

**A critical analysis of the role and nature of
dynamic capabilities to enable and sustain
organizational fitness, incorporating
complexity thinking**



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requirements for the degree of Master of Commerce
at the University of Stellenbosch.

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Declaration

I, the undersigned, hereby declare that the work contained in this assignment is my own original work and has not previously in its entirety or in part been submitted at any university for a degree.

Abstract

In light of the rising recognition that strategic management, especially in uncertain fast-changing environments, needs to be robust beyond time and space, this study has the objective to re-conceptualize the term “organizational fitness”. Due to the preliminary and isolated nature of existing organizational fitness models, the decision was made to incorporate the considerable knowledge base of “dynamic capabilities” and “complexity thinking”. The critical criteria for choosing these strategic management approaches were seen in their appreciation of change as a natural principle of life within the larger context of this currently fast evolving world. The study aims at establishing a sound understanding of the reference point, i.e. organizational fitness, as well as its hypothetical conceptual means, i.e. dynamic capabilities and complexity thinking. Furthermore, the relational aspects of these concepts were elaborated and converged into a synthesis of what could emerge to become a comprehensive and persistent approach towards organizational fitness and strategic management per se.

In respect to the complexity of the chosen concepts, a sequential method of incorporation was adopted. In reviewing and analyzing existing literature on organizational fitness, a possible definition and a general anatomy for organizational fitness could be established. Subsequently, the components and rationale of dynamic capabilities were critically delineated. The insights derived were then inserted in a preliminary fitness model. Hereafter, complexity thinking was investigated and related to the dynamic capabilities framework. Motivated by the complementary nature of these concepts, two emerging techniques of complexity thinking were delineated, viz. the co-evolutionary space and fitness landscapes, with the aim of deepening as well as extending the earlier preliminary concept.

This logical yet theoretical and normative study presents clear pointers concerning strategic enterprise robustness with which organizational fitness could be approached in the specific realm of this conceptual frame. In respect of its hypothetical and preliminary nature, the conclusions reached should be seen in their proper perspective. Moreover, further basic and applied research is seen as crucial to substantiate the conclusions and recommendations of this study.

Opsomming

In lig van die toenemende besef dat strategiese bestuur, veral in toestande van vinnige verandering, dinamies en robuust moet wees onbegrens deur die konsepte van tyd en spasie, het hierdie studie die doelstelling om die begrip van organisatoriese fiksheid te herkonseptualiseer. Op grond van die voorlopige en geïsoleerde aard van huidige organisatoriese fiksheidsmodelle, is besluit om die nuwer strategiese bestuursbenaderinge van 'dinamiese vermoëns' en 'kompleksiteitsdenke' in die omvang van die studie te inkorporeer.

Die kriteria vir die keuse van insluiting van die voorgenoemde strategiese benaderinge was hul toenemende potensiaal as onderliggende teorieë vir die verduideliking van verandering in die konteks van die toenemend snelle veranderende wereld. Die studie beoog om 'n deeglik-gefundeerde basis en vertrekpunt daar te stel, d.w.s. dinamiese vermoëns beskou as deel van kompleksiteitsdenke. Die interaktiewe en verhoudingsaspekte van die twee konsepte is intensief ontleed en 'n konvergensie is nagestreef ten einde 'n sintese van benadering daar te stel, wat die konsep van organisatoriese fiksheid en gepaardgaande strategiese bestuursimplikasies aandui.

In die uitvoering van die ondersoek van kompleksiteitsteorie is 'n sekwensiële wyse van ondersoek gekies. Omvattende ontleding van bestaande internasionale literatuur het 'n voorlopige definisie en anatomiese dimensies van die konsep van organisatoriese fiksheid opgelewer. Daarna is die komponente en rasionaal van dinamiese vermoëns krities ontleed. Die resulterende insigte is voorts in die konsep van organisatoriese fiksheid geïnkorporeer. 'n Verdere stap was ontleding en relevansie-passing van kompleksiteitsdenke in verband tot dinamiese vermoëns. Twee ontluikende tegnieke van kompleksiteitsdenke is afgebaken, naamlik ko-evoluerende spasie en fiksheidslandskappe, met die doel om die voorlopige konsep van organisatoriese fiksheid te verdiep en te verbreed.

Hierdie logiese, teoretiese en normatiewe studie voorsien duidelike aanduidinge to.v. strategiese ondernemings-robuustheid, waarmee die konsep van organisatoriese fiksheid toepaslik benader kan word. In die lig van die hipotetiese en voorlopige aard van die

studie, moet die gevolgtrekkings van die studie in sy begrensde konteks beskou word. Verder basiese en toegepaste navorsing word as noodsaaklik geag ten einde die gevolgtrekkings en aanbevelings van die studie te substansieer.

Auszug

Das heutige sozial und wirtschaftliche Umfeld ist zunehmender Massen gekennzeichnet bei turbulenten Wandlungen. Vor diesem Hintergrund wird es deutlich, dass ein neues Verstaendnis von strategischem Management notwendig ist. Diese Einsicht basiert auf der Forderung nach einem bestaendigen und robusten Konzept. Ein potentieller Weg besteht in einer neuen Konzeptualisierung von organisationaler Fitness basierend auf Forschungen im Bereich dynamischer Faehigkeiten und der Komplexitaetstheorie. Das bedeutendste Entscheidungskriterium fuer die Wahl dieser Konzepte war deren Auffassung von Zeit. Beide Konzepte sind dynamisch und enthalten somit eine wesentliche Voraussetzung fuer einen robusten Managementansatz. Die voliegende Studie ist ein erstmaliger Versuch diese Konzepte zusammenzufuehren. Das Ziel ist dabei in erster Linie den Leser auf dem gegenwaertigen Wissensstand aufmerksam zu machen und Synergien herauszuarbeiten.

Die Studie wurde in fuenf logisch aufeinanderfolgenden Schritten untergliedert. Zunaechst, wurde eine Literaturanalyse im Bereich organisationaler Fitness vorgenommen mit dem Ziel die begrifflichen und inhaltlichen Rahmenbedingungen festzulegen. Daraufhin, wurde ein Ueberblick des augenblicklichen Wissensstandes in der Forschung dynamischer Faehigkeiten gegeben. Im naechsten Schritt wurden die zuvor isoliert betrachteten Theorien in Kontakt gebracht mit dem Ergebnis einer neuen Betrachtung von organisationaler Fitness. Da dieser erste Versuch der Komplexitaet der Thematik nicht vollends gerecht werden konnte, wurde nun Komplexitaetstheorie als ergaenzende theoretische Ebene eingefuehrt. Als besonders hilfreich zeichneten sich dabei zwei Modelle ab, naemlich, Koevolution und Fitnesslandschaften.

Da es sich bei dieser Arbeit um einen erstmaligen hypothetischen Versuch handelt, die vorliegenden Theorien zu integrieren, muessen alle Antworten im Bezug auf die urspruengliche Fragestellung skeptisch betrachtet werden. Waehrend im Rahmen dieser Arbeit das Potential einer Integration hervorgehoben wird, bedarf es weiterer empirischer und nicht empirischer Forschung um diesen Standpunkt zu festigen.

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Dedication

Fuer meine Eltern und treuen Freunde,
die mir diese Chance im Leben ermoglicht und versuesst haben.

CHAPTER 1: Introduction

1.1. Background to the study

In the beginning of the 21st century, businesses are challenged by a fast-changing and uncertain environment. The degree of change and its impact on an organization are often viewed as punctuated periods of equilibrium (see e.g. Beinhocker, 1999; Leibold, 2002). This means that change occurs in unpredictable sequences of small, medium and large alterations on an ongoing basis. In other words, change is seen as the only constant today, but is unpredictable in its form. The catalysts of change are thereby seen as both inside and outside the organization, i.e. in its immediate environment and in the larger external world.

One of the prime examples of this uncertainty is the unexpected September 11th, 2001, attack in the United States that directly targeted the heart of the world's financial and political power. This event has not only been directly impacting on the location, nations and the business world in a tragic and destructive way, but also an avalanche of indirectly related events has been set in motion. Economies have been sliding into recession; industries such as the airline and tourism industries, especially in the United States, have been significantly affected. On the other hand, however, the financial world – one of the immediate targets – has been recovering rather quickly from the terrorist attack. Overall, this example visualizes the interdependency of the world as well as the irregularity with which changes impact on the world and its subsystems.

In the business world, non-linear systemic patterns have been recognized for the last two decades. Major drivers have been identified as globalization or communication and computer technologies. The global economy has been described as fast-changing, network-innovative and knowledge-driven (Leibold et. al., 2002). This perspective has given rise to a variety of approaches manifested under the term (organizational) fitness.

The predominant understanding is that organizations are not merely reacting to external changes, but are pro-actively seeking changes in their own way. Proactive search for fitness has been titled with slogans such as “run differently” (Leibold et. al., 2002), “become the architect of revolution” (Hamel, 1998), “reframe the business” (Normann, 2001), “reinvent the business model” (Gross, Pascale and Arthos, 1997; Abraham and Knight, 2001) or “change the rules of the game” (Govindarajan and Gupta, 2001). In this

respect, tailoring energy in the organization to both adaptation to as well as shaping of the environment seems to be crucial (Kelly and Allison, 1999).

Based on this ambitious goal, the limits of the Darwinian concept of survival of the fittest have been recognized and reinvented through the quest for co-evolution of an organization internally and within the larger environment (Moore, 1993). Furthermore, evidence suggests the importance of a truly dynamic attempt towards fitness. This means that fitness can only be captured by an approach consistent over time and in varying circumstances (Letiche, 2000).

At this point in time, approaches towards (organizational) fitness are manifold and divergent. They are referred to as ambiguous and insufficient for explaining the fundamentals of the emerging mental model (Anderson, 1999; Maguire and McKelvey, 1999). The reviewed approaches seem only partially to untangle the multiple, complex, non-linear, dynamic and systemic character of the emerging understanding of management and the business environment. Therefore, it seems appropriate to rely on complementary frameworks to fill the gaps, and to determine how organizational fitness can (co) evolve.

For the purpose of this study, two of the dominant management approaches have been chosen, namely the concept of dynamic capabilities and complexity thinking. Managers and academics alike have been discussing, refining and utilizing both frameworks frequently for more than two decades (Sanchez, 1997). Furthermore, there is evidence for their partial, even though critical, integration (see e.g. Brown and Eisenhardt, 1998; Eisenhardt and Martin, 2000; Galunic and Eisenhardt, 2001; Rindova and Kotha, 2001). As a result, studies of incremental (original perspective of dynamic capabilities) and emergent (complexity thinking) change, of evolution and co-evolution, of systemic and holistic nature, and of non-linearity and dynamism seem to converge.

In this sense, a synthesized version of dynamic capabilities and complexity thinking seems to be capable of dealing with the multiplicity of issues in an appropriate manner, i.e. not purely with reductionism and abstraction. In other words, their integration could result in the persistence across time and space necessary for an approach towards (organizational) fitness.

1.2. Statement of the problem

A major shift in business management from a purely competitive focus via the recognition of competition and collaboration towards a mindset of co-evolution within socio-cultural systems is taking place (Leibold, 2001). In this realm, organizational fitness is perceived as an organization's ability continuously to generate new value creating systems through internal and external co-evolution, i.e. competition and cooperation (see e.g. Normann, 2001; Brown and Eisenhardt, 1998; Moore, 1993; Pascale, 1999). It is therefore seen as important not only to understand new kinds of innovation, but also the underpinnings of innovation. This has been reflected in attempts to redefine strategic management, organizational form, the dynamics underlying internal and external change, as well as thinking in general (see e.g. Sanchez, 1997; Kappelhoff, 2001; Allison and Kelly, 1999; Yongblood, 1997; Kilroy and McKinley, 1997).

The reasons for companies' failures in today's environment should not be attributed to the characteristics of the external world only, i.e. fast non-linear changes and uncertainty. The failures are seen as the result of the inability of companies to continuously deploy and re-deploy resources into new value-creating systems and competencies (see e.g. Normann, 2001; Prahalad and Hamel, 1990). The inability seems to reside in processes, values and a culture that does not incorporate change (Christensen and Overdorf, 2000; Normann, 2001; Stacey et. al., 2000; Teece, 2000). The reasons for corporate decline or extinction are paraphrased as "core competencies turning into core rigidities" or "competency traps" (Rosenbloom, 2000; Tripsas and Gavetti, 2000), as "silent killers" (Beer and Eisenstat, 2001, 2002; Eisenstat and Dixon, 2001), or as "drift into equilibrium or chaos" (Lissack, 1997; Pascale, 1999). Organizational fitness for change is seen as dependent on open and adaptive, i.e. vivid, resilient, flexible, and innovative, organizations that evolve through the "élan vital" (Letiche, 2000) of human beings and are guided by purposeful, entrepreneurial, economic and social management (see e.g. Galunic and Eisenhardt, 2001; Normann, 2001; Yongblood, 1997).

An emphasis on employee empowerment or self-organization, on modular organizational forms, on resource and process innovation, and on creative tension reflects a new, hybrid thinking approach towards strategic management (see e.g. Leibold, 2001; Kilroy and McKinley, 1997; Lissack, 1997). In this realm, every moment and every situation is seen as unique, therefore requiring a logical and experiential approach, i.e. a "both/and" approach (see e.g. Letiche, 2000; Teece et. al., 1997; Eisenhardt and Martin, 2000).

The implications from the pointers elaborated above are the following:

- a) It would be fundamental for an approach towards organizational fitness to be sensitive to internal and external uncertainties, dynamics and inflections. Instead of generating sensitivity in a negative, impeding way, it should be proactively leverage into impetus, creativity and innovation on an ongoing basis. The existing approaches towards organizational fitness currently seem too ambiguous and inefficient to manage this challenge (Anderson, 1999; Letiche, 2000; Maguire and McKelvey, 1999). Further, “traditional” approaches of strategic management such as TQM, reengineering, strategy portfolios, or the five forces concept are considering either the environment, or the organization, or both. They are, however, to a large extent once off remedies that do not account for change and continuous innovation (Yongblood, 1997; Pascale, 1999). As it focuses on continuously sensing and seizing opportunities (see e.g. Eisenhardt and Martin, 2000, Henderson and Cockburn, 1994; Amit and Schoenmaker, 1993; Karim and Mitchell, 2000; Teece, 2000), the framework of dynamic capabilities seems to be suitable for a persistent approach towards organizational fitness. To substantiate its relevance, the role and nature that dynamic capabilities could play in an approach towards organizational fitness has to be identified. Consequently, a sound understanding of the concept of dynamic capabilities has to be established before attempting a preliminary synthesis.
- b) It has been realized by advocates of dynamic capabilities that the original scope of the concept does not fully reflect the multiplicity of today’s environment. Consequently, an attempt has been made to incorporate insights derived from complexity thinking to fast-changing markets (see e.g. Rindova and Kotha, 2001; Galunic and Eisenhardt, 2001; Eisenhardt and Martin, 2000). In the context of this study, i.e. organizational fitness, the key contribution seems to be the both/and consideration of incremental evolution and emergent co-evolution. The inclusion of emergence could be supported by the recognition that innovation cannot be formalized (see e.g. Mintzberg, 1994; Huffman, 2001), but rises in self-organizing environments (see e.g. Anderson, 1999; Leibold, 2001). In order to capture the contributions and implications of integrating complexity thinking in an approach towards dynamic fitness capabilities, a sound understanding of relevant techniques and approaches is necessary. The often cited challenge is therefore applying the “hard” science of complexity in the “soft” science context

of strategic and organizational management (see e.g. Letiche, 2000; Kappelhoff, 2001; Galunic and Eisenhardt, 2001).

1.3. Objective of the study

The overall objective of the study is to analyze critically the relevance of dynamic capabilities and its relationship to complexity thinking and applications, in the cultivation and sustaining of organizational fitness.

1.4. Scope of the study

Organizational fitness is an emerging topic attended to from various philosophies of management. A review of international literature showed the still premature character of these approaches in terms of both definition and anatomy of organizational fitness. Therefore, a fundamental task would be to forward a working definition of organizational fitness and of the conceptual base for this study. After extensive scrutiny of the literature the following definition has been formulated for the purpose of this study:

Organizational fitness is the capacity for continuous learning and renewal to adapt to and to shape the environment, thereby establishing, maintaining and disturbing external and internal consonance for the purpose of appropriate growth, development and survival. This capacity will be elaborated within the scope of dynamic capabilities and complexity thinking.

Competitive analyses based on fitness models are not only applicable to the organizational level but also to the individual and industry level. The above definition has determined the focus on organizational fitness in the light of dynamics within and outside the corporation. This indicates a hybrid approach towards organizational fitness. This approach has shown that for the purpose of organizational (co) evolution, fitness cannot be explained by simply focusing on the entity organization. Moreover, a flexible context has to be taken into consideration; a context incorporating systems within the organization and networks beyond corporate boundaries. Despite organizational fitness requiring the analysis of a larger whole, this larger context is not equal to the boundaries of an industry. Similarly, (emotional and rational) fitness characteristics of individuals or employees in an

organization have not been discussed in detail. Consequently, industry and individual fitness has not been subject in this thesis.

The above definition has limited the conceptual base for organizational fitness to the framework of dynamic capabilities and complexity thinking. Only where appropriate, have insights from other management philosophies been considered and investigated in terms of enhancing the explanatory power of this thesis. Especially, research in the field of knowledge management and organizational learning may enrich the discussion surrounding organizational fitness. Besides, the platform defined for this study does not explicitly account for measurement techniques for organizational fitness. Both concepts – dynamic capabilities and complexity thinking – do not investigate performance measurement per se. In this respect, it has been referred to the topic of intellectual capital, i.e. balanced score card, as providing pertinent insights.

Finally, it has to be considered that the literature sources used in this study are mainly drawing their conclusions from investigations of world class businesses located in Western industries including Japan. This focus excludes a range of businesses and regions. Small and medium sized companies for example often have different structures and priorities. The challenge for managers in these companies is to perceive critically, reflect and later apply management theories to their specific situation. A similar conclusion can be drawn for emerging and developing countries, especially on the African and South American continents. Local markets and environmental conditions affect organizations within their own set of rules. Therefore, the transfer of the findings of this study is only partially possible, i.e. after a critical review of the similarities and differences.

1.5. Methodology

The basis for this thesis is qualitative in nature and predominantly rests on secondary data. The research conducted relies on data in published and unpublished sources of information in the strategic management research and organizational studies' realm originating in North-America, Europe and South Africa. The data has been gathered through the facilities of the library and the possibilities of the Internet, in unpublished and published articles, working papers, official documents, books and WebPages.

The research is based on the phenomenal principle of *différence* (Letiche, 2000). This means that "truth" is a process of studying perspectives that:

- a) Imply one another;
- b) Support and criticize one another;
- c) Complement and deny one another.

In this sense the goal of this study is not to establish any absolute “truth”, but to be experientially relevant. In other words, the goal is to generate interesting perspectives and a lively text, which stimulate further discussion and research.

Furthermore, the research is consistent with postmodernism stating the impossibility of a value-free and neutral approach to research (Babbie and Mouton, 2001). Based on secondary sources, the author implicitly only extracted data that made sense to her in her perception of the world. Consequently, there might be other opinions and priorities within the specific context. This emphasizes another principle of postmodernism, viz. the heterogeneity of knowledge production.

In this sense, a preliminary approach to the objective of the study has been developed which can only be a spark for further in-depth study and validation in both an empirical and non-empirical sense.

1.6. Structure of the presentation

For the purpose of clarifying the logical flow of this study, the content is clustered into seven chapters.

Chapter 1 introduces the theme of the thesis and gives the necessary background. The statement of the problem motivating the study, and the main objective of the thesis follows this. Hereafter, the scope of the study and the methodology applied are described. Finally, the structure of the thesis is provided to guide the reader through the discussion, which follows.

Chapter 2 determines the definition and anatomy of organizational fitness. Therefore, popular and academic definitions of fitness and its relation to fit are reviewed. The insights gained are subsequently leveraged into a definition of organizational fitness pertinent for the purpose of this thesis. Furthermore, the relationship of critical potentially paradoxical terminology - consonance versus diversity - is clarified. Thereafter, the several approaches towards organizational fitness including fitness landscaping are categorized and shortly

delineated. In respect of the preceding discussion, the chapter concludes with a general frame of organizational fitness. The definition and anatomy derived serve as a conceptual platform for the subsequent application of dynamic capabilities and complexity thinking.

Chapter 3 contains a literature review of the concept of dynamic capabilities. Firstly, the origins of the framework in the resource-based view are presented. Thereafter, the concept of dynamic capabilities, viz. the definition and important terminology, is clarified. The rationale of the framework is delineated by describing the nature of dynamic capabilities, processes embedding dynamic capabilities, as well as their evolution and the creation of competitive advantage. Based on these insights, the chapter concludes with an indication of managerial implications and potential improvements for the approach.

Chapter 4 explicates the relevance of dynamic capabilities in shaping organizational fitness. After reviewing the key statements of the two concepts, a preliminary relationship is established. Subsequently, the role and nature of dynamic capabilities in both moderately dynamic and high-velocity markets is critically analyzed in the light of organizational fitness. Thereafter, a three-levered model of organizational fitness based on dynamic capabilities is established centering on the importance of learning and evolution. This culminates in a review concerning the relevance of dynamic fitness capabilities. Finally, the investigation changes perspective and presents the benefits of organizational fitness for the dynamic capabilities approach.

Chapter 5 extends the original scope of the study by introducing complexity thinking and its relationship to dynamic capabilities. For this purpose, the most pertinent concepts and metaphors underlying complexity management are described and induced into the business context. Subsequently, several critical aspects of the concept are discussed. The chapter moves on by explicating the relevance of complexity science for dynamic capabilities. Because this is justified by the importance of learning for dynamic capabilities, complexity science is firstly related to organizational learning and knowledge management. Finally, the integration of complexity thinking in the concept of dynamic capabilities is reviewed and a common conceptual base is outlined.

Chapter 6 further deepens the complementary aspects of dynamic capabilities and complexity thinking. Primary attention is therefore given to the nature of dynamic fitness capabilities in a co-evolutionary space and in fitness landscapes. While the former elaborates the probability to leverage opportunities in the light of the relationship between self-organization, emergence and natural selection, the latter explicates the metaphorical potential and limitations of fitness landscapes, search strategies and core rigidities. To

complement the insights gained, implications for organizational design and form are shortly sketched and the role of leadership and management as of complexity is presented. Finally, the potential of an approach towards organizational fitness based on dynamic capabilities and relevant complexity concepts is re-elaborated.

Chapter 7 is the concluding part of the thesis. Its aim is to summarize the main findings of the study and to give an overview of the most pertinent conclusions and recommendations resulting from the integration of dynamic capabilities and complexity thinking into an approach towards sustainable organizational fitness. This integration process is a preliminary attempt towards a more holistic approach toward sustainability, which raises many issues motivating future research projects. The most important questions are stated to conclude the thesis.

1.7. Summary

In this chapter, the background of the study was presented. Subsequently, the problem statement, which motivated the objective, was outlined. This led to the formulation of the objective. Thereafter, the scope of the study was defined and consequent limitations were indicated. The reader was familiarized with the methodology applied and, ultimately, provided with the outline of this study.

CHAPTER 2: The concept of organizational fitness

2.1. Introduction

The intention of this chapter is a critical analysis of the nature of the concept of organizational fitness. For this purpose, it is fundamental to provide an overview of the theory of organizational fitness. Therefore, definitions, components, and existing approaches to organizational fitness are reviewed. The aim is to elaborate the current level of sophistication of fitness approaches and to adopt a working definition and anatomy of organizational fitness.

2.2. A definition of fitness

Fitness per se is familiar terminology, commonly used in everyday language. Its origins are not based in business or management philosophies, but in biology, health, sports and other sciences. Only recently, fitness has been adopted as management vocabulary. The evolution of fitness from a broader context into the field of business management will guide the process towards a pertinent definition of organizational fitness.

2.2.1. A dictionary definition of fitness

The English Oxford Dictionary gives a definition of fitness in the general context. For the purpose of simplicity only the meanings relevant in today's language will be cited here. Accordingly fitness is:

- a) The quality or state of being fit or suitable; the quality of being fitted, qualified or competent; specific: the quality or state of being physically fit;
- b) The state of being morally fit; worthiness;
- c) The quality or condition of being fit and proper; conformity with what is demanded by the circumstances; propriety;
- d) The external fitness of things: a phrase extensively used in the 18th century with reference to the ethical theory of Clarke, in which the quality of moral rightness is

defined as consisting in a “fitness” to the relations inherent in the nature of a thing. Hence popularly used (...) for: What is fitting or appropriate.

(English Oxford Dictionary, 1989: 562 f.)

This definition reveals the multiplicity of situations, which the term fitness refers to. Mental and physical eligibility are only one component of the definition. It further comprises the appropriateness of any aspect of an organism for the environment or a “thing” for specific circumstances. Beyond the internal dimension, externalities are also included.

2.2.2. Clarification of the unit of analysis

Studies conducted in the field of management frequently differ concerning their focal interest. Contributions are made to the performance of employees, managers, the company as a whole, and larger entities and systems such as industries or ecosystems. In the context of fitness, too, several subjects have been identified, viz. agents, groups or teams, organizations, and industries (see e.g. Levinthal and Warglien, 1999; Eisenstat and Dixon, 2000).

These entities do, however, differ substantially. Moreover, they have to be seen as sequentially or recursively inter-linked. Agents team up in groups, which constitute organizations that in turn are situated in larger wholes such as industries or ecosystems. The complexity of aspects contributing to fitness thereby increases accordingly. While a single agent’s fitness is mainly concerned with his mental and physical state as well as his appropriateness for the environment, a group or team enhances its strength through interaction and synergies between different agents. On the company level, interactions and synergies are further complicated. Effectiveness and creativity are now defined by means of processes, capabilities, structure, as well as managerial and individual behavior. As the “simpler” units combine to form larger systems, it is concluded, that their fitness is not only the result of their internal dynamics, but also of the dynamics residing in some larger whole.

Nevertheless, a distinct analysis of all possible units would go beyond the intention and scope of this study, as indicated earlier. Consequently, a focus on organizations or systems¹ has been chosen and incorporated in the objective. This focus should not be

¹ The importance of systems as units of analysis will be clarified in context with complexity metaphors in chapter 5.

seen in isolation, but as clarification of the unit of analysis. This frame will be kept throughout the proceeding parts.

2.2.3. Definitions in the business context

The general and wide-ranging definition of fitness given by the English Oxford Dictionary has been shaped and refined during its application in various disciplines. Most applications were in the so-called “hard” sciences rather than “soft” science. The extrapolation of the terminology into management science – a “soft” science - clearly indicated a new frame of reference. Within this spectrum, several attempts have been made to find a pertinent definition of “organizational” fitness. The metric used to determine fitness ranges from profitability as a purely financial means to creativity, adaptability or knowledge. The following section gives an overview of existing definitions of organizational fitness.

In his assessment of “strategy in an increasingly complex world”, Leibold (2001) refers to organizational fitness in terms of an organization’s interaction with the environment. The locus of fitness creation is thus seen as internal to the organization. Fitness is specified as the ability to adapt to and influence the current situation. This ability can be achieved through developing dynamic capabilities. Capabilities are seen as increasing effectiveness and as widening the set of circumstances, within which adaptation and influencing is possible. Leibold concludes that strategic fitness is thereby seen as a precondition of organizational fitness.

Normann (2001) illustrates his fitness metric interaction with the environment in different terms. It is seen as a means of passively or proactively establishing harmony or consonance with, and finding a distinctive role in the external context. The external world itself is incrementally and disruptively changing. Normann’s approach implicitly assumes the importance of internal dynamics to achieve external fitness. Leveraging internal strength to a new level of fitness is described as reframing the business.

Organizational intelligence or system effectiveness is a systematic approach to organizational fitness (Schwaninger, 2000). Besides influence and adaptation, the purpose of fit organizations is to shape the environment, reframe it and add value to the larger whole, viz. society, ecology, and so forth. The potential for fitness is thereby found in integrating adaptation and learning with (self) reference, (self) transformation, and (self) renewal.

The capacity for learning and continuous renewal or, in other words, the capacity to learn and change, is the definition applied by Beer and Eisenstat (2002). The definition is dynamic insofar as it comprises both the possession and development of the capacity for fitness. Reference to the environment is made through the notion that unfit organizations are characterized by a lack of adaptation (Beer and Eisenstat, 2002; Beer, 2002).

Fit organizations are also seen as organizations that create value, viz. shareholder value and customer value, and continuously stay ahead of competition. Value creation is dependent on a set of sound core values and enabled by permanently cultivating and implementing winning strategies (Kilroy and McKinley, 1997).

In the tradition of research by Stuart Kauffman of the Santa Fe Institute in New Mexico, fitness has been investigated using the metaphor of fitness landscapes. Authors building on this concept use fitness synonymous with various metrics, viz. profitability (Beinhocker, 1999), differentiation (Ruef, 1997), optimal and near optimal points in space, or a goal related set of variables (Levinthal and Warglien, 1999). Stacey and colleagues give a possible definition: fitness is the “survival chance of a network of actors determined outside that network” (2000: 113).

Comparing all the different approaches towards a model of organizational fitness, one realizes that most of them establish a connection with the environment, either occurring in terms of fitness for the landscape (Leibold, 2001) or through the metaphor of a landscape (Beinhocker, 1997; Levinthal and Warglien, 1999). Fitness is thereby attributed to different aspects, viz. proactive and passive adaptation, learning and renewal, value creation, profitability or differentiation. There is still uncertainty concerning the explicit meaning of organizational fitness.

2.2.4. Fitness versus fit

On the way towards a comprehensive definition of organizational fitness, the related concept of fit has to be included. This is emphasized through the similarity of the general definitions of fitness and fit. The Oxford Advanced Learners paraphrases fit as the way in which something fits, suits, is accurate, or is of the right size and shape (Oxford Advanced Learner's Dictionary, 1995: 461).

Beer and Eisenstat's work (2002) aims to make companies fit to compete. In this context the importance of strategic fit is mentioned. Strategic fit is referred to as the alignment of

current strategy and capabilities. Capabilities are thereby seen as being cultivated through realigning a company's systems, culture and leadership behavior (Beer and Eisenstat, 2000). In this approach fit or (re) alignment are inherent in the concept of organizational fitness.

Porter (1996) mentions the concept of fit, more specifically strategic fit, independently of organizational fitness. He defines three different types of fit, namely: (1) contingency between activities; (2) reinforcing of activities; and (3) optimization effort. In essence, Porter highlights that the performance of a system is defined by the fit of the system of all activities. To cope with the constantly changing environment, he adds the importance of positioning and reshaping this position whereby distinctive strategies are developed. This integration of elements is also crucial in the study of Fuchs and colleagues (2000) on "strategic integration".

Normann (2001) combines the independent view of fit and the concept of fitness in his discussion of business ideas. Because of the unique character of business ideas, fit or consonance differ across firms. Nevertheless, Normann identifies three generic principles: (1) fit with the external environment; (2) fit with the offering of the company; and (3) fit with and among organizational structure, resources, knowledge and capabilities, equipment, systems, leadership and values. Normann sees the interrelation between business ideas and these principles as well as among the latter as key drivers of organizational fitness.

In this realm, it is concluded that fit and fitness are in alignment and complementary. Fit is thereby rather relating to existing environments, while fitness deals with the foreseen and unforeseen environment. The ability to adapt to the existing environment for example will be used interchangeably with creating a fit, consonance or alignment with the environment. Fitness transcends the notion of fit and unfit by incorporating the known and unknown, i.e. the past, present and future. It can be seen as a continuous process of reframing or renewing of the business and of implementing new business ideas. Consequently, fitness is a dynamic concept as opposed to the punctuated or temporary nature of fit (see e.g. Normann, 2001; Porter, 1996; Beer and Eisenstat, 2002).

2.2.5. An adapted definition of organizational fitness

For the purpose of this study, various perspectives and attempts translating fitness into the business world have been discussed. With respect to the unit of analysis, i.e. organizations and systems, the priorities of the approaches presented differ. A widely accepted and recited approach towards fitness seems to be missing. In the realm of this thesis, it is however seen as fundamental to agree upon a definition of organizational fitness. Therefore, the preceding approaches have been integrated into a working definition:

Organizational fitness is the capacity for continuous renewal and learning to adapt to and to shape the environment, thereby establishing, maintaining and disturbing external and internal consonance for the purpose of appropriate growth, development and survival.

Organizational fitness is purposefully defined as capacity, not only ability. Ability would imply that both knowledge and understanding about how to achieve and maintain organizational fitness and the ideas, processes and capabilities are readily available. Organizational fitness is, however, seen as a dynamic concept that requires constant development or refinement of such ability under various environmental conditions. An organization, therefore, has to have the capacity to exhibit or enable development and refinement, i.e. to bridge the course of rapidly occurring events. Such a capacity implies that the means and resources necessary for change are accessible, i.e. can be learned, acquired and used (Normann, 2001).

The terminology of continuous renewal and learning provided by Beer and Eisenstat (2002) draws on the necessity to incrementally strive for better performance throughout the whole organization. Within the present context, incremental improvement is, however, seen as necessary but not sufficient to reach the “global optimum” on a fitness landscape (Levinthal and Warglien, 1999). It is therefore emphasized that an organization has to be able to innovate, reframe or reinvent itself, too.

Adaptation to the environment incorporates both passiveness and proactivity. It defines a company's position in the existing and changing external context (Schwaninger, 2000; Normann, 2001). To survive major discontinuities in the external environment and to stay ahead of competition, it is often not sufficient merely to adapt. Moreover, new context has to be created, e.g. new market space has to be found (Kim and Mauborgne, 1999). In other words, "long-jumps" on the fitness landscape are necessary (Beinhocker, 1999). A company or system has to shape its environment thereby determining the course of events (Govindarajan and Gupta, 2001).

These internal and external dynamics are seen as establishing, maintaining and equally disturbing consonance or fit (Normann, 2001). In this specific context, the notion of consonance reflects that the performance of the whole depends on that of each individual element and the reinforcement among these interacting elements (Porter, 1996). Additionally, consonance incorporates fit with the existing, changing or created context, i.e. fit with the environment. These aspects are integrated in the definition as internal and external consonance.

Growth as a purpose of organizational fitness is not only related to company size and profitability, but also to intangible patterns. Indicators are for example the set of core values of an organization or its ability to leverage its initial conditions towards a more promising future. If the enacted future context symbolizes a true contribution to the larger whole, while the entity's own needs are still fulfilled, it is referred to as development (Schwaninger, 2000). This is the second goal of organizational fitness. The final aspect, survival, indicates the capability of growing and developing over the long-term. This purpose adds the notion of time, i.e. duration (Letiche, 2000), to the purposes of fitness.

Overall, The adopted definition of organizational fitness accounts for dynamics occurring equally outside and inside an organization that is striving for growth, development and survival. The organization is seen as a system able to make sense out of these dynamics through gradual, continuous and discontinuous (Abraham and Knight, 2001) or path-changing movements. The definition includes responsibilities in terms of for example profitability, but more importantly accounts for intra- and extra-organizational co-evolution over the long-term. The purpose of this definition is not to initiate a novel best practice, but to approach the fast-changing and uncertain environment realistically. In this sense, organizational fitness is not seen as a guarantee for organizational survival, but as providing an organization with the robustness necessary to react to and enact future changes while equally managing the present.

2.3. Determination and meaning of the components of organizational fitness

Organizational fitness is not a unilateral approach, nor is it a concept of reductionism. Consequently, managers have to focus on improving more than single factors, such as quality or core competencies. Moreover, it is important to take a systemic approach when searching for better performance. Such an approach includes the potential for modularity, which will be clarified in later chapters. Currently, however, the emphasis is on the components appearing throughout fitness approaches that contribute to the system. The following section discusses three aspects identified as key components, namely the environment, vision and mission, and the social system.

2.3.1. The environment

Evolution or better co-evolution takes place in a so-called ecosystem or socio-cultural system populated by various stakeholders (Leibold et. al., 2002). In this frame, companies strive for leadership or sustainable fitness (Moore, 1993). This external world is by no means stable; rather it evolves and is occasionally disrupted or even destructed by actions of its own members, by other systems, or by natural forces (see e.g. Beinhocker, 1999; Levinthal and Warglien, 1999; Leibold, 2001). Kaufmann (1993) named such an environment that shifts its multi-peak topography as coupled. The appearance of such a landscape at one point in time is sketched similar to the Himalayas or the Alps with their mountains and valleys. Due to the dynamics inherent in coupled landscapes, fitness can only be determined punctually and predictions are merely approximations of the future. Therefore, actions in the present should aim to create a meaningful existence in the future. Success is however no guaranteed (Leibold, 2001).

2.3.2. Vision and mission

Within the external context the unit of analysis, the organization or system, searches for a “distinctive role” (Normann, 2001). This is achieved through formulating a mission or vision, which might stimulate great ideas that contribute to the external world. This can be achieved by for example lifting the system up to a sole-source status (Moore, 1993) or tailoring products and services through processes of interactive marketing to exactly

meeting exactly the preferences of (a) certain set(s) of customers (Levinthal and Warglien, 1999).

Dell for example managed to establish such a distinctive role. The hardware company is expressing its mission as being the most successful computer company in the world at delivering the best customer experience in the markets served. Dell translated its role into practice by constantly challenging itself to provide the highest quality, leading technology, competitive pricing, individual and company accountability, and flexible customer capabilities (Dell, 2002).

Another example is Ikea. The vision of the company points out the business idea to offer a wide range of home furnishings with good design and function at prices so low that as many people as possible can afford them. Ikea realized this strategy by passing on the savings from customer participation, by providing simple products in various designs and functions, by optimizing synergies from production, packaging, shop-layout and so forth, as well as by adding value through e.g. children centers or restaurants (Ikea, 2002).

2.3.3. The social system

An intelligent organization designs itself around its vision and mission with its activities, structure and behavior (Schwaninger, 2000). In other words, the social embodiment for vision and mission emerges (Norman, 2001). This system comprises different levers, units, teams and agents. Besides human beings, the system consists of culture, strategies, capabilities or competencies, tangible and intangible assets, systems and processes, and so forth. All these components have to be considered when cultivating the fitness of an organization.

In sum, organizational fitness can be seen as consisting of an external dimension, i.e. the environment, a vision and mission that connect an organization with this environment and the organization as a social system itself.

2.4. Consonance versus flexibility and diversity

The components of organizational fitness point out the need for a systemic approach. This approach has to account for consonance between the environment and the system as well as within the system (Beer and Eisenstat, 2002; Porter, 1996). This seems to contradict the notion of unpredictability, complexity and rapid changes, which asks for flexibility and diversity (Beinhocker, 1999; Levinthal and Warglien, 1999). A closer look at this paradox might shed some light on the issue.

On the one hand, the precondition for increased performance and value creation is consonance (Kilroy and McKinley, 1997). Beer and Eisenstat (2000) highlight the necessity of fit between strategy and capabilities and further ascribe the enhancement of those capabilities to the realignment of the organization's system, culture, human resource system and leadership behavior. In other words, the system as a whole is as strong as its weakest element and only the whole pool of elements guarantees sustainability (Porter, 1996).

Similarly, Schwaninger (2000) argues concerning the normative, strategic, and operational level in the organization. These action levels are inter-linked and condition the potential or scope of each other. In other words, performance is interrelated and only consonance between the elements can be value adding for the whole.

Nevertheless, adaptation and influence as well as the evolving environment are well known in the context of fit. As the external world is altering permanently due to changing political, social, economic and technological factors, so the organization itself needs the capacity to renew and learn continuously (Beer and Eisenstat, 2002). New ideas or models of doing business are created, technology is advanced, services are added that change the state-of-art. Consequently, activities or elements have to be reinvented or reframed. In this sense, consonance is continuously renewed through tension or lack of consonance (Normann, 2001). Important to note is that fit is not only established for the sake of having it, but rather with regard to sustainable competitive advantage. Therefore, fit or consonance should be seen as a dynamic concept.

Examples are the achievements in telecommunication and the emergence of the Internet. As a result of research and development of several players in the business world, interaction between people, amongst and within organizations has changed. Customers became more knowledgeable as the impediments related to time and distance ceased, so did organizations themselves. Formerly well-aligned systems became disturbed or

deconstructed themselves. Consequently, fit had to be reestablished considering not only the advantages, but also the challenges of these technological breakthroughs. Still development hasn't stopped, implying that alignment is continuously reviewed and adjusted and that reinvention is necessary.

This is where the notion of flexibility and diversity becomes relevant. In order to hedge a system against rapid changes, Beinhocker (1999) suggests the cultivation of populations of robust and adaptive strategies. Populations varying according to their time focus, their relatedness to the current business and their risk, allow a company to adapt to a greater spectrum of circumstances and navigate on different time horizons (Beinhocker, 1999). Similarly, interdependencies between actions and the performing actors are seen as increasing diversity (Levinthal and Warglien, 1999). Cross functional teams for example are a means to foster diverse, often controversial discussions. This is a result of the different problem thinking of persons from various backgrounds.

But even those studies that highlight the need for diversity and flexibility do not negate the importance of consonance. Levinthal and Warglien (1999) point out that diversity is mostly found in the beginning stages of interaction, later on substituted by convergence of opinion. Furthermore, coordination is seen as a challenge resulting from fostering diversity (Levinthal and Warglien, 1999). Populations of strategies, too, are not a loose bundle of ideas; rather, they are built around a set of core competencies (Beinhocker, 1999).

Microsoft, a company practicing the concept of populations of strategies, did not move from its core of being a software producer. The different strategies expressed an investment in three related types of software, viz. DOS, OS/2 and Windows. As competitors similarly advanced these programs, Microsoft aimed to be independent from the final result. It wanted to guarantee its stake in the market, whatever software would turn out to be dominant in the end. But in hedging itself against the unknown evolution, it did not give up the fit of its strategies with its core business, namely software.

This discussion about diversity and flexibility versus consonance shows their complementing natures. Consonance is not treated in terms of permanent stability and flexibility and diversity is not equal to chaos in absolute terms. Moreover, they should be seen as reinforcing, disturbing and balancing concepts, and ultimately establishing an environment of learning, creativity and change.

2.5. The rationale of organizational fitness

2.5.1. Obstacles on the way toward fitness

Managers throughout the organization generally know about the importance of learning, renewal, adaptation, and shaping. Despite their obvious capabilities that qualified them for their positions, it seems, however, that they often not fully commit to or are constrained in their commitment to these goals. For a better understanding of the idea underlying the fitness concept, it is therefore firstly pointed out why companies tend to fail in establishing context.

Schwaninger (2000) and Porter (1996) criticize a trend toward reductionism inherent in many managerial practices. Total quality management, balanced score cards, core competencies, re-engineering, and new information technologies are seen as adding value merely in the short-term. These initiatives usually do not address the roots of the problem; they are rather seen as remedies to overcome the complexity of problems (Beer and Eisenstat, 2000). Over the long haul, they encourage managers in the mindset of running harder than their competitors. In other words, their initial radical impact mitigates rather quickly.

Another finding is that leadership often fails to reframe the organization and to enhance capabilities once a powerful design and culture have evolved. The reasons are seen in the tendency of managers to be caught up in “the good old days” (Normann, 2001), to negate the opportunities arising from stepping down from a fitness peak (Oliver and Roos, 2000; Pascale, 1999), and their anxiety when required to abandon formerly made commitments and to take risks (Beer, 2002). The common excuse is a lack of financial means. Ultimately, managing change proactively is perceived as constituting a threat to the manager’s own career (Beinhocker, 1999). As a result of this behavior, organizational core competencies or strength are turning into core rigidities or silent killers (Beer, 2002).

2.5.2. Approaches toward organizational fitness

The obstacles discussed above have been motivating several authors coming from various perspectives of managerial science to develop a model toward organizational fitness. In the realm of this study, it seems to be pertinent to cluster and delineate these approaches, before turning to an approach towards organizational fitness derived from the insights of dynamic capabilities and complexity thinking. Therefore, an attempt was made to structure

several of the existing approaches according to their consideration of holism and dynamism. In a subsequent step, each approach will be shortly delineated. For clarification purposes, a distinction has thereby been made between isolated fitness models and publications within the context of fitness landscaping.

2.5.2.1. Dynamism and holism in fitness models

Organizational evolution is no longer seen as an isolating concept, rather within ecosystems, clusters or strategic networks (see e.g. Moore, 1993; Porter, 1998; Gulati et. al., 2000). Consequently, collaborative or competitive interaction describes the focal point of evolution. Interaction is exhibited horizontally and vertically within the organization, with the environment, i.e. stakeholders such as customers, competitors, suppliers, distributors, governments, as well as legal and educational entities, and even across the boundaries of conventional context with for example hidden customers (Normann, 2001; Gibbert et. al., 2001; Evans and Wurster, 1997; Govindarajan and Gupta, 2001). Thus, the term co-evolution is more appropriately applied to describe evolution (Moore, 1993).

Aligning the concept of co-evolution or dynamic fit with organizational fitness, two important conclusions can be drawn. Firstly, an approach towards organizational fitness needs to be systemic or holistic. This is evident in the argument that co-evolution appears inside the organization as well as in the larger context of ecosystems or networks. Secondly, the concept per se indicates dynamism. Not only the environment is changing in continuous or disruptive ways, but also the internal dynamics of the organization are subject to change. Consequently, the extremes of holistic/systemic and dynamic as opposed to the extremes of peripheral and mechanic have been chosen to analyze the concepts of fitness developed in managerial science. The analysis is summarized in Figure 1 and will be substantiated in the presentation of each approach.

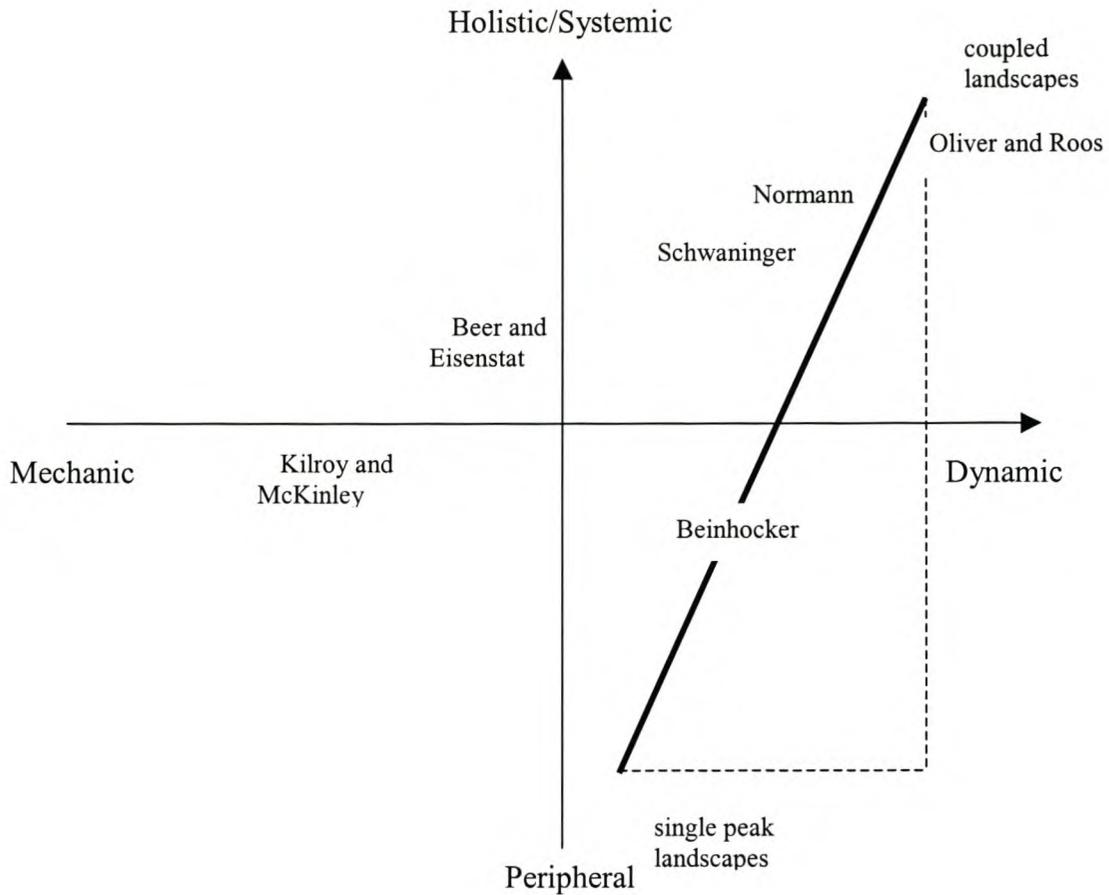


Figure 1: Classification of fitness approaches

2.5.2.2. Kilroy and McKinley's fitness approach

Distinguishing ideas built on a set of core values and translated into winning strategies are the result of several capabilities at the core of which lies hybrid thinking – i.e. a combination of linear and non-linear thinking (Kilroy and McKinley, 1997). The pure reliance on analytical and logical thinking jeopardizes a lead as competitors quickly see through the concept. Adding the attribute intuition, i.e. thinking in a non-linear fashion, makes the starting point and consequently the whole thought process less traceable (see also Leibold, 2001). For the purpose of fitness, a hybrid thinking process is suggested, starting off with non-linear thinking and being later on complemented by traditional linear thinking.

According to Kilroy and McKinley (1997) fitness is enabled in a three step process on the strategic level, viz. management of information, development of alternatives, and, finally, analysis and evaluation of the resulting business strategies in terms of their novelty and value creation potential. This step-by-step scheme is seen as the most mechanic

approach towards fitness. On the second dimension, holism, the approach is seen as fairly unsophisticated, too. There is no evidence in the model as to co-evolution. It rather seems like a one-way backup in terms of value creation with assumptions of interaction in the experience of managers.

2.5.2.3. Beer and Eisenstat's concept of fitness profiling

Beer and Eisenstat (2002) highlight that challenges have to be met with a systemic approach. These challenges are mostly found inside the organization, less as a result of the external context, therefore the approach is seen as just entering the systemic quadrant. To overcome the internal barriers towards fitness – i.e. silent killers - a process called organizational fitness profiling has been designed. The process is realized in a joint attempt of leadership, a taskforce consisting of the best employees and external consultants.

Through institutionalizing open and safe conversation a partnership of commitment and trust is established. This allows a company to uncover and overcome silent killers such as conflicting priorities, poor coordination, or an ineffective top team (see e.g. Beer and Eisenstat, 2000). These barriers negatively impact on the quality of direction, on implementation, and on the quality and speed of learning (Beer and Eisenstat, 2002; Beer, 2002).

Organizational fitness profiling enables the development of a vision and an action plan focussing on a few promising initiatives suiting the current circumstances. An environment of learning is triggered, within which new capabilities are built, existing ones are supported, and both are ultimately tailored towards the strategy. Those capabilities and strategies – the result of a vision – are further enhanced and (re) vitalized through the realignment of the organizational system and culture (Beer, 2002). Continuity or a double-loop scheme is, however, not explicit in fitness profiling. It is rather a matter of mechanical repetition. Therefore, the model is not seen as truly dynamic.

2.5.2.4. Intelligent organizations according to Schwaninger

In his research, Schwaninger (2000) points out that managers confronted with complexity are craving for a single comprehensive and lasting way to cope with it. Drawing on this desire, three models of cybernetics have been integrated into a framework for intelligent organizations. In this model organizational fitness or effectiveness is achieved through control by development, meaning by interrelated – both reinforcing and constraining – (self) control on the normative, strategic, and operational level. These intrinsic control mechanisms are tailored towards fulfilling both their own needs and those of the larger whole. Through adding (self) control through learning and (self) control through transformation, the robustness of the organization is enhanced (Schwaninger, 2000).

This combination enables self-renewal or change of identity, vision and ethos - the fundamental parameters of an intelligent organization. Alterations of these central characteristics impact on the three organizational dimensions defined in the framework, viz. activities, structures and behaviors. In other words, all components are dynamically interrelated. Additionally, well balanced management interventions can influence activities, structures and behaviors for example in form of reframing, revitalizing, and empowering behavior, of reshaping profile and trust internally and externally, or of redesigning organizational processes.

Schwanger (2000) points out that his model is still a preliminary approach towards a framework of intelligent organizations. In comparison to the preceding models, however, it seems to be more sensitive to the external environment as well as highly dynamic.

2.5.2.5. Norman's approach of fitness through reframing

The most holistic and dynamic approach is seen in the work of Normann (2001). One reason therefore is that the organization determines its "distinctive role" generally in a larger system called ecogenesis. As a result of technological breakthroughs economic actors interact in this ecogenesis as co-producers. Furthermore, new value constellation systems, manifested in structure and mode of functioning, are constantly formed to establish temporary consonance with the external world. Dynamism is thereby a result of the reciprocal interaction or impact between the mind – the catalyst for change – and the created realm of action space. The latter is a result of thought processes that span from the past to the future and from the conscious to the unconscious.

Normann's (2001) intention is to emphasize that value is created beyond the mode of adaptation and correction, through frame-breaking reconfiguration – i.e. great ideas – and recurrent purposeful emergence – i.e. great companies. This is achieved through processes leading not only to single-loop learning, but also to double-loop learning and, ultimately, to knowing how to know/learning how to learn (Normann, 2001). This would, however, not take place without a set of critical capabilities roughly categorized in five domains, viz. interaction or social capabilities, framing or cognitive capabilities, artefaction or design capabilities, ecological interfacing or spatial capabilities and political leadership or power (to and with) capabilities.

The main message of Normann's (2001) study for the context of organizational fitness is that organizations need to have a mission for now and later and a vision about the future that gives them a distinctive, meaningful role in and for the external environment. Both vision and mission are embodied in a social system. The position of the social system is continuously altered through a process of reframing where new and promising existing elements or value commitments are leveraged into the new system. Companies that successfully build an infrastructure for the new system are called prime movers (Normann, 2001).

The common notion of all the preceding models is, in the words of Porter (1996), that the whole system is as strong as its weakest element. An example would be that leaders don't have the courage to engage truly in fitness profiling and, therefore, block continuous learning and change, the source of long-term competitive advantage (Beer and Eisenstat, 2002). The differences lie, amongst others, as sketched above, in the degree of dynamism and holism.

2.5.2.6. Fitness landscapes

Another stream in the realm of fitness is landscaping. The notion of fitness landscapes dates back to the early stages of the 20th century (Stacey et. al., 2000). It pictures an image of (co) evolution on a three-dimensional landscape (Oliver and Roos, 2000). Stuart Kauffman transferred this concept as a metaphor of complexity into the business world (see e.g. Beinhocker, 1999; Levinthal and Warglien, 1999; Pascale, 1999). The presentation of complexity thinking will be given in-depth at a later stage of this thesis; therefore fitness landscaping is delineated independently of related complexity metaphors.

Landscapes consist of peaks and valleys. Peaks can signify variables such as profitability, performance or chance of survival (Levinthal and Warglien, 1999; Stacey et. al., 2000). Valleys, in contrast, characterize a loss making or unfit state. The unit of analysis on the landscape can vary from single actors, to groups, or systems.

According to Stacey et. al. (2000), the shape of fitness landscapes is a function of its internal dynamics. It is dependent on internal interactions as well as the size of and the connectivity with the larger whole. Various levels of dynamism emerge as a result of changing numbers of internal and external actors/systems as well as the number and strength of their connection (Levinthal and Warglien, 1999; Stacey et. al., 2000). The rationale is the more and the stronger the interactions/relationships between elements, the more conflicting constraints exist and the more rugged and unstable the landscape becomes. These underlying relationships are often referred to as a pattern of self-organization (Levinthal and Warglien, 1999; Kappelhoff, 2001).

As a result of the level of connectivity landscapes are categorized into single-peak, multi-peak and coupled landscapes (Beinhocker, 1999). Levinthal and Warglien (1999) distinguish between single payoff (single- and multi-peak) and multi payoff (coupled) landscapes. Single payoff landscapes are static, while coupled landscapes are constantly deforming. Consequently, the nature of the landscape defines the degree of uncertainty involved in searching for the highest fitness peaks. The most realistic type of landscape in this context are coupled landscapes.

On a single peak landscape, each actor is able to climb the global optimum irrespectively of the actions around him/her. Consequently, a single peak landscape implies the existence of independent best practices (Beinhocker, 1999). It is therefore assumed that despite differences in behavior, the success of the search process is highly predictable, i.e. all agents walk incrementally upwards. As a result, change on rather smooth landscapes, whereof single peak is the extreme, is easy to imitate by competitors (Stacey et. al., 2000). Each competitor will sooner or later reach the optimum with its own best practice.

The second type of landscape is called multi-peak. It is assumed that a collection of peaks exists on a fixed or static landscape. The number of peaks apparent in this landscape is seen as a function of the number of interdependencies. Consequently, agents are no longer assumed to reach the highest peak with their own best practice. They need to engage in interaction, e.g. in the form of cross-functional teams, which triggers diversity, exploration and (non)- incremental search. This increases their chance to climb the global

optimum, i.e. highest peak in the landscape (Levinthal and Warglien, 1999). A complementary issue is to balance the degree of interaction. The reason is that too much connectivity is to the detriment of coordination, thus equally impeding as too little.

According to Stacey et. al. (2000), behavior of agents is a pattern emerging from interaction - not chance or choice - and from the agents' capacity to produce coherence. The impact of the change of a single action on a larger system is described in the realm of Porters (1996) explanation of synchronized success. The actions taken, in turn, are seen as the result of different rules or conflicting constraints, which are characterizing interaction. Conflicting constraints that alter through random mutations control the evolution of the system through establishing stability at the edge of chaos (Stacey et. al., 2000).

In contrast to the static concepts of single- and multi-peak landscapes, coupled landscapes are constantly bucking and heaving (Beinhocker, 1999). Direct and indirect deformation of the landscape or pattern of co-evolution is formally captured in Kauffman's NK(C) model (Levinthal and Warglien, 1999; Stacey et. al., 2000). The model analyzes aspects related to the number of elements navigating the landscape, the number of connections among those elements and interrelations with other systems or networks. As a result, an optimal balance of high-payoff connections – collaboration – can be determined (Eisenhardt and Galunic, 2000). This balance is necessary for successful navigation at the edge of chaos. The model accounts for both diversity and conflicting constraints being crucial determinants of indirect intervention and natural emergence.

The basic concept of landscaping, as in the tradition of Kauffman, has been applied and taken further by Beinhocker (1999) as well as by Oliver and Roos (2000). Their findings will be presented in the following sections.

2.5.2.7. Beinhocker's strategy landscapes

Beinhocker (1999) used coupled landscapes in his work about robust, adaptive populations of strategies. He describes coupled landscapes as extreme foggy and subject to earthquakes. Systems exploring the landscape operate without map and with limited food for the journey. To hedge a system against the struggles and dangers inherent in the search process over the long-term and to enhance the chance of profitability (fitness), the cultivation of populations of strategies is suggested. A sophisticated family of strategies

should thereby not only include initiatives to protect and to extend existing business, but also initiatives able to foster disruptive change (see also Burgelman and Doz, 2001).

The key is to move constantly on the landscape by means of single and parallel search as well as a mix of short-, medium-, and long-jumps. In other words, a balance between exploitation and exploration of knowledge throughout the organization has to be found when formulating strategic initiatives (Levinthal and Warglien, 1999). Beinhocker (1999) additionally points out the importance of diversity, which is realized through changes in organizational processes, measurement metrics and incentives. The model does not claim perfection and optimization of each strategy; moreover, it is a heuristic approach. The message is to build at more than one strategy and to tailor and re-tailor the “population” to the evolving core competencies of the organization (Beinhocker, 1999). As a result, the potential to remain in the game and to enact the future is seen as enhanced.

2.5.2.8. Oliver and Roos: Knowledge landscapes

In the context of organizational fitness, Oliver and Roos (2000) prefer to move away from the notion of fitness landscapes to knowledge landscapes. This argumentation draws on the shift from tangible to intangible assets as indicators for an individual’s or an organization’s fitness. The shape of the landscape is no longer only the result of the number and strength of interconnections, but also of the horizon or world view of the individual itself. It is constituted of a combination of tacit and explicit knowledge. Peaks on the landscape are fewer and higher the more detailed and specialized the knowledge is.

On this knowledge landscape individuals choose trails to explore. As some trails are taken, while others are ignored, the individual becomes dependent on the paths chosen. Exploring of trails is thereby seen as a synonym for deepening knowledge in a certain direction, e.g. in a certain technology. Another phenomenon of knowledge landscape is the increasing paucity of choices – trails – the higher the mountaineer has climbed the peak. Consequently, an individual might have to climb down and reassess his/her core values to avoid a lock-in. In other words, stepping down the path is seen as broadening the array of choices, thus creating the potential to identify an even higher peak.

The landscape explored is, however, by no means static. Moreover, it deforms as the individual or other individuals on the landscape deepen their knowledge. Besides, changes are not equally rapid in all areas of the landscape. As a consequence, an individual has to

climb faster in rapidly changing knowledge areas as opposed to moderately changing ones to avoid getting swallowed by the water level, i.e. obsolete knowledge.

Identifying the pace of climbing and the current state on the knowledge landscape is thereby a question of personal benchmarking of explicit and, more importantly, tacit knowledge. Conventional external analyses (yellow pages, competency profiles) are seen as limited in this respect. The reason is seen as their static nature and their inability to create an objective list of knowledge. The meaning of benchmarking can, however, be improved by leveraging an individual's perspective to the knowledge of communities (communities of practice, cross-functional teams) or of networks within which the individual acts.

Generally seen, the concept of landscaping is a hybrid model that ranges from peripheral to systemic applications. As the degree of holism increases so does the extent of dynamism. Consequently, a triangular form has been chosen to map landscaping in the context of figure 1.

2.6. Discussion of Fitness concepts and application to the adapted definition

The different concepts or approaches discussed throughout this chapter draw on the need to investigate how an organization as a complex system of interaction prospers and (co)evolves in a permanently altering environment. The most striking differences between approaches towards organizational fitness as shown in figure 1, are the varying degrees of holism and dynamism. Additionally, a distinction has been made between independent fitness models and fitness landscaping.

There seems to be a common understanding throughout the approaches that organizational fitness needs to be a concept of everyday life. Incremental change and disruption triggered internally or externally are crucial parts thereof. While fitness landscaping focuses on a corollary stemming from non-linearity and natural selection (see chapter 5), the independent fitness models see the danger mostly inside the organization in the form of silent killers or core rigidities (Beer and Eisenstat, 2001).

As a consequence, independent fitness models approach fitness as a pattern to cure inside the organization. Organizational fitness is hereby seen as dependent on the state-of-art – the smoothness and sophistication - of capabilities such as communication,

coordination, competence, thinking and framing (Beer and Eisenstat, 2002; Normann, 2001; Kilroy and McKinley, 1997). These capabilities have to be enhanced and freed from barriers (Eisenstat and Dixon, 2000). Their development is thereby subject to path dependencies (Normann, 2001). Consequently, capabilities are at the heart of enabling fitness.

As capabilities are related to processes that are exhibited by human beings, independent fitness approaches highlight the importance of commitment throughout the company. Leaders are therefore seen as coordinators, guides and integrators (Beer and Eisenstat, 2002, Schwaninger, 2000), or purposeful and open-minded rebels (Normann, 2001) and visionaries (Kilroy and McKinley, 1997). Employees, on the other hand, are accountable, responsible and proactive (Beer and Eisenstat, 2002). Consequently, employees have to be empowered and leadership has to be built and encouraged throughout the organization (Beer and Eisenstat, 2000; Eisenstat and Dixon, 2000; Beer, 2002).

In the context of business, the landscaping approach admits that single- and multi-peak landscapes are merely a tool for simulations. Reality is most properly represented by coupled landscapes. In this context, systems are seen to operate in a landscape that is deformed by their own actions and the actions taken in the external world. Instead of relying on curing mechanisms, landscaping assumes that systems exhibit self-organization that can be indirectly catalyzed through leadership. It is however recognized that agents including leaders operate locally, i.e. there is no such thing as an omniscient human being. Besides, co-evolution is seen as a matter of interaction shaped by conflicting constraints or external events. It can be disturbed as well as cultivated through appropriate leadership. The underlying concept is thereby derived from the science of complexity.

In this sense, the insights of both complexity thinking and evolutionary approaches such as dynamic capabilities are influencing the discussion towards a comprehensive concept of organizational fitness. The diverging perspectives should not be treated as rivaling approaches, but integrated. Kelly and Alison (1999) highlight the importance of simultaneously considering internal capabilities and external considerations (see also Leibold, 2002). They clustered these two dimensions, on the one hand, into various degrees of self-organization and, on the other hand, into stages of robustness against selection (see Figure 2). According to its sophistication an organization can pinpoint itself along the fitness continuum from a species nearing extinction, over an endangered, a surviving, and a dominant species, to a new breed.

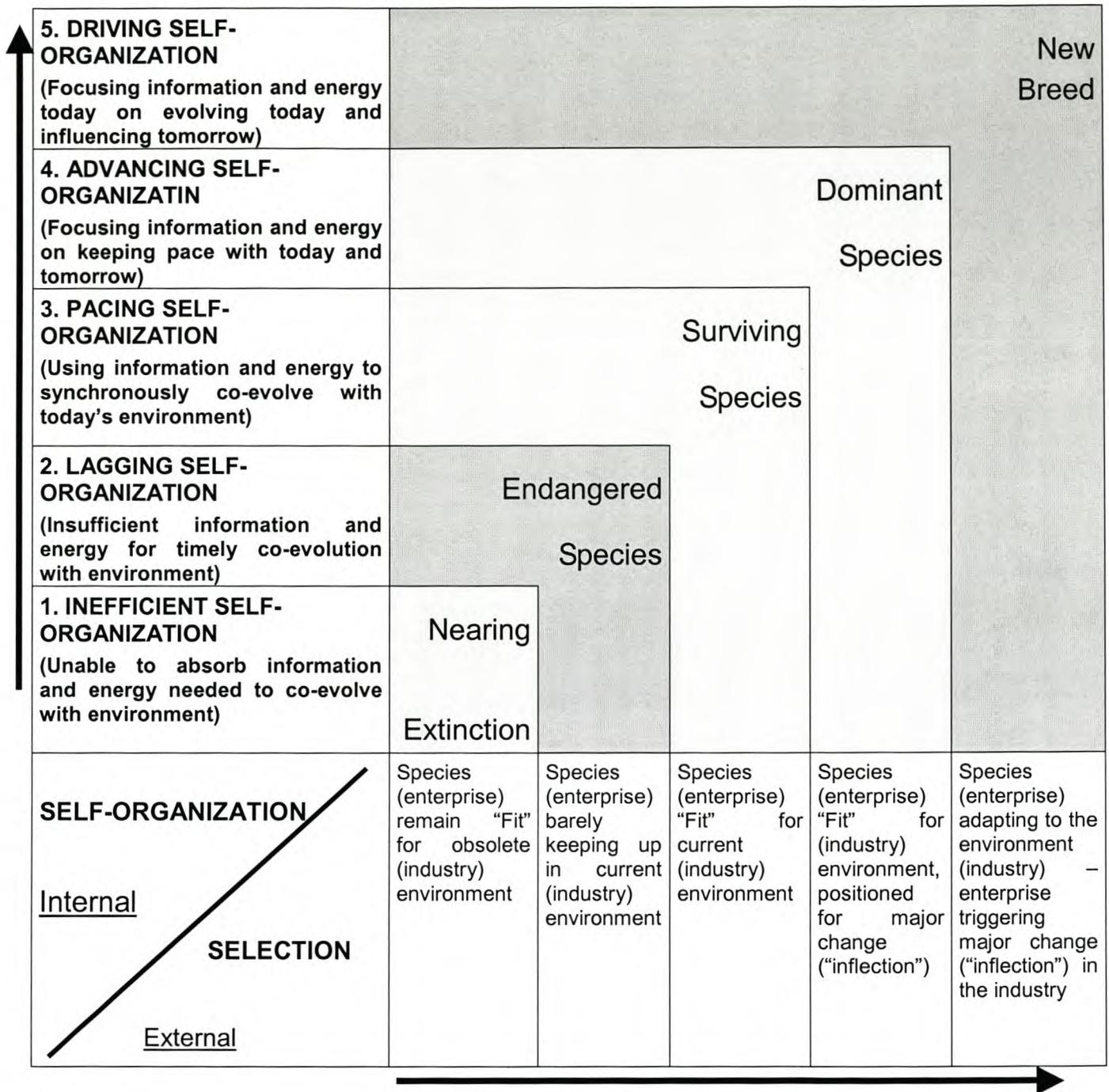


Figure 2: Stages of organizational fitness for co-evolution,

Source: Kelly and Allison, 1999

This synthesis of various facets of organizational fitness is seen as a pertinent frame for further investigations related to organizational fitness. Consequently, the frame will serve as the basis for the following discussion of the pertinence of dynamic capabilities as well as complexity thinking for a concept of organizational fitness. It is, however, seen as important to note the premature nature of this generalized platform. A more in-depth understanding of critical elements and success factors in relation to this dualistic perception is seen as necessary. This is the aim of the subsequent chapters.

2.7. Summary

The preceding chapter discussed the recently-emerging concept of organizational fitness. It was shown that both the anatomy and definition of organizational fitness is still emerging and premature. Therefore, a definition has been adapted to build the basis for this study. Additionally, the components of organizational fitness and several models have been presented. As the models do, however, significantly differ, the chapter concludes with a fairly general frame of fitness presented as the stages of organizational fitness for co-evolution. This general consonance will build the background for the following discussion of the relevance of dynamic capabilities and complexity thinking. The aim was to derive a broad and rather abstract conceptual base, which is however by no means comprehensive due to its theoretical nature. Further research and practical application are seen as keys to refine the roughly projected hypothesis forwarded in this chapter.

CHAPTER 3: A review of the concept of dynamic capabilities

3.1. Introduction

In the 1950s, a Spaniard Enrique Bernat Fontlladosa had the great idea to produce a sweet on a stick (Kilfoyle and Fellow, 1996). To make this idea reality, he took over the company he was working for in 1957 and only one year later sold his first lollipop under the slogan “Chupa un Chups”. Over the years, S.A. Chupa Chups, as Bernat renamed the company, has been developing into a global player. But the way towards this position was not without complications and challenges, rather an ambitious journey.

Bernat’s strategy was built on quality of the product. This was the field where failures were not allowed. To ensure his standards, Bernat complemented his sweets manufacturing facility through the acquisition of a mechanic construction plant now running under the name Confipack. With this move, the company ensured direct control over all materials necessary for their product. These technological capabilities acquired did not remain static; the company converted them into dynamic capabilities, namely the ability to integrate internal knowledge with external technological advances and customer requirements into new production facilities, product variations and advanced packaging material, to ultimately stay ahead of competition.

Advantages due to the ownership of dynamic technological capabilities didn’t stop at this point, rather they were extended to the entering strategies of the company. In countries like Russia and China, locations with different circumstances to the Western markets, obsolete equipment was revitalized in the early stages of entry, decreasing risk and fitting the expertise of local staff (Kilfoyle and Fellow, 1996). Only when demand exceeded the capacity of the older equipment were advanced technologies implemented. Chupa Chups’s present and past capabilities were leveraged through managerial and organizational processes shaped by its position and paths, and opened up opportunities in countries all over the world.

The example of Chupa Chups shows how a company has become a global player over the last 50 years through building, strengthening, and configuring capabilities over time, but also through memorizing and revitalizing past strengths. This example stems from a slow changing industry and the process seems like slow motion, compared to the rapid changing technology industries that frequently underlie today’s research. However, Chupa Chups in its own special way allows for visualizing dynamic capabilities, a framework that

will be discussed in further depth in the following chapter. The purpose of this chapter is to provide a concise presentation of dynamic capabilities to enable their later integration into the concept of organizational fitness.

3.2. The framework's origins

Research in the 1950s firstly denoted attention to organizations' capabilities as an ability to succeed in the market place (McGuinness and Morgan, 2000). The aim was to determine strengths and weaknesses and to prosper through distinctive competencies (see e.g. Normann, 2001, Helfat and Raubitschek, 2000, Wernerfelt, 1984). This notion, however, gained little attention in a time when another theoretical approach, the environmental perspective, gained influence. Its dominant representative was the competitive forces model.

Later on, this approach was criticized because it failed to explain the origins of competitive advantage, as it analyzed the creation of profitability purely as a means of differentiated positioning and entry barriers in industries (Cockburn et. al., 2000). As criticism reached a critical mass, the resource-based view (RBV) emerged.

The RBV refocused attention on the organization's heterogeneous resources, on the internal organization of the firm, its superior system and structure, and combined this with the external analyses of the industry and the competitive environment (Collis and Montgomery, 1995). According to Wernerfeld (1884) the RBV does thereby not exclude the competitive forces approach. He argues that resources create a resource position barrier that is only valuable if it leads to at least one entry barrier, a crucial part of five forces. Competitive forces and RBV should rather be seen as complementary (Teece et. al., 1997; Cockburn et. al., 2000).

The difference of the RBV is that it attempts to explain how to achieve and sustain competitive advantage within firms over time (Eisenhardt and Martin, 2000). In this context, the environment is degraded to a secondary factor. This inward looking view of the organization and its activities ascribes the main attention to resources (see e.g. McGuinness and Morgan, 2000).

Resources are seen as a wide terminology comprising physical and intangible resources and capabilities embedded in routines, processes, and culture (Collis and Montgomery, 1995). The RBV is therefore mainly concerned with firm-specific resources that are

valuable, rare, inimitable and non-substitutable (VRIN-attributes) (Eisenhardt and Martin, 2000). It is suggested that those attributes can be achieved through bundles of resources, rather than a single resource (Karim and Mitchell, 2000). Competitive advantage is achieved when resources are leveraged into innovative value-creating strategies. Leveraging therefore means that resources cross-subsidize across products, services and markets (Bartlett and Ghoshal, 2000).

An example for leveraging a firm's resources in innovative value creating strategies can be seen in the case of Sony – the “gorilla in the TV industry” (Schlender, 2002). The brand is present beyond TV devices on walkman, cell phones, cameras and many more products. Over years, Sony accumulated skills, expertise, assets and capabilities that are continually expanded and leveraged into new fields.

One of the latest results of this process is the Palm-based Clié. This miniature version of a notebook with integrated camera is the result of the combination of resources gained in photo-technology, telecommunication, TV, audio, marketing and management. The freshness of Sony's Clié strategy lies in the focus on fun, thus, opposing the rest of the Palm industry, which targets less-price sensitive mobile executives. Whether it will be successful is still open, especially as technology can still be advanced. Nevertheless, Sony once again goes its own special way and leverages its resources in a new innovative strategy.

According to Cockburn et. al. (2000), the RBV goes deeper than highlighting the importance of internal capabilities. Structural features of the industry are explained through internal resources of competing firms and supra-normal returns through the imperfection of markets for resources. Tacit knowledge or a powerful brand name are examples for difficult-to-trade resources. Imperfect markets, the complexity of business development, and the difficulty of adding value with acquired resources are reasons for what Teece et. al. (1997) refer to as the stickiness of resource endowments. Stickiness means that resources or resource configurations are difficult to imitate in the marketplace.

The nature of resources, their stickiness and heterogeneity, open up the opportunity for a company to truly distinguish itself in the marketplace. Put into a different perspective it reveals that resources create both value and constraints on how a company can change, on what it can and cannot do, especially in the short-term (Karim and Mitchell, 2000). An example therefore would be that a bakery is able to expand its product line to a patisserie, but it will not be able to expand into a butchery by simply leveraging its resource base over night.

Nevertheless, the concept is often criticized for being a static model equal to the five forces approach (McGuinness and Morgan, 2000). Early attempts failed to specify the evolution of resources (Teece et. al., 1997) besides insisting on a balance between resource exploitation and exploration (see e.g. Wernerfelt, 1884). Similarly, Makadok (2001) argues that the RBV, a framework of the Ricardian tradition, focuses on the selection of resources. Selection is thereby centered on acquisition as opposed to internal development in the form of learning. Finally, it is argued that the resource perspective did not clearly explain the origins of the competitive advantage of specific firms in dynamic environments (Eisenhardt and Martin, 2000). As a result an approach combining distinctive competence and the Schumpeterian view has been emerging. This model, known as the dynamic capabilities framework, considers development or evolution of both internal and external factors. It thus leverages the originally static resource perspective into a dynamic framework.

This framework has since been frequently investigated and applied. It has become one of the dominating approaches of the 1990s reaching into the new millennium. What exactly is meant by dynamic capabilities as well as its implications for the business world, i.e. its widely accepted and controversial sides, will be delineated throughout the following sections.

3.3. The concept of dynamic capabilities

Teece et. al. (1997) motivate their concept of dynamic capabilities as follows: purely resource accumulating RBV strategies are not enough, “winners in the global market place have been firms that can demonstrate timely responsiveness and rapid and flexible product innovation, coupled with the management capability to effectively coordinate and re-deploy internal and external competencies” (1997: 515).

This statement was the base for the authors to extend on the RBV, for creating the framework of dynamic capabilities, a concept that gained tremendous attention and was not unchallenged over the last years. The concept integrates various fields such as learning organizations, knowledge management, innovation as well as the environmental and the resource-based perspective. Before going further into explaining the rationale of this concept, it seems to be appropriate to provide a definition of dynamic capabilities.

3.3.1. Definition

The groundwork for dynamic capabilities was done by Teece et. al. in 1990 and later on, in 1997. Since then, the concept has been reviewed and analyzed on a broader scope and under different lights (see e.g. Eisenhardt and Martin, 2000; Henderson and Cockburn, 1994; Amit and Schoenmaker, 1993; Karim and Mitchell, 2000).

In the original study, dynamic capabilities were defined as “a firm’s ability to integrate, build and reconfigure internal and external competences to address rapidly changing environments” (Teece et. al., 1997: 516). In other words, they were presented as the ability to achieve new and innovative forms of competitive advantage given path dependencies and market position (Leonard-Barton, 1992). In essence dynamic capabilities are embodied in processes, which in turn are shaped by the company’s current asset position and paths (Leibold, 2001).

Amit and Schoenmaker (1993: 35) defined capabilities as a “firm’s capacity to deploy combinations of resources using organizational processes to effect a desired end”. In this definition not all capabilities are seen as equally affecting competitive advantage. Only VRIN capabilities and resources, i.e. “strategic assets”, are considered important.

“Component competencies” and “architectural competencies” are synonyms to resources and dynamic capabilities. Architectural competencies are seen as “architectural knowledge and problem solving and competence building routines” (Henderson and Cockburn, 1994: 66). Architectural knowledge therefore refers to means of communication, information filtering and problem solving, which are evolving through complex interaction, and includes fundamental parameters of the organization such as the control system, culture and values.

Recently, Eisenhardt and Martin (2000) redefined dynamic capabilities. Additionally to existing attributes, the notion of shaping the environment, varying degrees of market dynamics, and the importance of exit strategies were included. As a result dynamic capabilities were defined as: “the firm’s processes that use resources – specifically the processes to integrate, reconfigure, gain and release resources – to match and even create market change. Dynamic capabilities thus are the organizational and strategic routines by which firms achieve new resource configurations as markets emerge, collide, split, evolve and die” (Eisenhardt and Martin, 2000:1107).

As this definition integrates the former attempts it is regarded as the most comprehensive determination of dynamic capabilities. One aspect that might, however, be considered is

raised by Karim and Mitchell (2000). They point out that in the so-called knowledge era, companies also have to have the ability to protect resources. As companies are navigating in so-called ecosystems (Moore, 1993) or strategic networks (Gulati et. al., 2000), processes of resource protection will be considered as dynamic capabilities.

3.3.2. Terminology used in the dynamic capability framework.

3.3.2.1. The relation of capabilities and dynamic capabilities

The term capabilities appears with different attributes throughout the literature. This spans from technological or production over organizational to dynamic capabilities. The attributes considered and related to dynamic capabilities are strategic, organizational and managerial capabilities.

Strategic capabilities comprise the ability to identify, translate and execute upon the origins of competitive advantage. Baghai et. al. (1999) refer to organizational capabilities as skills embedded in people, processes, and institutional knowledge. Lastly, managerial capabilities are seen as leadership abilities, for example the ability to guide or to clearly articulate vision and direction as well as the possession of skills, experience and knowledge. The latter ones often included in organizational capabilities.

Dynamic capabilities in turn are embedded in organizational and strategic processes (Eisenhardt and Martin, 2000). The nature of these processes is, depending on market dynamics, seen as strongly influenced by managers (Teece et. al., 1997; Eisenhardt and Martin, 2000). Consequently, it could be concluded that dynamic capabilities are to a certain extent strategic, organizational and managerial capabilities. It is, however, evident that the extent is dependent on the interpretation of the concept.

Teece et. al. (1997) describe dynamic capabilities as strategic. The reason is seen as lying in their heterogeneity across firms and market imperfection. As a result dynamic capabilities are difficult to imitate by competitors and therefore they are strategic. In a different approach, Eisenhardt and Martin (2000) point out the possibility of emulating dynamic capabilities because of commonalities in features. Idiosyncrasy is seen in detail and true heterogeneity across companies is seen as embedded in resource configurations. In this context, dynamic capabilities are seen as strategic when applied in a superior way.

Dynamic capabilities are also considered as organizational and managerial capabilities. In this context, Leibold (2001) emphasizes the importance of building dynamic organizational capabilities. Another indication stems from the examples of dynamic capabilities, viz. systems of learning, decision making, product development among others (Helfat and Raubitschek, 2000; Eisenhardt and Martin, 2000). Both the management and the organization as a whole in varying intensity are essential for their efficient and effective management. Therefore, dynamic capabilities can be seen as organizational and managerial capabilities.

As a result, dynamic capabilities will be considered as organizational and managerial capabilities in the first place. Their nature only becomes strategic if they are translated into a distinct competence of a firm in the market place.

3.3.2.2. Components of dynamic capabilities

The definitions of dynamic capabilities pointed out several patterns important to the concept such as resources, processes, routines, (core-)competencies, paths and capabilities. These patterns are used either interchangeably or independently, thus confusing the reader as to what concept specifically is used by the current author. The following section will be devoted to further explaining this terminology as it is used in the different studies contributing to the framework.

Amit and Schoenmaker (1993) define resources as stocks of available factors that are owned and controlled by the firm. According to Wernerfelt (1984) ownership and control are not permanent terms. Furthermore, ownership is challenged by the notion that organizations can access resources in larger networks or ecosystems (Gulati, 1999). Consequently, resources are only owned to a certain extent and on a temporary basis (Hitt et. al., 2001).

Resources or stocks of available factors comprise firm-specific human, organizational, and physical assets, thus they are tangible and intangible (see e.g. Eisenhardt and Martin, 2000; Amit and Schoenmaker, 1993; Teece et. al., 1997; Karim and Mitchell, 2000). Fulfilling the VRIN attributes mostly in combinations, resources are seen as the center of competitive advantage (Eisenhardt and Martin, 2000).

Rather controversial is the relation between resources and routines/processes and the relation between routines and processes. Eisenhardt and Martin (2000) distinguish

between information-based visible processes and invisible routines (see also Christensen and Overndorf, 2000; Amit and Schoenmaker, 1993). A separation that is not always undertaken (Teece et. al., 1997). Routines are sometimes characterized as tacit, co-specialized and embedded in the organization (Karim and Mitchell, 2000). Additionally, routines and processes are in some instances seen as a combination of resources that enable distinct activities (Teece et. al., 1997), and in other cases, assemblies of routines are seen as constituting resources (Karim and Mitchell, 2000). In the latter instance resources are not seen as assets, but as capabilities or combinations of assets complemented by related activities.

Baghai et. al. (1999) refer to capabilities as operational and growth enabling skills, privileged assets, and special relationships. In a different perspective, capabilities are described as high-level (combinations of) routines that provide management with a set of options for decision making to generate a desired end (Winter, 2000). A special form of capabilities is dynamic capabilities as defined earlier in the text.

Finally, position is referred to as a firm's current specific asset endowment and path as the strategic options available to the management (Teece et. al., 1997; Leibold, 2001). Path is thereby seen as a means of path dependencies and future opportunities (Eisenhardt and Martin, 2000). In other words, the asset position delineates the current situation, while path encompasses a time span from the organization's history into the future.

The preceding discussion has been fairly controversial, especially concerning the utilization of resources and routines. To illustrate the different terminology tailored to the purpose of this study, the following table has been created.

Components	Relevance	Examples
Resources	Firm's tangible and intangible assets feasible for being the source of competitive advantage	Tacit knowledge, skills, superior sales force, specialized equipment, external relationships
Processes, Routines, Competencies	Firms internal and external activities enabled by a combination of resources	Production process, marketing routines
Core competencies	A firm's core business	Branding and beverages in the case of Coca Cola
Dynamic capabilities	Drivers of the creation, integration, reconfiguration, protection and abandoning of resources	New product development, development of a new marketing campaign, alliancing, learning systems
Position	Current specific endowments of a firm's assets	Financial position, technological position, market position, firm's boundaries
Paths	Strategic options available to a firm shaped by future opportunities and path dependencies.	Acquire firm B or leverage the own R&D under consideration of the financial position and the current knowledge position and market needs

Table 1: Components of dynamic capabilities

Resources are seen as firm specific, tangible and intangible assets meeting the VRIN conditions. Processes, routines and competencies are used interchangeably, as being activities resulting from assembling resources in human interaction. Competencies forming the essence of the business are defined as core competencies. Dynamic capabilities are seen as the antecedents of routines, as the ability to create, integrate, reconfigure, protect and abandon resources. Consequently, dynamic capabilities can be seen as generators of freshness for the resources. Position and paths determine the stickiness or opportunities of a firm's abilities in the future. All six components taken together comprise the actual framework of dynamic capabilities.

3.4. The rationale of dynamic capabilities

Dynamic capabilities are seen as embedded in processes, which are shaped by a firm's specific asset position and paths/options (Leibold, 2001; Teece et. al., 1997; Rosenbloom, 2000). Resources, especially knowledge resources, are manipulated into new value creating strategies by organizational and managerial processes. As a result of building, integrating, reconfiguring and abandoning resources, value is created within extremely and moderately dynamic markets (Eisenhardt and Martin, 2000). Value creation, thereby, was originally seen as a means of incremental change (Teece et. al., 1997). Later research extended this view including the possibility of frame-breaking change (Eisenhardt and Martin, 2000; Helfat and Raubitschek, 2000; Karim and Mitchell, 2000). In other words, dynamic capabilities can be seen as the means of directing or managing all facets of an organization for the purpose of increasing responsiveness to and innovating the ever-changing environment.

3.4.1. Dynamic capabilities: What they are

3.4.1.1. The nature of dynamic capabilities

There is a wide agreement that dynamic capabilities are firm-specific and idiosyncratic (Makadok, 2001; Karim and Mitchell, 2000, Henderson and Cockburn, 1994). The actual degree of heterogeneity as well as its implications is however seemingly controversial. Teece et. al. (1997) argue that dynamic capabilities are difficult to replicate and consequently inimitable and not substitutable. More recently however, heterogeneity has been attributed to resources (Hitt et. al., 2001) with idiosyncrasy lying in detail of dynamic capabilities and commonalties existing in general features. This means that dynamic capabilities can be gained from various paths, i.e. are equifinal as well as fungible and substitutable across industries and contexts (Eisenhardt and Martin, 2000: 1109).

Various firms for example emulate knowledge brokering. The Sony case showed how knowledge from various existing products was integrated and leveraged to create the Clié. Similarly, the Siemens's knowledge management system allows consultants to create solutions to customer problems in relying on preceding work in similar scenarios. In this sense, knowledge brokering relies on some sort of cross-functional interaction that might take various appearances.

As a result, imitation of dynamic capabilities is not necessary, as various ways lead to their efficient and effective application. Consequently, the often cited obstacle of imperfect markets especially for tacit knowledge or intangible resources (see e.g. Amit and Schoenmaker, 1993; Henderson and Cockburn, 1994) does not necessarily impede on the quality of dynamic capabilities, but rather challenges their role of leveraging resources.

The nature of dynamic capabilities is also seen as distinct in markets of moderate dynamics and in high-velocity markets. Eisenhardt and Martin (2000) delineated the types of dynamic capabilities in the following table.

	Moderately dynamic markets	High-velocity markets
Market definition	Stable industry structure, defined boundaries, clear business models, identifiable players, linear and predictable change	Ambiguous industry structure, blurred boundaries, fluid business models, ambiguous and shifting players, nonlinear and unpredictable change
Pattern	Detailed, analytical routines that rely extensively on existing knowledge	Simple, experiential routines that rely on newly created knowledge specific to the situation
Execution	Linear	Iterative
Stable	Yes	No
Outcomes	Predictable	Unpredictable
Key to effective evolution	Frequent, nearby variation	Carefully managed selection

Table 2: Dynamic capabilities and types of dynamic markets

Source: Eisenhardt and Martin, 2000: 1115

The nature of dynamic capabilities in moderately dynamic markets is to a large extent consistent with the original approach by Teece et. al. (1997). In contrast, the processes, which configure dynamic capabilities in high-velocity markets, are created within the context of simple priority and boundary-setting rules. The simple rules principle seems to stem from complexity thinking. It has been adapted and refined in various studies (see e.g. Rindova and Kotha, 2001; Brown and Eisenhardt, 1998; Eisenhardt and Sull, 2001). The application of Galunic and Eisenhardt (2001), who base simple rules for architectural innovation on the combination of economical and social logic is interesting. Eisenhardt and Martin (2000) limit the application of simple rules to creative and innovative processes and

state that in the phase of implementation and execution more detailed codified processes seem pertinent, as they increase efficiency and decrease cost.

In addition, it has been shown that dynamic capabilities are not necessarily restricted to corporate boundaries, as emphasized by Gulati (1999) and Griffith and Harvey (2001). In this sense, dynamic capabilities are embedded in processes of interaction with the larger social environment, which is seen as crucial to sense and seize opportunities, e.g. to identify future alliance partners (Gulati, 1999).

Finally, it is recognized that dynamic capabilities do not guarantee sustainable competitive advantage (Eisenhardt and Martin, 2000). Because dynamic capabilities can trigger opportunities in the market, they are necessary and valuable for competitive advantage, however not sufficient for sustainability. Moreover, sustainable competitive advantage is a function of dynamism, flexibility and ongoing leverage of a number of opportunities (Galunic and Eisenhardt, 2001).

3.4.1.2. The processes embedding dynamic capabilities

The definition of dynamic capabilities implies that they are embedded in either simple or detailed processes or routines (Winter, 2000; Christensen and Overdorf, 2000; Karim and Mitchell, 2000). Eisenhardt and Martin (2000) specify processes as organizational and strategic. The following section will describe the functioning of dynamic capabilities as means of resource manipulation. Five areas of importance have been identified, namely: integration, reconfiguration, creation, release and protection of resources.

Dynamic capabilities with resource integration function: Dynamic capabilities that integrate or coordinate resources are processes such as product development, networked incubation, decision making, or logistic planning (Eisenhardt and Martin, 2000; Teece et. al., 1997). Their rationale is seen in Porter's (1996) strategic fit theory spanning beyond the scope of organizational boundaries. Their essence lies in internal as well as external efficiency and effectiveness (Teece et. al., 1997).

An example in moderately dynamic markets is the Just-in-time system or KANBAN order point control developed over a period of twenty years in the premises of Toyota (Ballou, 1999; Beasley, 2002; Kenworthy, 1997). Western companies striving to imitate the system purely based their attempts on the observed reduction of inventory levels. They failed to recognize the integrative nature of dynamic capabilities. A process centered around waste

elimination by coordinating and improving aspects such as the production process, purchasing, supplier relations, quality management and scheduling to demand.

Dynamic capabilities with resource reconfiguration function. Karim and Mitchell (2000: 1066) define reconfiguration as “the change of resources within an organization”. The flexibility of the system is seen as dependent on the nature of dynamic capabilities. Simple rules encourage higher flexibility and creativity (Eisenhardt and Martin, 2000), while more complex rules support the notion that internal transformation is costly and time-consuming (Teece et. al., 1997). In general, organizations can support reconfiguration through decentralization and local autonomy (Teece et. al., 1997; Rindova and Kotha, 2001). Examples of reconfiguration include processes such as shifting synergies, patching, knowledge brokering, and benchmarking (Eisenhardt and Martin, 2000; Helfat and Raubitschek, 2000; Teece et. al., 1997).

Galunic and Eisenhardt (2001) investigated resource reconfiguration, i.e. architectural innovation, in a large multi-business organization. Based on three patterns the organization constantly remapped product-market domains (charters) among divisions. The patterns are: (1) new charter opportunities, i.e. reallocation of new opportunities from high performers to weak divisions as a chance for rejuvenation; (2) charter wars, i.e. competition between divisions for charters; and (3) charter foster homes, i.e. rapid placing of orphaned charters in temporary homes. Decision rules about recombination were thereby both social (e.g. rewarding the loyal and strengthening the weak) and economical (skills and resources). Based on simple dynamic capabilities an environment for continuous renewal and learning was created.

Dynamic capabilities with resource creation function: Resources may be gained by means of acquisition, alliancing or learning. Acquisition and alliancing is often seen as a means of extending or deepening the resources of a company, thereby overcoming imperfect markets, bounded rationality as well as time problems (Karim and Mitchell, 2000; Gulati, 1999; Henderson and Cockburn, 1994). Related studies suggest the need for careful due diligence, implementation and post-acquisition monitoring to minimize uncertainties and obstacles, thus ultimately creating synergies (Lambrechts, 1990; Bartlett and Goshal, 2000; Eisenhardt and Galunic, 2000).

Knowledge building routines or learning mechanisms are a means of developing resources internally potentially considering external knowledge sources such as customer, supplier, and universities (Helfat and Raubitschek, 2000; Winter, 2000; Eisenhardt and Martin, 2000). Learning, the most important dynamic capability, is an intrinsically social and

collective process (Teece et. al., 1997; Zollo and Winter, 2002). In other words, problem solving is interactive and stimulated by common language and codes of conduct (Helfat and Raubitschek, 2000).

An example for upgrading the resource base through learning is co-option of customer competence (Gibbert et. al., 2001). By using Web-based application and e-business, customer relationships can be strengthened by increasing the potential for interaction as well as the number of interactions. Knowledge explored in this process can then be leveraged in the organization's resource base.

Dynamic capabilities with resource release function: Superior technical solutions or knowledge bases do, however, not necessarily ensure success in the business environment. One of the famous examples thereof is the victory of the less sophisticated VHS system over Sony's Betamax. It is therefore important for companies to develop dynamic capabilities, which trigger the exit of resources (Eisenhardt and Martin, 2000; Burgelman, 1996). If companies are not able to abandon resources or competencies, they are jeopardized to carry along what is often referred to as core rigidities (Rosenbloom, 2000; Tripsas and Gavetti, 2000).

Dynamic capabilities with resource protection function: An aspect perceived as specifically important in the "knowledge era" is the protection of resources. The emphasis is therefore less on external protection through i.e. patents and copyrights, than on protecting the flow of knowledge across organizational boundaries through "gatekeepers" (Teece, 2000; Karim and Mitchell, 2000).

3.4.2. The evolution of dynamic capabilities

The evolution of dynamic capabilities seems to be related to its antecedents, viz. processes, position and path. There are however means of overcoming the rigidity inherent in those antecedents. In this sense, dynamic capabilities are seen as developing through learning mechanism, self-generation and flexible setups or as gained through acquisition. A general obstacle to their purposive evolution seems to be the social imperative of bounded rationality. The recent incorporation of complexity thinking, however, seems to resolve this issue partially.

3.4.2.1. The co-evolution of processes, position and paths

At a specific point in time, its processes, specific asset position and strategic options characterize a company. Not only does this imply that each company is unique, but also that a company's uniqueness or characteristics change throughout its evolution (Teece et. al., 1997; Moore, 1993). Start-up companies, for example, have different endowments and future opportunities than incumbent firms. In general, processes, paths and position determine a companies abilities and disabilities over the short-term and can be altered over the long-term.

Processes have been identified as the means of manipulating resources such as product development, alliancing, and learning. The level of sophistication of processes is seen as evolving over time (Ballou, 1999; Helfat and Raubitschek, 2000). They develop through internal learning and evolution, technological opportunities and changes in the external knowledge base through, for example, academic and field research or advancements of competitors (Teece et. al., 1997).

The position of a company is characterized by its specific assets such as financial, technological or institutional assets as well as organizational boundaries (Teece et. al., 1997). They comprise for example specialized plants, the sales force, reputation, structure, modes of governance, product market positions, the degree of integration and so forth. Assets are seen as having a significant impact on a company's competitive (dis)advantage at a certain point in time.

The path of a company is determined by strategic alternatives available to the company, the degree of increasing returns as well as path dependencies (Teece et. al., 1997). Historical engagements of a company in the form of investments and the existing routines influence future opportunities. This is seen as specifically true in environments of increasing returns to adoption, such as fixed-line and wireless telecommunication networks, which are triggered by network externalities, the presence of complementary assets, or scale economies in production and distribution. Combined with technological opportunities, path dependencies are seen as defining a company's future opportunities.

As such, position and paths impact on the development of processes that in turn embed dynamic capabilities. In other words, processes, position and paths are interrelated concepts and shape the evolution of dynamic capabilities

3.4.2.2. Learning mechanism and setups for dynamic capabilities

Eisenhardt and Martin (2000) approach the means of path dependencies in a different way. According to them, path dependencies are seen as learning mechanisms. In this sense, dynamic capabilities develop through learning. Potential learning mechanisms include repeat practice, prototyping, testing and pacing (Eisenhardt and Martin, 2000). They account for both single- and double-loop learning. The crucial aspect of learning mechanism is that small losses and crises are seen as important and refocusing attention, and are consequently preferred over major failures. Pacing of experience enables managers to balance learning inputs, i.e. hedging against information overload. Sometimes codification is seen as important for the evolution of dynamic capabilities, too, because of their heterogeneous and infrequent nature (Zollo and Winter, 2002). Eisenhardt and Martin (2000) in contrast, point out the limitations of codification due to the vast amount of tacit knowledge involved.

According to Amit and Schoenmaker (1993), capabilities are interdependent. They argue that the more complementing dynamic capabilities are, the more they reciprocally impact on their development. In contrast, if dynamic capabilities substitute each other, their value decreases or they are rendered obsolete. A company might for example enter an alliance for the purpose of new product development. The better the alliancing processes and the higher the synergies, the more a company can gain for its own product development capabilities. Consequently, dynamic capabilities prosper and disappear throughout the evolution of the organization.

Christensen and Overndorf (2000) approach the evolution of dynamic capabilities in a different way. According to them, especially incumbent firms struggle with reinventing capabilities as the focal point of what a company can and cannot do migrate into values and ultimately culture, i.e. rather inertial manifestations. Consequently, they suggest three strategies for rejuvenating capabilities in set-ups that are not affected by the inertial characteristics of the existing organization:

- a) Reconfiguring of internal boundaries, thereby recombining employees into new heavy-weight or cross-functional teams that are using the learning mechanisms for developing new capabilities and are personally responsible for the success of the entire project;

- b) Cultivating new processes tailored towards a new business model in a spinout organization (networked incubator) which is actively supported by resources from the organization as well as the corporate leadership (CEO);
- c) Acquiring organizations with the required capabilities, thereby maintaining the separate entity – embeds processes – and inserting resources of the parent company.

Consequently, dynamic capabilities are evolving through the influence of directly and indirectly related learning mechanism. The survival of dynamic capabilities is thereby a matter of selection resulting from their interdependency. Finally, in cases of corporate rigidity, which impedes on the evolution of dynamic capabilities, flexibility has to be reinserted through new spatial configurations.

3.4.2.3. Managerial cognition versus self-organization

Winter (2000) states that the processes that embed dynamic capabilities are evolving through human interaction (see also Gulati, 1999; Zollo and Winter, 2002). Therefore, it is seen as necessary to consider the social imperative inherent in interaction (Galunic and Eisenhardt, 2001), i.e. the bounded rationality of both managers and employees (Tripsas and Gavetti, 2000). This means that sense- and decision-making is determined by the narrow or broad, but bounded, view of an individual about the world. Consequently, resource manipulation takes place within the limited, often local perception of managers – the manipulators (Galunic and Eisenhardt, 2001) - concerning the status of their company and the competitive environment. Therefore, failures or sub-optimal solutions are possible.

An example is the failure of Intel to reallocate its resources due to the decision of a middle manager (Burgelman, 1996). Similarly, Holbrook et. al. (2000) assume the failure of two of the semiconductor companies as originating in the bounded rationality of managers who held on to past decisions concerning the R&D focus and the R&D cooperation with weakening research centers. Their disregard of the obsolescence of these decisions triggered the extinction of the companies.

Recently, metaphors stemming from complexity thinking have been incorporated to explain the processes underlying the (co)evolution of dynamic capabilities. Rindova and Kotha (2001) mention the emergence of dynamic capabilities and point out the importance of self-organization combined with simple open-ended organizing principles, i.e. simple rules,

in this context (see also Eisenhardt and Martin, 2000). Furthermore, Winter (2000) refers to Kauffman's NK model and explains the evolution of dynamic capabilities with search processes on a landscape.

The integration of complexity theory to explain the processes of (co)evolution has the advantage of overcoming the often criticized ex post character of the dynamic capability framework and its now partly removed reliance on predictability. Besides, the concept of self-organization enables a company to mitigate the problem of bounded rationality (Gulati, 1999).

In the preceding discussion it has been shown that the evolution of dynamic capabilities is sensitive to initial conditions. The path of evolution is thereby determined by specific learning mechanisms targeting either the processes or the resources constituting these processes. Learning mechanisms can be constrained by managerial cognition. In rather flexible and creative environments, their effect is mitigated by self-organization throughout the organization. In general, literature focuses little attention on how exactly dynamic capabilities evolve. Therefore, further application of the matter will be treated cautiously.

3.4.3. Dynamic capabilities and competitive advantage

The concept of dynamic capabilities was initiated by the recognition that companies need to understand the underpinnings of optimizing their resources and, ultimately, of creating innovative value adding strategies (Teece et. al., 1997). Therefore, attention was shifted away from resources towards processes, paths and position of the organization. While position and paths explain the sensitivity of an organization's evolution to its initial conditions, processes express various ways of manipulating resources to spark new opportunities – i.e. advantages. The following conclusions have been drawn concerning competitive advantage.

Generally speaking, managing dynamic capabilities enables both path-dependent (incremental) and path-breaking change (Eisenhardt and Martin, 2000; Helfat and Raubitschek, 2000; Karim and Mitchell, 2000). Small alterations are thereby seen as having the potential to trigger significant breakthroughs (Teece et. al., 1997).

The strength or weakness of cause-effect relationships is seen as dependent on the market. While moderately dynamic markets are seen as more predictable, management with foresight is regarded as inappropriate in uncertain fast-changing environments

(Eisenhardt and Martin, 2000). This opinion is reflected in the role and nature of dynamic capabilities in these two distinct market settings. Rather rigid complex and detailed processes are seen as pertinent in moderately dynamic markets. In contrast, a number of potential opportunities should be created simultaneously through processes framed by simple, experiential rules in high-velocity markets.

Despite this distinction, it is however recognized that dynamic capabilities are in neither environment a guarantee for sustainable competitive advantage. The reason therefore lies in their equifinal and fungible nature. As a result, faster, more intelligent and providential application of dynamic capabilities than competitors can create temporary competitive advantage (Eisenhardt and Martin, 2000).

3.5. Managerial implications

The dynamic capabilities approach highlights the importance of strategic management (Teece et. al., 1997). It is seen as important that the managers have the ability not only to assess people, but also an organizations abilities and disabilities (Christensen and Overndorf, 2000). The deployment and redeployment of resources is thereby seen as the center of attention, rather than game playing with competitors (Teece et. al., 1997; McGuinness and Morgan, 2000). Entry strategies and timing are seen as stemming from a firm's existing knowledge assets and their overlap with market needs (Holbrook et. al., 2000). It depends on managerial competence to identify the right situation, whereby every situation itself is described as unique (Teece et. al., 1997).

Furthermore, the processes of leveraging resources into value creating strategies are seen as being initiated by managerial activities (Karim and Mitchell, 2000; Helfat and Raubitschek, 2000). Managers rely on foresight and vision when choosing path-creating strategies (Gulati, 1999). This is where the often cited danger of bounded rationality or managerial cognition comes in (Burgelman, 1996 ; Amit and Schoenmaker, 1993).

Recently, emphasis has been put on the importance of self-organization. It is said that self-organization is enabled in high-velocity environments where dynamic capabilities are embedded in "purposefully simple ... also not completely unstructured rules" (Eisenhardt and Martin, 2000: 1116). In this sense the role of leaders has been redefined as "entrepreneurs, ... as architects of the divisional context and guardians of the culture", who base their activities on both economic and social logic (Galunic and Eisenhardt, 2001:

1250). In other words, managers have to ensure an organizational environment capable of transformation (Christensen and Overndorf, 2000).

Because dynamic capabilities comprise both organizational and managerial capabilities, one could conclude that leadership is subject to evolution itself.

3.6. Towards a more sophisticated framework of dynamic capabilities

The framework of dynamic capabilities is still in an emerging state. Several crucial extensions have been incorporated in the framework recently such as self-organization, market dynamics, modularity and so forth. Nevertheless, several of these suggestions are preliminary. The general trend seems to be towards a more comprehensive approach of dynamic capabilities including aspects beyond the traditional components of the framework, i.e. processes, resources, competencies and so forth. There are several areas where future empirical and non-empirical research as well as a more sophisticated incorporation of complexity thinking could add considerable value. The following five aspects have been identified throughout the review and will be presented in descending priority (the list is by far not comprehensive and only indicates a number of issues related to the current thesis).

- a) Management based on dynamic capabilities has been discussed in detail and exemplified with a number of processes in moderately dynamic as well as fast changing markets. Nevertheless, research seems to be neglected in two areas: (1) the transformation towards management based on dynamic capabilities and (2) the transformational process from managing in moderately dynamic markets to managing in high-velocity markets. Such investigations are seen as critical concerning the feasibility of the dynamic capabilities framework as a managerial approach and as part of the organizational environment.
- b) Furthermore, the notion of priority and boundary setting rules seems rather vague. Christensen and Overndorf (2001) for example point out the inversely proportional relation of flexibility and seize, i.e. a \$40billion business has to grow \$5billion a year to maintain its growth rate, while a \$40million business only needs to realize \$5million. Consequently, the former organization would tend to prioritize larger innovations than the latter to satisfy market expectations, thus neglecting several otherwise promising initiatives. Further refinements are seen as appropriate

concerning (1) the general applicability of a rule technique and (2) the emergent quality of rules.

- c) Within the tradition of the resource-based view several studies highlight the importance of so-called network resources (see e.g. Gulati, 1999; Gulati et. al., 2000). Similarly, complexity thinking – a research approach, which is generally acknowledged by advocates of dynamic capabilities – highlights the importance of co-evolution. Nevertheless, dynamic capabilities are predominantly analyzed within the intra-organizational context and competition is seen merely between organizations. Further research in dynamic capabilities across organizational boundaries could provide relevant insights concerning the nature of competition. Investigations should attend to core rigidities and competency traps in this context.
- d) With respect to strategic management, the notion of bounded rationality and managerial cognition formed the predominant research focus. Especially as a result of the re-conceptualization of dynamic capabilities into two distinct types, more interest in the role of leadership seems to arise (see e.g. Galunic and Eisenhardt, 2001). It is suggested not to reinvent leadership tailored towards a dynamic capabilities approach, but to engage in interdisciplinary research with e.g. complexity thinking to derive further clarity concerning this aspect.
- e) Measurement of dynamic capabilities is seen as inexact and too time consuming (Galunic and Eisenhardt, 2001); nevertheless, some sort of measurement is necessary concerning the short- and long-term implications of cultivating dynamic capabilities. A potential research approach should thereby incorporate both financial and non-financial measurement criteria. Potential benefits could be derived from adjusted balance scorecard approaches or intellectual capital measurement techniques. The critical aspect would be to ensure a comprehensive platform for measurement.

3.7. Summary

The aim of the preceding chapter was to clarify the framework of dynamic capabilities. Dynamic capabilities are embedded in managerial and organizational processes. They are seen as enabling the survival of a company in the competitive environment through increasing responsiveness and adaptability. In this sense, dynamic capabilities are seen as bearing the potential for both incremental and path-breaking change.

The study revealed that the primary drivers for a company's future direction are related to its current and historical endowments. The degree of sensitivity to initial conditions is delineated as varying with market dynamics, i.e. the type of dynamic capabilities. Higher sensitivity can and according to the concept should be attributed to moderately dynamic markets. Evolution in this context is seen as manageable through small variations of existing knowledge, i.e. predominantly resource (knowledge) exploitation. On the contrary, in high-velocity markets competitive advantage should be constantly renewed through resource (knowledge) exploration. In other words, newly created knowledge should be continuously leveraged in several opportunities.

In the light of the review of the concept of dynamic capabilities, its strength and weaknesses, the thesis can now attempt a preliminary synthesis with organizational fitness. The following chapter will investigate the role and nature of dynamic capabilities in the fitness context.

CHAPTER 4: The relevance of the dynamic capabilities framework for organizational fitness

4.1. Introduction

In the preceding chapters, two concepts, viz. organizational fitness and dynamic capabilities, have been discussed. It has been established that various fitness approaches can be broadly synthesized in a general frame integrating both inside-out (self-organizing) and outside-in (selection status) perspectives. The still emerging framework of dynamic capabilities started off as rather theoretical, but has lately gained enormously in practical insight and further specification. In this chapter, the focus will be on using the frame of organizational fitness and filling it with the insight of dynamic capabilities. In other words, the chapter aims at investigating the role and nature of dynamic capabilities for enabling organizational fitness.

4.2. Review of organizational fitness and dynamic capabilities

Before combining the two approaches into an attempt towards organizational fitness, it is seen as appropriate to reconsider their main messages.

4.2.1. Organizational fitness

Organizational fitness has been defined as the capacity for continuous learning and renewal to adapt, influence and shape the environment. The aim is to create, deconstruct and (re) establish internal and external consonance. Consonance is continuously altering through co-evolution of actors and networks on the landscape. The overall goals that the organization is focusing on are development, growth and survival. In other words, organizations aim to sustain fitness for the landscape.

The definition reveals that organizational fitness has an internal and external dimension (Kelly and Allison, 1999). Leibold (2002) highlights that both dimensions have to be considered simultaneously and interdependently. Internally the energy levels of a system have to be mastered. The underlying goal is to enable both efficient performance in current operations and the flexibility to alter and even reinvent the system to shape the future or

hedge against unpredictability. Being adaptable to exogenous changes and being able to inflect major changes are the external goals. This implies an organization's focus on the external environment and the capacity to survive incremental and disruptive alterations as well as to shape this environment.

To picture the fitness level of an organization, landscape images are used. Landscapes enable visualization of the organization in its various aspects in relation to the larger whole. They continuously deform due to actions taken within the system or the larger business world as well as through external forces such as natural disasters, political or cultural changes. In this regard, fitness is equalized with peaks in the landscape that have to be climbed. Nevertheless, peaks are not perceived as guarantee for survival as they can become higher or lower and even collapse. Therefore, an organization has to conserve its leadership through continuous renewal and learning with the aim to adapt to and even shape the landscape to new scenarios of peaks and valleys.

4.2.2. Dynamic capabilities

Stemming from the resource-based view, dynamic capabilities refocused the emphasis on processes, position and paths of an organization, i.e. the antecedents of dynamic capabilities. Examples for dynamic capabilities are product development, alliancing and architectural innovation. They are enabling temporary competitive advantage by means of gaining, integrating, coordinating, reconfiguring, releasing and protecting internal and external resources. Competitive advantage stems from competencies embedded in configurations of resources.

The concept distinguishes between two different market settings, viz. moderately dynamic markets and high-velocity markets. Moderately dynamic markets are seen as rather smooth and predictable in their development. High-velocity markets, in contrast, are characterized by rapid, complex and unpredictable change.

This differentiation impacts on the appearance of dynamic capabilities. In moderately dynamic markets, companies are encouraged to base their operations on detailed analytical processes. In this context, processes foster incremental variations relying on existing knowledge as a means of continuous improvement. Disruptive change in this setup depends on flexible autonomous models, e.g. networked incubators, and is seen as rather rare. Simple and experimental processes are seen as crucial in high-velocity markets. Through selection of promising newly created knowledge, several opportunities

are cultivated to hedge against the unpredictable future. In this tentative environment both incremental and path-breaking change are possible.

The evolution of dynamic capabilities is sensitive to initial conditions, viz. processes that are shaped by the specific assets position and paths/options of an organization. They rise and fall through learning mechanisms, such as repeat practice and mistakes in single- or double-loop processes. Creating an environment for learning is seen as essential. To a certain extent the evolution is constrained by the bounded rationality and cognition of managers. Consequently, smooth development of dynamic capabilities is seen as an ideal.

In short, the framework of dynamic capabilities aims at gaining competitive advantage through sensing and seizing opportunities. The focus is thereby on what a company can and cannot do as well as on how to extend, renew and reinvent the abilities of the company. Thus, continuous learning and change are the key.

4.3. Organizational fitness and dynamic capabilities in relation

The framework of dynamic capabilities and the concept of organizational fitness have so far been treated as distinct management approaches. The aim of this thesis is to discuss their potential integration. Their inherent relation will be clarified in the following section.

Both concepts highlight the importance of learning and renewal for the purpose of adapting to and shaping the environment. The dynamic capabilities framework is therefore centered on learning and flexibility. Learning is not only a means of manipulating resources, but also of enhancing capabilities (Helfat and Raubitschek, 2000; Winter, 2000; Eisenhardt and Martin, 2000). In this sense, the ability to renew competence is seen as crucial for dynamic congruence with the rapidly changing environment (Teece et. al., 1997). Nevertheless, the ease of renewal is seen as decreasing with age and size of the company and the consequent manifestation of processes, values or rather rigid established relationships ties the organization beyond corporate boundaries (Christensen and Overndorf, 2000; Gulati et. al., 2000).

In the fitness realm, organizations and their agents are seen as engaging in search processes (Beinhocker, 1999; Levinthal and Warglien, 1999). Search processes that are impeded by silent killers and incorporate conflicting constraints (Beer and Eisenstat, 2002; Stacey et. al., 2000). Searching is a means of learning and renewal that takes place on fitness landscapes. It is related to organizational processes (Levinthal and Warglien, 1999)

the smoothness of which is seen as dependent on the sophistication of capabilities (Normann, 2001; Kilroy and McKinley, 1997).

Consequently, dynamic capabilities can be seen as a means of ensuring learning and renewal in a fitness environment. In other words, dynamic capabilities are the glue that keeps an organization on the spot for sensing and seizing opportunities quickly (Lissack and Roos, 1999; Teece, 2000).

4.4. The role of dynamic capabilities in enabling fitness

The framework of dynamic capabilities considers two distinct settings, viz. moderately dynamic markets and high-velocity markets. For the purpose of explaining the role of dynamic capabilities as a means of shaping organizational fitness those settings will be considered as starting point. The discussion in the respective market environments will be visualized by the case of S.A. Chupa Chups in a moderately dynamic market and with the examples of Sony and Siemens Nixdorf Information Systems in high-velocity markets.

4.4.1. Fitness in moderately dynamic markets

Industries for commodities, like the confectionery market targeted by S.A. Chupa Chups, are evolving along a rather linear and predictable path (Eisenhardt and Martin, 2000). Changes occur incrementally and major breakthroughs are the exception rather than the norm. Such stable environments are seen as smooth in the context of fitness landscaping (Levinthal, 1997), i.e. peaks and valleys buckle and heaven rather rarely. The following section will, firstly, attend to the evolution and growth of S.A. Chupa Chups. Secondly, learning mechanism and the evolution of dynamic capabilities will be visualized. Finally, a critical notion on the approach in a moderately dynamic market environment will be given.

Evolution and growth: For more than fifty years, S.A. Chupa Chups's core product, lollipops, has now been sold in the markets. Product changes have been mostly incremental, i.e. variations in flavor, and only sometimes radical, i.e. invention of the plastic stick (Kilfoyle and Fellow, 1996). Competition is valid and hard in the market, but only randomly deconstructing the industry architecture. Besides, market share – in this special case – is mostly increased through international expansion.

In this market, setup evolution is very much a function of path and position of the company. The early history of the company, i.e. start-up phase, is seen as strongly influenced by the founder(s) (Rosenbloom, 2000; Helfat and Raubitschek, 2000; Holbrook et. al., 2000). Their experience, knowledge and contacts determined the early capabilities and resources of a company. Enrique Bernat Fontlladosa, the founder of S.A. Chupa Chups, did indeed significantly influence the initial conditions of the company through his idea to produce a lollipop and his perception of how to establish the company in the market, i.e. gain market acceptance.

This influence determines the original position of an organization, which opens up a unique set of opportunities or potential paths (Eisenhardt and Martin, 2000). The company starts traveling along its path thereby continually choosing among the strategic options sensed. An important decision for S.A. Chupa Chups was, for example, to buy or create the lollipop packaging production technology. The company opted for developing the technology itself and acquired a production company. This decision proved to be a valuable choice for the future path of the company. It enhanced the company's adaptable fitness qualities when penetrating international markets. The technological insights gained gave S.A. Chupa Chups the flexibility to establish consonance with the environment under various circumstances, i.e. use of obsolete technology in developing and emerging markets and of state-of-art technology in advanced markets, which triggered appropriate growth and development.

Learning and the evolution of dynamic capabilities: The further the company searches, the more the path traveled becomes an indicator of future possibilities additional to the current asset position. This is where the notion of path dependencies or learning mechanisms becomes relevant (Teece et. al., 1997; Eisenhardt and Martin, 2000); especially, learning mechanisms that shape the evolution of dynamic capabilities. In the case of S.A. Chupa Chups, such a capability can be seen in entry strategies. On its way towards becoming a global player, the company had to learn through practice and mistakes, how to enter the markets in various countries with unique and distinct setups. S.A. Chupa Chups's fitness capabilities were not equally suitable for each environment and consequently learning and flexibility – exploration and exploitation of resources – was necessary.

Based on knowledge existing in the company, for example the experience of managers with prior market entries, S.A. Chupa Chups varied its strategies slightly in the new environmental conditions based on a trial and error basis and through the integration of external resources (Gulati, 1999; Tripsas and Gavetti, 2000). Thereby, the company

gained resources and integrated, coordinated and reconfigured them. In several instances, resources even had to be released, i.e. the original distributor in the United States proved after more detailed evaluation to be a marijuana distribution network and had to be replaced (Kilfoyle and Fellow, 1996).

But not only the resource base changed over time, the processes manipulating them evolved, too. The processes evolved into analytical and detailed sophisticated patterns. They allowed the company to maintain the current fitness level and guided the search for new fitness peaks. An example is that all affiliates have to report on a daily basis to the headquarters; a process allowing for the measurement and improvement of the coordination of resources on a daily basis.

As a result, the evolution of dynamic capabilities and their application enabled continuous learning in S.A. Chupa Chups and adaptation to the various environments faced. In the context of organizational fitness, two conclusions can be drawn from this case. Firstly, the company constantly searched on the fitness landscape for new peaks and thereby adapted to and even shaped the environment. Secondly, S.A. Chupa Chups continuously evolved its internal fitness in terms of dynamic capabilities and the manipulation of resources.

Criticism: An interesting contradiction to the focus on detailed and analytical processes in moderately dynamic markets as basis for organizational fitness can be identified when elaborating the case of S.A. Chupa Chups, namely in the areas of decision making and product innovation. S.A. Chupa Chups did not follow detailed analytical processes in certain areas of those two aspects. While the dynamic capabilities approach would suggest a formal decision making process especially at the highest level, S.A. Chupa Chups did not have any formal board meetings. As the corporate management, only family members, shared common culture and objectives, the time of decision making could be reduced to 24 hours as opposed to weeks or months. Furthermore, product innovations were mostly not derived from complicated laboratory analysis, but simply by listening to customers in the shops. This would suggest that fitness in moderately dynamic markets cannot be rigidly attributed to detailed analytical processes, but that simple, iterative and experiential routines might be more appropriate in certain areas.

4.4.2. Fitness in high-velocity markets

Rugged coupled landscapes describe the interactions and developments in high-velocity markets (Beinhocker, 1999; Levinthal and Warglien, 1997; Stacey et. al., 2000). They are characterized by rapid, unpredictable changes initiated externally, through actions of other actors in the landscape or natural disasters as well as internally through interactions within the company. Consequently, a company that seems to be climbing a fitness peak might suddenly find itself in a valley, due to the heaving and bucking of the landscape. The following section delineates the potential of dynamic fitness capabilities with the example of Sony, and points out a critical limitation in relation to the transformation of Siemens Nixdorf Information Systems.

Dynamic fitness capabilities in Sony: In the 1940s, Sony Corporation started off as a subsidiary of Tokyo Telecommunications (Helfat and Raubitschek, 2000; Schlender, 2002). Being shaped by the mother company's existing business, the focus was on repairing and upgrading radios. Over the years, Sony diversified into television products, transistors, and telecommunication among others. As the dynamic capabilities framework suggests, learning mechanisms rely on the selection of newly created knowledge and the incorporation of several advantages into the company's portfolio of strategies (Eisenhardt and Martin, 2000; Levinthal, 1997). Flexibility in the growing organization is maintained by relying on light weighted teams (Christensen and Overdorf, 2000; Galunic and Eisenhardt, 2001).

The rules guiding the search on the landscape are simple and experiential. An example is Sony's process for product development. Several R&D units within the company work on developing ideas, either interrelated or secretly. Fragile semi-structured processes allow the R&D team to self-organize, gather the necessary feedback for the learning process to ultimately turn the failure into a success. The rule is not about 'either/or' but "either/both". Given this frame one of Sony's development teams has been able and motivated to launch the Data Discman despite the failure of the initially invented 8cm single compact disc.

In this realm, fitness is enabled through working with just enough discipline and maintaining a state of creative tension. This allows the necessary flexibility for adapting to and shaping of the environment through formally and informally altering the resource base in scope and interaction.

Shortcoming of dynamic fitness capabilities: One of the major deficiencies of managing with dynamic capabilities in fast-changing markets can be seen in the aspect of culture. As

Christensen and Overndorf point out, the abilities and disabilities especially in large established organizations transcend processes and persist in values or culture. An example is the transformation of Siemens Nixdorf Information Systems (Bartlett and Goshal, 1999). This organization is a shadow organization of the Siemens AG, which merged with Nixdorf.

After a period of struggle subsequent to the merger, a new CEO was appointed to renew the spin out. The organization was radically restructured from a hierarchical single "business unit" into a decentralized matrix organization. Furthermore, amongst others new processes were designed to increase innovation and flexibility and thus, spark organizational fitness in the rapidly changing market. Despite several indications for improvement, viz. an increase in implemented innovative initiatives and a significant number of very committed key employees, the majority of employees met the change initiative with resistance. This can be attributed to three key issues: (1) unfamiliarity with change; (2) suspicion towards the change initiative and anxiety concerning job losses; (3) aspects of the German culture, e.g. the inability to exit hopeless projects and the bureaucratic attitude. As a result, the process of organizational renewal was tremendously slowed down.

This example demonstrates that an approach purely relying on dynamic capabilities thereby ignoring the larger social context, might fall short of improving organizational fitness. It might also show, that Teece et. al.'s (1997) argument of change as costly and time consuming is often underestimated. Consequently, the case of Siemens Nixdorf supports the earlier stated suggestion to investigate the transformation towards a dynamic capabilities management approach. The existing organizational as well as national culture are two important facets of such an investigation. Additionally, a point could be made concerning the size of shadow organizations. The case exemplifies, that there are limits concerning the maximal size of a feasible shadow organization. Even though Siemens Nixdorf seems small compared to the parent organization, Siemens AG, it is too large to bear the flexibility necessary for organizational spin outs.

Overall, the role of dynamic capabilities in the context of organizational fitness is to leverage the resource base into value creating strategies. According to the market specifics, dynamic capabilities are characterized either by strict or rather loose rules guiding the organizational search process. They enable the organization to focus its energy and information on manipulating internal and external competencies that in turn

enable adaptation to and innovation of the environment (Kelly and Allison, 1999). The means of innovating and adapting themselves are thereby continuously improved.

4.5. Learning and adaptation

Earlier in this thesis, the relation of dynamic capabilities and organizational fitness was established along with the importance of learning and renewal. It is seen as pertinent to denote more attention to the capacity of dynamic capabilities in terms of learning and, additionally, to adaptation.

In the definition of organizational fitness, learning is reflected as continuous learning and renewal (Beer and Eisenstat, 2002), and adaptation is not only seen in passive terms, but also as proactively enacting the environment (Schwaninger, 2000). These dimensions determine the two focal areas of the fitness concept.

The dynamic capabilities framework depicts learning on two levels: firstly, capabilities do trigger learning in the organization and, secondly, they have to evolve through learning mechanisms in appropriate learning environments themselves. Consequently, learning lies at the heart of the dynamic capabilities framework.

Through processes that integrate, reconfigure, gain and release resources, different learning steps are triggered, directly or indirectly in the organization, viz. incremental learning or resource deepening and double-loop or step-function learning (Teece et. al., 1997; Helfat and Raubitschek, 2000; Winter, 2000). As a result of learning the organization evolves along or breaks with the path traveled (Eisenhardt and Martin, 2000; Karim and Mitchell, 2000). This allows an organization to adapt to and shape the environment.

Internal renewal is seen as dependent on the flexibility of the processes involved. Simple rules enable greater flexibility as they evolve around newly created knowledge, while more complex rules impede on rapid changes due to the focus on existing knowledge (Eisenhardt and Martin, 2000).

The notion of adaptation and learning has been visualized in the following chart:

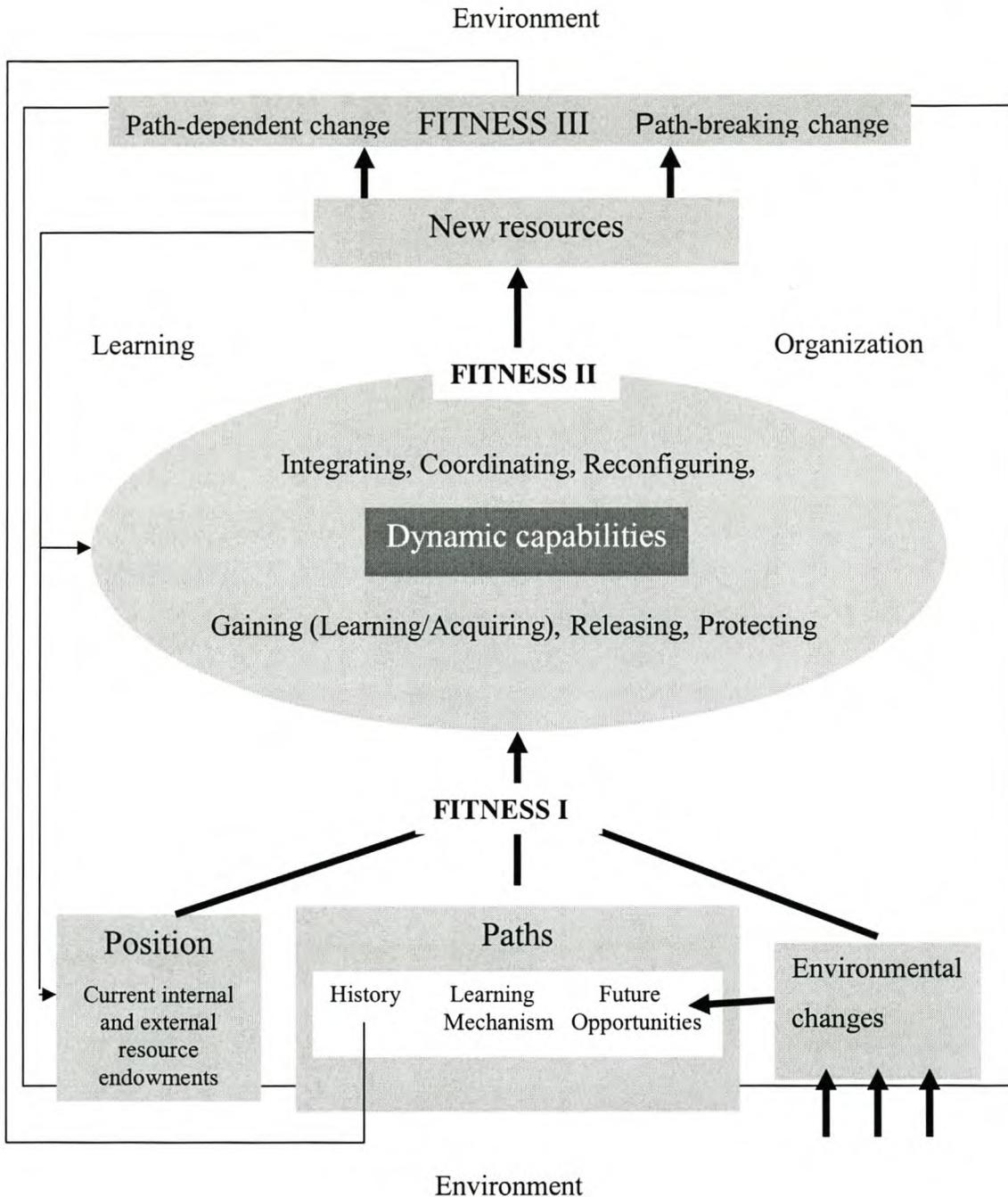


Figure 3: Internal and external fitness in the concept of dynamic capabilities

Figure 3 combined the view point of dynamic capabilities with organizational fitness. Three fitness levels have been identified in this figure: Fitness I describes the evolution of dynamic capabilities; Fitness II comprises the means of manipulation; and Fitness III covers the adaptability and the capacity to influence. In other words, levels II and I comprise the internal domain of organizational fitness, while level III describes potential toward the external world.

Fitness I: Fitness I describes the process of continuous improvement of dynamic capabilities. In a learning cycle the current processes, existing knowledge and the company's historical path are updated with changes and opportunities in the environment. Trial and error techniques with instantaneous feedback are used to enable purposeful improvement. The extent to which newly-generated and adopted knowledge is integrated is dependent on the anatomy of dynamic capabilities. Especially in environments with strong, yet inadequate organizational values, the radical renewal of capabilities depends on either acquisitions, the creation of heavy-weight teams or the use of shadow organizations (Christensen and Overndorf, 2000; Teece et. al., 1997).

Fitness II: Continuously improved or newly-created processes are the means for manipulating resources. The ultimate goal is to enable the evolution of or to develop innovative value-creating strategies. Sophisticated constantly improved human resource processes, for example, enable the organization to have access to key personal. Exit rules and processes facilitate the cancellation of hopeless projects. Coordinative management processes can facilitate intra- and inter-organizational learning to create new resources. As this example shows, capabilities constantly stimulate organizational fitness by depriving the organization of obsolete or inadequate resources, by increasing the efficiency and effectiveness of resource applications and by giving access to pertinent new resources.

Fitness III: The importance on both levels is to enable a double-loop process of collective learning activities that allows for optimizing the internal means of current efficiency and effectiveness as well as sustaining innovation (Christensen and Overndorf, 2000). Reaching this target establishes the flexibility and sophistication necessary to minimize costs and optimize time needed for path-deepening and path-changing improvement. The synthesis of these two learning loops enables a learning organization and triggers continuous renewal. The sophistication of these processes then impacts on fitness III.

Depending on the outcome at fitness level III, the organization adapts to or shapes the environment. The outcome is seen as rather predictable in moderately dynamic markets, while unpredictable in high-velocity markets (Eisenhardt and Martin, 2000). Therefore, it is suggested that a company should follow several advantages in aggressive environments.

There are several points that demand further attention within the discussion of adaptation and learning. The fitness chart of dynamic capabilities embeds the learning organization within its environment. It is indicated that the organization interacts at certain stages with the external world (Gulati et. al., 2000). The argument here is that interaction is a the key

to determining the strengths and weaknesses of the dynamic capabilities framework as a relevant concept for organizational fitness.

Furthermore, the concept of organizational fitness highlights the importance of leaders, managers and employees in the organization (see e.g. Levinthal and Warglien, 1999; Beer and Eisenstat, 2002; Kilroy and McKinley, 1997). The subsequent question is in how far the framework of dynamic capabilities does define the role of individuals. Therefore, the following sections will discuss the sophistication of dynamic capabilities in considering the key role of the environment and the organization as a social system.

4.5.1. The role of the environment

A holistic approach towards organizational fitness perceives the organization as a sub-system of the larger whole. It is stated that the organization strives for development by determining, reviewing and reinventing its distinctive competence in the environment (Normann, 2001; Schwaninger, 2000). Additionally, fitness approaches point out that networks of actors are interdependent with other networks across organizational boundaries on the fitness landscape in terms of searching as well as deformation of the landscape. Consequently, the environment is key for both learning and renewal as well as adaptation. The following section discusses the importance of the environment from a dynamic capabilities point of view.

External stimuli and feedback are described as inputs for the evolution of dynamic capabilities (Zollo and Winter, 2002). Technological opportunities in the market and information from network partners open new strategic options for an organization (Teece et. al., 1997; Gulati, 1999). Similarly, frequent readily available new knowledge constitutes the base for knowledge selection in high-velocity markets (Eisenhardt and Martin, 2000). In other words, the organization relies on external knowledge and processes, technological advances and relationships in building dynamic capabilities. As such interaction with the environment enables the evolution of dynamic capabilities as drivers for organizational fitness.

Besides, processes manifest the connection with the external environment (Galunic and Eisenhardt, 2001). They align the resource base across organizational boundaries (Gulati, 1999). Alliances or customer relationship management are examples of this. The degree of interaction with the environment is thereby a function of horizontal, vertical and lateral integration as well as historical engagement in networks with e.g. suppliers, customers or

distributors (Teece et. al., 1997; Gulati et. al., 2000). Consequently, companies exert resources from unique networks across organizational boundaries.

The main emphasis concerning the environment is, however, on inter-organizational relationships. Organizational networks are seen in the light of competency enhancement as well as competency traps (Gulati et. al., 2000). The lock in effect is thereby seen as related to the strength of membership ties with strong – highly regulated ties – being more rigid, than loose relationships. At this state in time investigations only suggest the potential lying in further analysis of evolution within networks transcending organizational boundaries.

Within the learning cycles of dynamic capabilities information and knowledge stemming from the environment are seen as important inputs and as part of an extended resource base. The main area of concern is relationships within the immediate environment and their implications concerning flexibility and adaptability. The notion of interdependency on the fitness landscape specifically with reference to deformation is not attended to in this context, nor is the potential of formal and informal relationships across the immediate organizational environment.

4.5.2. The role of individuals in the learning organization

The dynamic capabilities approach centers on resources, capabilities and competencies of an organization. These patterns evolve through human interaction. Consequently, individuals in the organization are of key importance in enabling an organization's functioning. Surprisingly, little attention is however given to the role of individuals in the organization, i.e. leaders, managers and employees.

The framework of dynamic capabilities recognizes the importance of capable managers for the purpose of renewing competence in changing environments (Teece et. al., 1997). In the entry state, for example, a company's position, its abilities and disabilities, and its strategic options are seen as largely determined by the experience, skills and relations of its founder(s) (Holbrook et. al., 2000). McGuinness and Morgan (2000) critically add that in later stages of the evolution the framework assumes managers to be capable of identifying and controlling dynamic capabilities.

Top managers could be perceived as staying at the center of resource manipulation, as designers that manipulate interaction (Levinthal and Warglien, 1999). They could be seen

as the ones who develop the rules for the game, who decide to what extent employees are empowered or to what extent the responsibility rests on their own shoulders. The organizational form supported is decentralized with autonomy (Teece et. al., 1997). Organizations are seen as being high-flex (Teece, 2000). This in turn would support responsibility and accountability or self-organization throughout the organization.

It is also stated that the emphasis is on codifying tacit knowledge and even processes (Teece et. al., 1997; Zollo and Winter, 2002). This would make operations independent of key individuals so as to facilitate replication. The aim is to circumvent the impediments stemming from intra-organizational conflict (Amit and Schoenmaker, 1993), bounded rationality (Burgelman, 1996), and managerial cognition (Tripsas and Gavetti, 2000). Contrary suggestions deny the potential of codification, due to the tremendous amount of tacit knowledge involved in dynamic capabilities (Eisenhardt and Martin, 2001).

Overall, the framework does not study the role of either leader, or managers or employees in-depth. Only recently, Galunic and Eisenhardt (2001) referred broadly to the role of managers as entrepreneurs, guardians of the culture and ambassadors of the organization. This is, however, so far one of the only indications of managerial behavior. The role of employees could be assumed in relation with resources. Generally seen, no clear indication can be given concerning the role of human beings within the current level of sophistication of dynamic capabilities.

4.6. The essence: organizational fitness through dynamic capabilities

The preceding discussion related the concepts of organizational fitness and dynamic capabilities to each other. The role of capabilities for achieving and sustaining fitness has been delineated. Furthermore, the frameworks contribution to learning and adaptation has been shown emphasizing the role of the environment and individuals within the organization. The insights gained throughout this chapter will now be summarized shortly.

Dynamic capabilities are the means of sensing and seizing opportunities, opportunities that enable an organization to adapt and shape the environment, to walk towards peaks on the fitness landscape. Opportunities are, however, not found within the environment, but derived from organizational competencies. Competencies consist of assemblies of mostly intangible resources that are embedded in organizational and strategic processes and routines. Routines and processes are evolving over time through various means of

learning. Consequently, dynamic capabilities leverage internal abilities or internal fitness for the purpose of establishing and sustaining fitness for the environment.

The organization is engaged in learning and renewal on two different levels: firstly dynamic capabilities have to be developed through learning mechanisms; and secondly, dynamic capabilities are often processes of learning. In both cases learning is a means of creation as well as extinction. As such an organization focuses its energies and information on learning, on greater efficiency and effectiveness, on changes and opportunities in the environment, on incremental renewal in the short-term and reinvention over the long-term thereby avoiding competency traps through continuous movement, trial and error as well as multiple choices.

The framework suggests this learning process should be generated according to the specifics of the environment. More predictable markets with stable boundaries for a significant time span, favor rather detailed and analytical processes guiding learning and renewal through variation towards a predictable outcome. Coupled landscapes, in contrast, are approached with simplicity enabling greater flexibility and open-mindedness towards newly created knowledge. The organization builds on a set of chances to hedge against unpredictability.

The environment is an important player throughout the whole process of learning. It delivers inputs and information that guide and enhance the potential of resource manipulation and capability building. The environment is, however, not the natural source and catalyst for value-creation, which is rather inside an organization. The organization form should be high-flex – decentralized and loosely coupled - and the roles of its actors are assumed as evolving throughout the learning processes.

Managing based on dynamic capabilities means high responsiveness through Schumpeterian innovation. Responsiveness hedges against earthquakes through flexibility derived from purposeful manipulation, tailored guiding principles and the seizing of a number of opportunities. Additional to the limitations of the dynamic capabilities framework established in chapter 3, two important aspects have to be highlighted. Firstly, there seems to be evidence that the classification of dynamic capabilities according to market environments might be too rigid. Secondly, the dynamic capabilities framework predominantly neglects the importance of values and culture as obstacles to change and flexibility.

4.7. The importance of the fitness concept for building dynamic capabilities

There seems to be evidence that not only dynamic capabilities can be perceived as a means toward organizational fitness, but also the insights gained from fitness concepts assist in creating the responsiveness aimed for through dynamic capabilities. In the following section, several related aspects will be discussed, viz. mapping dynamic organizational fitness capabilities, guiding energies and information through values and perceiving the organization as a social system of interaction.

Fitness landscaping opens the possibility of mapping the fitness of an organization or of organizational patterns on a landscape. After framing the picture, it can be zoomed closer or extended in width and height (Lissack and Roos, 1999). This allows a company not only to get an overview of its competitive environment, but also to visualize internal fitness aspects, such as dynamic capabilities.

An organization could, for example, determine its resources as peaks and dynamic capabilities as rivers. The smoother the processes, the flatter the river (Beasley, 2002; Kenworthy, 1997), the more innovative the resources connected by processes, the higher the resource peaks. Such an analysis could be done on a three dimensional level indicating the performance of e.g. business units, the organization and the ecosystem. On the business unit level for example the internal sophistication in relation to the whole organization could be measured or opportunities for synergies could be detected. The analysis could also indicate potential lying covered within the ecosystem or threatening aspects therein.

There is evidence that the purposefulness of processes of interaction is dependent on values and vision (see e.g. Christensen and Overndorf, 2000; Lissack and Roos, 1999; Normann, 2001). Values should be meaningful in the larger whole, thereby giving an organization its distinctive role (Normann, 2001). Guiding principles should be aligned around basic values (Lissack and Roos, 1999). As such dynamic capabilities should be incorporating rules that are in consonance with the values of an organization. Eisenhardt and Gulanic (2001) treat organizations as social communities that encompass both competitive and cooperative aspects in their culture or value system. The circle is closed by a set of rules, viz. sensing and seizing external opportunities, interdivisional competition and management support for orphaned divisions. These rules reflect the beliefs of individuals in the organization, stimulate self-organization, and thus round up the smoothness of a system working with dynamic capabilities.

Finally, an organization cannot be seen merely as a system of resources, processes, and capabilities. Rather, all three patterns are embedded in a system of human interaction, in a social system. Indeed codification suggests that key individuals are replaceable with ease (Zollo and Winter, 2002), but due to informal ways of interaction, individuals will always give a special touch to the performance of an organization. Dynamic capabilities are a means of determining: how critical decisions are made about this social system; how interactions take place internally and in the larger whole; and how human resources are gained, trained and released. These decisions do, as path dependencies suggest, lead to longer-term commitments (Normann, 2001; Teece et. al., 1997). Dynamic capabilities are also means of leadership, of enabling self-organization or employee empowerment. Therefore a sound understanding of the organization as a social system or community is seen as crucial to the dynamic capabilities framework.

As such the dynamic capabilities framework can gain from fitness concepts in several aspects. The preceding examples were only a fraction of the contributions. An additional example can be seen in Kelly and Allison's (1999) stages of organizational fitness for co-evolution as a map of the sophistication of dynamic capabilities.

4.8. Summary

The preceding chapter investigated the relevance of dynamic capabilities for organizational fitness. Evidence was found that dynamic capabilities trigger learning and renewal in the company, thereby preparing the organization for adaptation to and shaping of the environment. It seems however, that dynamic capabilities do not capture the holistic perspective that organizational fitness requires. The framework rather simplistically suggests a learning evolution towards organizational fitness without paying too much attention to explaining detailed patterns such as human interaction, the role of individuals in the organization and the essence of the change triggered. Besides, and more importantly, a hybrid approach integrating both types of dynamic capabilities could be more suitable for the purpose of organizational fitness. Therefore, the following chapter discusses the relevance of complexity thinking for the conceptual upgrading of the concept of dynamic capabilities.

CHAPTER 5: The relevance of complexity science as a basis for developing dynamic capabilities to achieve organizational fitness

5.1. Introduction

Research in various disciplines like physics, chemistry, biology, computation, philosophy and others has started challenging the Newtonian insights of cause and effect which have dominated perception over a long period (Maguire and McKelvey, 1999). Despite the new theory, referred to as the complexity theory still not being a distinct new field, evidence suggests that the formerly established laws and rules do no longer account for the patterns occurring in today's environment (Kappelhoff, 2001; Lissack, 1997). The main criticism concerns the matter of predictability; in other words, the suggestion that every cause is followed by an anticipative effect (Lissack and Roos, 1999). Complexity science extends this simplistic argumentat by concepts explaining the role of uncertainty, unpredictability and irregularity of patterns such as self-organization, emergence, non-linearity or complex adaptive systems.

Its application into the business world originated in the Santa Fee institute in Santa Fe (Lissack, 1997). At this institute, the concept was leveraged into explaining patterns in the world of workers, organizations, industries and markets. The research was enabled in this scope by a sponsorship of Citicorp. The organization was looking for a new paradigm allowing managers to cope with and benefit from the current circumstances in the business world– e.g. speed, change and unpredictability. Citicorp intentionally sponsored the research despite knowing that this research stream, if treated properly, does not claim to articulate best practices, a point that is often overlooked in current applications (see also, Leibold et. al., 2002).

The logical concern at this point of the study is the question about the relevance of complexity theory for enabling dynamic capabilities, thereby ultimately leading to organizational fitness. In order to answer this question, an understanding of the complexity theory, its novelty and managerial implications is crucial. Furthermore, it is seen as pertinent to give a short introduction in connection with organizational learning and knowledge management. Given this background, a general platform of the relevance of complexity management for dynamic capabilities will be given, which will be more concisely discussed in the following chapter.

5.2. The aura of complexity

The term complex means that something is “composed of two or more parts, not simple, intricate. A conceptual whole made up of complicated related parts” (Lissack and Roos, 1999, p. 2). Consequently, a complex thing consists of parts/nodes that are connected through links. Interrelationships, interdependencies or interactions – intangible patterns – describe such links. Examples of such systems of nodes and links can be found in natural, mathematical or social phenomena. They comprise teams, species, ecosystems and so forth.

Complexity science and complexity management build on those intangibles by adding a temporal dimension. Factors such as speed, change and uncertainty render formerly predictable outcomes less and less possible. Simultaneously, systems evolution is sensitive in differing degrees to its initial conditions. Thus complexity thinking attempts to bridge the gap and to balance between the past, the present and the future.

Drawing on contributions from various fields complexity science has been developing a mindset, a language and metaphors to untangle, picture and constructively manage the swirl of rapidly passing events. The use of complexity metaphors is seen as allowing managers to view their organizations differently, and thus to run them differently to the competition (Lissack, 1997; Leibold et. al., 2002). Complexity management is therefore the branch, which deems to carefully apply complexity theory in organizational science.

The important point is careful application of the insights generated by complexity theory. There seems to be a struggle in its managerial applications concerning the integration of social phenomena. Some criticize the careless transformation of the theory into traditional approaches (Stacey et. al., 2000), while others foresee the extinction of complexity science due to its aversion towards social aspects in organizations as living systems. Therefore, an attempt is made to avoid losing the novelty inherent in complexity thinking, while highlighting the importance of human beings (agents) and their social interrelations in complex adaptive systems.

5.3. The lingua of complexity management

In recent years, management lingua has been enriched or flooded with a great number of new concepts, principles or metaphors stemming from research in the field of complexity. An introduction covering all facets of this new “language” is beyond the scope of this study and does not serve the objective followed here. Nevertheless, it is important to note the attempt to create a new mindset and setting the limits for it by introducing a language different from existing communication, thus ideally avoiding the rigidity of existing terminology.

The focus in this study has been reduced to, firstly, the units of analysis of complexity science namely agents and complex adaptive systems. Additionally, the most popular and pertinent concepts of complexity management will be delineated and discussed. A number of additional metaphors will be introduced throughout the presentation.

5.3.1. Agents and complex adaptive systems (CAS)

The smallest unit within complexity science is referred to as an *agent*. Agents can be individuals, groups or coalitions of groups. Their behavior is determined by what Anderson (1999) refers to as schemata – images of the salient complexity of the larger environment – and recipes – feedback-triggered sequences of action applied in routine situations. Additionally and more importantly, agents act out of impulse or out of the situation, i.e. triggered by internal dynamics and conflicting constraints in interaction (Stacey et. al., 2000).

Agents interacting with each other have the ability to self-organize and redirect efforts (Leibold, 2002). Like a single ant is not able to exhibit any effect on the system, so are isolated agents (Beinhocker, 1997). According to Letiche whose insights draw on phenomenology according to Bergson, the process of knowing emergence is intuition which is self-organizing and emergent itself, i.e. a “non-cumulative direct unreasoned manner” (2000: 555). Consequently, an emphasis in complexity is placed on both internal dynamics and on the self of the life-experiencing individual, which is simultaneously coherent and incoherent.

By the process of intuition, Galilee for example found out that our planet is not flat, but round. This revolutionary finding would, however, not have made any impact on our society and thinking, if Galilee had kept this knowledge to himself. Moreover, interaction

and proclamation triggered a controversial discussion, i.e. energized the system that changed the perception of the world. His perception was however only accepted after a critical mass of support was reached and “tipped” the system towards a new attractor. This is the point where complex adaptive systems (CAS) come into play.

Complex adaptive systems are per definition consistent of two or more agents who are connected to one another by feedback loops (Brown and Eisenhardt, 1998; Anderson, 1999). Within this system, agents are behaving in their local context (Maguire and McKelvey, 1999). Because agents are acting intuitively and are interacting within a net of feedback loops, behavior of CAS is surprising and hard to predict (Casti, 1994). Nevertheless, order is seen as a corollary of interaction at lower levels of aggregation, which manifests itself at higher levels (Anderson, 1999).

On a larger scale, two or more CAS can form another CAS, thus smaller CAS become the “adaptive agents” in larger CAS (Maguire and McKelvey, 1999; Kappelhoff, 2001). In this sense, CAS are not limited to a specific entity, but reappear recursively in unique forms. Besides, CAS are interdependent with some larger environment (Anderson, 1999). This is reflected in the inter-linked examples of CAS such as teams, groups, networks, ecosystems and so fourth. Consequently, reductionism and holism are complementary strategies in analyzing such systems.

According to Beinhocker (1997), CAS are open, dynamic systems made up of interaction between agents. In this sense, CAS are in a state of bounded instability that is triggered through flows of energy streaming internally and from outside the system. The degree of instability is seen as a function of connections or interaction as in Kauffman’s NK-model and NK(C)-model (see e.g. Kappelhoff, 2001). Additionally, these open and dynamic systems exhibit the ability for self-organization and emergence (Beinhocker, 1997). This enables CAS to adapt to and to (co)evolve through internal and external changes as well as to shape the environment.

At this point, it seems appropriate to refer to a controversial point within complexity theory. The question is whether CAS can be associated with the existing view of entities such as organizations or industries. In this respect, one way seems to be simply to accept the definition of entities as it has existed over years. Nevertheless, the definition of CAS includes interaction, openness and dynamics, therefore potentially suggesting a move away from traditional entities toward open systems and processes (see e.g. Stacey et. al., 2000). The implications of both approaches will become clear in the discussion of the following principles.

5.3.2. Important principles

Within the metaphorical multitude of complexity thinking the concepts of non-linearity, edge of chaos, self-organization, emergence, coherence, fractal structures, co-evolution, fitness and selection have been chosen as being the most pertinent for the purpose of this study. The description and debate of those principles enables establishing the mindset striven for by the framework.

In contrast to the Newtonian mindset characterized by linear or proportional cause-effect relationships, complexity science emphasizes the existence and importance of *non-linearity*. Uncertainty and unpredictability are reflected in the fact that a cause or a number of causes can result in either small or large effects or simply not impact (Anderson, 1999). The general understanding is that smaller alterations appear frequently, while larger changes happen at unpredictable intervals the frequency of which is smaller in absolute terms. Beinhocker (1999) refers to this phenomenon as punctuated equilibrium.

A related notion are so-called tipping points or points of inflection. In this state, systems are seen as reaching a critical mass and as taking off (Oliver and Roos, 2000). The consequence of tipping points can be to the advantage of the one and the detriment of others. Independently of the cause-effect expression, the importance of initial conditions is however underlined. This means that minimal differences in the initial state can lead to totally different evolutions or outcomes (Anderson, 1999). This is referred to as butterfly effect². Additionally, it indicates the temporal dimension of complexity with past, present, and future being intertwined (Letiche, 2000).

Complexity science argues that a system is able to emerge to a higher level of order (Anderson, 1999). The highest potential therefore is seen in a state called the *edge of chaos*. This state of bounded instability is seen as the most nutritious ground for innovation and creativity because the system is perceived as having the highest level of energy. It is pictured as a state between stasis and chaos which both symbolize death of the CAS (see e.g. Pascale, 1999; Brown and Eisenhardt, 1998). In the space in between these extremes a system is seen as operating in relative balance between rigidity and randomness. The paradoxical quality of the edge of chaos maintains the system in constant flow and seeds further (co)evolution.

² Butterfly effect: This concept is used for explaining the complexity in weather developments. It is commonly expressed as the potential that a butterfly flapping its wings in Capetown, can cause a tornado in Toronto (see e.g. Leibold, 2002).

At the edge of chaos agents are seen as intuitively exhibiting *self-organization* in their search for order in the “messiness” (Pascale, 1999). Self-organization or autocatalysis is consequently not initiated by a superior force, but a bottom-up phenomenon (Beinhocker, 1997). In other words, something is self-organizing if it tends to become more organized when left to itself (Shalizi, 2001). Self-organization can be initiated through formal and/or informal interaction between agents, CAS or both who dissipate energy derived from internal dynamics, feedback or the external world (Leibold, 2002).

Self-organization is also seen as a means of self-retaining the edge of chaos situation. This is referred to as self-organizing criticality (Kappelhoff, 2001).

Complementary to the concept of self-organization is the notion of *emergence*. The general definition is that the whole is more than the sum of its parts. More dynamically, it is the consequence of local interaction between agents (Stacey, 2000). An often cited example of emergence is the Internet. Several decades ago, computer specialists at various places around the world were working autonomously on connecting computers to networks. They were following different purposes and working on different scopes. None of them anticipated the avalanche set free by their efforts. Still today, the Internet is moving and evolving in unpredictable dimensions. In other words, their intuitive activity revealed self-organization, which transcended its original elements, i.e. emergence. On a smaller scale, solutions might emerge from direct interaction, e.g. the invention of a new product or service.

Human beings are complex and differ from one another in sourcing and applying energy consciously or unconsciously (Leibold, 2002). In interaction with other human beings or agents, they strive for *coherence* - “the alignment of context, viewpoint, purpose and action that enables further purposive action” (Lissack and Roos, 1999, p.2). The options generally available to agents in interaction are thereby to compete, to collaborate or to walk away. Only the former two are creating energy that might lead to purposeful action.

Closely related to the concept of coherence is the notion of conflicting constraints (Stacey et. al., 2000). This metaphor implies that interaction among different agents is influenced by formal and informal power exhibited by the participating agents. Thus, conflicting constraints determine the internal dynamics of the system. The options taken by agents determine how and whether those constraints are overcome and what implications arise for the evolution of the system in terms of creativity, innovation or catastrophe.

Coherence can also be observed in the notion of *fractal structures*. The latter describes an effect similar to the well-known peer-pressure, but in a more neutral context. As in society, smaller groups in organizations tend to be shaped by the context, culture and dynamics of the larger whole (Leibold, 2002). This pattern is described as self-similarity (Klenk et. al., 2000). The phenomenon is seen as a driver for coherence and co-evolution.

Agents and CAS exhibiting autocatalysis and emergence are interconnected. They cooperate and/or compete in a network of networks in order to survive (Stacey et. al., 2000). Evolution is consequently no longer only a matter of the fittest will survive out of its own efforts, but it also depends on adaptation to and the shaping of the environment. In this sense, complexity theory uses the term *co-evolution*.

In the process of co-evolution, agents, systems or networks deform each other's as well as their own *fitness landscape*. The extent of deformation or ruggedness is seen as a function of connections within and between the CAS. The ideal degree of ruggedness according to Kauffman is found at a moderate level of connectivity (as in Kappelhoff, 2001). Fitness is increased by searching the landscape through e.g. adaptive walks for the highest peaks, i.e. the highest fitness level or the global optima (see e.g. Beinhocker, 1999). As the landscape itself is constantly heaving and buckling, the search process cannot be built on prediction.

Lastly, the concept of *natural selection*, even though stemming from the Darwinian concepts, merits attention here. Natural selection means that every system, independently of its efforts, is a potential candidate for extinction. The reason is that despite advanced technology leading to increased transparency and real-time information, there is still no such thing as an omniscient being or entity – not even the CIA.

5.3.3. Complexity thinking in business

On the basis of the preceding introduction to complexity thinking, the mindset will now be discussed in the business context. The key statement is thereby that mental models matter, and complexity thinking attempts to be a new mental model.

Instead of considering the importance of organizations or industries, CAS form the new unit of analysis. CAS delineate recursive networks of interaction between agents, CAS or both. The interesting alteration is that there is strictly speaking no such thing as rigid boundaries framing the space relevant for CAS. The reason therefore is that CAS interact

both directly or indirectly in competitive or cooperative ways. Ignorance of this aspect is impossible because CAS constantly explore and exploit deforming landscapes.

Lissack and Roos (1999) visualize this situation with the example of Apple and Xerox. Xerox invited a team from Apple for a presentation of their latest research findings. Secrets got revealed because of the assumption that Apple wasn't a competitor of Xerox. However, the visit introduced the Apple team to the mouse and the graphical interface, which allowed Apple with the Macintosh a major breakthrough in the computer industry. As a result not only Apples directly connected landscape was deformed, but Xerox's landscape, too.

It is therefore critical to find the appropriate frame – even though a heuristic solution - for the landscape for both explanatory and measurement purposes. Because systems are not able to consider the whole globe, it is important to draw the appropriate boundaries for the landscape or to consider different scopes for different purposes. Xerox obviously drew them too tight, so did IBM when disregarding the potential of Microsoft and Intel (Oliver and Roos, 2000).

Complexity thinking offers a variety of potential frames or modules such as agents, CAS, patches³, fractal structures, ecosystems/socio-cultural system⁴ and landscapes. All of them allow the observer better to grasp the complex reality and its underlying patterns, to work with modules, to untangle complexity and to get an impression of the status quo or map potential future scenarios.

Additionally, these modules enable agents throughout the system to understand the importance of interaction for evolution. Agents, CAS or ecosystems interact in collaborative and/or competitive patterns. They exhibit the potential to redirect evolution and self-organize which potentially results in emergence. Note that emergence might be self-generating, too.

Self-organization is seen as most likely in close vicinity to the edge of chaos. The reason for this is that in a state of bounded instability and diversity systems are seen as being most creative and innovative. They benefit from feedback-loops and might even be able to identify tipping points in their early stages. Consequently, they operate in a more proactive way, as shaper of rather than adapter to the landscape. One of Sony's fairly

³ For the purpose of simplifying the solution of complex problems, Kauffman introduced the potential of clustering the whole in a number of distinct, coupled patches. Patches are seen as working selfishly, but co-evolving through constant interaction (Lissack,1997).

⁴ In contrast to biological systems that self-organize through genetic codes, socio-cultural systems self-organize through cultural codes. In other words, culture is the DNA of a social system (Leibold et. al., 2002)

autonomous acting product development groups for example struggled when facing the failure of one of their inventions. Instead of giving up, they intuitively self-organized and found a new application.

Constant flow or bounded instability is most likely with a moderate level of connections and a relative balance between rigidity and randomness, between simplicity and diversity, between logic and experience (Brown and Eisenhardt, 1998; Letiche, 2000). This scenario enables the system to benefit from opportunities arising inside and outside the system. Agents operating in this state are seen as striving for a higher level of order, thus intuitively developing coherence.

Nevertheless, human beings, who act selfishly, do not always see the highest payoff in tailoring all their energy towards the development of the organization. Nor are they anxious to proactively seek new ways of doing things. This underlines the important role of leadership in the organization. Complexity science sees theirs as a dual role. On the one hand employees have to be motivated to contribute to organizational performance through enacting an appropriate reward system, communicating the normality of making small mistakes, nurturing relationships and so forth (Yongblood, 1997). And on the other hand, a clear understanding of the general direction has to be given, while simultaneously inertia has to be overcome by disturbing the system.

Because of natural selection, emergence and the potential of mistakes, systems are constantly facing the potential of slowdowns or worse extinction. Mistakes and slowdowns are seen as necessary for the purpose of reaching higher fitness levels. Selection and extinction, in contrast, are not determined by the organization, but intangible phenomena of the external world. Because of high sensitivity and a high level of innovation, extinction is seen as less likely at the edge of chaos. Ultimately, there is, however, no guarantee.

In this sense, the mental model developed through complexity metaphors or language enables managers to visualize the extremely dynamic business environment. It shows the limitations of managerial influence, but, and more importantly, it does not create a discouraging atmosphere. Moreover, an encouraging lingua is used that enables managers to deal with and benefit from those dynamics.

5.4. Complexity management in perspective

Within the science of complexity a controversial discussion about what truly constitutes complexity and the related metaphors is currently evident. Kappelhoff (2001) extensively discusses the question concerning the novelty of complexity management, especially in the context of social science. Similarly, Stacey et. al.'s (2000) elaboration of the theory and their criticism of the current literature is directed towards this. To discuss this controversy three important issues have been chosen, namely the issue of novelty derived from complexity metaphors, the search for order and the role of managers.

5.4.1. The novelty of complexity science

Complexity theory in the organizational and managerial context claims to have the potential for a new paradigm, even though careful applications prove the approach has not yet matured. Within the current state of sophistication authors such as Kappelhoff (2001) or Leibold et. al. (2002) recognize the general continuity of complexity theory with insights gained in evolutionary theory e.g. dynamic capabilities. Beyond pure adaptation and shaping, complexity theory, however, explicitly includes the matter of non-linearity. Internal dynamics and the external environment are altered in non-linear self-generating ways. Additionally, the introduction of CAS altered the perception of internal and external from e.g. an organization with boundaries – even if permeable – to recursively occurring systems and networks of interaction.

In a different approach, Letiche (2000) sees the potential of complexity theory as being phenomenal. He suggests a hybrid, ironic conceptualization of complexity incorporating both logic and experience. In his theory logic should be understood as experiential itself, i.e. evolving and changing. Only this precondition could enable complexity truly to integrate time as well as to persist over time. Letiche concludes that the crucial aspect is to extend the focus on processes – internal dynamics – with a focus on the experiencing subject – self.

5.4.2. The search for order in life

In one of his publications Kauffman claimed that he was searching for a deeper theory of order in life in a spectrum as broad as possible: from the origin of life itself via the dynamics of evolution and ecosystems, the complexity of human societies to the global measurement of Gaia. His belief is that complexity theory will enable us to find such an understanding (translated and adapted from Kappelhoff, 2002: 18). The order Kauffman is referring to results from both self-organization and selection. Reconsidering the definition of selection, order is therefore a phenomenon that is unpredictable and intangible for human beings. The principle of emergence would be adequate for describing the underpinnings of order.

Despite unpredictability in absolute terms (positive or negative catastrophe), non-linearity and emergence do in many instances include developments that either follow direct, immediate cause-effect relationships or, in a wider sense, effects within a general direction (Anderson, 1999). The question arising from these evolutionary options is, to what extent can and should managers interfere in the system. Authors such as Brown and Eisenhardt (1998), Leibold et. al. (2002), Lissack and Roos (1999), or Pascale (1999) argue in this context that simple rules communicated by managers would facilitate self-organization and emergence. Another suggestion is that managers should hedge against uncertainty through populations of strategies developed around the evolving core competencies of the organization (Beinhocker, 1999).

5.4.3. The role of leadership and management

Stacey et. al. (2000) negate the potential of managerial interference with the argument that rules that allow the adaptation or shaping of the environment, i.e. moving to a new attractor, do not exist pre ante. They argue that attractors emerge through internal dynamics inherent in the process of (co)evolution (see also Maguire and McKelvey, 1999). Consequently, managers can neither choose attractors nor avoid any extinctive event with foresight.

Considering unpredictability in absolute terms, Stacey et. al.'s (2000) argument seems to go to the bottom line of the problem. Their criticism seems to be especially appropriate to many popular management guides suggesting a set of pre-specified rules as means of stimulating innovation within an organization. The suggestions made within complexity

science should however be understood in terms of rules being situational and experimental themselves.

Rules should be seen as managerial processes that evolve over time. Their aim is not to direct a system towards a certain attractor. Moreover, rules are the means of (re)focusing attention of agents, who are somehow inertial and selfish human beings, towards the purpose of the organization, and to catalyze bounded instability. They are used to establish context, to disturb the system and, simultaneously, to cultivate the organization (Yongblood, 1997). They allow organizations to increase their survival chances by building on a set of opportunities on several spatial and temporal scopes (Beinhocker, 1999). Consequently, rules are not determining behavior, but give direction and guide. In other words, the perception of a central controller is obsolete (Leibold et. al., 2002).

5.5. The relation of complexity science to organizational learning and knowledge management

In chapter 3 of this study, a model was developed to explain the role and nature of dynamic capabilities for establishing and maintaining organizational fitness. The model was based on three levels of fitness. Level 1 and 2 expressed the importance of learning for the evolution of dynamic capabilities and learning as dynamic capability itself. Furthermore, the dynamic capabilities framework highlights the importance of leveraging resources, especially knowledge resources, into value-creating strategies. It is therefore seen as pertinent to shortly delineate the relationship of complexity science to organizational learning (OL) and knowledge management (KM), before relating it directly to dynamic capabilities.

Based on the recognition of second generation KM approaches that not only individual, but also collective knowledge matters (McElroy, 2000), the discussion will draw no distinction between OL and KM.

It is evident that value-creation and competitive advantage are to a large extent determined by intangibles, such as knowledge (Leibold et. al., 2002). It is therefore important to, firstly, create – acquire or develop internally – and, secondly, apply knowledge throughout the organization to add value (Roos et. al., 1997). For this purpose, an environment for continuous learning, which is triggered by interaction and communication, has to be established (Engelhardt and Simmons, 2002).

Complexity theory seems to be beneficial for a learning environment in two respects. Lissack (1997) researched the pertinence of complexity metaphors for KM and OL. His research was based on Wittgenstein's statement, "the limits of my language mean the limits of my thoughts" (Wittgenstein in Lissack, 1997: 216). Besides, there are approaches going beyond the pure reliance on language. It is argued that CAS are indeed learning organizations and complexity science naturally explains the patterns underlying learning as well as knowledge creation and application in an organization (McElroy, 2000).

Lissack (1997) argues that complexity metaphors are a powerful tool for fostering responsiveness of the organization to its environment. He explains that the central task of systemic sense-making and knowledge creation is the conversion of conflict into co-operation through fostering coherence (1997). Common language and meaning as supplied by complexity thinking are an important part of this process. They are seen as increasing an organization's absorptive capacity and the agents' motivation for self-organization (Cohen and Levinthal, 1990).

Nevertheless, Lissack (1997) emphasizes that the language of complexity might not be pertinent in all departments of the organization. It should rather be the language of creatives or searchers and management. In cost-orientated departments of the organization it might have rather hindering effects (see, also Levinthal and Warglien, 1999). Two case studies – Biotech and Internet – visualize the benefits of using complexity lingua. The crucial pattern is to engage in continuous communication to create mutual understanding of the metaphors and models applied. Likewise to dynamic capabilities, complexity language should be understood as equifinal, i.e. sound detailed understanding is emergent (Letiche, 2000).

In a different approach complexity science is seen as explaining the pattern underlying a learning organization. McElroy (2000) points out that KM and OL recognized that knowledge is the natural product of innovation schemes inherent in living systems. They also agree that creative tension is the prerequisite to innovation or learning. Both knowledge creation (learning) and application are about sharing (Roos et. al. 1997). Sharing is a quest for communication and interaction. In CAS agents interact internally and with the larger whole thereby exhibiting patterns of self-organization and emergence. It is evident that the highest likeliness for self-organization and emergence – innovation – is found in vicinity to the edge of chaos. Including the phenomenon of natural selection, complexity theory also identifies the learning attempts important for evolution/fitness.

Hence, it naturally selects pertinent knowledge generated (Engelhard and Simmons, 2002).

Further contributions to OL and KM can be derived from concepts such as coherence, landscaping and feedback loops. Coherence explains the emergence of identity, values and culture that facilitate learning in the sense described by Lissack (1997). Landscaping as explored by Oliver and Roos (1999) enables entities to map individual, group and organizational knowledge in the larger context. It is a tool for benchmarking the current knowledge as well as visualizing opportunities for future knowledge deepening in consistence with the impact of paths dependencies. Finally, complexity science highlights that agents interact through feedback loops. Consequently, CAS not only learn in single-loops, but also in double-loops.

Complexity science is a dynamic and systemic approach to organizational management. It explains the dynamics underlying system performance. This is crucial for both OL and KM. It can therefore be concluded that both concepts can gain value from integrating complexity management. As learning is also seen as a crucial pattern of dynamic capabilities, an indirect connotation between complexity science and dynamic capabilities can be assumed.

5.6. Is complexity science relevant to dynamic capabilities?

Given the background of complexity science and its relation to OL and KM, it seems that the relevance of complexity science for the purpose of enabling organizational fitness through dynamic capabilities can be established. Important contributions to a general synthesis of these approaches have been made by Kathleen Eisenhardt and her colleagues as well as by Ron Sanchez. The work by Eisenhardt and colleagues attempted to overcome the weaknesses of the original dynamic capabilities approach of Teece et. al. (1997) by integrating complexity science into the concept (see also Eisenhardt and Martin, 2000; Brown and Eisenhardt, 1998; Galunic and Eisenhardt, 2001; Eisenhardt and Galunic, 2000; Eisenhardt and Sull, 2001). Sanchez (1997) in contrast claims the potential for a new conceptual approach of strategic management based on complexity science and dynamic capabilities respectively. Both approaches will be outlined in the following section.

5.6.1. Dynamic capabilities in high-velocity markets: a matter of complexity science!

Eisenhardt and Martin (2000) introduced the distinction between dynamic capabilities in moderately dynamic and high-velocity markets (see chapters 3 and 4). High-velocity markets are characterized by rapid change and unpredictability. In order to navigate under those conditions, Eisenhardt and Martin (2000) point out the importance of creating an environment for self-organization through dynamic capabilities that are embedded in a small set of simple experimental rules (see also Rindova and Kotha, 2001).

Simple experimental rules are seen as catalysts for ongoing co-evolution horizontally and vertically (Galunic and Eisenhardt, 2001; Moore, 1993). Co-evolution is maintained, firstly, by fostering collaboration through flexible adaptive boundaries and, secondly, by rewarding individual business performance rather than collaborative efforts (Eisenhardt and Galunic, 2000). Instead of determining behavior and activities, rules are a means of guiding and giving direction (Eisenhardt and Sull, 2001).

In high-velocity markets, competitive advantage is only temporary. Therefore, continuous innovation building on a number of opportunities is essential. The dynamic capabilities approach recognizes that innovation is most likely in a state of tension, thus at the edge of chaos (Galunic and Eisenstat, 2001; Brown and Eisenhardt, 1998). This state is seen as enabled through a shared identity in an organization of modules that compete and collaborate with each other. Thus, a balance between order and disorder is crucial and seen as partly initiated through the set of rules and guiding managerial behavior. Each of these patterns is thus a means to continuous transformation itself (Rindova and Kotha, 2001, Letiche, 2000). Consequently, change or transformation can be seen as the only constant in the system over time.

In this sense, high-velocity markets require the incorporation of complexity science into the dynamic capabilities framework. Nevertheless, the approach is still to a large extent focused on rather rigid organizational boundaries within which co-evolution takes place. Sanchez's (1997) cornerstones address this issue.

However, before determining a relational frame, it seems appropriate to mention the criticism pointed towards complexity thinking. Galunic and Eisenhardt (2001) state that complexity thinking rigidly relies on insights gained from "hard" science. Organizations are, however, socio-cultural communities (see, also Leibold et. al., 2002). It is therefore seen as crucial to integrate insights from sociology and psychology into complexity science. This

question has also been taken up by Letiche (2000), Kappelhoff (2001) or Anderson (1999), who clearly point out the current limitations and potential solutions for complexity science within the frame of social science.

5.6.2. Sanchez's cornerstones towards a synthesis

Sanchez (1997), too, recognized the potential of incorporating complexity science with dynamic capabilities. In line with the understanding of Eisenhardt and colleagues, he recognizes that traditional approaches towards strategic management are only situational remedies that might be valuable in slowly changing environments but not in fast-changing markets. In this sense, he established a general synthesis along four cornerstones – dynamic, systemic, cognitive, and holistic. This view point has been adapted for the purpose of this study.

Dynamic: The only constant variable in today's environment is change, which is reflected in both the dynamic capabilities framework and complexity science. As the external environment – market preferences, technologies, institutions, culture, the political landscape – changes over time, so need the activities an organization is able to perform and the capabilities that give rise to potential opportunities to evolve over time. The corollary of change is, however, the rise of uncertainty and causal ambiguity concerning the nature of critical resources and processes.

Systemic: Organizations in a complex environment are no longer isolated, closed systems in competition against each other. Rather, organizations are seen as complex, dynamic and open systems – CAS - embedded in a larger system of resources. Beyond simple competition in terms of market outputs, an environment for co-evolution has to be created and cultivated to give access to critical inputs – resources – over time. In this sense, complexity science leverages the dynamic capabilities approach in a more hybrid scope.

Cognitive and experiential: It is recognized by complexity science as well as by the dynamic capabilities framework that all individuals are subject to bounded rationality, i.e. they act locally. The challenge is therefore to optimize cognitive capabilities throughout the organization by enabling self-organization, and by framing the boundaries therefore. Letiche (2000) adds the importance of experiential processes of intuition in the behavior of individuals. Consequently, the unconscious use of energy by individuals complements the cognitive understanding of consciousness.

Holistic: An approach towards corporate transformation and search for fitness needs to be holistic. In order to navigate in the vicinity of the edge of chaos, the optimal connectivity on the fitness landscape needs to be reinvented continuously. This means creating and disturbing wealth to a constantly altering set of resource providers – stakeholders – within the larger system. Once again complexity management places the boundaries for the framework naturally in a wider scope than the dynamic capabilities approach attempts to.

Sanchez (1997) argues that through the integration of dynamic capabilities and complexity science a new conceptual base for strategic management could be built. Fitness is thereby seen as an ongoing process of adaptation and (co)shaping through strategic flexibility and self-generating processes guided by managers within their perspective of the world. In contrast to scientific understanding of time as sequentially occurring events, fitness implies continuous flux, with the present incorporating the immediate past and immediate future (Letiche, 2000).

5.7. Summary

The preceding chapter delineated complexity science, the second column for an approach toward organizational fitness. The reader has been introduced to the evolution of complexity science, its meaning and several metaphors applied in this framework. The major concern was thereby to enable a sound understanding of the theoretical definitions of complexity concepts, and to relate them critically to the business context. In the second part of the chapter, a preliminary relationship between complexity science and dynamic capabilities has been established. The relationship was motivated by the integration of complexity thinking in studies of dynamic capabilities in fast-changing environments. It was argued, that complexity thinking broadens the conceptual base of dynamic capabilities along four cornerstones, i.e. dynamic, systemic, cognitive-experiential and holistic.

This approach will be taken further and complemented with a more in-depth analysis in the following chapter. The aim is to establish a preliminary approach towards organizational fitness based on both concepts.

CHAPTER 6: Emerging approaches and techniques utilizing complexity management approaches to build dynamic capabilities for the cultivation and sustaining of organizational fitness

6.1. Introduction

The aim of this study is to show the potential of a synthesis of dynamic capabilities and complexity science for an approach towards organizational fitness. In the preceding chapter the relevance of complexity thinking for dynamic capabilities was established along four cornerstones, viz. systemic, dynamic, cognitive, and holistic. Building on this general relationship, several emerging approaches and techniques stemming from or related to complexity science and that contribute to the conceptual base of dynamic fitness capabilities will be discussed.

The chapter firstly delineates the importance of self-organization, emergence and selection in the realm of the evolution of dynamic capabilities and their role and nature in the fitness context. Furthermore, the concept of fitness landscapes in the realm of dynamic fitness capabilities is discussed. After giving a short note on the implications for organizational form and design, pertinent leadership and management as of complexity thinking is presented. Finally, the approach towards organizational fitness is put into perspective.

6.2. The co-evolutionary space

One of the major insights stemming from complexity science is the reinvention of evolution. Instead of explaining evolution or development as a matter of a single entity that can be supported by relationships beyond its boundaries, the notion of CAS in CAS delineates evolution as a matter of non-linear interaction (Kappelhoff, 2001). In this sense, systems no longer merely evolve, but co-evolve within the larger whole.

There are three basic principles in complexity science that explain the patterns of co-evolution within a continuously changing and uncertain environment, viz. self-organization, emergence and natural selection. In general, one can say that self-organization describes the potential of an organization to adapt to and (co) shape the environment. Emergence, in contrast, is either the corollary of self-organization or the outcome of unintended and unconscious interdependencies between actions. Finally, natural selection symbolizes the

power of an “external force” inherent in the dynamics of the larger environment to allow for survival or for extinction. The following figure tries to visualize the interdependencies and relationship between those patterns in the co-evolutionary space.

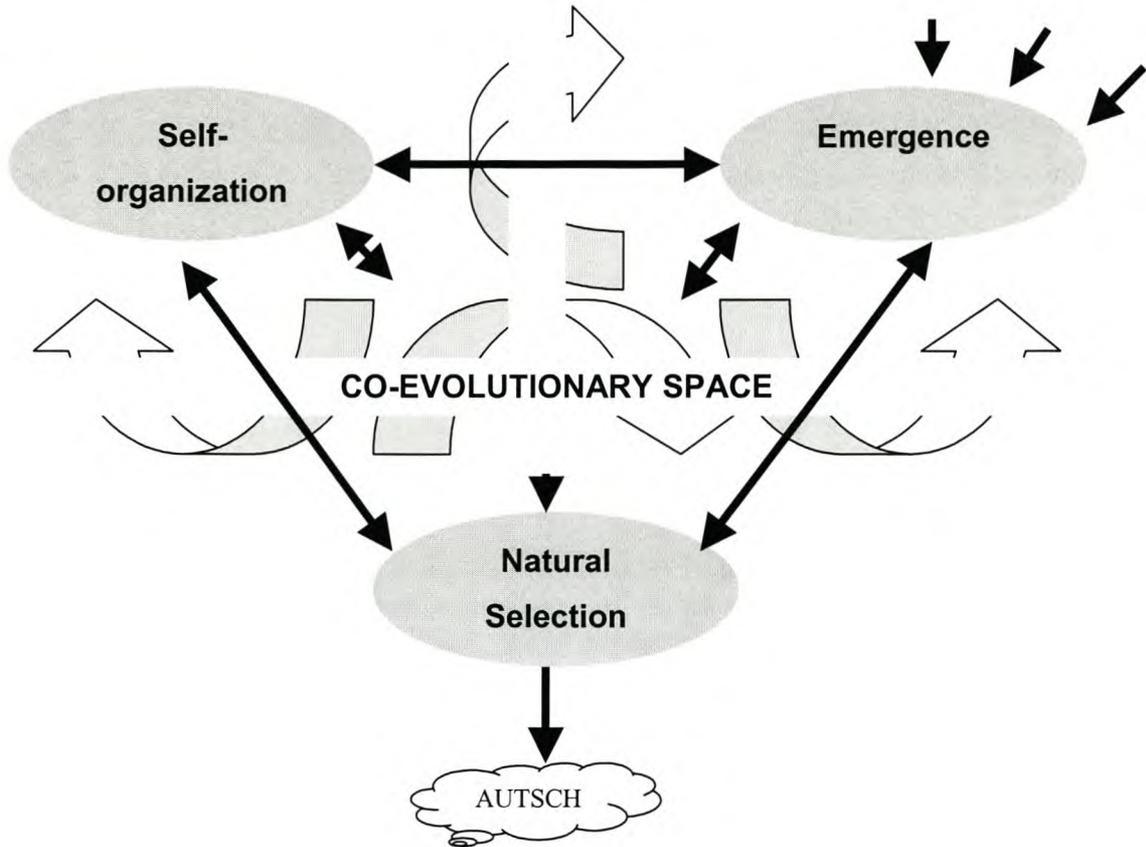


Figure 4: Evolution within the co-evolutionary space

The idea underlying figure 4 is that evolution in a co-evolutionary space can generally take any direction due to the emergence of patterns. As stated above patterns emerge either as a result of self-organization or are self-generating. This has two basic implications on the potential of self-organization: firstly, organizations can create the emergence of a (new) co-evolutionary space themselves and, secondly, emergence can be the result of external forces, thus requiring organizations to be able to adapt to the changing conditions through self-organization. The question whether an organization is successful in its attempts to (co) shape or adapt is, however, ultimately answered externally through natural selection. As a result, one could state that organizational fitness is dependent on the capacity to self-organize.

As a co-evolutionary space is continuously transforming, i.e. incrementally or disruptively, fitness is seen as a dynamic process rather than static. In other words, an organization’s survival depends on its ability to continue functioning over long periods of time in a wide

variety of circumstances (Beinhocker, 1999). Consequently, an environment for self-organization, which hosts flexibility, communication and innovation, has to be cultivated.

In order to understand the rather abstractly designed map of “evolution” in a co-evolutionary space and to relate it further to the creation of dynamic fitness capabilities, it seems to be pertinent to discuss the three elements in more detail.

6.2.1. Self-organization for fitness

The recognition that organizations are living systems operating in a dynamic and unpredictable environment reveals the limits of central control as a means of maintaining survival over the long-term. The new understanding is that strict control from a central entity within an organization is fairly rigid and static due to the bounded rationality of the dominating actors. Continuous inflections generated in the environment and the stipulation for organizations to enact such inflections themselves, emphasize the need for a more flexible approach to evolution.

Attendants of evolutionary science have recognized this phenomenon and turned to the science of complexity for a solution (Eisenhardt and Martin, 2000; Rindova and Kotha, 2001). The solution was found in the insights derived from CAS, which exhibit the ability to self-organize under conditions of bounded instability. Given the right design and frame, accountability and responsibility, appropriate rewards as well as alignment towards a clear, yet evolutionary core, agents in living systems seem to bear the potential to continuously sense and seize opportunities that enhance the chances of survival (Eisenhardt and Galunic, 2000; Teece, 2000).

The basic insight gained from complexity science is that under certain circumstances, individuals, groups, teams or units are willing and able to come up with innovative approaches to optimize their own payoff and ultimately the performance of the whole. They might stimulate consciously and unconsciously incremental or revolutionary ways of e.g. increasing quality, inventing new products, alliancing, scheduling production and so forth. In other words, they are able to develop the capabilities to convert physical resources into knowledge resources as well as to unbundle and later on rebundle those resources in value-enhancing ways (Normann, 2001). It is important to note, that there is always some sort of relation to initial conditions or history present in this process, i.e. path dependencies.

There are three important aspects of self-organization to consider here: (1) throughout the process of self-organization agents learn; (2) learning is fostered by interaction; and (3) throughout interaction coherent behavior evolves that facilitates conscious learning.

Learning as a pattern of self-organization: The ability for self-organization relies on the continuous flow of energy, material and feedback within and from outside the system (Leibold, 2002). Agents, who wish to create meaning in an uncertain environment, use these incoming energy or information resources combined with their existing understanding. They experiment with trial and error techniques both to explore new knowledge and to exploit existing knowledge (Levinthal and Warglien, 1999). This is realized through e.g. considering multiple realities, playing games, and/or seeking out interesting contrasts and contradictions (Lissack, 1997).

Learning is seen as both a dynamic fitness capability and the stimulator of further learning and action to build new and enhance existing dynamic fitness capabilities (Engelhardt and Simmons, 2002; Christensen and Overdorf, 2000). Learning is a continuous creation of self (I) by self as well as collective, i.e. process, "that draws unforeseeable effects out of each moment" (Letiche, 2000: 552). In this sense, energy and information coming into the system can not only be directed towards evolving in the current environment, but also in the environment faced tomorrow (Kelly and Allison, 1999).

Learning as a corollary of interaction: The strength of CAS is that they are open systems characterized by interrelationships in their internal and external environment. Interrelationships symbolize nothing else than the combination of a variety of simple agents. Through this dynamic combination conflicting constraints between agents and their convictions appear that disturb the local reality, thus stimulating self-organization and learning (Pascale, 1999; Beinhocker, 1997; Stacey et. al., 2000). In other words, self-organization is the natural consequence of non-linear interaction (Anderson, 1999). It is catalyzed and supported by (co) adaptation and (co) shaping in the co-evolutionary space in which organizations navigate (Brown and Eisenhardt, 1998; Leibold et. al., 2002).

An interesting recognition of complexity science is that interaction is happening on various levels and scales. It can be informal and formal, collaborative and competitive, between individuals, teams, organizations or socio-cultural systems as well as within those entities. The infinite number of combinations possible makes each organized system unique, yet, recognizable in its form (Leibold, 2002). The key for successfully leveraging interaction or interrelationships is seen in balancing the number of connections between agents that a single entity is dealing with (Eisenhardt and Galunic, 2000; Anderson, 1999). Only a well

balanced number of connections allows true and constructive communication between the different entities without falling into chaotic patterns that symbolize death (Pascale, 1999).

The evolution of coherent behavior: In situations where interactions between many of components appear, it has been found that some behaviors quickly rule out others and the interacting elements become self-similar (Levinthal and Warglien, 1999). Besides, structure and design on a higher level evolve. The condition for this phenomenon is that the elements are involved in positive feedback loops. In this sense, coherent behavior emerges under conditions of self-organization and learning, through simple patterns of natural selection. Due to the constant flow of energy from outside the system, it does, however not fall into a state of equilibrium (death) (Anderson, 1999).

Keeping the system in bounded instability can be achieved by heating the energy levels up and down. This is where the critical role of management and leadership comes into play. Several means of energizing the system as well as creating coherence will be discussed later on.

6.2.2. Emergence: the unconscious driver of change

One key insight of complexity science is that interaction and interdependencies between dissipative structures are non-linear (Anderson, 1999). As a consequence, the effects resulting from interaction are to a large degree unpredictable. Not only do they influence the situation of the local environment, but also foster changes at a higher level. In this sense, novelty can be seen as the direct result of self-organization and additional self-generating. This phenomenon is generally referred to as emergence – whereby the emergence of the whole is often larger than the sum of its parts (Pascale, 1999).

Examples of emergence often draw on the spontaneous emergence of order or “order for free” (Kappelhoff, 2001; McGuinness and Morgan, 2000). The earlier cited evolution of coherent behavior ultimately leading to the emergence of structure on a larger level or the emergence of the Silicone Valley are only two examples of this. Today Silicon Valley is not only seen as an accumulation of internet ventures, but as the technological Mecca of the world, thus supporting the definition of emergence.

Letiche has investigated an interesting version of emergence (2000). According to him, emergence or transformation is the only unity over time; it occurs in multiple non-cumulative ways out of each moment. Additional to the widely discussed emergence as a

result of interaction, individuals are seen as able to know emergence through intuition, i.e. directly experiencing the moment. Consciousness – as language and pre-structure – and emergence – as referent – are seen as experientially inseparable. Consciousness is ironic as it cannot grasp emergence *ex ante*, which is only possible through intuition. Thus, emergence is prior to consciousness.

In the context of co-evolutionary space, one can conclude that order emerges out of the co-evolutionary space and that the current order in the co-evolutionary space gets deconstructed from outside and internally. In respect to dynamic fitness capabilities two crucial implications result from this: (1) the sensing and seizing of new opportunities relies on the utilization of new knowledge or intuition, which gives the flexibility to both adapt to and shape new patterns of order; and (2) the rules underlying behavior in a system and embedding dynamic fitness capabilities have to evolve over time.

6.2.3. The third dimension: natural selection

The last element of the co-evolutionary space is natural selection. Selection processes arise from the environment within which an entity exists (Engelhardt and Simmons, 2002). They are consistent with the insights derived from evolutionary theory about the survival of the fittest. The difference in complexity science is, however, the interdependency of natural selection and self-organization, which both determine the emergence of order (Kappelhoff, 2001; McGuinness and Morgan, 2000). Consequently, natural selection has to be delineated in context.

Evolution and development of an organization are not merely determined by natural selection, but by the interaction of external selection processes with the internal self-organizing ability (Leibold, 2002). Organizations do not survive the selection process if they are not able to adapt to the current and/or future environment. In other words, they are eliminated, if they do not possess the flexibility and capacity to react to tipping points in the environment. Beyond pure reactions, organizations can however trigger inflection in the environment themselves. Consequently, hedging against natural selection is possible to a certain extent and has to be one of the major concerns of organizations.

The interrelationships described in the co-evolutionary space are combined with the two major organizational fitness dimensions described in chapter 2 in the figure of Kelly and Allison (1999). On the one hand, the figure comprises the importance to direct energy and information in ways that enable the organization to cope with today's and tomorrow's

environment and, on the other hand, it comprises the potential of organizations to hedge against selection by being able to adapt to today's environment and trigger inflection for the future evolution. With respect to dynamic fitness capabilities, complexity science seems to combine consciousness – i.e. known detailed or simple processes – with unconsciousness – unknown experiential and intuitive capabilities. Consequently, dynamic fitness capabilities could exhibit the potential for both incremental and emergent change.

6.3. A complexity mindset for dynamic capabilities

The dynamic capabilities framework states that a company's ability to cultivate and sustain fitness depends on its ability to manipulate resources into innovative value-creating strategies (Karim and Mitchell, 2000; Henderson and Cockburn, 1994; Amit and Schoenmaker, 1993). This ability should be exercised in a detailed analytic fashion in moderately dynamic markets (Teece et. al., 1997), while guided self-organizing approaches are seen as pertinent in high-velocity markets (Eisenhardt and Martin, 2000). Despite the delineation of specific examples of what dynamic capabilities are and how they appear in those two contexts, the framework fails to give a more detailed conceptual base for innovation (Sanchez, 1997).

Complexity science also deals with the importance of deploying and re-deploying resources. Beyond simply stating the importance and patterns of innovation, it developed a number of valuable metaphors and approaches to visualize the conceptual base for innovation. One of the mental models or an interface is the metaphor of fitness landscapes originally deriving from biology (Maguire and McKelvey, 1999; Levinthal and Warglien, 1999). This metaphor has been adopted into a powerful tool to enable managers and the whole organization to see the world as well as their actions in a way different to the original race metaphor (Lissack, 1997).

6.3.1. Fitness landscapes

Fitness landscapes consist of peaks and valleys. As discussed in chapter 2, they can take various forms depending on the dynamics (single-peak, multi-peak and coupled) or on the focus of the analysis (knowledge, strategy, performance and so forth) (Levinthal and Warglien, 1999; Oliver and Roos, 2000; Lissack, 1997). In this context, it has been established that the most realistic landscapes seem to be coupled.

Coupled landscapes are constantly deforming due to the interdependencies between the elements of the socio-cultural system (employees, customers, suppliers, competitors, regulators and so forth) that navigate on the landscape as well as due to impact stemming from the external environment (Lissack, 1997). Put differently, on the one hand, internal dynamics of the focal element or other elements and, on the other hand, external events such as changes in other landscapes, earthquakes, hurricanes, war and so forth can alter the configuration of the landscape.

The patterns of deformation are often delineated with the notion of punctuated equilibrium (Anderson, 1999). It implies that small changes can have small, medium and large outputs. In general, it is said that a system frequently faces smaller variations and only occasionally earthquakes – major changes (Beinhocker, 1997 and 1999). Interestingly, the occurrence of small and large changes over time is not solely seen as related to inertia, but also as a natural pattern of co-evolving agents under selection pressure (Anderson, 1999). Thus, tension leading to larger changes can even be present in cases of weak inertia. In other words, tipping points or points of inflection are a natural characteristic of a coupled landscape.

In the case of organizational science the elements navigating on a fitness landscape are individuals, teams, groups, organizations and so forth (Levinthal and Warglien, 1999). They are the open systems - the agents and CAS - that complexity science describes. According to Anderson (1999) each of these elements searches the landscape in an attempt to optimize its own payoff. The complexity of this search lies therefore in their interdependency as well as in the continuous transformation of the landscape. The former argument is the focal point of Kauffman's NK-model or NK(C)-model, which elaborate the implications of interdependencies (Maguire and McKelvey, 1999; Kappelhoff, 2001).

The corollary of many investigations in the role of interdependencies or the number of interactions of a system in the landscape showed that the highest fitness level can be achieved in the vicinity of the edge of chaos (Kappelhoff, 2001; Levinthal, 1997). Too many interdependencies are seen as resulting in chaotic consequences resulting from small changes in behavior, while independence is seen as stimulating purely small changes which trigger equilibrium or stasis over time (Anderson, 1999). Both extremes symbolize the death of complex adaptive systems (Pascale, 1999).

It is, however, important to note that the models depicted by Kauffman are often seen as too simplistic to grasp the complexity of human interaction and therefore should only be applied carefully (Anderson, 1999; Eisenhardt and Galunic, 2000). To capture the

complexity, the introduction of a number of other variables would be necessary such as noise or fog (Maguire and McKelvey, 1999; Levinthal, 1997). And even then fitness landscapes are only narratives as the landscape constantly deforms, and description can only be an approximation of the “truth”.

6.3.2. Searching the fitness landscape

In the metaphor of fitness landscapes, agents navigating on the landscape are often described as mountaineers (Maguire and McKelvey, 1999; Beinhocker, 1999). The process and conditions of climbing the mountain range towards the highest peaks can be delineated in the following tale.

The mountaineer starts climbing the landscape from a point symbolizing its initial conditions, i.e. his current knowledge. Already at the beginning of the trip he faces several limiting conditions: firstly, he does not know the landscape and doesn't have a map (Beinhocker, 1999); secondly, the landscape is very foggy and he is only able to see one meter further from his current location (Maguire and McKelvey, 1999); and thirdly, he only has a limited amount of food for the journey (Beinhocker, 1999). This is where strategizing comes into place.

The behavior of the mountaineer on the landscape is based on three possibilities. He can exploit his already existing knowledge – experience and memory – and he can explore the landscape to gain new knowledge, or both simultaneously (Lissack and Roos, 1999). The strategies he can follow are either to engage in adaptive walks or make medium and long jumps (Levinthal, 1997; Levinthal and Warglien, 1999). With adaptive walks the mountaineer relies heavily on his current knowledge. He makes small steps upward and downward in the landscape within the one meter of sight. For medium and long jumps the mountaineer has a pogo stick (Beinhocker, 1999). This stick helps him to jump to another unseen point in the landscape. Consequently, he can gain new knowledge.

While adaptive walks seem to be less risky in the first place because a mountaineer can decide to walk constantly upwards, they carry the danger of his getting trapped on a local hilltop, but not on the one that produces his highest payoff. The risk carried with jumps is generally high and increases with the length of the jump, because the mountaineer might find himself in a deep valley after such a jump. He knows, however, that large hills lie close to each other and can therefore carefully apply this technique. Note, however, that jumps

on the landscape take up a lot of the mountaineer's energy, and can thus only be applied occasionally.

Beinhocker has pointed out the meaning of adaptive walks, and medium and long jumps (1999). Accordingly, adaptive walks delineate the capability to defend and extend existing businesses. Medium jumps are seen as the ability to build on existing capabilities for new businesses. Finally, long jumps symbolize the capability to explore the landscape and to seed potential future businesses. The key for survival is seen in simultaneously following all three approaches thereby balancing time (short-term, medium-term, long-term) and risk (low, moderate, high). This can be seen as a deepening of Eisenhardt and Martin's (2000) approach towards dynamic capabilities, i.e. building on a number of opportunities.

In contrast to traditional top-down approaches or self-sufficient business unit approaches, complexity management not only sends one mountaineer or totally autonomous (groups of) mountaineers to explore the landscape, but various interacting agents. In complexity lingua this is referred to as parallel walks of selfishly acting, non-overlapping, but coupled patches (Beinhocker, 1999; Lissack, 1997). Being coupled means that patches are interacting and affecting each other's fitness, thus co-evolving. Besides, formally designed interaction, agents can also engage in informal interaction out of free will (i.e. communities of practice) (Levinthal and Warglien, 1999; Eisenhardt and Galunic, 2000). In terms of dynamic capabilities this means, that empowerment throughout the company is necessary to sense and seize opportunities in a co-evolutionary process.

In this sense, the original tale could be altered in the following way: Imagine now that a number of individuals in groups of five are exploring the landscape. The five individuals in each group stay in close vicinity to each other and are in constant communication. Each individual has a cell phone that can be used to call three other persons that do not necessarily belong to the organization, but whose knowledge is useful for exploring the landscape. Additionally, the cell phones can be connected to the Internet and gather pertinent information. Finally, one individual in each group gets flown out once a week to meet with members of the other groups and discuss their knowledge about the landscape.

As a result of interaction, the knowledge of each agent about the landscape can increase much faster than in cases of independent search. They can learn from each other where local peaks are and where higher peaks are located. Consequently, they can gain more confidence to engage in medium and long jumps. News about little earthquakes can show them which areas are currently deforming and where new hills are likely to emerge. The information gathered with information technology and through personal meeting enables

the individuals, as well as the organization, to be constantly moving, which is crucial on a coupled landscape (Beinhocker, 1999). Note, however, that interaction is by no means smooth. Moreover, it is spiked by conflicting constraints and power relationships (Stacey et. al., 2000; Anderson, 1999).

This tale could be further varied in unlimited ways. Levinthal and Warglien (1999) for example suggest to take members from different functions to search the landscape. The weekly meetings could be extended to bring individuals exploring different landscapes or belonging to different organizations or having a different interest in the landscape such as customers, government or investors together. One could also imagine that one group of actors can constantly call the other groups for information, but operates on its own mission as suggested by networked incubators (Hansen et. al., 2000).

Another critical aspect of the landscape is natural selection, recombination and the entry of new agents and organizations on the landscape (Anderson, 1999; Normann, 2001). Companies bring new individuals on board, they place others in different groups and lay off weak employees. Furthermore, companies go bankrupt, change to a different landscape or become new entrants in the existing landscape. This enhances the ruggedness of the landscape and triggers it to deform continuously.

An important consequence of the various facets of the landscaping metaphor is that the focal concern is not fitness peaks, but the behavioral paths the agents and CAS follow (Levinthal and Warglien, 1999). The reason therefore lies in the conditions limiting search processes as well as in the constant heaving and buckling of peaks. Consequently, experimentation and imagination replace foresight on the fitness landscape (Brown and Eisenhardt, 1998). Translating this in the dynamic capabilities framework, the focus on processes instead of content is confirmed.

6.3.3. A short notion on competency traps and core rigidities

According to the dynamic capabilities framework, the major threat to the sustainable fitness of an organization is that core competencies of the organization turn into core rigidities. On the fitness landscape one could describe this with getting locked in on a local optimum, which might potentially buckle and become a valley, or with navigating in an area of the landscape that turns into a vast desert.

Complexity science is not unaware of this peril. As Oliver and Roos (2000) point out, one of the major challenges is to frame the boundaries of the landscape. Lissack and Roos (1999) exemplify this challenge with IBM disregarding Microsoft and Intel as important players in their landscape and being struck by an volcanic explosion that lowered their fitness peak tremendously. The market for information is imperfect and agents operate with bounded rationality, i.e. locally. Consequently, one cannot exclude the threat of competency traps in absolute terms.

The threat is inherent in the notion of the edge of chaos with stasis and chaos symbolizing death of the CAS (Pascale, 1999; Beinhocker, 1997; Yongblood, 1997). In this sense, organizations are not only facing extinction because of too little activity, but also because of chaotic interrelationships. In the latter case, the slightest variation in behavior has the capacity to kick the system off its fitness peak into a deep valley (Anderson, 1999). An important aspect in relation to stasis of an organization is the problem of data or information overload. Kauffman points out that too much data works like a brake on the system (Kauffman in Lissack, 1997). He adds, however, that individuals do naturally avoid getting trapped by ignoring some of the data and consequently increasing their freedom.

Additionally, complexity science delineates a way of actively hedging against core rigidities by cultivating populations of strategies. As indicated in the discussion about search processes, Beinhocker (1999) identified three key components: move constantly, parallel search and a mixture of short, medium and long jumps. The emphasis is on a balanced approach – stable and flexible, competitive and collaborative, exploiting and exploring - with regard to risk, time and space (Brown and Eisenhardt, 1998, Beinhocker, 1999). This combination makes an organization fit in the sense of the highest fitness level described by Kelly and Allison (1999) without negating uncertainty.

6.4. Organizational form and design

Complexity science seems to blur the traditional perception of organizations and industries as separated entities that derive their performance through either positioning or internal resources. The systems perspective is hybrid and describes the new organizational design in terms of CAS (“hard” science of complexity) or social communities (“soft” science of complexity) (see e.g. Pascale, 1999; Beinhocker, 1999; Eisenhardt and Galunic, 2000; Maguire and McKelvey, 1999).

Within those systems a combination of decentralization and centralization seems to persist. The paradox can be described alongside Kauffman's notion of patches (Lissack, 1997). On the one hand, patches can be compared to the traditional concept of strategic business units in the sense that they are acting selfishly, are autonomous and non-overlapping. On the other side, the strength of patches as contributors to the overall performance depends on interacting with other patches and their focus on the overall organizational direction, purpose, values and identity. They are interacting in the sense of dynamic fit (Porter, 1996; Sanchez, 1997), thus affecting each other's actions, respectively. Consequently, patches do have enough freedom for innovation, while simultaneously being tied together to avoid gray areas and to co-evolve within and for the purpose of the larger whole.

The application of patches is in consonance with the notion of CAS in CAS (Kappelhoff, 2001). As defined earlier CAS are recursively occurring open systems that strive for their highest pay-off while co-evolving with other CAS within the larger whole. As pointed out, co-evolution is thereby partially a result of self-organization through learning by interacting. As in patches continuous learning is a function of decentralization and centralization. This can be observed in CAS by means of interaction. Interaction can either be informal – e.g. in communities of practice - or formal through for example business meetings. The problematic aspect from a managerial point of view is, however, to identify value-adding informal interaction and to measure its impact.

An additional aspect concerning organizational form and design is evolution. Contrary to the traditional viewpoint of rather static, predefined organizational forms such as matrix or strategic business units, CAS are constantly evolving in their form. This means that in the process of interaction as well as through managerial guidance, the form evolves according to the needs of generating information and energy to be successful today and enact the landscape of tomorrow.

Similar insights about organizational form and design have been gained in recent dynamic capabilities studies and are referred to as social communities (Eisenhardt and Galunic, 2001) or continuous morphing (Rindova and Kotha, 2001). In this sense organizations morph as they face new environments within which they strive for survival.

6.5. Leadership and management

One of the key contributions of complexity science to dynamic fitness capabilities is the identification and presentation of the role of leadership and management. While the dynamic capabilities view seems to rely largely on the understanding of an evolutionary management and the simple rule principle, complexity science delineated a number of key challenges for managers to enable constant purposeful flow of information and energy within the organization or CAS.

The key challenge in strategic management is seen as the acceptance of uncertainty and unpredictability, which is replaced by a focus on imagination and experimentation (Brown and Eisenhardt, 1998). In order to catalyze these two patterns in a purposeful way, the following two columns for management towards continuous fitness have been identified. Firstly, an interpretative cultural context can be established and disturbed through the manipulation of energy levels in the system (see e.g. Levinthal and Warglien, 1997; Anderson, 1999; Yongblood, 1997). Secondly, populations of strategies can be created and cultivated to hedge against unpredictability (Beinhocker, 1999). In this sense, management is experiential in itself (Letiche, 2000).

6.5.1. Mastering the interpretative cultural context

Instead of directly controlling the behavior of agents as proposed by traditional management, complexity management highlights the importance of indirect efforts. There is strong evidence that self-organization and emergence are linked to diversity as well as coherence (Anderson, 1999). Normann (2001) paraphrases this aspect as integrated diversity whereby actors and knowledge components are enabled to interact with each other. Co-evolution is thereby seen as being maximized through the optimization of connectivity as suggested in the NK-model and NK(C)-model (Kappelhoff, 2001). As Eisenhardt and Galunic (2000) point out, this optimum is situation specific and therefore relies on experimentation. Consequently, the role of managers is seen as purposefully guiding the system by means of “just-enough-discipline” (Leibold, 2001) thereby playing with the interpretative cultural context according to the principle of successful failure (Kappelhoff, 2001).

Yongblood (1997) proposes three main areas of intervention important for the evolution of an interpretative cultural context: (1) fostering coherence by establishing a clear identity and context; (2) disturbing and energizing the system; and (3) cultivating the organization.

6.5.1.1. Fostering coherence by establishing context

Co-evolution and evolution in CAS or socio-cultural systems (Leibold et. al., 2002) is contingent on determining the meaning for “development” (Schwaninger, 2001). The role of leaders, as agents in the system, is to initiate and catalyze an identity that in turn stimulates action. This identity will be co-shaped and ultimately shared by the other agents in the CAS. The following means are seen as pertinent for this process:

Environment selection: Identity of a system not only evolves around internal aspects, but also by creating fit with the environment. Leaders choose a landscape to operate on. The system is subsequently self-organizing around this landscape.

Clarifying a shared vision: Purposeful action and the stimulation of interaction are dependent on coherence, which evolves in the system. One aspect of coherence is a shared vision. Leaders bring this vision in the focus of the system and its agents through engagement in active participation and communication thereby fostering both short-term and long-term commitment.

Enriching the culture: As a second dimension of coherence, culture is reflected in a system as its collective mindset – its intention, beliefs, and memories. As the famous bus ride story (Lissack and Roos, 1999: 78) indicates, leaders enrich and expand culture. The general corollary of a powerful culture is that agents are able to create self-directed, purposive and productive results relying only on a few simple rules. Those rules stretch from how-to rules via boundary rules, priority rules and timing rules to exist rules (see Eisenhardt and Sull, 2001).

Promoting understanding and managing meaning: Agents in a system are often challenged by the amount of or the contradictory nature of data. The role of leaders is the interpretation of “noise”, the encouragement to disregard data, thus developing mutual understanding and making sense of information, events as well as the evolutionary context of the system. It is therefore important that communication is understandable to the agents. Potential tools to create meaning are asking questions, telling stories and playmaking rituals.

Developing alignment: The evolution of coherence in a system is dependent on a shared vision, core beliefs and mutual understanding. There is evidence that systems with high consonance are more focused and ultimately higher performers. Leaders use their global perspective to enable consonance within the pattern framing the space for coherence.

6.5.1.2. Disturbing and energizing the system

Creativity and innovation are most likely in a state of bounded instability. As the natural tendency of systems is to evolve towards patterns of order, leaders need to energize the system by upsetting the status quo or creating a sense of urgency. This allows the system to navigate at the edge of chaos. The following actions can be taken by leaders to disturb the system:

Creating compelling goals. Slogans by Jack Welch such as “be the 1st or 2nd in the industry” are audacious, unifying and inspiring. Such goals are large, contentious and even alarming (Leibold et. al., 2002). They stretch the limits, trigger both competition and collaboration, and enflame imagination.

Ensuring a rich flow of information: Leaders complement and support the local knowledge of agents by enabling them to obtain important and sense-making information and feedback from the ecosystem and from their own local domain. This is especially important as agents might deny, neglect or distort pertinent information.

Promoting diversity of opinion: Diversity is no longer seen as a constraint to performance, but as a stimulator of novelty and ultimately growth and change (Leibold et. al., 2002). Consequently, leaders need to communicate and to live the appreciation of differing viewpoints. Besides, they can stimulate diversity of opinion through human resource decisions and reconfiguration – making and breaking - of the network of nodes.

Holding anxiety: Making change and disturbance a part of every day life, instead of fearing it, is the challenge of our society. Leaders need to generate a mindset that promotes anxiety as the spark to creative action without exceeding the ability of agents to handle the stress engendered.

6.5.1.3. Cultivating the organization

Instead of relying on direct control as a means of tying agents to the system or network, leaders need to recognize the agents' self-organizing ability – the ability to generate order and to act creatively. Leadership is critical to develop the conditions for a self-generating system.

Promoting ownership: Through reward systems for informal and formal initiatives, leaders make agents participate in the success of the organization. The key to avoid free-riding, according to Eisenhardt and Galunic (2000), is to reward for self-interest. These methods communicate self-reliance and foster individual performance in a context that promotes the need for collaboration.

Nurturing relationships: Patching, multi-business teams, communities of practice or networked incubators are models of informal or formal interaction. Leaders need to initiate, promote, support and sometimes disturb these kinds of interactions. They need to highlight the long-term benefits of relationships, as well as the value added by mutual enrichment.

Encouraging learning: Leaders should seek out initiatives, innovations and creativity throughout the system. They add value by advising the initiators about pertinent competencies available in other parts of the system, by bringing in agents that benefit from such initiatives and by promoting the concept of successful failure (Kappelhoff, 2001).

Nourishing the human spirit: Productive, self-organizing and purposeful action of agents – people – depends on inspiration, hope, personal meaning, and satisfaction. Leaders need to establish such an environment by channeling emotions into positive energy and commitment. Consequently, a dynamic, vital and thriving system emerges (Leibold et. al., 2002).

Framing the structure and initiating real-time communication: An environment of self-organization can be indirectly stimulated and framed by relying on critical structure points and real-time communication channels (Eisenhardt and Brown, 1998). Leaders need to identify the highest pay-off connections for the system (Eisenhardt and Galunic, 2000) and to initiate channels for fact-based real-time communication.

6.5.2. Populations of strategies – hedging against uncertainty

The concept of punctuated equilibrium indicates varying degrees of uncertainty that unexpectedly confront a system and its evolution. Thus solely relying on a single first choice or strategy, thus, makes a system more vulnerable to uncertainty. As indicated in relation with search strategies, parallel walks that combine various extents of exploitation and exploration seem much more appropriate. In this sense, Beinhocker (1999: 101) suggests the creation and cultivation of populations of strategies. He distinguishes three key horizons of interest for potential strategies:

Horizon 1: initiatives are efforts to extend and defend existing businesses (adaptive walks);

Horizon 2: initiatives seek to build on existing capabilities to create new businesses (medium jumps)

Horizon 3. Initiatives plant the seeds for future businesses that do not yet exist (long jumps);

There are many management approaches pertinent to creating such initiatives. Kim and Mauborgne (1999) for example suggest looking across conventional patterns of businesses such as the chain of buyers, complementary product and service offerings, time and so forth. Gibbert et. al. (2001) suggest to co-opt customer competence and Normann (2001) customer co-production. Govindarajan and Gupta (2001) point out the potential of redesigning the end-to-end value chain architecture, of reinventing the concept of customer value and of redefining the customer base. Finally, Beinhocker (1999: 104) himself suggests six actions: to invest in diversity of people, to value strategies as real options, to map “jumps” on the landscape, to test populations of strategies, to bring the market inside and to use venture capital performance metrics.

Such approaches when properly and carefully applied stimulate new business models that create opportunities along the horizons defined by Beinhocker (1999). The options are seen as valid hedges against uncertainty, if they are robust and adaptive. In other words, such strategies highlight both temporal and spatial flexibility. This means that the search for optimum and perfection is traded for more heuristics results.

Overall, complexity management describes the limits of leadership as a all controlling and predictive task based on foresight. This does, however, not render leadership useless and obsolete, but new thinking capabilities are required. Leaders are attributed a new role of stimulating coherence, framing the landscape, disturbing and simultaneously cultivating

the system. Because it is recognized that such efforts do by no means guarantee success, it is additionally suggested that a wider spatial and temporal area of flexibility through robust adaptive populations of strategies should be created. In this sense, leadership is in itself an ongoing evolutionary process.

6.6. Towards a preliminary approach of organizational fitness

The objective of this thesis is to determine the role and nature of dynamic capabilities integrating complexity management to cultivate and sustain organizational fitness. Organizational fitness has been defined as the capacity for continuous renewal and learning to adapt to and to shape the environment, thereby establishing and maintaining or disturbing external and internal consonance for the purpose of appropriate growth, development and survival. The fitness concept as established in this context consists of two generic aspects, i.e. it requires the optimization of internal self-organization persistent over time as well as a hedging capacity targeted at external selection in an uncertain (rapidly) changing environment.

The aim of this section is to re-evaluate how dynamic capabilities enriched by insights from complexity thinking can enable organizational fitness with respect to appropriate growth, development and survival over time and under varying circumstances. Subsequently, several aspects that seem to be vague, unclear, but promising in terms of future research will be touched upon.

6.6.1. General insights for organizational fitness derived from dynamic capabilities

With respect to developing a robust fitness concept, the conceptual base provided by Sanchez (1997) seems to be pertinent. Such an approach has to be dynamic, systemic, both cognitive and experiential as well as holistic. Within the realm of dynamic capabilities, the following conclusions can be drawn:

- i) Dynamic capabilities per se are consciously or unconsciously inherent in every organization over time, independently of them being actually managed. The reason for this lies in the components of dynamic capabilities, viz. resources, processes, routines, competencies, position, paths, and even values. Those components are

present in every company even though their present impact might be different, i.e. varying with size, age, scope or organizational form (Ruef, 1997; Christensen and Overndorf, 2000). Besides, the evolution of dynamic capabilities is sensitive to the past and present. Flexibility can however be enhanced by means of e.g. heavy-weighted teams, shadow organizations, learning mechanism or acquisition. Consequently, an approach based on dynamic capabilities is inherently persistent over time and not merely a remedy, i.e. dynamic.

- ii) A fundamental renewal of the framework of dynamic capabilities is the incorporation of market dynamics. Accordingly, the nature of dynamic capabilities is sensitive to the frequency of change in the environment (Eisenhardt and Martin, 2000). While in moderately dynamic markets detailed analytical processes and routines are seen as preferable, the unpredictability inherent in high-velocity markets is approached with increased flexibility and diversity through simple experiential processes, which are directed by priority and boundary setting rules. The key challenge for continuous fitness is expressed in the ability to continuously sense and seize opportunities. Consequently, persistence in at least two worlds is explicitly considered.
- iii) The cognitive aspect is recognized with respect to people's bounded rationality. It does, however, not limit the framework in absolute terms, rather the recognition of the temporary nature of competitive advantage, the quest to sense and seize several opportunities frequently and quickly, as well as the experiential nature of dynamic capabilities seem to establish an encouraging broader view concerning appropriate growth, development and survival.
- iv) With regard to the open-systems design of an organization and a holistic managerial perspective, the contribution of dynamic capabilities towards organizational fitness can be described as yet premature. The general perception of an organization with boundaries still predominates despite the emphasis on internal flexibility (Teece et. al., 1997). The emphasis is on knowledge created within the organization as well as by traditional means of acquisition and alliancing. Only recently, studies in strategic networks detected the potential lying in a broader conceptual scope (see e.g. Gulati et. al., 2000). Their implications are promising, but not yet sufficiently substantiated and adopted within the dynamic capabilities realm. In this respect, the incorporation of the notion of co-evolution, i.e. wealth creation and destruction in the larger environment, seems to be promising.

With respect to organizational fitness, the dynamic capabilities framework does account for the need to be able to adapt and shape the environment through the ongoing manipulation of resources into value-creating strategies, through e.g. architectural innovation or acquisitions. Building on more than one opportunity and hedging against selection are also incorporated. In this sense, the dynamic capabilities framework clearly accounts for organizational survival. The question of development and appropriate growth is gradually penetrating the discussion. The main preliminary argument is that fitness cannot only be seen in economic terms, but the social dimension has also to be incorporated (Galunic and Eisenhardt, 2001).

6.6.2. Deepening and extending contributions from complexity thinking

Conceptually motivated by recent work as well as by limitations of the dynamic capabilities framework and by its own emphasis on fitness, complexity thinking has been chosen as the second generic column for an organizational fitness concept. The main contributions of complexity thinking can be seen in relation to punctuated emergent change and (co)evolution, which extends and deepens the arguments used in the dynamic capabilities framework. The following conclusions can be drawn in respect to organizational fitness:

- a) Complexity thinking alters the conceptual base for organizational fitness through its specific incorporation of change. It is pointed out that emergence is a natural element of evolution. The consequent key implication for strategic management is seen in turning emergence into a quality of the organization and in optimizing its impact. This is done by the following means:
 - i) Organizations should be designed as open adaptive systems, which derive energy and information from their embodiment in a larger whole. In order to be open an organization needs to have a large number of receptors. This is ensured through the emphasis on frequent and continuous interaction across organizational boundaries. The second characteristic of adaptability is ensured by clustering the system into patches that are able to deal with the information and energy received, i.e. they are self-organizing.
 - ii) Emergent qualities are further catalyzed by means of internal interaction. Instead of creating merely self-sufficient patches, regular interaction between the patches has to be stimulated. In this sense, patches are interdependent, i.e. they influence each other's actions and fitness. The predominating perception is

therefore that interdependency cumulates throughout the system and even the larger whole. Consequently, systems co-evolve internally and with their environment. Competition is no longer between organizations as such, but within and between networks or socio-cultural systems

- b) As the environment is generally perceived as unpredictable and determined by changes alike to the notion of punctuated equilibrium, complexity thinking generally speaking aligns with dynamic capabilities in high-velocity markets. Open adaptive systems are seen as most likely to grow, develop and survive in a state of creative tension with just enough structure and self-organization throughout the system. Under these circumstances innovation and creativity are seen as flourishing most. Leaders and managers can channel the ability to sense and seize opportunities by:
- i) Influencing the cultural context of the organization. Leaders and managers are seen as optimizing the efforts by fostering coherence, disturbing the system and cultivating the organization. This stimulates the first fitness dimension of internal self-organization.
 - ii) Hedging against uncertainty with respect to the capacity of the organization. The emphasis is on simultaneously defending today's business, enhancing capabilities for tomorrow's environment and seeding novel competencies. This is seen as crucial for the second fitness dimension, i.e. external selection.
- c) In the realm of this study two techniques were emphasized, viz. the co-evolutionary space and fitness landscapes. These techniques are seen as delineating an experiential approach and a logical approach towards organizational fitness. The descriptive power of fitness landscapes – the logical approach – is strong, but limited as deformations in an uncertain environment cannot be predicted nor absolutely detected. The co-evolutionary space detects the general principles underlying today's environment. In this sense, it can explain the existence of known and unknown, of consciousness and unconsciousness, of incremental and emergent change in general.

It can thus be concluded that the synthesis of dynamic capabilities and complexity thinking provides a strong theoretical platform for an approach towards organizational fitness. The critical aspects should be investigated in further detail.

6.6.3. A critical elaboration of the synthesis

With respect to the definition of organizational fitness, the following critical indications concerning an approach based on dynamic capabilities as well as complexity thinking can be made:

- a) As indicated in chapter 4, the separation of two distinct market environments are forwarded by the dynamic capabilities approach, might be too rigid. An approach along a continuum with the two identified extreme types of dynamic capabilities seems to be more appropriate as the critical criteria not only lie in the market dynamics, but also e.g. in distinct functional areas (Levinthal and Warglien, 1999).
- b) Despite its powerful theoretical nature complexity thinking is predominantly based on findings in laboratory contexts that are extrapolated into business reality. Therefore future empirical research is seen as necessary to adapt the “hard” science principles to the social business environment.
- c) In the light of the preceding arguments, the role of processes and the implications of interdependencies should be further elaborated. If organizational fitness is based on processes, it would be interesting to investigate the relation – complementary or substitutable – of processes of human interaction and invisible or visible routines. Based on the insights gained, the validity and implications of interdependencies, especially with respect to emergence and fractal structures could be elaborated. This investigation should also relate to the notion of lock-in as a result of very strong membership ties in networks. Overall, further insights into these aspects could bring clarity concerning the feasibility of the complexity perspective.
- d) It has been determined that organizational fitness has to be approached systemically and holistically. Besides, it was seen as critical to establish manageable patches to enhance flexibility and freedom to ultimately enable self-organization. The question resulting from both aspects is where boundaries should be drawn. Such an investigation should not only relate to the scope of socio-cultural systems or the frame of fitness landscapes, but also detect a feasible form and size for patches under various circumstances.
- e) Finally, complexity thinking suggests that both formal and informal interaction is value-adding to the organization in terms of self-organization and redirecting efforts. Research could focus on the relation between communities of practice and informal

networks. The question could be asked, if and to what extent these forms of informal interaction add value to organizational fitness.

6.7. Summary

Based on the relevance of complexity thinking for dynamic capabilities, two emerging complexity techniques have been delineated, viz. the co-evolutionary space and fitness landscaping. The emphasis has thereby been on visualizing the potential extension of the fitness model designed in chapter 4. The critical aspect exemplified, in this context, was the positioning of resources and dynamic capabilities, i.e. the drivers of organizational fitness, within the larger environment. Subsequently, the approach of complexity thinking towards organizational form and the role of leadership and management has been shortly indicated. The impetus therefore has been that change and evolution are not merely attributable to processes and resources, but also to the organizational and cultural context. The chapter has concluded with a review of the key insights gained from the synthesis of dynamic capabilities and complexity thinking in a preliminary approach towards organizational fitness. This overview included both potential contributions and several shallow issues.

CHAPTER 7: Summary, conclusions and recommendations

7.1. Introduction

The objective of the study was outlined in chapter 1. The present thesis was designed to elaborate the role and nature of dynamic capabilities incorporating complexity thinking in an approach towards organizational fitness. This was done by way of investigation in the current level of sophistication of the focal concepts and their synthesis into a preliminary organizational fitness approach. Therefore, a conceptual study involving international literature in the targeted fields has been conducted.

The aim of this final chapter is to re-emphasize the main findings of this thesis in an abbreviated version and to give an opinion concerning future research possibilities. The chapter is divided into three sections. Firstly, a comprehensive summary of each chapter will be given. Secondly, the most relevant conclusions drawn throughout the investigation are presented. Finally, implications for future research and advancement of thought are presented in ascending order of priority.

7.2. Summary

7.2.1. Introduction (chapter 1)

The introductory chapter briefly sketched the need for a robust approach towards strategic and organizational management in the light of the fast-changing uncertain environment. Against this insight a conceptual base for the study was identified and translated in the statement of the problem. The subsequent objective of the study was designed as a corollary of the preceding discussion. The purpose of this thesis was the critical analysis of the relevance of dynamic capabilities in the cultivation and sustaining of organizational fitness incorporating complexity thinking and approaches. Given the broad conceptual base targeted, the scope of the study limited the focus of the investigation, while the methodology used highlighted the need for a vivid, diverse, yet critical presentation of the various contributions to the topic within the preset boundaries. Ultimately, an indication concerning the sequential outline of the thesis was given to provide a guiding framework for the reader.

7.2.2. The concept of organizational fitness (chapter 2)

In chapter 2 the phenomenon under investigation was conceptualized, viz. organizational fitness. The purpose was to clarify its definition and general anatomy. This was considered relevant due to the infancy and conceptual vagueness currently predominant. Despite various contributions, there seems to be no consensus concerning the definition and conceptualization of organizational fitness. Clarity of thought was, however, seen as key premise for the subsequent insertion of the concept of dynamic capabilities and complexity thinking.

The objective of this chapter was to review and synthesize current perceptions of organizational fitness in order to enable a sound understanding of the conceptual platform. In this respect, a definition was derived from investigating popular and pertinent meanings of the terminology and weighing them with the traditional notion of fit. Thereafter, three generic aspects of organizational fitness were identified, viz. environment, vision and social system. In the light of the definition and anatomy of organizational fitness, which highlight the importance of a systemic/holistic and dynamic approach, several existing models and techniques were delineated. Ultimately, a categorization of organizational fitness in an internal self-organizing dimension and an external selective dimension was established. In view of the necessary persistence/robustness for and the complex nature of an approach towards organizational fitness, the subsequent investigation in a broader field of thought, viz. dynamic capabilities and complexity thinking, was justified and conceptually framed.

7.2.3. A review of the concept of dynamic capabilities (chapter 3)

One of the dominant approaches recognizing the dynamic nature of business management was identified in the framework of dynamic capabilities. Especially recent research contributions were seen as bridging the gap between the traditionally assumed predictability of the future and the rising recognition of an unpredictable and fast-changing environment. This was seen as a key characteristic for approaching organizational fitness. In order to enable a preliminary convergence of the two frameworks, it was seen as crucial to provide the reader with an review of the dynamic capabilities framework. The purpose of chapter 3 was to discuss the currently established nature of the still emerging concept with respect to critical generic aspects in terms of the objective of this thesis.

The chapter, firstly, provided a background of the origins of the framework in the resource-based view. Subsequently, various approaches were reviewed concerning the application

of the components of the concept. They were compared and critically analyzed. In order to ensure a sound understanding of the conceptual platform applied in this context, an attempt was made to define the components. The reader was additionally familiarized with the concept by discussing its rationale. In this respect, the author emphasized the nature of dynamic capabilities and their practical application within the identified five generic aspects of resource manipulation, viz. integrating, coordinating, building, releasing and protecting of resources. To delineate the truly dynamic nature of the concept, the evolution and development of dynamic capabilities was investigated. The discussion of the current research state-of-art was completed with a short overview of implications for competitiveness and management. Ultimately, attention was drawn back to the still emerging nature of the concept and several potential areas of improvement were touched upon. Despite its existing deficiencies, it could be argued that a preliminary approach towards organizational fitness based on dynamic capabilities can be attempted.

7.2.4. The relevance of the dynamic capabilities framework for organizational fitness (chapter 4)

Chapter 4 attempted to synthesize the insights gained throughout the discussions in chapter 2 and 3. In respect to the novelty of this attempt, the author concentrated on the main precondition of an approach towards dynamic capabilities, i.e. robustness over time and throughout varying circumstances. The key challenge was seen in framing a conceptual base for organizational fitness within the realm of dynamic capabilities. To entangle the complexity of the respective concepts, attention was focused on the definition and general anatomy of organizational fitness as well as the types of dynamic capabilities.

The objective of chapter 4 was to arrive at a preliminary, yet comprehensive integration of fitness as a continuous goal in the framework of dynamic capabilities. The investigation was therefore logically structured into four main areas of concern. Firstly, a short review of the concepts of organizational fitness and dynamic capabilities was given and inserted into a initial synthesis. Secondly, the potential of dynamic fitness capabilities in moderately- and fast-changing environments was exemplified and critically analyzed. Thirdly, a model was created to encapsulate the role and nature of dynamic capabilities within the conceptual platform of organizational fitness. Ultimately, elaborating the conceptual relationship from a dynamic capabilities perspective as well as from an organizational fitness perspective summed up the analysis. In this sense, the groundwork was laid for

further investigation in dynamic fitness capabilities within the scope of this study and for future research projects.

7.2.5. The relevance of complexity science as a basis for developing dynamic capabilities to achieve organizational fitness (chapter 5)

Chapter 5 introduced complexity thinking as second cornerstone for an approach towards organizational fitness and elaborated its relevance as a platform for dynamic capabilities. The conceptual extension had been motivated throughout the preceding chapters by explicit reference to critical concepts of complexity thinking. The major challenge faced in this chapter was to identify principles of complexity thinking key to the purpose of this study and to provide a comprehensive motivation for their conceptual relevance with respect to dynamic fitness capabilities. The complexity was thereby identified as predominantly lying in the emerging nature of complexity thinking and its strong connotation with so-called “hard” sciences.

The chapter was divided in two major sections. The first half of chapter 5 aimed at providing a sound understanding of complexity thinking and relating it to business management. Therefore, several pertinent complexity principles were identified, defined and exemplified. To enhance understanding, a section was designed presenting the novel way of thinking in business context. Finally, complexity thinking was put into perspective. This critical analysis was centered on three major areas of interest, viz. novelty, the quest for order, and the role of leadership. The second half of chapter 5 aimed at establishing the relevance of complexity thinking for dynamic capabilities. The investigation was structured according to an indirect and direct motivation of relevancy. Firstly, the importance of learning derived from the discussion in chapter 4 was recaptured and consequently a connotation between organizational learning, knowledge management and complexity thinking was delineated. Thereafter, advocates of dynamic capabilities were cited who integrate complexity thinking. Ultimately, an integrative conceptual base was presented along four cornerstones, i.e. dynamic, systemic, cognitive as well as experiential, and holistic. The complementary aspect was seen as strong and comprehensive justifying a critical synthesis of dynamic capabilities and complexity thinking for an approach to organizational fitness.

7.2.6. Emerging approaches and techniques utilizing complexity management approaches to build dynamic capabilities for the cultivation and sustaining of organizational fitness (chapter 6)

Chapter 6 enriched the earlier attempt to establish organizational fitness through dynamic capabilities with emerging approaches and techniques stemming from complexity thinking. The main emphasis was on presenting the qualities of emergent change in the larger co-evolving environments from an experiential and a logical, yet distant, perspective. The underpinnings of this presentation were seen in line with the phenomenal and postmodern methodological research characteristics defined in chapter 1. In this sense, the value-laden heterogenesis could have been interpreted as increased vagueness or as fulfilling the objective of the thesis of initiating discussion about the preliminary insights into a dynamic and systemic/holistic approach towards organizational fitness.

The fitness model originally designed in chapter 4 was reinvented in a broader conceptual scope referred to as co-evolutionary space. The critical dynamics of co-evolution were thereby based on a triangular relationship between self-organization, emergence and natural selection. Furthermore, the metaphorical qualities of complexity thinking in respect to co-evolution were critically analyzed in terms of strategizing on fitness landscapes. To refocus attention on the reference point organization, organizational and managerial implications in an emerging environment as indicated by complexity thinking were added. The chapter concludes with a re-elaboration of the implications of both the dynamic capabilities framework and complexity thinking for organizational fitness. It was thereby attempted to provide not only the main supporting arguments, but also to identify potential deficiencies within both concepts that require future research relevant to the topic of this thesis.

7.2.7. Summary, conclusions and recommendations (chapter 7)

Chapter 7 draws together the most salient aspects of this study. It entails, firstly an abridged version of the entire analysis, in order to outline the potential of the reinventing of organizational fitness by incorporating a broader, thus more robust conceptual base. An overview of the major conclusions that could be drawn in the course of the analysis, is subsequently provided. Based on the finding of the study a number of recommendations for advancement of business applications and theory are made.

7.3. Conclusions

The impetus for conducting this research was delineated in chapter 1. The most salient conclusions are the following:

- a) Upon analysis of prevailing definitions and their conceptualization the following preliminary definition of organizational fitness is suggested:

Organizational fitness

- i) encompasses the capacity to direct energy and information internally towards learning and renewal' as well as
 - ii) the capacity to create consonance with today's environment and inflect the future environment
 - iii) for the purpose of appropriate growth, development and survival.
- b) A corollary of this definition is that any attempt towards organizational fitness should be persistent over time and throughout various spatial qualities. This would entail the incorporation of both linearity and non-linearity, a robust approach towards strategic management as well as a broadly defined space of probabilities.
 - c) A critical conceptual synthesis of dynamic capabilities and complexity thinking could potentially suffice for the identified preconditions for an approach towards organizational fitness. With respect to the preliminary nature of this study and the emerging qualities of the focal concepts, critical contributions of the dynamic capabilities framework and complexity thinking could be seen in:

Dynamic capabilities

- i) The components of the dynamic capabilities are fundamental to every organization.
- ii) The approach accounts for the dynamic nature of these components in a logical and experiential manner.
- iii) Change and learning are seen as a crucial qualities of an organization mainly driven internally, yet embedded in a larger network of resources.

- iv) The framework derives some persistence from a dualistic design and the positioning of innovation throughout the organization.
- v) The key for growth, development and survival is seen in the frequency of capturing opportunities.
- vi) Major deficiencies are identified in terms of the need for a more hybrid (not dual) approach, the partial ignorance of emergent qualities as well as the vagueness concerning managerial and organizational concerns in terms of e.g. values and rules.

Complexity thinking

- vii) The concept enriches the dynamic capabilities perspective through the triangular relationship between self-organization, emergence and natural selection in the co-evolutionary space.
 - viii) It entails both incremental and emergent change in the light of unpredictability.
 - ix) Purposeful self-organization is stimulated by managerial direction (not direction of behavior) and attributed to a state of creative tension.
 - x) Opportunity seeking or strategizing is approached in terms of three horizons, viz. deepen, extend and explore, not in terms of foresight.
- d) Upon analysis, it can be assumed that management based on dynamic capabilities and complexity thinking is already in place. This could limit the applicability of the approaches due to the lack of understanding of the transformational phase towards those mindsets.
- e) The conceptual relevance of dynamic capabilities and complexity thinking in respect to organizational fitness is dependent on their practicality. The major deficiency might thereby stem from the foundation of complexity thinking in “hard” science. The key challenge is seen in establishing an account for an approach towards organizational fitness based in the economical and social context of business.

7.4. Recommendations

7.4.1. Recommendations for a reinvented concept of organizational fitness

The following recommendations, based on the findings of this study, are proposed in order to enhance the understanding of the role and nature of dynamic fitness capabilities shaped by complexity thinking:

- a) The present study suggests a view of dynamic capabilities in a logical incrementally -volving as well as in an experiential-emergent context. The description of an environment in punctuated equilibrium would even suggest an intuitive connection between these areas, which challenges present thinking.
- b) Instead of blindly following the quest for sensing and seizing opportunities faster and more frequently than the competition, complexity thinking enables a more sophisticated approach concerning strategizing under uncertainty. The three horizon approach of deepening and extending existing business as well as seeding completely novel businesses should be seen as a guiding post.
- c) The notion of co-evolutionary space suggests an extension of the predominantly existing conceptual base for dynamic fitness capabilities. As the metaphor of coupled fitness landscapes implies, deformation of the fitness qualities defined can be catalyzed by direct and indirect relevant actions both inside and outside the organization. A pointer towards this possibility should especially be seen in the simplicity of processes constituting dynamic capabilities. Therefore, one should be careful when attributing the terminology organizational to capabilities, as this could restrict the space for possibilities to the traditional boundaries of an organization.
- d) The various philosophies of management delineated in the study should be integrated. This should not be perceived in the light of unity of knowledge, rather as inter-conceptual discussion sparked by multiple opinions should be seen as a catalyst for an approach ambitious to persist beyond time and space. Researchers themselves should live up to their findings concerning co-evolution, self-organization and emergence.

7.4.2. Recommendations for future research

Recommendations for future research to clarify the structure and general approach of the emerging and preliminary concepts under consideration are an integral part of a theoretical study. This thesis concludes with the provision of such recommendations in two generic areas, viz. advancement of business applications and theory.

7.4.2.1. Recommendations for the advancement of business applications

- a) One of the main aspects forwarded in the realm of this thesis is the need for a robust and persistent approach towards organizational fitness. Instead of relying on a single strategy, information and energy should be catalyzed throughout the organization to hedge against uncertainty. A purposeful approach to strategy could be seen in a broad categorization along three major areas, viz. to build on and extend today's operations, to have the capacity to adapt to future changes, and to seed potential future inflections.
- b) In the light of performance requirements both financial and innovative, organizational fitness approaches need to be balanced. Balance is related to inserting creative tension, not seeking for equilibrium. This insight seems to be valid across market environments. The organizational and managerial challenge is, however, to determine balance given the specific circumstances, not merely to innovate more and faster (quantitatively) than other companies do.
- c) One of the major challenges when initiating a culture that incorporates change e.g. through dynamic fitness capabilities, is careful investigation of the status quo. One of the aspects should be a sound understanding of the values predominating within the organization. Another relevant point should be awareness of regional and national culture and value systems and sensitivity and alertness of their implications. An example of distinctive national issues is the low labor protection in the U.S. and a highly protected environment in Germany.
- d) Another major challenge is related to managing with simple boundary- and priority-setting rules. An approach guided by simplicity and the notion of just-enough structure might be overly reductive. Despite the need to establish some persistent

guidance with rules, they should be seen as evolving, too. In other words, rules should be challenged and questioned on an ongoing basis.

- e) Ultimately, organizations should understand, that even the most robust and pertinent approach towards organizational fitness is not a guarantee for survival. The principle of natural selection cannot be avoided in absolute terms. However, navigating in a state of creative tension, emphasizing flexibility and diversity, leveraging knowledge and initiatives throughout the organization can hedge an organization. In this sense, thinking capabilities should not be tailored towards “win-loose”, but rather emphasize “win-win” mentalities. One should be alert when figures decrease, but subsequent actions shouldn’t be merely logically, but equally creative.

7.4.2.2. Recommendations for the advancement of theory

Throughout the present study, deficiencies in the existing approaches to dynamic capabilities and complexity thinking that affect their synthesis in an organizational fitness concept have been detected. Major issues discerned are seen as relevant for further scholarly efforts. The following list is meant to provide preliminary recommendations for such advancement of theory:

- a) The conceptual base in the context of this study has been drawn in the light of two generic dimensions, viz. internal self-organizing capacity and external selection, for the purpose of appropriate growth, development and survival. The subsequent analysis was therefore mainly focused on the role and nature of processes (capabilities) and contextual drivers for change, i.e. complexity principles. While the main emphasis in this study and in pertinent literature is on processes of human interaction, the social aspect is by large neglected. When creating an environment for learning attention should be given to social aspects beyond the notion of cognition and bounded rationality.
 - i) An important contribution could be derived from insights in psychology and sociology concerning the development of human self and concerning human behavior in diverse cultural backgrounds. This is seen as important because incremental and emergent change is not so much experienced in processes of interaction, but by human beings themselves.

- ii) Research in the nature of human beings should additionally transcend the personal level. Insights derived should be leveraged in the vivid discussion surrounding organizations as complex adaptive systems or social communities. The key aspect is thereby seen in merging the principles from “hard” managerial science, i.e. derived from physics, biology and so forth, with insights in “soft” managerial science, i.e. related to sociology and psychology.
 - iii) The complementary power of “hard” and “soft” managerial science should be investigated, as these could feedback on the nature of processes and capabilities. Potential is specifically seen in the realm of directive rules and their emergent qualities. In perspective, inflecting rules on a system without consideration of individual and collective social aspects comes close to the negated behavior of a central controller.
- b) A potential clash between the dynamic capabilities framework and complexity thinking could be seen in the interpretation of processes as (1) patterns of human interaction and (2) as invisible routines and visible processes. Depending on the perception, differing conclusions can be drawn concerning the implications of interdependencies. It should be investigated to what extent interdependencies exist in and impact on the organizational environment. Interesting questions could thereby stem from the incorporation of emergence and self-similarity. The Question can be asked, if these phenomena are valid in the business context, where they can be observed, and whether the observations derived are robust.
- c) Research potential in close relationship with the social considerations and the aspect of interdependencies is seen in the role and nature of communities of practice, networked incubators and heavy-weighted teams. The primary question in this context could circulate around their contribution to organizational performance and transformation.
- i) With regard to communities of practice, an investigation into their distinctive nature as opposed to other informal ways of interaction should be made. As pointed out earlier on, the definitions seem rather vague, i.e. overlapping and open to interpretation. In case a clearly definable and measurable distinction can be drawn, the subsequent questions would be concerned with their contribution towards organizational development. Specifically, the reasons for their contributions as opposed to other informal networks, and the means of catalyzing and rewarding informal interaction should be detected.

- ii) Networked incubators and heavy-weighted teams are seen as possible ways of enabling the creation of novel processes independently of the existing cultural endowments. Existing investigations highlight their power as separate or smaller entities to enhance flexibility. In the light of organizational fitness, it would be interesting to identify the possibilities of adopting processes created within these entities throughout the organization. In other words, the complexity principle of self-similarity should be tested.

- d) Finally, the question of boundaries reappears in both the concept of dynamic capabilities and complexity thinking. Instead of industries, organizations and self-sufficient business units, patches, CAS in CAS, fitness landscapes and socio-cultural systems enrich the discussion. The general idea seems to be to re-conceptualize the perception and consequent implications of competition and collaboration as well as of efficiency and effectiveness. Future research could investigate the feasibility and applicability of these distinct, yet open systems and substantiate their novelty as opposed to existing entities, i.e. organization and industries. With regard to the latter aspect, priority could be given to the advantages resulting from perceived the business landscape as an environment of systems and networks as opposed to entities.

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