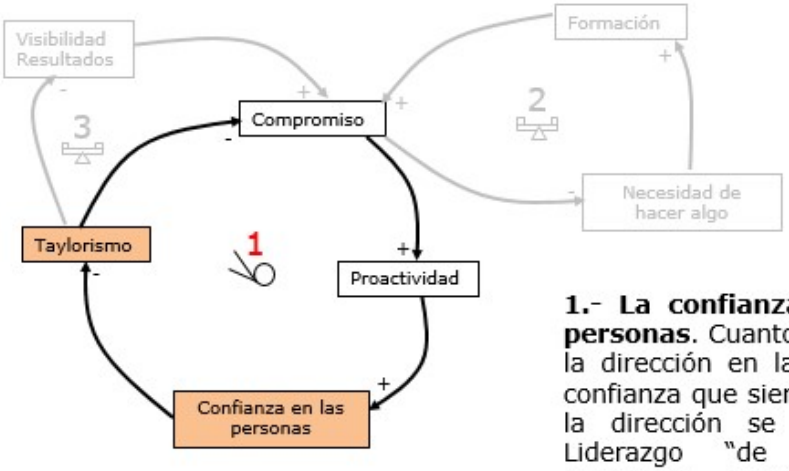
-Ekipoan jendea ez inplikauta

-Transparentziak gora

-Balorazio sistemak behera

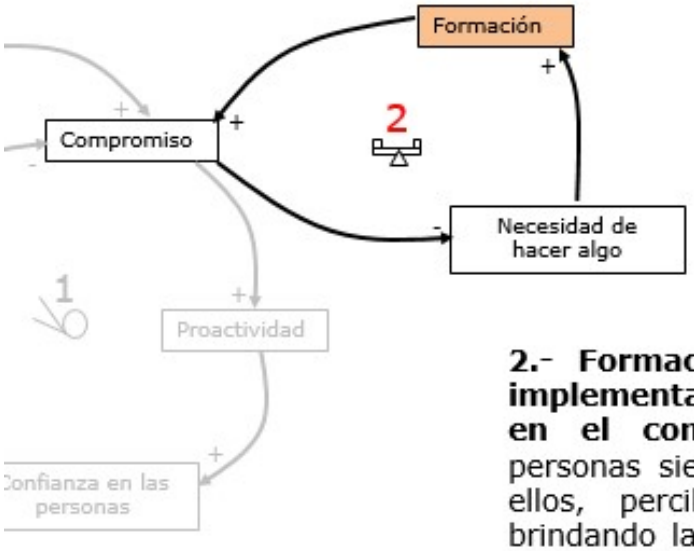
5. FEEDBACK LOOPS

First Loop



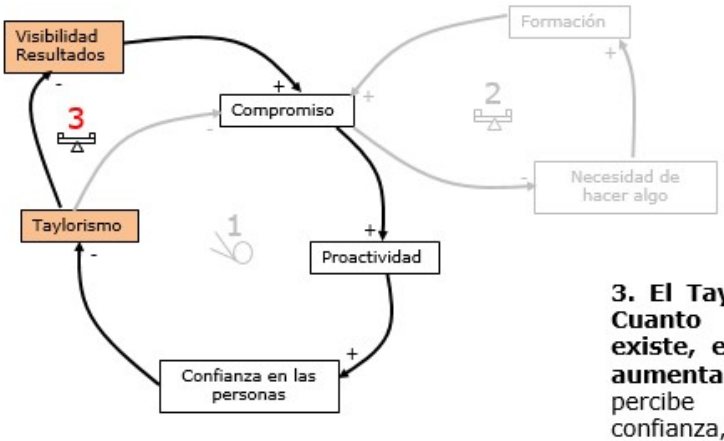
1.- La confianza de la dirección en las personas. Cuanto mayor compromiso percibe la dirección en las personas, mayor será la confianza que siente en ellas. La confianza de la dirección se traslada a un estilo de Liderazgo "de apego" (escucha alta, positividad, refuerzo positivo, apoyo a las personas, etc). Este estilo de Liderazgo produce un efecto positivo en el nivel de compromiso de las personas.

Second Loop



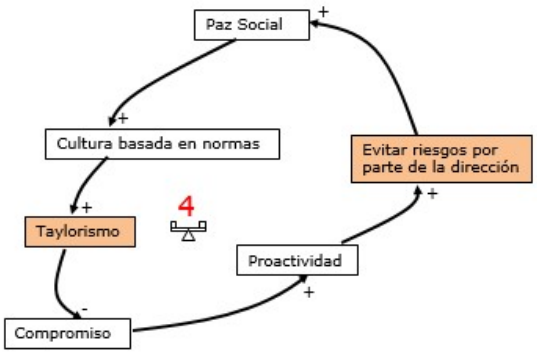
2.- Formación. Influencia de la implementación de prácticas HRM en el compromiso. Cuando las personas sienten que se invierte en ellos, perciben que se les está brindando la oportunidad de avanzar profesionalmente, lo que aumenta el nivel de compromiso.

Third Loop



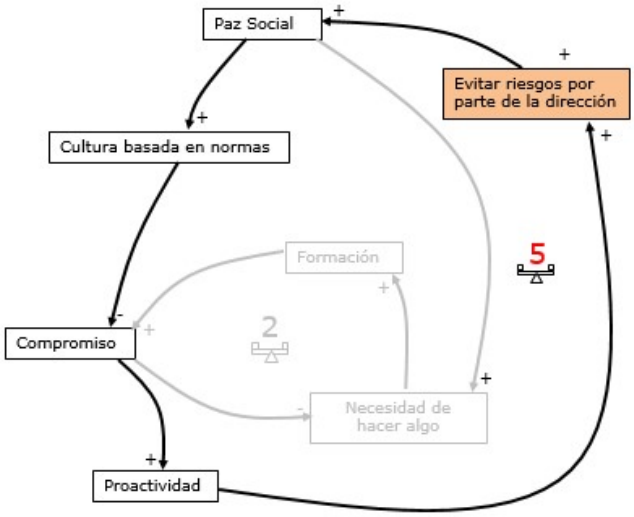
3. El Taylorismo y el "control". Cuanto mayor compromiso existe, el nivel de proactividad aumenta. Cuando la dirección percibe esto, mayor será la confianza, menores serán los mecanismos de "Taylorismo" (Control, falta de transparencia, intensificación del trabajo...). Cuanto mayor es la visibilidad y transparencia en resultados, mayor será la implicación de las personas.

Fourth Loop



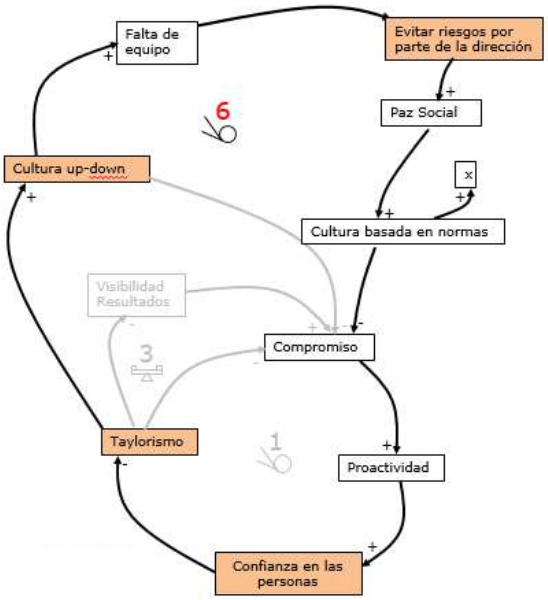
4.- El ambiente de trabajo. Un nivel de compromiso relativamente bajo conlleva a comportamientos individualistas ("que el siguiente se busque la vida") y también a comportamientos poco respetuosos con otros compañeros (sobre todo si ciertas personas tienen un carácter especial). Estos comportamientos de falta de ayuda, respeto, etc deriva en un mal ambiente y este mal ambiente influye en la tensión que viven entre ellos, que a su vez influye en la satisfacción y compromiso de las personas. Por este motivo, la dirección busca "evitar riesgos", para conseguir paz social, lo que es entendido como buen ambiente de trabajo. Y así reducir la cultura basada en normas y el Taylorismo, el cual reduce considerablemente el nivel de compromiso.

Fifth Loop



5.- El ambiente de trabajo. Un nivel de compromiso relativamente bajo conlleva a comportamientos individualistas ("que el siguiente se busque la vida") y también a comportamientos poco respetuosos con otros compañeros (sobre todo si ciertas personas tienen un carácter especial). Estos comportamientos de falta de ayuda, respeto, etc deriva en un mal ambiente y este mal ambiente influye en la tensión que viven entre ellos, que a su vez influye en la satisfacción y compromiso de las personas

Sixth Loop

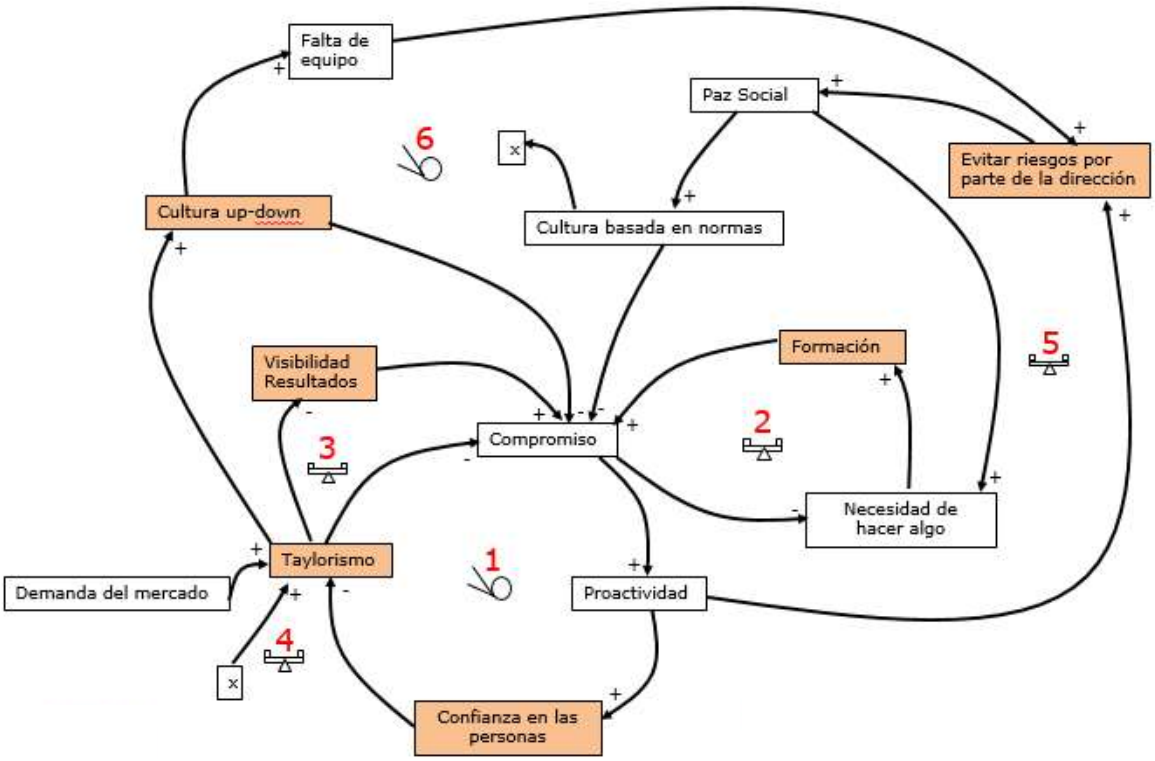


6. El trabajo en equipo y la cooperación.

Cuanto más bajos sean los comportamientos de cooperación y ayuda entre los compañeros, mayor será la necesidad de tener que actuar en este sentido. Cuanto mayor sea el estándar deseado (en términos de patrón de comportamiento deseado dentro de la organización) por parte de la organización, mayor será la necesidad de tener que actuar en este sentido.

Una mayor necesidad llevará a la organización a poner en marcha iniciativas de fomento del trabajo en equipo e iniciativas de gestión de conflictos. Estas iniciativas mejorarán los comportamientos de cooperación y ayuda mutua entre las personas.

6. GENERAL DIAGRAM

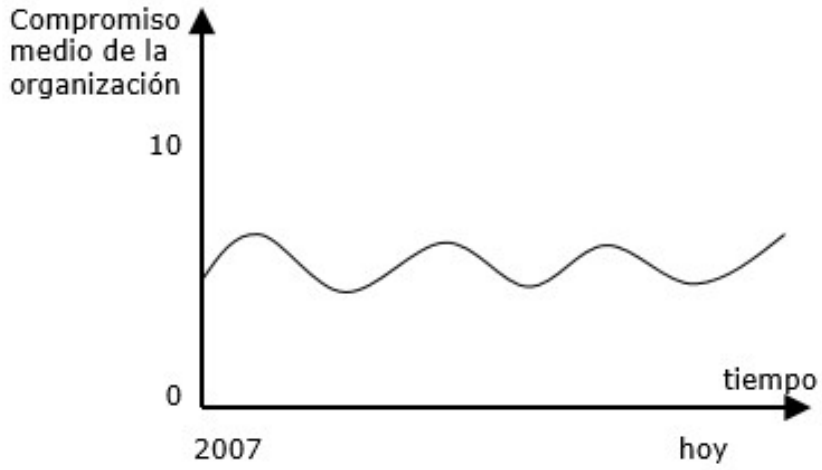


GROUP MODEL BUILDING TWO

1. NAME: B

2. CHALLENGE/PROBLEM: Improvement of workers COMMITMENT to achieve a win-win relationship between: (i) People, well-being and feeling as a part of the organisation, (ii) organisation, better sustainability or competitiveness.

3. TIME HORIZON:



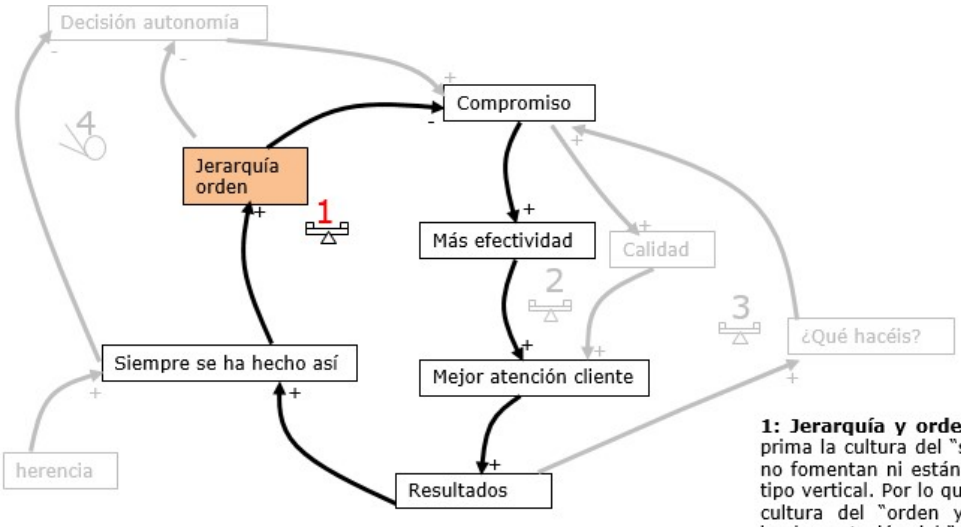
4. EXCHANGE OF VARIABLES:

- Mejor atención cliente
- Mejor calidad
- Más efectividad producción
- Jerarquía
- Siempre se ha hecho así
- Flexibilidad horaria
- Formación
- Información
- Carga trabajo
- Complicidad amistad
- Mejor ambiente

- Desarrollo profesional/personal
- Mejor coordinación
- Trabajo equipo, apoyo
- Participación decisiones colectivas
- Poder, opinar y decidir
- Relación con el cliente
- Mejores resultados
- Transparencia

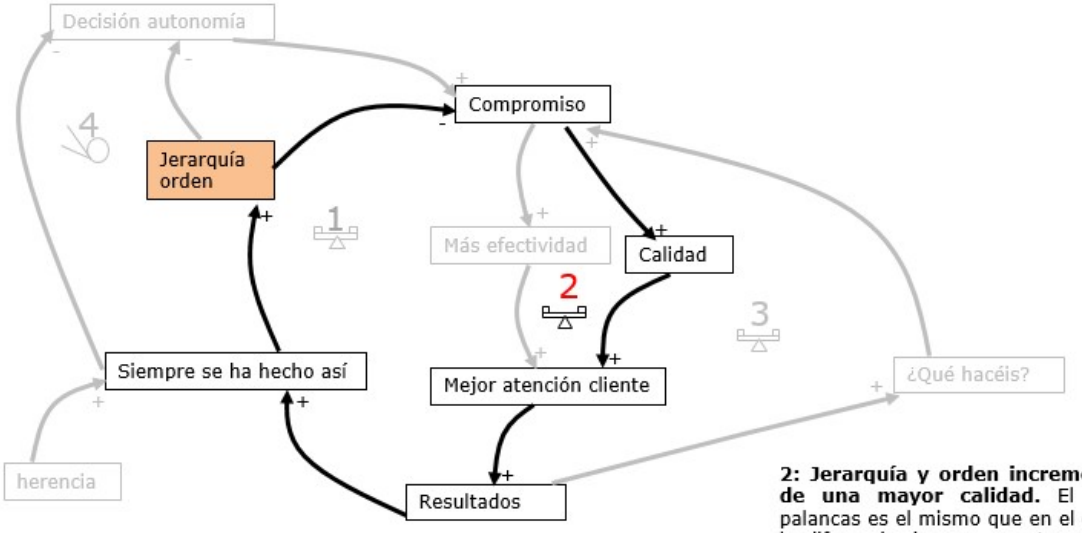
5. FEEDBACK LOOPS

First Loop



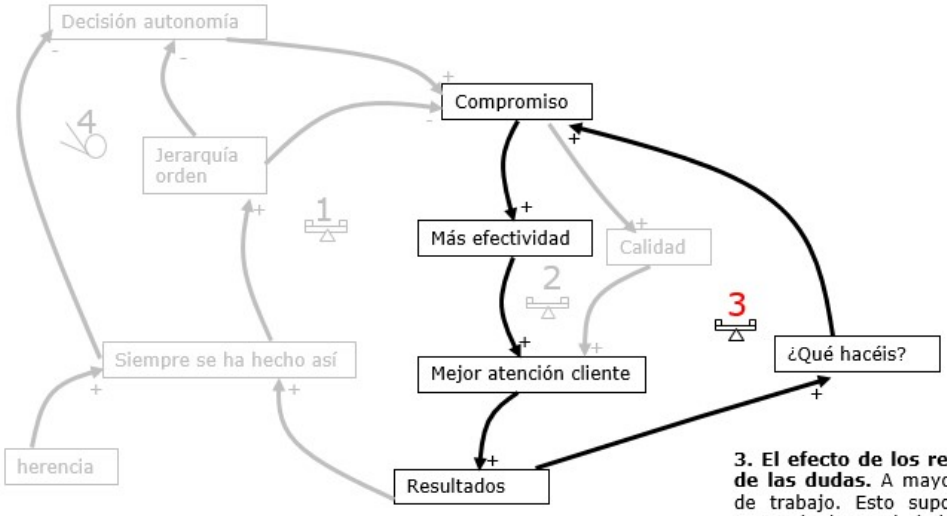
1: Jerarquía y orden. Las organizaciones donde prima la cultura del "siempre se ha hecho así", que no fomentan ni están dispuestos al cambio, son de tipo vertical. Por lo que, aparecen las jerarquías y la cultura del "orden y control". La jerarquía y la implementación del "orden y control" como palanca para la gestión, el compromiso se ve reducido.

Second Loop



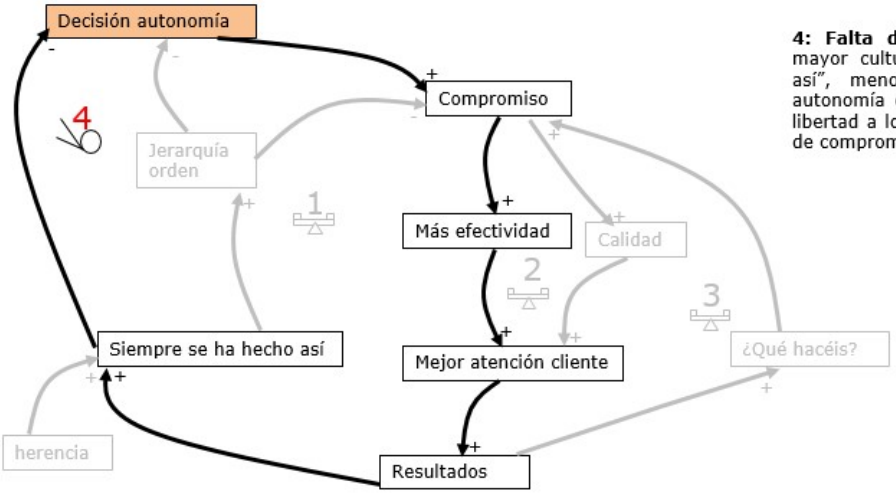
2: Jerarquía y orden incrementados a causa de una mayor calidad. El efecto de estas palancas es el mismo que en el caso anterior. Con la diferencia de que en este caso se visualiza el incremento de resultados a causa de una mayor calidad.

Third Loop



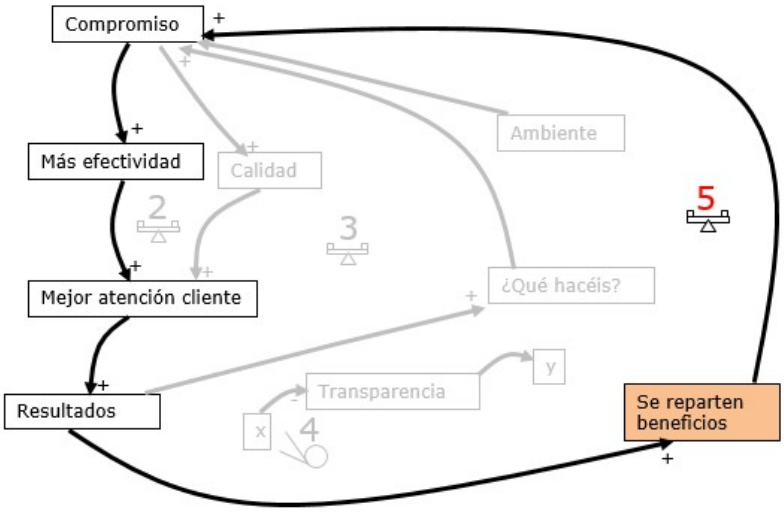
3. El efecto de los resultados en el incremento de las dudas. A mayores resultados, mayor carga de trabajo. Esto supone mayores preguntas por parte de los trabajadores y mayor necesidad de delegar por parte de la dirección.

Fourth Loop



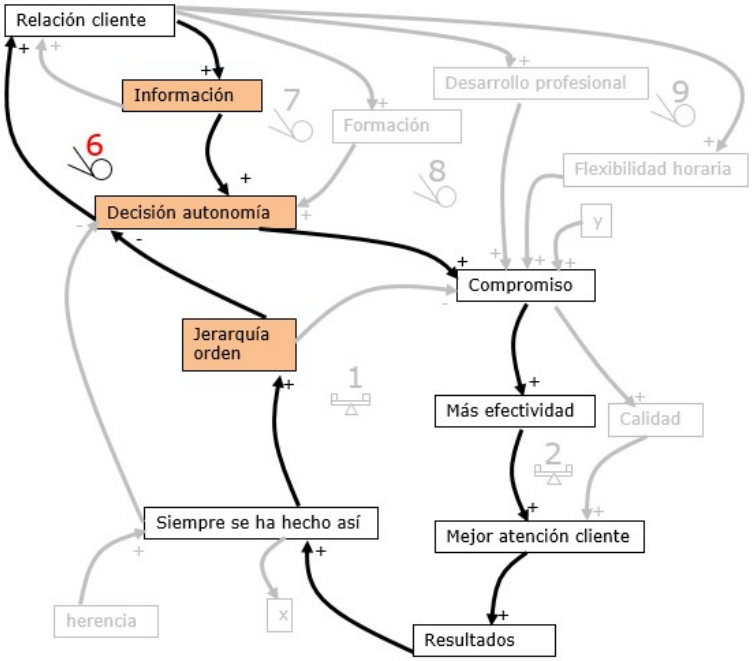
4: Falta de decisión y autonomía. A mayor cultura del "siempre se ha hecho así", menos posibilidad de decisión y autonomía existe. El hecho de no dar esa libertad a los trabajadores, reduce su nivel de compromiso.

Fifth Loop



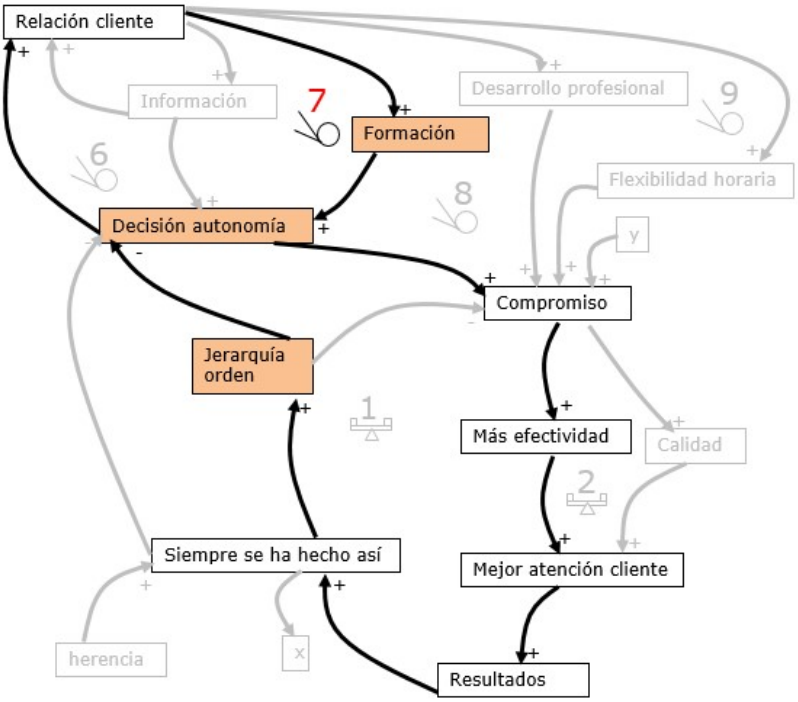
5: Reparto de beneficios. El hecho de ser más efectivos, gracias a un nivel de compromiso alto, mejora la atención al cliente, lo que repercute positivamente en los resultados. De esta manera, se impulsa el reparto de beneficios, lo que ayuda a que el nivel de compromiso aumente.

Sixth Loop



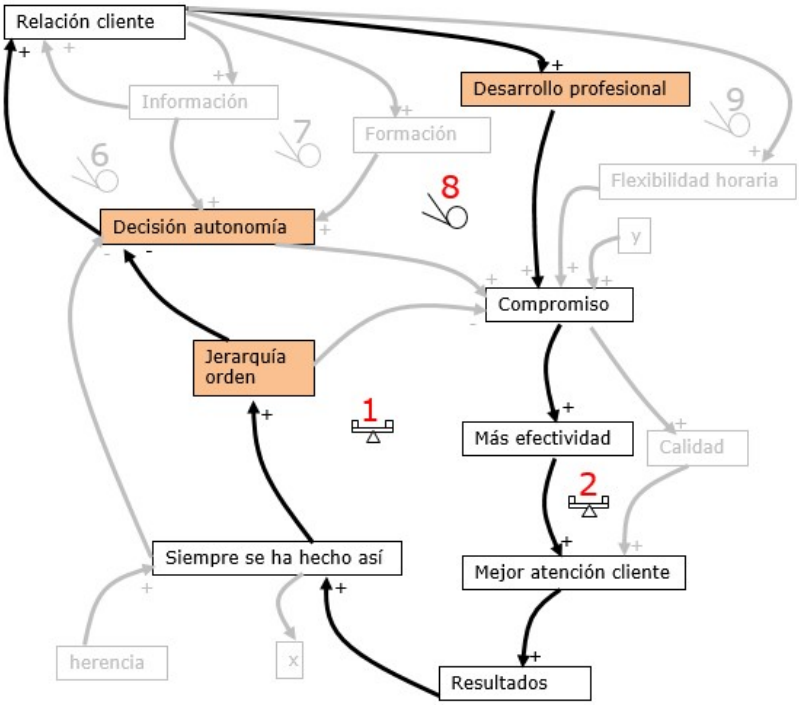
6: Transparencia en la información. Se entiende la transparencia en la información como palanca para la autonomía del trabajador y el poder de decisión. De esta manera, el nivel de compromiso es incrementado.

Seventh Loop



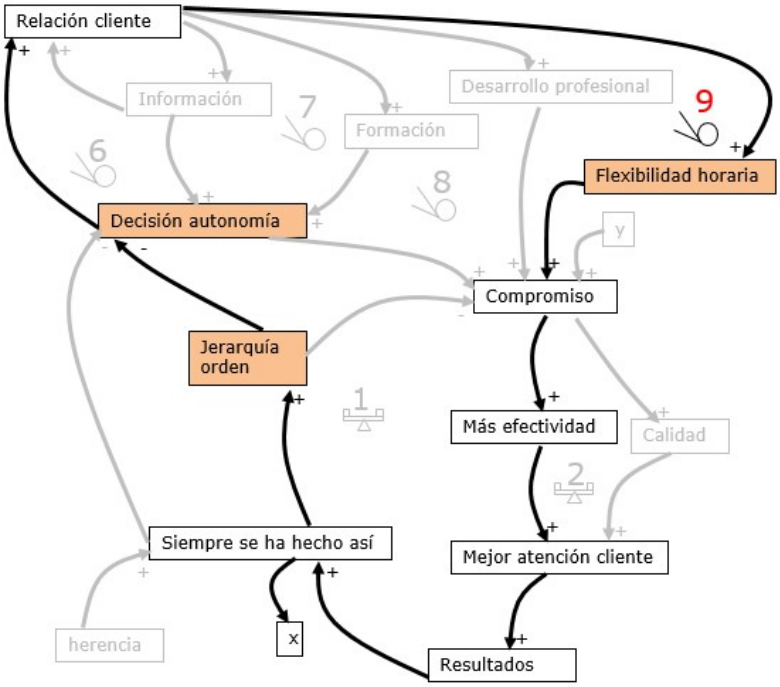
7: Formación. Se entiende la inversión en formación como palanca para la autonomía del trabajador y el poder de decisión. De esta manera, el nivel de compromiso es incrementado.

Eighth Loop



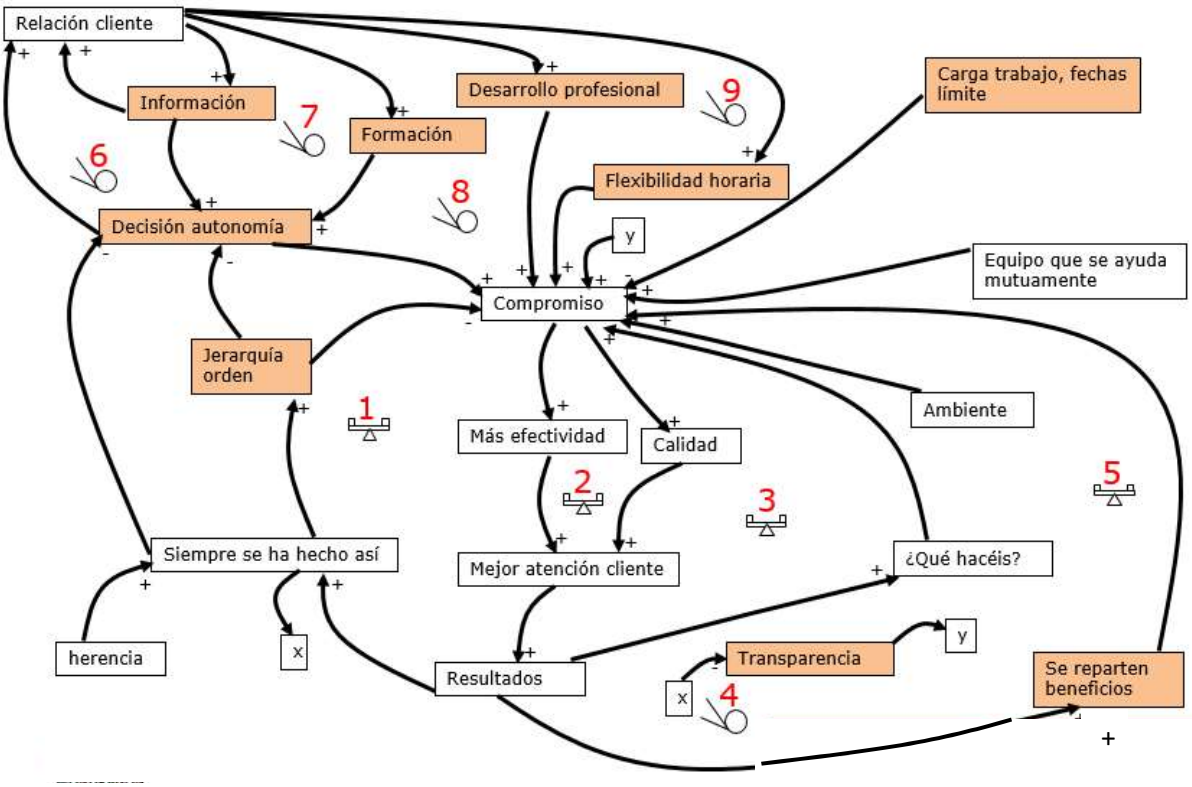
8: Desarrollo profesional. Se entiende la posibilidad de desarrollo profesional como palanca para la autonomía del trabajador y el poder de decisión. De esta manera, el nivel de compromiso es incrementado.

Ninth Loop



9: Flexibilidad horaria. Se entiende la flexibilidad horaria como palanca para la autonomía del trabajador y el poder de decisión. De esta manera, el nivel de compromiso es incrementado.

6. GENERAL DIAGRAM

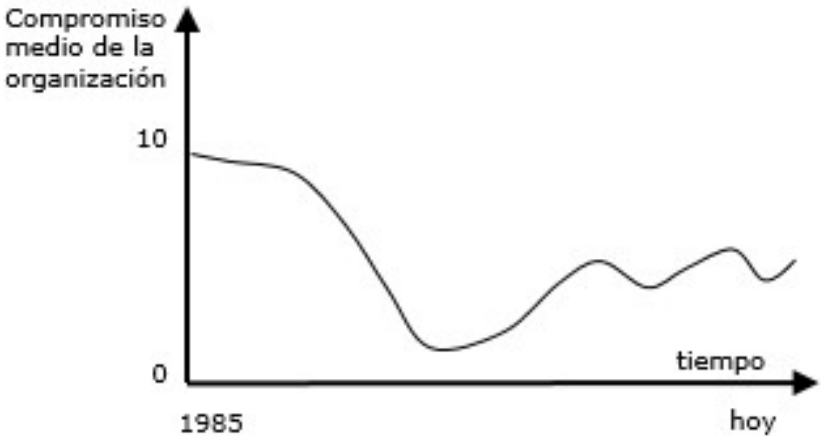


GROUP MODEL BUILDING THREE

1. NAME: C

2. CHALLENGE/PROBLEM: Improvement of workers COMMITMENT to achieve a win-win relationship between: (i) People, well-being and feeling as a part of the organisation, (ii) organisation, better sustainability or competitiveness.

3.TIME HORIZON:



4. EXCHANGE OF VARIABLES:

-Cambio estilo vida

-Desconfianza

-Lana behera, esfortzua ez bada rekonpentsatzen ekonomikoki

-Falta de reconocimiento

-Falta de llamadas de atención

-Arazo garrantzitsuen falta

-Emaitza onak azken urteetan

-Salmentak gora

-Jardunaldiak gora

-Beti berdin

-Ilusión proyecto

-Pausoz pauso aurrera

-Danok batera lana

-Jende asko

-Zatiketa organoen artean

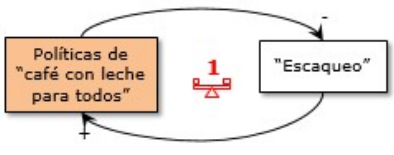
-Ekipoan jendea ez inplikauta

-Transparentziak gora

-Balorazio sistemak behera

5. FEEDBACK LOOPS

First Loop

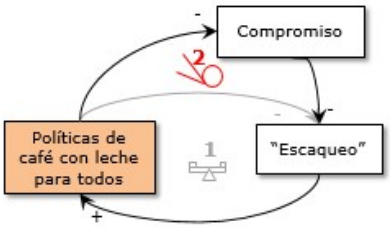


1. Políticas de "café con leche para todos".

Cuanto mayor es el "escaqueo de las personas, mayor es la tendencia a establecer políticas de "café con leche para todos". Estas políticas consiguen reducir el "escaqueo". Se establece por tanto un equilibrio entre el nivel de "escaqueo" y el cantidad de políticas de "café con leche para todos".

Según esta lógica las políticas de "café con leche para todos" es una solución al problema del "escaqueo" (que lo soluciona a corto plazo).

Second Loop

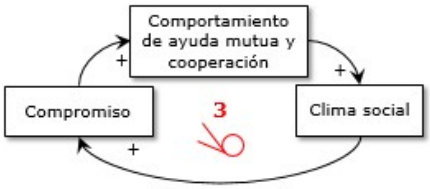


2. La desafección de las políticas de "café con leche para todos".

La lógica del "café con leche para todos" ayuda a reducir el "escaqueo" a corto plazo (ver círculo nº 1). Sin embargo, a medio plazo genera un mayor nivel de "desafección" (o falta de compromiso). Esta falta de compromiso aumentara con el tiempo el nivel de "escaqueo" de las personas.

La política de "café con leche para todos" es una palanca que tiene dos efectos: (i) a corto plazo reduce el "escaqueo" y (ii) a medio plazo genera una mayor desafección (falta de compromiso) que alimentará más el "escaqueo" a medio plazo.

Third Loop

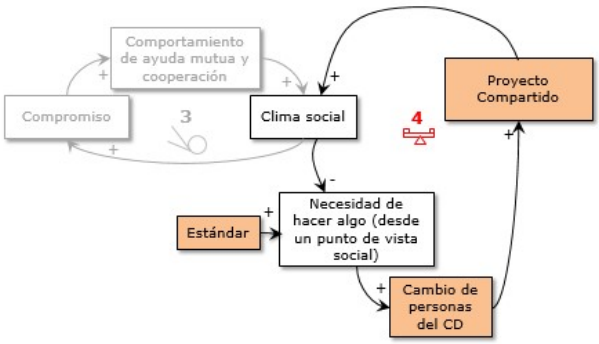


3. El clima social ayuda al compromiso colectivo.

Cuanto mayor es el nivel de compromiso colectivo (en la organización) más frecuentes e intensos serán los comportamientos de ayuda mutua y cooperación entre las personas. Estos comportamientos de ayuda mutua contribuirá a mejorar el clima social de la organización. Una mejora del clima social, a su vez, contribuirá positivamente a la mejora del compromiso medio de la organización.

Este círculo puede también interpretarse en sentido inverso: cuanto menor es el compromiso de las personas, menores son los comportamientos de ayuda mutua y cooperación. La falta de comportamientos de cooperación reduce el clima social, influyendo negativamente en el compromiso medio de la organización.

Fourth Loop



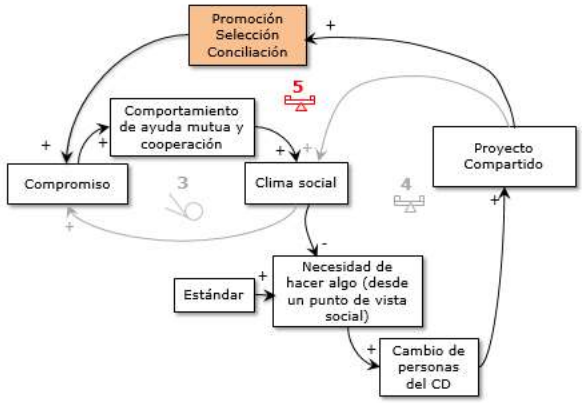
4. El cambio de las personas en el CD.

Un clima social muy deteriorado (bajo), en contraste con un Estándar / deseado específico, contribuye a generar la sensación de que es necesario hacer algo (desde un punto de vista social). Cuanto más alto es el estándar / nivel deseado de clima social, mayor es la necesidad de tener que hacer algo (tomar algún tipo de decisión), y viceversa.

Cuanto mayor es la necesidad de tener que hacer algo, más probable es que se promueva un cambio de personas en el Consejo de Dirección. Personas nuevas en el consejo de dirección, ayuda a que se genere un Proyecto de Empresa más unido y compartido entre ellos. Cuanto más fuerte y compartido es el proyecto entre los diferentes miembros del Consejo de Dirección, mejor será el clima social, pues no habrá oportunidad para la división interna.

Nota: en este caso, el cambio de personas en el consejo de dirección es claramente una "palanca" que deriva en un proyecto más cohesionado y compartido en la dirección. El nivel Estándar / deseado de clima social es el que contribuye a activar antes o después el cambio de personas en la dirección.

Fifth Loop

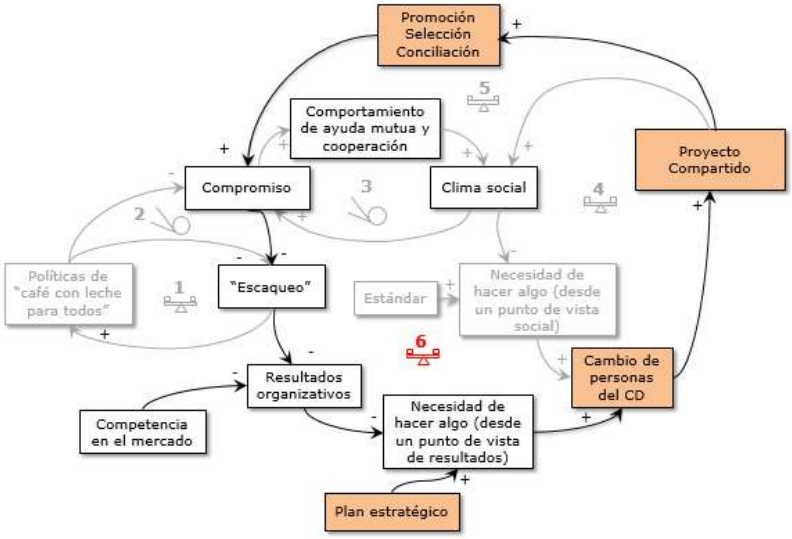


5. Las palancas de gestión de personas.

Un proyecto más o menos compartido (en el consejo de dirección) requerirá de una serie de políticas de gestión de personas que hagan sentirse a las personas más comprometidas. Estas políticas son de promoción, selección y conciliación. Un mayor compromiso de las personas (derivadas de las políticas ya mencionadas), fomentará un comportamiento de ayuda y cooperación mutua, mejorando el clima social. Cuanto mejor el clima social, menor será la necesidad de un cambio en la dirección.

Las políticas (de promoción, selección y conciliación) son palancas que mejoran el compromiso de las personas y por tanto el clima social.

Sixth Loop

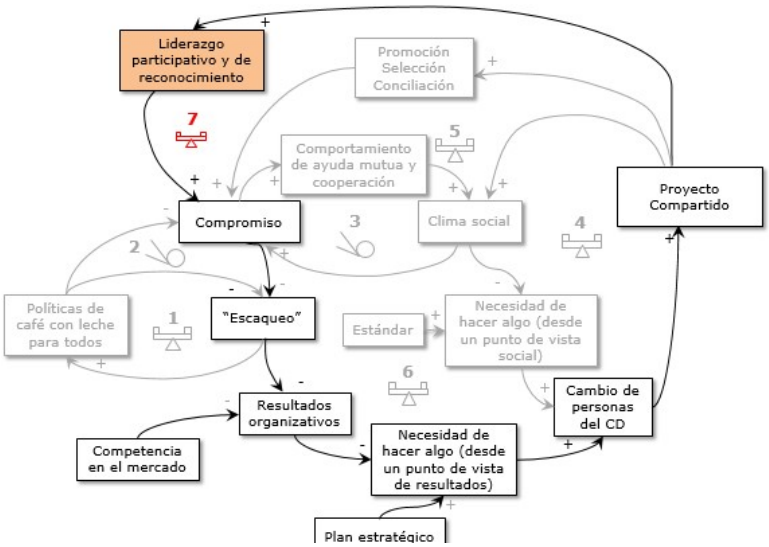


6. Los resultados organizativos.

El cambio de la dirección descrita en el círculo nº 4 es también posible desde la perspectiva de los resultados organizativos. Cuanto mayor es el "escaqueo" (originado por una falta de compromiso), menores son los resultados organizativos, incrementando la necesidad de tener que hacer algo. Será mayor la necesidad de tener que hacer algo cuanto más bajos sean los Resultados organizativos y/o más ambiciosos sean los objetivos del plan estratégico. La necesidad de tener que hacer algo deriva en un cambio de personas en el consejo de dirección. Las nuevas personas contribuirán a que el equipo de dirección visualice el proyecto de forma más compartida, favoreciendo políticas de gestión de personas (promoción, selección, etc) que ayudan a mejora el compromiso de las personas y por tanto a reducir el "escaqueo". Un bajo "escaqueo" ayudará a mejorar los Resultados organizativos minimizando la necesidad de tener que hacer algo.

Las políticas (de promoción, selección y conciliación) son palancas que mejoran el compromiso y los resultados.

Seventh Loop

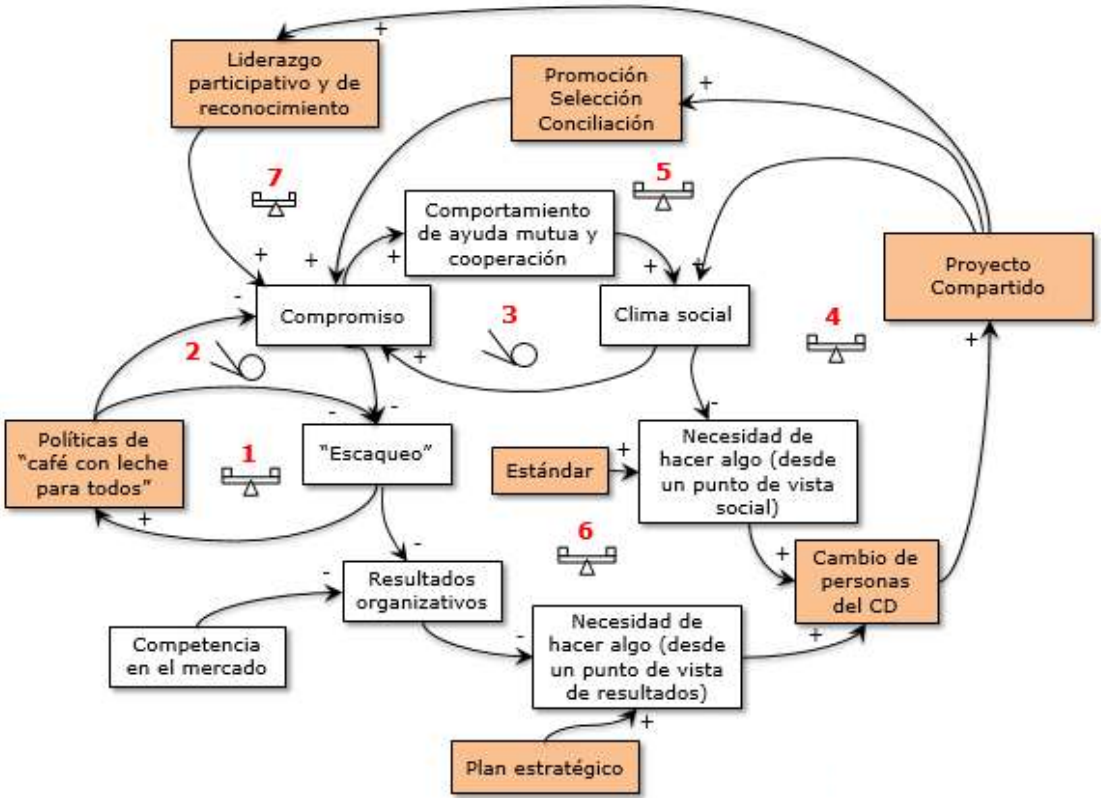


7. El liderazgo participativo y de reconocimiento.

El cambio de personas de la dirección, contribuye a tener un proyecto más compartido. Cuanto más compartido el proyecto, mayor será el estilo de liderazgo participativo y de más reconocimiento por parte de las personas. Este tipo de liderazgo contribuye a mejorar el nivel de compromiso de las personas. Un mayor nivel de compromiso reduce el "escaqueo", mejorando los resultados y minimizando la necesidad de un cambio de personas en el consejo de dirección.

El "liderazgo participativo y de reconocimiento" es una palanca que mejora el compromiso y los resultados organizativos.

6. GENERAL DIAGRAM

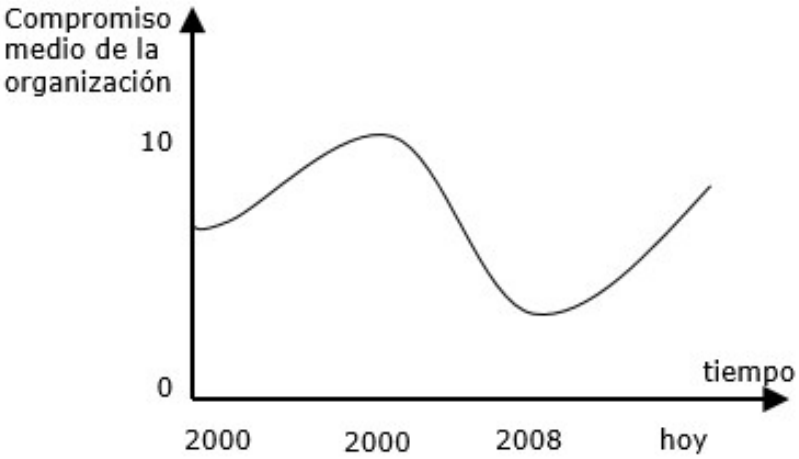


GROUP MODEL BUILDING FOUR

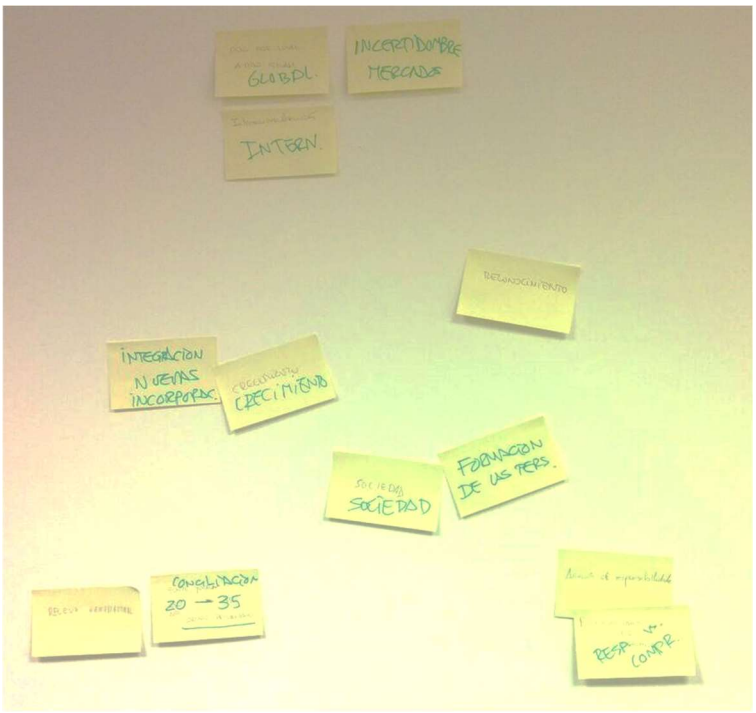
1. NAME: D

2. CHALLENGE/PROBLEM: Improvement of workers COMMITMENT to achieve a win-win relationship between: (i) People, well-being and feeling as a part of the organisation, (ii) organisation, better sustainability or competitiveness.

3. TIME HORIZON:



4. EXCHANGE OF VARIABLES:



-Incertidumbre mercado

-Incertidumbre global

-Incertidumbre interna

-Integración nuevas incorporaciones

-Crecimiento

-Sociedad

-Formación de las personas

-Conciliación 20-35

-Reconocimiento

-Modelo dirección

-Cultura ocio

-Cambio modelo de negocio

-Modelo organizativo

-Equipo

-Compañerismo

-Liderazgo

-Tipo de trabajo

-Resultados

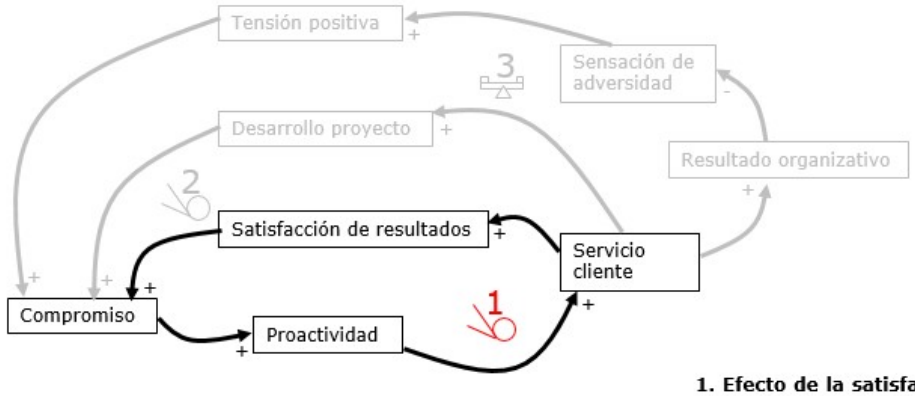
-Cooperativa

-Resistencia adversidad

-Saratxaga

5. FEEDBACK LOOPS

First Loop

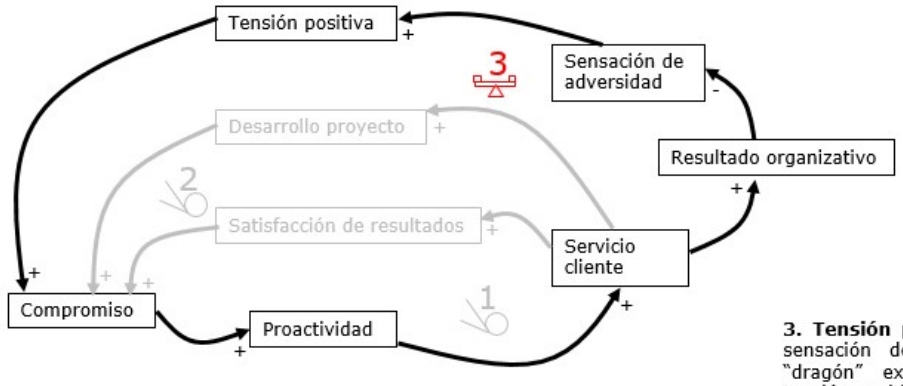


1. Efecto de la satisfacción de resultados en el compromiso. A mayor proactividad, mayor servicio al cliente. Esto a su vez incrementa la satisfacción obtenida, la cual aumenta el nivel de compromiso del trabajador.

Second Loop

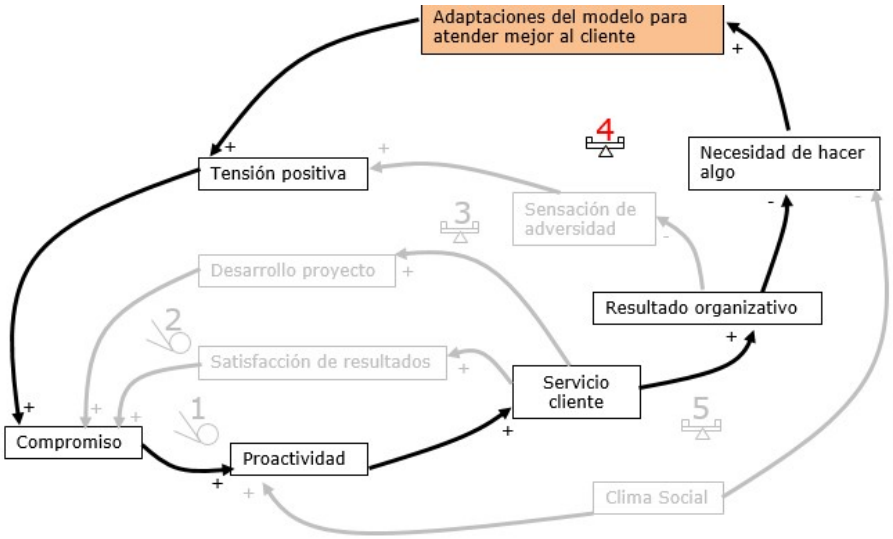
2. Efecto de "Desarrollo proyecto" en el nivel de compromiso. El hecho de que surjan nuevos proyectos a partir de un alto nivel de proactividad entre los trabajadores aumenta el compromiso.

Third Loop



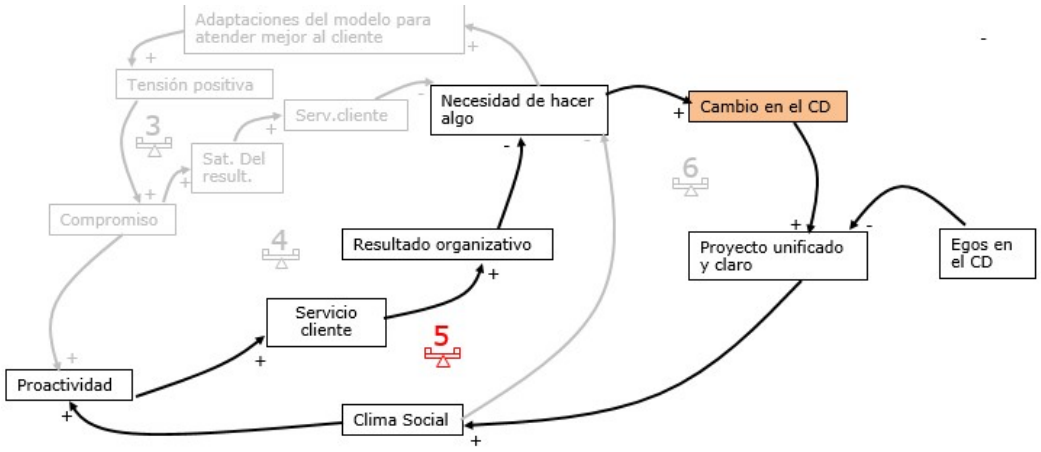
3. Tensión positiva. Cuanto mayor sea la sensación de adversidad y el miedo al "dragón" exterior, más se despierta la tensión positiva, la cual actúa como motor y palanca para la actuación.

Fourth Loop

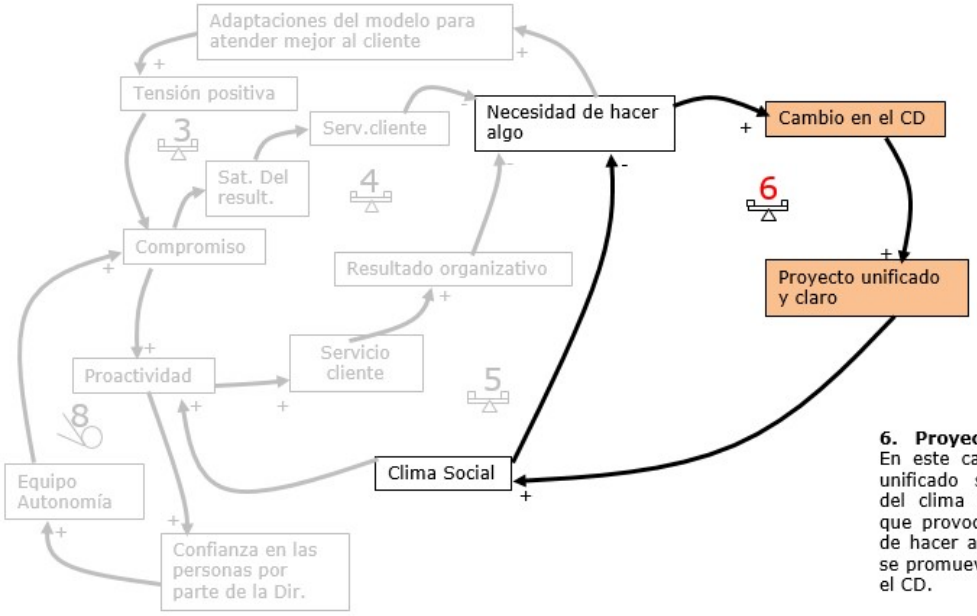


4. Adaptaciones del modelo para atender mejor al cliente. Cuanto mejores resultados organizativos se consiguen, mayor necesidad de hacer algo existe. De esta manera, son necesarias más adaptaciones del modelo para atender mejor al cliente. Lo que resulta en tensión positiva y mayor compromiso.

Fifth Loop

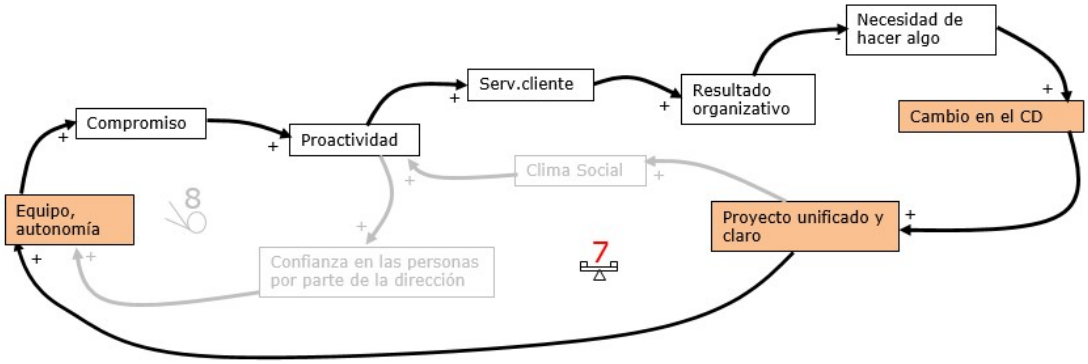


Sixth Loop



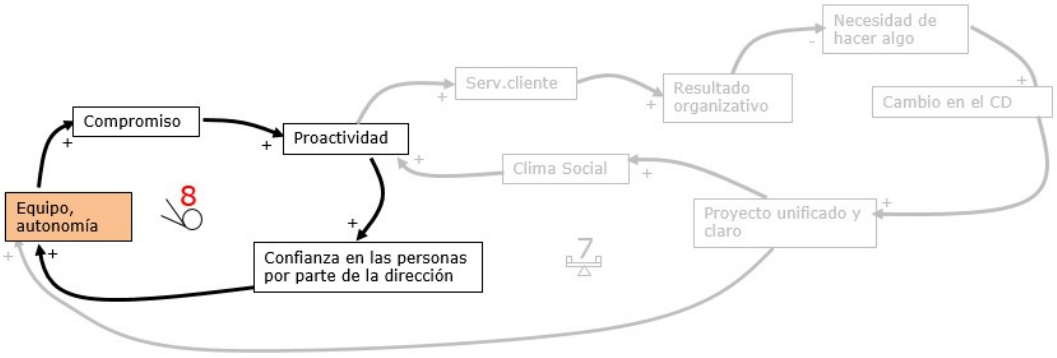
6. Proyecto unificado. En este caso el proyecto unificado surge a partir del clima social positivo, que provoca la necesidad de hacer algo, y con esto se promueve el cambio en el CD.

Seventh Loop



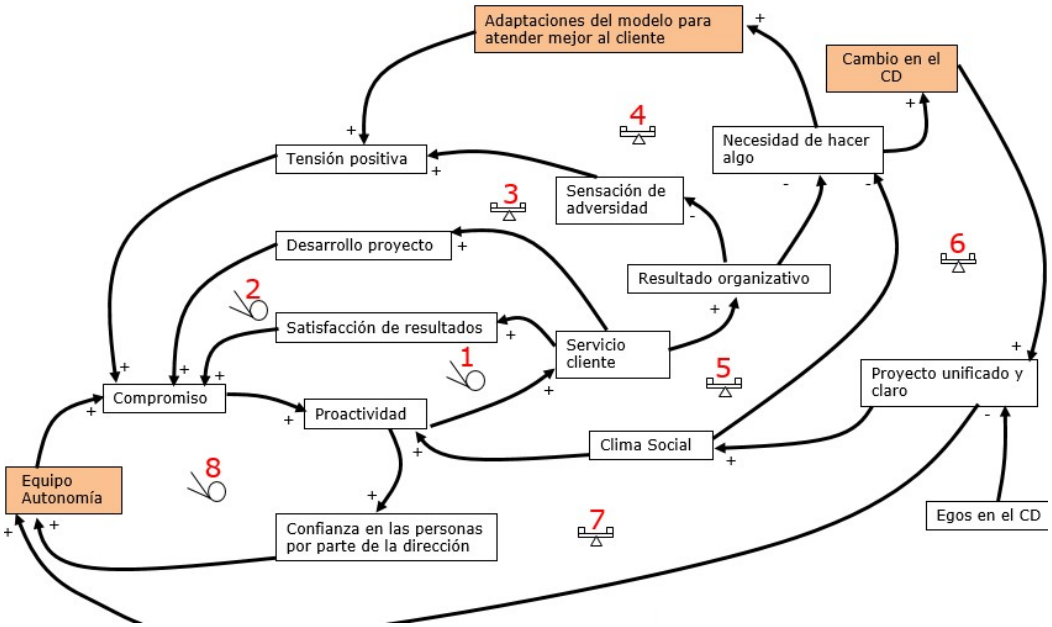
7. Efecto necesidad de hacer algo. A raíz de la definición del proyecto unificado y claro, se fomenta el equipo y la autonomía. Esto aumenta el nivel de compromiso.

Eighth Loop



8. Equipo y autonomía. Al igual que en el caso anterior, se visualiza el equipo y la autonomía como palanca directa para el aumento del compromiso. A mayor confianza en la personas, mayor autonomía y poder de decisión.

6. GENERAL DIAGRAM

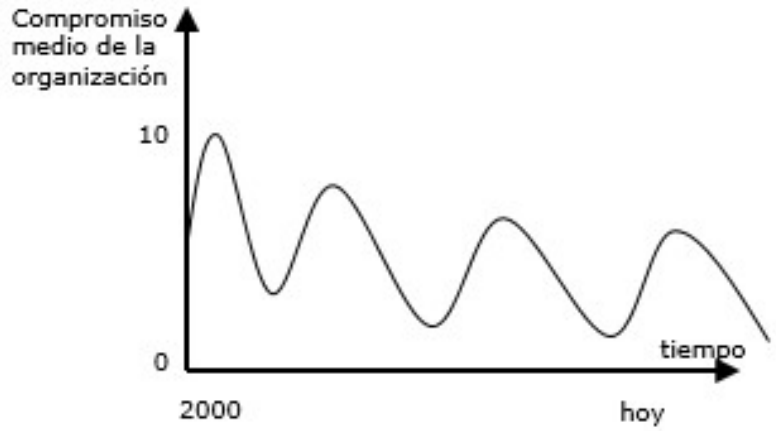


GROUP MODEL BUILDING FIVE

1. NAME: E

2. CHALLENGE/PROBLEM: Improvement of workers COMMITMENT to achieve a win-win relationship between: (i) People, well-being and feeling as a part of the organisation, (ii) organisation, better sustainability or competitiveness.

3.TIME HORIZON:



4. EXCHANGE OF VARIABLES:

-Cambio estilo vida

-Desconfianza

-Lana behera, esfortzua ez bada

rekonpentsatzen ekonomikoki

-Falta de reconocimiento

-Falta de llamadas de atención

-Arazo garrantzitsuen falta

-Emaitza onak azken urteetan

-Salmentak gora

-Jardunaldiak gora

-Beti berdin

-Ilusión proyecto

-Pausoz pauso aurrera

-Danok batera lana

-Jende asko

-Zatiketa organoen artean

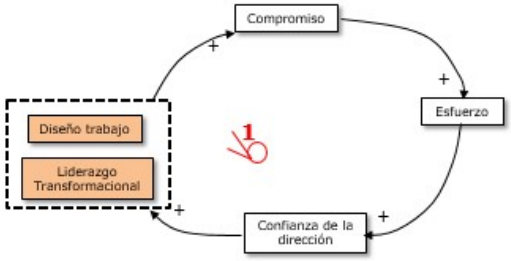
-Ekipoan jendea ez inplikauta

-Transparentziak gora

-Balorazio sistemak behera

5. FEEDBACK LOOPS

First Loop

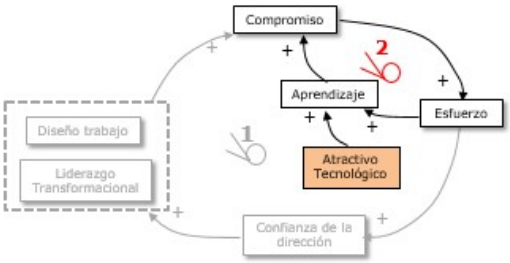


1. El ciclo de la confianza.

La confianza de la dirección en las personas contribuye positivamente a que se diseñen puestos de trabajo autónomos (con formación e información) y a practicar un liderazgo transformacional (que busca la "emancipación" de las personas). El desarrollo de puestos de trabajo de estas características contribuye a generar un clima de confianza (hacia la dirección) por parte de las personas y a generar así un compromiso de las personas hacia la organización. Este compromiso contribuirá positivamente a que las personas materialicen comportamientos "extra-rol" favorables a la organización. Estos comportamientos materializados en el día a día por parte de las personas refuerza la confianza depositada por la dirección en las personas, alimentando con más fuerza un desarrollo más ambicioso de las palancas (diseño, liderazgo, etc).

Este ciclo puede también interpretarse en el sentido contrario. Una falta de confianza, conlleva un diseño con poca autonomía y un liderazgo "clásico". Las personas se sienten en un entorno de desconfianza y no se comprometen con la organización; esto no conlleva un esfuerzo extra, reforzando la falta de confianza de la dirección en las personas.

Second Loop



2. El desarrollo profesional de las personas.

El compromiso de las personas conlleva un esfuerzo por su parte para superar los retos en el trabajo. El esfuerzo y trabajo diario contribuye positivamente a generar aprendizajes. Estos aprendizajes, generan la sensación de que uno se está desarrollando profesionalmente aumentando así el compromiso respecto a la organización.

Este ciclo se puede también interpretar en el sentido inverso. Una falta de compromiso no conlleva abarcar nuevos retos, esforzarse para superar obstáculos en el trabajo y por tanto no genera la sensación de aprendizaje / desarrollo profesional.

Nota: la tecnología de programación empleada por la organización parece que no presenta un atractivo para los jóvenes (debido a que se trata de una tecnología relativamente desconocida).

Third Loop

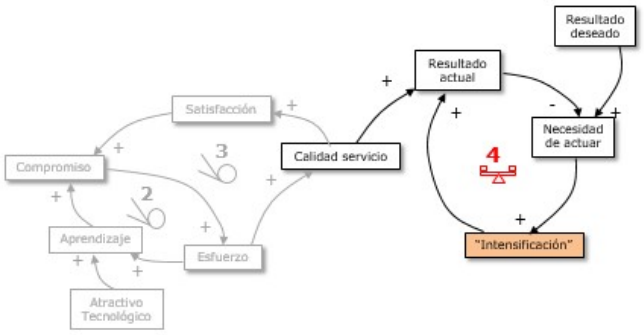
3. La satisfacción por la buena atención al cliente.

El compromiso de las personas contribuye positivamente a que las personas se esfuercen en sacar adelante los retos organizativos y en atender bien a los clientes. Este esfuerzo contribuirá a mejorar la calidad del servicio a los clientes. Una buena calidad de atención, contribuye positivamente a generar bienestar en las personas que prestan dicho servicio (satisfacción), y esto alimenta el compromiso de las personas con la organización.

Es un ciclo que representa la satisfacción de realizar un buen servicio al cliente con su consiguiente efecto en el compromiso de las personas.

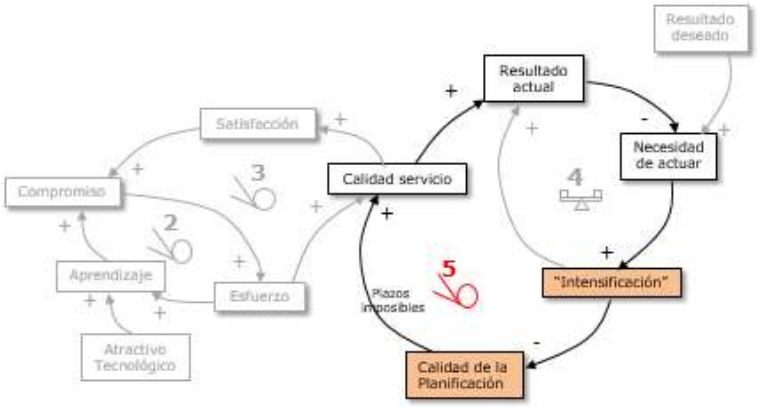
Este ciclo puede también interpretarse en el sentido inverso: un bajo compromiso lleva a poco esfuerzo, lo cual lleva a una baja calidad de servicio, a una falta de satisfacción y por tanto a un menor compromiso.

Fourth Loop



4. La calidad del servicio y el resultado organizativo. Una buena calidad de servicio a los clientes ayudará positivamente a generar Resultados organizativos deseados. Cuantos mejores sean los resultados organizativos (y más cerca se encuentren de los deseados en el plan estratégico o de gestión) menor será la necesidad de actuar. La actuación normalmente está relacionada con la intensificación de la labor comercial para captar nuevos pedidos. Cuantos más pedidos se captan más se "intensifica" el trabajo (mayor es la relación carga – capacidad de trabajo). Esta intensificación contribuye (a corto plazo) positivamente en los Resultados organizativos.

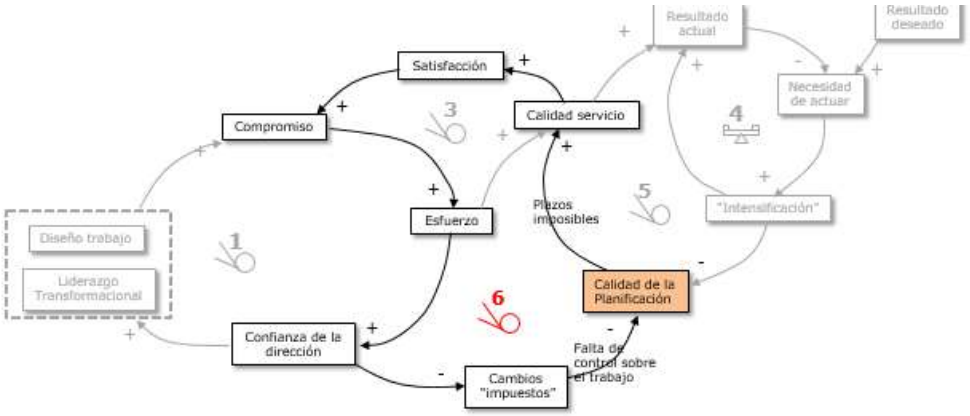
Fifth Loop



5. La planificación del trabajo. Cuantos más pedidos se capten y más se "intensifica" el trabajo (alta relación entre carga y capacidad), más complicado se vuelve la planificación (con plazos que pueden llegar a ser imposibles de cumplir). Esto tensiona a la organización y reduce la calidad de servicio a los clientes, repercutiendo negativamente en la satisfacción y compromiso de las personas (ver ciclo nº 3) y pudiendo repercutir también negativamente en el Resultado Organizativo (a medio plazo).

Cuanto mejor se cuide la relación carga-capacidad (intensificación) y/o mejor se realice la planificación del trabajo, menor será la incidencia insatisfactoria en las personas y en los clientes.

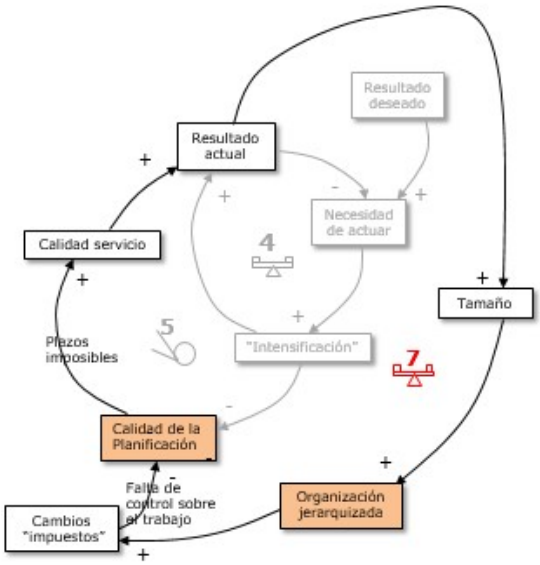
Sixth Loop



6. Falta de "control" sobre el trabajo. Los cambios que se "imponen" desde la dirección, generan una sensación de falta de "control" sobre el trabajo de uno. Estos cambios distorsionan la planificación empeorando la calidad de servicio a los clientes (a los que no se ha podido atender a pesar de haberse comprometido con ellos). Esto genera una gran insatisfacción que revierte negativamente en el compromiso de las personas. Una bajada en el compromiso repercute negativamente en la capacidad de esfuerzo de las personas para el bien de la organización. La dirección observa comportamientos no tan favorables a la organización minando su confianza en las personas y tendiendo a realizar más cambios "impuestos" en la planificación.

Nota: este ciclo también podría interpretarse en el sentido inverso.

Seventh Loop

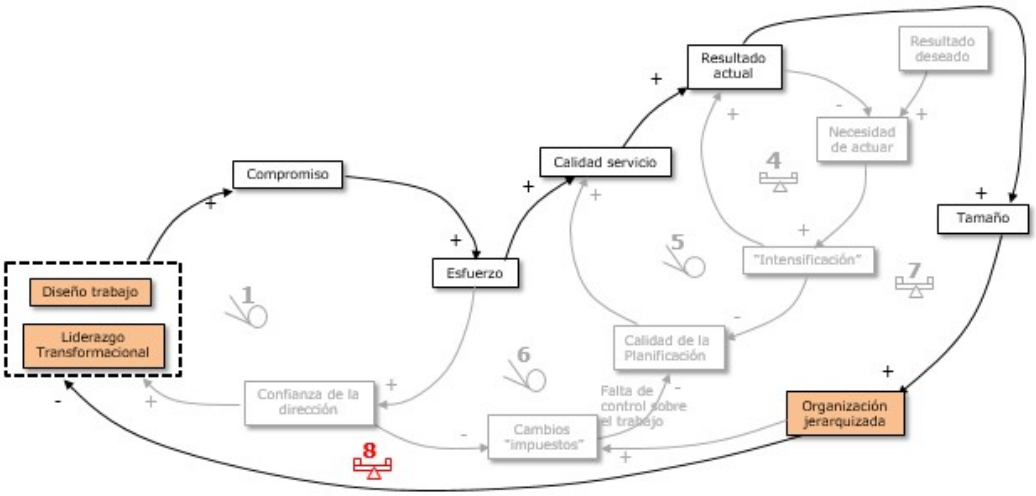


7. El tamaño aumenta la sensación de falta de "control".

Cuanto mejor es la calidad del servicio más fácil es captar nuevos pedidos y a medida de la calidad del servicio ayuda a mejorar los Resultados Organizativos, más fácil es realizar inversiones para que la organización crezca en tamaño. Esto es, una buena calidad del servicio y unos buenos resultados organizativos contribuirán positivamente a que la organización crezca en tamaño. Crecer en tamaño significa crecer en número de personas y a medida que se produce este crecimiento, la organización tiende a jerarquizarse (responsables que coordinan, personas más centradas en tareas locales perdiendo la visión global, las relaciones se distancian pues la comunicación no es tan directa y cercana, etc).

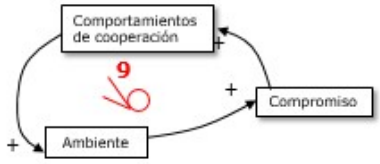
Con una organización más "jerarquizada", será mayor la tendencia a "imponer" cambios en la planificación que producen insatisfacción en las personas y en los clientes.

Eighth loop



8. El tamaño influye en el diseño y liderazgo. Cuanto más grande se hace la organización más tiende a diseñar los trabajos de forma "especialista" (perdiendo visión global) y más tiende a ejercer un liderazgo clásico (o transaccional) más que otro transformacional. Esto influye negativamente en el compromiso y por tanto en el esfuerzo que las personas hacen en el trabajo. Esta reducción del compromiso y esfuerzo tendrá una influencia negativa en la Calidad de Servicio y Resultado Organizativo, frenando el crecimiento de la organización.

Ninth loop

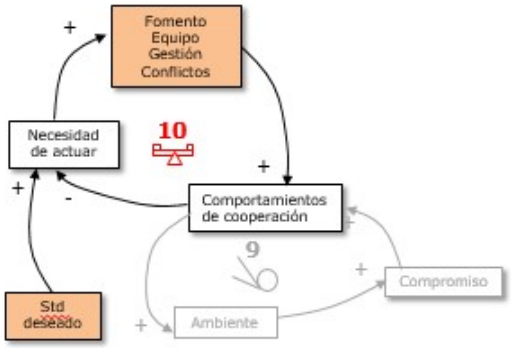


9. El ambiente de trabajo entre compañeros.

Cuanto mayor sea el compromiso de las personas, más probable es que las personas materialicen comportamientos de ayuda y cooperación con sus compañeros. Estos comportamientos contribuirán a un ambiente agradable en el trabajo influyendo positivamente en el compromiso de las personas.

Este ciclo puede interpretarse también en sentido inverso: una falta de compromiso no ayudará a que se generen comportamientos de cooperación y ayuda entre compañeros. Estos comportamientos no ayudarán a generar un ambiente agradable influyendo negativamente en el compromiso.

Tenth loop

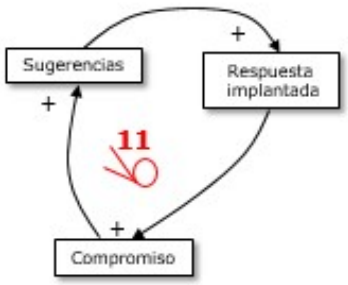


10. El trabajo en equipo y la cooperación.

Cuanto más bajos sean los comportamientos de cooperación y ayuda entre los compañeros, mayor será la necesidad de tener que actuar en este sentido. Cuanto mayor sea el estándar deseado (en términos de patrón de comportamiento deseado dentro de la organización) por parte de la organización, mayor será la necesidad de tener que actuar en este sentido.

Una mayor necesidad llevará a la organización a poner en marcha iniciativas de fomento del trabajo en equipo e iniciativas de gestión de conflictos. Estas iniciativas mejorarán los comportamientos de cooperación y ayuda mutua entre las personas, frenando así el crecimiento y deterioro del ciclo nº 9.

Eleventh loop



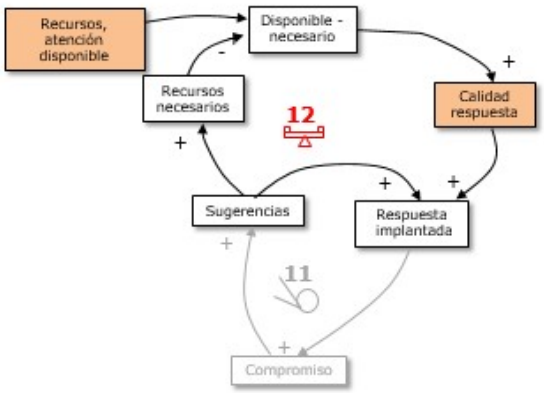
11. Las sugerencias de las personas.

Cuanto mayor sea el compromiso de las personas, mayor será la cantidad de sugerencias que se reciban por parte de las personas (sugerencias encaminadas a mejorar el producto y/o el servicio ofrecido al cliente). En la medida que la organización es capaz de atender y responder a dichas sugerencias (implantando aquellas que se vean factibles) mayor será el compromiso de las personas, pues las personas se sentirán escuchadas y verán que sus sugerencias han sido implantadas produciendo un bien en el producto y/o servicio.

Este incremento del compromiso tenderá a visualizarse en una mayor cantidad de sugerencias (creando un círculo de crecimiento virtuoso).

Nota: este círculo puede ser interpretado en el sentido inverso.

Twelfth loop

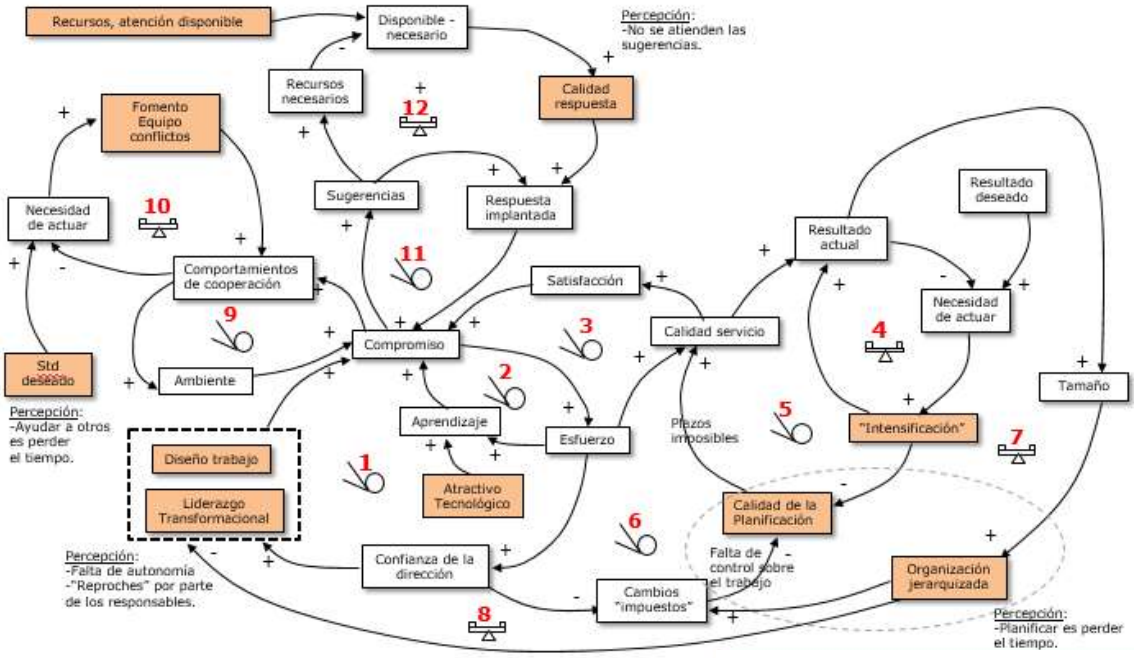


12. La calidad de respuesta de las sugerencias.

Cuantas más sean la sugerencias recibidas mayor es la necesidad de recursos (o capacidad de respuesta) por parte de la organización. Dado que la organización tiene una capacidad de respuesta / atención limitada, se puede llegar a saturar la capacidad de respuesta, incrementando notablemente el tiempo de respuesta y reduciendo notablemente la calidad de respuesta a las sugerencias. Esta reducción de la calidad de respuesta revertirá negativamente en el número de respuestas implantadas, reduciendo el compromiso de las personas y frenando así el número de sugerencias realizadas.

La capacidad de respuesta / atención de las sugerencias recibidas frena el crecimiento del número de sugerencias. A mayor capacidad de respuesta, mayor crecimiento de las sugerencias y viceversa.

6. GENERAL DIAGRAM

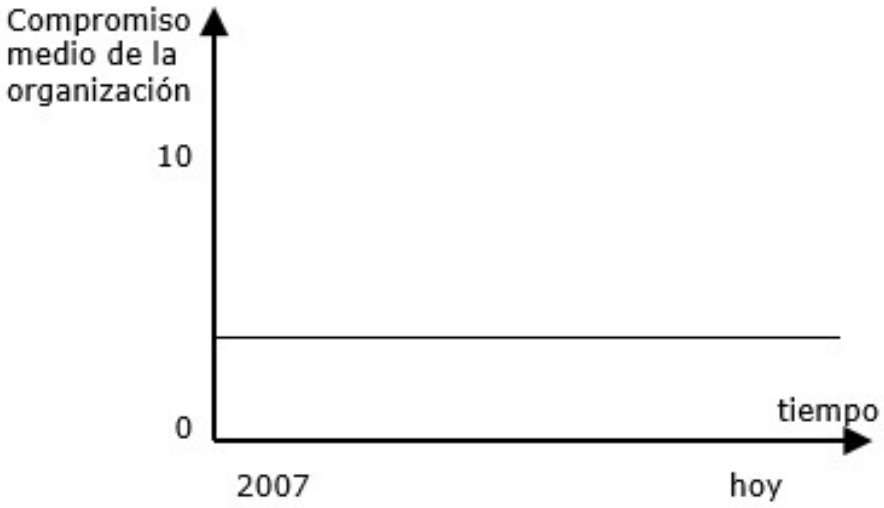


GROUP MODEL BUILDING SIX

1. NAME: F

2. CHALLENGE/PROBLEM: Improvement of workers COMMITMENT to achieve a win-win relationship between: (i) People, well-being and feeling as a part of the organisation, (ii) organisation, better sustainability or competitiveness.

3.TIME HORIZON:



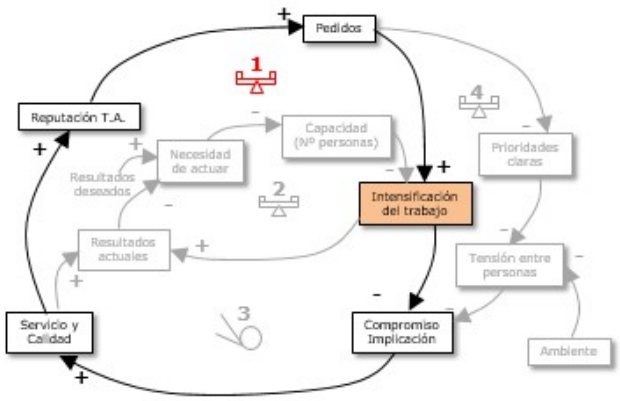
4. EXCHANGE OF VARIABLES:

- Baja calidad productos
- Orden y limpieza
- Trato desigual
- Agravios comparativos

- Desconfianza
- Valorar al trabajador
- Falta de comunicación
- Ambiente
- Falta de compañerismo
- Mala relación entre los compañeros
- Rencillas
- Envidias
- Dinero

5. FEEDBACK LOOPS

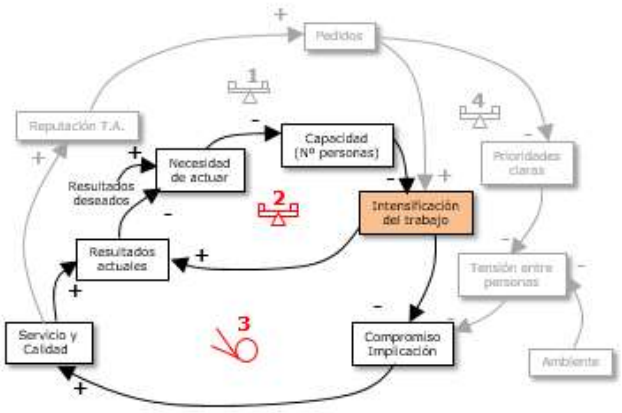
First Loop



Nota: el color naranja el elemento "gestionable" por parte de la organización.

1. La intensificación del trabajo: Cuanto mejor calidad de producto y mejor servicio al cliente, mejor será la reputación de la empresa entre los clientes. Esta reputación contribuirá a captar más pedidos futuros. Estos pedidos contribuirán a saturar la capacidad de la organización e intensificar el trabajo. La intensificación produce un efecto negativo en el compromiso / implicación de las personas, llegando a producir un efecto negativo sobre la calidad del producto y servicio al cliente. Esto es, existe un equilibrio entre la intensificación del trabajo y la calidad de producto / servicio al cliente (con el compromiso de las personas mediando entre ambos).

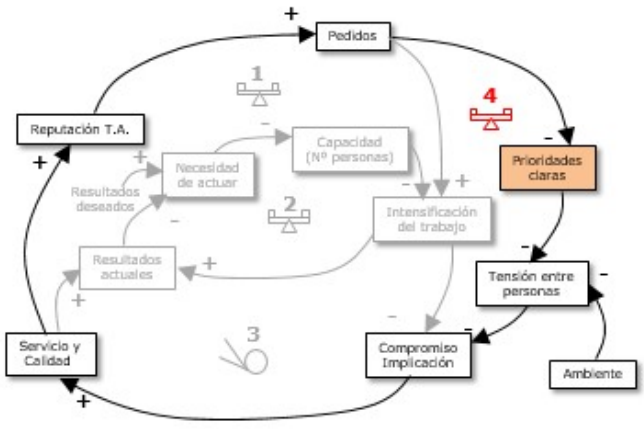
Second and Third Loop



Nota: el color naranja el elemento "gestionable" por parte de la organización.

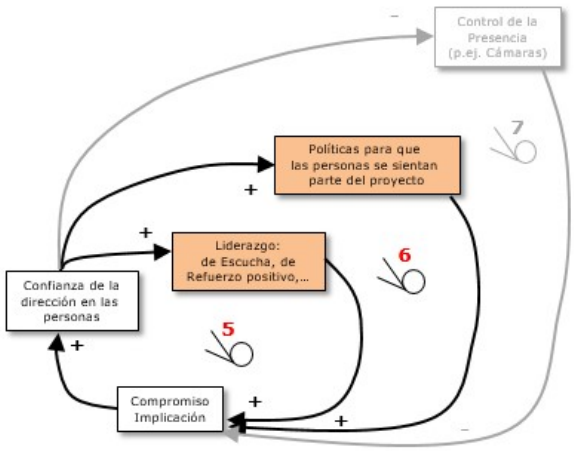
2 - 3: La intensificación del trabajo. Los resultados dependen de la intensificación del trabajo (a mayor intensificación mejores resultados) y de la calidad del pdto. (a mejor calidad mejores resultados pues hay menos reprocesados, etc). Cuantos mejores resultados, menor es la necesidad de ajustar las personas y por tanto menos se intensifica el trabajo. Esto es, existe un equilibrio entre intensificación y resultados. A su vez, la intensificación del trabajo produce un efecto negativo en las personas, y como derivada en la Calidad del pdto. y servicio. Esto es, la intensificación contribuye al resultado a corto pero a medio puede ser contraproducente debido a un empeoramiento de la calidad de pdto.

Fourth Loop



4: La planificación / prioridades: Cuantos más pedidos, mayor es la necesidad de planificar el trabajo marcando prioridades claras. Con más pedidos habrá más confusión acerca de las prioridades. Esto genera tensión entre las personas, pues dependiendo del ambiente / relación entre las personas, se priorizan de una forma u otra el trabajo. La tensión derivada de prioridades no claras empeora el nivel de compromiso / implicación, con su efecto (ya descrito en los ciclos 1, 2 y 3) en la calidad del servicio y resultados.

Fifth and Sixth Loops

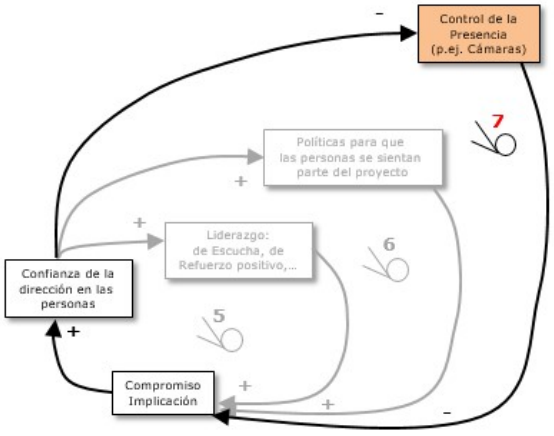


Nota: el color naranja el elemento "gestionable" por parte de la organización.

5: La confianza de la dirección en las personas. Cuanto mayor compromiso percibe la dirección en las personas, mayor será la confianza que siente en ellas. La confianza de la dirección se traslada a un estilo de Liderazgo "de apego" (escucha alta, positividad, refuerzo positivo, apoyo a las personas, etc). Este estilo de Liderazgo produce un efecto positivo en el nivel de compromiso de las personas.

6: Políticas "sentirse parte". La confianza de la dirección en las personas se traduce en políticas que transmiten dicha confianza (p.ej. Transparencia, participación en decisiones, autonomía en el trabajo, responsabilidades, etc). Estas políticas contribuyen a mejorar el compromiso de las personas, mejorando a su vez la confianza de la dirección en ellas.

Seventh Loop



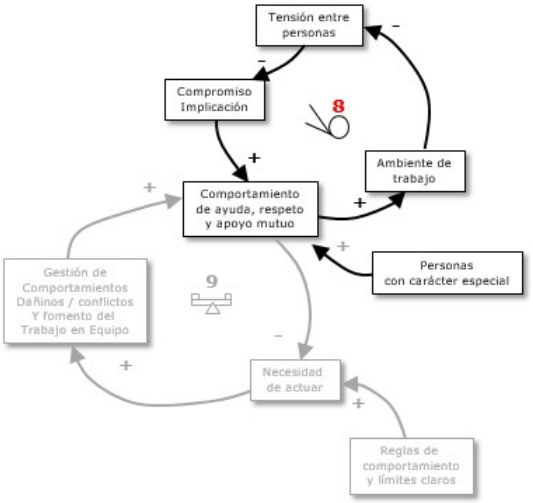
Nota: el color naranja el elemento "gestionable" por parte de la organización.

7: El "control". Cuanto mayor compromiso percibe la dirección en las personas, mayor será la confianza que siente en ellas. A mayor confianza, menor será el uso de mecanismos de "control de la presencia" (p.ej. cámaras). Cuanto menor es el uso del control, mayor será la implicación de las personas.

Nota: en este caso por control se entiende el control de la presencia (horas) y del proceso (productividad), no del control del resultado.

Este ciclo se puede leer a la inversa. Cuanto menor es el compromiso de las personas, menos confía la dirección en ellas y mayor es la necesidad de mecanismos de control de la presencia y proceso derivando en una mayor desmotivación de las personas.

Eighth Loop

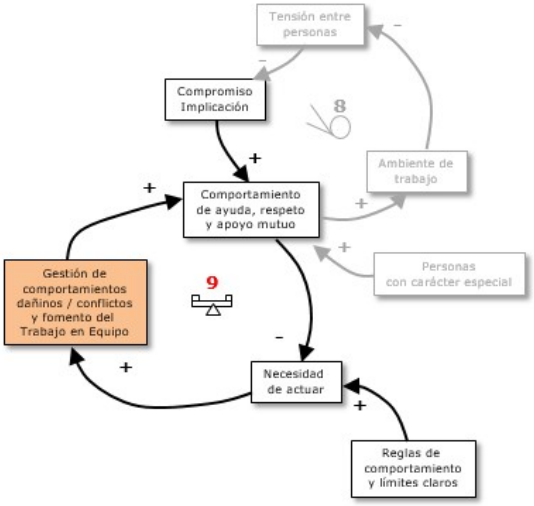


Nota: el color naranja el elemento "gestionable" por parte de la organización.

8: El ambiente de trabajo. Un nivel de compromiso relativamente bajo conlleva a comportamientos individualistas ("que el siguiente se busque la vida") y también a comportamientos poco respetuosos con otros compañeros (sobre todo si ciertas personas tienen un carácter especial). Estos comportamientos de falta de ayuda, respeto, etc deriva en un mal ambiente y este mal ambiente influye en la tensión que viven entre ellos, que a su vez influye en la satisfacción y compromiso de las personas.

Es un círculo que cada vez va a más en un sentido negativo (como el descrito) o en un sentido positivo (justo a la inversa de la explicación).

Ninth Loop

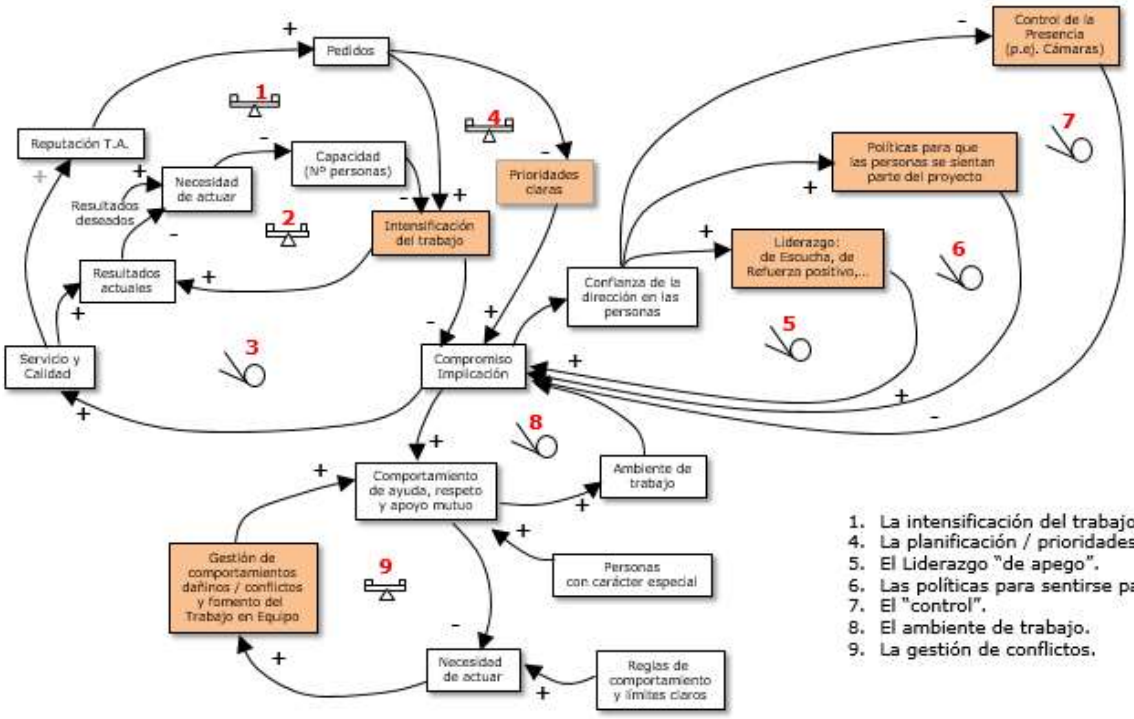


Nota: el color naranja el elemento "gestionable" por parte de la organización.

9: La gestión de los conflictos. La organización no se puede permitir un mal ambiente, pues incide en el resultado (calidad de producto, etc) a través de un compromiso relativamente bajo. Cuando el comportamiento de las personas se deteriora, aumenta la necesidad de actuar (motivado por unas reglas de comportamiento básicas conocidas por todos). La acción estará relacionado con acciones encaminadas a corregir comportamientos indeseables y favorecer el Trabajo en Equipo (la colaboración entre las personas).

Esta gestión del conflicto y fomento del trabajo en equipo fomentará un comportamiento de respecto, ayuda y apoyo mutuo en la organización, alimentando positivamente en ambiente de trabajo y por tanto en el compromiso de las personas.

6. GENERAL DIAGRAM



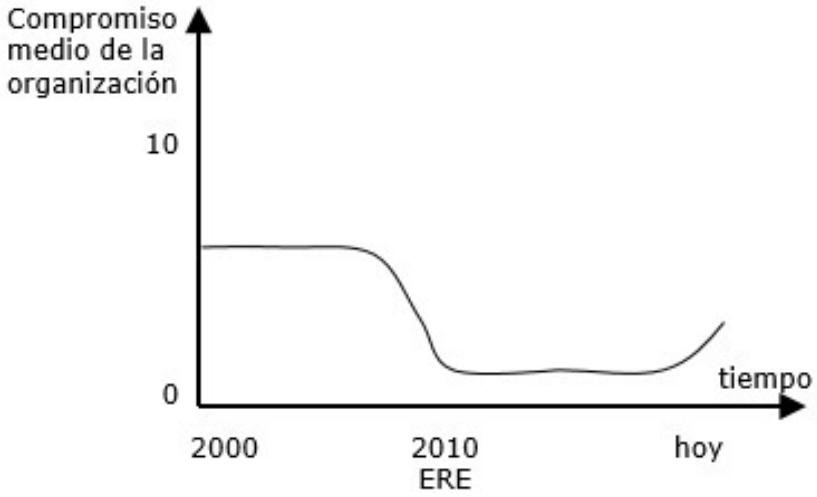
1. La intensificación del trabajo.
4. La planificación / prioridades.
5. El Liderazgo "de apego".
6. Las políticas para sentirse parte.
7. El "control".
8. El ambiente de trabajo.
9. La gestión de conflictos.

GROUP MODEL BUILDING SEVEN

1. NAME: G

2. CHALLENGE/PROBLEM: Improvement of workers COMMITMENT to achieve a win-win relationship between: (i) People, well-being and feeling as a part of the organisation, (ii) organisation, better sustainability or competitiveness.

3.TIME HORIZON:



4. EXCHANGE OF VARIABLES:

-Krisiak sortutako Ere-a

-Soldata jeitsi

-5 urte ERE

-Galerak

-Nagusien portaera

-Enpresaren estruktura mota

-Bazkideen jarrera berekoia

-Lankideen arteko giroa okertu da

-Sozio eta langileen tirabirak

-Jubilatutako langile batzuk oraingoak baino abantaila gehiago zeuzkaten

-Rekonozimentu eskasa

-Enpresa gestio inprobisatua

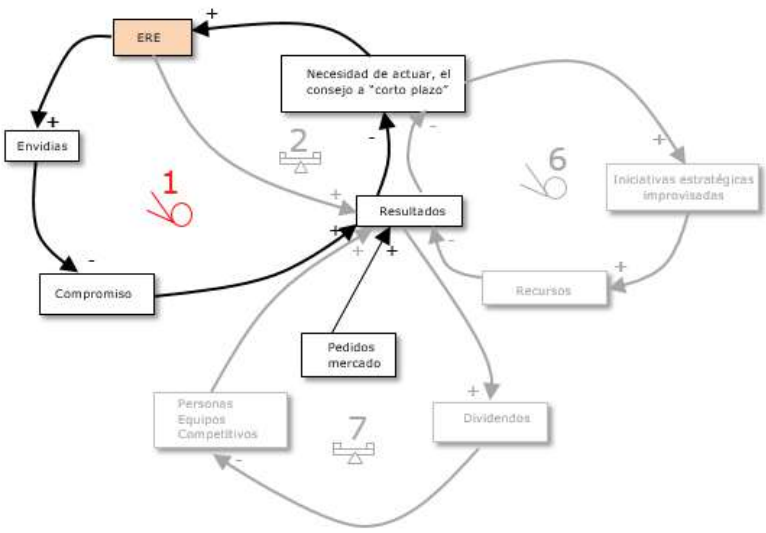
-Lanean bakoitzak aportazio desberdina eta giro txarra sortzen da

-Motibazio falta

-Lanerako gogorik ez

5. FEEDBACK LOOPS

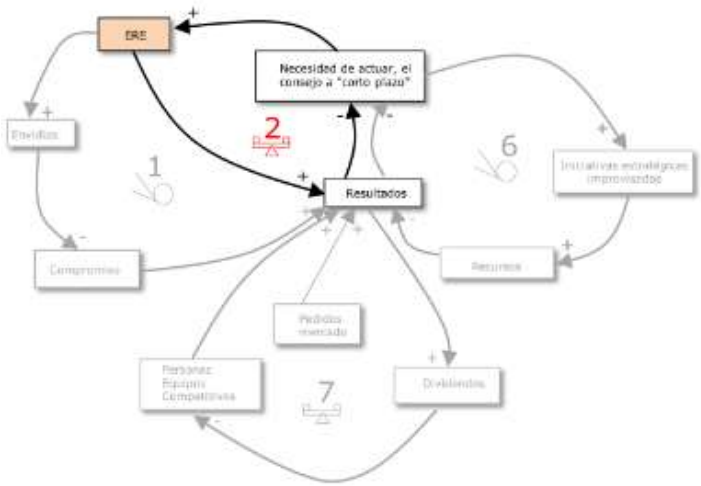
First Loop



1. El ERE como respuesta a los malos resultados:

Cuanto más bajos sean los resultados, mayor es la necesidad de actuar (por parte del consejo). La decisión fue un ERE y reducciones de salarios. Éstos generaron envidias entre las personas reduciendo su nivel de compromiso / implicación, que a su vez, empeora a medio plazo todavía más los resultados.

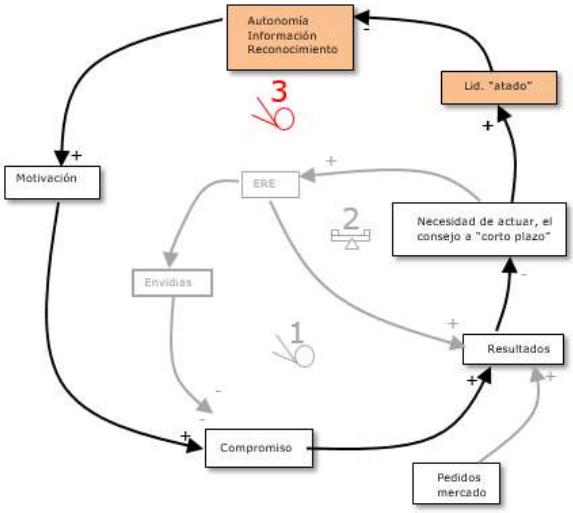
Second Loop



2. El ERE como respuesta a los malos resultados :

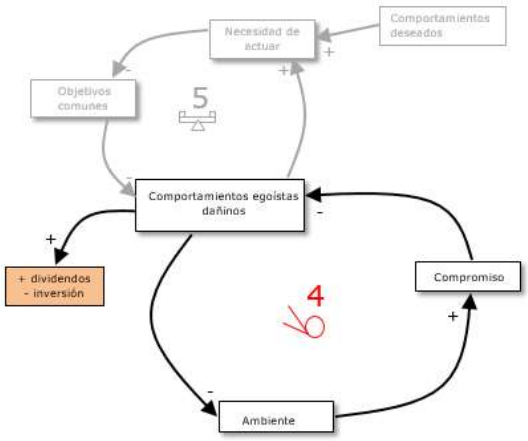
Cuanto más bajos sean los resultados, mayor es la necesidad de actuar (por parte del consejo). La decisión fue un ERE y reducciones de salarios. Este ERE y reducción de salarios mejoraron los Resultados, manteniendo la supervivencia de la organización. Esto es, el ERE tiene un efecto positivo en los Resultados (a corto plazo) pero no en el compromiso medio de las personas, con un efecto previsiblemente negativo en los Resultados a medio plazo.

Third Loop



3. Influencia tipo de liderazgo y las políticas de gestión de personas implantadas:
Cuantos más bajos son los resultados, mayor es la necesidad de intervenir por parte del Liderazgo. Sin embargo, en este caso, el Liderazgo ha estado "atado" o condicionado por el consejo. Esta "falta" de liderazgo ha imposibilitado poner en marcha políticas que buscan hacer partícipes a las personas del proyecto de empresa (autonomía, información, etc). Cuanto menos de estas políticas menor es la motivación de las personas y por tanto menor es su compromiso afectando negativamente en el compromiso. Esta reducción del compromiso tendrá, a medio plazo, un efecto negativo en el Resultado incrementando así la necesidad de actuar por parte del consejo. Se trata de un círculo que se refuerza a sí mismo.

Fourth Loop

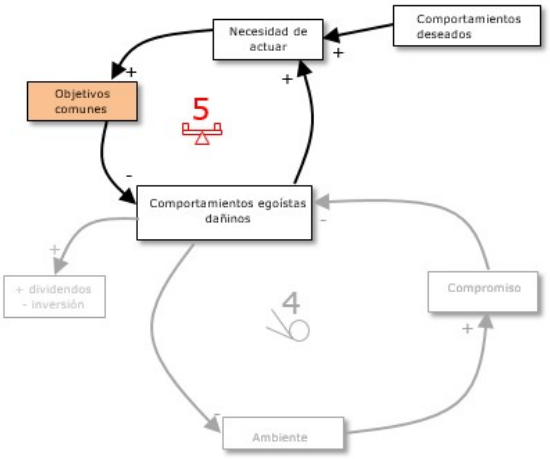


4. Los comportamientos egoístas / dañinos.

Un nivel de compromiso relativamente bajo conlleva a comportamientos individualistas, también a comportamientos poco respetuosos con otros compañeros (sobre todo si ciertas personas tienen un carácter especial o se encuentran en una posición "de poder" porque son socios). Estos comportamientos egoístas contribuyen a aumentar el reparto de dividendos y a minimizar la inversión en el negocio. Por otro lado, los comportamientos de falta de ayuda, respeto, etc deriva en un mal ambiente. Este mal ambiente influye negativamente en el compromiso de las personas.

Es un círculo que cada vez va a más en un sentido negativo (como el descrito) o en un sentido positivo (justo a la inversa de la explicación).

Fifth Loop

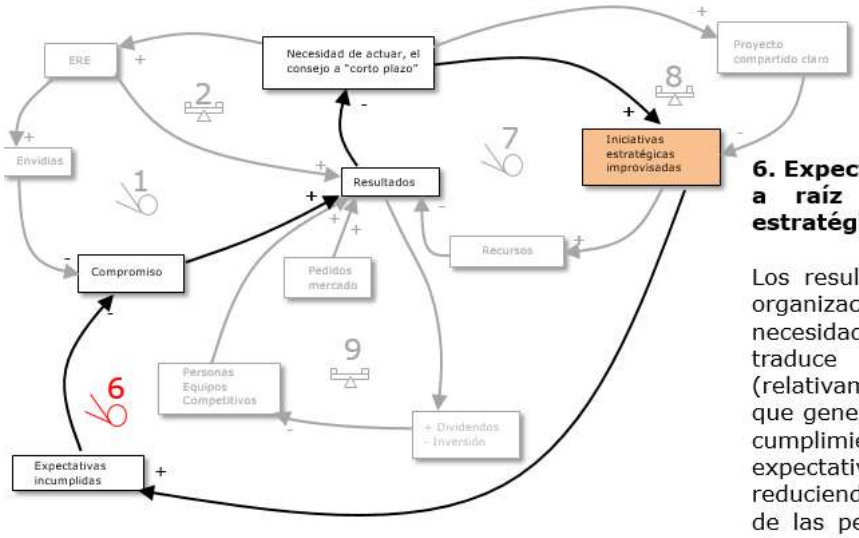


5. Los comportamientos egoístas / dañinos:

Los comportamientos poco respetuosos con otros compañeros (sobre todo si ciertas personas tienen un carácter especial o se encuentran en una posición "de poder" porque son socios) tienden a incrementar la presión para actuar (por parte de la dirección). Las actuaciones encaminadas a compartir objetivos (en Equipo) y a la gestión de conflictos, tenderán a reducir los comportamientos egoístas / dañinos.

Esta reducción de los comportamientos egoístas / dañinos tenderá a mejorar el ambiente y el compromiso de las personas (ver círculo 4).

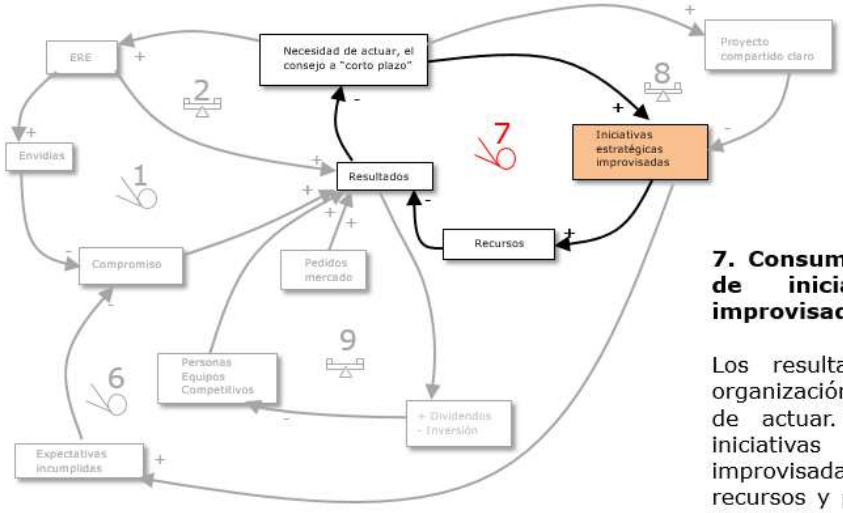
Sixth Loop



6. Expectativas frustradas de a raíz de las iniciativas estratégicas improvisadas:

Los resultados negativos en la organización fomentan la necesidad por actuar. Esto se traduce en iniciativas (relativamente improvisadas) que generan expectativas. El no cumplimiento de las expectativas genera frustración, reduciendo más en compromiso de las personas y empeorando el resultado a medio plazo y por tanto aumentando todavía más la necesidad de tener que actuar a corto plazo.

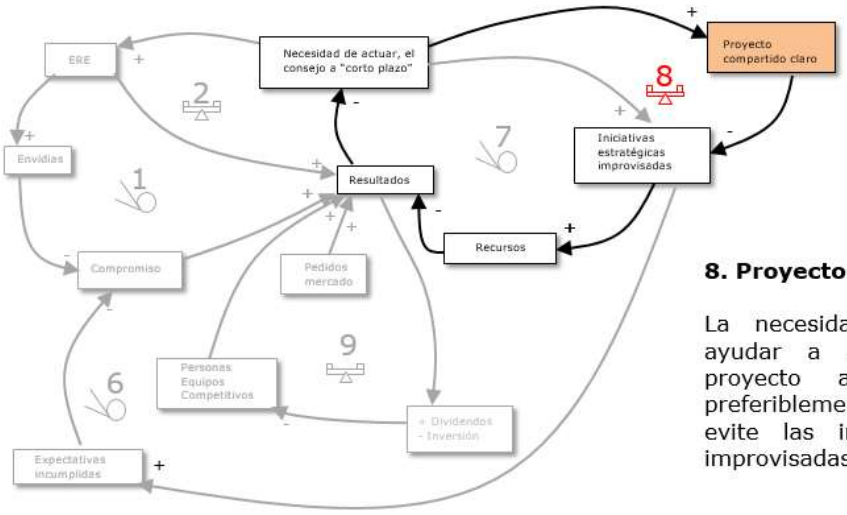
Seventh Loop



7. Consumo de recursos a raíz de iniciativas estratégicas improvisadas:

Los resultados negativos en la organización fomentan la necesidad de actuar. Esto se traduce en iniciativas más o menos improvisadas que consumen recursos y por tanto empeoran los Resultados. Cuanto más bajos los resultados, mayor es la necesidad de actuar a corto plazo, agravando así el problema.

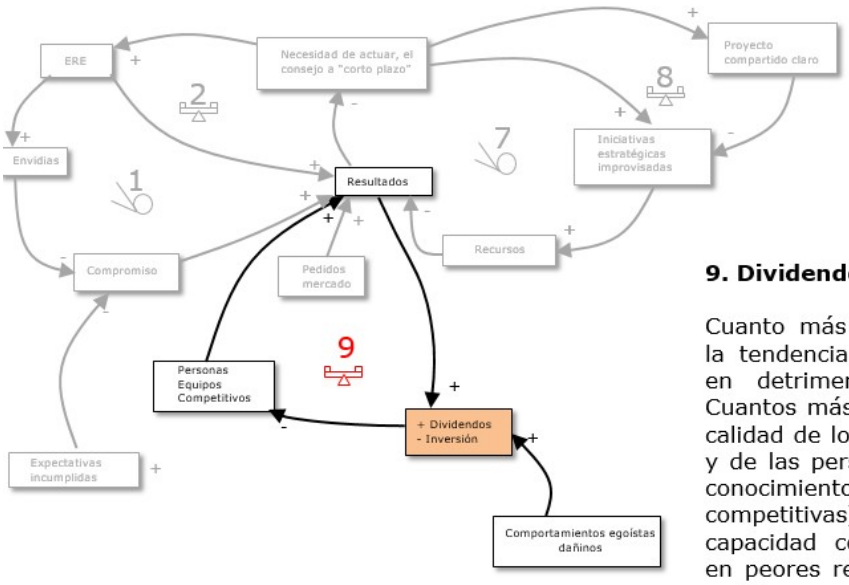
Eighth Loop



8. Proyecto compartido claro:

La necesidad de actuar puede ayudar a la definición de un proyecto a futuro claro (y preferiblemente compartido) que evite las iniciativas estratégicas improvisadas.

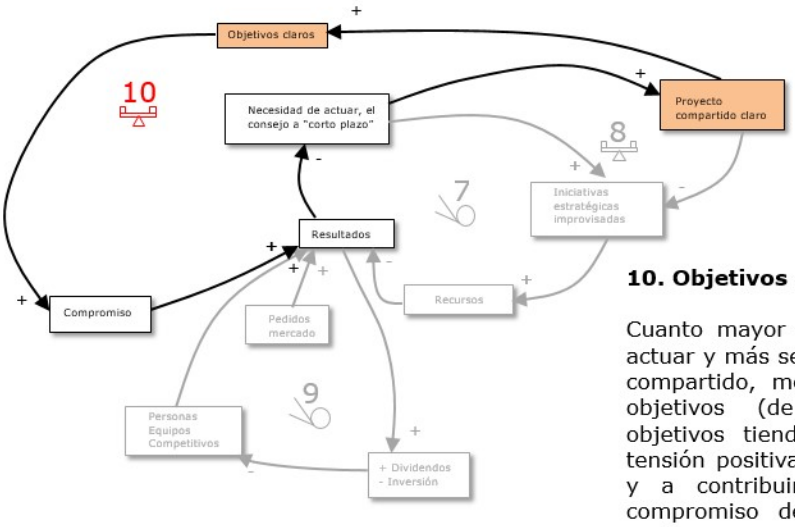
Ninth Loop



9. Dividendos vs. Inversión:

Cuanto más resultados, mayor es la tendencia a repartir dividendos en detrimento de la inversión. Cuantos más dividendos peor es la calidad de los equipos (más viejos) y de las personas (en términos de conocimientos y capacidades competitivas). Esta más baja capacidad competitiva se traduce en peores resultados agravando el problema a medio plazo.

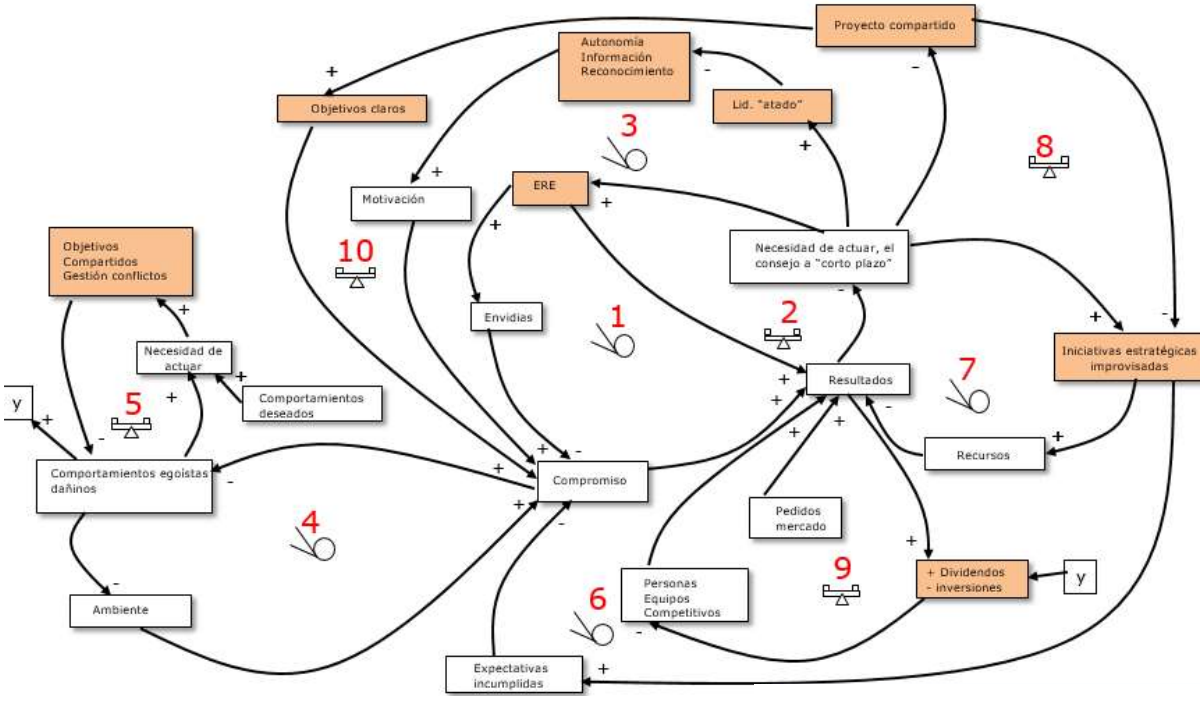
Tenth Loop



10. Objetivos claros:

Cuanto mayor es la necesidad de actuar y más se trabaja el proyecto compartido, mejor se definen los objetivos (de equipos). Estos objetivos tienden a generar una tensión positiva entre las personas y a contribuir positivamente al compromiso de las personas, el cual, a su vez redundará a medio plazo en los resultados, reduciendo así la necesidad de actuar.

6. GENERAL DIAGRAM

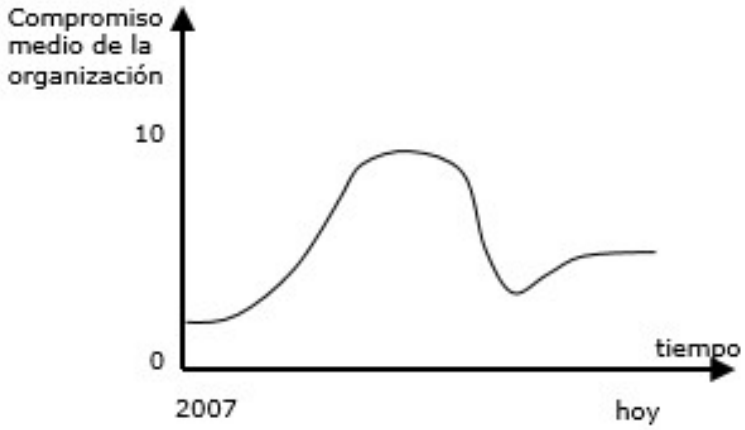


GROUP MODEL BUILDING EIGHT

1. NAME: H

2. CHALLENGE/PROBLEM: Improvement of workers COMMITMENT to achieve a win-win relationship between: (i) People, well-being and feeling as a part of the organisation, (ii) organisation, better sustainability or competitiveness.

3.TIME HORIZON:



4. EXCHANGE OF VARIABLES:

-Cambio estilo vida

-Desconfianza

-Lana behera, esfortzua ez bada rekonpentsatzen ekonomikoki

-Falta de reconocimiento

-Falta de llamadas de atención

-Arazo garrantzitsuen falta

-Emaitza onak azken urteetan

-Salmentak gora

-Jardunaldiak gora

-Beti berdin

-Ilusión proyecto

-Pausoz pauso aurrera

-Danok batera lana

-Jende asko

-Zatiketa organoen artean

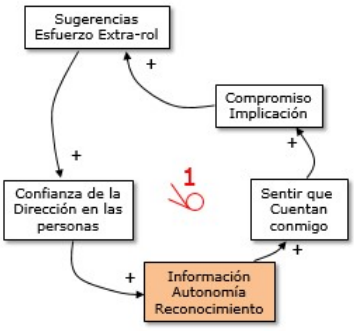
-Ekipoan jendea ez inplikauta

-Transparentziak gora

-Balorazio sistemak behera

5. FEEDBACK LOOPS

First Loop

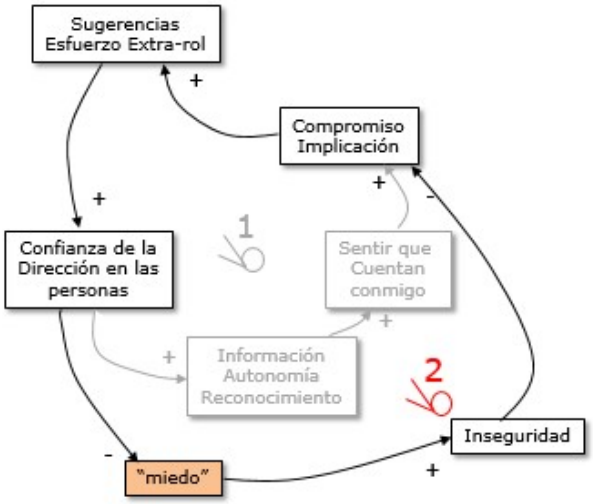


1. El ciclo de la confianza:

Una dirección que confía en las personas tenderá a implantar políticas que hagan a las personas partícipes del proyecto de empresa (p.ej. Información, autonomía, reconocimiento). Estas políticas contribuirán a que las personas sientan que se confía en ellas (que se cuenta con ellas), confiando ellas también más en la dirección. Esta confianza se materializará en una mayor implicación de las personas, el cual a su vez, contribuirá a maximizar comportamientos favorables a la organización (sugerencias; esfuerzo extra-rol). Finalmente, estos comportamientos contribuirán a reforzar la confianza de la dirección en las personas, impulsando todavía más las palancas mencionadas.

Este círculo puede también ser interpretado de la forma contraria. Cuanta menor confianza de la dirección en las personas, menor desarrollo de palancas, menor confianza de las personas en la dirección, menores comportamientos favorables a la estrategia que refuerzan la falta de confianza de la dirección.

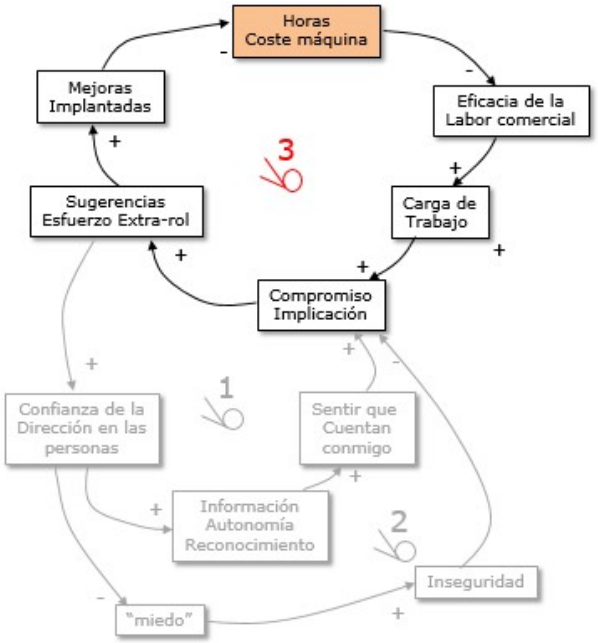
Second Loop



2. El "miedo" y la inseguridad:

Cuanto menor sea la confianza en las personas mayor es la necesidad de recurrir al "miedo" para movilizar a las personas. Sin embargo, este "miedo" genera inseguridad y no contribuye positivamente en la implicación / compromiso de las personas. La falta de compromiso e implicación no se materializa en comportamientos extra-rol y por tanto la dirección se reafirma en su falta de confianza en las personas, recurriendo con más fuerza a argumentos de "miedo" (y acentuando así el circulo).

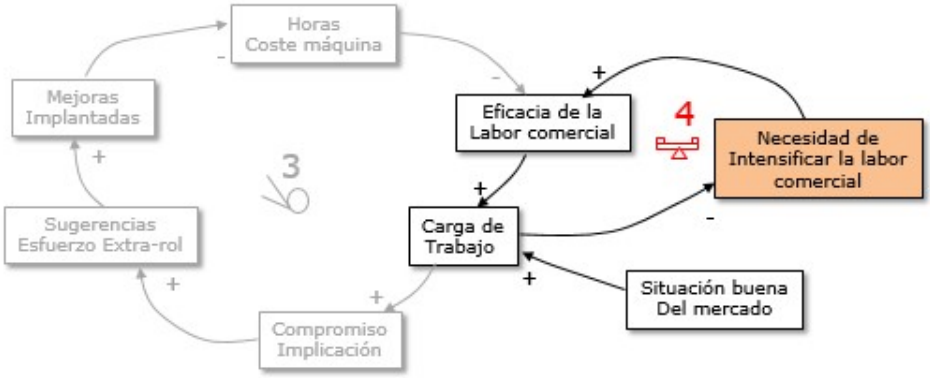
Third Loop



3. La carga de trabajo:

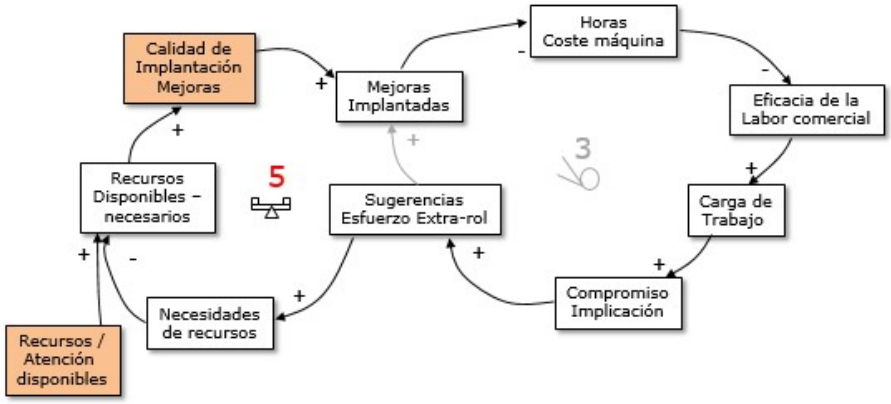
Las sugerencias de las personas y su esfuerzo extra-rol contribuirá positivamente a mejorar los procesos y por tanto a reducir el coste de la máquina (debido a una reducción de las horas de montaje y puesta a punto). Cuanto más bajo el coste de la máquina más eficaz será la labor comercial, contribuyendo positivamente a la captación de nuevos pedidos. Los nuevos pedidos suponen una carga de trabajo que contribuye positivamente al compromiso / implicación de las personas.

Fourth Loop



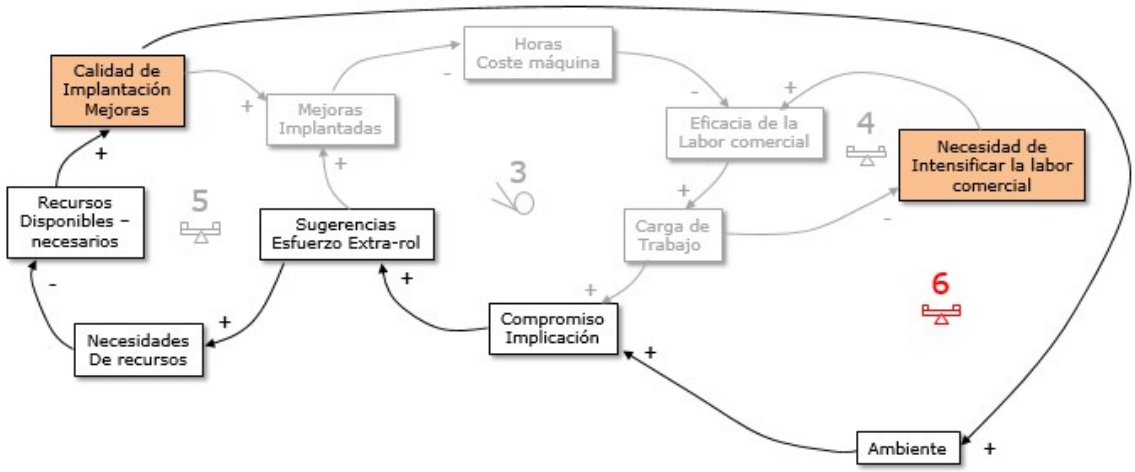
4. La labor comercial. Cuanto más baja es la carga de trabajo, mayor es la presión para intensificar la labora comercial. Una mayor intensificación de la labor comercial ayudará a replantear la labor comercial y a mejorar su eficacia ayudando a captar más pedidos (y por tanto, carga de trabajo que influirá positivamente en el compromiso de las personas). La carga de trabajo (derivado de la labor comercial) dependerá también de la buena o mala situación del mercado.

Fifth Loop



5. Garantizar las mejoras. Una mayor compromiso / implicación de las personas contribuirá a que las personas realicen más sugerencias (y mayor esfuerzo extra-rol). Estas sugerencias requerirán de una capacidad de respuesta por parte de la organización. Cuantas más sugerencias, mayor necesidad de capacidad de respuesta. La calidad de la implantación de las mejoras depende de la capacidad de respuesta de la organización. Cuanta mayor capacidad de respuesta, mayor es la implantación de las sugerencias y por tanto más competitiva es el coste de la máquina. Esta competitividad del coste de la máquina ayudará a mejorar la labor comercial y por tanto a mejorar la implicación de las personas.

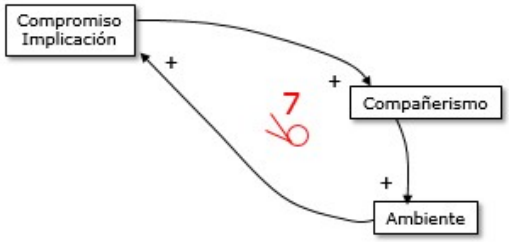
Sixth Loop



6. Las mejoras y la implicación:

La calidad de implantación de las mejoras ayudará a mejorar el ambiente de trabajo y por tanto la implicación de las personas. La mayor implicación ayudará a incrementar las sugerencias requiriendo más recursos por parte de la organización y frenando la calidad de implantación de las mejoras (es una balanza).

Seventh Loop

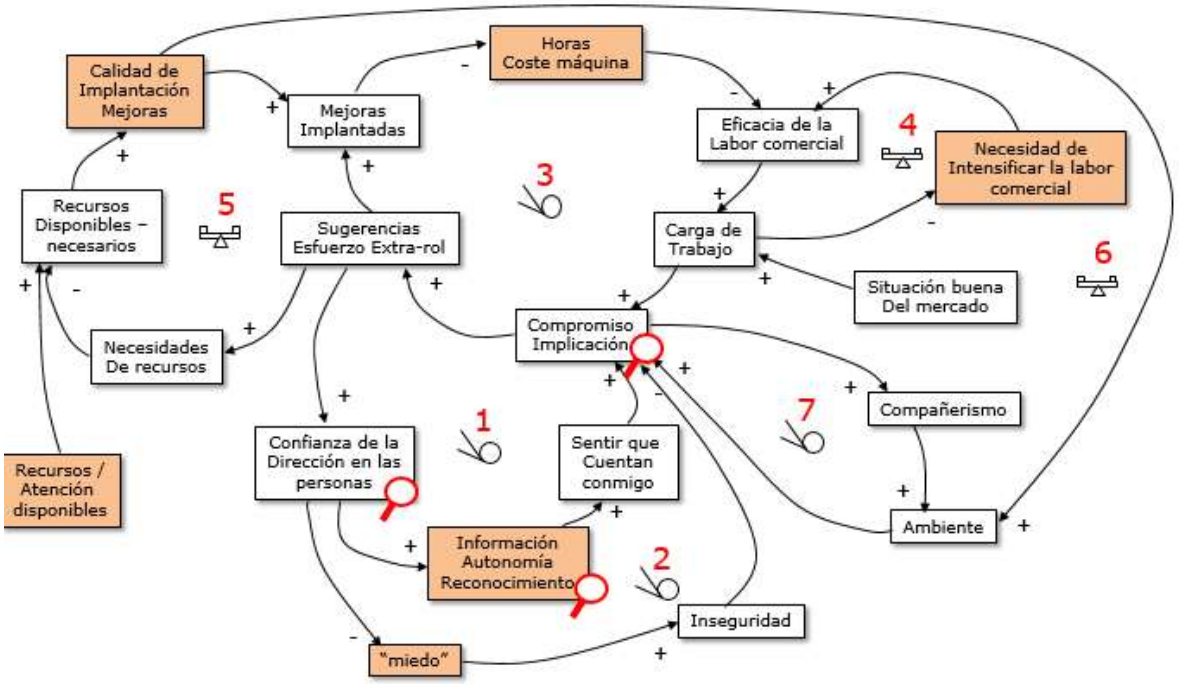


7. El ambiente:

Un mayor compromiso e implicación de las personas contribuirá positivamente al compañerismo. Una mejora del compañerismo ayudará a mejorar el ambiente de trabajo y éste, a su vez, mejorará el compromiso / implicación de las personas.

Nota: este círculo también puede interpretarse en el sentido inverso. Cuanto más bajo es la implicación / compromiso de las personas, menor será el compañerismo y por tanto peor el ambiente. Un ambiente relativamente malo no ayudará a que el colectivo mejore el nivel de compromiso /implicación.

6. GENERAL DIAGRAM

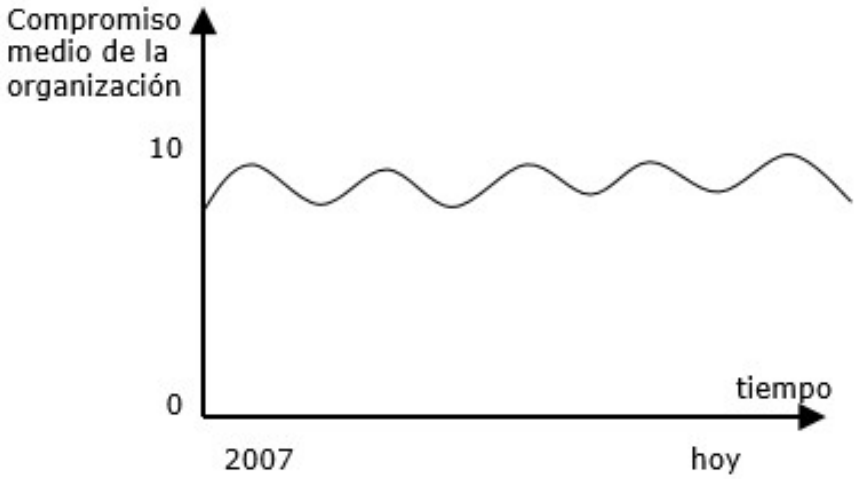


GROUP MODEL BUILDING NINE

1. NAME: I

2. CHALLENGE/PROBLEM: Improvement of workers COMMITMENT to achieve a win-win relationship between: (i) People, well-being and feeling as a part of the organisation, (ii) organisation, better sustainability or competitiveness.

3. TIME HORIZON:



4. EXCHANGE OF VARIABLES:

-Komunikazio falta

-Desarrollo en el puesto de trabajo

-Conocer/asumir proyecto empresarial

-Visión futuro

-Proyecto compartido

-Helburu argiak

-Ver que le trabajo se conoce

-Talde sentitzen zarenean

-Arazo larriak daudenean

-Poca transparencia

-Lankideekin konfiantza

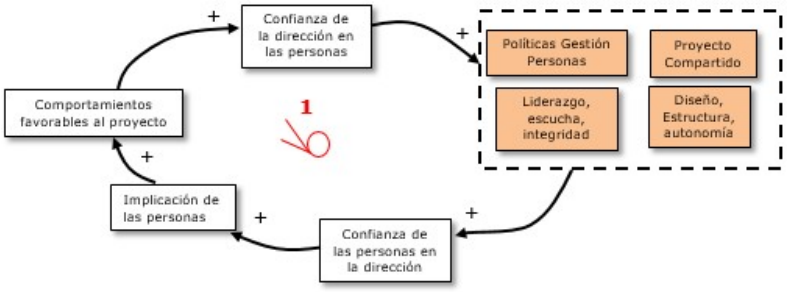
-Coherencia

-Confianza en los órganos

-Goikoenganako konfiantza

5. FEEDBACK LOOPS

First Loop

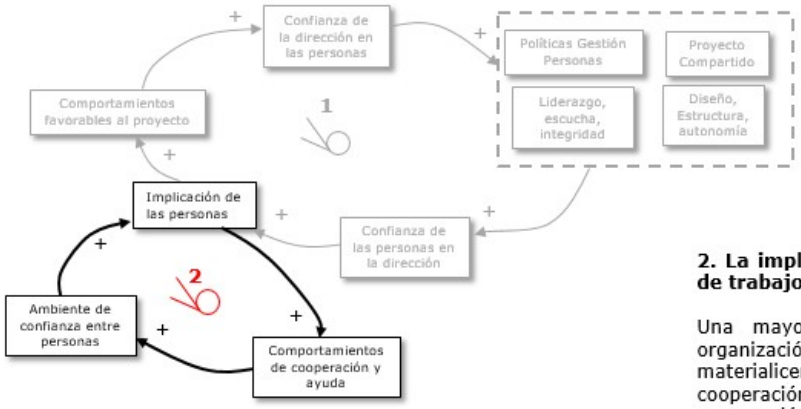


1. El ciclo de la confianza.

Una dirección que confía en las personas tenderá a: (i) implantar políticas que hagan a las personas partícipes del proyecto de empresa, (ii) compartir el proyecto, (iii) practicar un liderazgo de escucha e integridad, (iv) diseñar estructuras participativas y dar autonomía a las personas. Todo este conjunto de elementos contribuirá a que las personas sientan que se confía en ellas, confiando ellas también más en la dirección. Esta confianza se materializará en una mayor implicación de las personas, el cual a su vez, contribuirá a maximizar comportamientos favorables a la organización. Finalmente, estos comportamientos contribuirán a reforzar la confianza de la dirección en las personas, impulsando todavía más las cuatro palancas mencionadas.

Este círculo puede también ser interpretado de la forma contraria. Cuanta menor confianza de la dirección en las personas, menor desarrollo de palancas, menor confianza de las personas en la dirección, menores comportamientos favorables a la estrategia que refuerzan la falta de confianza de la dirección.

Second Loop

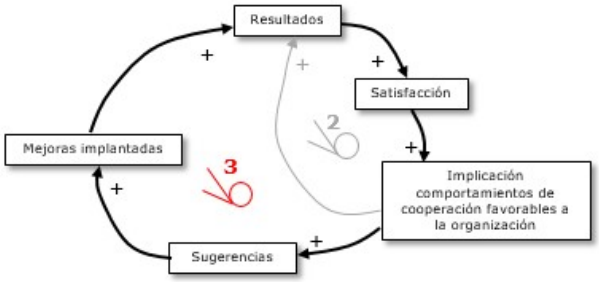


2. La implicación de las personas y el ambiente de trabajo.

Una mayor implicación de las personas en la organización contribuirá positivamente a que se materialicen comportamientos de ayuda y cooperación entre las personas. La ayuda y cooperación contribuirá positivamente a mejorar un ambiente de confianza entre las personas. Este ambiente, a su vez, contribuirá a que las personas se impliquen más en la organización.

Este círculo puede también interpretarse de forma negativa: cuanta pero implicación, menos comportamientos de ayuda y cooperación, empobreciendo el ambiente y a su vez reduciendo todavía más la implicación de las personas.

Third Loop

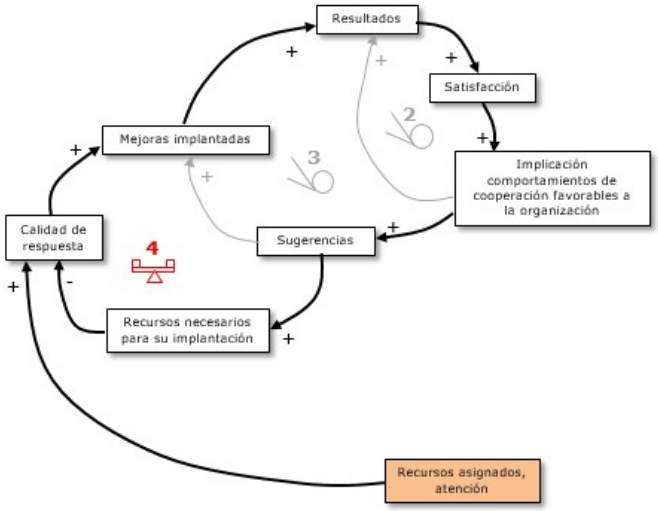


3. **Las sugerencias para mejorar los procesos.**

La satisfacción que se alimenta de unos buenos Resultados Organizativos (entre otras), contribuye a que las personas se impliquen y materialicen comportamientos favorables a la organización. Esta mayor implicación contribuye positivamente a que las personas realicen más sugerencias sobre cómo mejorar los procesos. Cuantas más mejoras, mayor será el número de mejoras implantadas contribuyendo así positivamente en los Resultados Organizativos y mejorando todavía más la satisfacción de las personas. Se crea así otro círculo de reforzamiento positivo.

Nota: este ciclo puede interpretarse también en el sentido contrario. Cuanto peores resultados, menor satisfacción, menor implicación, menores sugerencias y por tanto mejoras que no se implantan repercutiendo negativamente en el Resultado.

Fourth Loop

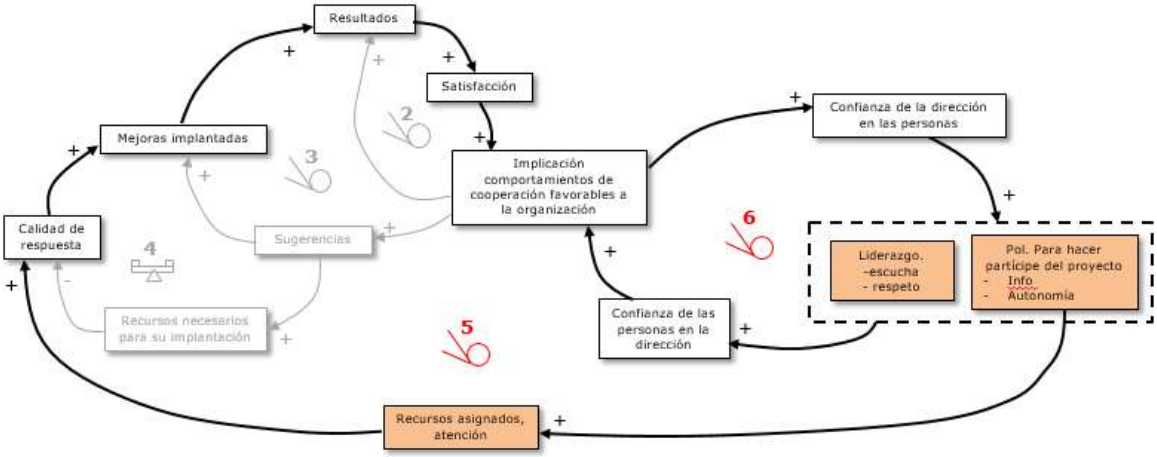


4. Los recursos para atender las sugerencias.

La implantación de las mejoras sugeridas por las personas dependerá (entre otras) de la Calidad de respuesta que tiene la organización para atender la cantidad de sugerencias que se realizan. Esta capacidad de respuesta depende de los recursos asignados y del nivel de atención / prioridad que se confieren a las sugerencias realizadas por parte de las personas. Cuanta mayor sea la calidad de respuesta, mayores serán las mejoras implantadas produciendo mejores Resultados Organizativos que revierten en una mejor satisfacción, una mayor implicación y en la realización de un mayor número de sugerencias.

En la medida que la organización es capaz de atender con relativa rapidez el número de sugerencias que se realizan, este número de sugerencias aumentará (debido a la satisfacción que produce ver Resultados Organizativos derivados de la implantación de sugerencias realizadas por uno mismo). En el momento en que el número de sugerencias sobrepasa la capacidad de respuesta de la organización, se frenarán y reducirán las sugerencias.

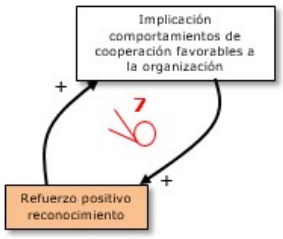
Fifth and Sixth Loop



5-6. El ciclo de la confianza. Una dirección que confía en las personas tenderá a: (i) implantar políticas que hagan a las personas partícipes del proyecto de empresa (información, transparencia, autonomía, etc), y (ii) practicar un liderazgo de escucha, integridad y respeto a las personas. Todo este conjunto de elementos contribuirá a que las personas sientan que se confía en ellas, confiando ellas también más en la dirección. Esta confianza se materializará en una mayor implicación de las personas, el cual a su vez, contribuirá a maximizar comportamientos favorables a la organización. Finalmente, estos comportamientos contribuirán a reforzar la confianza de la dirección en las personas, impulsando todavía más las palancas mencionadas. Los recursos asignados y la atención prestada para implantar las sugerencias es también una palanca que deriva de las políticas implantadas (a raíz de una mayor o menor confianza en las personas).

Este círculo puede también ser interpretado de la forma contraria. Cuanta menor confianza de la dirección en las personas, menor desarrollo de palancas, menor confianza de las personas en la dirección, menores comportamientos favorables a la estrategia que refuerzan la falta de confianza de la dirección.

Seventh Loop

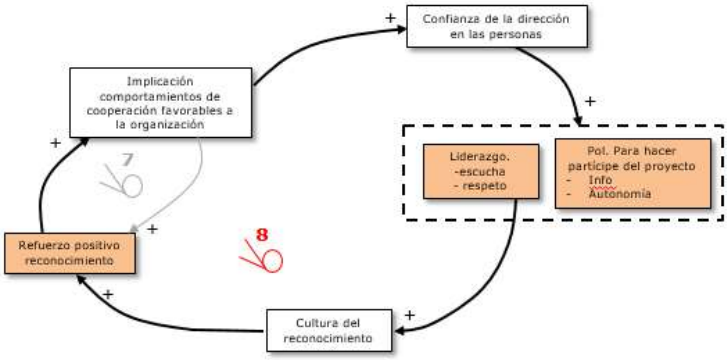


7. El refuerzo positivo.

El refuerzo positivo (por parte de la dirección y los responsables) de los comportamientos favorables a la organización materializados por las personas, contribuye a mejorar la implicación de las personas y favorece más todavía el florecimiento de los comportamientos responsables / favorables a la organización. Se trata de un círculo denominado de refuerzo positivo porque un elemento se alimenta del otro y contribuye a maximizarlo todavía más.

Este círculo puede interpretarse también en el sentido contrario: cuanto menos se refuerza menos comportamientos favorables a la organización se producen y viceversa.

Eight Loop

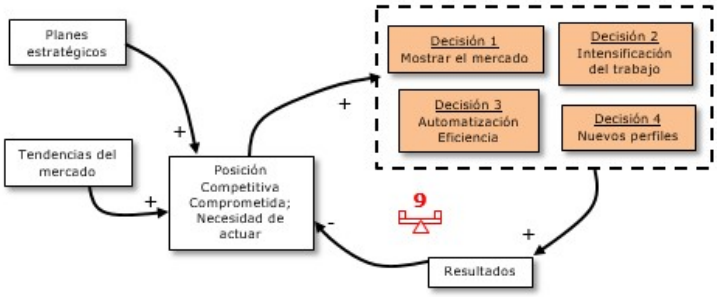


8. El Liderazgo: escucha, respeto y refuerzo positivo. El refuerzo positivo del ciclo nº7 depende de una cultura del reconocimiento y refuerzo arraigado en la estructura de mando de la organización. Esta cultura sólo es posible si la organización premeditadamente desarrolla un estilo de Liderazgo "de apego" (escucha, respeto, ayuda y atención a las personas, reconocimiento y refuerzo positivo). El desarrollo de este estilo de Liderazgo sólo es posible si existe un enfoque de confianza en las personas por parte de la dirección.

La implicación y los comportamientos favorables a la organización que florecerán como resultado de este estilo de Liderazgo, reforzarán positivamente la confianza que la dirección deposita en las personas (cuando se implanta un estilo de Liderazgo de estas características). Esta confianza reforzada, tenderá a maximizar todavía más la cultura del reconocimiento a través de este nuevo estilo de Liderazgo.

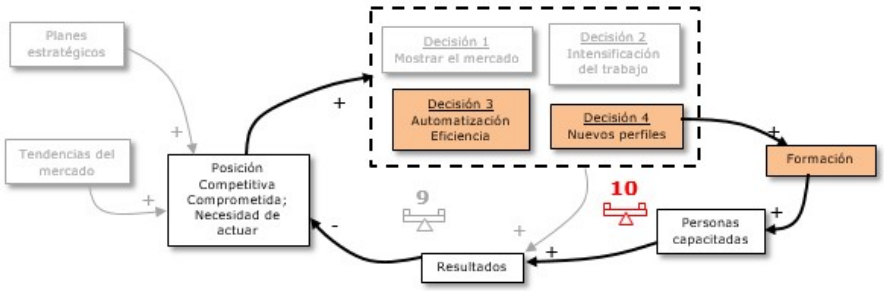
Este círculo puede interpretarse también en el sentido contrario / inverso.

Nineth Loop



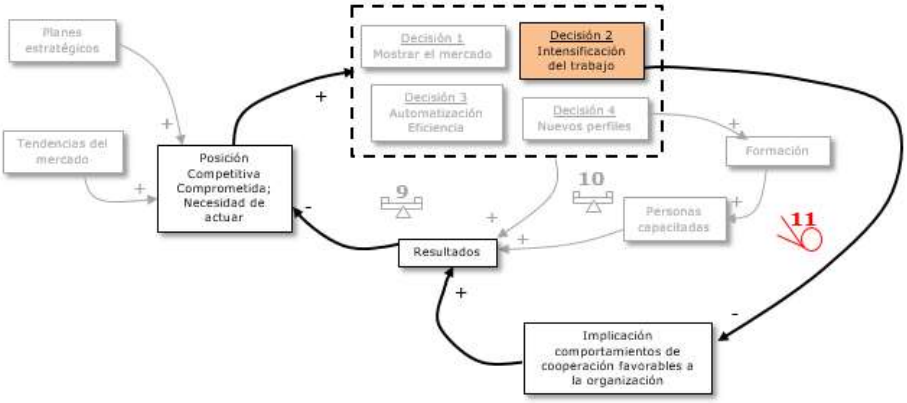
9. Las decisiones estratégicas. Cuantos peores sean los resultados de la organización, mayor será la necesidad de actuar (para mejorar la posición competitiva de la organización a medio plazo). La necesidad de actuar será mayor, cuantos más exigentes sean los objetivos estratégicos planteados en el plan estratégico / plan de gestión y en función de nuevas tendencias que pudiera tener el mercado. Una mayor necesidad de actuar derivará en decisiones que pueden ser: (i) mostrar el mercado a las personas, (ii) la intensificación del trabajo, (iii) un incremento de la eficiencia a través de la automatización y/o (iv) el desarrollo de nuevos perfiles para adaptarlos a las necesidades cambiantes del mercado / proceso de fabricación. Estas cuatro acciones (cada una de ellas de forma autónoma y/o en combinación) tienden a mejorar los Resultados económicos de la organización. Una mejora de los resultados tenderá a reducir la necesidad de actuar minimizando la intensidad de las decisiones.

Tenth Loop



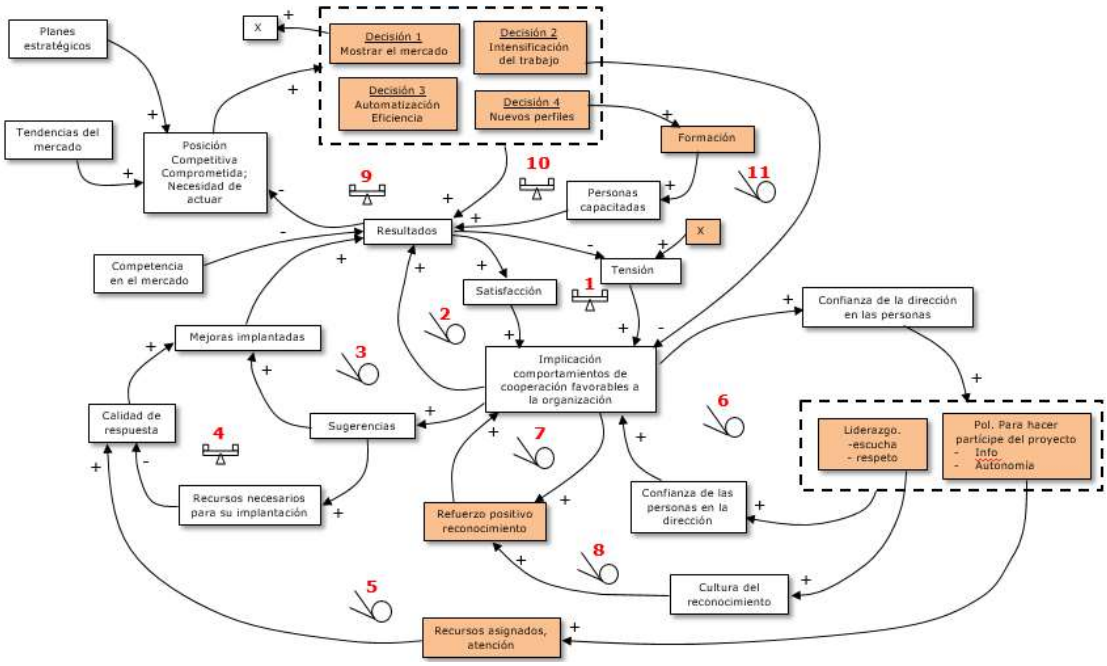
10. Los nuevos perfiles requeridos. Dos de las decisiones estratégicas que se derivan de la necesidad de tener que actuar para mejorar los Resultados (y la posición en el mercado) es (i) la automatización de los procesos y (ii) la necesidad de desarrollar nuevos perfiles que atiendan las tendencias y los retos crecientes del mercado. Ambas cuestiones contribuirán a desarrollar un plan de formación. Este plan contribuirá a que las personas tengan una mayor capacitación / competencia repercutiendo positivamente en los Resultados de la organización.

Eleventh Loop



11. El efecto de la intensificación del trabajo. Una intensificación del trabajo o incremento en el nivel de producción (derivado de la necesidad de tener que mejorar los resultados y/o la posición en el mercado), tiene efectos positivos en el Resultado económico, pero a su vez, tiene efectos negativos en las personas. Un incremento del nivel de producción tiende reducir la implicación y los comportamientos favorables a la organización y en última instancia puede tener efectos negativos en el resultado. Una reducción de los resultados puede poner en riesgo la posición de la organización en el mercado y por tanto incrementa la necesidad de actuar intensificando aún más (entre otras acciones estratégicas) el trabajo.

6.-GENERAL DIAGRAM

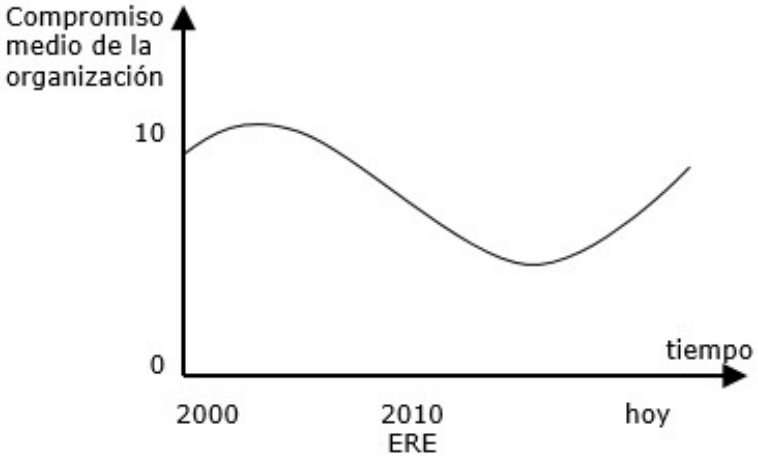


GROUP MODEL BUILDING TEN

1. NAME: J

2. CHALLENGE/PROBLEM: Improvement of workers COMMITMENT to achieve a win-win relationship between: (i) People, well-being and feeling as a part of the organisation, (ii) organisation, better sustainability or competitiveness.

3. TIME HORIZON:

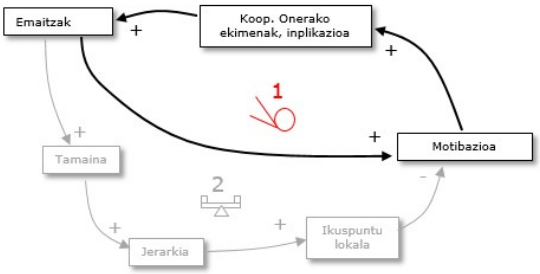


4. EXCHANGE OF VARIABLES:

- En entzutea eskaerak
- Lanaren egoera
- Ezagutza falta
- Konfidantza
- Seguratsuna
- Jendea ezagutzea
- Gorutz automatizazioa
- Organoen enfokatzea
- Lan karga
- Pertsonen arteko erlazioa
- Elkar arteko lana
- Epe motzera begiratu
- Ikuspuntua aldatzeko irekita egon
- Mailegu aldaketak
- Formatuagoak
- Esperientzia falta
- Negozio eta departamentuak isolauta
- Informazioa
- Organoen lotura
- Kontseilu sozial txarra
- Irabaziak
- Poztasuna
- Organoen artean landu proiektuak
- Jentearen harremanak
- Lanaren egoera
- Ezagutza falta
- Organoen enpoderatzea

5.- FEEDBACK LOOPS

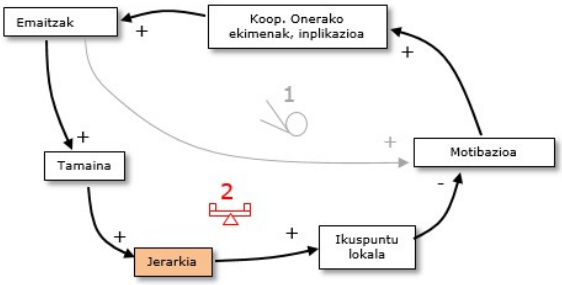
First Loop



1. La motivación y los resultados.

Las personas motivadas materializan comportamientos responsables y favorables a la organización (iniciativas para el bien de la organización). Estas iniciativas / comportamientos favorables ayudarán a lograr mejores resultados. La mejora de los resultados anima a la motivación de las personas. Esta motivación mejorada, a su vez, contribuye a incrementar comportamientos favorables.... Se crea así un círculo virtuoso. Nota importante: este círculo se puede leer también a la inversa (en sentido negativo).

Second Loop

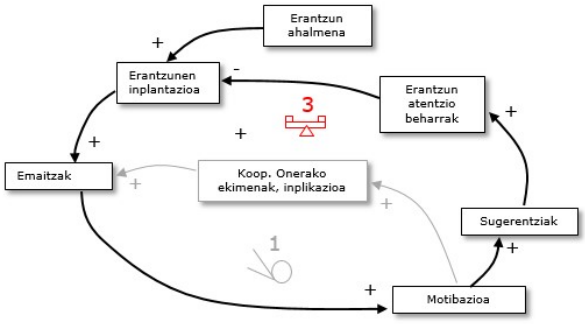


2. El tamaño de la organización.

Cuantos mejores resultados, más grande se hace la organización (a través de actividades de expansión, inversión, etc – no graficados). Un mayor tamaño tiende a requerir una organización más jerárquica. Cuanto más grande sea la organización y más jerárquica, menor será la motivación, pues se tiende a perder la perspectiva global del negocio (ikuspuntu local eta/edo partzialak), aumentan las distancias para una comunicación efectiva, etc.

En resumen, un mayor tamaño dificulta la motivación de las personas.

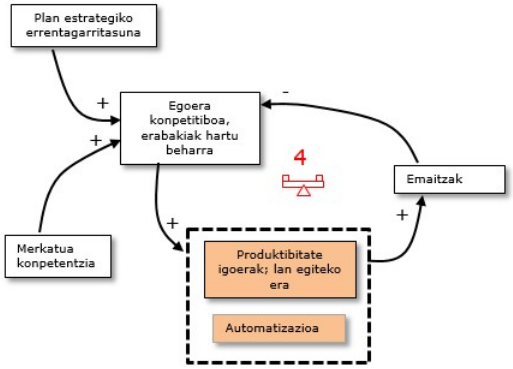
Third Loop



3. Las sugerencias.

Cuanto más motivadas las personas, mayor será la cantidad de sugerencias que se recojan para mejorar los procesos. Cuantas más sugerencias, mayor es la necesidad de atención (respuesta) por parte de la organización. A mayor necesidad de respuesta, peor será la calidad de la respuesta (implantación de las sugerencias) pues satura los recursos disponibles (o la capacidad de respuesta disponible). Por último la implantación de las sugerencias contribuye a mejorar los resultados. El hecho de ver que las sugerencias de uno han sido atendidas y ver que producen resultados ayuda a incrementar la motivación de las personas (y por tanto a realizar más sugerencias). Si la capacidad de respuesta disminuye (por una falta de recursos o de atención a las sugerencias) no habrá mejoras, las personas no se motivarán y por tanto tampoco habrá sugerencias.

Fourth Loop

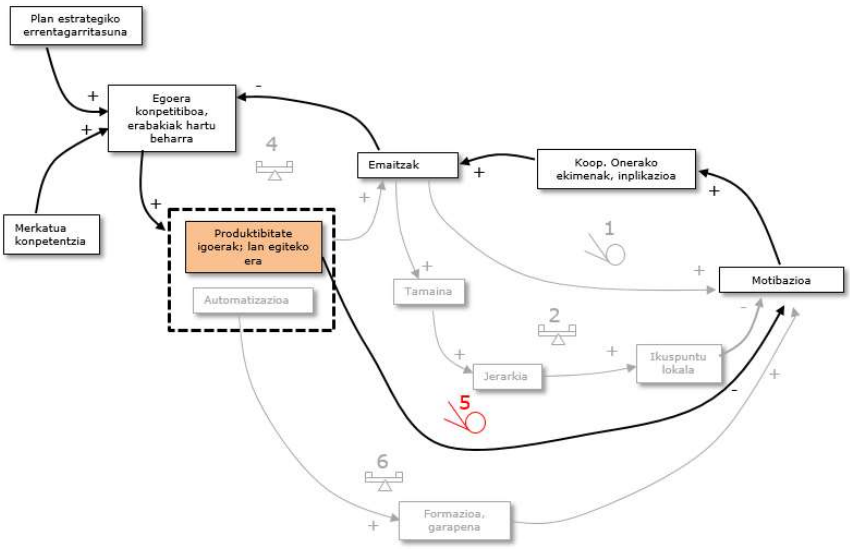


4. La productividad / eficiencia para mejorar los resultados.

Unos relativamente bajos resultados, sumados a unos objetivos exigentes del Plan Estratégico y sumado a la creciente competencia del mercado, contribuyen a incrementar la necesidad de tomar decisiones para mejorar los resultados (y la posición competitiva). Una decisión es incrementar la productividad (a través de cambios en la forma de trabajo) y otra decisión es automatizar los procesos. Ambas decisiones contribuyen a mejorar los resultados.

Esto es, la organización tiende a mejorar productividades y automatizar para hacer rentable el negocio y posicionar la empresa bien en el mercado.

Fifth Loop

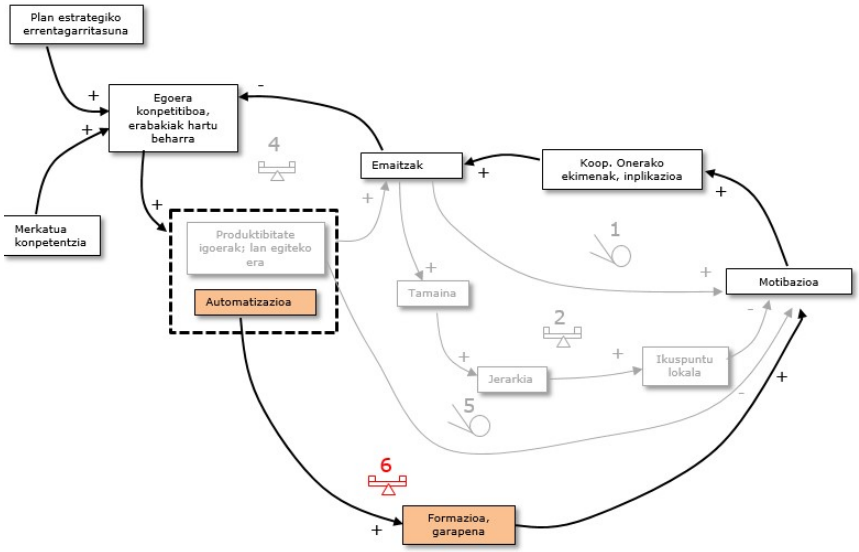


5. La productividad en las personas.

La decisión de incrementar la productividad (a través de cambios en la forma de trabajar) contribuye positivamente en los Resultados (como se ha mencionado anteriormente) pero negativamente en la motivación de las personas, pues se produce una "intensificación" del trabajo.

Una reducción de la motivación, tenderá a una reducción de la implicación iniciativa de las personas contribuyendo a reducir los resultados. Unos resultados no suficientemente buenos (según el Plan Estratégico) tenderá a que la organización tome decisiones de más productividad, empeorando (a medio plazo) todavía más la motivación de las personas. Se puede entrar así en un círculo vicioso.

Sixth Loop

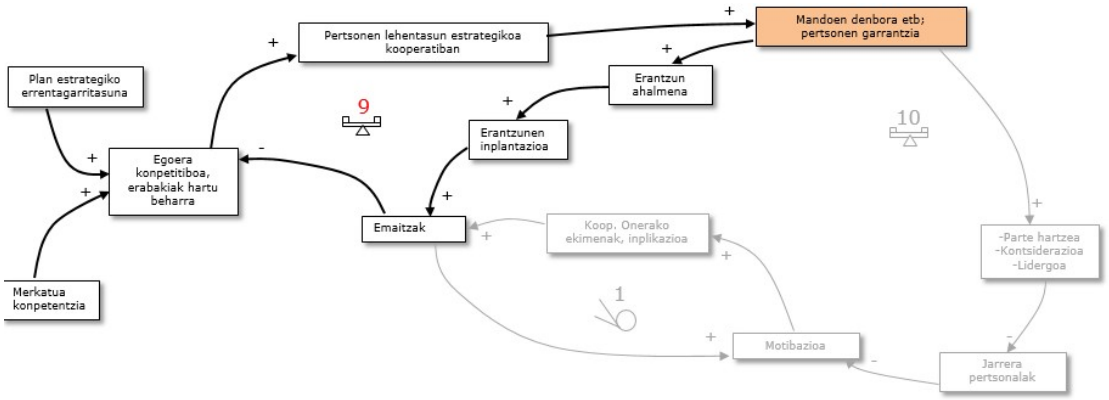


6. La automatización y las personas.

Las decisiones de automatizar tomadas para mejorar los resultados, requieren de una formación / desarrollo de las personas. Esta formación contribuye a incrementar la motivación de las personas y esta motivación contribuirá a un incremento del resultado.

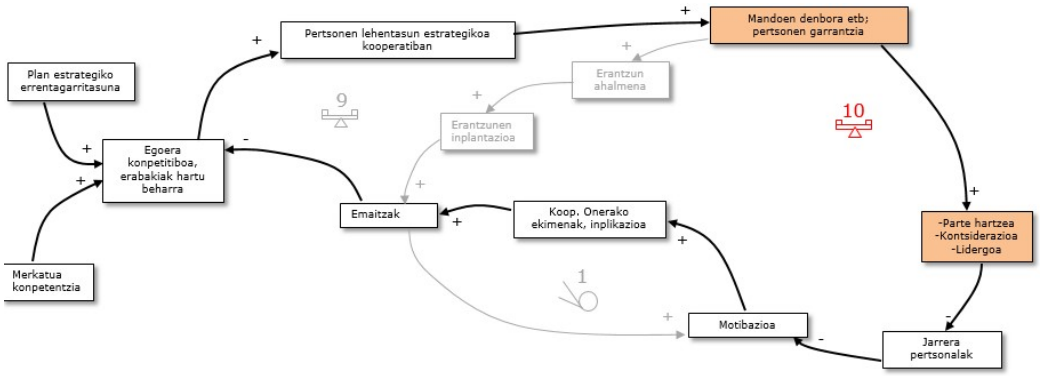
En este caso, el resultado se mejora a través de la automatización y a través de un mayor incremento de la motivación de las personas (pues se desarrollan profesionalmente).

Seventh Loop



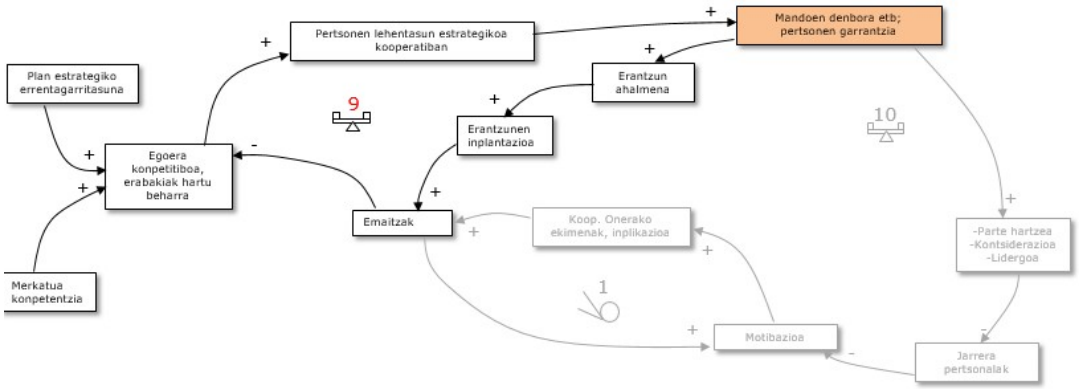
9. La estructura para responder a las sugerencias. Otra decisión (derivada de la necesidad de mejorar los resultados) además de la automatización y el incremento de productividad es considerar a las personas como una prioridad estratégica en la organización. Esta perspectiva estratégica de las personas contribuirá a que toda la estructura de mando se vuelque en la atención de las necesidades / sugerencias de las personas. Esta atención a dichas necesidades contribuirá a incrementar la capacidad de respuesta, mejorando la implantación de las sugerencias que se realizan y por tanto mejorando los resultados. En la medida que se mejoran los resultados, se tiende a reducir la necesidad de tomar decisiones para mejorar la posición de la organización en el mercado.

Eight Loop



10. La participación y el Liderazgo. La perspectiva estratégica de las personas no sólo contribuirá a volcar la estructura de mando en la atención de las sugerencias de las personas sino también en desarrollar un Liderazgo más cercano (de mayor escucha, más consideración, reconocimiento – refuerzo positivo, etc), así como en desarrollar políticas que fomentan la participación de las personas en decisiones que se consideran importantes. Esto ayudará a reducir los comportamientos individualistas y a mejorar la motivación. Esta mejora de la motivación revertirá positivamente en el resultado.

Ninth Loop



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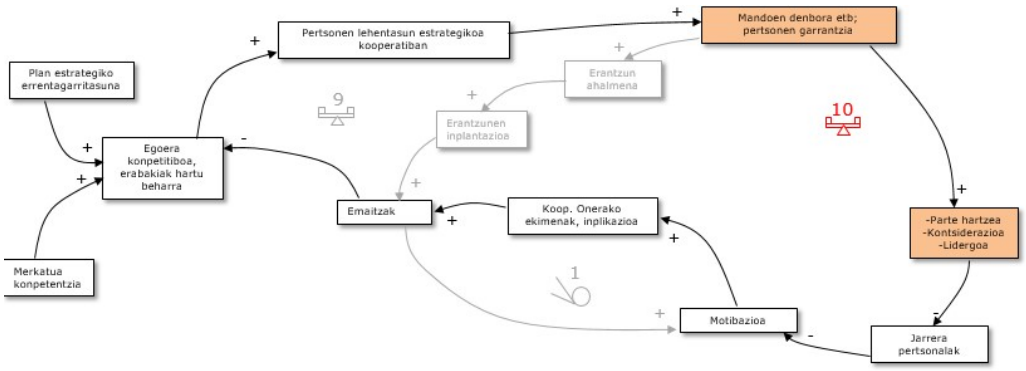
Tenth Loop



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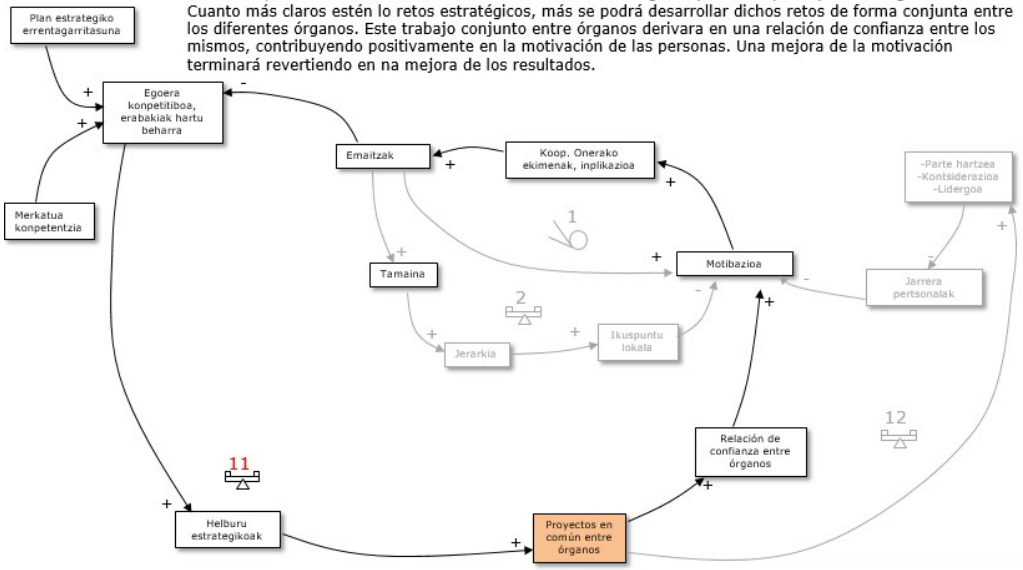
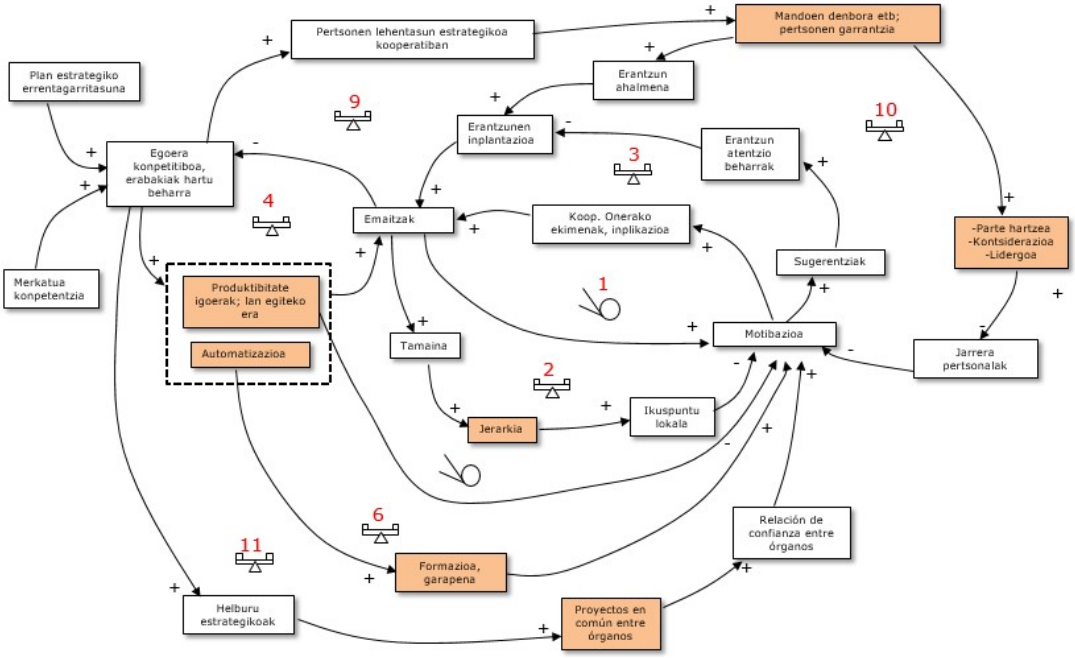
Eleventh Loop

11. Retos compartidos entre los órganos. La necesidad de tomar decisiones estratégicas que mejoren los resultados, deriva en una definición clara de los retos estratégicos que tiene que superar la organización. Cuanto más claros estén lo retos estratégicos, más se podrá desarrollar dichos retos de forma conjunta entre los diferentes órganos. Este trabajo conjunto entre órganos derivara en una relación de confianza entre los mismos, contribuyendo positivamente en la motivación de las personas. Una mejora de la motivación terminará revertiendo en na mejora de los resultados.



6..-GENERAL DIAGRAM

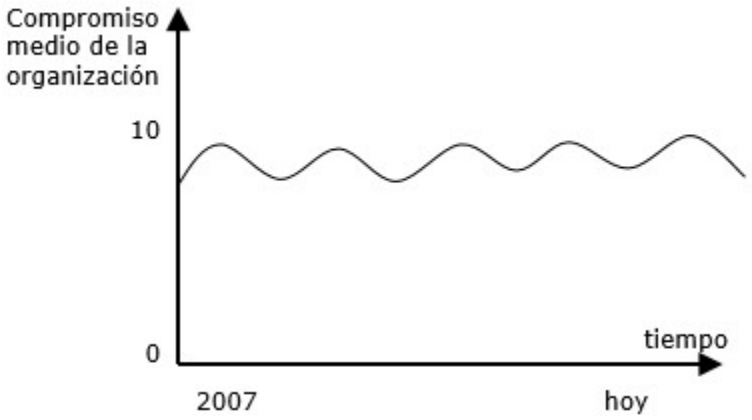


GROUP MODEL BUILDING ELEVEN

1. NAME: K

2. CHALLENGE/PROBLEM: Improvement of workers COMMITMENT to achieve a win-win relationship between: (i) People, well-being and feeling as a part of the organisation, (ii) organisation, better sustainability or competitiveness.

3. TIME HORIZON:



4. EXCHANGE OF VARIABLES:

-Komunikazio falta

-Desarrollo en el puesto de trabajo

-Conocer/asumir proyecto empresarial

-Visión futuro

-Proyecto compartido

-Helburu argiak

-Ver que le trabajo se conoce

-Talde sentitzen zarenean

-Arazo larriak daudenean

-Poca transparencia

-Lankideekin konfiantza

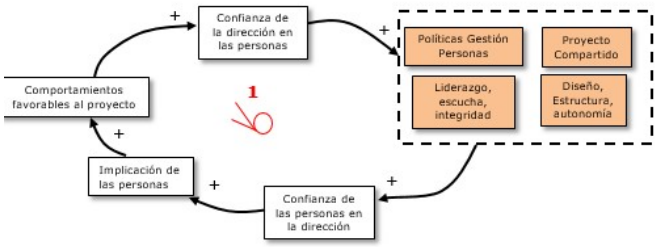
-Coherencia

-Confianza en los órganos

-Goikoenganako konfiantza

5.- FEEDBACK LOOPS

First Loop

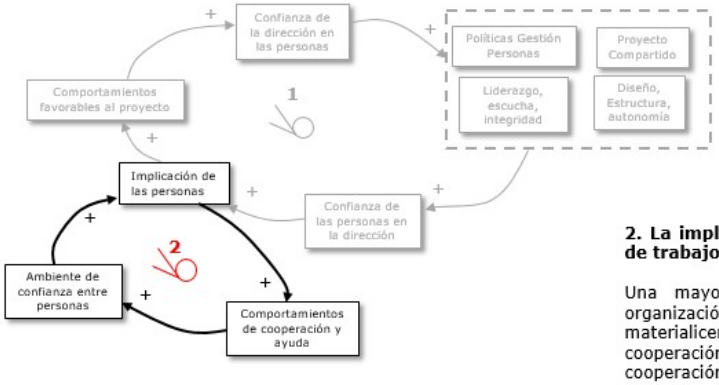


1. El ciclo de la confianza.

Una dirección que confía en las personas tenderá a: (i) implantar políticas que hagan a las personas partícipes del proyecto de empresa, (ii) compartir el proyecto, (iii) practicar un liderazgo de escucha e integridad, (iv) diseñar estructuras participativas y dar autonomía a las personas. Todo este conjunto de elementos contribuirá a que las personas sientan que se confía en ellas, confiando ellas también más en la dirección. Esta confianza se materializará en una mayor implicación de las personas, el cual a su vez, contribuirá a maximizar comportamientos favorables a la organización. Finalmente, estos comportamientos contribuirán a reforzar la confianza de la dirección en las personas, impulsando todavía más las cuatro palancas mencionadas.

Este círculo puede también ser interpretado de la forma contraria. Cuanta menor confianza de la dirección en las personas, menor desarrollo de palancas, menor confianza de las personas en la dirección, menores comportamientos favorables a la estrategia que refuerzan la falta de confianza de la dirección.

Second Loop

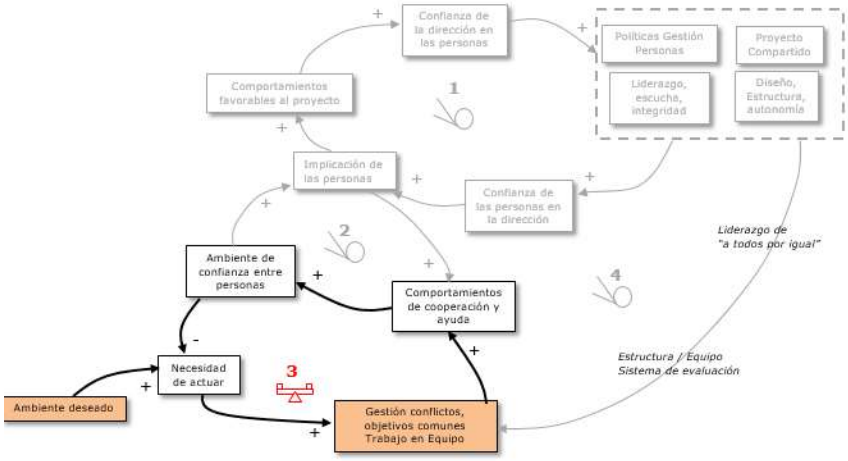


2. La implicación de las personas y el ambiente de trabajo.

Una mayor implicación de las personas en la organización contribuirá positivamente a que se materialicen comportamientos de ayuda y cooperación entre las personas. La ayuda y cooperación contribuirá positivamente a mejorar un ambiente de confianza entre las personas. Este ambiente, a su vez, contribuirá a que las personas se impliquen más en la organización.

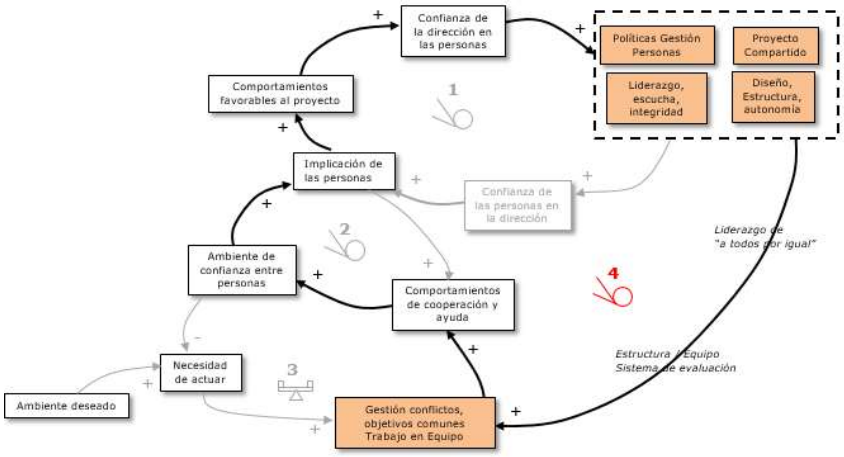
Este círculo puede también interpretarse de forma negativa: cuanta pero implicación, menos comportamientos de ayuda y cooperación, empobreciendo el ambiente y a su vez reduciendo todavía más la implicación de las personas.

Third Loop



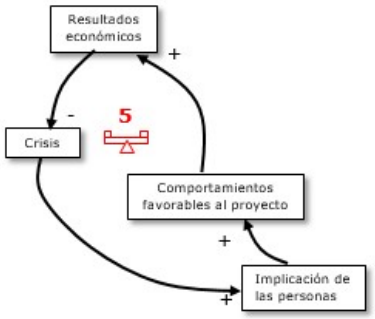
3. Objetivos de equipo y gestión de conflictos. Cuanto peor sea el ambiente de trabajo en una sección / área, mayor es la necesidad de tener que actuar. Esta necesidad de actuar será mayor cuanto más exigente sea el ambiente de trabajo que se desea en la organización. La necesidad de actuar conlleva generalmente a la gestión de conflictos, el establecimiento de objetivos comunes, y el fomento del trabajo en equipo. Estos elementos, ayudarán a favorecer los comportamientos de ayuda y cooperación entre las personas, mejorando el ambiente y finalmente, la implicación (tal y como se ha descrito en el ciclo 2).

Fourth Loop



4. La estructura, Equipo y sistema de evaluación. Parte de las palancas que se derivan de un enfoque de confianza de la dirección en las personas (p.ej. El diseño de la estructura, la creación de equipos y el sistema de evaluación), contribuirán positivamente a la creación de equipos con objetivos comunes. Estos equipos con objetivos comunes, al mismo tiempo que gestionando conflictos, contribuirán a favorecer comportamientos de cooperación y ayuda y a mejorar el ambiente de trabajo (y por tanto la implicación de las personas). La mejora de la implicación, revertirá en una mejora de los comportamientos favorables para la organización, reforzando así la confianza de la dirección en las personas y por tanto afianzando las palancas que constituyen la lógica de equipo.

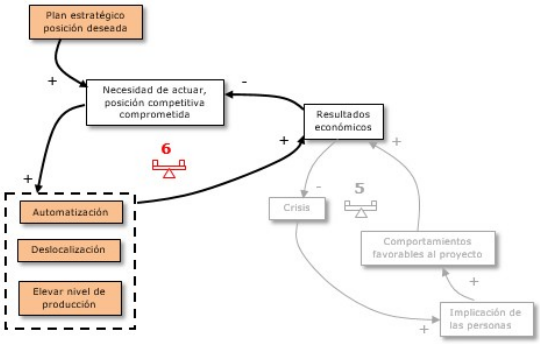
Fifth Loop



5. Los resultados "anestesian" la implicación.

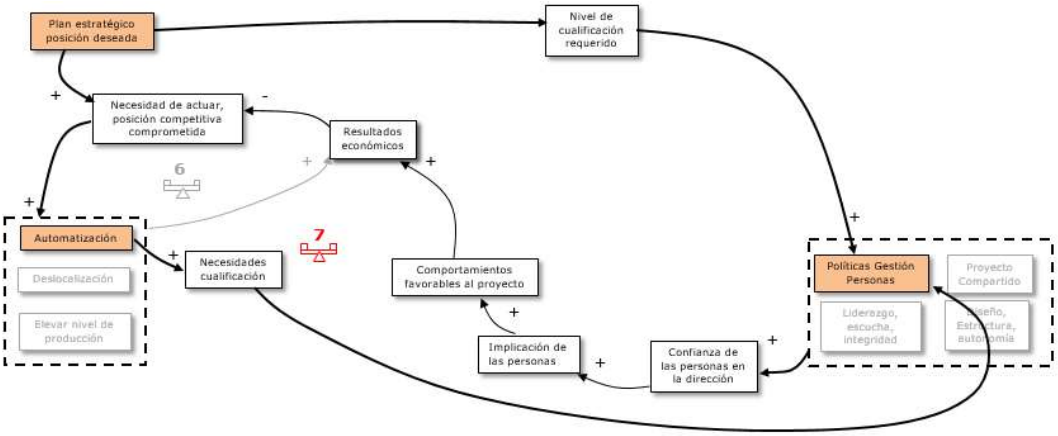
Cuanta mayor implicación, más son los comportamientos favorables al proyecto por parte de las personas. Estos comportamientos contribuirán a los resultados de la organización. Cuantos mejores resultados, menor es la sensación de "urgencia" o "crisis", y por tanto menor será la implicación de las personas. Esto es, muy buenos resultados continuados en el tiempo, pueden llegar a anestesiar a las personas (o viceversa).

Sixth Loop



6. La automatización, deslocalización y eficiencia. Cuantos peores sean los resultados de la organización, mayor será la necesidad de actuar (para mejorar la sostenibilidad de la organización a medio plazo). La necesidad de actuar será mayor, cuantos más exigentes sean los objetivos estratégicos planteados en el plan estratégico / plan de gestión. Una mayor necesidad de actuar derivará en decisiones que pueden ser: (i) una automatización, (ii) una deslocalización, (iii) un incremento de la productividad a través de mejoras / cambios en la forma de trabajo. Estas tres acciones (cada una de ellas de forma autónoma y/o en combinación) tienden a mejorar los Resultados económicos de la organización.

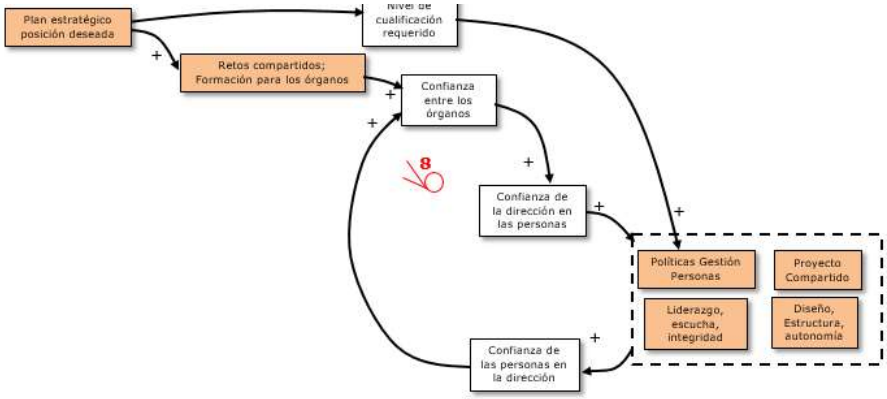
Seventh Loop



7. La automatización y los nuevos perfiles. La creciente automatización (para mejorar los resultados económicos y la posición de la organización en el mercado) está generando una necesidad de cualificación diferente en las personas. Esta necesidad de cualificación (para elevar el perfil de las personas), derivará en un plan de formación / desarrollo de las personas, ayudando a mejorar la confianza de las personas y por tanto su nivel de implicación. Esta implicación permitirá materializar comportamientos favorables al proyecto organizativo y contribuirá positivamente al Resultado de la organización, reduciendo la necesidad de actuar y por tanto reduciendo la necesidad de automatizar, deslocalizar o elevar el nivel de producción.

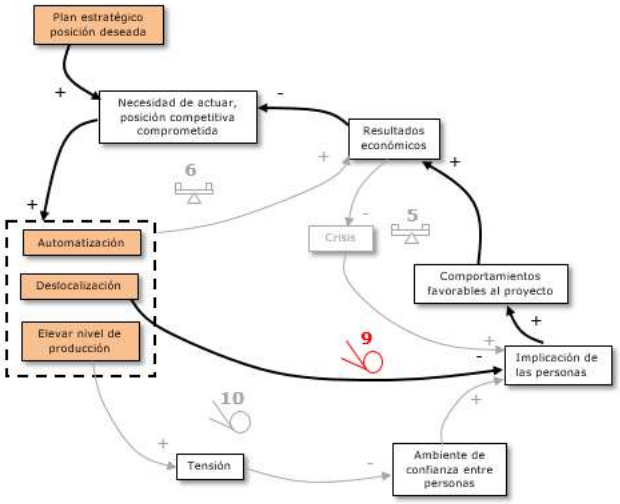
Por otro un plan estratégico que visualiza una posición determinada en el mercado, derivará en un plan de cualificación requerido por parte de las personas incrementando la necesidad de un plan de formación que eleve las capacidades de las personas revirtiendo en la implicación y en los resultados positivamente (tal y como se ha descrito anteriormente).

Eight Loop



8. Compartir retos entre órganos. Los retos que se derivan del plan estratégico / de gestión, deberían ser compartidos entre los diferentes órganos (trabajo conjunto para sacar adelante los retos). Este trabajo conjunto, junto con una formación adecuada sobre los roles y funciones de cada órgano contribuirá a mejorar la confianza entre los órganos. Esta mejora de la confianza entre los órganos revertirá positivamente en la confianza de la dirección en las personas. Esta confianza se materializará en una serie de palancas (ya descritas en el ciclo nº1), los cuales contribuirán a mejorar el clima de confianza de las personas hacia la dirección. Finalmente, este clima de confianza de las personas contribuirá también a mejorar la confianza entre los órganos.

Nineth Loop

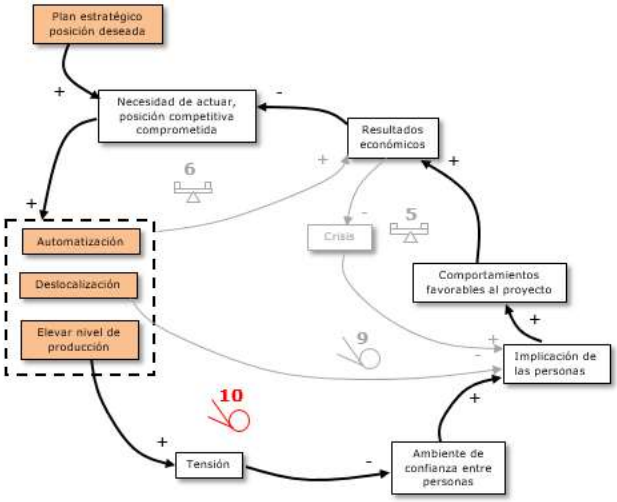


9. El efecto de la deslocalización.

La deslocalización puede mejorar los resultados económicos de la organización (tal y como se ha visto en el ciclo nº 6), pero al mismo tiempo tiene un efecto desmoralizador entre las personas, pudiendo afectar negativamente a la implicación de las mismas.

Una reducción de la implicación, contribuirá a una reducción de comportamientos favorables al proyecto y por tanto de los resultados económicos. Una reducción de los resultados económicos requerirá de más deslocalizaciones, automatizaciones, o incrementos de niveles de producción.

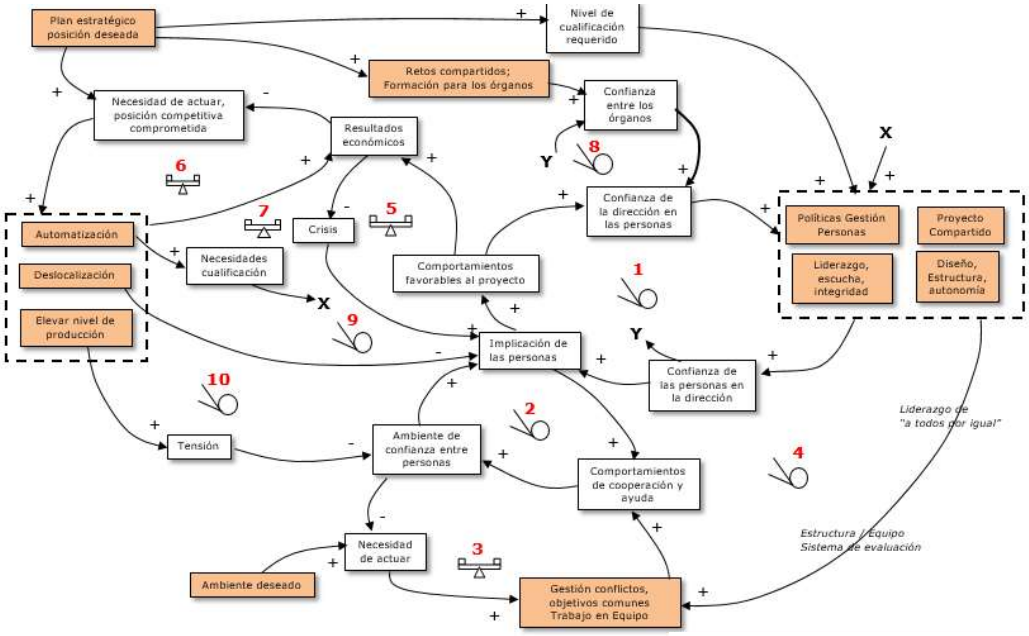
Tenth Loop



10. El efecto de un mayor nivel de producción.

Al igual que en el caso anterior (ciclo nº 7), un incremento en el nivel de producción (derivado de la necesidad de tener que mejorar los resultados y/o la posición en el mercado), tiene efectos positivos en el Resultado económico, pero a su vez, tiene efectos negativos en las personas. Un incremento del nivel de producción tiende a incrementar la tensión entre las personas, reduciendo el ambiente de confianza y colaboración entre las mismas. Este empeoramiento del ambiente, reduce la implicación, los comportamientos favorables a la organización y en última instancia puede tener efectos negativos en el resultado.

6.- GENERAL DIAGRAM



8.4. ANNEX: COMPUTATIONAL MODEL

EQUATIONS

(1)Actual performance= INTEG (increase in performance,80)

This is an stock which represents the actual level of Organisational Performance. It has just one entrance, an inflow called increase in performance. It has a medium-high initial value (80), it range goes from 0 to 100.

(2)Au= GAME (0)

This variable is activated in the scenarios in which the strategy of organisations helps to develop autonomy. It is defined as "Game" in order to change its value during the execution of the simulation.

(3)Aux intensif=increase intensification

Its value is equal to the flow called increase in intensification. The reason for including this variable was symbolic, to make the connection with output commitment.

(4)Auxiliar disaffection=DELAY FIXED (OrderControl , 5 , 0)

This variable is a delay of 5 months in the effect of order and control. Conceptually this is equal to the disaffection feeling of workers.

(5)Auxiliar increase in autonomy=(lookup necessity*trust*2)*Au

This variable conceptually represents Autonomy HR lever. It is dependent on the necessity of improving extra role and the level of trust. Au is the variable added to activate the lever in the scenarios in which is necessary.

(6)Auxiliar increase in leadership=(lookup necessity*trust*2)*Le

This variable conceptually represents Leadership HR lever. It is dependent on the necessity of improving extra role and the level of trust. Le is the variable added to activate the lever in the scenarios in which is necessary.

(7)Auxiliar increase in training=(trust*lookup necessity*2)*Tr

This variable conceptually represents Training HR lever. It is dependent on the necessity of improving extra role and the level of trust. Tr is the variable added to activate the lever in the scenarios in which is necessary.

(8)Auxiliar increase intensification= WITH LOOKUP (gap3*(Actual performance/100),([(-1,-100)-(1,100)],(-1,-100),(-0.5,-80),(-0.223242,0),(0,0),(0.2,2),(0.5,80),(1,100)))

This variable defines the effect of the relationship of Actual Performance and the gap between it and the desired on intensification. Inputs go from -1 to 100, and outputs from 1 to 100.

(9)Auxiliar LOI=DELAY FIXED(Lack of Inrole , 2 , 0)

This variable represents a delay of 2 months in the effect of Lack of In Role on Auxiliar Order and Control.

(10)Auxiliar order = WITH LOOKUP (auxiliar LOI,([(0,0)-(1,1)],(0,0),(0.4,0.15),(0.685015,0.495614),(0.795107,0.842105),(1,1)))

This variable is a lookup which defines the effect of Lack of In Role on Order and Control. It is an ascendant curve. Both the ranges of inputs and outputs go from 0 to 1.

(11)Commitment= INTEG (IF THEN ELSE(wish of improvement=5,input commitment-output commitment+STEP(-input commitment+output commitment , 75) , input commitment-output commitment),8)

This is the central variable of analysis. It starts from a high value (it range goes from 0 to 10).There is a condition to control the scenario in which wish is 5. In that case, the purpose was to block the effect of the oscillation of commitment from the 75th month on.

(12)Consistency=((auxiliar increase in autonomy*auxiliar increase in leadership)/10)+auxiliar increase in training

Consistency represents what conceptually is the implementation of all the levers together and aligned with the organizational strategy. Auxiliar increase in training is a sum due to the forth dynamic hypothesis (see Validation Chapter). We divided the multiplication by 10 to control the curve and reduce its speed.

(13)Delay vertigo orden and control= DELAY FIXED (vertigo*Size, 10 , vertigo*Size)

This variable is a delay of 10 months in the the effect of the relationship of vertigo and size of the organization on order and control.

(14)Extra role=Commitment

Extra Role behaviours of workers follow the same pattern of Organisational Commitment.

(15)Extra role contribution to performance= WITH LOOKUP (extra role-(Lack of Inrole/2),([(0,-0.3)-(10,1)],(0.030581,-0.22),(2.66055,-0.22),(6,0),(6.66,0.39),(8.2,0.77),(10,1)))

This variable is a lookup which represents the capacity of improving performance depending on the extra role and in role level of workers. When extra role and in role behaviours synergy has 6 value, they start to contribute to performance.

(16)Extra role improvement necessity = WITH LOOKUP (wish of improvement-extra role, ([(-10,0)-(10,1)],(-10,0),(0,0),(5,0.7),(10,1)))

This lookup represents the necessity of improving extra role behaviours, depending on the established wish of improvement and extra role level. When wished improvement is higher, there is more necessity to improve. Moreover, when extra role behaviours decreases there is more necessity to improve.

(17)Extra role real improvement to performance=extra role contribution to performance*performance improvement potential

This variable represents the real capacity of contributing positively to performance depending on extra Role behaviours. Both Extra Role level and potential (depending on the initial value of performance the same activities have different effect) are taken into account.

(18)Gap1=(10-Commitment)/10

This gap is useful to limit the values of Commitment in 10 (negative values).

(19)Gap2=Commitment/10

This gap is useful to limit the values of Commitment in 10 (positive values).

(20)Gap3=(objective-Actual performance)/100

This gap represents the difference between the objective stablished for Performance and the actual level.

(21)Gap4=(100-intensification)/100

This gap is useful to limit the values of Intensification in 100 (negative values).

(22)Gap40=(10-Lack of Inrole)/10

This gap is useful to limit the values of Lack of InRole in 10 (negative values).

(23)Gap41=Lack of Inrole/10

This gap is useful to limit the values of Lack of InRole in 10 (positive values in the inflow).

(24)Gap43=Lack of Inrole/10

This gap is useful to limit the values of Lack of InRole in 10 (positive values in the outflow).

(25)Gap5=intensification/100

This gap is useful to limit the values of Intensification in 100 (positive values).

(26)Gap51=(100-Actual performance)/100

This gap is useful to limit the values of Actual Performance in 100 (negative values).

(27)Gap52=Actual performance/100

This gap is useful to limit the values of Actual Performance in 100 (positive values).

(28)Gap8=(10-Commitment)/10

This gap is useful to limit the values of Commitment in 10 (negative values).

(29)Gap9=Commitment/10

This gap is useful to limit the values of Commitment in 10 (positive values).

(30)Increase in performance=(((auxiliar increase intensification*2)+(extra role real improvement to performance*100/6))/2)*gap51*gap52

This is the inflow which feeds the stock of Actual Performance. It depends on the relationship of both increase of intensification and extra role improvement to performance.

(31)Increase intensification=auxiliar increase intensification*gap4*gap5*Tasa200

This is the inflow which feeds the stock of Intensification. It depends on the relationship of both increase of intensification and Commitment value.

(32)Increase of Lack of Inrole1=Tasa30*gap41*gap40*100/8

This is the inflow to the stock called Lack of In Role. It is influenced by the Tasa which defines the effect of Commitment.

(33)Input commitment=gap8*perception*gap9*4

This is the inflow of Commitment. The factor that directly opens this valve is the perception of workers (perception of the policies implemented by management).

(34)Intensification= INTEG (increase intensification-output intensification,50)

Stock with a medium value (it range goes from 0 to 100).

(35)Lack of Inrole= INTEG (increase of Lack of Inrole1-OrderControl,1)

This is the stock which represents the problem of the Fixes That Fail od “Order and Control strategy”.

(36)Le= GAME (0)

This variable is activated in the scenarios in which the strategy of organisations helps to develop Transformational Leadership. It is defined as “Game” in order to change its value during the execution of the simulation.

(37)Lookup necessity= WITH LOOKUP (extra role improvement necessity,([(0,0)-(1,1)],(0,0),(0.05,0.005),(0.198777,0.236842),(0.391437,0.460526),(0.544343,0.583333),(0.70948,0.635965),(1.00917,0.72807)))

This lookup helps to make the scale change from the necessity of improving extra role to HR levers. It helps to represent the extra role improvement necessity in a scale from 0 to 1.

(38)Objective= GAME (80)

This is the stablished objective for organizational performance, it is in a high initial value (range 0-100)

(39)OrderControl=auxiliar order*gap43*10

This is the fix defined by managers when they want to solve Lack of In Role. IT is the outflow of Lack of in role.

(40)Output commitment=gap1*gap2*(((aux intensif/2)+tasa)/2)*100/3

This is the outflow of Commitment stock. Intensification and the Tasa which defines the effect of disaffection open this valve.

(41)Output intensification=0

Outflow of intensification, it is just symbolic.

(42)Perception=consistency+tasa vertigo orden and control

This variable represents the perception of workers of what managers do. It is dependent on consistency of levers implementation and the tasa which related vertigo and order and control. When levers are implemented in a consistent way in time, perception increases. Tasa is the inverse of order and control. SO, more order and control has a negative effect on perception.

(43)Performance improvement potential= WITH LOOKUP (Actual performance,([(0,0)-(100,1)],(0,1),(5,0.7),(15.9,0.43),(35.78,0.24),(75.54,0.08),(100,0)))

This variable is a lookup which defined the possibilities organization had to improve depending on its initial value of Organizational Performance. When the organisation has a high initial value of organizational commitment, policies and levers are not as much perceived, as in the case of the organisations with initial low organizational commitment value. When they need help any action is much more appreciated.

(44)Size=IF THEN ELSE(wish of improvement=10, 1 , (IF THEN ELSE(wish of improvement=5, -1 , 1)))

This variable conceptually represents the differences between organizations depending on the size. It is demonstrated that big companies have more middle management that small ones, as a result their management have a greater tendency to suffer from vertigo. The equation works as a condition to define the value of size depending on the wish of improvement they have as an organization.

(45)Tasa= WITH LOOKUP (auxiliar disaffection*Tasa100,([(0,0)-(1,1)],(0,0),(0.131498,0),(0.360856,0),(0.5963,0.0877193),(0.798165,0.219298),(0.9297,0.570732),(1,1)))

This variable is a lookup which defines the effect of the relationship between disaffection and actual value of commitment on the final commitment. More disaffections ends into less organizational commitment (output valve is more open).

(46)Tasa vertigo orden and control= WITH LOOKUP (delay vertigo orden and control,([(-1,-10)-(0.1,0.1)],(-1,-10),(-0.82844,-6.14605),(-0.599694,-2.86798),(-0.25,0),(0,0)))

This variable is a lookup which defines the relationship between the delay of the effect of vertigo on order and control and perception workers have about implemented management practices. More vertigo turns into more order and control, and this damages perception of workers.

(47)Tasa100= WITH LOOKUP (Commitment,([(0,0)-(10,1)],(0,0),(1.2,0),(10,1)))

This lookup is useful to activate the effect of the initial value of commitment on the effect of disaffection on final commitment. A higher organisational commitment results in a higher negative effect of disaffection on organizational commitment.

(48)Tasa200= WITH LOOKUP (Commitment,([(0,0)-(10,1)],(0,0),(1.2,0),(10,1)))

This lookup is useful to activate the effect of the initial value of commitment on the effect of intensification on final commitment. A higher organisational commitment results in a higher negative effect of intensification on organizational commitment.

(49)Tasa30= WITH LOOKUP (Commitment,([(0,-0.5)(10,0.5)],(0.122324,0.320175),(1.95719,0.307018),(3.02752,0.245614),(4.34251,0.122807),(5.01529,-0.00438596),(5.65749,-0.22807),(6.69725,-0.407895),(8.2263,-0.464912),(10,-0.5)))

This lookup defines the effect of commitment on Lack of in Role. It defines the effect in both positive and negative ranges. When organizational commitment is in 5 value, starts to have a visible effect on Lack of in role.

(50)Tr= GAME (0)

This variable is activated in the scenarios in which the strategy of organisations helps to develop Training. It is defined as “Game” in order to change its value during the execution of the simulation.

(51)Trust=(extra role/10)+(wish of improvement/30)

This variable represents the level of trust in each moment depending on the level of extra role behaviours of workers and the wish of improvement management have. A higher extra role, results in a higher organisational commitment. An increased wish ends into more necessity of a trust based organizational context.

(52)Vertigo=IF THEN ELSE(Size>0, 0 , (extra role/10))

This variable represents the negative feeling middle management have when the size of the company increases and extra role behavior of workers is dominant.

(53)Wish of improvement= GAME (0)

This variable represents the objective management stablished for extra role level of workers.

8.5. ANNEX: SURVEYS

ORGANISATIONAL CULTURE SURVEY FOR WORKERS (2017)

1) PROJECT	**Strongly disagree**	**Disagree**	**Slightly disagree**	**Slightly agree**	**Agree**	**Strongly agree**
V1) I feel that I am a participant in the company's overall project (mission, vision, values).	1	2	3	4	5	6
V2) I share the strategy and the overall goals that guide this company.	1	2	3	4	5	6
V3) The mission and vision are elements that guide me in my job.	1	2	3	4	5	6

2) SYSTEM. This section asks about the practices used to manage people in the company.

SF1) I feel that the company dedicates sufficient resources to foster my professional development.	1	2	3	4	5	6
SF2) I feel that the company provides me enough training to perform my job.	1	2	3	4	5	6
SF3) I think that the company values and promotes my training.	1	2	3	4	5	6
SP1) I participate in the definition of the annual targets for my department/section.	1	2	3	4	5	6
SP2) I participate in the definition, control and monitoring of the business plan on an annual basis.	1	2	3	4	5	6
SP3) I have the chance to participate in important decisions about the future of my department/section.	1	2	3	4	5	6
SA1) My job allows me a chance to use my personal initiative or judgement in carrying out the work.	1	2	3	4	5	6
SA2) The job allows me to make a lot of decisions on my own.	1	2	3	4	5	6
SA3) The job provides me with significant autonomy in making decisions.	1	2	3	4	5	6

SI0) I am informed about our company's plans for the future (challenges, targets, investments,…).	1	2	3	4	5	6
SI1) I have frequently updated information about the performance of my department/section (sales, results, project status, etc.).	1	2	3	4	5	6
SI2) I have enough information to do my job properly.	1	2	3	4	5	6

3) LEADERSHIP: The following items ask you about how you perceive the leadership style of the managers of your company.

Supervisors / managers in this Company …	**Strongly** disagree	**Disagree**	**Slightly** disagree	**Slightly** agree	**Agree**	**Strongly agree**
LV1) … have a clear understanding of where we are going.	1	2	3	4	5	6
LP1) … say things that make us proud to be part of this organization.	1	2	3	4	5	6
LP2) … say positive things about the work unit.	1	2	3	4	5	6
LP3) … encourage us to see changing environments as situations full of opportunities.	1	2	3	4	5	6
LG1) … maintain a high level of performance.	1	2	3	4	5	6
LG2) … are demanding and strict with the performance of their collaborators.	1	2	3	4	5	6
LG3) … inspire collaborators to give the best of themselves.	1	2	3	4	5	6
LS1) … are warm and accessible.	1	2	3	4	5	6
LS2) … are interested in hearing about our problems.	1	2	3	4	5	6
LS3) … pay attention to our opinions.	1	2	3	4	5	6

4) RESULTS

	Strongly disagree	**Disagree**	**Slightly** disagree	**Slightly** agree	**Agree**	**Strongly agree**
RC1) I am proud to be working for this company.	1	2	3	4	5	6
RC2) I feel a strong sense of belonging to this organization.	1	2	3	4	5	6
RC3) I really feel as if this organization's problems are my own.	1	2	3	4	5	6
RC4) I would refer a friend to come work at this organization.	1	2	3	4	5	6

ORGANISATIONAL CULTURE SURVEY FOR MANAGEMENT (2017)

1) BUSINESS PLAN.

In group A and B, we have implemented and/or managed structured and consolidated mechanisms so that…	**Strongly Disagree**	**Disagree**	**Somewhat Disagree**	**Somewhat agree**	**Agree**	**Strongly agree**
dV1) … people feel part of the global project of the company (mission, vision, values).	1	2	3	4	5	6
dV2) … people share the strategy and the overall objectives that guide our organisation.	1	2	3	4	5	6
dV3) … the mission and vision are elements that direct and guide people in their daily work.	1	2	3	4	5	6

2) SYSTEM: in this section you will be asked about aspects on training, participation, autonomy and information.

In group A and B, the organisation…	**Strongly Disagree**	**Disagree**	**Somewhat Disagree**	**Somewhat agree**	**Agree**	**Strongly agree**
dSF1) … dedicates sufficient resources to promote the professional development of individuals.	1	2	3	4	5	6
dSF2) … provides sufficient training so that people can do their jobs well.	1	2	3	4	5	6
dSF3) … gives importance to and promotes the training of people.	1	2	3	4	5	6

In group A and B, we systematically offer people opportunities to take part…	**Strongly Disagree**	**Disagree**	**Somewhat Disagree**	**Somewhat agree**	**Agree**	**Strongly agree**
dSP1) … in the definition of the annual objectives of their area/section/department.	1	2	3	4	5	6
dSP2) … in the definition, control and monitoring each year of the management plan.	1	2	3	4	5	6
dSP3) … in important decisions regarding the future of their area/section/department.	1	2	3	4	5	6

We have designed people's work places (for group A and B) so that…	**Strongly Disagree**	**Disagree**	**Somewhat Disagree**	**Somewhat agree**	**Agree**	**Strongly agree**
dSA1) … they can make decisions and be proactive when carrying out their work.	1	2	3	4	5	6
dSA2) … they can make many decisions for themselves.	1	2	3	4	5	6
dSA3) … they have considerable autonomy in making decisions.	1	2	3	4	5	6

We systematically and strictly ensure that people (from group A and B) have…	**Strongly Disagree**	**Disagree**	**Somewhat Disagree**	**Somewhat agree**	**Agree**	**Strongly agree**
dSI0) … information about the future plans of the organisation (challenges, objectives, investments, etc.).	1	2	3	4	5	6
dSI1) … frequently updated information (at least monthly) about how their area/section is progressing (sales, results, project status, etc.).	1	2	3	4	5	6
dSI2) … enough information to do their jobs well.	1	2	3	4	5	6

3) LEADERSHIP:

For group A and B...	**Strongly Disagree**	**Disagree**	**Somewhat Disagree**	**Somewhat agree**	**Agree**	**Strongly agree**
dLV1) … we are clear about the direction for the future.	1	2	3	4	5	6
dLV2) … we clearly communicate to people the vision of how things should be.	1	2	3	4	5	6
dLV3) … we have a clear vision of where we will be in 5 years.	1	2	3	4	5	6

In group A and B...	**Strongly Disagree**	**Disagree**	**Somewhat Disagree**	**Somewhat agree**	**Agree**	**Strongly agree**
dLP1) … we make people feel proud to work in this organisation.	1	2	3	4	5	6
dLP2) … we infect people with optimism.	1	2	3	4	5	6
dLP3) … we encourage people to view changes and problems as opportunities.	1	2	3	4	5	6
dLG1) … we maintain a high level of performance.	1	2	3	4	5	6
dLG2) … we are demanding and rigorous with respect to people's performance.	1	2	3	4	5	6
dLG3) … we encourage people to give the best of themselves.	1	2	3	4	5	6
dLS1) … we are friendly and approachable.	1	2	3	4	5	6
dLS2) … we are interested in listening to people's problems.	1	2	3	4	5	6
dLS3) … we pay attention to people's opinions	1	2	3	4	5	6

4) TEAM:

We work hard and implement specific initiatives (in group A and B) so that…	**Strongly Disagree**	**Disagree**	**Somewhat Disagree**	**Somewhat agree**	**Agree**	**Strongly agree**
dRET1) … there is a great deal of communication between people, meeting often and exchanging information fluently.	1	2	3	4	5	6
dRET2) … people are actively involved in finding solutions to the problems encountered by the team.	1	2	3	4	5	6
dRET3) … support among co-workers is common.	1	2	3	4	5	6