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A Qualitative System Dynamics Model of Barriers to Organizational Change

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By

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Abstract

Successful organizational change is one of the major challenges organizations are confronted with nowadays. Despite its importance, our understanding of potential barriers to organizational change (BOC) is still limited. This research paper argues that existing rational-linear, cause-effect change management models do not adequately capture the complex and nonlinear essence of change and its barriers. In other words, they do not suffice to explain and cope with phenomena such as BOC. This paper argues that system dynamics models – by taking an endogenous feedback perceptive – are better able to capture the nonlinear complexity of BOC. Therefore, a qualitative system dynamics model is built which aims to expand our understanding of BOC in order to identify potential coping strategies. Consequently, this thesis' research results seek to support organizations which are trying to improve their ability of successfully dealing with barriers to organizational change.

Key words: *barriers to organizational change, organizational change, resistance to change, insight inertia, action inertia, system dynamics, modeling, endogenous perspective, systems thinking, feedback, complexity*

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List of Abbreviations

BOC	Barriers to Organizational Change
CLRE	Culture of Learning, taking Risk and Experimentation
ERTC	Employees' Resistance to Change
FFA	Force Field Analysis
IPV	Immediately Preceding Variable
ODC	Organization Development and Change
RQ	Research Question
RTC	Resistance to Change
SD	System Dynamics
TPC	Theory of Planned Change

A Qualitative System Dynamics Model of Barriers to Organizational Change

Chapter 1: Introduction

"In today's dynamic market, the only constant is change, which happens continuously" (Jaramillo, Mulki, Onyemah and Pesquera, 2012: 548). In order to be successful, organizations must effectively adapt and respond to these changes (Jaramillo et al., 2012: 550). Many contemporary researchers such as Michel, Todnem and Burnes (2013: 761) agree by claiming that "sustainable organisational change is crucial to the development, growth, success and survival of any organisation operating within an ever changing environment". Zorn, Page and Cheney (2000: 534) also point out that change is a practical necessity in today's environment to allow organizations to provide efficient and effective service. Therefore it can be held that if the environment of an organization is changing, organizations need to adapt in order to be able to develop, grow, succeed and survive. However, as Michel et al. (2013: 761) posit, "there seems to be a clear consensus among researchers and practitioners alike that a majority of organisational change initiatives fail". According to Maurer (2005: 30) the remains of change initiatives that have resulted in failure are ubiquitous. Bareil (2013: 60) also attests a high failure rate of change implementation. Empirical studies conducted by Strebel (1996), Isern and Pung (2007) and Eaton (2010) confirm low success rates of change initiatives. Burnes (2005: 85) concludes that "changing organizations appears to be getting more rather than less difficult". One reason for these difficulties is a lack of knowledge and understanding of organizational change and its barriers (Samuel and Jacobsen, 1997: 164). In 1997, Samuel et al. (1997: 164) claim that "our understanding of this phenomenon is still limited, to some extent even speculative". Fourteen years later, Burke (2011: 163) still holds that "we must face the reality that well above the majority of organization change efforts fail. To assume that we know a lot about organization change and how to manage change effectively is a matter of unwarranted hubris". Therefore it is time to expand our understanding of barriers that impede effective change management in order to gain more competence in managing change successfully (Burke, 2011: 143; Burnes, 2005: 85). This thesis follows up on this request by building a qualitative system dynamics model of barriers to organizational change, i.e. it aims to identify endogenous sources of barriers to change. With the help of the model, this thesis seeks to examine possible reasons for barriers' strength and enlarge the pool of potential coping strategies.

Research Objective

By building a qualitative system dynamics model this research project aims to expand our understanding of barriers to organizational change in order to identify potential coping strategies which facilitate change, so organizations are better able to successfully maneuver their change processes and actively influence their change efforts' results.

Research Questions

In order to be able to fulfil the research objective, the thesis poses the following three research questions:

(1) What can be considered a barrier to organizational change?

(2) What influences the behavior of these identified barriers to organizational change?

(3) Which strategies bear potential to cope with these barriers and facilitate change?

Scientific Relevance

According to Burke (2011: 163) the academic field of Organization Development and Change (ODC) "has been stagnant for at least the past two decades with respect to innovation and new social technology (…) there is considerable unfinished business at hand". In addition, Senge (2006: xvi) holds that "building enterprises capable of continually adapting to changing realities clearly demands new ways of thinking and operating". This thesis aims for scientific relevance by shedding new light on the topic, i.e. by scrutinizing barriers to organizational change from a system dynamics perspective.

Societal Relevance

In general terms, the thesis aims for societal relevance as it seeks to support organizations in improving their ability to successfully maneuver their change processes and actively influence their change efforts' results. In concrete terms, the research results are used by a large Austrian company in the service sector. This company is facing difficulties in adapting to changes occurring in their environment. The company's concern is solving this problem and taking action. Consequently, the company very much appreciates the development of a model about barriers to organizational change and the identification of potential strategies to cope with these barriers and facilitate change.

Outline

After providing definitions of organizational change and barriers to organizational change (BOC), chapter 2 introduces two theoretical perspectives, namely Kurt Lewin's view and system dynamicists' view on BOC. After describing Lewin's two change models and listing their limitations, the need for new change models is demonstrated. The chapter then introduces qualitative system dynamics (SD) and describes its perspective on BOC. Summaries of four qualitative SD models of BOC found in the current literature are followed by their analysis which concludes the need for building a further qualitative SD model of BOC. In order to be able to build this model, an exploratory research is conducted. Details of the exploratory research are provided in chapter 3 dealing with methodology. This chapter provides arguments for conducting research in close collaboration with a case study company. In addition, it offers detailed information about the three qualitative data collection techniques (interview, model-building session, focus group meeting). Last but not least, this chapter describes research ethics which have been executed throughout the whole research. Chapter 4 provides this thesis' research results. In other words, it presents the qualitative SD model in detail and answers the three research questions by referring to the model. Chapter 5 compares this thesis' model with the four models introduced in chapter 2. Finally, chapter 6 concludes this paper by presenting insights, academic and practical implications, limitations and suggestions for future work.

Chapter 2 Barriers to Organizational Change from Two Theoretical Perspectives

Defining Organizational Change

According to Harvey and Broyles (2010: 10) change "simply means to move from one state of being to another, to become or do something different". Del Val and Fuentes (2003: 148) add more details when defining organizational change as "an empirical observation in an organizational entity of variations in shape, quality or state over time, after the deliberate introduction of new ways of thinking, acting and operating". Harvey et al. (2010: 10) hold that change "begins in response to some stimulus, whether internal or external, which motivates us to move from doing one thing to doing something else". One possible "aim of organizational change is an adaptation to the environment" (Del Val et al., 2003: 148). In other words, organizational change can be defined as process starting with an initial stimulus (e.g. a changing environment). This stimulus motivates organizations to change. After a specific change initiative is introduced, change can be initiated and implemented. However, as mentioned in chapter 1, this process is often hindered by barriers of organizational change.

Defining Barriers to Organizational Change

According to Danışman (2010: 202) and Erwin and Garman (2010: 40) barriers to organizational change (BOC) try to obscure, hinder, prevent or inhibit organizational change. In other words, BOC refer to *anything that tries to avoid organizational change and maintain the status quo*. Sometimes this definition – or at least a very similar definition – is also used to describe related concepts such as organizational inertia (Del Val et al., 2003: 149, Geiger and Antonacopoulou, 2009: 430, 431; Harvey et al., 2010: 99; Samuel et al., 1997: 156), resistance to change (RTC) (Del Val et al., 2003: 149; Harvey et al., 2010: 99; Lewin, 1947: 13, 14; Piderit, 2000: 784; Samuel et al., 1997: 156) and restraining or opposing forces (Lewin, 1947: 14, 16; Piderit, 2000: 784). Due to the similar definitions, these four terms[1] are often seen as equivalent (Harich, 2010: 39). However, unthoughtful synonymous use of these terms might be misleading. Especially when using the term resistance to change, it is necessary to be very precise. This term is also often used when referring to a specific, concrete form of resistance, namely employees' resistance to change (ERTC). For instance, Bareil (2013) does not define resistance to change as *anything that tries to avoid*

[1] namely BOC, organizational inertia, RTC and restraining forces

organizational change and maintain the status quo. Instead, she is more concrete when defining resistance to change as "a change-specific behavioral response of a change recipient (or a group of stakeholders) toward a change initiative that is usually proposed by a sponsor or a leader. This behavioral response can be more or less intense and can appear before, during, or after a change implementation" (Bareil, 2013: 62). In order to avoid any confusion, this thesis uses the term resistance to change (RTC) as equivalent to BOC. In contrast, when referring to a change-specific behavioral response of employees toward a change initiative introduced by an organization's change leader[2], then this thesis uses the term employees' resistance to change (ERTC). This chapter proceeds by looking at BOC from two theoretical perspectives. First, Kurt Lewin's view on RTC is presented and his two change models are introduced. After arguing for a need for a new change model, qualitative system dynamics (SD) and its view on RTC are introduced. This chapter concludes by presenting four SD models which focus on BOC and providing arguments for building a further SD model.

Kurt Lewin's Perspective on Barriers to Organizational Change

Lewin (1947) saw social settings in a state of constant change while stability is at best quasi-stationary (Burnes, 2004b: 993). Present situations are maintained by certain conditions or forces (Burnes, 2004b: 981). Lewin (1947: 16) distinguished thereby between forces that drive change and forces that oppose or restrain change. Driving forces are constantly operating in favor of change, i.e. they support change. The restraining forces, also known as BOC or RTC, are constantly trying to maintain the current situation, i.e. they want to hinder change (Nixon, 2004: 3). A quasi-stationary equilibrium prevails as long as the driving and restraining forces are equally strong (Lewin, 1947: 17). Lewin (1947) believed that some difference in the forces was required to initiate change (Harich, 2010: 38). In other words, change occurs "when one of these two forces becomes stronger than the other" (Nixon, 2004: 3). Therefore, it can be assumed that Lewin would have agreed to the following metaphor: Change "fails to occur because we are a living contradiction (…) with one foot on the gas and one foot on the brake. (…) when there is a foot on the gas and a foot on the brake there is an enormous amount of energy cycling through that system. But because the energies are cycling in opposing directions, the car is not moving" (Kegan and Lahey, 2009: 38-41).

[2] This thesis uses the term "change leaders" when referring to people responsible for initiating and/or implementing a specific change initiative.

Kurt Lewin's Two Change Models

In order to capture these dynamics, Lewin (1947) introduced a first change model, namely the force field analysis (FFA). The FFA helps identifying and examining the forces for and against change (Shirey, 2013: 69). This examination not only serves the purpose to gain a richer understanding of the barriers' sources, i.e. why change is or is not occurring, but also to find out "what forces would need to be diminished or strengthened to bring about change" (Shirey, 2013: 69). According to Burnes and Cooke (2013: 420) "Lewin's basic argument was that, if one does not understand the current situation, the forces that are maintaining the current quasi-stationary equilibrium, one cannot even begin to bring about change". In other words, all the information collected within the FFA needs to be examined and understood before using it to guide action (Shirey, 2013: 69). Action refers to either "strengthening the driving forces and/or weakening the restraining forces" (Shirey, 2013: 70). According to Dent and Goldberg Galloway (1999: 30) "[Lewin] held that it was more effective to weaken the barriers than to strengthen the drivers" because pushing strategies foster resistance (Harvey et al., 2010: 7). Lewin (1947: 34, 35) also introduced another change model called theory of planned change (TPC), also known as the three-phase model of unfreezing, change and freezing (Rufo, 2012: 324). As mentioned above, Lewin (1947: 17) believed that some difference in the forces "was required to produce the unfreezing that began a change" (Harich, 2010: 38). In other words, the first stage of unfreezing begins "when one of these two forces becomes stronger than the other" (Nixon, 2004: 3). It is in this first stage[3] when a force field analysis (FFA) should be conducted (Shirey, 2013: 70). The second stage involves the process of moving to a new state, which might involve uncertainty and fear (Shirey, 2013: 70). The third stage, freezing[4], "demands stabilizing the change so that it becomes embedded into existing systems such as culture, policies, and practices" (Shirey, 2013: 70). It can be concluded that Kurt Lewin saw the reason for adaptation difficulties in restraining forces, i.e. resistance to change. Lewin's (1947) suggestion was to identify and examine the barriers to change, understand their sources and try to weaken them while applying the three-phase model. It is indisputable how enormously influential

[3] "Unfreezing, the 1st stage, involves getting ready for change. This stage entails (…) recognizing a problem, identifying the need for change, and mobilizing others to see the need for change. Unfreezing may begin with (…) conducting a gap analysis illustrating discrepancies between the desired and current state. Creating a sense of urgency for change is part of unfreezing. A solution is then selected, and preparation for moving away from a current reality or equilibrium ensues" (Shirey, 2013: 69, 70).

[4] According to Rufo (2012: 325) in the third stage "ongoing education, communication, and policies are important to drive stability".

Lewin's work has been on contemporary organizational change theories (Styhre, 2002: 343). Erwin et al. (2010: 40) and Harvey et al. (2010: 21) confirm that much of the research dealing with organizational change and resistance to change is rooted in Lewin's work. In addition, Lewin's two models have been used extensively by businesses and organizations undertaking change (Nixon, 2004: 3). It is also indisputable that, by offering a framework to guide change, Lewin's models have supported organizations in reducing resistance to change and avoiding common pitfalls of change initiatives (Nixon, 2004: 3; Shirey, 2013: 70).

However, facing the reality that well above the majority of organizational change efforts fail (Burke, 2011: 163) implies the need for new models of BOC. In fact, Lewin's models are "criticized for being too simplistic[5], quaintly linear, and framed from a static perspective" (Shirey, 2013: 70). Lewin proposed rational-linear, cause-effect change management models (Shirey, 2013: 70) which oversimplify the complex phenomenon of BOC (Samuel et al., 1997: 164). According to Shirey (2013: 70) and Burnes (2005: 74) organizational change is complex, nonlinear and dynamic and therefore, using Lewin's change models often seems inappropriate. Styhre (2002: 345) concludes that Lewin's models serve "as a powerful metaphor for organization change, but because of its simplistic assumptions on the organization's environment it is a weak model for understanding how organization change is proceeding in real life activities". Linear models cannot adequately capture the dynamic essence of change (Samuel et al., 1997: 164). Therefore we need to expand "the notion of a system beyond anything Lewin ever described" (Dent et al. (1999: 39). In other words, there is a need for models of BOC which are able to capture the nonlinear complexity of organizational change and its barriers. The next section provides arguments for why system dynamics models are indeed capable of fulfilling this need.

Qualitative System Dynamics

According to Wolstenholme (1999: 423, 424) qualitative system dynamics (SD) is equivalent to systems thinking and introduces an endogenous[6] perspective (also known as feedback perspective). In other words, it aims to "uncover endogenous sources of system behavior"

[5] It's important to note that Lewin (1947) viewed change as a complex process and recognized its unpredictable non-linear nature (Burnes, 2004b: 993). In fact, "Lewin's conception of stability and change is very similar to that of many complexity theorists" (Burnes, 2004b: 993). However, this complex perspective is not reflected by his two change models (Styhre, 2002: 345).

[6] The term endogenous means arising from within a system (Sterman, 2000: 95)

(Richardson, 2011: 241) in contrast to exogenous sources[7] (Vennix, 1996: 45). The SD premise is that "systems behave the way they do because of their internal structure rather than as a result of external factors" (Vennix, 1996: 45). By taking an endogenous, feedback perspective system dynamicists claim that a system causes its own behavior (Senge, 2006: 43). This suggests "that every influence is both cause and effect. Nothing is ever influenced in just one direction" (Senge, 2006: 75) or in Forrester's (1958) words: "A feedback control system exists whenever the environment causes a decision which in turn affects the original decision" (Forrester, 1958: 39). An endogenous perspective enables us to see that we are "continually both influenced by and influencing our reality" (Senge, 2006: 78). In other words, it enables us to see that the world is a complex system, in which everything is connected to everything else (Sterman, 2000: 4). According to Bierema (2003: 32) system dynamicists usually don't ask questions such as "what or who caused this?" Rather, they ask for patterns and interrelationships (Bierema, 2003: 32). According to Senge (2006: 78) applying an endogenous perspective means giving up "the assumption that there is an individual, or individual agent, responsible. The feedback perspective suggests that everyone shares responsibility for problems generated by a system". In this respect, Vennix (1996: 261) holds that "in an important way we are actually creating the reality that we assume to exist independent of our own actions". Senge (2006: 42) requests that "we must look beyond individual mistakes or bad luck to understand important problems. We must look beyond personalities and events. We must look into the underlying structures which shape individual actions". These underlying endogenous structures are depicted in form of feedback loops. According to Vennix (1996: 58) "the purpose in system dynamics is to find the feedback loops underlying a problem". Richardson (2011: 221) holds that "it is worth noting that feedback loops are really a consequence of the endogenous point of view". We talk about feedback loops when "variables are organized in a circle or loop of cause-effect relationships" (Senge, 2006: 74). In other words, it is possible to trace a route that returns to the same variable from which it starts out" (Macri, Tagliaventi and Bertolotti, 2002: 303). Social systems are "composed of a number of interlinked feedback loops" (Vennix, 1996: 48). The loops'

[7] According to Sterman (2000: 95, 96) "The focus in system dynamics on endogenous explanations does not mean you should never include any exogenous variables in your models. But the number of exogenous inputs should be small, and each candidate for an exogenous input must be carefully scrutinized to consider whether there are in fact any important feedbacks from the endogenous elements to the candidate".

interaction[8] with one another causes behavior (Sterman, 2000: 13). Even though a system can contain a very large number of feedback loops, there are only two types[9]: reinforcing[10] and balancing[11] feedback loops (Sterman, 2001: 17; Vennix, 1996: 58). According to Bierema (2003: 32) "systems thinkers are (…) nonlinear in their thinking. This thinking in circles, not lines, allows them to appreciate the complexity of the system". So while Lewin's models depict driving and restraining forces in straight lines – which is a sign for linear cause-effect thinking[12] (Sterman, 2001: 11) – system dynamics models use circles (or feedback loops) to capture the nonlinear complexity of phenomena such as organizational change and its barriers.

Qualitative System Dynamics Models

In this paper the terms qualitative SD model, causal loop diagram and dynamic hypothesis are used as synonyms and refer to a "working theory of how the problem arose" (Sterman, 2000: 95), i.e. they communicate the important feedbacks you believe are responsible for a problem" (Sterman, 2000: 137). According to Sterman (2000: 95) qualitative SD models provide an explanation of the problematic behavior by representing its underlying structure, i.e. they capture all model variables[13], causal links[14] and feedback loops and give them a frame (Lane, 2008: 9; Sterman, 2000: 137; Sterman, 2001: 17). It is essential to point out that "a causal diagram captures the structure of the system, not its behavior" (Sterman, 2000: 152). Therefore, "the causal diagram doesn't tell you what will happen. Rather, it tells you what would happen if the variable were to change" (Sterman, 2000: 139). In addition, it is also important to note that models are never final, but always provisional, subject to revision or abandonment (Sterman, 2000: 95, 166). They "evolve as your understanding improves" (Sterman, 2000: 167). Also, models are simplifications of reality (Morecroft, 2012: 656). "All we ever have are assumptions, never 'truths'" (Senge, 2006: 174). Therefore, models "can never be comprehensive (and you shouldn't try: modeling is the art of simplification)" (Sterman, 2000: 166).

[8] see appendix 1 – glossary "Feedback Loop Interaction"
[9] Methods how to identify the type of feedback loop, i.e. whether it is balancing or reinforcing loop, can be found in appendix 1 – glossary "Feedback Loop Identification".
[10] see appendix 1 – glossary: "Reinforcing (Positive) Loops"
[11] see appendix 1 – glossary: "Balancing (Negative) Loops"
[12] see appendix 1 – glossary: "Exogenous Perspective: Linear Thinking in Endless Cause-Effect Chains"
[13] see appendix 1 – glossary: "Variable"
[14] see appendix 1 – glossary: "Causal Link"

Boundary of a SD Model

Depicting all possible variables and feedback loops would not only go beyond the scope of any research, but would create a complexity counterproductive to the purpose of any modeling effort. Senge (2006: 66) and Forrester (1975: 112) confirm this when they call for the "principle of the system boundary", which implies that only those variables ought to be included in a model that are most important to the issue at hand and "essential in creating the causes and symptoms of the particular behavior being explored" (Forrester, 1975: 142). Richardson (1991: 297) holds that "the closed boundary separates the dynamically significant inner workings of the system from the dynamically insignificant external environment". In other words, all relationships "which are considered important to explain the dynamic behaviour should be included in the system dynamics model" (Vennix, 1996: 45). According to Sterman (2000: 154) models should neither be too big nor too small as "having too much detail makes it hard to see the overall feedback loop structure and how the different loops interact. Having too little detail makes it hard for your audience to grasp the logic and evaluate the plausibility and realism of your model". Morecroft (2012: 657) argues for small models when holding that system dynamicists aim for models "with few assumptions and recognizable traits embedded in a clear feedback structure".

Purposes of Qualitative SD Models

The purposes of qualitative SD models are manifold. First, they help identifying feedback loops (Sterman, 2000: 137; Sterman, 2001: 17; Vennix, 1996: 52, 108). The act of identifying feedback loops can be referred to as closing the loop (Senge, 2006: 159). According to Lane (2008: 8) qualitative SD models help problem owners to think through the internal structure of the problematic behavior and thus help people close the loops. Second, models facilitate learning and aid understanding (Morecroft, 2012: 656; Vennix, 1996: 110). According to Vennix (1996: 110) "awareness of feedback processes can significantly alter people's perception of the problem", in other words, it can make them learn. Models also facilitate understanding by graphically showing the whole structure at once, i.e. they help people see deeper patterns where others only see events and details (Senge, 2006: 73). Third, building a qualitative SD model can facilitate the identification of potential high leverage strategies (Senge, 2006: 64). According to Senge (2006: 65) "there are no simple rules for finding high leverage changes, but there are ways of thinking that make it more likely. Learning to see

underlying structures rather than events is a starting point. (…) Thinking in terms of processes of change rather than snapshots is another".

Leverage

According to Godkin and Allcorn (2008: 82) "leverage means identifying a feature of the system that is open to influence and that, if changed, might interrupt vicious cycles or even transform them into benevolent ones". According to Senge (2006: 69) "systems thinking is a discipline for (…) discerning high from low leverage change". High leverage refers to "a change which – with a minimum of effort – would lead to lasting, significant improvement" (Senge, 2006: 64). In other words, it refers to small, well-focused actions which produce enduring improvements (Senge, 2006: 64). Speaking of enduring, "system dynamics aims at identifying policies, which prove effective in the longer run" (Vennix, 1996: 106). Low leverage, in contrast, "is a reliable indicator of nonsystemic thinking" (Senge, 2006: 61) and refers to situations when "the more effort you expend trying to improve matters, the more effort seems to be required" (Senge, 2006: 58), also known as the "what we need here is a bigger hammer" syndrome (Senge, 2006: 61). One can also use the following metaphors for low leverage changes: "The harder you push, the harder the system pushes back." (Senge, 2006: 58) or "The easy way out usually leads back in." (Senge, 2006: 60). According to Sterman (2000: 3) "many times our best efforts to solve a problem actually make it worse". Worse still, acting with low leverage usually "leaves the underlying system of structural conflict unaltered" (Senge, 2006: 147). Therefore, system dynamicists are aiming for high leverage change. However, the problem is that "areas of highest leverage are often the least obvious" (Senge, 2006: 63). According to Senge (2006: 64) high-leverage changes "are not 'close in time and space' to obvious problem symptoms. This is what makes life interesting".

System Dynamics' View on Barriers to Organizational Change

According to Vennix (1996: 106) and Sterman (2000: 3) system dynamicists use the terms "systemic compensation" or "policy resistance" for explaining failures of change efforts. Policy resistance "is the tendency for a system to continue its current behavior, despite the application of force to change that behavior" (Harich, 2010: 37). But why do change efforts fail, i.e. why does policy resistance occur? Or as Allcorn and Godkin (2011: 89) pose it: Why are barriers "to change and organizational inertia so pervasive and predictable despite our

best efforts?" According to Vennix (1996: 106) and Senge (2006: 88) the answer lies in feedback processes that counteract change efforts and try to maintain "the status quo, even when all participants want change" (Senge, 2006: 86). Those who attempt organizational change often find themselves unwittingly caught in counteracting feedback structures (Senge, 2006: 86). According to Sterman (2000: 10) "policy resistance arises because we often do not understand the full range of feedbacks operating in the system". Worse still, these feedback processes are usually not even noticed by those who invest their efforts. According to Senge (2006: 88) whenever there is policy resistance, you can count on there being hidden feedback loops and until the feedback structure "is recognized, the change effort is doomed to failure" (Senge, 2006: 87). One reason why we have trouble recognizing feedback structures is that we are also part of the system's structure. According to Senge (2006: 44) "the nature of structure in human systems is subtle because we are part of the structure" therefore "it's doubly hard to see the whole pattern of change" (Senge, 2006: 7). A second reason is that our mental models are incomplete. According to Godkin et al. (2008: 84) mental models "help individuals feel the world is orderly and predictable. These often uninspected mental models are the framework from which experience of the environment is perceived and interpreted". In other words, mental models determine how we see things, how we see the world. "Very often, we are not consciously aware of our mental models or the effects they have on our behavior" (Senge, 2006: 8). Sterman (2001: 10) argues that "as wonderful as the human mind is, the complexity of the world dwarfs our understanding" and therefore "our mental models often fail to include the critical feedbacks determining the dynamics of our systems" (Sterman, 2000: 137). In other words "our ability to understand the unfolding impacts of our decisions is poor" (Sterman, 2001: 10). According to Sterman (2001: 10) our mental models are limited, inconsistent, unreliable, "incomplete, and, especially in Western culture, chronically nonsystemic" (Senge, 2006: 174). Senge (2006: 73) therefore concludes that "reality is made up of circles but we see straight lines". When seeing straight lines instead of circles or loops, we tend to explain our experiences as a series of events (Sterman, 2001: 11). According to Senge (2006: 21) these event explanations "distract us from seeing the longer-term patterns of change that lie behind the events and from understanding the causes of those patterns". The consequence of this "blindness" is that we often make low leverage decisions, i.e. decisions that "often return to hurt us in the long run" (Sterman, 2001: 10) while the real leverage lies in seeing how we can improve over

time (Senge, 2006: 66). “Where the world is dynamic, evolving, and interconnected, we tend to make decisions using mental models that are static, narrow, and reductionist” (Sterman, 2001: 11). According to Senge (2006: 250) “this accounts for a great deal of why managers are so drawn to low leverage interventions” and still “wonder why our deepest problems never seem to get solved” (Senge, 2006: 7).

Similarity between Lewin and SD: Systems Perspective on Barriers to Change

It is important to note that both Lewin and system dynamicists hold that taking a systems perspective is essential when dealing with BOC. “We all know the metaphor of being unable to ‘see the forest for the trees’. Unfortunately, when most of us ‘step back’ we just see lots of trees. We pick our favorite one or two and focus all our attention and change efforts on those” (Senge, 2006: 124). Both Lewin as well as system dynamicists, however, suggest trying to see the forest as a whole. The voices of Lewin, Senge, Sterman and many more tell us to look at a problem from all angles to find potential missing abstractions (Harich, 2010: 37). Senge (2006: 77) calls for a systems perspective when holding that “seeing only individual actions and missing the structure underlying the actions (…) lies at the root of our powerlessness in complex situations”. Vennix (1996: 261) and Sterman (2000: 4) confirm the importance of viewing the whole rather than focusing only on parts. Dent et al. (1999: 31) confirm that “for Lewin, resistance to change was a systems phenomenon”, in other words Lewin had a systems understanding of barriers to change (Dent et al., 1999: 39). According to Burnes et al. (2013: 411) “[Lewin suggested] rather than attempting to understand a situation by focusing on one or two elements in isolation, one needs to consider the situation as a whole”. This perspective is reflected by Lewin’s force field analysis (FFA) which identifies all possible forces for and against change “by mapping out the totality and complexity of the field in which the behaviour takes place” (Burnes, 2004a: 311). After examining the situation as a whole, a richer understanding of the sources of problematic behavior is gained. This information is then used to guide actions (Shirey, 2013: 69). The same applies for qualitative SD modeling which also tries to capture the totality and complexity of a problem by representing its underlying structure. Just as FFA models, SD models also facilitate understanding of the problematic behavior’s sources (Morecroft, 2012: 656; Vennix, 1996: 110) and help identifying potential policies (Senge, 2006: 7). Both FFA models and SD models try to resemble the whole structure at once, i.e. they help people see

deeper patterns where others only see events and details. Thus it can be implied that both Lewin as well as system dynamicists agree to the statement that "true barriers to change come from within the system" (Kegan et al., 2009: 118). It can be concluded that the main difference between Lewin's and SD's explanations for failures of change efforts is that Lewin has not included nonlinear feedback processes in his models. In other words, system dynamics modeling goes one step further: it is closing the loops, i.e. it is trying to discover "how apparent external forces are actually interrelated" (Senge, 2006: 159). This way, it aims to identify potential high leverage interventions capable of facilitating change.

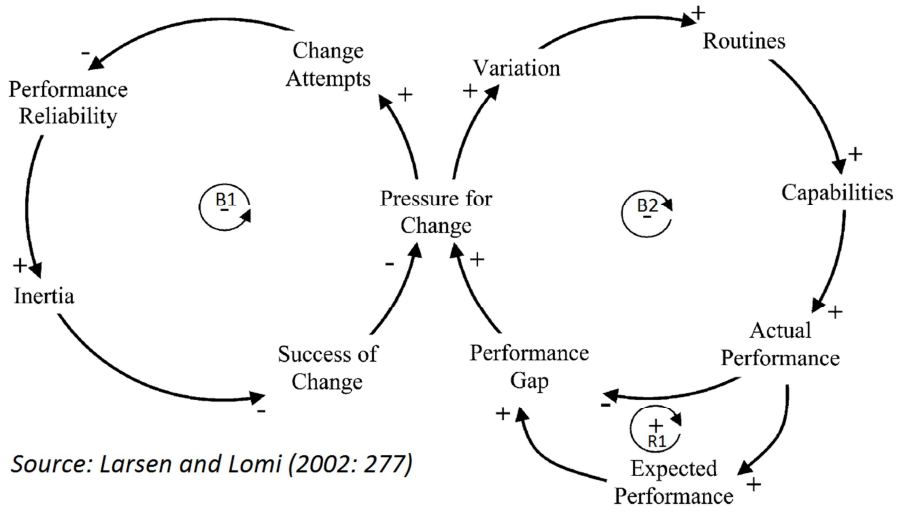
Qualitative SD Models of Barriers to Organizational Change

When a lack of understanding of operating feedback processes leads to low leverage changes, then the logical inversion is that a richer understanding of feedback structure leads to high(er) leverage changes. A richer understanding about barriers to change can be gained by identifying their feedback structure, i.e. by closing the loops. Sterman (2000: 12) agrees when holding the following: "To avoid policy resistance and find high leverage policies requires us to expand the boundaries of our mental models so that we become aware of and understand the implications of the feedbacks created by the decisions we make. That is, we must learn about the structure and dynamics of the increasingly complex systems in which we are embedded". Godkin et al. (2008: 92) also claim that a first step towards overcoming BOC is the appreciation of its complexity. Samuel et al. (1997: 164) go even further when they claim that ignoring feedback structures surrounding BOC may not only hinder the identification of high leverage, but might even lead to unintended consequences. According to Senge (2006: 93) "structures of which we are unaware hold us prisoner. Conversely, learning to see the structures within which we operate begins a process of freeing ourselves from previously unseen forces and ultimately mastering the ability to work with them and change them". Consequently, qualitative SD models dealing with BOC have the task and duty to depict (previously unseen) feedback structures surrounding barriers to change in order to learn about BOC and eventually support the identification of high leverage changes. To the best of my knowledge, only four system dynamics models have focused on BOC so far. How these four models fulfill their purpose of showing feedback loops, which can help explaining difficulties in changing, is the topic of the next section.

Four Qualitative SD models dealing with Barriers to Organizational Change

The model by **Larsen and Lomi (2002)** is depicted in figure 2.1 and contains two balancing feedback loops and one reinforcing loop. The subsequent table 2.1 provides a description of the three feedback loops.

Figure 2.1: A System Model of Organizational Inertia and Capabilities



Source: Larsen and Lomi (2002: 277)

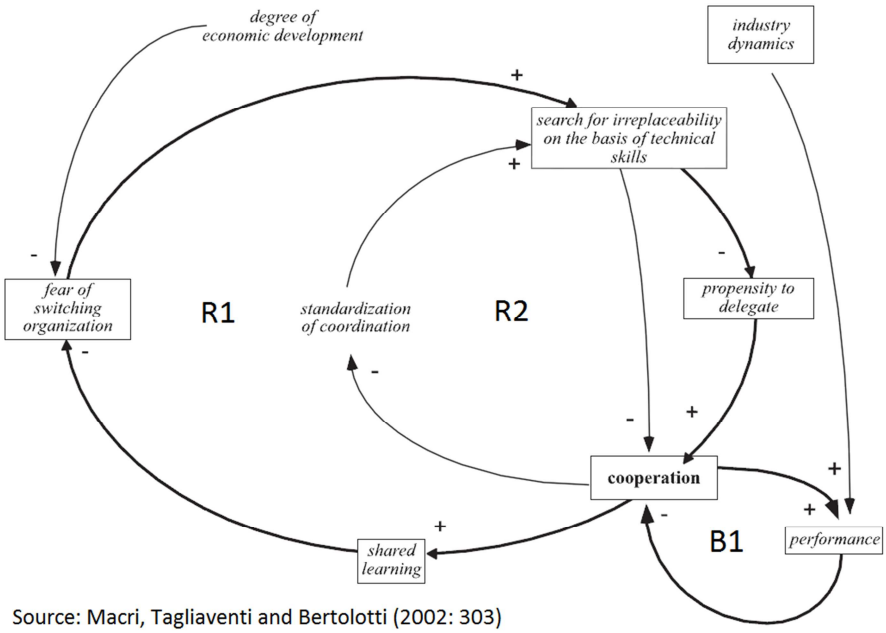
Table 2.1: Description of Feedback Loops by Larsen and Lomi (2002)

Loop	Description
B1	"As inertia increases the likelihood of successful change becomes smaller. In turn, prolonged periods of stasis increase the pressure for change in the organization. As pressure for change increases, it is reasonable to expect that at least some new change attempts will be made. (…) repeated attempts at changing organizational structures and processes decrease reliability" (Larsen et al., 2002: 275) and with it inertia. B1 is a classical balancing loop which seeks balance. Change disrupts reliable systems of roles and routines in which organizational memory and competencies are stored (Larsen et al., 2002: 274, 276). Reliability is one of the "primary sources of survival advantage for modern complex organizations" (Larsen et al., 2002, 273). However, performance reliability also fosters routinization which generates "inertial pressures because they encourage replication and exploitation of existing competencies" (Larsen et al., 2002, 273, 274). Larsen et al. (2002: 271) define inertia "as the tendency of formal organizations to resist change" and hold that routines are "sources of structural inertia" (Larsen et al., 2002: 276) and thus make organizations "progressively less attentive to change opportunities, and less responsive to change attempts" (Larsen et al., 2002: 272).
B2	"Variations are introduced when performance fails to meet expectations or performance goals. A gap between expected and actual performance triggers processes of exploration and problemistic search. When this happens, the pressure for change in organizations increases. Pressure for change introduces variations though change attempts. Unsuccessful variations are selected out. Successful variations are retained and are, more or less, slowly turned into performance programs – or routines – that can be invoked when needed. Capabilities emerge out of the repeated execution of routines – or performance programs" (Larsen et al., 2002: 277) and positively affect actual performance which reduces the performance gap (Larsen et al., 2002: 279).
R1	Unfortunately Larsen et al. (2002) do not provide any verbal descriptions of this loop. However, figure 2.1 implies that actual performance has a positive effect on expected performance which widens the performance gap.

A very interesting aspect of this model is the double-edged role of routinization. According to Larsen et al. (2002: 276) routines imply both, they "give organizations a survival advantage [but] also make them more resistant to change".

The model by **Macri, Tagliaventi and Bertolotti (2002)** is depicted in figure 2.2 and contains two reinforcing feedback loops and one balancing loop. The subsequent table 2.2 provides a description of the three feedback loops.

Figure 2.2: A Model of Resistance to Change



Source: Macri, Tagliaventi and Bertolotti (2002: 303)

Table 2.2: Description of Feedback Loops by Macri, Tagliaventi and Bertolotti (2002)

Loop	Description
R1	R1 progressively bears down on performance by reinforcing low cooperation, weak propensity to delegation and unshared learning (Macri et al., 2002: 305). *Cooperation – Shared Learning:* Because of the low level of cooperation "actors in this small company react against, and prevent, any form of institutionalized, shared learning" (Macri et al., 2002: 305). *Shared learning – fear of switching organization:* Unfortunately this link is only presented in the model. Macri et al. (2002) do not provide any verbal descriptions for this link. *Degree of economic development – fear of switching organization*: Change generates resistance when employees perceive threats to their job security (Macri et al., 2002: 295). In fact this fear seems plausible as the region is economically poorly developed. A lack of alternative job opportunities fosters employees' wish to maintain their employment (Macri et al., 2002: 304). *Fear of switching organization – search for irreplaceability on the basis of technical skills*: In order to prevent losing their jobs "actors build a position of irreplaceability that is rooted in their exclusive operational competencies" (Macri et al., 2002: 304). In other words, employees try to gain exclusive skills (Macri et al., 2002: 304) and "competence is used (…) to maintain one's own irreplaceability" (Macri et al., 2002: 300, 301). *Search for irreplaceability on the basis of technical skills – propensity to delegate*: Employees "strongly resist any kind of delegation, regarding it as a way of sharing information

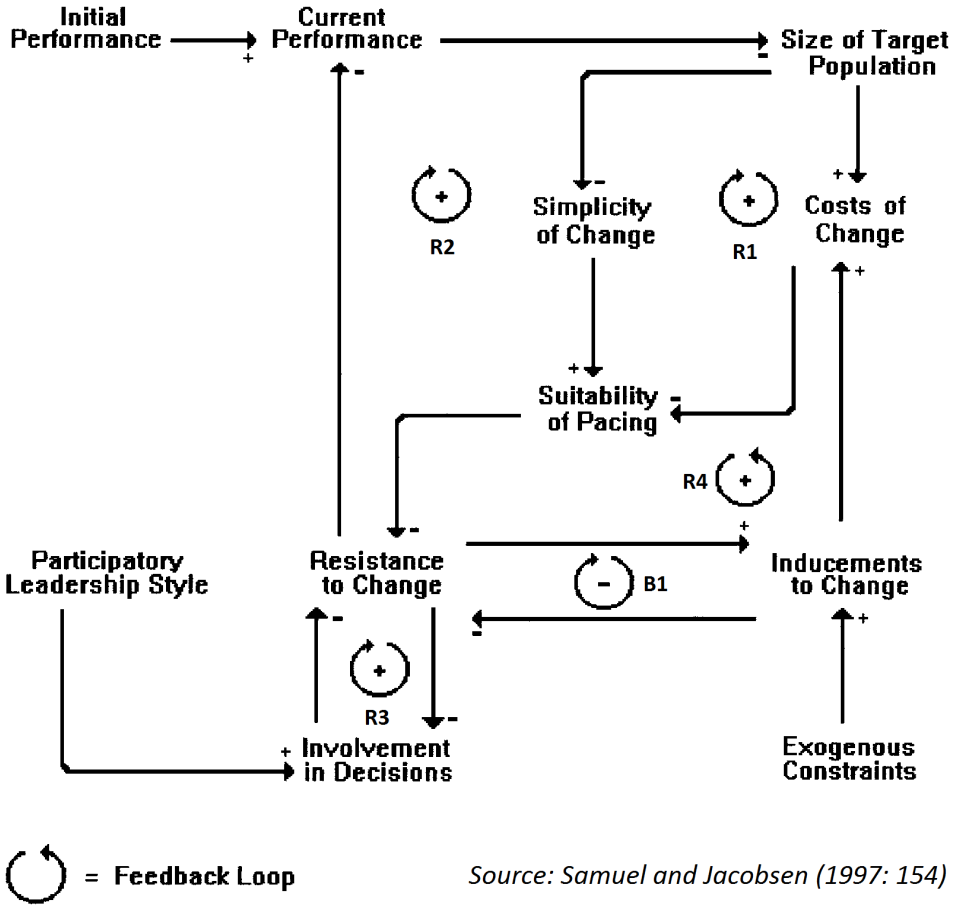
	and transferring skills" (Macri et al., 2002: 304). According to Macri et al. (2002: 300, 301) "the process of delegation is experienced as highly threatening in as much as it can expropriate actors of their irreplaceability and lessen their defection threat". *Propensity to delegate – cooperation*: "A tacit agreement appears to take place among organizational actors: none is willing to share their knowledge nor expects others to do so" (Macri et al., 2002: 305). Cooperation is reduced to a minimum (Macri et al., 2002: 304).
R2	R2 reinforces organizational fragmentation through standardization of coordination (Macri et al., 2002: 305). A low level of cooperation, i.e. a minimized level of interactions, leads to stable patterns. In other words, standard procedures become institutionalized and individuals privilege familiar roles (Macri et al., 2002: 304). Standardization fosters the search for irreplaceability which again fosters low cooperation.
B1	"The low level of cooperation impacts on performance" (Macri et al., 2002: 304). "As soon as performance drops below the minimum level required by competition and by contracts with clients, actors feel forced to promote cooperation in order to improve performance. (…) It is when profit levels decrease, market shares are being lost, and customers are dissatisfied that organizational members are more likely to perceive that their current ways of doing things are no longer working" (Macri et al., 2002: 305). B1 starts operating once performance drops below a minimum level required the market (Macri et al., 2002: 305). However, "as soon as performance reaches a level sufficient to fulfil market requirements, though, consolidated behavioral patterns prevail over the need for cooperation" (Macri et al., 2002: 305).

This model does not explicitly depict any variables which clearly refer to change or barriers to change, i.e. variables such as "change", "inertia" or "resistance". Instead, Macri et al. (2002) imply low change rates due to low cooperation, unshared learning, employees' fear and weak delegation. According to Macri et al. (2002: 305) "the apparent immobility of the organization under observation is in reality the result of rebalancing processes and systematic adaptations".

The model by **Samuel and Jacobsen (1997)** rests on the following key concepts: "organizational performance, size of change, cost of change, type of change, pace of change process, resistance to change, leadership style, and inducements to participants. In this model we propose, these concepts are interconnected elements of a dynamic system" (Samuel et al., 1997: 153). According to Samuel et al. (1997: 154) "an organization operates according to some performance target (goal)". "A performance gap may develop as a result of some change in external conditions, internal ones or any combination of them. Organizational change is likely to occur when the routines in use cannot close the discrepancy between the desired and the actual performance of the organization. (…) The wider the performance gap, the more likely is the organization to initiate change" (Samuel et al., 1997: 155). The model is depicted in figure 2.3 and contains four reinforcing feedback loops and one balancing loop. In other words, "the structure of the system tends overwhelmingly to

intensify existing trends: good performance leading to further improvement and poor performance to deeper decline" (Samuel et al., 1997: 158). The subsequent table 2.3 provides a description of the five feedback loops.

Figure 2.3: A System Dynamics Model of Planned Organizational Change



Source: Samuel and Jacobsen (1997: 154)

Table 2.3: Description of Feedback Loops by Samuel and Jacobsen (1997)

Loop	Description
R1	In addition to initiating change, a wide performance gap can also be responsible for a larger size of the target population, i.e. an increased number of people who are affected by the change (Samuel et al., 1997: 155). Growth of the target population increases costs which lead to unsuitable pacing (Samuel et al., 1997: 158). Pacing refers to the speed of change. "A change program may be introduced into the organization either at a slow, stepwise pace, or in a rapid drive toward instant change. (…) Since any change requires some adjustment period during which new forms can be absorbed in the organization, the element of appropriate pace or speed is crucial in the process" (Samuel et al., 1997: 156). Unsuitable pacing leads to more resistance which fosters lower performance (Samuel et al., 1997: 158). A wide performance gap, which implies low current performance, leads to lower performance next time around.
R2	Low current performance again leads to a larger size of the target population. Growth of the target population fosters more complex change which leads to unsuitable pacing, more resistance and lower performance (Samuel et al., 1997: 158). Low current performance leads to lower performance next time around.
R3	According to Samuel et al. (1997: 157) "members' involvement and participation in the process of change has been repeatedly identified as most important and effective. A 'participatory leadership style' reflects the extent that the change leaders encourage the

	organization's members to participate in the change process". "Lack of involvement in the decisions about the change tends to increase resistance, while more resistance means more alienation and still less involvement with the change" (Samuel et al., 1997: 158). Low involvement leads to lower involvement next time around.
R4	Resistance leads to "a greater need for inducements, which again increase the costs" (Samuel et al., 1997: 158). More costs lead to unsuitable pacing and more resistance (Samuel et al., 1997: 158). Resistance leads to higher resistance next time around.
B1	B1 "tends towards equilibrium because resistance will decline if and when more inducements are provided" (Samuel et al., 1997: 158). According to Samuel et al. (1997: 157) "in many cases, management offers financial compensation such as salary raises, promotions, incentive payments, stock options, or other kinds of inducements to get employees to cooperate with the change program". However, inducements can increase the total cost of change sometimes quite substantially (Samuel et al., 1997: 157). Also, their use might be restricted by exogenous constraints (Samuel et al., 1997: 158).

Samuel et al. (1997: 156) conclude that "resistance to change is likely to be stiffened by high performance, structural complexity, large size, length of convergence period, and the level of environmental tranquility". A first insight derived from this model is that change is rarely an instant event, but an unfolding process whose benefits might not be perceived immediately (Samuel et al., 1997: 165). However, managers often do not know any better and "stop the progress of the change shortly after its initiation, and (…) search for alternative, supposedly more effective, courses of action" (Samuel et al., 1997: 165). This "premature ending of the process is counter-productive and a waste of opportunity" (Samuel et al., 1997: 165). A second insight refers to the following: "A series of changes, following one after the other without proper readjustment, may push the organization downward toward the point of collapse. On the other hand, organizations that try to avoid deterioration of performance by refraining from conducting changes become non-adaptive to their environments, so that they eventually go out of business. Somewhere between those pathological extremes rests the optimal change policy that differentially applies to various types of organizations and stages of life cycles" (Samuel et al., 1997: 165).

The model by **Harich (2010)** deals with environmental problems, i.e. the difficulty of adopting proper policies in favor of our planet's environment. This thesis deals with organizational change. Still, Harich's (2010) model can be applied to the topic of organizational change as it features the feedback structure of resistance to change in a generic way. Harich's (2010) model is depicted in figure 2.4 and contains two reinforcing feedback loops and one balancing loop. The subsequent table 2.4 provides a description of the three feedback loops.

Figure 2.4: A Model of Change Resistance

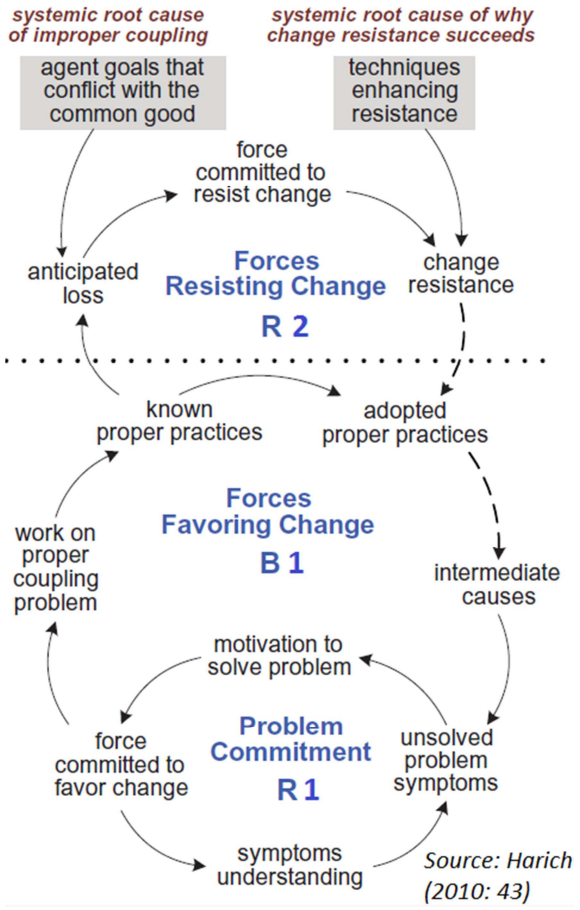


Table 2.4: Description of Feedback Loops by Harich (2010)

Loop	Description
R1 and B1	"Intermediate causes is the problem to solve. When symptoms of those causes begin to arrive (…), unsolved problem symptoms starts to grow. This activates the Problem Commitment loop [R1]. This causes force committed to favor change to start growing, which activates the Forces Favoring Change loop [B1]. If the model contained only the loops below the dotted line, growth of the (…) loop [B1] would eventually increase adopted proper practices enough to reduce the intermediate causes to an acceptable level, which would solve the problem" (Harich, 2010: 42).
R2	However, Harich (2010: 42, 43) points out that "the human system is not that simple. A third loop [R2] sits atop the other two, silently lurking, just waiting to be activated. That occurs when known proper practices start growing. This increases anticipated loss for some agents, causing the Forces Resisting Change loop [R2] to spring into action. If loop amplification is strong enough, change resistance will be high enough to overwhelm efforts to get the known proper practices adopted. The result is solution failure". There are "two possible systemic root causes of why the upper loop [R2] exhibits such high gain, (…) [namely] techniques enhancing resistance (…) [and] agent goals that conflict with the common good" Harich (2010: 43).

According to Harich (2010: 44) "the core of the dynamic hypothesis lies in the tension between the upper [R2] and middle [B1] loops. This directly models Kurt Lewin's idea that the status quo represented an equilibrium between the barriers to change and the forces favoring change. To preserve the status quo the upper loop [R2] strives to block adoption of pro-

per practices, while the middle loop [B1] promotes adoption. The winning loop determines whether the problem is solved or not". With regard to potential strategies how to cope with resistance Harich (2010: 56) points out that resistance does not occur "at the level of individuals and can thus [not] be overcome by (…) inspiration, exhortation and bargaining" which can be considered low leverage points. Instead, "resistance is much more likely to be systemic than local or located within individual agents" (Harich, 2010: 56). Therefore, high leverage lies in loop R2 because if "resistance was low the problem would already be solved, and because resistance cannot originate in the lower loops [R1 and B1]" (Harich, 2010: 43). "Problem solvers must therefore abandon the Sisyphean task of trying to strengthen the two lower loops [R1 and B1], and change to strategies centering on how to weaken the upper loop [R2]. (…) [This] should lead to finding the root causes with the highest leverage points" (Harich, 2010: 56).

Analysis of Four Qualitative SD models dealing with Barriers to Organizational Change

Table 2.5 summarizes the four models by providing answers to this thesis' three research questions. Table 2.5 shows that each model provides – with very few exceptions mentioned below – different answers.

Table 2.5: Summary of Four System Dynamics Models

Research questions	**Larsen and Lomi (2002)**	**Macri, Tagliaventi and Bertolotti (2002)**	**Samuel and Jacobsen (1997)**	**Harich (2010)**
(1) What can be considered a barrier to organizational change?	inertia	the model does not depict any variable which clearly refers to a barrier to change, instead low change rates are implied by low cooperation, high standardization of coordination, unshared learning, employees' fear and weak delegation	resistance to change	change resistance
(2) What influences the behavior of these barriers to organizational change?	interaction of 2 balancing loops; IPV[15]: performance reliability	interaction of 3 feedback loops; a concrete answer concerning the IPV requires selecting one of the barriers mentioned above; as the majority of the models' variables are considered barriers, basically all model variables have direct influence	Interaction of 5 loops; IPV: suitability of pacing, inducements, involvement	interaction of 3 loops; IPV = anticipated loss, techniques enhancing resistance
(3) Which	no	no strategy is mentioned	no	resistance cannot be over-

[15] IPV refers to Immediately Preceding Variables. IPV are directly related to the barrier via a causal link. IPV are those variables which are at the tail of a causal link leading to a barrier.

strategies bear potential to cope with barriers?	strategy is mentioned		strategy is mentioned	come by inspiration, exhortation, bargaining (low leverage), instead high leverage lies in weakening loop R2 (Harich, 2010: 43, 56)

One similarity of the two models of Larsen et al. (2002) and Macri et al. (2002) can be found in the definitions of the variables "performance reliability" (Larsen et al., 2002) and "standardization of coordination" (Macri et al., 2002). Even though the variable names differ, the definitions provided by the authors seem to refer to more or less the same, namely stable patterns of employees' roles and competencies as well as organizational procedures. However, despite similar definitions, the structures surrounding these two variables differ quite substantially[16]. In contrast to the model by Larsen et al. (2002), the models by Samuel et al. (1997) and Harich (2010) locate the main reason for low change rates in resistance to change. As already pointed out in chapter 2, when using the term resistance to change, it is necessary to be very precise, as this term is often used to define different concepts. In Samuel et al.'s (1997) model, resistance is directly influenced by suitability of pacing, inducements for and involvement of employees. This implies that Samuel et al. (1997) refer to the specific type of employees' resistance to change (ERTC) which is defined as a "change-specific behavioral response of a change recipient (or a group of stakeholders) toward a change initiative that is usually proposed by a sponsor or a leader" (Bareil, 2013: 62). In Harich's (2010) model, resistance is directly influenced by agents' anticipated loss due to changing practices. As already mentioned above, Harich's (2010) model does not deal with organizational change, therefore "employees" are not specifically mentioned. However, when using the term resistance Harich (2010) also seems to refer to a behavioral response of change recipients toward a specific change initiative. Therefore, it can be concluded that Samuel et al. (1997) and Harich (2010) refer to the same type of resistance. However, while they seem to agree on the fact that the variable ERTC should receive a prominent place in a model dealing with change, the two models still depict substantially different feedback structures surrounding this variable[17]. Macri et al. (2002) (even though they do not explicitly

[16] While "performance reliability" (Larsen et al., 2002) is influenced by the number of change attempts, "standardization of coordination" (Macri et al., 2002) is influenced by the level of cooperation. "Performance reliability" (Larsen et al., 2002) leads to inertia, low success of change, increased pressure for change and more change attempts. "Standardization of coordination" (Macri et al., 2002) on the other hand leads to an intensified search for irreplaceability, lower delegation and a lower level of cooperation.

[17] Samuel et al. (1997) identify unsuitable pacing, low inducements and low involvement as boosting factors for ERTC. Harich (2010) sees the growth of known proper practices, agents' anticipated loss and techniques en-

depict ERTC as a variable in their model) also perceive ERTC as a barrier to change as they consider "fear of switching organization" responsible for employees' resistance[18]. In conclusion, all four models fulfill their purpose of depicting feedback processes which try to explain why change can be a quite challenging endeavor. While few variables are defined in a very similar way, interesting indeed is that each model captures a different feedback structure, i.e. the models' causal links and feedback loops are substantially different. In other words, each model takes another perspective on barriers to change. With regard to potential strategies how to cope with barriers to change, it can be hold that only one out of four models, namely Harich's (2010) model, mentions leverage. Concerning the sources of the models, it can be concluded that three models are based on academic literature and the fourth model (Macri et al., 2002) is grounded in a specific social setting of a small Italian manufacturing firm (Macri et al., 2002: 296). Samuel et al. (1997: 165) suggest more theoretical elaboration and empirical examinations in order to expand theoretical ground and Larsen et al. (2002: 292) hold that more work and more models are needed. Following up on these requests as well as arguing that with only four available models little feedback thinking and almost no suggestions for leverage can be found in the current literature on the topic, this thesis aims to build a qualitative SD model of BOC in order to (1) gain richer understanding why difficulties emerge when organizations are trying to adapt to changes occurring in their environment and (2) identify potential strategies how to cope with these difficulties. After presenting this model in chapter 4, a comparison is made between this thesis' model and the four models described above. In order to be able to build a model and fulfill these aims an exploratory research is conducted. Details of the exploratory research are subject to the next chapter.

hancing resistance responsible for strong resistance and thus low change rates. The consequence of resistance is lower performance in Samuel et al.'s (1997) model and unsolved problems in Harich's (2010) model.

[18] Change generates resistance when employees perceive threats to their job security (Macri et al., 2002: 295).

Chapter 3: Methodology

Conducting Exploratory Research

Consistent with the nature of the research objective, an exploratory research strategy is adopted. According to Saunders and Lewis (2012: 110) exploratory research "is about discovering general information about a topic that is not understood clearly by the researcher" and "aims to seek new insights, ask new questions and to assess topics in a new light" (Saunders et al., 2012: 110). As our understanding of the phenomenon barriers to organizational change is still limited (Samuel et al., 1997: 164) and the need for expertise in organizational change has never been greater (Burke, 2011: 143) exploratory research is a very appropriate research strategy. This thesis aims to expand our understanding of BOC and seek new insights by assessing the topic in a new light. So far, it seems that only four models shed "endogenous" light on the topic, i.e. have scrutinized BOC from a feedback perspective. Therefore, more exploration is needed. In fact, more modeling is needed.

Case Study Company

Nord and Jermier (1994: 406) call researchers for trying to better address employees' subjective experiences made in the *real* world in order to obtain a more valid understanding of what barriers to change are really about. The authors suggest moving "to the realities of the workplace and the people who inhabit it" (Nord et al., 1994: 406). As mentioned in the introduction, the research results are used by a large Austrian company in the service sector which is confronted with difficulties in adapting to changes occurring in their environment. Therefore, the company very much appreciates the development of a model of BOC and the identification of potential strategies to cope with barriers and facilitate change. In exchange for the research results, employees agreed to actively and openly participate in various phases of the modeling process. Closely working together with a case study company also proves useful as it seems to add more methodological diversity to the field of BOC. Erwin et al. (2010: 39) found that reported research about RTC "used primarily self-report questionnaires to gather data, which are quantitatively analyzed". Erwin et al. (2010: 53) continue that research methods such as qualitative studies, case studies and action research "may provide more perspectives that would be helpful in understanding the messy reality of the

practitioner's world, and provide a more meaningful and useful link between research and practice" and "perhaps a more actionable knowledge base" (Erwin et al., 2010: 50).

Three Qualitative Data Collection Techniques

This exploratory research is based on the following three qualitative data collection techniques: interviews, a model-building session and a focus group meeting. According to Saunders et al. (2012: 110) conducting interviews is one of "the most usual ways of conducting exploratory research". Sterman (2000: 157) not only confirms the frequency, but also the usefulness of interviews when saying that "much of the data a modeler uses to develop a dynamic hypothesis comes from interviews and conversations with people in organizations. (…) Interviews are an effective method to gather data useful in formulating a model". However, Sterman (2000: 157) continues by stating that "interviews are almost never sufficient alone and must be supplemented by other sources of data (…). [The modeler should use] as many sources of data as possible to gain insight into the structure of the problem situation". Therefore, while the primary data collection method is the interview, two additional methods are used within this exploratory research, namely model-building with the gatekeeper[19] and a focus group meeting. With regard to the employees' mental contributions, access is guaranteed through a successful collaboration with the gatekeeper of the company, who was willing to support the organization of interviews and the focus group meeting. Table 3.1 provides a summary of (1) the reasons *why* those three qualitative data collection techniques were applied, i.e. their specific purposes, and (2) clear descriptions *how* the three methods were conducted.

Table 3.1: Summary of Three Qualitative Data Collection Techniques

	Interviews	**Model-building session and ensuing modeling process**	**Focus group meeting**
purpose	• collect data to draw causal links and build feedback loops • capture many different viewpoints • become familiar and build rapport with participants	*model-building session:* • construction of some first preliminary feedback loops *ensuing iterative modeling process:* • preliminary model	• validation of model structure • collect new structure with regard to coping strategies • shared learning environment • ownership and commitment to model
no. of participants	10	1 (gatekeeper)	6 (all six participants have also been interviewees)
type of sample	purposive	purposive	purposive

[19] see appendix 1 – glossary: "Gatekeeper"

length	40-60 minutes per interview	session: 4 hours ensuing modeling process: 6 weeks	3 hours
location	Interviewee's office or meeting room on the company's premises	model-building session: gatekeeper's office	meeting room on the company's premises
type	semi-structured interview	convergent and divergent model-building activities	presentation by author, sub-group meetings, sub-group presentations, discussion
at the beginning…	the purpose of the interview was explained	the purpose of the modeling session was explained	the purpose of the focus group meeting was explained
recording	interviews were tape-recorded and transcribed verbatim	four flipchart papers full of feedback loops emerged during the model-building session	model structure was drawn on blackboard; at the end a pictures were made of the drawn model
data analysis	• coding scheme was developed • data was coded using "MAXQDA"	feedback loops were transcribed using "iThink"	pictures were used for adapting the model structure and adding potential coping strategies
final product	6-page-long list of variables & causal links	preliminary model	this thesis' model (presented in chapter 4, figure 4.7)

Interviews:

The main purpose of the interviews was to collect various cause-effect chains which could be used later on when constructing feedback loops, i.e. when building a qualitative SD model (Vennix, 1996: 116). According to Luna-Reyes and Andersen (2003: 287) "finding connections and patterns in the qualitative data [is] a critical aspect of creating dynamic hypotheses". Sterman (2000: 158) describes this task very clearly by saying that "once you've done your interviews, you must be able to extract the causal structure of the system from the statements of the interview subjects. (…) Causal links should be directly supported by a passage in the transcript". In order to do so, modelers need to "elicit rich stories from participants' mental databases" (Luna-Reyes et al., 2003: 287). According to Luna-Reyes et al. (2003: 286) interviews have great potential as they "allow for insights about the mental models of experts in the field and the variety of individuals' understanding about meanings and connections, and uncover the complexity of real world systems through detailed stories and descriptions". According to Senge (2006: 250) "each person's mental model focuses on different parts of the system". Therefore, a second purpose of conducting interviews was to capture many different viewpoints about the problem, i.e. to get "as many ideas as possible out on the table" (Andersen and Richardson, 1997: 111). A third reason for conducting interviews was to become familiar and build rapport with the participants which indeed proved useful during the subsequent focus group meeting (Vennix, 1996: 116).

In total, 10 employees of the case study company were invited to participate in the interviews. This sample is a purposive one. According to Saunders et al. (2012: 138) purposive sampling "is used particularly to select a small sample when collecting qualitative data. When a researcher selects a purposive sample, she or he is using their judgment to actively choose those who will best be able to help answer the research question and meet the objectives". In this case, the task to choose appropriate candidates was delegated to the gatekeeper of the company, as he was better able to judge the suitability of the sample. All 10 employees accepted their invitation. Each interview lasted a maximum of 60 minutes in length. All interviews were conducted during a period of two consecutive days. The interviews were held either in the interviewees' offices or in a meeting room on the premises of the company. The interviews were conducted in a semi-structured way as Sterman (2000: 157) suggests that this kind has "proven to be particularly effective". According to Saunders et al. (2012: 151) a semi-structured interview is "a method of data collection in which the interviewer asks about a set of themes using some predetermined questions, but varies the order in which the themes are covered and questions asked. The interviewer may choose to omit some topics and questions and ask additional questions as appropriate". The predetermined questions, which can be found in appendix 2, were sent to all interviewees one week prior to the interviews in order to give them a first impression about the kinds of questions they can expect. In the beginning of the interview, just as suggested by Vennix (1996: 117), the purpose of the interview was made clear by showing and explaining an example of a very simple qualitative system dynamics model dealing with a different topic[20]. The interviewees were informed that the purpose of this exploratory research is to build a model similar (but still more complex) to this one. This way, the respondents understood what was expected of them and the relevance of the questions (Vennix, 1996: 121).

In order to facilitate data analysis, all interviews were tape-recorded and transcribed verbatim. A coding scheme was developed and the data was coded using "MAXQDA – Qualitative Data Analysis Software". The coding scheme contained codes that represented either (1) definitions of variables or (2) variables causally related to resistance to change. Throughout the data analysis, the author kept trying to be mindful not to impose any codes but rather to let them emerge from the data. Luna-Reyes et al. (2003: 286) hold that "once

[20] The model was about the topic "time pressure" and showed a very simple structure containing four feedback loops. The model can be found in Sterman (2000: 149).

the analyst defines the codes, she applies them systematically to a set of texts". According to Vennix (1996: 124) systematic "implies that rules are consistently applied in the coding process". The author followed Vennix' (1996: 124, 125) clear descriptions how to proceed systematically. The interview transcripts were carefully read sentence by sentence. As soon as variable definitions or causal links to and from RTC were identified, they were coded according to the previously developed coding scheme using MAXQDA.

As already mentioned "interviews are almost never sufficient alone and must be supplemented by other sources of data" (Sterman, 2000: 157). As noted by Vennix (1996: 125) the causal links retrieved by interviews generally show a number of white spots. Sterman (2000: 158) argues that "typically, people will not describe all the links you may see and will not explicitly close many feedback loops". Therefore the information retrieved from the interviews had to be expanded by conducting a model-building session with the gatekeeper as well as an ensuing iterative modeling process.

The Model-Building Session and the Ensuing Iterative Modeling Process:

The main aim of the 4-hour model-building session with the gatekeeper was the construction of some first preliminary feedback loops. A 6-page-long list of variables and causal links, which were mentioned during the interviews, served as useful starting point to construct a preliminary model. The fact that the model-building process was conducted with the gatekeeper only, instead of inviting a whole group of participants and conducting a group model-building session, had to do with the difficulty to find a time slot for a 4-hour-meeting in which all interviewees would have been able to participate. Therefore, the model-building process was started with only one employee of the case study company. The model-building session was a convergent activity, as the gatekeeper was asked to sift through the available list of variables and causal links and identify key themes he found important to include in the model. With the help of the author, he then started to identify further causal links not mentioned on the list. The author of this thesis was responsible for drawing the links on a flip-chart. By linking one variable after the other, various feedback loops kept emerging. In total, four flipchart papers full of feedback loops emerged during this model-building session. Afterwards, the feedback loops were transcribed by using "iThink", a dynamic modeling and simulation software, and served as starting point for an iterative modeling process.

The ensuing iterative modeling process, which lasted about six weeks, included divergent and convergent modeling. These activities were carried out individually and alternately by the author of this thesis and the gatekeeper of the case study company. Both, divergent as well as convergent modeling proved necessary. Divergent modeling was conducted as not all apparently important variables and causal links, which were mentioned in the interviews, had already been captured by the model. Within the divergent phase of the modeling process, these missing variables and links were added to the model. In addition, it was of utmost importance to also conduct convergent modeling, as according to Samuel et al. (1997: 153) "for the sake of theoretical parsimony, a model of change can contain only a limited number of key variables". Senge (2006: 72) warns that "thousands of variables and complex arrays of details can actually distract us from seeing patterns and major interrelationships". Morecroft (2012: 645) also confirms this by stating that "very often, smaller models are extremely useful, particularly when their purpose is to aid communication and to build shared understanding of contentious problem situations in business and society". The product of this iterative modeling process was a preliminary model, which was presented to the focus group.

Focus group meeting:

A third data collection method was a focus group meeting. According to Luna-Reyes et al. (2003: 281) this "data collection technique (…) elicit[s] information from groups of respondents who interact with each other in the research environment. Focus groups (…) rely heavily upon respondents building off each other's experiences and remarks. (…) The role of the researcher is again that of guide, keeping the group focused and making sure that all respondents are heard while in particular guarding against one or two individuals taking the floor". The focus group meeting served four purposes. First, the meeting aimed to serve as validation tool for the preliminary model structure. Second, it aimed to collect data with regard to potential coping strategies in the form of variables, causal links and feedback loops. In order to fulfil these aims, the focus group participants were asked to (1) share their opinion about the adequacy of the model's structure and propose structural changes and (2) share their ideas about potential strategies against BOC. Their ideas were directly translated into structure. Third, the focus group meeting had the purpose to provide a shared learning environment for the participants. According to Vennix (1996: 5) "it is not enough if

individuals learn, rather it is team learning which should be enhanced. The learning process should create a shared social reality and result in a shared understanding of the problem and potential solutions". Fourth, the meeting aimed to support ownership and create a sense of commitment to the final model.

All interviewees were invited to participate in the focus group meeting. Unfortunately, four out of 10 interviewees were not able to participate due to their time constraints; therefore the focus group consisted of six participants. The meeting lasted three hours in length and was held in a meeting room on the premises of the company.

A short description of the agenda and purposes of the meeting was followed by a 20-minute introductory presentation of the main characteristics of qualitative system dynamics modeling in general and the preliminary model in particular. The introduction also included a description of three metaphors with the topic of "change and its barriers"[21]. As stated by Morecroft (2012: 661) using metaphors proves very useful as they fire the participants' imagination and help them to make sense of potentially abstract and complex terms used in the model. After the introductory presentation, the six participants were asked to split into two groups consisting of 3 persons each. Each group received a 5-page-long paper of a particular story, i.e. a document about a specific part of the preliminary model. The two papers (one for each group) included both graphical illustrations (variables, causal links, feedback loops) as well as verbal illustrations including anonymized quotes from the interviews. In order to use the limited time of the focus group as efficiently as possible, the author invested considerable time and efforts in iteratively simplifying the documentation prior to the meeting, so it would not cost the participants too much time and efforts to read and understand the stories. The groups were asked to carefully read the documentation, try to understand the story so it can be retold and redrawn later on and answer the questions[22] found on the last page of the document. In addition, the participants were invited to

[21] The three metaphors were dealing with the challenges of quitting smoking, cooling tea and changing direction of a ship which is heading towards an iceberg

[22] The following questions were listed on the last page of the documentation:

- Are all variables and causal links comprehensible?
- Should we add something? Is there an important variable or link missing?
- Should we merge something? Can we leave something out? Can we get to the point even more by reducing graphical statements?
- Which variables should be weakened in your opinion?
- Which variables should be strengthened in your opinion?
- How would you strengthen "good" variables and weaken "bad" variables? Can you identify a meaningful leverage? What would you do in order to improve the situation?
- Could you gain new insights?

critically review their specific part of the preliminary model and "use the documentation to assess the adequacy of the model boundary and the appropriateness of its underlying assumptions" (Sterman, 2000: 890). Just as suggested by Vennix (1996: 102) the participants were invited to criticize and adapt the model as they see fit. This way it was possible to check and confirm prior interpretations of the data, which helped sharpening the analysis and increasing confidence in the usefulness of the model (Geiger et al., 2009: 418). After the 30-minute subgroup meetings each subgroup was asked to present their story to the other group by drawing variable by variable and link by link on the blackboard while at the same time verbally explaining the evolving story using their own words. Both groups tried to answer the questions and also invited the other group to air their opinions and provide feedback. Some statements unfolded conflicting interpretations of variables and causal links. In other words, cognitive conflict emerged, which according to Vennix (1996: 153) "is related to the group task and generally involves differences of opinion or viewpoint". If cognitive conflict is not becoming too overwhelming[23], this type of conflict indeed increases the quality of discussion, as according to Vennix (1996: 156) cognitive conflict promotes vigilance and "disagreement causes a more thorough investigation of the problem, more information processing and a consideration of more alternatives" (Vennix, 1996: 154). Indeed, the cognitive conflict which emerged during the focus group meeting led to a fruitful discussion which proved very useful as it reduced misunderstandings and facilitated the alignment of different perceptions and ideas, thus team learning. After both stories were captured on the blackboard, in a final round all participants were invited to look at the whole model, which had emerged gradually in front of the participants' eyes, and reflect on possible leverage. Senge (2006: 250) argues that "each team member carries his or her own, predominantly linear mental models. Each person's mental model focuses on different parts of the system. Each emphasizes different cause-effect chains. This makes it virtually impossible for a shared picture of the system as a whole to emerge in normal conversation". It is argued that – in contrast to a normal conversation – the methods applied in this meeting facilitated shared learning by depicting one part of the system after the other until eventually a shared picture of the system was created. It is also argued that the focus group meeting was able to support ownership and foster commitment to the model as the participants were asked to

[23] According to Vennix (1996: 154) „the relationship between the number of conflicts and quality of decision is curvilinear in shape. More conflict induces higher quality decisions. Beyond a certain point however, decision quality will deteriorate with a further increase in the number of conflicts".

retell and redraw the stories themselves. The product of the focus group meeting was a picture made of the model which was jointly drawn on the blackboard. This picture was used for adapting the structure of the model as well as for adding potential coping strategies. This thesis' model is presented in chapter 4.

Research ethics

When conducting the interviews and focus group meeting, first of all, the participants had been thanked for attending the interviews/meeting. Next, the envisaged research objective was described, the purpose of the interview/meeting was explained and the way how the participants could contribute to fulfilling the research objective was elaborated. Also, the participants were asked whether they were still willing to be interviewed/participate and they were informed that they could ask questions and/or stop the interview/leave the meeting anytime. In addition, they were informed that they should feel free not to answer any questions they feel uncomfortable with. Next, the participants were asked for permission to audiotape the interview/group meeting. Finally, while guaranteeing confidentiality and anonymity of all that was said, the participants were asked whether they agreed to the use of the contents in form of anonymous quotations in the master thesis. The participants were informed to get access to the master thesis once it is completed. The gatekeeper will present the paper to the company's top management board which will use the research results for improving their ability to successfully maneuver future change processes and actively influence their change efforts' results.

Chapter 4: The Qualitative System Dynamics Model

After conducting exploratory research as described in the previous chapter, it was possible to derive three barriers to organizational change, i.e. three reasons why difficulties emerge when organizations ought to adapt to their environment's changes:

1. Decision-makers do not perceive any need for change.
2. The structures of the organization are too rigid and therefore hamper change.
3. Employees are resisting change.

These three barriers are expressed in the model by using the following variables:

1. insight inertia
2. action inertia
3. employee resistance to change (ERTC)

The research result, i.e. this thesis' final qualitative SD model, depicts a feedback structure surrounding these three variables. This chapter presents the model structure by introducing 38 causal links and 16 feedback loops (4 reinforcing and 12 balancing)[24] which operate either in favor of or against organizational change. A great majority of the causal links is directly supported by a passage in the interview transcript. The remaining causal links have been captured during the model-building session, the ensuing iterative modeling process or the focus group meeting. Both the model structure as well as its verbal descriptions and implications presented in this chapter have been entirely derived from the three qualitative data collection techniques introduced in the previous chapter. It's important to point out that this model is a dynamic hypothesis, i.e. it provides one possible explanation why organizations are confronted with difficulties when trying to change. Thus the model captures one possible structure of the system. It's also essential to point out that the model structure and accompanying verbal descriptions and implications distance themselves from demonstrating any real behavior. Rather, they try to explain why something *could* happen *if* something else was to change. However, they definitely refrain from telling what will happen. Also, the strategies derived from the model structure and presented in this chapter do not claim to lead to real improving behavior. Instead, the strategies are to be seen as a pool of ideas which might prove useful in the real world.

[24] In fact, the total number of feedback loops and causal links is higher. However in order to facilitate keeping the overview of the model, only 16 feedback loops and 38 causal links are introduced and described in this chapter.

In order to facilitate the presentation of the model structure, this chapter follows Sterman's (2000: 155) advice to build up the whole model "in stages, with a series of smaller causal loop diagrams. Each diagram should correspond to one part of the dynamic story being told". This thesis' final qualitative SD model is telling the following three dynamic stories:

- Story 1: Rose-colored Glasses vs. Reality Check
- Story 2: Rigidity vs. Culture of Learning, Taking Risk and Experimentation
- Story 3: Employees' Commitment vs. Timely Decision-Making

Story 1: Rose-colored Glasses vs. Reality Check

The first story deals with problem-solving and insight inertia. This story's model is illustrated in figure 4.1. The subsequent table 4.1 provides a description of 9 causal links and table 4.2 introduces the two balancing loops B1 and B2.

Figure 4.1: Feedback Structure of Story 1

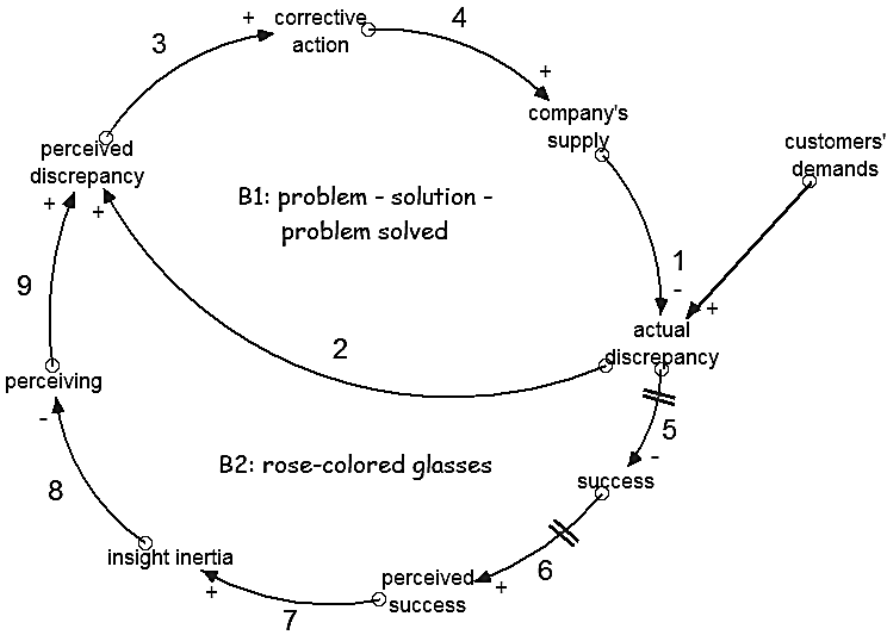


Table 4.1: Causal Links of Story 1

Link #	Description
1	Actual discrepancy is the difference between a desired and actual state of a system. In this case it refers to the discrepancy between customer's demands (desired state) and company's supply (actual state). Customer's demands are constantly changing. In order to be able to meet these demands, it's necessary to adapt the services a company is providing. It is necessary to keep up with the times. Put in simplified terms, actual discrepancy refers to a problem an organization is facing. *All else equal, if the demands increase, actual discrepancy will increase (and vice versa). All else equal, if the supply increases, actual discrepancy will decrease (and vice versa).*

2	A distinction between actual and perceived discrepancy is made because of the possibility that a discrepancy between demand and supply exists, but stakeholders are not aware of it (yet). *All else equal, if actual discrepancy increases, perceived discrepancy will increase (and vice versa).*
3	Perceived discrepancy fosters corrective action as it needs some tension to set things in motion, i.e. it needs some discomfort with the current situation in order to initiate change. *All else equal, if perceived discrepancy increases, corrective action will be fostered (and vice versa).*
4	All corrective action is change, but not all change is corrective action. The latter refers to an action which is actually capable of reducing the discrepancy between desired and actual state. In this case it refers to an action capable of adjusting the company's supply to its customer's demands. *All else equal, if corrective action is implemented, the company's supply will keep adjusting to the customers' demands (and vice versa).*
5	Actual discrepancy between customer's demands and company's supply will eventually affect the company's overall success. The word *eventually* refers to the delay[25] in this causal link. The delay refers to the possibility that an actual discrepancy might not have an immediate effect on success; however, if the discrepancy keeps increasing, the company's success will eventually decline. *All else equal, if actual discrepancy increases, the company's success will eventually decrease (and vice versa).*
6	A distinction between actual and perceived success is made because of the possibility that actual success rates are changing, but stakeholders have not perceived it yet. In fact, the delay refers to the possibility that success might not have an immediate effect on perceived success. In case no decline in success rates is perceived yet, stakeholders can easily get irritated when someone suggests ideas for changing the current course. However, if success rates keep declining, this will eventually be perceived. *All else equal, if actual success increases, perceived success will eventually increase (and vice versa).*
7	The more success has been accumulated in the past, the more insight inertia exists in a company. Instead of opening their eyes and gaining information of the current situation, stakeholders turn their attention to past success stories. They are dazzled by past success. Legitimation through past success is easier than playing with probabilities of the future. *All else equal, if perceived success keeps increasing, insight inertia will also increase (and vice versa).*
8	A high level of insight inertia refers to the fact that an organization is not flexible in perceiving new information. This is comparable to stakeholders wearing rose-colored glasses. The thicker and rosier the lenses of the glasses, the less can be seen. *All else equal, if insight inertia increases, perceiving discrepancy will decline (and vice versa). If insight inertia takes on extreme forms, the process of perceiving is more or less not taking place.*
9	*All else equal, if perceiving increases, perceived discrepancy will increase*, i.e. actual discrepancy is perceived more and more. Vice versa, *all else equal, if perceiving decreases, perceived discrepancy will decrease*, i.e. actual discrepancy is perceived less and less.

Table 4.2: Feedback Loops of Story 1

Loop #	Description
B1: problem – solution – problem solved	This feedback loop operates in favor of change and refers to a very simple problem solving process: A current situation is compared with a desired situation, the difference is the problem. The problem is perceived, a solution (corrective action) is applied and the current situation is adjusted so it equals the desired situation. The problem seems solved. However, another loop is also operating.
B2: rose-colored glasses	This loop operates against change as long as high levels of (perceived) success keep fostering insight inertia. This loop only starts operating in favor of change, once success rates decline and stakeholders perceive this decline. Only then

[25] see appendix 1 – glossary: "Delay"

	insight inertia is reduced, the perception of actual discrepancy is fostered and corrective action adjusts the supply to customers' demands.

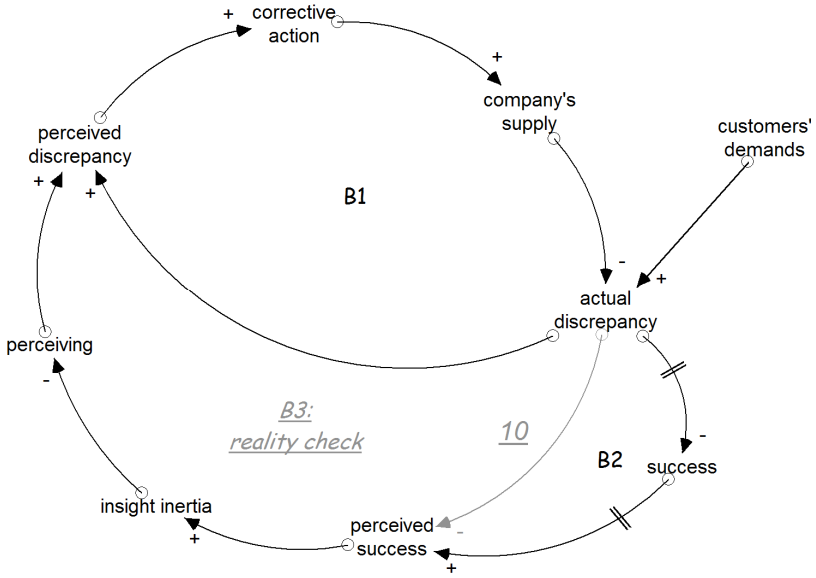
So far this story contributes to answering research questions (RQ) 1 and 2:

RQ1: **Insight inertia** is considered a barrier to organizational change as it prevents the perception of actual discrepancy: when there is no problem perceived, no solution is applied and thus no change occurs.

RQ2: Insight inertia is influenced by perceived and actual success. Insight inertia is only decreased once success rates decline, i.e. stakeholders have to learn it the hard way.

Story 1 also contributes to answering RQ3 by depicting figure 4.2 which illustrates a potential strategy to reduce insight inertia. Strategies are marked in grey color and the names of their links and loops are underlined and italic. When perceiving success of a company, the newly introduced causal link 10 suggests not only turning attention to actual success rates, but also to directly observing potential discrepancies between customers' demands and company's supply. *All else equal, if actual discrepancy increases, perceived success will decrease (and vice versa).* Feedback loop B3 "reality check" takes the short cut from actual discrepancy to perceived success, i.e. it doesn't wait for an eventual update of perceived success via success. B3 is more flexible than B2 as it does not contain any delays. All else equal, discrepancies between supply and demand reduce perceived success which leads to less insight inertia and more perceived discrepancy, more corrective action and more adaptation to changing customers' demands. This part of story 1 contributes to answering research question 3 (RQ3). In order to cope with high levels of insight inertia, stakeholders are advised to directly observe potential discrepancies between customers' demands and company's supply, instead of waiting for declining success rates. Applying this strategy gives stakeholders the opportunity to start planning and initiating changes already at an early

Figure 4.2: Potential Strategy to reduce Insight Inertia



stage, before learning it the hard way via a decline in success. Besides, proactive approaches facilitate the change management process as it's always easier to determine the customers' taste (before the customers even know it) instead of being chased by customers' demands.

Story 2: Rigidity vs. Culture of Learning, Taking Risk and Experimentation

The second story deals with rigidity, action and insight inertia and "culture of learning, taking risk and experimentation" (CLRE). The latter variable takes a significant role in this story and refers to a culture which emphasizes curiosity, learning and trying out new things, taking risks and learning from mistakes. The company hazards the consequences of trying out new things without knowing what exactly will happen. By distributing responsibility employees get the chance to try out new things. If mistakes happen, they are seen positive and are not hidden but made transparent in order to foster learning.

This story's model is illustrated in figure 4.3. The subsequent table 4.3 provides a description of causal links 11 to 16. Table 4.4 introduces the four feedback loops R1, R2, B4 and B5.

Figure 4.3: Feedback Structure of Story 2

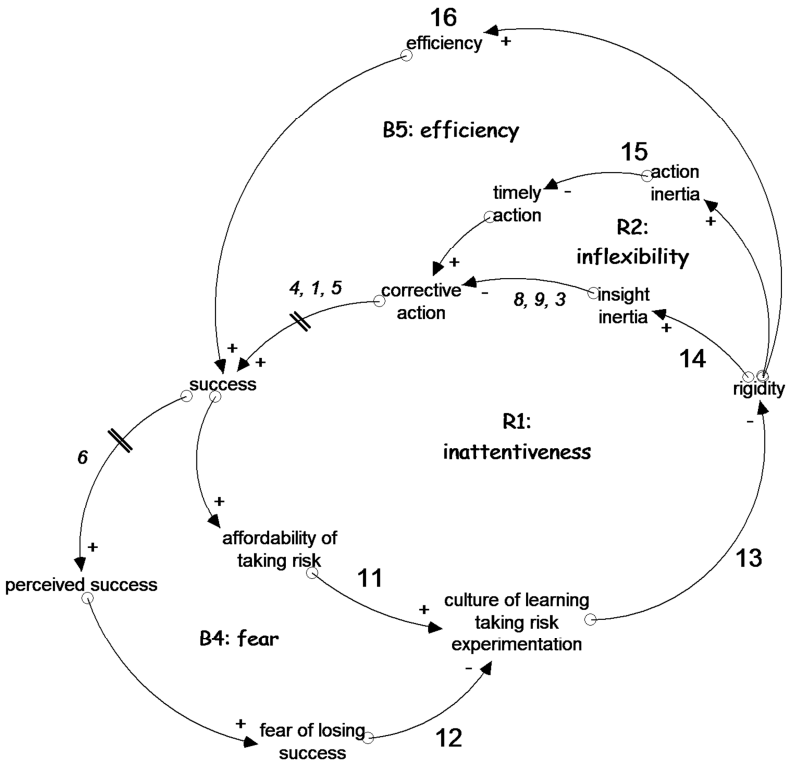


Table 4.3: Causal Links of Story 2

Link #	Description
11	Success can influence CLRE in two ways: it can influence it either in the same or opposite direction. Causal link 11 refers to an influence in the same direction. The success of a company gives rise to increased affordability to take some risk and try out something

	new. When there are sufficient financial buffers, it feels safe to take risk. No risk, no fun. *All else equal, if success increases, CLRE will increase due to increased affordability of taking risk (and vice versa).*
12	This link refers to an influence in the opposite direction. Fear of losing success implies that stakeholders do not want to be the first ones confronted with declining success rates, therefore they prefer to stay on the safe side and don't take any risks. The delay in causal link 6 refers to the possibility that success might not have an immediate effect on perceived success and thus on fear. In other words, it is possible that success is declining, while fear is still omnipresent as no update has occurred yet. However, if success rates remain low for some time, fear of losing success will eventually also decline. *All else equal, if success increases, CLRE will decline due increased fear of losing success (and vice versa).*
13	Rigidity refers to routine, i.e. to doing things always the same, usual and familiar way. There are no surprises, employees know what to expect. Learning and trying out new things, taking risks and learning from mistakes disturb the regular way of doing things. *All else equal, if CLRE increases, rigidity will decrease (and vice versa).*
14	Doing things always the same way makes people less attentive towards opportunities for change. Instead of opening their eyes and gaining information of the current situation, stakeholders keep doing things the usual way. They are dazzled by rigidity. *All else equal, if rigidity increases, corrective action will decrease due to increased insight inertia (and vice versa).*
15	By doing things always the same way, structures and procedures are becoming rigid, thus inflexible and difficult to change. This leads to action inertia which contributes to reduced corrective action. *All else equal, if rigidity increases, corrective action will decrease due to increased action inertia (and vice versa).*
16	Rigidity also has its advantages. By doing things always the same way, employees are getting more efficient, because they don't have to think hard about each and every step they take. A decrease in rigidity implies chaos or at least some disturbance of efficiency. *All else equal, if rigidity increases, success will increase due to an increase in efficiency.*

Table 4.4: Feedback Loops of Story 2

Loop #	Description
R1: in-attentive-ness **R2: inflexi-bility**	If we assume that the higher the level of rigidity, the more insight and action inertia will emerge, then corrective action is limited successively which will eventually lead to lower success rates. Lower success rates deplete the afforda-bility of taking risk, consequently CLRE declines. This will reinforce rigidity, i.e. an initially high level of rigidity leads to an even higher level next time around.
B4: fear	This loop can also contribute to a high level of rigidity, at least as long as fear of losing success is at a high level. As long as the company is perceived to be successful, fear of losing success is omnipresent. This fosters rigidity. As there is a delay (in causal link 6), even in the case of declining success, fear of losing success can still remain at a high level for some time. Therefore, B4 can contribute to keeping inertia at a high level and corrective action at a low level, despite possible declines in success rates.
B5: efficiency	This loop does not affect corrective action directly, but indirectly via influencing the level of rigidity. While all three previous loops R1, R2 and B4 contribute to keeping rigidity high and rates of change low, B5 bears potential to foster change indirectly. If we assume that the higher the level of rigidity, the more efficiency will take place, then success and affordability of taking risk are increased. This leads to an increased CLRE which reduces rigidity. In other words, high efficiency rates make it possible to invest in taking risks. Experimentation lowers rigidity. A lower level of rigidity disturbs efficiency and reduces investments. This is a classical balancing feedback loop which tries to maintain equilibrium. If rigidity is high, B5 will try to lower it. If rigidity is low, B5 will try to increase it.

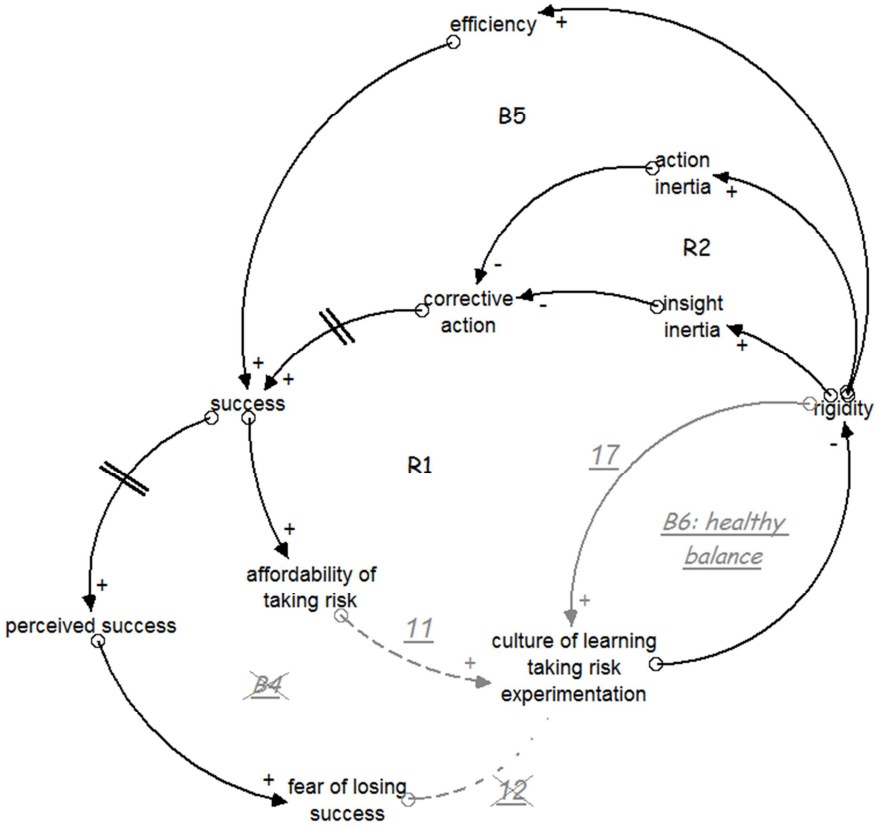
So far this story contributes to answering research questions 1 and 2:

RQ1: Next to insight inertia, **action inertia** is also considered a barrier to organizational change as it prevents a company from initiating corrective action: when structures are too rigid and inflexible, timely action might be impeded.

RQ2: Insight and action inertia are influenced by rigidity. Inertia only decreases once rigidity declines.

Story 2 also contributes to answering RQ3 by depicting figure 4.4 which illustrates three potential strategies to reduce action and insight inertia. Strategies are marked in grey color and the names of their causal links and feedback loops are underlined and italic.

Figure 4.4: Potential Strategies to reduce Action Inertia and Insight Inertia



In figure 4.4 causal link 12 is dissolving which implies that a decision to invest or not to invest in CLRE should be made independent from fear.

Causal link 11 is dotted which implies that the decision should not entirely be dependent on financial means via success. Also in times of scarcity should a CLRE be possible.

Instead, the level of CLRE should depend on the level of rigidity. This is suggested by the newly introduced causal link 17: *If rigidity increases, causal link 17 indicates that CLRE should also increase. Vice versa, if rigidity decreases, CLRE should be reduced.* Feedback loop B6 called "healthy balance" refers to a healthy balance of rigidity and CLRE. All else equal, if we assume that the higher the level of rigidity, the more learning, risk-taking and experimentation will take place which decreases rigidity. Vice versa, low levels of rigidity (which can be considered problematic when efficiency suffers) limit learning, risk-taking and experimentation. This fosters rigidity and thus efficiency. This is a classical balancing feed-

back loop which tries to maintain equilibrium. If rigidity is high, B6 will try to lower it. If rigidity is low, B6 will try to increase it. This part of story 2 contributes to answering research question 3 (RQ3). In order to cope with high levels of action and insight inertia, stakeholders are advised to keep a healthy balance of CLRE and rigidity. Extremes should be replaced by manageable proportions. Stakeholders should not be frozen in rigidity and stability, but also not completely lose track and order due to total freedom and unbounded risk-taking. According to Senge (2006: 66) "many apparent dilemmas (…) only appear as rigid "either-or" choices, because we think of what is possible at a fixed point in time. (…) but the real leverage lies in seeing how both can improve over time". With the help of loop B6, the rigid "either CLRE or rigidity" choice is bypassed by a healthy balance which has potential to enable both corrective action and efficiency.

Story 3: Employees' Commitment vs. Timely Decision-Making

The third story deals with employees' resistance to change (ERTC). ERTC can take on any behavior or attitude that is not reflecting full consent to the change initiative, such as hesitating, waiting, hiding, being concerned, being skeptical, being frustrated, observing, scrutinizing, actively searching the dialogue with others, opposing and sabotaging.

This story's model is illustrated in figure 4.5. The subsequent table 4.5 provides a description of causal links 18 to 34. Table 4.6 introduces the five feedback loops R3, B7, B8, B9 and B10.

Figure 4.5: Feedback Structure of Story 3

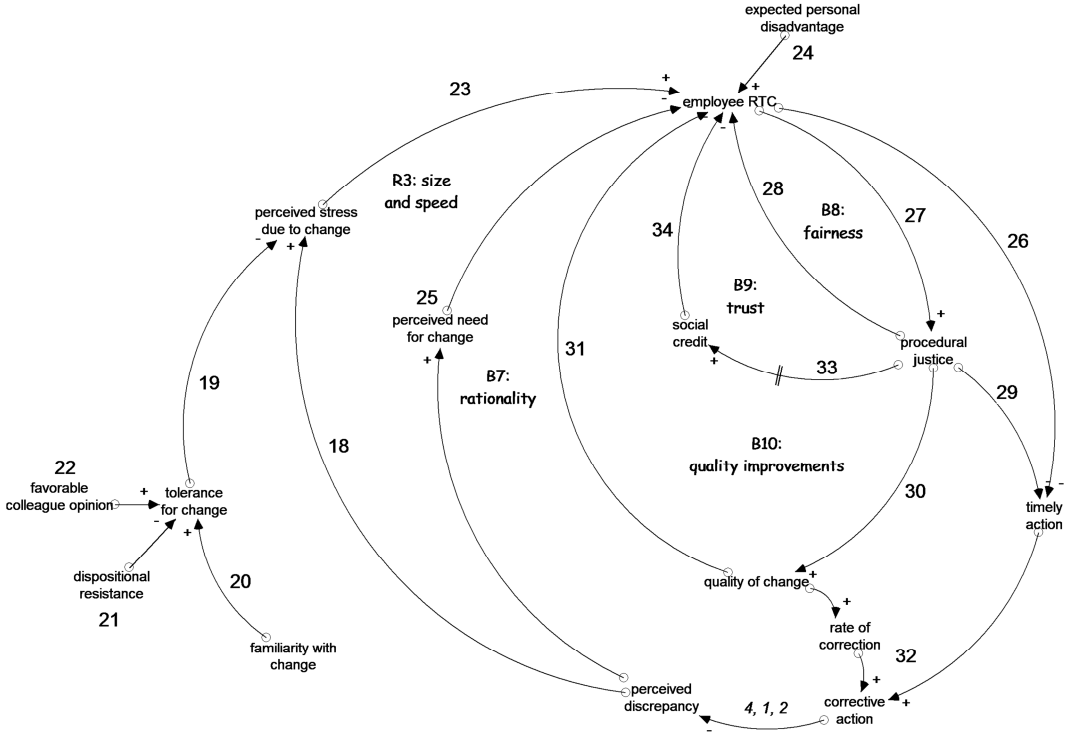


Table 4.5: Causal Links of Story 3

Link #	Description
18	The larger the perceived discrepancy between supply and demand, the more stress is perceived. Crisis can trigger panic. In other words, the larger the crisis, the more change is needed. Large size and high speed of change initiatives tend to trigger psychological stress. Also, change implies uncertainty which also fosters psychological stress. *All else equal, if perceived discrepancy increases, perceived stress due to change will increase (and vice versa).*
19	Perceived stress is also influenced by employees' level of tolerance for change. High levels of tolerance can counteract psychological stress in case of large discrepancies. Vice versa, low tolerance can foster perceived stress even in case of only minor discrepancies. Low tolerance can make a mountain out of a molehill. *All else equal, if tolerance for change increases, perceived stress due to change will decrease (and vice versa).*
20	Three causes for tolerance are identified. The first refers to the level of familiarity with change. As humans are creatures of habit, continuous exposures to change increase employees' level of tolerance. *All else equal, if familiarity with change increases, employees will become more tolerant for change (and vice versa).*
21	Tolerance for change is also influenced by dispositional resistance which refers to personal traits of employees. It is argued that some people are more and some are less dispositionally resistant to change. This can depend on several factors such as previous experiences, education and socialization. Consequently, some are more and some are less tolerant towards change. *All else equal, if dispositional resistance increases, tolerance for change will decrease (and vice versa).*
22	The third influence is favorable colleague opinion which refers to colleagues who support the change initiative. This influence can also be described as group pressure. *All else equal, the more colleagues favor a change initiative, the more tolerance for the initiative there will be (and vice versa).*
23	It was possible to derive six influences of employees' actual resistance to change (ERTC)[26]. Perceived stress is one influence. If a change initiative is too large or complex and is supposed to be pushed through too quickly, employees can easily get overwhelmed. Psychological pressure is produced which does not encourage openness and commitment towards change, but instead provokes closing up, blocking and hiding. Stress fosters resistance. *All else equal, if perceived stress increases, ERTC will increase (and vice versa).*
24	Expected personal disadvantage refers to expected individual discomfort or loss due to a specific change initiative. Personal disadvantages can range from fear of additional workload over fear of failure due to a lack of expected skills to fear of losing power/prestige/job due to an upcoming change initiative. Fear fosters resistance. *All else equal, if expected personal disadvantages increase, ERTC will increase (and vice versa).*
25	The third influence of ERTC is perceived need for change, which refers to a very pragmatic and rational influence. If employees perceive discrepancies between supply and demand, i.e. problematic situations, they will understand that there is a need for change and thus they will react less resistant towards upcoming change initiatives. *All else equal, if perceived discrepancy increases, perceived need for change will increase which leads to less ERTC (and vice versa).*
26	ERTC can take on many behavioral forms. Examples range from skepticism over (too) slow implementation to sabotage. All forms have in common that they lead to more time needed to implement change. *All else equal, if ERTC increases, timely action will decrease*

[26] The difference between dispositional resistance (causal link 21) and actual ERTC lies in the actual behavior of employees. It is possible that employees are dispositionally resistant, however, in the end they might not resist change due to other influences.

	(and vice versa).
27	One possible strategy to cope with high levels of ERTC is to increase the level of procedural justice. This can involve communication and providing honest, transparent, clear and comprehensible information about the change initiative, as well as active participation in developing change initiatives and taking decisions. *All else equal, if ERTC increases, the need for and thus procedural justice will increase (and vice versa).*
28	If employees feel adequately informed, included, involved, valued, heard, respected and treated in a fair manner during a change process, they will less likely resist change. Lack of information, exclusion, inequity and unjust treatment foster resistance. *All else equal, if procedural justice increases, ERTC will decrease (and vice versa).*
29	The drawback of procedural justice is, however, that it prolongs the length of the change process, i.e. it's time-consuming. *All else equal, if procedural justice increases, timely action will decrease (and vice versa).*
30	A further benefit of procedural justice is a potential increase in quality of change which refers to the extent an organization as a whole benefits from the change. The more employees feel involved and participate in a change process and receive honest, transparent, clear and comprehensible information, the more likely they will give thought to the change initiative and share their potential concerns. In other words, the change initiative becomes subject to critical review. If the reviews' results are then indeed used for improving the change initiative, procedural justice can increase quality. *All else equal, if procedural justice increases, quality of change will increase (and vice versa).*
31	Employees less likely resist change when they can appreciate its value for the company as a whole. On the contrary, employees tend to resist change when they are skeptical about the change's benefits for the company. Doubts about quality of change foster resistance. *All else equal, if quality of change increases, ERTC will decrease (and vice versa).*
32	It is essential to note that change does not equal corrective action and thus successful adaptation. While adaptation always implies change, this does not apply vice versa. Some change initiatives have more and some have less potential to successfully adapt to changes in the environment. Quality of change refers to the ability of a change initiative to adjust an actual state (company's supply) to a desired state (customers' demands) by fostering the rate of correction. *All else equal, if quality of change increases, the rate of correction and therefore corrective action will increase (and vice versa).* Corrective action does not just depend on the rate of correction, but also on whether the change is implemented in time. *All else equal, if timely action increases, corrective action will increase (and vice versa).* If a change initiative increases the rate of correction but is not implemented in time, corrective action is limited. Also, if a change initiative is initiated in time, but shows insufficient quality, corrective action is limited. Of course it's possible that the change initiative is still implemented, however, due to its limited quality, this change would not be reflected by the model as it doesn't contribute to adjusting the current to the desired state of the company.
33	Social credit refers to employees' level of support and trust towards the change leaders. Procedural justice leads to support and trust when involvement and honest and transparent information fill up social credit. The delay refers to the fact that a change in procedural justice might not have an immediate effect on social credit. There is the possibility that procedural justice is declining, but employees still trust and support their change leaders, or vice versa, procedural justice is increasing, but employees keep being suspicious. However, if procedural justice keeps changing, social credit will eventually adapt. *All else equal, if procedural justice increases, social credit will eventually increase (and vice versa).*
34	Support and trust towards change leaders promotes commitment and openness towards the change. Employees trust that change leaders are doing the best to their

	knowledge. The higher the social credit, the less ERTC is to be expected. The lower the social credit the more cynicism and thus resistance are to be expected. Mistrust fosters resistance. *All else equal, if social credit increases, ERTC will decrease (and vice versa).*

Table 4.6: Feedback Loops of Story 3

Loop #	Description
R3: size and speed	This loop is responsible for reinforcing either high or low levels of ERTC. If we assume that the higher the level of ERTC, the fewer timely and corrective action takes place which fosters perceived discrepancy. The larger the problem, the larger and faster the change will need to be. This leads to psychological stress and employees resisting the change. Again corrective action is limited and the problem grows worse. Size and speed of the change initiative increase and resistance is reinforced, i.e. a high level of ERTC leads to an even higher level next time around. This loop R3 can also work in the opposite direction in which low ERTC fosters even lower ERTC: Low ERTC leads to timely corrective action and therefore to low actual and perceived discrepancy. As there is no discrepancy, employees don't perceive any psychological stress due to an upcoming change.
B7, B8, B9 and B10	B7, B8, B9 and B10 try to balance ERTC. If ERTC is high, these loops will try to lower it. If ERTC is low, they will try to increase it. They are classical balancing feedback loops which try to maintain equilibrium.
B7: rationality	B7 is the "rational" loop. Just as loop R3, this loop also assumes that a high level of ERTC fosters perceived discrepancy. But then, large perceived discrepancy leads to increased perceived need for change which lowers ERTC and leads to corrective action which reduces the discrepancy. Put in simple words, if the company faces a problem, employees will recognize that something needs to change. As they perceive this need, they will less likely resist any upcoming change efforts, so change can take place to solve the problem. High ERTC leads to lower ERTC next time around. Vice versa, this loop can also increase ERTC. If we assume a low level of ERTC, there will be a lower level of perceived discrepancy. Consequently, employees will not perceive any need for change. If change is then introduced (even though employees don't perceive any need for it), they will resist it.
B8: fairness	The balancing loops B8, B9 and B10 do not affect corrective action directly, i.e. they don't incorporate the variable "corrective action" in their loops, but they affect corrective action indirectly via influencing procedural justice and quality of change. B8 refers to the following: If we assume a high level of ERTC, procedural justice will increase which lowers ERTC next time around. If we assume a low level of ERTC, procedural justice will decrease (it's not needed anymore as coping strategy), consequently, ERTC will increase.
B9: trust	If we assume a high level of ERTC, procedural justice will increase which fills up social credit. Social credit reduces ERTC. If we assume a low level of ERTC, procedural justice will decrease, social credit gets eventually depleted which increases ERTC.
B10: quality improvements	If we assume a high level of ERTC, procedural justice will increase which increases quality of change, this lowers ERTC next time around. However, if we assume a low level of ERTC, procedural justice will decrease and with it quality of change. This refers to situations when people are very euphoric about change. Low resistance can lead to low procedural justice and low critical thinking and reviewing. People who only perceive the positive sides of change might tend to miss and overlook potential flaws or essential things might get lost due to the change. Indeed, resistance can be a sign that employees care about the quality of change. High levels of ERTC can be regarded as beneficial if they help preventing change initiatives with low quality.

So far this story contributes to answering research questions 1 and 2:

RQ1: **Employees' resistance to change (ERTC)** is considered a barrier to organizational change due to two reasons. First, high ERTC can directly lead to low change rates because employees implement the change too slowly (causal link 26). Second, high ERTC can indirectly lead to low change rates via procedural justice. The latter is very time-consuming and can therefore work against timely action (causal links 27, 29).

RQ2: ERTC is influenced by perceived stress, fear of personal disadvantage, lack of perceived need for change, unjust treatment, low quality of change and lack of trust towards the change leader.

Story 3 also contributes to answering RQ3 by depicting figure 4.6 which illustrates four potential strategies to reduce ERTC. Strategies are marked in grey color and the names of their variables, causal links and feedback loops are underlined and italic. The subsequent table 4.7 provides a description of these potential strategies.

Figure 4.6: Potential Strategies to reduce Employees' Resistance to Change

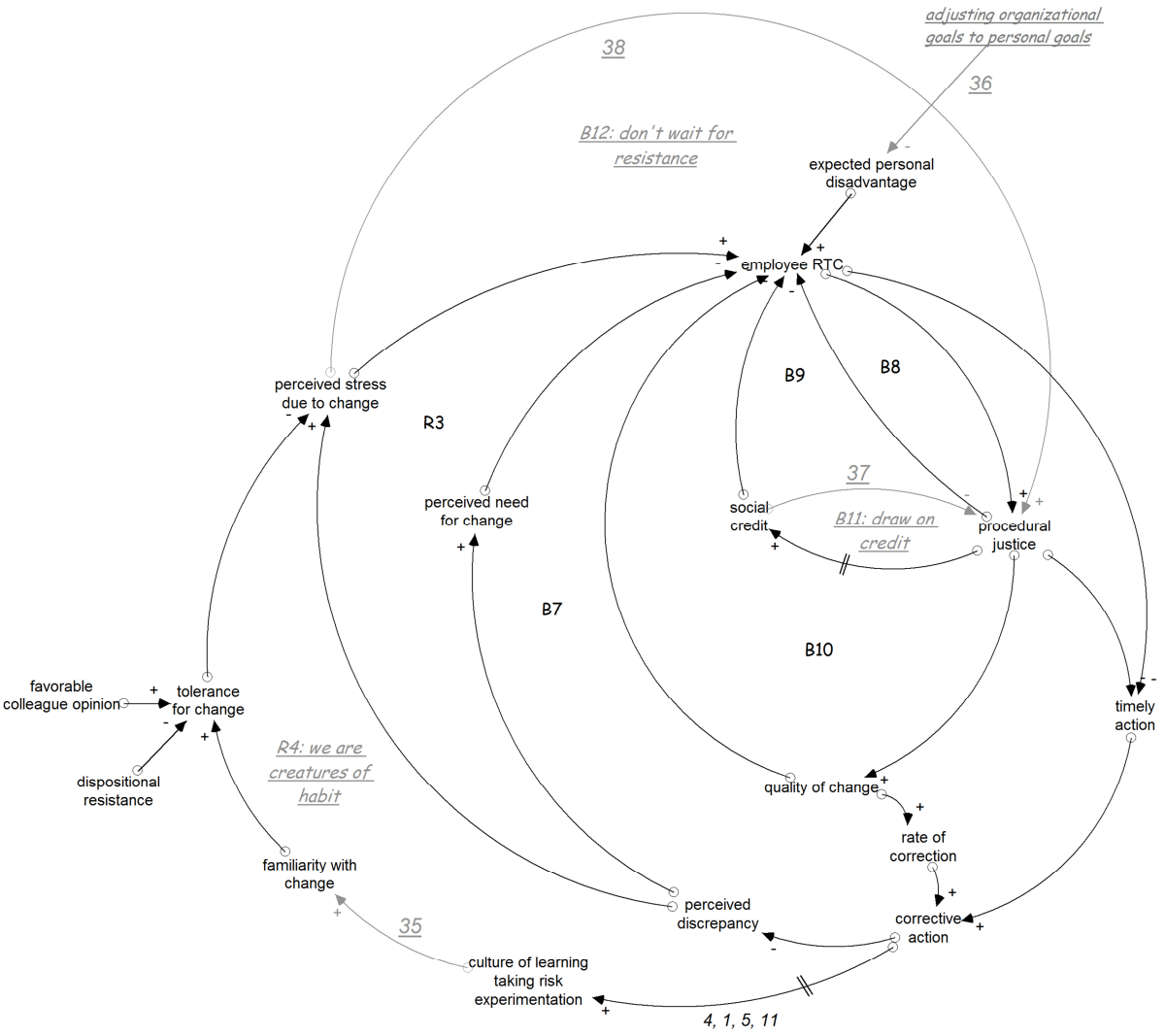


Table 4.7: Potential Strategies How to Cope With ERTC

Strategy	Description
Causal link 35 and loop R4: Reduction of ERTC due to increased CLRE	The newly introduced causal link 35 suggests increasing the company's CLRE as such cultural norms make employees more familiar with change. Frequent exposure to learning and trying out new things, taking risks and learning from mistakes subsequently increases employees' tolerance for change. *All else equal, if CLRE increases, familiarity with change will increase (and vice versa).* By linking CLRE with familiarity with change, link 35 closes loop R4 called "we are creatures of habit". R4 tries to reinforce CLRE, i.e. a high (low) level of CLRE leads to an even higher (lower) level next time around. If we assume high levels of CLRE, familiarity with and tolerance for change increases, perceived stress and resistance are reduced which leads to increased corrective action. This eventually fosters success and secures investments in CLRE (see story 2). When comparing loop R4 with R3, strong ERTC leads to increased perceived stress in both cases, and stress again fosters resistance. So how is perceived stress reduced? Loop R3 suggests reducing perceived discrepancy. However, loop B7 argues that low discrepancy can foster ERTC, as employees need to perceive a need for change. Loop R4 on the other hand tries to reduce perceived stress by increasing employees' tolerance for change via cultural norms.
Causal link 36: Reduction of ERTC due to adjusting organizational goals to personal goals	The newly introduced variable "adjusting organizational goals to personal goals" and causal link 36 suggest reducing expected personal disadvantages and with it ERTC by adjusting organizational goals to personal goals in case they differ. It is argued that individual goals don't necessarily have to differ from organizational goals and vice versa. For instance, the process of jointly developing a shared vision can lead to an adjustment of goals. However, if this shared vision is missing, it is argued, personal needs often have priority. *All else equal, if adjustment increases, personal disadvantages and thus ERTC will decrease (and vice versa).*
Causal link 37 and loop B11: Reduction of ERTC by drawing on social credit	The newly introduced causal link 37 suggests reducing procedural justice whenever the stock of social credit is filled up. *All else equal, if social credit increases, procedural justice can/should be reduced (and vice versa).* This strategy has the following implications: Low procedural justice leads to facilitated timely actions. As there is a delay between procedural justice and social credit, it is possible that a high level of social credit reduces ERTC even though procedural justice is declining. Reduced ERTC also leads to facilitated timely actions. This strategy sounds like a perfect scenario: Timely action is guaranteed through (a) low procedural justice and (b) low ERTC due to high social credit. However, this strategy has two drawbacks: First, low procedural justice leads to lower quality of change, which in turn limits corrective action. Second, the delay between procedural justice and social credit will not last forever, i.e. low procedural justice will eventually reduce social credit which then leads to increased ERTC. It is argued that the first drawback (reduced quality due to lower procedural justice) cannot be removed. This implies that an appropriate trade-off between quality of change and timely action needs to be identified. However, the second drawback can be removed to a certain degree by introducing causal link 37 which closes balancing loop B11. This loop B11 called "draw on credit" tries to keep a balance between procedural justice and social credit. If change leaders repeatedly refrain from applying procedural justice, social credit will eventually deplete. Low social credit in turn fosters procedural justice. Increasing procedural justice eventually refills the stock of social credit and so forth. As there is a delay involved in this loop it's important to remember not to overlook the need for refilling the stock of social credit. With the help of loop B11, the rigid "either timely action or employees' commit-

	ment" choice can be bypassed by drawing-on and refilling social credit from time to time. It is argued that a healthy balance between social credit and procedural justice has potential to facilitate both aims (1) timely action and (2) employees' approval and commitment.
Causal link 38 and loop B12: Avoidance of ERTC via increased procedural justice due to stress	As already shown, perceived stress directly influences ERTC via a positive link (causal link 23). However, the newly introduced causal link 38 represents a negative causal link from perceived stress to ERTC via procedural justice. *All else equal, if perceived stress increases, procedural justice should be increased (and vice versa).* This strategy suggests – instead of waiting for ERTC and then reacting upon it – taking a short cut from stress to procedural justice by initiating procedural justice as soon as stress starts to get perceived. By linking stress to procedural justice, causal link 38 closes the loop B12 called "don't wait for resistance". B12 indicates that stress fosters procedural justice which leads to lower ERTC, more timely and corrective action and thus less perceived stress. Introducing procedural justice early on in the process as a consequence of perceived stress gives stakeholders the opportunity of preventing the emergence of major ERTC at the outset.

All three stories at a glance: the whole model and this thesis' research results

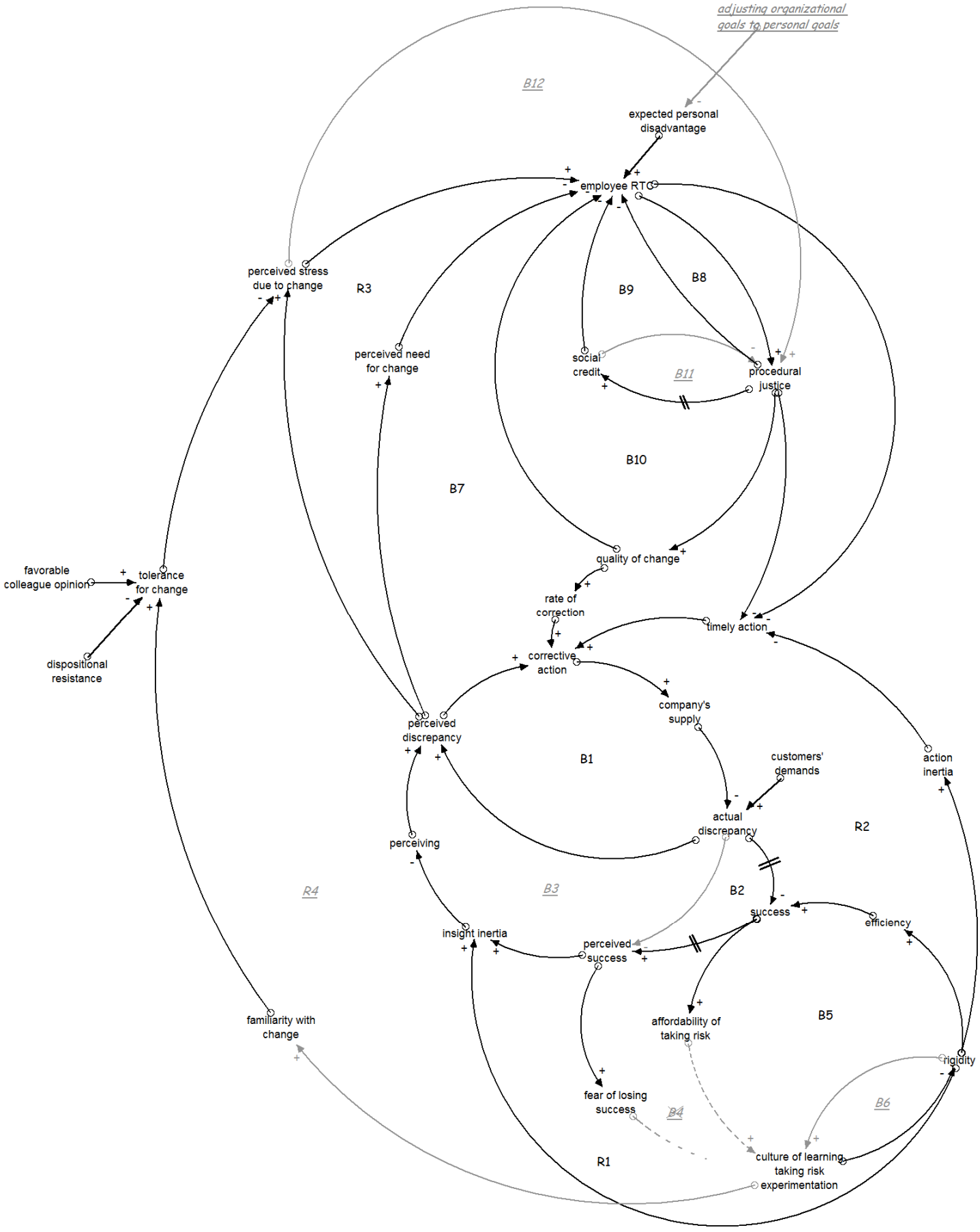
Table 4.8 summarizes this thesis' research results by providing answers to the three research questions. The subsequent figure 4.7 graphically presents all three stories about BOC including possible coping strategies at a glance. By linking the three stories one can clearly see their interconnectedness. Everything influences and is influenced by everything else.

Table 4.8: Summary of Research Results

Research questions	**Answers**
(1) What can be considered a barrier to organizational change?	a.) insight inertia b.) action inertia c.) ERTC
(2) What influences the behavior of these three identified barriers to organizational change?	The interaction of 16 feedback loops with each other. The respective IPV[27] are the following: a.) Insight inertia: perceived success and rigidity b.) Action inertia: rigidity c.) ERTC: perceived stress due to change, expected personal disadvantage, perceived need for change, procedural justice, social credit, quality of change
(3) Which strategies bear potential to cope with these barriers and facilitate change?	• observe potential discrepancies between customers' demands and company's supply • establish a healthy balance between CLRE and rigidity; don't make your decisions dependent on fear and financial security • foster CLRE and thereby increase employees' tolerance for change; adjust organizational goals to personal goals; occasionally reduce procedural justice and draw on social credit and but remember to fill it up again; don't wait for ERTC to emerge by initiating procedural justice upon perceiving stress

[27] IPV refers to Immediately Preceding Variables. IPV are directly related to the barrier via a causal link. IPV are those variables which are at the tail of a causal link leading to a barrier.

Figure 4.7: This Thesis' Qualitative System Dynamics Model about Barriers to Organizational Change



Chapter 5 Comparison to Four System Dynamics Models

This chapter compares the four models introduced in chapter 2 with this thesis' model introduced in the previous chapter by identifying similarities and differences.

A Comparison with Larsen and Lomi (2002)

Table 5.1 provides a comparison of the models' answers to the three research questions.

Table 5.1: Comparison of the Model by Larsen and Lomi (2002) with this Thesis' Model

Research questions	Larsen and Lomi (2002)	This Thesis' Model
(1) What is a barrier to organizational change?	**inertia**	• **insight inertia** • **action inertia** • ERTC
(2) What influences the behavior of inertia?	interaction of 2 balancing loops; IPV: **performance reliability**[28]	interaction of 16 loops; respective IPV: • Insight inertia: perceived success & **rigidity** • Action inertia: **rigidity**
(3) Strategies	no strategy is mentioned	see chapter 4, table 4.8

A first similarity is that both models identify inertia as a barrier to organizational change, even though this thesis' model is a bit more precise as it distinguishes between insight and action inertia. A second similarity refers to the IPV of inertia, as performance reliability and rigidity share a similar definition[29]. A third similarity is that both models give routine a double-edged role as it is made responsible for inertia[30] but also leads to an organization's competitive advantage via increased efficiency[31] and capabilities[32]. In order to illustrate this similarity graphically, figure 5.1 compares Larsen et al.'s (2002) model with this thesis' feedback loops R2 and B5. A major difference of the two models lies in the causal origins of performance reliability/routines and rigidity. The model by Larsen et al. (2002) introduces change attempts and variation as IPV of performance reliability and routines. This thesis' model on the other hand lets success and CLRE directly influence rigidity. Another difference

[28] Performance reliability fosters routinization which generates inertia (Larsen et al., 2002: 273, 274).

[29] According to Larsen et al. (2002: 273, 274, 276) performance reliability refers to reliable systems of roles and routines in which organizational memory and competencies are stored. By encouraging replication and exploitation of existing competencies, performance reliability fosters routinization. According to causal link 13 of this thesis' model rigidity refers to routine, i.e. to doing things always the same, usual and familiar way. There are no surprises, employees know what to expect.

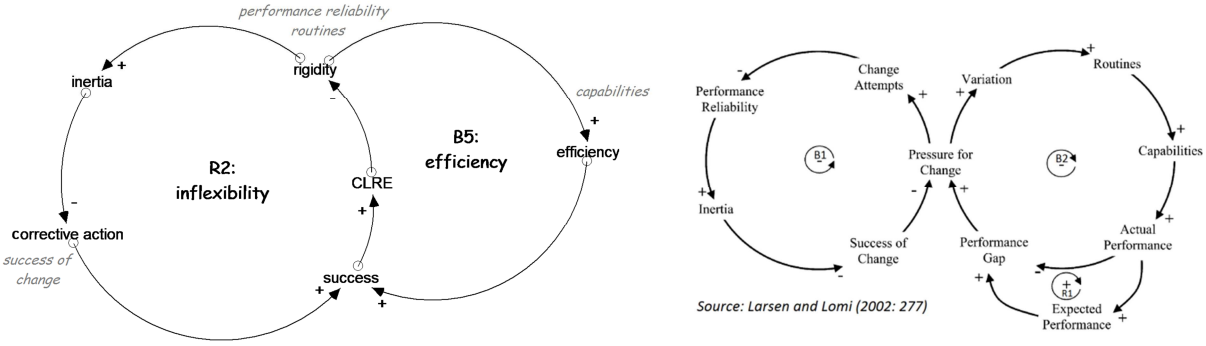
[30] Rigidity leads to inertia, just as performance reliability leads to inertia. Inertia opposes corrective action in this thesis' model (which implies reduced success of change), just as inertia opposes success of change in Larsen et al.'s (2002) model.

[31] Causal link 16: By doing things always the same way, employees are getting more efficient. Increased efficiency leads to more success.

[32] "Capabilities emerge out of the repeated execution of routines" (Larsen et al., 2002: 277) and positively affect actual performance (Larsen et al., 2002: 279).

lies in the size and complexity of the models[33]. Last but not least, Larsen et al. (2002) do not suggest any potential strategies how to cope with inertia.

Figure 5.1: Comparison of the Model by Larsen and Lomi (2002) with this Thesis' Model



A Comparison with Macri, Tagliaventi and Bertolotti (2002)

Table 5.2 provides a comparison of the models' answers to the three research questions.

Table 5.2: Comparison of the Model by Macri, Tagliaventi and Bertolotti (2002) with this Thesis' Model

Research questions	**Macri, Tagliaventi and Bertolotti (2002)**	**This Thesis' Model**
(1) What can be considered a barrier to organizational change?	the model does not depict any variable which clearly refers to a barrier to change, instead low change rates are implied by low cooperation, **high standardization of coordination**, unshared learning, **employees' fear** and weak delegation	• insight inertia • action inertia • **ERTC**
(2) What influences the behavior of these barriers to organizational change?	interaction of three feedback loops; a concrete answer concerning the IPV requires selecting one of the barriers mentioned above; as the majority of the models' variables are considered barriers, basically all model variables have direct influence	interaction of 16 loops; respective IPV: • Insight inertia: perceived success and **rigidity** • Action inertia: **rigidity** • ERTC: stress, **expected personal disadvantage**, perceived need, procedural justice, social credit, quality
(3) Strategies	no strategy is mentioned	see chapter 4, table 4.8

One similarity is that Macri et al. (2002) (even though they do not explicitly depict ERTC as a variable) also perceive ERTC as a barrier to change as they consider "fear of switching organization" responsible for employees' resistance[34]. This is similar to this thesis' causal link 24 which claims that fear fosters resistance[35]. A second similarity refers to the definitions of the variables "standardization of coordination" and "rigidity"[36]. The third similarity is that "CLRE" bears resemblance to "shared learning" insofar as both refer to an institutionali-

[33] Larsen et al. (2002) depict two balancing loops incorporating 13 causal links, while this thesis' model presentation focuses on 16 feedback loops and 38 causal links.
[34] Change generates resistance when employees perceive threats to their job security (Macri et al., 2002: 295).
[35] Causal link 24: fear of losing job is one possible expected personal disadvantage which can foster resistance.
[36] Both refer to stable patterns of employees' roles and competencies and organizational procedures.

zation of shared learning. However, despite these three similarities in variable definitions, the two models do not share any further common ground. The models' feedback loop structures differ substantially. Their causal links do not exhibit any similarities. A further difference lies in the size and complexity of the models[37]. Last but not least, Macri et al. (2002) do not suggest any potential strategies how to cope with barriers to change.

A Comparison with Samuel and Jacobsen (1997)

Table 5.3 provides a comparison of the models' answers to the three research questions.

Table 5.3: Comparison of the Model by Samuel and Jacobsen (1997) with this Thesis' Model

Research questions	**Samuel and Jacobsen (1997)**	**This Thesis' Model**
(1) What is a barrier to organizational change?	**resistance to change**	• insight and action inertia • **ERTC**
(2) What influences the behavior of ERTC?	interaction of 5 loops; IPV: **suitability of pacing**, inducements, **involvement**	interaction of 16 loops; IPV of ERTC: **perceived stress due to change**, expected personal disadvantage, perceived need for change, **procedural justice**, social credit, quality of change
(3) Potential strategies	not mentioned	see chapter 4, table 4.8

The first similarity is that both models identify ERTC[38] as a barrier to organizational change. A second similarity refers to related IPV of ERTC. Suitability of pacing bears resemblance to perceived stress[39]. Involvement bears resemblance to procedural justice[40]. The third similarity refers to a similar feedback structure. Loop R2 in Samuel et al.'s (1997) model bears considerable resemblance to this thesis' model loop R3 called "size and speed"[41]. A first difference refers to loop R3 in Samuel et al.'s (1997) model and this thesis' model loop B8 called "fairness". As mentioned above the definitions of "involvement" and "procedural justice" are similar. However, the illustration of their surrounding structure differs substantially[42].

[37] Macri et al. (2002) depict three feedback loops and 12 causal links, while this thesis' model emphasizes 16 feedback loops and 38 causal links.

[38] In Samuel et al.'s (1997) model, resistance is directly influenced by suitability of pacing, inducements for and involvement of employees. This implies that Samuel et al. (1997) refer to the specific type of employees' resistance to change (ERTC) which is defined as a "change-specific behavioral response of a change recipient (or a group of stakeholders) toward a change initiative" (Bareil, 2013: 62).

[39] Both concepts refer to the speed of change. Unsuitable pacing can foster stress (Samuel et al., 1997: 156). Causal link 18 also claims that too much speed fosters stress. If a change initiative's pace is not suitable, employees can easily get overwhelmed and stress is produced which fosters ERTC (Samuel et al., 1997: 156, 158)

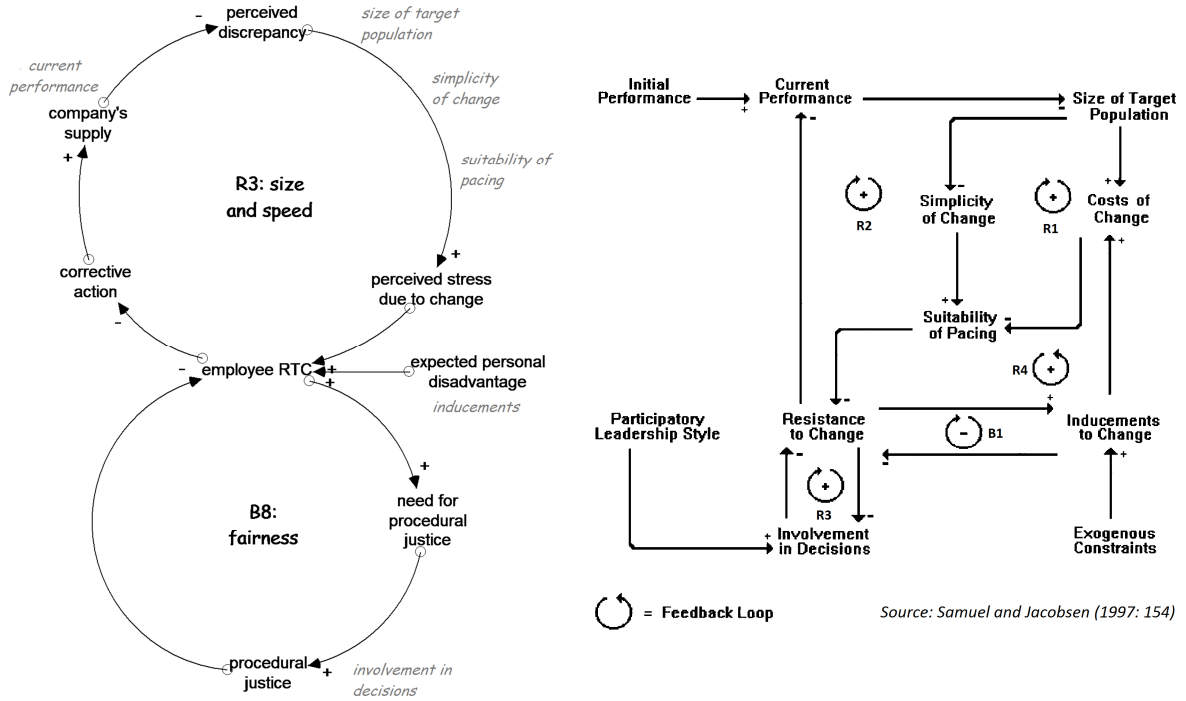
[40] Causal link 28 also posits that involvement reduces ERTC and exclusion and lack of information foster ERTC.

[41] "Current performance" (Samuel et al., 1997) can be compared to "company's supply". Both influence ERTC and are influenced by ERTC in the same way. While the variable names from current performance/company's supply to ERTC are different, the journey still tells the same story: discrepancy/performance gap lead to a larger size and speed of change, i.e. unsuitable pacing, and increased perceived stress which foster ERTC.

[42] R3 depicts a negative causal link from ERTC to involvement as ERTC means more alienation (Samuel et al., 1997: 158). B8 illustrates a positive link as ERTC means more need for procedural justice which leads to more actual procedural justice. This leads to R3 being a reinforcing and B8 a balancing loop.

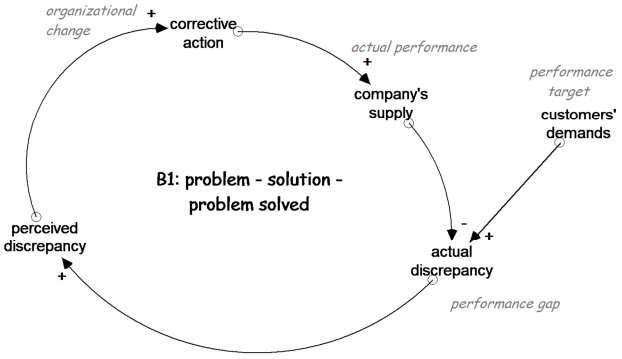
The second difference refers to the variables "inducement" in Samuel et al.'s (1997) model and "expected personal disadvantage" in this thesis' model. They seem related insofar as inducements might be able to reduce disadvantages and with it ERTC. However, the conceptualization of these two variables is very different[43]. The third difference is that this thesis' model does not capture the variable "costs of change" or any other variable with a similar definition. Therefore, this thesis' model does not include feedback like Samuel et al.'s (1997) loops R1 and R4. In order to illustrate the models' similarities and differences graphically, figure 5.2 compares Samuel et al.'s (1997) model with this thesis' feedback loops R3 and B8.

Figure 5.2: Comparison of the Model by Samuel and Jacobsen (1997) with this Thesis' Model



Even though Samuel et al.'s (1997) model does not capture variables such as "goal", "target", "demands", "gap" or "discrepancy", they still agree with this thesis' model (see loop B1 in figure 5.3) that change is initiated as a reaction of a discrepancy between a desired and actual

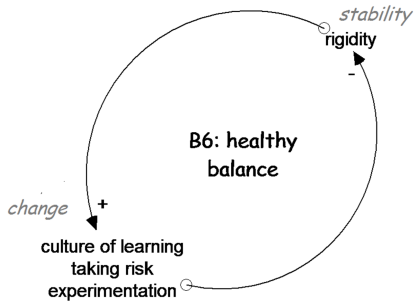
Figure 5.3: This Thesis' Model Loop B1



[43] In this thesis' model "expected personal disadvantage" is an exogenous variable. "Inducements" on the other hand is an endogenous variable, i.e. it does not only influence ERTC but is also influenced by it (see loop B1 in Samuel et al.'s (1997) model).

state (Samuel et al., 1997: 155)[44]. In other words, both models agree that it needs some tension to get things in motion. A further mutual consent refers to Samuel et al.'s (1997) insight that "a series of changes, following one after the other without proper readjustment, may push the organization downward toward the point of collapse. On the other hand, organizations that try to avoid deterioration of performance by refraining from conducting changes become non-adaptive to their environments, so that they eventually go out of business. Somewhere between those pathological extremes rests the optimal change policy that differentially applies to various types of organizations and stages of life cycles" (Samuel et al., 1997: 165).

Figure 5.4: This Thesis' Model Loop B6



As this insight is not depicted in form of a model but only stated verbally, it is not possible to compare any model structures. However, the text reminds of this thesis' model loop B6, shown in figure 5.4, which also calls for a healthy balance between rigidity and CLRE which can also be interpreted as balance between stability and change. Last but not least, the size and complexity of the models differ[45] and Samuel et al. (1997) do not suggest any potential strategies how to cope with ERTC.

A Comparison with Harich (2010)

Table 5.4 provides a comparison of the models' answers to the three research questions.

Table 5.4: Comparison of the Model by Harich (2010) with this Thesis' Model

Research questions	Harich (2010)	This Thesis' Model
(1) What is a barrier to change?	**change resistance**[46]	• insight and action inertia • **ERTC**
(2) What influences the behavior of ERTC?	interaction of 3 loops; IPV = **anticipated loss**, techniques enhancing resistance	interaction of 16 loops; IPV of ERTC: stress, **expected personal disadvantage**, need for change, procedural justice, social credit, quality
(3) Potential strategies to cope with ERTC	resistance cannot be overcome by inspiration, exhortation, bargaining (low leverage), instead high leverage lies in **weakening loop R2** (Harich, 2010: 43, 56)	foster CLRE, increase tolerance for change; **adjust organizational goals to personal goals**; occasionally reduce procedural justice and draw on social credit; initiate procedural justice upon perceiving stress

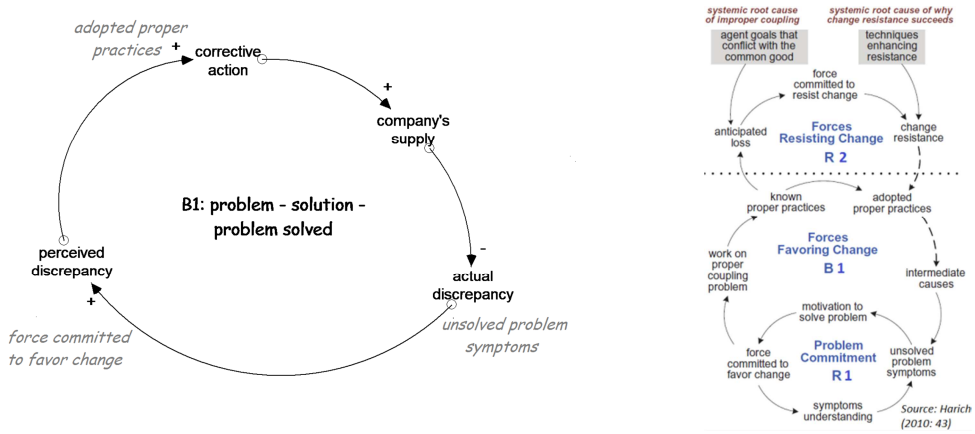
[44] Organizations operate according to a performance target. Organizational change occurs when there is a performance gap, i.e. a discrepancy between a desired and actual performance (Samuel et al., 1997: 154, 155).

[45] Samuel et al.'s (1997) model depicts five feedback loops and 15 causal links, while this thesis' model emphasizes 16 feedback loops and 38 causal links.

[46] When change resistance is high enough, it can "overwhelm efforts to get the known proper practices adopted. The result is solution failure" (Harich, 2010: 43).

A first similarity is that both models identify ERTC as a barrier to organizational change[47]. A second similarity refers to an IPV of ERTC, namely "anticipated loss" (Harich, 2010) which bears great resemblance with the variable "expected personal disadvantage"[48]. However, the IPV of these two variables differ[49], which exhibits a first difference of the models. A third similarity refers to the two feedback loops B1. Harich's (2010) model loop B1 called "Forces Favoring Change" bears great resemblance to this thesis' model loop B1 called "problem – solution – problem solved"[50]. In order to illustrate this similarity graphically, figure 5.5 compares Harich's (2010) model with this thesis' feedback loop B1.

Figure 5.5: Comparison of the Model by Harich (2010) with this Thesis' Model



A second difference is that this thesis' model does not depict a variable such as "symptoms understanding" (or any other variable with a similar definition) which draws a direct causal link from perceived discrepancy to actual discrepancy. Therefore, this thesis' model does not include a feedback structure like Harich's (2010) loop R1. With regard to potential strategies how to cope with barriers to change, it can be hold that only Harich's (2010) model mentions leverage, which implies a further similarity of the two models. However, while Harich (2010) keeps vague by listing measures *not* capable of overcoming resistance and suggesting that strategies should center on how to weaken loop R2 (Harich, 2010: 56), this thesis model provides a pool of several *concrete* potential strategies how to cope with barriers to change.

[47] Even though Harich (2010) does not explicitly deal with organizational change and employees, when using the term "change resistance" he seems to refer to a behavioral response of change recipients (agents) toward a specific change initiative (proper practices). This implies the resemblance to ERTC.

[48] According to causal link 24, expected personal disadvantage also refers to loss, i.e. to expected individual loss due to a specific change initiative. Fear of loss fosters resistance.

[49] In Harich's (2010) model, anticipated loss is directly influenced by "known proper practices" (Harich, 2010: 42) and "agent goals that conflict with the common good" (Harich, 2010: 43). In this thesis' model on the other hand, expected personal disadvantage is an exogenous variable.

[50] Actual discrepancy leads to perceived discrepancy, just as unsolved problem symptoms lead to force committed to favor change. Perceived discrepancy fosters corrective action which decreases actual discrepancy, just as force committed to favor change fosters adopted proper practices which decrease unsolved problem symptoms.

Among those is a strategy, which might also be applicable to Harich's (2010) model as it deals with reducing anticipated loss, namely the strategy of "adjusting organizational goals to personal goals"[51].

Summary of Comparisons

Identifying similarities between the four models and this thesis' model can serve as a useful validation tool. The identification of differences, on the other hand, provides valuable opportunities for learning from each other. For instance, Larsen et al. (2002) introduce variables such as "change attempts" and "variation", while Samuel et al. (1997) point towards "costs of change" and "inducements". These four variables are not captured by this thesis' model and thus provide ground for further elaboration. In addition, all five models offer different perspectives on possible feedback structures. Samuel et al. (1997), for instance, suggest that ERTC can decrease involvement (instead of increase it as suggested by this thesis' model). Also, Harich (2010) suggests depicting "anticipated loss" as an endogenous variable (instead of an exogenous variable as suggested by this thesis' model) by linking it with available change ideas. This thesis' model takes yet another perspective on the feedback structure surrounding BOC. A first new feature is that this thesis' model captures three *different kinds* of BOC in one single SD model. A second new feature refers to a distinction made between different phases of change processes. In the beginning of chapter 2, organizational change was defined as process starting with an initial stimulus (e.g. a changing environment produces an actual discrepancy). This stimulus motivates organizations to change. After a specific change initiative is introduced, change can be initiated and implemented. However, this process is often hindered by barriers along the way. This thesis' model distinguishes between BOC according to certain phases of a change process. According to the model, insight inertia is seen as barrier which opposes the perception of actual discrepancy, thus it can prevent organizations from being motivated to change. ERTC on the other side is a response to a specific change initiative. Action inertia, just as ERTC, can prevent timely initiation or implementation of a specific change initiative. A further substantial difference is that this thesis' model introduces potential coping strategies (chapter 4 provides a detailed description; table 4.8 summarizes the strategies). Last but not least, a difference lies also in the size and complexity of the models. This thesis' model with

[51] see chapter 4, table 4.7, causal link 36

its 16 loops and 38 links is indeed bigger than the other four models. As mentioned in chapter 2, models should neither be too big nor too small as “having too much detail makes it hard to see the overall feedback loop structure and how the different loops interact. Having too little detail makes it hard for your audience to grasp the logic and evaluate the plausibility and realism of your model” (Sterman, 2000: 154). It is hoped that this thesis’ model has found an adequate balance of simplicity and plausibility.

Chapter 6 Insights, Implications, Limitations and Suggestions for Future Work

This thesis has succeeded in fulfilling its research objective. This section provides several arguments why building a qualitative system dynamics model has indeed led to an expansion of our understanding of barriers to organizational change as well as an identification of potential coping strategies.

First, chapter 2 has demonstrated the need for a new model which is able to capture the nonlinear complexity of organizational change and its barriers. This thesis' model shown in figure 4.7 does indeed capture nonlinear complexity by depicting 16 feedback loops surrounding the three variables insight inertia, action inertia and employees' resistance to change, also known as the three BOC identified within this research (see table 4.8). This model illustrates the three BOC as endogenous variables, i.e. as variables that are both influencing and influenced by the system. In other words, in this thesis' model, BOC are both cause and effect. Therefore the thesis contributes to seeing BOC as jointly generated instead of individually caused. As can be seen in appendix 3, almost all 38 causal links presented in this thesis' model have already been mentioned and examined in previous publications. What is new, i.e. what expands our understanding of BOC, is that this thesis' model has discovered "how apparent external forces are actually interrelated" (Senge, 2006: 159). Therefore, this thesis' model has gone one step further than Lewin's FFA: It has closed the loops.

Second, chapter 2 has argued that with only four available SD models little feedback thinking and almost no suggestions for leverage can be found in the current literature on the topic. Therefore, building a new model has been suggested. In fact, this proved very useful, as this thesis' model provides a new perspective on BOC. In other words, it again expands our understanding of BOC. A first new feature is that this thesis' model captures three *different kinds* of BOC in one single SD model. A second new feature is that this thesis' model distinguishes BOC according to certain phases of a change process.

Third, this research contributes to reducing rigid either-or, black-or-white, good-or-bad views and facilitates thinking in "greyish" IF-THEN scenarios. For instance, this thesis' model shows that ERTC can both increase quality of change, but can also prevent timely action[52]. Procedural justice can reduce ERTC, but can also limit timely action. Rigidity can foster

[52] If ERTC is strong, organizations can be kept from changing and consequently also from successful adaptation. If ERTC is weak, there might not be sufficient barrier to harmful change initiatives. Weak ERTC therefore does not necessarily lead to successful adaptation to changes occurring in the environment.

efficiency, but can also lead to action and insight inertia. CLRE can lead to more familiarity with and tolerance for change, but can also reduce rigidity and thus efficiency. Perceived discrepancy can lead to employees' understanding of a need for change, but can also produce psychological stress. Consequently, this research suggests thinking in and keeping healthy balances instead of drifting off to extremes. Therefore, the thesis agrees with Leana and Barry (2000: 758) who hold that change and resistance to it are simultaneous forces "and both are a necessary part of organizations' effective functioning over the long term".

A fourth argument why this research has succeeded in fulfilling its objective is the introduction of eight potential coping strategies which might prove helpful for organizations confronted with BOC. A detailed description can be found in chapter 4 while table 4.8 provides a summary of the strategies. Worth to be noted here is that none of the eight potential coping strategies suggests reducing BOC directly[53]. Instead, this research agrees with Kegan et al. (2009) and Senge (2006) when they claim that "any lasting change will require the system to change" (Kegan et al., 2009: 222) and "artful leaders discern the source of the resistance" (Senge, 2006: 88) in order to see "how we contribute to our own problems" (Senge, 2006: 21). Another feature important to be mentioned at this point refers to the two coping strategies B6 and B11. The feedback loop B6 suggests the following: If rigidity is high, you should foster CLRE. However, don't go too far as you could harm efficiency. Likewise, B11 suggests that if social credit is large, reduce procedural justice so you can foster timely action while still keeping ERTC low. But don't go too far as you could deplete social credit and/or threaten the quality of change. These "go there, but don't go too far" coping strategies clearly illustrate the complexity of change and its barriers and that linear cause-effect chains do not suffice to explain and cope with phenomena such as BOC.

Academic Implications

According to Burke (2011: 163) the academic field of ODC "has been stagnant for at least the past two decades with respect to innovation and new social technology". This thesis contributes to bringing a stop to this stagnation by offering new "academic lenses". As demonstrated before, linear cause-effect chains do not suffice to explain and cope with phenomena such as BOC. This research contributes to our understanding of BOC by

[53] Typically, most people are pushing harder to overcome resistance (Senge, 2006: 88). Reducing BOC directly refers to strategies demanding, for instance, that employees should stop being resistant or organizations should not act as inert.

generating a new dynamic hypothesis which has been validated twofold. First, by searching the academic literature it was possible to find verbal pendants to almost all causal links in the model. A list of the model's 38 causal links and their corresponding references can be found in appendix 3. Second, the focus group served as a validation tool as the participants had been invited to openly air their opinions about the model structure and suggest changes. Still, despite the application of these two tools, this thesis' model does not claim to be valid, final or complete. In fact, according to Sterman (2000: 890) "all models are wrong, so no models are valid or verifiable in the sense of establishing their truth". Instead, this thesis' model is a simplification of reality. It is a working theory offering one possible explanation. "The question facing clients and modelers is never whether a model is true but whether it is useful" (Sterman, 2000: 890). As this research report has clearly demonstrated, the thesis' model is indeed useful because it has helped understand, communicate, learn, think, align different ideas, discover new things and expand our knowledge about barriers to organizational change.

Practical Implications

By expanding our understanding of BOC as well as enlarging the pool of potential coping strategies, it is hoped that this thesis can contribute to supporting organizations in improving their ability to successfully maneuver their change processes and actively influence their change efforts' results. In concrete terms, the research results are presented to the top management board of the case study company and the insights derived from this research are used by the company to support the set-up of a strategic action plan. In addition, this thesis' model can be used by the case study company as a reference point when talking about change and its barriers. Thus it can contribute to facilitating future communication among employees. Last but not least, a further practical use of this research project refers to the fact that shared learning has taken place. The participants of the exploratory research have not only shared their valuable knowledge and opinions, but they have also received something in return, namely a shared learning environment provided at the focus group meeting with the help of the model. Thus, this thesis agrees with Morecroft (2012) and Senge (2006) when they claim that "modeling is for learning, for aiding understanding" (Morecroft, 2012: 656) and "you cannot change how someone thinks, but you can give them a tool the use of which leads them to think differently" (Senge, 2006: 286).

Limitations and Suggestions for Future Work

One of the limitations of this research project is a missing quantification and simulation of the model. According to Sterman (2000: 29) the human mind is unable "to make reasonable inferences about the dynamics of the system despite perfect and complete knowledge of the system structure". Lane (2008: 6) also supports this by saying that "the interaction of these complicated relationships is almost always beyond the capability of the human mind to infer; mental simulation is deficient. Computer simulation is therefore needed rigorously to deduce the consequences of these relationships and to reveal the counter-intuitive behaviour that results from the assumptions in the model". Therefore the reader is strongly advised to refrain from inferring any dynamic behavior from this paper's model shown in figure 4.7. As already mentioned in chapter 2, "a causal diagram captures the structure of the system, not its behavior" (Sterman, 2000: 152). Therefore, "the causal diagram doesn't tell you what will happen. Rather, it tells you what would happen if the variable were to change" (Sterman, 2000: 139). The paper proposes future work on a quantification and simulation of this thesis' model due to two reasons. First, simulation can possibly reveal counterintuitive behavior which might lead to new insights. Second, quantification can be used as a further validation tool because "simulation modeling provides a tool for formally testing the dynamic hypothesis and determining its adequacy. If the testing is done properly, the flaws in a model will generally make themselves evident when the model's behavior is compared with that of the real world" (Homer and Oliva, 2001: 349).

A further limitation of the research project is that the data gathered is "only" based on the mental models of a sample of ten employees working in one case study company. The inherent subjectivity of this approach is fully recognized. However, as Geiger et al. (2009: 419) point out, due to the fact that this is an exploratory research "it does not come as a quest for ultimate truth but rather for a plausible and interesting analysis that enriches our understanding of socially constructed phenomena". Still, this research refrains from any generalizations of the results. According to Saunders et al. (2012: 110) exploratory studies are usually "followed up with more detailed research to provide more dependable answers". Consequently, the paper proposes further validation of the model in order to support the results or identify different feedback loops responsible for BOC.

Last but not least, a further limitation refers to the difficulty of implementing the insights derived from this research in the real world. Senge (2006: 163) holds that systemic insights

by themselves „never find their way into operating policies. (…) [This doesn't stem] from weak intentions, wavering will, or even nonsystemic understanding, but from mental models. More specifically, new insights fail to get put into practice because they conflict with deeply held internal images of how the world works, images that limit us to familiar ways of thinking and acting". Senge (2006: 167) further holds that "the inertia of deeply entrenched mental models can overwhelm even the best systemic insights". In fact, this reminds of the concept of "insight inertia" presented in this research as a barrier to change. One suggestion of this thesis' model for overcoming insight inertia is changing the mental model of the company's success. Senge (2006: 12, 131, 163) goes one step further and argues that real organizational change requires systems thinking, shared vision, team learning, personal mastery and aligned mental models. Therefore, future work should emphasize integrative processes of building shared visions, team learning, personal mastery, aligning mental models and last, but definitely not least, thinking in terms of feedback when dealing with barriers to organizational change.

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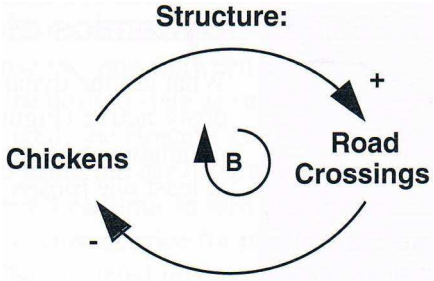
Appendix 1 – Glossary

Balancing (Negative) Loop

According to Meadows, Meadows, Randers and Behrens (1972: 42) a loop is a balancing loop when "a change in one element is propagated around the circle until it comes back to change that element in a direction opposite to the initial change". According to Sterman (2001: 19) "negative loops are selfcorrecting". Vennix (1996: 45, 46) describes balancing loops as goal seeking[54], they are responsible for stabilizing behavior, i.e. they "seek balance and equilibrium" (Sterman, 2000: 12). "In a balancing (stabilizing) system, there is a self-correction that attempts to maintain some goal or target" (Senge, 2006: 84). According to Senge (2006: 86) "in general, balancing loops are more difficult to see than reinforcing loops because it often looks like nothing is happening".

Example of a Balancing (Negative) Loop

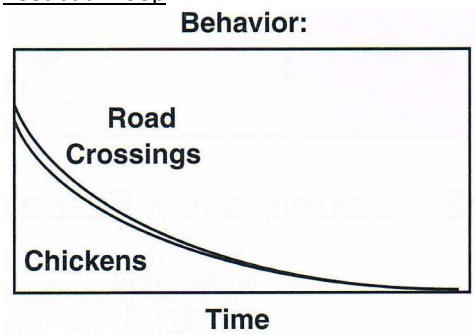
Figure A.1: Negative Feedback Loop



Source: Sterman (2000: 13)

"As the chicken population grows, various negative loops will act to balance the chicken population with its carrying capacity. One classic feedback is shown here: The more chickens, the more road crossings they will attempt. If there is any traffic, more road crossings will lead to fewer chickens. An increase in the chicken population causes more risky road crossings, which then bring the chicken population back down. The B in the center of a loop denotes a balancing feedback" (Sterman, 2000: 13). "If the road-crossing loop was the only one operating, the number of chickens would gradually decline until none remained" (Sterman, 2000: 13). Further examples of balancing loops can be found, for instance, in Senge (2006: 75-77, 84-85).

Figure A.2: Behavior generated by Negative Feedback Loop



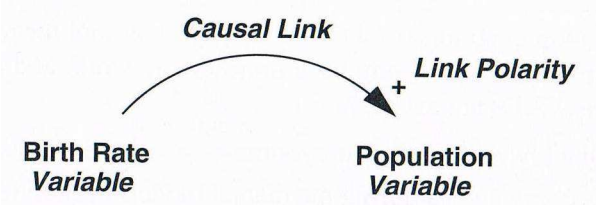
Source: Sterman (2000: 13)

[54] "The goal can be an explicit target, as when a firm seeks a desired market share, or it can be implicit, such as a bad habit, which despite disavowing, we stick to nevertheless" (Senge, 2006: 79).

Causal Link

As shown in figure A.3 "variables are related by causal links, shown by arrows" (Sterman, 2000: 138). According to Vennix (1996: 52) "the variable at the tail is supposed to have a causal effect on the variable at the point". "Each causal link is assigned a polarity, either positive (+) or negative (-) to indicate how the dependent variable changes when the independent variable changes" (Sterman, 2000: 138).

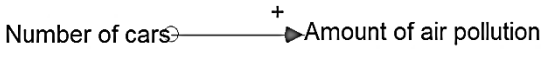
Figure A.3: Causal Link



Sterman (2000: 138)

Positive Causal Links 

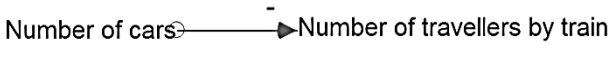
According to Vennix (1996: 52) "A positive causal relationship implies that both variables will change in the same direction". In other words, it means that, all else equal, if X increases, Y increases above what it would otherwise have been. It also means that, all else equal, if X decreases then Y decreases below what it would otherwise have been (Sterman, 2000: 139).

Example of a positive causal link: 

This causal link "can be read as follows: the higher the number of cars, the higher the amount of the air pollution. Or alternatively: the lower the number of cars, the lower the amount of the air pollution" (Vennix, 1996: 52).

Negative Causal Links 

According to Vennix (1996: 52) "a negative relationship (…) implies that both variables change in opposite directions". In other words, it means that, all else equal, if X increases Y decreases below what it would otherwise have been. It also means that, all else equal, if X decreases then Y increases above what it would otherwise have been (Sterman, 2000: 139).

Example of a negative causal link: 

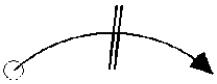
This causal link "can be read as: the higher the number of cars, the lower the number of travelers by train. Or as: the lower the number of cars, the higher the number of travelers by train" (Vennix, 1996: 52).

Link Polarities do not describe Behavior

According to Sterman (2000: 139) "link polarities describe the structure of the system. They do not describe the behavior of the variables. That is, they describe what would happen IF

there were a change. They do not describe what actually happens". In other words, a link polarity is "solely determined by the relationship between the two variables and does *not* depend on the fact whether the effect variable actually increases or decreases" (Vennix, 1996: 53).

Delay

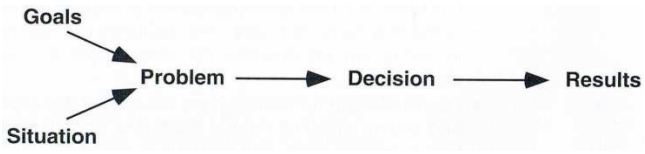
According to Senge (2006: 79) "many feedback processes contain 'delays', interruptions in the flow of influence which make the consequences of actions occur gradually". In other words, delays are "interruptions between your actions and their consequences" (Senge: 2006: 88), i.e. the "output lags behind its input" (Sterman, 2000: 411). According to Sterman (2000: 150) it is important to indicate delays in causal links because, if unrecognized or not well understood, they can "lead to instability and breakdown, especially when they are long" (Senge, 2006: 89). When you want to communicate a delay, i.e. when you want to describe an arrow with a delay, then Senge (2006: 90) suggests that you should "add the word 'eventually' to the story". Graphically a delay is communicated via two lines crossing the causal link: 

Exogenous Perspective: Linear Thinking in Endless Cause-Effect Chains

Senge (2006: 20) claims that people often misperceive "problems as externally caused. (…) 'The enemy is out there', however, is almost always an incomplete story. 'Out there' and 'in here' are usually part of a single system". According to Sterman (2000: 28) "a fundamental principle of system dynamics states that the structure of the system gives rise to its behavior. However, people have a strong tendency to attribute the behavior of others to dispositional rather than situational factors, that is, to character and especially character flaws rather than the system in which these people are acting". According to Sterman (2000: 10) it "is our tendency to interpret experience as a series of events (…). We are taught from an early age that every event has a cause, which in turn is an effect of some still earlier cause. (…) Such event-level explanations can be extended indefinitely, in an unbroken Aristotelian chain of causes and effects (…). The event-oriented worldview leads to an event-oriented approach to problem solving".

Exogenous problem-solving

Figure A.4: Event-oriented View of the World



Source: Sterman (2000: 10)

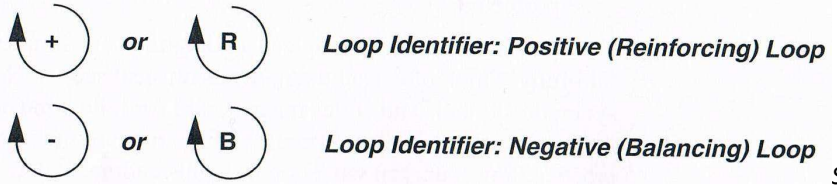
Figure A.4 "shows how we often try to solve problems. We assess the state of affairs and compare it to our goals. The gap between the situation we desire and the situation we perceive defines our problem. (…) You then consider various options to correct the problem. (…) You select the option you deem best and implement it, leading (you hope) to a better result" (Sterman, 2000: 10). "Problem solved – or so it seems" (Sterman, 2001: 12). According to Sterman (2001: 11) this "event-oriented, open-loop worldview leads to an event-oriented, reactionary approach to problem solving". According to Senge (2006: 78) "from each side's linear view, responsibility clearly lies with the other side. (…) A linear view always suggests a simple locus of responsibility. When things go wrong, there is either blame – "he, she, it did it" – or guilt – "I did it". At a deep level, there is no difference between blame and guilt, for both spring from linear perceptions. From the linear view, we are always looking for someone or something that must be responsible".

Feedback Loop Identification

According to Sterman (2000: 143) "there are two methods for determining whether a loop is positive or negative: the fast way and the right way". "The fast way to tell if a loop is positive or negative is to count the number of negative links in the loop. If the number of negative links is even, the loop is positive; if the number is odd, the loop is negative. The rule works because positive loops reinforce change while negative loops are self-correcting (…). The right way to determine the polarity of a loop is to trace the effect of a small change in one of the variables as it propagates around the loop. If the feedback effect reinforces the original change, it is a positive loop; if it opposes the original change, it is a negative loop. You can start with any variable in the loop; the result must be the same" (Sterman, 2000: 144).

According to Sterman (2000: 138) "important loops are highlighted by a loop identifier which shows whether the loop is a positive (reinforcing) or negative (balancing) feedback".

Figure A.5: Loop Identifier



Source: Sterman (2000: 138)

In addition to indicating their polarity it is also useful to give the loops an individual name. According to Sterman (2000: 148) “you will often find yourself trying to keep track of more loops than you can handle. Your diagrams can easily overwhelm the people you are trying to reach. To help your audience navigate the network of loops, it’s helpful to give each important feedback a number and a name”.

Feedback Loop Interaction

According to Sterman (2001: 17) “much of the art of system dynamics modeling lies in discovering and representing the feedback processes and other elements of complexity that determine the dynamics of a system. One might imagine that there is an immense range of different feedback processes to be mastered before one can use system dynamics effectively. In fact, all dynamics arise from the interaction of just two types of feedback loops, positive (or self-reinforcing) and negative (or self-correcting) loops”. Arthur (2013: 12, 13) holds that the presence of positive and negative feedbacks acting together makes the system alive, in other words, a mixture of both feedbacks shows interesting and complex behavior. In fact, “the most complex behaviors usually arise from the interactions (feedbacks) among the components of the system, not from the complexity of the components themselves” (Sterman, 2000: 12).

Gatekeeper

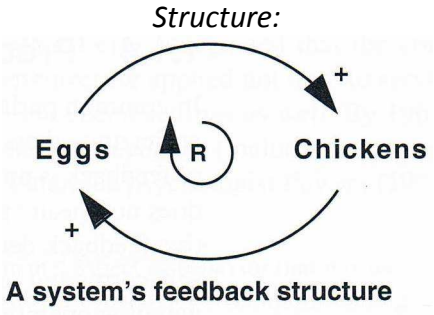
According to Richardson and Andersen (1995: 115) a gatekeeper is “a person within, or related to, the client group who carries internal responsibility for the project, usually initiates it, helps frame the problem, identifies the appropriate participants, works with the modeling support team to structure the sessions, and participates as a member of the group. Aware of system dynamics literature and practice but not necessarily a modeler, the gatekeeper is an advocate in two directions: within the client organization she speaks for the modeling process, and within the modeling support team she speaks for the client group and the problem. The locus of the gatekeeper in the client organization will significantly influence the process and the results”.

Reinforcing (Positive) Loop

According to Vennix (1996: 45) "a positive loop creates action which increases a system state, which in turn leads to more action further increasing the system state". In other words these loops are self-reinforcing (Sterman, 2000: 13), i.e. they "reinforce or amplify whatever is happening in the system" (Sterman, 2000: 12). According to Levin, Roberts and Hirsch (1975: 7) a positive feedback loop refers to the "fact that an initial change in any factor eventually induces further self-change in the original direction". Senge (2006: 80) holds that in reinforcing processes "a small change builds on itself. Whatever movement occurs is amplified, producing more movement in the same direction. (…) Some reinforcing (amplifying) processes are "vicious cycles", in which things start off badly and grow worse. (…) But there's nothing inherently bad about reinforcing loops. There are also virtuous cycles – processes that reinforce in desired directions". In short, "the behavior that results from a reinforcing loop is either accelerating growth or accelerating decline" (Senge, 2006: 82).

Example of a Reinforcing (Positive) Loop

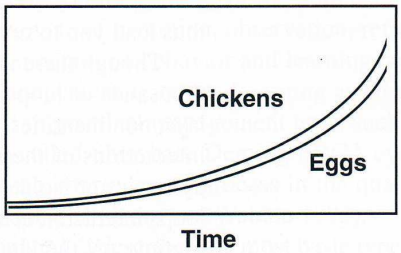
Figure A.6: Positive Feedback Loop



Source: Sterman (2000: 13)

"In this case, more chickens lay more eggs, which hatch and add to the chicken population, leading to still more eggs, and so on. (…) an increase in the chicken population causes the number of eggs laid each day to rise above what it would have been (and vice versa: a decrease in the chicken population causes egg laying to fall below what it would have been). The loop is self-reinforcing, hence the loop polarity identifier R" (Sterman, 2000: 13). "If this loop were the only one operating, the chicken and egg population would both grow exponentially." (Sterman, 2000: 13). "But of course, no real quantity can grow forever. There must be limits to growth. These limits are created by negative feedback." Sterman (2001: 19). Further examples of reinforcing loops can be found, for instance, in Senge (2006: 70, 81).

Figure A.7: Behavior generated by Positive Feedback Loop



Source: Sterman (2000: 13)

Variable

According to Sterman (2000: 152) “variable names in causal diagrams and models should be nouns or noun phrases” and “must have a clear sense of direction. Choose names for which the meaning of an increase or decrease is clear, variables that can be larger or smaller” (Sterman, 2000: 152). In other words, “the idea is to select variable names in such a way that they can take on high or low values (…) or anything in between” (Vennix, 1996: 53). In addition, Sterman (2000: 153) suggests that “variable names should be chosen so their normal sense of direction is positive. Avoid the use of variable names containing prefixes indicating negation”.

Appendix 2 – Predetermined Questions for Semi-Structured Interviews

1. Why is the company confronted with difficulties in adapting to changes occurring in the environment?

2. In case a change is imminent, one possible reaction is that employees react restrained, even resistant towards the change. Why would they react this way?
    - Can you think of anything that might increase resistance to change?
    - Can you think of anything that might decrease resistance to change?

3. In case a change is imminent, one possible reaction is that employees react open, even euphoric towards the change. Why would they react this way?
    - Can you think of anything that might increase openness towards change?
    - Can you think of anything that might decrease openness towards change?

4. What are consequences of employees' open/euphoric reactions?
    - Imagine, the majority of employees is very euphoric about the change. What are possible good/bad consequences?

5. What are consequences of employees' restrained/resistant reactions?
    - Imagine, the majority of employees is very resistant towards the change. What are possible good/bad consequences?

6. What are strategies which might be successful in changing employees' attitudes and behaviors towards change?

Appendix 3 – Validation of the Model's Causal Links by Academic Literature

Causal link 1	Vennix (1996: 48), Sterman (2000: 155), Schein (1996: 29)
Causal link 2	Sterman (2000: 23, 156), Senge (2006: 166, 174), Morecroft (2012: 655)
Causal link 3	Vennix (1996: 48), Sterman (2000: 155)
Causal link 4	Vennix (1996: 48), Sterman (2000: 155)
Causal link 5	
Causal link 6	Geiger and Antonacopoulou (2009: 411, 412, 431), Senge (2006: 166), Sterman (2000: 150)
Causal link 7	Godkin and Allcorn (2008: 84, 85), Geiger et al. (2009: 411, 430, 432), Huang, Lai, Lin and Chen (2013: 978)
Causal link 8	Allcorn and Godkin (2011: 92), Huang, Lai, Lin and Chen (2013: 984)
Causal link 9	Del Val and Fuentes (2003: 149)
Causal link 10	Senge (2006: 167, 171)
Causal link 11	Nutt (2002: 264), Harvey et al. (2010: 23), Kegan et al. (2009: 320), Senge (2006: 143, 162)
Causal link 12	Schein (1996: 29), Ford and Ford (2010: 26), Nutt (2002: 37)
Causal link 13	Harvey et al. (2010: 84)
Causal link 14	Allcorn and Godkin (2011: 92), Leana and Barry (2000: 755), Rahmandad, Repenning and Sterman (2009: 310), Godkin and Allcorn (2008: 83)
Causal link 15	Geiger et al. (2009: 431), Leana et al. (2000: 755), Hannan and Freeman (1984: 151, 152, 162), Harvey et al. (2010: 85, 100), Godkin et al. (2008: 82), Boyer and Robert (2006: 324), Allcorn and Godkin (2011: 92), Del Val et al. (2003: 150), Huang et al. (2013: 978, 979, 981)
Causal link 16	Leana and Barry (2000: 753, 755, 756), Hannan and Freeman (1984: 162), Larsen and Lomi (2002: 291), Huang, Lai, Lin and Chen (2013: 980)
Causal link 17	Schein (1996: 30), Burnes and Cooke (2012: 1407), Kegan et al. (2009: 205), Harvey et al. (2010: 85, 86)
Causal link 18	Harvey et al. (2010: 17, 79), Godkin and Allcorn (2008: 87), Michel et al. (2013: 764)
Causal link 19	Kotter and Schlesinger (2008: 132), Harvey et al. (2010: 10)
Causal link 20	Harvey et al. (2010: 24)
Causal link 21	Erwin and Garman (2010: 44), Jaramillo et al. (2012: 549, 551, 552, 558), Kegan et al. (2009: 253), Kim and Kankanhalli (2009: 568, 569), Leana and Barry (2000: 753), Mabin, Forgeson and Green (2001: 170), Michel et al. (2013: 761, 762, 764, 765, 774, 775), Kunze et al. (2013: 743), Oreg (2006: 76), Saksvik and Hetland (2009: 175, 176, 180, 181), Senge (2006: 272)
Causal link 22	Oreg (2006: 81), Kim and Kankanhalli (2009: 571, 578, 579), Harvey et al. (2010: 103, 104, 106), Battilana and Casciaro (2013: 833), Michel et al. (2013: 762), Vennix (1996: 153)
Causal link 23	Kotter and Schlesinger (2008: 134), Harvey et al. (2010: 13, 29, 30, 31, 79, 80), Godkin and Allcorn (2008: 87), Mabin, Forgeson and Green (2001: 170)
Causal link 24	Harvey et al. (2010: 24, 28, 29, 31, 48, 54, 64, 82, 83), Kotter et al. (2008: 132, 134), Chawla et al. (2004: 487, 495), Kim et al. (2009: 569), Del Val et al. (2003: 149), Jaramillo et al. (2012: 548, 549, 551, 558, 559), Smollen (2011: 13, 14), Nutt (2002: 109), Erwin et al. (2010: 45), Godkin et al. (2008: 87), Dent et al. (1999: 26), Thomas and Hardy (2011: 323), Agócs (1997: 917), Mabin, Forgeson and Green (2001: 170), Senge (2006: 195)
Causal link 25	Senge (2006: 143, 144), Rufo (2012: 324, 325), Levasseur (2001: 72), Harvey et al. (2010: 17, 25, 100, 101, 102), Nutt (2002: 109)
Causal link 26	Godkin and Allcorn (2008: 83, 85), Jaramillo et al. (2012: 548, 549, 550), Michel et al. (2013: 762), Smollan (2011: 12), Bareil (2013: 60, 61, 62, 63), Del Val and Fuentes (2003: 148, 153), Allcorn and Godkin (2011: 91), Erwin and Garman (2010: 39, 42, 43), Ford and Ford (2010: 24), Nutt (2002: 87, 88), Smollen (2011: 13), Harvey et al. (2010: 54)
Causal link 27	Harvey et al. (2010: 6, 7, 53, 67), Thomas and Hardy (2011: 323), Smollen (2011: 14), Nutt (2002: 109)
Causal link 28	Kotter et al. (2008: 132, 134, 135), Chawla et al. (2004: 487, 488, 494), Harvey et al. (2010: 3, 5, 19, 20, 27, 41, 42, 53, 54, 71, 77, 78, 93), Jaramillo et al. (2012: 549, 558, 559), Levasseur (2001: 72, 73), Erwin and Garman (2010: 45, 46, 47), Oreg (2006: 81, 94), Michel et al. (2013: 775), Dent and Goldberg Galloway (1999: 26), Mabin, Forgeson and Green (2001: 170), Kim and Kankanhalli (2009: 579), Smollen (2011: 13, 14), Nutt (2002: 29, 30, 31, 32, 99, 105, 110), Allcorn and Godkin (2011: 101), Senge (2006: 144), Thomas and Hardy (2011: 323), Furst and

	Cable (2008: 453), Askarany (2006: 711, 712), Burnes and Cooke (2013: 420), Kotter and Schlesinger (2008: 135, 139), Mabin, Forgeson and Green (2001: 170), Ford and Ford (2010: 27)
Causal link 29	Kotter and Schlesinger (2008: 135, 136), Harvey et al. (2010: 20), Sterman (2000: 114, 115)
Causal link 30	Allcorn and Godkin (2011: 101), Bareil (2013: 61, 63, 64), Burke (2011: 157), Del Val and Fuentes (2003: 148), Erwin and Garman (2010: 40), Ford and Ford (2010: 27, 34, 35), Ford, Ford and D'Amelio (2008: 363, 369), Giangreco and Peccei (2005: 1816), Harvey et al. (2010: 20, 62), Jaramillo et al. (2012: 550, 559, 560), Kotter and Schlesinger (2008: 134), Mabin, Forgeson and Green (2001: 170), Nutt (2002: 109, 110), Smollen (2011: 12, 13), Thomas and Hardy (2011: 322, 324), Vennix (1996: 153, 154, 156)
Causal link 31	Harvey et al. (2010: 18, 84, 92, 93), Kotter et al. (2008: 132, 134), Kim et al. (2009: 572, 578), Jaramillo et al. (2012: 549), Smollen (2011: 13), Michel et al. (2013: 764), Perren and Megginson (1996: 26), Erwin and Garman (2010: 45, 46), Dent and Goldberg Galloway (1999: 26), Smollen (2011: 13)
Causal link 32	Eisenhardt (1990: 39)
Causal link 33	Harvey et al. (2010: 77), Harvey et al. (2010: 90) Chawla and Kelloway (2004: 485, 487, 488), Nutt (2002: 100), Mabin, Forgeson and Green (2001: 169), Erwin and Garman (2010: 50), Stanley, Meyer and Topolnytsky (2005: 437, 457), Senge (2006: 148)
Causal link 34	Kotter and Schlesinger (2008: 133), Nutt (2002: 100), Furst and Cable (2008: 458), Smollen (2011: 13), Erwin and Garman (2010: 47, 48), Oreg (2006: 81), Chawla and Kelloway (2004: 486), Stanley, Meyer and Topolnytsky (2005: 430, 431, 433, 438, 454, 457), Del Val and Fuentes (2003: 150)
Causal link 35	Harvey et al. (2010: 23), Danışman (2010: 200, 201, 202), Mabin et al. (2001: 169)
Causal link 36	Harvey et al. (2010: 4)
Causal link 37	Nutt (2002: 100)
Causal link 38	Erwin and Garman (2010: 47)