The Open Enterprise

Building Business Architectures for Openness and Sustainable Innovation

by
Joseph M. Firestone, Ph.D.
& Mark W. McElroy

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Joseph M. Firestone, Ph.D.
And
Mark W. McElroy

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PREFACE

In early 1998, the Knowledge Management Consortium (KMC), later to become the KMCI ('I' for International), was just getting started and one of us (Firestone) became a founding member, soon to be followed by the other (McElroy) in October 1998. We first met at a KMCI mini-conference session at the KM Expo Conference in October 1998 in Chicago. At the time, Joe was working on Knowledge Management Metrics and thereafter on basic Knowledge Management theory, and on Artificial Knowledge Management Systems (AKMSs), a concept very closely related to his previous Distributed Knowledge Management System (DKMS) idea. He was also working on epistemology for Knowledge Management and on complex adaptive systems, as well. Mark was working in the areas of sustainability, systems modeling, and complex adaptive systems.

Joe's work on the AKMS/DKMS paradigm developed through the fall of 1998, and he produced a paper on Enterprise Knowledge Management Modeling and the DKMS for the KM Expo-hosted conference already mentioned; and also two working papers for a rather premature, but very exciting, KMCI standards conference held in Silver Spring, MD in January of 1999. One of these papers was on a Knowledge Base Management System (KBMS) standard, and the other was on an Artificial Knowledge Management System (AKMS) standard. Both papers, and a number of others written since that time, as well as a recent book, helped to develop work in the Enterprise Knowledge Portal (EKP) area. This work is reflected in various places in this book, and most heavily in chapter 11. These papers also all emphasized the importance of validation in transforming information to knowledge, an idea that would prove central in KMCI's later work on the Knowledge Life Cycle.

Before meeting Joe in the fall of 1998, Mark had become deeply involved in the study of management applications of complexity theory via the New England Complex Systems Institute (NECSI). In April 1998, he presented a paper at NECSI's first conference on Complexity in Management in Toronto which (the paper) was entitled, "Complexity, IT, and the Interprise." In his paper, Mark introduced the idea of "unmanaging" knowledge, an early reference to what would .later become the *Policy Synchronization Method* (discussed variously throughout this book), according to which enhancements in innovation can be achieved not so much by managing knowledge, but by managing the conditions in organizations in which knowledge is produced and integrated. Mark's interest in the development of a complexity-inspired

approach to KM became the basis of his introduction to Joe later that year, and their affiliation ever since.

At about the same time that Joe published the first article on the EKP (in March 1999), both of us were involved in significant work at the KMCI on the foundations of Knowledge Management. That work, done primarily in collaboration with each other, led to the initial formulation of the Knowledge Life Cycle (KLC) framework for Knowledge Processing, and to the first sharp distinctions among Business Processing, Knowledge Processing, and Knowledge Management. We also built into the KLC framework a strong emphasis on Knowledge Claim Evaluation (earlier we called it Knowledge Claim Validation), because we wanted to reflect the emphasis of both Karl R. Popper and Charles Sanders Peirce on testing and evaluating knowledge claims, and also Popper's very strong emphasis on both subjective and objective knowledge and the distinction between them. Along the same lines, our common interests in complex adaptive systems theory suggested that the idea of competing ideas or rules having different weights or values – or 'credit assignments,' as the theory puts it – ought to be reflected in our model. Knowledge Claim Evaluation satisfied these needs. In addition, the distinction between Knowledge Claim Formulation and Knowledge Claim Evaluation, as well as our realization that epistemic problems (i.e., gaps in our knowledge) triggered KLC events and processes, were abstractions to the process level of Popper's tetradic schema for problem-solving, learning, and adaptation.

What came out of all of this was a blend of organizational learning and adaptive systems theory spiked with a strong dose of Popperian epistemology. This vision and the KLC eventually became the basis for Mark's definition of the second-generation Knowledge Management concept in 1999, and its subsequent adoption as the KMCI orientation to KM.

Since its origination in the Spring of 1999, Mark and Joe have continued to collaborate in developing the KLC concept, and a Knowledge Management framework based on it. Many of our publications on the foundations of KM are available at www.dkms.com, at www.macroinnovation.com, and at www.kmci.org. Mark has also published *The New Knowledge Management* (2003), which presented The Open Enterprise idea (pp. 20-24) for the first time in a published work. Joe has published *Enterprise Information Portals and Knowledge Management* (2003), and Joe and Mark have collaborated on *Key Issues in the New Knowledge Management* (2003), where they extended the construct of the Open Enterprise somewhat further. All three books appeared in the same KMCI Press/Butterworth-Heinemann series and are milestone publications in the development of The New Knowledge Management.

All of our recent work has been done against the backdrop of, and with an eye toward, the broader work in *The New KM*. That work now encompasses not only the foundations of Knowledge Management and conceptual frameworks of the KLC and KM, but additional work on: Sustainable Innovation, Social Innovation Capital, KM Strategy, The Open Enterprise, Knowledge Management Metrics, Knowledge Management Framework Methodology, and the relationship of Enterprise Information Portals and the full range of IT products to Knowledge Management.

The idea of The Open Enterprise is based on Karl Popper's classic *The Open Society and Its Enemies*. It is an adaptation of Open Society ideas to formal organizations. Recently, Popper's great work and his philosophy of Critical Rationalism, generally, is experiencing a rebirth of interest and relevance. George Soros has been generous in providing foundation support for educational activities spreading and reinforcing Open Society ideas in the emergent states of the former Soviet Empire. The World Wide Web has stimulated the development of a number of discussion groups in which Popper's ideas have figured prominently. And Mark A. Notturno, with Soros Foundation support, has published an excellent book relying heavily on Popper's ideas called *Science and the Open Society* (Central European University Press, 2000), and a shorter work called *On Popper* (Wadsworth, 2003), intended to make Popper much more accessible to the reading public.

In addition, the rebirth is being fed by major societal developments. The terrorist challenge to Western Democracy is reminiscent of the Nazi and Communist challenges that gave birth to Popper's *Open Society* work. Its basis in what Popper called "tribal religions" makes his opposing construct of Critical Rationalism, with its fundamental opposition to 'appeals to authority' and epistemological foundationalism particularly relevant. In addition, the great epidemic of corporate malfeasance in the corporate world also attests to the need for greater transparency and openness in corporate governance, a need that also is addressed by Open Society ideas.

In the spring of 2001, Mark McElroy and Mark Notturno, began consideration of how Popper's notions might be applied in the context of Knowledge Management in the enterprise. They soon involved Joe Firestone in their discussions, and Mark McElroy and Joe decided to further develop the Open Enterprise idea and to incorporate it in the KMCI Certified Knowledge and Innovation Manager (CKIM) certification program. It was in the context of our work in that program that much of our collaborative work on the Open Enterprise prior to this book occurred. From it, we have confirmed the idea that the most important value proposition for KM is to enhance ***organizational intelligence***, the ability of an organization to adapt to

its environment. Adaptation ultimately is based on new, relevant, and effective knowledge. So to adapt over time, an organization must be able to ***innovate sustainably***. It must be able to recognize problems, to respond to them with tentative solutions (new ideas), to eliminate those solutions that have errors, and thus to create or produce high-quality knowledge that can support more effective decisions. The idea of error elimination, another important emphasis of Popper's, is particularly important here, since its systematic employment is one of the prime distinguishing elements in the Open Enterprise construct.

Further, in the course of enhancing organizational intelligence, it turns out that openness in Knowledge Processing is a requirement that is paramount in realizing this goal. Such openness, in turn, is a protection against malfeasance and corruption. So, it turns out that *The New KM*, in seeking organizational intelligence for enhancing adaptation through The Open Enterprise, is at the same time providing an antidote to the poison of corporate corruption and its corrosive effects on commerce, the capital markets, and the international economic system, more generally.

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INTRODUCTION

Organizations are born free, but everywhere they are in chains – chains forged from constraints on who within them is authorized to detect and recognize problems, propose solutions, and criticize, test and evaluate ideas once they have been proposed. Mostly, as organizations develop, they increasingly confine problem detection, solution formulation, and the critical process of testing and evaluating new ideas to a small decision making elite. This results in mistakes in recognizing some problems and outright failures to recognize others. It results in the emergence of fewer and lower quality solutions. And, finally, it results in solutions that produce unintended consequences that may threaten the very existence of the organizations whose adaptive processes are constrained.

Thus, Enron adopts a solution to the problem of maximizing its market value that, after initial success, in the end destroys nearly all of its market value. And it does so, in great part, because it hides critical details of its market strategy from employees and Board Members alike, and concentrates knowledge of it within a very small band of insiders. Similar stories apply to Worldcom, Tyco, Global Crossing, and many, many others. For these companies, steering the course of adaptation was relegated to the hands of a few in relatively closed conditions. Learning and the adoption of new knowledge was restricted to small groups within top management. Stockholders and other parties were excluded, even though their vested interest in the quality of knowledge produced and integrated into practice in these firms was enormous. Knowledge Processing in such firms is carried out by innovation oligarchies, whose tight-fisted control over the power to produce and adopt ideas is only exceeded by their authority to compel their subordinates to carry them out. Bad ideas get too far along in such ways.

The reality is that successful, and *sustainable*, adaptation is driven by ***distributed*** Knowledge Processing, characterized by free thinking workers whose self-organizing patterns create organizational knowledge in an atmosphere of openness in problem recognition, solution formulation, and solution evaluation. The type of organization that is characterized by such agents operating in such an atmosphere, whether private or public, is what we call The Open Enterprise.

PURPOSE

The primary purpose of this book is to provide an organizational solution to problems of adaptation and corporate corruption. We will do this by introducing a prescriptive model called The Open Enterprise. The Open Enterprise is a "social architecture for openness" (Bennis, 2002), as well as an engine for sustainable innovation. It is prescriptive because it specifies a specific end-state vision for Knowledge Management Strategy. It is a type of organization optimized for sustainable innovation and adaptation, and for internal organizational transparency in governance, heightening both employee participation and stockholder democracy. Knowledge Management sorely needs a prescriptive model of this sort, and in providing it we will address the issues just mentioned, and also provide an entirely new framework for Knowledge Management strategy. Moreover, we will show that Knowledge Management is uniquely qualified to address issues related to business innovation and corporate corruption, using the control and management of Knowledge Processing rules as a lever for doing so. And all this, we will argue, can be achieved without undermining or compromising the control and authority of managers to organize and direct the affairs of the enterprise as they see fit.

Thus, the objective of KM strategy according to what we shall call the New Knowledge Management (McElroy, 2003) now becomes the attainment and maintenance of The Open Enterprise. And the goals of KM – enhancing innovation, adaptation, knowledge sharing, transparency, competitive advantage, performance and effectiveness – flow from fulfillment of this objective. So, the Open Enterprise orientation being developed in this book has the potential to redirect all of KM and to enhance its value propositions far beyond the constraints of first-generation knowledge-sharing and the IT applications aimed at supporting it. Let us examine these ideas in more detail.

THE OPEN ENTERPRISE AND THE TWIN PROBLEMS OF INTEGRATION AND ADAPTATION

Any organization must cope with the twin problems of integration and adaptation. Integration involves coordinating an organization's activities to maintain the identity of the organization and its unity in pursuing its primary goals and objectives. Integration also presupposes the existence of knowledge about coordinating activities and configuring and operating the firm in productive, effective ways.

Despite the effectiveness of a particular organizational arrangement, all firms exist in environments in which they very often encounter conditions (if not *problems*) to which they must adapt. Adaptation involves coordinating an organization's activities to cope with change in its environment. Our focus here is on the problem of adaptation and the manner in which a firm's *capacity to adapt* can be managed and enhanced. Adaptation presupposes the existence of knowledge about how to adjust to changes in the environment, be they anticipated ones or not. Or, at the very least, it requires the production of such knowledge. It also presupposes the existence of knowledge about how to solve problems and how to learn when the need to do so presents itself. Thus, adaptation requires learning, problem-solving, and the production and integration of relevant new knowledge (that is, innovation) in response to business problems. In business, competitive advantage over time requires adaptation. In politics the same is true, and among nations as well.

Is there a type of organization that is optimized for adaptation and innovation, in the sense that innovation and organizational learning is sustained and sustainable in it over time? In this book we develop the theory that a type of organizational system called The Open Enterprise (OE) is just this type of organization. And we will do this on the basis of the view that a firm's capacity to adapt and to solve its problems is critically dependent upon its ability to successfully and sustainably recognize its problems, develop new tentative solutions about them, and eliminate the errors in these solutions. We will do this, further, by demonstrating that the kinds of confined and exclusionary conditions that attend Knowledge Production and Integration in most firms today are dysfunctional and unsustainable. The tragedies seen in such firms as Enron, Worldcom, Tyco and many others go much deeper than bad managers making bad decisions. Indeed, the causes of such failures are systemically rooted in the ways modern corporations go about the business of making their knowledge, and it is there that we will find better and longer lasting solutions to the corporate ills of our time.

Pressure to put more management focus on learning and the quality of Knowledge Processing in business has been building for some. As an example, consider the following statement made over ten years ago by Arie de Geus (in Senge, 1990), former Head of Planning for Royal Dutch Shell:

> *"The ability to learn faster than your competitors may be the only sustainable competitive advantage."*

While largely agreeing with de Geus's view, Mark W. McElroy (2002) added:

> *"Yes, but who cares how fast your learning is if your learning*

> *system, itself, is not sustainable? Thus, the ability to learn faster than your competitors on a sustainable basis may be the only sustainable competitive advantage."*

More recently, in the wake of epidemic levels of corporate malfeasance, Warren Bennis (2002), whose work has been well-known in management and systems theory circles for 40 years, said:

> *"What businesses now need more than ever are managers who know how to create* ***social architectures for openness*** *in business."*

What ties the de Geus and Bennis statements together is the performance ethic they share, and the fact that Bennis's proposition is precisely the prescription required in order to achieve the vision expressed by de Geus. Add McElroy's element of sustainability, and you come away with a viable prescription for high performance learning and adaptation, as well as an organizational model that can continually guard against management corruption and malfeasance. Indeed, openness is the key to achieving sustainable innovation. Thus, the Open Enterprise fulfills all of these needs. It is at once a social architecture for openness, for sustainable innovation for competitive advantage, and still more generally for adaptation to environmental change.

This book is the first full-length work on the Open Enterprise, the normative model of The New Knowledge Management (TNKM) (McElroy, 2003; Firestone and McElroy, 2003), the thoroughgoing reformulation of the field of knowledge management being developed by the Knowledge Management Consortium International (KMCI) and its allies. It is an important book for those interested in organizational intelligence because it proposes an emergent "pattern," or what complexity theorists call an "attractor basin," for Knowledge Processing that is aimed at achieving sustainable continuous learning, problem-solving, and adaptation, the very definition of organizational intelligence. Thus, creating the Open Enterprise is all about creating the underlying conditions of organizational intelligence, and this book is about learning how to do that.

The Open Enterprise (OE) model is based on the view that enhancements in organizational openness:

- Should not threaten or undermine the decision-making authority of managers – rather, they should support it
- Should be aimed at the Knowledge Processing activities in a firm,

not its business processes – the former involve Knowledge Production and Integration, while the latter entail knowledge *use*

- Should be aimed at enhancing the KM function in a firm
- Should seek to expand the scope of stakeholder involvement in the production and integration of new knowledge (i.e., to increase inclusiveness)
- Should seek to expand the scope of problem, issue, and opportunity detection by inviting all organizational stakeholders to participate in enterprise-wide Knowledge Processing
- Should be carried out in the form of policies and programs aimed at enhancing the natural tendency of people in organizations to detect and solve their individual and shared problems (i.e., to produce and integrate new knowledge) in their own endemic ways, and to harness and apply these tendencies to the advantage of the organization
- Should also take current and legacy background issues into account, such as trust, politics, management styles, historical factors, incentive and reward systems, market conditions, culture, etc.

THE INTERRELATED PROBLEMS OF CORPORATE CORRUPTION, ORGANIZATIONAL DEMOCRACY, AND EMPLOYEE PARTICIPATION

The corporate excesses of the late 1990s have now surfaced. More and more corporate "paragons" are being shown to have been involved in accounting irregularities that either border on fraud or have actually crossed over the often unclear line between acceptable practice and highly questionable behavior. In case after case, we are seeing revelations of business practices that were hidden from most employees and stockholders, often not well understood by Boards of Directors, the knowledge of which was restricted to a very small group of executives. Thus, the questionable decisions and practices leading to corruption were not widely tested and evaluated within the affected firms before they were put into practice. In other words, their Knowledge Processing systems were crippled or broken.

This is not the first time that calls for radical change in corporate management and governance have precipitated the need for deep, systemic change. Reforms in corporate governance and the creation of formal

stockholder democracies were undertaken in the early 20th century and reached their peak in the 1930s. They were stimulated by such organizations as the 20th Century fund and by some of the luminaries in the Roosevelt administration. But especially since the 1970s, accelerating in the 1980s and reaching its peak in the 1990s, business has been characterized by an increasingly strong trend toward oligarchy. And such oligarchies have become centralized in small groups within upper management that have increasingly undermined the fiduciary responsibilities and functions of corporate Boards of Directors, and, more generally, their functions as representatives of stockholders. Thus, the "iron law of oligarchy" has once again defeated formal democracy in the corporate world, and as many commentators have recently indicated, the result is that many corporations are "the fiefdoms" of their CEOs, who function as veritable feudal lords.

In addition to the problems of increasing corporate corruption and declining stockholder democracy and Board relevance, there is the third problem of declining employee participation in decisions that matter to a corporation. The issues surrounding employee participation and its desirability and legitimacy are complex and we will not consider them in detail here. But in public companies, it is clear that the formal basis of authority is stockholder ownership and that Board, Management, and other employees all derive their authority and roles from the stockholders. The stockholders elect the Board to represent them and to act in a fiduciary capacity on their behalf. The Board appoints the top-level Executive Staff and this staff hires everyone else. From the standpoint of formal authority and legal foundations, then, there is no requirement for employee participation in the decisions that matter and no legitimacy for employee involvement. Nevertheless, employees can and do have a meaningful role to play in the support of organizational governance, as we shall shortly see.

As for governance, if the corporation were a machine and there was a mechanical, determinate way to measure the will of the stockholders, and if the stockholders had the time and knowledge to tell the Board what to do in order to meet the problems of the organization; then the Board would do only as the stockholders tell them; and top-level management only what the Board tells it; and so on down the line until the lowest level employee, the last cog in the corporate machine, would do only what it had been told to do. But organizations, of course, are not machines. Rather, they are Complex Adaptive Systems (CASs), a concept taken from complexity theory according to which living systems, such as organisms, organizations, and societies survive and adapt by learning and innovating collectively. Very often, the components of a CAS are also complex adaptive systems operating at lower

levels of scale, all of which have autonomy relative to the higher level CAS, or corporation in this case, even as they subordinate themselves in the service of its functioning.

In reality, stockholders have neither the knowledge, time, inclination, nor the resources to run corporations. Thus, Board members must interpret the vaguely expressed will of stockholders to represent them. Separately, top Management must have a great deal of autonomy relative to the Board, because they are charged with the day-to-day affairs of the organization. And various levels of employees in an organization all have roles that they are charged with fulfilling, with relatively little supervision from levels above. So the reality is that all levels must represent the stockholders or owners by playing their designated roles, and all these partially autonomous agents and activities must somehow become organized to create and maintain the identity of the corporation. But how?

Performing one's role in an organization is relatively easy as long as knowledge necessary for making decisions is available and accessible. But when it is not, *the gap between what someone knows and what they need to know in order to make a decision produces a problem (an epistemic one)* that must be solved by the decision maker or someone else if the job involved is to get done. So*, serving the stockholders requires epistemic problem-solving on an organizational scale, and the related tasks of producing and integrating new knowledge in reliable high-quality ways.* And it is in connection with this need for epistemic problem-solving that the need for employee participation becomes particularly acute.

Thus, while there may be no formal justification or authority for employee participation in business-process decision making beyond the decision types specified in an employee's formal role, *there are some very practical reasons why employees need to participate in decision making in the Knowledge Production and Integration sphere:*

- First, employees of all types first surface knowledge gaps affecting business process decision-making. Thus, provided they have the ability to solve problems that arise, it is clearly more efficient for the corporation if they are given the latitude to solve them, rather than assigning them to others who may have less motivation to produce the necessary solutions.

- Second, even when they cannot close knowledge gaps themselves, their domain expertise may be invaluable in helping to close these gaps if they work as part of a larger team or community.

- Third, important corporate decisions ought to be based on knowledge

claims that have survived testing and evaluation by a broad spectrum of employees representing different perspectives. And the more important the knowledge claim involved, the more necessary rigorous testing and evaluation become within the constraints of time available for decision making.

So there is a manifest need for widespread employee participation in Knowledge Production and Integration due to the efficiency, domain expertise, and critical perspective they bring to the task of testing and evaluating new knowledge claims. The lack of employee participation in decision making in Knowledge Processing is therefore a problem that besets modern organizations along with the corporate corruption and stockholder democracy problems previously discussed. Modern corporations have become knowledge oligarchies, in which the untested will of the few determines the behavior of the many. What we have received in return is what we deserved – bad ideas moving too quickly into the realm of practice, long after they should have died of their own disease, thanks to shortfalls in the three conditions mentioned above.

In this book, one of our central claims will be that these three problems are inter-related. In addition, we will argue that changes in **knowledge operating systems** designed to involve employees across the board in Knowledge Production and Integration will create a new transparency in organizations. This new transparency, if accompanied by the creation of an autonomous Knowledge Management function responsible directly to the Board of Directors will, in turn, make it easier for Boards and stockholders to acquire the knowledge they need to strengthen corporate democracy and to end the fiefdoms of the 1980s and 1990s. The new transparency, along with the increase in democracy and influence of the Board will, at the same time, also make it far more difficult for small elites to put forward knowledge claims that both survive the process of testing and evaluation, and are manifestly not in the stockholders' interests. In Chapter 12, we will examine a number of case studies that tend to support this claim.

THE PROBLEM OF ORGANIZATIONAL INTELLIGENCE

When faced with the need to adapt in response to changes in the environment, organizations frequently find that their pre-existing knowledge does not tell them what they need to know to close the gap between where they are and where they want to be. An epistemic gap between what they know and what they need to know must be closed. In other words, an epistemic problem must be solved? How are such gaps closed and such

problems solved? We believe the answer is 'through the adaptive strategy of organizational learning' (Argyris, 1993). The capacity to solve problems through learning is what we mean by organizational intelligence. Organizations vary in this capacity.

The problem of organizational intelligence is the problem of enhancing the capacity of organizations to learn. Since organizations are CASs, characterized by self-organization of their components and the emergence of global attributes (Gell-Mann, 1994; Holland, 1995, 1998; Kauffman, 1995; Waldrop, 1992) such as organizational intelligence, the changes in learning capacity necessary to create such intelligence cannot be introduced by Business Process Re-engineering (BPR), with its emphasis on top-down change management. Organizational intelligence must be enhanced by creating underlying conditions that enable its emergence. In this book, we will contend that those underlying conditions are the various attributes and patterns that we call the Open Enterprise.

A PRESCRIPTIVE MODEL

The model of The Open Enterprise is a prescriptive (i.e., normative), applied model. It is an application of the developing KMCI descriptive frameworks (See Firestone and McElroy, 2003), including the Knowledge Life Cycle (KLC) framework, the Knowledge Management Process framework, the CAS Social Network framework, the Decision Execution Cycle/Organizational Learning framework, the Sustainable Innovation framework, and the Metaprise framework. The OE model does not describe *what is*, but instead focuses on providing a vision of *what ought to be* while it assumes that sustainable adaptation, reducing corporate corruption and increasing stockholder democracy are all desirable end-state goals. It then develops a network of knowledge claims asserting that The Open Enterprise is the form of organization that will achieve these goals, and further that we can achieve this form of organization by following certain policies that will encourage a transition to the Open Enterprise. And finally, it contends that we should attempt to create The Open Enterprise because of its ability to help us achieve the goals of sustainable adaptation, decreased corporate corruption, and increased stockholder democracy.

THE BOOK'S "ROADMAP"

The Open Enterprise: Creating Organizational Intelligence through Knowledge Management is intended to be a wide-ranging examination of its subject. It includes:

- An introduction to the background and essential ideas behind the Open Enterprise
- An examination of ideas about Knowledge Processing and Knowledge Management that are foundational to the Open Enterprise
- A detailed examination of the *knowledge operating system* pattern called the Open Enterprise, followed by KM strategies for changing from other operating and political patterns governing Knowledge Processing to the Open Enterprise
- Application of the previous analysis to consider the OE's relationship to:
  - Sustainable innovation
  - Transparency, corporate malfeasance, organizational democracy, and employee participation in Knowledge Production
  - Deep Ecology and Deep KM
- Benefits and Costs of the Open Enterprise.

The book ends with conclusions on (a) The OE and its enemies, (b) KM Strategy, (c) the normative side of the shift to The New Knowledge Management, (d) the place of values in KM, and (e) creating organizational intelligence. Here are short previews of the book's chapters.

Chapter 1 is one of four chapters providing the background needed for an analysis of the Open Enterprise idea. It describes Karl Popper's construct of the Open Society and shows that it is the inspiration for the Open Enterprise construct and, in many respects, provides its foundation. Chapter 1 also explains fallibilism and falsificationism, two critical elements in both Popper's thinking and the Open Enterprise construct. Fallibilism is the doctrine that no knowledge claim about reality or value can be certain, whether or not it is true, or in the case of value, legitimate. Falsificationism holds that no descriptive or valuational knowledge claim may be verified in the sense that one can formulate a set of premises that necessitates acceptance of it as a conclusion, while it may be falsified in the precise and surprising sense we will specify in Chapter 1. Fallibilism is critical to the

Open Enterprise because it underlines the need to test and evaluate uncertain knowledge claims. In turn, falsificationism is also critical because it underlines the need to test and evaluate knowledge claims by looking for errors in them, rather than looking for support for them.

In Chapter 1, we also discuss the essential defining characteristics of the Open Enterprise and provide an overview of the relationship of the Open Enterprise idea to the problems of adaptation, organizational intelligence, and corporate corruption. This section will sketch out the reasons why the Open Enterprise is an important construct if one cares about such problems. And why as a state of affairs, rather than a concept, it represents a solution to the problems of maximizing adaptation and organizational intelligence, while minimizing corporate corruption. Finally, the conclusion leads into the remainder of the book.

In Chapter 2, we begin to provide the conceptual foundations for the Open Enterprise. We begin with CAS theory because it highlights the central role of distributed Knowledge Processing in adaptation. Next, we take a social-psychological turn and move to the social and psychological frameworks that underlie our thinking about decision making and decision cycles. Here we develop the behavioral foundations of our theory and make clear that our CASs are all about social networks and the human side of Knowledge Processing and KM. This aspect of our conceptual framework places culture in the context of decision making and CAS interaction. This analysis also provides the context for a unified theory of knowledge and then develops a process view of how knowledge is produced and integrated into organizations, and of the relationship of knowledge and Knowledge Processing to business outcomes and Business Processing. Next, the process, or Knowledge Life Cycle, framework we develop describes the target for Knowledge Management activities aimed at enhancing Knowledge Processing and knowledge outcomes. It is also a representation of Popper's theory of problem-solving and Knowledge Production writ large.

From the viewpoint of the Open Enterprise, there are three especially critical aspects of the Knowledge Life Cycle that need elaboration: Problem Recognition, Knowledge Claim Formulation, and Knowledge Claim Evaluation. Chapter 3 gives a more detailed specification of these in preparation for later development of the Open Enterprise construct. We describe the nature of Problem Recognition in detail and discuss a classification of knowledge gaps that are most frequently encountered in the origin of Knowledge Processing. We treat Knowledge Claim Formulation by discussing both different types of knowledge claims and different methods of formulating them. Knowledge Claim Evaluation is described by presenting a

framework for guiding it. This framework presents a variety of criteria for comparing and assessing alternative knowledge claims.

In Chapter 4 we begin by clarifying the distinction between Knowledge Processing and Knowledge Management. It supplements the earlier one made between Knowledge and Processing and Business Processing, and completes the outline of our three-tier model of Business Processing, Knowledge Processing, and Knowledge Management. Here we develop a conceptual framework for Knowledge Management (KM) including definition of this critical term, specification of levels of KM, KM Processes, and a classification of types of KM activities. We develop the view that KM is comprised of activities and processes whose purpose is to enhance an organization's knowledge processes: Knowledge Production and Knowledge Integration. We also discuss the possibility that *levels of KM* may be found in organizations. We then classify types of KM using Henry Mintzberg's (1973) management activity categories, the KLC categories, the KM levels categorization, the distinction between supply- and demand-side KM interventions, and the distinction between social and technological interventions. The result is the most detailed segmentation of types of KM interventions in the field of KM today. Chapter 4 ends our treatment of the conceptual background needed for developing the Open Enterprise construct.

Chapter 5 begins a detailed specification of attributes and their values that characterize the 'attractor pattern' called the Open Enterprise. Decision Processing, Business Processing, and Knowledge Processing attributes applying to all knowledge sub-processes are described in this chapter. In each category, we present the attribute values (correlates) of the Open Enterprise pattern.

Decision Processing refers to the dynamics of making decisions at the level of individual agents. From the point of view of an agent, how does the Open Enterprise differ from other patterns in problem recognition and response? How do the capabilities of Open Enterprise agents differ from the capabilities of agents in other systems? How does the distribution of the right or entitlement to recognize problems on behalf of the firm differ? How does the motivation to respond to problems differ? We answer these and other questions about the Open Enterprise in the course of examining its Decision Processing attributes.

Next, Chapter 5 moves from Decision Processing to Business Processing in the Open Enterprise. We examine the correlates of the Open Enterprise in such areas as process cycle time, collaborative, cooperative, and conflict behavior, accessibility, and other areas. We trace how differences in Decision Processing impact differences in Business Processing in these various areas,

and we show how the pattern of Business Processing in the OE also extends to the pattern of Knowledge Processing, though the pattern of Knowledge Processing also includes additional correlates. These correlates in Knowledge Processing are analyzed in Chapter 6 where we specify the attributes and attribute values specific to the sub-processes in the Knowledge Life Cycle. The attribute categories covered are: attributes applying to Information Acquisition, Individual and Group Learning, Knowledge Claim Formulation, Knowledge Claim Evaluation, Broadcasting, Teaching, and Sharing.

The Open Enterprise is also characterized by a particular pattern of Knowledge Management attribute values. Chapter 7 specifies this aspect of the OE attractor pattern. In particular, Knowledge Management Process attributes are analyzed in the context of Mintzberg's framework of management activities. That means we discuss how the Open Enterprise is different in the way: 1) the KM function is represented symbolically, 2) leadership is performed, 3) external relationships are built, 4) KM level knowledge is produced and integrated, 5) Knowledge Processing rules are changed, 6) crises are handled, 7) resources are allocated, and 8) agreements are negotiated.

Chapter 8 is the last of four chapters analyzing the correlates of the Open Enterprise. It specifies the important *outcome*, rather than *process*, attributes of the OE pattern. These include values of a wide variety of outcomes in the following categories: the Distributed Organizational Knowledge Base (DOKB), including belief knowledge, knowledge claims, and track records of error elimination activities; non-DOKB Decision Process, Knowledge Process and KM Process Outcomes; and other Business Process Outcome attributes. Some examples of the outcomes covered in these categories include: ability to recognize and formulate problems, motivation to initiate and implement knowledge life cycles, distribution of trust, formulated knowledge claims, surviving knowledge claims, acceptance and support for outcomes of various aspects of Knowledge Processing, distributed architecture of information and knowledge base, proportion of surviving formulated knowledge claims, quality of surviving knowledge claims, distribution of surviving knowledge claims about changing Knowledge Processing rules, extent to which knowledge workers believe in the fallibility of knowledge claims and the pursuit of truth as a regulative ideal, extent to which employees believe in Knowledge Claim Evaluation through fair comparison, and various other important attributes, the values of which specify correlates of the Open Enterprise.

After completing the specification of correlates of the Open Enterprise, Chapter 9 turns to dynamics. Specifically, it discusses the KM strategy of

how to change other types of enterprises into the Open Enterprise. Our analysis uses the concept of 'phase space' as a way of articulating the end-state or operating-state of an Open Enterprise, and views the OE as one attractor pattern in phase space. We then describe three other types of knowledge politics, other attractors in the phase space of natural Knowledge Processing systems. These include: Repressive Politics, the Politics of Hysteria, and the Politics of Coercive Mobilization. Next, we propose a method called the Policy Synchronization Method (PSM) for moving from one of these other types to the Open Enterprise, and also discuss the strategies that comprise this method. Finally, we discuss how the PSM may be used to maintain the Open Enterprise, once it is attained.

One of the major value propositions claimed for The Open Enterprise is its support for sustainable innovation, the basis for continued, successful adaptation to the environment. Chapter 10 discusses various aspects of this relationship and along the way provides definitions of innovation and sustainability. In it, we also develop the distinctions between invention and innovation, innovation and sustainable innovation, and micro- and macro-innovation. We show that sustainable innovation is concerned not only with the present, but also with balancing the present and the future. And, finally, we develop the theoretical perspective showing that The Open Enterprise supports both sustainable innovation, and through it, successful adaptation to its environment.

What software applications can assist in the transition to the Open Enterprise and support its maintenance? In chapter 11 we contend that such software applications must support openness in Problem Recognition, Knowledge Claim Formulation, and Knowledge Claim Evaluation. The most difficult of these three to support is Knowledge Claim Evaluation, because it requires creation of a new type of software object called a *knowledge claim object*. This chapter evaluates five types of software and correlates each to the attributes of the Open Enterprise they support. It ends by considering a sixth type of software, the Enterprise Knowledge Portal, a future software application that supports the Open Enterprise particularly well.

Recent events make it clear that modern day corporations pay a high price for governance arrangements that restrict Knowledge Production and Integration to a small elite. This chapter discusses the promise of organizational governance supplemented by the Open Enterprise in solving the problems of corporate excess, fraud, and malfeasance; increasing the effectiveness of stockholder democracy, and providing increased employee participation. The analysis will include five case studies in which corporate irregularities that might have been prevented by the Open Enterprise are

reviewed. Finally, we take up the question of whether all corporate excess can be prevented by the Open Enterprise or any other form of organization.

Deep Ecology is an approach to ecology defined in 1972 by Arne Naess. It is *ecocentric* in its orientation, not just human- or anthropocentric. It *includes* concern for the welfare of humans, but is not confined to it. Deep Ecology and the "Deep Questioning" that leads to it have a close relationship to ideas about "Deep" KM and The Open Enterprise. In this chapter, we will explore this relationship and other relationships of Deep Ecology, "Deep" KM, the Open Enterprise, Sustainable Innovation, The New Knowledge Management, and Value Theory. Our objective is to show that The Open Enterprise is a system of knowledge politics friendly to "Deep" KM, but even more generally to the idea that Knowledge Production in the Open Enterprise, from the viewpoint of "Deep" KM, involves taking values into account during the Knowledge Production process.

At various points in the book we show the connection between the Open Enterprise and many of its benefits and costs. Chapter 14 provides a systematic and more comprehensive analysis of potential costs and benefits and of the difficulties of determining them. Categories of benefits include: Enhancements in learning, Impact on Authority of Management, Greater Investor Awareness, Lower Risk for Investors, Enhanced Opportunities for Employees, Enhanced Employee Participation in Knowledge Processing, Improvements in the Rate and Quality of Innovation, Increase in Competitive Advantage, Enhanced ROI, Enhanced effectiveness, Increased Sustainability of Innovation, Improved Balance Between Integration and Adaptation, and Enhanced Organizational Agility (adaptiveness).

In this final Chapter, we discuss the following areas: The Open Enterprise and Its Enemies, Reprise: Getting to the Open Enterprise, The Normative Side of the Shift to The New KM in Knowledge Management, The Place of Values in Knowledge Management, and Creating Organizational Intelligence Through Knowledge Management. The Open Enterprise and Its Enemies provides some perspectives on views in KM, and political theory and philosophy that are opposed to the central tenets of the Open Enterprise. There are many such views. Some of the main ones examined here include foundationalism and justificationalism, and consensus views of knowledge process decision making. Next, we summarize our previous argument on how the Open Enterprise may be created from other system types. We then show that the Open Enterprise is a derivative of The New Knowledge Management approach in the area of normative or prescriptive theory. Since this and a number of earlier chapters in the book raise the issue of the place of values in KM, we answer that question in a general way here and show that Knowledge

Management is a field in which values play a central role and in which true objectivity requires that they be taken into account systematically. Finally, we end the book by showing that The Open Enterprise is the embodiment of organizational intelligence, and that if one is interested in creating organizational intelligence in order to enhance adaptation, then one must use KM to move toward and eventually attain The Open Enterprise.

WHO THIS BOOK IS FOR

Communities that would be interested in the book include:

- The KM community
- The Organizational Learning community
- The Innovation Management community
- The IT and portal communities
- The R&D community
- The HR and OD communities
- The Intellectual Capital Management Community
- The 'complexity theory as applied to business' Community
- The Systems Thinking Community
- The 'system dynamics as applied to business' Community

The following management communities will also be interested:

- Board members (interested in mitigating management errors, malfeasance and corruption, and who are also interested in enhancing their own fiduciary performance)
- CEO/Executive (interested in ANY approach that results in increased rates and relevance/quality of innovation outcomes as a source of competitive advantage)
- OD practitioners (interested in anything that relates to strategies for improving organizational performance)
- HR Directors (interested in business methods that lead to improvements in the value of 'human capital' and enhanced learning strategies)

- CIOs (interested in tracking developments in KM)
- CFOs (rapidly rising interest in growing and 'valuing' intellectual capital, or 'intangibles,' and reporting on same via the Finance function)

HOW TO USE THIS BOOK

Read the first four chapters for background on the Open Enterprise, and the next four to gain a detailed view of the Open Enterprise. Then read Chapter 9 on strategy and dynamics. Thereafter, chapters 10-13 may be read in any order, and chapters 14 and 15 on benefits and conclusions should be read last.

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THE OPEN ENTERPRISE

1

THE OPEN SOCIETY AND THE OPEN ENTERPRISE

POPPER'S "OPEN SOCIETY"

At the end of World War II, Karl Raimund Popper (1945, 1945a) published a two-volume work in political philosophy called The Open Society and Its Enemies. Popper's book, with its cutting, forthright, and effective critiques of Plato, Hegel, and Marx, had an extraordinary impact on elite opinion during the emerging Cold War period. His Open Society ideas have again become extremely popular in the aftermath of the collapse of the Soviet Union and its empire. During the late 1980s and 1990s, Open Society ideas, and Popper's philosophy of Critical Rationalism, more generally, have been diffused throughout Central and Eastern Europe by George Soros's philanthropy and by the Open Society Institutes begun in various Central and Eastern European nations with Soros foundation funds. Soros's purpose in founding these institutes has been to provide some of the infrastructure necessary to support the development of attitudes and practices supportive of democracy and market economies, tempered by political constraints appropriate for maintaining both democracy and markets.

Of course, even more recently, the relevance of Popper's Open Society ideas have also been increasing as a result of the highly visible attacks on Western targets by terrorists adhering to Islamic fundamentalist beliefs and the kind of vision of society that Popper attacked as "tribalism" in "Open Society." Popper's work brings into high relief, once again, the basic distinction between societies and political systems based on authoritarian, totalitarian, or communitarian (unquestioning submission to community norms) principles (closed societies) and those based on problem-solving,

openness to criticism, and individualism (open societies). The "War on Terrorism" is another struggle between open and closed society visions of the future of humankind, as were the previous conflicts between Fascism and Democracy, and later between Communism and Democracy.

Karl Popper did not like definitions, and he tried, as best he could, to avoid them while explicating the language he used. In characterizing "The Open Society," he made clear that it was not the same thing as democracy, even though democracy may provide the most favorable environment for maintaining Open Society. He also made clear that Open Society was not the same thing as market economy, though, again, market economies and open societies may be closely associated. Rather than being focused on political or economic forms of organization, Popper viewed Open Society as being distinguished by the freedom it provides for the critical faculties of man and their use in the pursuit of truth and the growth of knowledge. So at bottom, his notion of "Open Society" is distinguished by its pattern of ***epistemics***, problem-solving, or learning, rather than by its pattern of politics or economics, even though the latter patterns may well be greatly influenced by the former.

The importance of ***the freedom to criticize,*** and beyond the mere absence of restraint, actual openness to criticism in an organization, may not immediately seem so significant to some, but it turns out to be absolutely central to the development of human society and to the human capability to adapt. To understand its importance, consider Popper's views on truth, the growth of knowledge, and problem-solving. Popper thought that "all life is problem-solving" (2001). And that effective problem-solving (a) required a search for truth, (b) produced the growth of new knowledge, and (c) was essential in adapting to challenges presented by one's environment.

In this view, "truth" serves as a regulative ideal, attainable in principle, but also lacking an objective criterion to determine whether a particular statement or network of statements is actually or certainly true. This absence of criteria for determining truth suggests the principle of fallibilism, to be explained in a little while. Its significance is that when coupled with the principle of anti-justificationism, it implies that no knowledge claim, even if true, can ever be "justified." According to Popper, there are no foundational justifications for knowledge claims, but only a posteriori criticisms of them. Popper also thought that the search for true solutions to problems follows the abstract pattern illustrated in Figure 1.1. The problem is recognized and then recognition is followed by activity producing tentative solutions (sometimes called tentative theories if one is engaged in scientific problem-solving). This, in turn, is followed by error elimination activity, which leaves one with

falsified and surviving knowledge claims and also with new problems to be solved in another cycle. The new problems are more sophisticated problems than the old ones, and their greater sophistication is a result of the continually growing knowledge that has produced them.

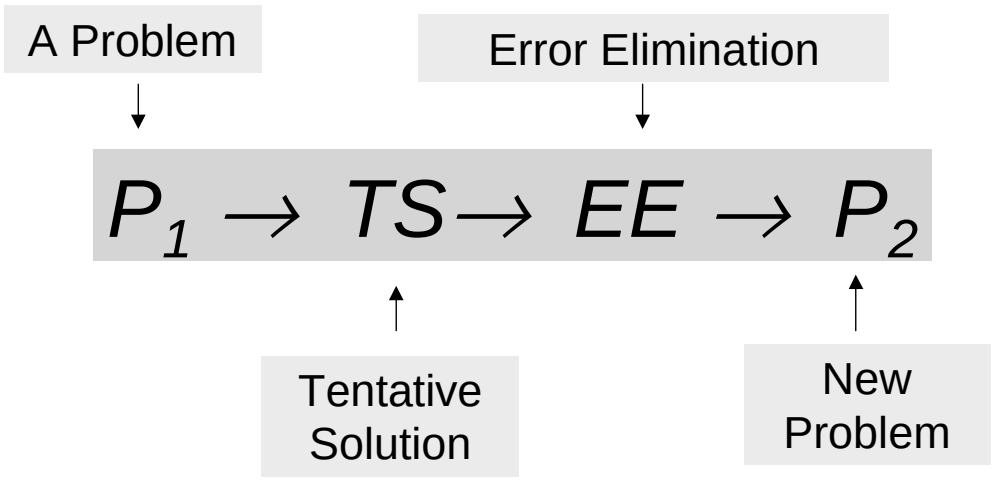

Figure 1.1
Popper's Tetradic Schema: A Framework for Problem-Solving

It is in relation to this "tetradic" problem-solving/knowledge production schema that the role and importance of openness to criticism in knowledge production, problem-solving and adaptation is most clearly seen. Error elimination activities use criticism to search for and eliminate errors in competing knowledge claims. Without criticism, there is no error elimination, and the knowledge emerging from problem-solving would be low in quality. Even problem recognition and developing tentative solutions involves criticism. There is more than one way to formulate a problem, and to select among alternative problem formulations, critical evaluation is needed. Similar reasoning applies to formulating tentative solutions. There are many of these for each problem, and a decision must be made to stop formulating tentative solutions at some point. That decision also requires critical evaluation.

Sidebar 1.1 Glossary of Key Terms

- **American Pragmatism** – A philosophy which views human thought, intelligence, and reason as tools for achieving control of our environment in the pursuit of the ends we value. Pragmatism contends that practical experimentation is the proper context in which to use such tools; that 'truth' is a function of the utility of a belief or claim, and that all of our beliefs and claims are both fallible and based on knowledge presuppositions. Most often associated with Charles S. Peirce, William James, and John Dewey, though they were not in agreement on the nature of truth, Pragmatism is a diverse movement full of variations among its adherents and nuances in their philosophical views.
- **Anti-foundationalism** – A class of epistemologies opposed to the view that we can justify our knowledge by appealing to some underlying, bedrock set of truths assumed to be certain. According to anti-foundationalism, there is no justified or justifiable set of "core" or "bedrock" knowledge claims from which all of our remaining knowledge claims may be derived through the use of reason and thereby given justifications of their own. Nor are such foundational claims necessary for arriving at knowledge.
- **Anti-justificationism** – The view that we can never justify our knowledge as true, and that we should therefore not attempt to do so. Our knowledge claims need not be justified, but only subjected to criticism, testing and evaluation as part of the process of problem-solving and arriving at surviving knowledge claims.
- **Communitarianism** – A form of justificationism which makes an appeal to a consensus or community-held view as a basis for justifying knowledge as true and certain. It is often associated with Thomas Kuhn's characterization of 'paradigms' and the views of the prevailing scientific community upon which they rested. But communitarianism harkens back to forms of knowledge production and decision making in traditional closed societies, where decision making in both knowledge and social processing relies heavily on community consensus and on cultural traditions that are strongly supported and reinforced by an organic tightly knit community.
- **Critical Rationalism** – The orientation of Karl R. Popper which holds that all human knowledge is fallible and should be regarded as such (see *Fallibilism*), and that we are rational only to the extent that we hold our

beliefs and our knowledge claims open to criticism and testing in order to eliminate the errors in them (see *Falsificationism*). It is based on the idea that "all life is problem-solving" (Popper, 2001), and that problem solving is a process of creating trials (between competing knowledge claims) and engaging in error elimination (criticism of these competing knowledge claims relying on the use of deductive reasoning and empirical testing where possible). Critical rationalism stands in opposition to foundationalism and justificationism, and is broader than falsificationism, which relates to empirical testing of knowledge claims only.

- **Empiricism** – A form of justificationism, expounded most notably by John Locke, David Hume, and in the 20th century by Logical Positivism and its immediate successors. Empiricism holds that knowledge can be justified by sensory perception, or experience alone; and that the role of reason or intellect is limited to deducing the consequences of propositions verified by experience.
- **Fallibilism** – A viewpoint that sees all human knowledge as irreparably fallible and incapable of being proven or shown to be certain or justified. As Popper put it: "By 'fallibilism I mean here the view, or the acceptance of the fact, that we may err, and that the quest for certainty (or even the quest for high probability) is a mistaken quest." Fallibilism provides one of the critical underpinnings of anti-justificationism.
- **Falsificationism** – The doctrine that scientific knowledge is distinguished from other forms of knowledge by the falsifiability of its universal knowledge claims, not by their verifiability, and that we create such knowledge by attempting to falsify it through empirical testing and evaluation.
- **Falsification** – A decision made by a scientist during empirical testing and evaluation to regard a universal statement as false when a singular statement entailed by the universal statement is logically contradicted by an observation report resulting from a test of the universal statement. The decision is a choice made to resolve the logical contradiction by falsifying the universal statement rather than other statements in the system that play a role in producing the contradiction. No such choices ever entail justifications or proofs that the beliefs or claims that are falsified are certainly false, or that the beliefs or claims that survive falsification are certainly true.
- **Floating Foundationalism** – A form of foundationalism that seeks to ground knowledge upon a subjective commitment to a belief, theory,

paradigm, or type of group solidarity which, themselves, are not justified, but which are regarded by their subscribers as though they are (Notturno, 2000).

- **Foundationalism** – A justificationist form of epistemology which claims that we can justify our knowledge and show it to be certain by appealing to some underlying, bedrock set of truths or authority (e.g., Cartesian Rationalism and British Empiricism).
- **Justificationism** – The view that knowledge is justified true belief, and that we can and should attempt to justify our knowledge as infallibly true by demonstrating that it is.
- **Rationalism** – An epistemology characterized by both justificationism and foundationalism, expounded most notably by Rene Descartes, which held that knowledge could be justified by reason or intellect alone, and not by sensory perception or experience.
- **Relativism** – A form of justificationism that denies an objective external reality or criterion for truth, and regards all truth and certainty as personal, local, and 'relative' to an individual – i.e., anti-foundationalist, but not anti-justificationist. From a slightly different perspective Popper defined relativism (1966, p. 369) as: ". . . the theory that the choice between competing theories is arbitrary; since either, there is no such thing as objective truth; or, if there is, no such thing as a theory which is true or at any rate (though perhaps not true) nearer to the truth than another theory; or if there are two or more theories, no ways or means of deciding whether one of them is better than another".
- **Verificationist Program of Logical Positivism** – A form of justificationism and foundationalism, expressing the view that only beliefs or claims that can be verified should be regarded as cognitively meaningful, whereas all other beliefs or claims are meaningless nonsense. The Logical Positivists attempted to provide a logical reconstruction of scientific knowledge by explicitly defining all abstract scientific terms in terms of observables.

So, criticism and our critical faculties, according to Popper's theory, play a central and irreplaceable role in our producing knowledge, growing it, solving problems, and adapting to changes in our environments. For that reason, societies that support openness to criticism and that cultivate human critical faculties will, assuming certain background conditions, solve more

problems, produce more knowledge, and adapt more effectively than societies of other types. In short, other things being equal, and in the long run, open societies will perform better than closed societies. And in protracted, less than all-out conflicts between representatives of the two types, time is on the side of open societies.

THE EPISTEMOLOGICAL BACKGROUND OF POPPER'S OPEN SOCIETY

It will help us with what comes later if we take some space here to go a little more deeply into the epistemological background of Popper's Open Society ideas and his emphasis on criticism as the instrument of adaptation and the growth of knowledge. In particular we will examine the doctrines of fallibilism, anti-justificationism, anti-foundationalism, and falsificationism more closely, since it is the clustering of these principles that leads to critical rationalism.

FALLIBILISM

Fallibilism is the doctrine that no knowledge claim about logic, reality, or value is certain, whether or not it is true, or in the case of value legitimate.[1] Fallibilism developed historically out of the failure of foundationalist epistemologies such as rationalism and empiricism to sustain the certainty of core knowledge claims or beliefs established either by "grasping" basic abstract truths (rationalism), or by perceptions of immediate experience (empiricism). Without establishing such foundational claims, the rest of human knowledge cannot be "justified" in the manner required by these epistemologies. In order to get a feel for the strength of the fallibilist position, we provide a brief examination of generalizations and singular knowledge claims along with some of the reasons why these claims are always uncertain.

All generalizations, no matter what their performance in the past, may cease to describe future events. In the case of universal generalizations, a single future counter-instance can cause us to falsify a generalization. In the case of statistical generalizations, results from a number of samples may, if they fail to fit the expected probability distribution, also lead us to falsify a generalization.

The idea that observational knowledge claims (also called observational reports, basic statements, protocol statements, singular statements etc.) or other singular knowledge claims are uncertain is sometimes hard to accept. But nevertheless the arguments supporting fallibilism are formidable. The

first thing to note is that there is always an epistemic gap between our knowledge claims and our experience; so in making knowledge claims we may be mistaken in describing an aspect of the world, or we may be lying. Excluding such possibilities the really important argument for uncertainty in observational or existential knowledge claims is that they are always theory-impregnated and make use of ***general dispositional terms*** (e.g., 'the glass on the table is fragile') implying conceptual and theoretical commitments that, in turn, entail uncertain general knowledge.

As Popper indicated in *Conjectures and Refutations* (1963, p. 387):

> *"Empiricists usually believed that the empirical basis consisted of absolutely 'given' perceptions or observations of* 'data', *and that science could build on these* data *as if on a rock. In opposition I pointed out that the apparent 'data' of experience were always interpretations in light of theories, and therefore affected by the hypothetical or conjectural character of all theories.*
>
> *That those experiences which we call 'perceptions' are interpretations - interpretations, I suggest, of the total situation in which we find ourselves when 'perceiving' - is an insight due to Kant. It has often been formulated, somewhat awkwardly, by saying that perceptions are interpretations of what is given to us by our senses; and from this formulation sprang the belief that there must be present some ultimate 'data', some ultimate material which must be uninterpreted (since interpretation must be* of *something, and since there cannot be infinite regress). But this argument does not take into account that (as already suggested by Kant) the process of interpretation is at least partly physiological, so that there are never any uninterpreted data experienced by us: the existence of these uninterpreted data is therefore a* theory, *not a fact of experience, and least of all an ultimate, or 'basic' fact.*
>
> *Thus there is no uninterpreted empirical basis; and the test statements which form the empirical basis cannot be statements expressing uninterpreted empirical 'data' (since no such data exist) but are, simply, statements which state observable simple facts about our physical environment. They are, of course, facts interpreted in the light of theories; they are soaked in theory, as it were.*

> *As I pointed out in my* Logic of Scientific Discovery *(end of section 25) the statement 'Here is a glass of water,' cannot be verified by any observational experience. The reason is that the* universal terms *which occur in this statement ('glass', 'water') are dispositional; they 'denote physical bodies which exhibit a certain law-like behaviour'."*

Israel Scheffler in Science and Subjectivity (1967, p. 34-35) makes the following comment on the certainty of the 'given':

> *"Error and certainty, like truth and falsehood, are purported characteristics of descriptions, not in general of things described. If tables, for example, cannot be mistaken, this is no sign of their infallible truth, but rather a symptom of their ineligibility for either truth or falsehood. To speak of given qualities as incapable of being mistaken, is, similarly, no evidence of their certainty, but rather a reflection of their being like tables, non-descriptions."*

In other words, we do not say of phenomena such as ‘given qualities’, or tables, or perceived colors, or feelings, or objects in general that they are true or false, but rather that they are existent or non-existent, there or not there. Truth and falsehood, certainty and uncertainty are not predicates that apply to the phenomena themselves but to descriptions of them expressed in statements, and, of course, these descriptions, as just noted, cannot be certain. They are always subject to the possibility of error.

So the notion of the 'given' falls to establish a distinction between singular observational reports and universal theoretical statements. The given could be present as an element in experience and could, indeed be unalterable and ineffable in the sense described by some philosophers. And even if this were true, the observation reports, in the context of which conceptualization meets the given, could still not provide error-free descriptions of what is given. ***There are no error-free descriptions, simply because the given, on this account is ineffable, and observation reports necessarily involve conceptualization and hence theoretical commitments which are subject to error and to our demands for further justification.***

The fallibility of knowledge claims about color is addressed in an interesting way by R. G. Collingwood (1940), a well-known British Philosopher who thought that our color classifications were not a direct apprehension of some immediate experience, but instead were mediated by culture. Collingwood (1940, p. 195) said:

> *"The ancient Greeks and Romans classified colors not as we classify them, by the qualitative differences they show according to the place they occupy in the spectrum, but by reference to something quite different from this, something connected to dazzlingness or glintingness, or gleamingness or their opposites, so that a Greek will find it natural to call the sea "winelooking" as we call it blue, and a Roman will find it natural to call a swan "scarlet" - or the word we conventionally translate scarlet - as we call it white."*

Finally, note Bruce Aune's argument against the infallibility of a mind's awareness of its own states including pain (Aune, 1970, 140-141)

> *" . . . It has commonly been assumed by philosophers that a mind's awareness of its own states is infallible, but this assumption is just as questionable as our everyday assumptions concerning observation.*
>
> *Consider the case of a man's firm belief that he is experiencing an intense pain. Although the idea that his belief could not be false is nowadays endorsed by empiricists as well as by rationalists, it is indefensible on Hume's critical principals. The reason is simple: a belief that pain is being experienced is one thing and a feeling of pain is another. Given this undeniable difference between the belief and the pain, there can be no contradiction in the idea that a man may believe that he is in pain and yet be wrong; the supposition that such a mistake occurs is perfectly consistent. This means that the principle "If a man believes strongly that he feels pain, he cannot be wrong," is not demonstrably certain; it cannot be known to be true by deduction. Since it is logically synthetic and also general, it can be established, if at all, only by inductive generalization. But the latter form of inference (even assuming that it is justifiable) can yield only probable conclusions: if all observed ravens have been black, we can conclude only that all ravens are probably black; we cannot conclude that they are necessarily black. Similarly, the most that we could establish inductively about belief in pain is that if a man believes strongly that he is in pain, then he* probably *is in pain; we could not establish that he* must certainly *be in pain under these conditions."*

This example relates to one' beliefs rather than one's knowledge claims, but if the epistemic gap between one's beliefs and one's feelings makes the

supposed necessary connection between the two doubtful, how much more likely is it that the epistemic gap between one's knowledge claims and one's feelings makes that assumed connection still more doubtful?

ANTI-JUSTIFICATIONISM AND ANTI-FOUNDATIONALISM

Popper was not only a thoroughgoing fallibilist, but still more importantly he developed a position of anti-justificationism as well. ***Justificationism is the view that knowledge is justified true belief and that knowledge claims must be demonstrated to be true (justified) before we can properly call them knowledge. Anti-justificationism is the idea that knowledge claims need not be justified, but only subjected to criticism, testing and evaluation as part of the process of problem-solving and arriving at surviving knowledge claims. These surviving knowledge claims are our knowledge***. Put simply, this view states that there is no such thing as justified true belief, nor can there be. Moreover, rationality and objectivity in problem-solving is not to be found by justifying solutions through appeals to authority, reason, or sense experience, but rather, ***objectivity and rationality inhere in exposing tentative solutions to criticism, testing, and evaluation***. So, knowledge "is objective and rational not because we have justified it, but because we can criticize it" (Notturno, 2003, p.).

This position of giving up the whole justificationist enterprise, at least in broad outline, is the one favored by Popper and those who have been influenced by both his views and those of Charles Sanders Peirce (1955). If one believes that all knowledge claims, whether arrived at through reason or through sense perceptions, are fallible, and that, in addition, no knowledge claims can be, or need be, justified, then one will also believe, as Popper did, ***that there is no justified or justifiable set of "core" or "bedrock" knowledge claims from which all of our remaining knowledge claims may be derived through the use of reason and thereby given justifications of their own***. ***This view is what we mean by anti-foundationalism***. It is closely related to anti-justificationism and to fallibilism, since it is a consequence of both. And its significance is the rejection of all foundationalist epistemologies, including the classical programs of Cartesian Rationalism and British Empiricism, along with the verificationist program of Logical Positivism, which held that all knowledge of reality had to be verified through observation and experiment.

There have been two important reactions to arguments made by Popper and many others, including many pragmatists against justificationism and foundationalism. First, many have abandoned the goal of giving an account of

objective knowledge at all. Some of these, such as Paul Feyerabend (1975), have embraced relativism and denied the possibility of objective knowledge, but, second, most others now practice what Mark Notturno (2003) has called "Floating Foundationalism." As Notturno has put it (2003, pp. xx-yy):

> *Philosophers today tell us that they have given up Descartes' project of 'bedrock' foundationalism. But they have often replaced it with a justificationist program that would 'ground' our knowledge upon a subjective 'commitment' to a belief, or theory, or paradigm that they regard as neither justified nor rational. We can see this approach in the later philosophies of Wittgenstein, Carnap, and Quine; in Thomas Kuhn's theory of scientific paradigms, and in Richard Rorty's appeal to 'solidarity' as a substitute for objectivity. These philosophers tell us that scientific knowledge can indeed be justified. But they also say that its justification is always tentative, fallible, and precarious and, in any event, ultimately based upon commitment: forgetting, perhaps, the reason why we wanted a justification in the first place. Their approach is a kind of 'floating foundationalism' that retains the foundationalist theory of rationality, and its demand for justification by logical argument, but leaves the foundations themselves floating in midair. But the problem of knowledge, if Popper is right, can no longer be the problem of justifying our empirical theories, for no foundation is grounded upon bedrock, and those that float in midair cannot show that our theories are true or even probably true.*

Second, the alternative to relativism and to "floating foundationalism," is, of course, Popper's own epistemological program of critical rationalism (Popper, 1963, pp. 26ff). That program is based fundamentally on the ideas of criticism, falsification and error elimination. And it is these ideas that ultimately provide the clearest connection between Popper's epistemological views and the essential ideas of Open Society.

FALSIFICATIONISM, ERROR ELIMINATION, AND CRITICISM: "KILLING OUR BAD IDEAS BEFORE THEY KILL US"

Falsificationism proceeds from fallibilism, anti-justificationism, and anti-foundationalism, and holds that no universal ***knowledge claim about reality (such as 'all Ravens are black') may be verified*** in the sense that one can formulate a set of singular knowledge claims (e.g., raven a is black, raven b is

black, raven c is black . . .) that ***necessitates*** acceptance of it as a conclusion***, while it may be falsified*** in the following precise (and perhaps surprising) sense.

(a) The universal knowledge claim can be one of several premises that entail a conclusion contradicted by a singular knowledge claim such as a measurement or other observation report (e.g., at time 'x' and place 'y', The authors have seen a white raven). And

(b) When faced with such a contradiction, we ***choose*** to regard the universal knowledge claim as false, rather than one of its accompanying premises, or the singular knowledge claim.

This statement makes clear that falsification is not a rule-governed process. Falsification is not determined by observation, as one might expect. There is no mandate that we must falsify the universal knowledge claim if it is contradicted by what we observe. We must only recognize that the body of knowledge claims, including the first knowledge claim, and all the background assumptions and "auxiliary" knowledge claims that accompany it as premises, as well as the second knowledge claim (the observation report) and all of its background assumptions and auxiliary knowledge claims, are contradictory. It is the contradiction and our desire for consistency in our body of surviving knowledge claims that ***forces us to decide*** which knowledge claims are false in order to eliminate the errors in our body of surviving claims.

By choosing to falsify these knowledge claims and thus eliminate such errors, we also "kill our bad ideas before they kill us." And our knowledge grows in the very specific sense that we know which of our knowledge claims we have classified as false, and which survive to help us solve problems in the future.

Popper proposed falsificationism as part of his solution to the demarcation problem of how to separate scientific inquiry from other forms of inquiry including metaphysics. His proposed solution to this problem was to require that systems of scientific knowledge claims must be falsifiable (testable) by observation reports, while non-scientific knowledge claims need only be subject to criticism of other types. In this book, demarcation is not an important concern, because we are concerned with more broadly organizational, rather than "scientific," knowledge. Still, Popper's ideas about falsifiability and falsification remain of central concern because they focus us on ***the role of deductive logic*** in criticizing and evaluating knowledge claims, and in forcing us to choose among our surviving knowledge claims. Thus, it

is the ***logical contradiction*** between an observation report (a singular knowledge claim) and its related knowledge claims, and ***the conclusion deduced*** from a universal knowledge claim (and its related assumptions and auxiliary knowledge claims) that forces us to revise a body of knowledge claims to eliminate error and grow our knowledge.

Falsificationism emphasizes logical contradictions that arise between deductions about expected observation reports and actual observation reports, but the principle involved in falsification, in our view, is broader than falsifiability. Any time we create a group of knowledge claims that are in contradiction with one or more of our previously surviving knowledge claims, we are forced to consider a choice among our knowledge claims. Where know-how and resources are available, as they are in many fields within the sciences, we may choose to conduct "crucial experiments" or other empirical tests to provide a basis for falsifying knowledge claims in Popper's precise sense. But frequently, such tests may be impractical or beyond our present capabilities to perform; yet we still may need to decide that some of the knowledge claims in our contradictory system are in error and should be eliminated. We decide this by subjecting the competing claims to criticisms of various kinds, and then, after evaluation of how well they survive criticism, decide to eliminate those claims that contribute to inconsistency in the system and that also perform poorly in the face of criticism.

So, the most important point here is the role of logical deduction in ***setting problems*** for our knowledge claims, and in forcing us to evaluate them through testing and criticism of various kinds. And this in turn emphasizes the central role of criticism in problem-solving and inquiry. When we accept fallibilism, anti-justificationism, anti-foundationalism, and falsificationism, rational inquiry and problem-solving come down to problem recognition, openness to new ideas, and openness to criticism through a process of error elimination. Thus, Popper's tetradic schema represents the essentials of critical rationalism. It is based on the idea that "all life is problem-solving" (Popper, 2001), and that problem solving is a process of creating trials (between competing knowledge claims) and engaging in error elimination (criticism of these competing knowledge claims and selection and elimination of those that are in error).

FALLIBILISM, ANTI-JUSTIFICATIONISM, ANTI-FOUNDATIONALISM, FALSIFICATIONISM, CRITICAL RATIONALISM AND OPEN SOCIETY

Fallibilism, anti-justificationism, anti-foundationalism, and falsificationism, along with their confluence in critical rationalism, are

closely related to the Open Society construct. First, if all knowledge claims are fallible and none, including foundational knowledge claims, can ever be justified, then it follows that ***there is never any justification to close oneself off from new criticisms of any knowledge claim,*** no matter how well it may have survived testing and evaluation in the past. In Open Society, the process of criticism of knowledge claims is open to all. Any "settling of inquiry" or solution to a problem, is always tentative, even after error elimination has occurred. Thus, we arrive at Peirce's (1955, p. 54) famous dictum: "Do Not Block the Way of Inquiry," a recommendation for both Science and Open Society that fits the reality that all knowledge claims are fallible, and supports the ideas of openness in problem recognition, knowledge claim formulation, and in criticism. It also envisions the possibility of continuous inquiry in the service of problem-solving and societal adaptation.

Second, falsificationism underlines the need to test and evaluate knowledge claims in Open Society by looking for errors in them, rather than looking for support for them. And this, in turn, brings ***criticism*** in the course of problem-solving and continuous inquiry front-and-center in the Open Society. Popper's philosophy is called critical rationalism for two primary reasons: (1) the centrality of criticism to error elimination, and (2) the idea that 'rationality' is error elimination through the use of deductive logic in the service of *criticism*.

While openness to criticism is the centerpiece of Open Society because of its role in adaptation, there is also an important negative aspect of openness to criticism, along with openness in problem recognition, and openness to new ideas. The negative aspect, well-recognized by Popper, is the strain resulting from the breakdown of closed, tribal, magical, authoritarian, communitarian, and collectivist societies, and the attempted transition to a stable Open Society, characterized by individualism, freedom, personal responsibility, voluntaristic social groupings, and adaptation to continuous change. In the introduction to his *The Open Society and Its Enemies* (1945, p. 1), Popper characterized his book this way:

> *It sketches some of the difficulties faced by our civilization - a civilization which might be perhaps described as aiming at humaneness and reasonableness, at equality and freedom; a civilization which is still in its infancy, as it were, and which continues to grow in spite of the fact that it has been so often betrayed by so many of the intellectual leaders of mankind. It attempts to show that this civilization has not yet fully recovered from the shock of its birth - the transition from the tribal or*

> *'closed society', with its submission to magical forces, to the 'open society' which sets free the critical powers of man. It attempts to show that the shock of this transition is one of the factors that have made possible the rise of those reactionary movements which have tried, and still try, to overthrow civilization and to return to tribalism. And it suggests that what we call nowadays totalitarianism belongs to a tradition which is just as old or just as young as our civilization itself.*

After 57 years, Popper's words still seems highly relevant today, in the wake of the rise of yet another challenge from those who would destroy the Open Society in those nations where the transition to it has made the most progress. And who would also stop and reverse the transition from closed, tribal society, in many developing areas that are experiencing the disadvantages of the transition, without sharing very much in its manifold benefits. We refer, of course, to the challenge to Open Society from Islamic Fundamentalism; a challenge that seeks to impose a new, but backward-looking, religion-based authoritarianism that envisions the re-imposition of an idealized communitarian society, governed by religious laws and customs – a society within which each individual has a well-defined place and relationship to both God and other men, and in which the burden of freedom and responsibility has been lifted from individuals and assumed by the collective. About this type of "Escape From Freedom" (Fromm, 1941), and specifically the version of it prescribed by Plato in Ancient Greece, Popper (1945, pp. 200-201) had this to say:

> *The lesson which we thus should learn from Plato is the exact opposite of what he tries to teach us. It is a lesson which must not be forgotten. Excellent as Plato's sociological diagnosis was, his own development proves that the therapy he recommends is worse than the evil he tried to combat. Arresting political change is not the remedy; it cannot bring happiness. We can never return to the alleged innocence and beauty of the closed society. Our dream of heaven cannot be realized on earth. Once we begin to rely upon our reason, and to use our powers of criticism, once we feel the call of personal responsibilities, and with it, the responsibility of helping to advance knowledge, we cannot return to a state of implicit submission to tribal magic. For those who have eaten of the tree of knowledge, paradise is lost. The more we try to return to the heroic age of tribalism, the more surely do we arrive at the Inquisition, at the Secret Police, and at a*

> *romanticized gangsterism. Beginning with the suppression of freedom and truth, we must end with the most brutal and violent destruction of all that is human.* ***There is no return to a harmonious state of nature. If we turn back, then we must go the whole way - we must return to the beasts.***

ESSENTIAL IDEAS OF THE OPEN ENTERPRISE

Modern democracy is associated with Open Society, not because Open Society provides for majority rule and a peaceful means of replacing leaders, but because it provides for minority rights and protection of freedom of inquiry. These things, in turn, serve the adaptive interests of society. Given that knowledge is fallible, there are two primary virtues of democracy from the standpoint of enhancing our adaptive capability (Thorson, 1962, chs. 7-9):

(1) It keeps open the way of inquiry, and

(2) Also keeps open the possibility of change with respect to social goals

Because it does not block the way of inquiry and safeguards the possibility of change in social goals, democracy supports Open Society ***and*** openness in organizations. But adaptation is more directly tied to openness in inquiry and learning than it is to democracy. From the standpoint of adaptation and learning, democracy is a means to openness in learning and hence to adaptation. Openness, then, is a means to adaptation.

Turning to business, most large firms are oligarchies. Politics in them is controlled by a few managers who hold most of the power based on authority delegated by Boards elected by stockholders in manipulated and frequently uncontested elections. The rule of managers is generally self-perpetuating because they manipulate both stockholders and Boards. Employees follow the direction of these Managers.

The authority of managers also extends to Knowledge Production, which is centralized, based on 'justified true belief,' and maladaptive. What would the enterprise be like if it were open? Can oligarchies be open and "adaptive"? Can they be adaptive without being open?

The "Open Enterprise" is the organizing concept we use to consider these questions. As we will see, the "Open Enterprise" need not be a democracy. But, if it is not, it must still exhibit many characteristics of democracy ***in its Knowledge Processing and Knowledge Management*** behaviors**.** In other words, oligarchies may be open, too, so long as they protect individual rights in producing and integrating knowledge! That is, they can at once be open in

Knowledge Processing while maintaining the authority of management in decision making.

The essential ideas of the Open Enterprise are:

1. Openness to problem recognition and detection
2. Openness in problem-solving to ideas that are new to us and in formulating tentative solutions
3. Openness to criticism of our solutions, theories, or knowledge claims in error elimination, and
4. Honesty in reporting problems, new ideas, and criticisms (Notturno, 2001).

The first three requirements relate to the steps in Popper's tetradic schema. The fourth recognizes that the problem-solving process will not produce outcomes of quality, approaching closer and closer to the true solutions to problems, if honesty is not present in the system. The reason is that dishonesty would undermine the effectiveness of problem-solving in that (a) the most serious problems facing an enterprise would not be identified, (b) the most promising tentative solutions would not be identified for comparative testing and evaluation, and (c) the competing solutions would not face the strongest challenges to their ability to survive.

The pay-off of the Open Enterprise is the growth of knowledge targeted on solving adaptivity problems, including the growth of knowledge about how to solve problems, innovate, and adapt. This pay-off of the Open Enterprise is enhanced adaptive capability, or, in other terms, organizational intelligence.

THE OE, ORGANIZATIONAL INTELLIGENCE, AND ADAPTATION

The term "organizational intelligence" has been used in a number of ways. Sometimes it refers to information of higher quality, but not of such high quality that it is knowledge. Sometimes it is used to refer to the aggregate of the intelligence of individuals comprising an organization. Sometimes it is used as a synonym for Knowledge Management. And sometimes it refers to an organization's capacity to solve problems through learning. This last definition is the way we will use the term in this book.

Organizations vary in their intelligence. In later chapters we will show that this variation is due to differences in the way they typically process their knowledge, and that such performance is in turn affected by the underlying

conditions of knowledge processing in organizations.

The problem of organizational intelligence is the problem of enhancing the capacity to learn of organizations. Organizations are complex adaptive systems, characterized by self-organization of their components and the emergence of global system attributes (See chap. 2, and Gell-Mann, 1994; Holland, 1995, 1998; Kauffman, 1995; Waldrop, 1992). The changes in learning capacity necessary to enhance the global system attribute called organizational intelligence cannot be mandated or designed. Instead, it must be enhanced by creating the underlying conditions that enable its emergence. That emergence will ultimately be determined by the self-organizing interactions of the individuals and groups comprising the organization. In this book, we will make the case that those underlying conditions are the various attributes and patterns that add up to what we call the Open Enterprise. And that the way to enhance organizational intelligence, as well as adaptation, is to transition one's organization to the Open Enterprise from other organizational patterns.

CORPORATE CORRUPTION, TRANSPARENCY, AND THE OPEN ENTERPRISE

The primary value proposition of the Open Enterprise is in its enhancement of problem-solving, learning, innovation, and adaptation. But, openness in knowledge processing also has implications for mitigating corporate corruption and improving transparency. We have outlined this relationship in the introduction. Its essence lies in the continuous effort at error elimination characteristic of the Open Enterprise and in the greater breadth of participation of its employees in the error elimination process. Corrupt policies that breach the fiduciary relationships between top management, the Board, and stockholders are more difficult to implement when, in the Open Enterprise, they are exposed to criticism while being formulated, prior to their adoption into business processes. Furthermore, in the Open Enterprise, the greater transparency of knowledge production processes can enhance Board and stockholder oversight of policy and program formulation and implementation. This transparency can be enhanced even further if appropriate information technology support is implemented to support Knowledge Processing in the Open Enterprise. We will return to the question of information technology support for the Open Enterprise in Chapter 11, and to a much more detailed argument on the impact of the Open Enterprise on corporate corruption and transparency in Chapter 12.

CONCLUSION

We have overviewed the most important concepts underlying Open Society including fallibilism, anti-justificationism, anti-foundationalism, falsificationalism and critical rationalism and shown how they relate to problem-solving and adaptation in the Open Society. Then we took these ideas and applied them to the idea of the Open Enterprise by specifying its basic requirements. Next we described the relationships we believe exist between the Open Enterprise and both organizational intelligence and corporate corruption and transparency. We now move on to develop our ideas about the Open Enterprise in a more comprehensive and rigorous fashion. In the next chapter, we develop the foundations of the theoretical framework underlying the Open Enterprise construct. These foundations include complex adaptive systems theory, social and psychological foundations, culture, the unified theory of knowledge, and the Knowledge Life Cycle and its origins.

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END NOTES

[1]This is our formulation of Fallibilism, not Popper's. Popper (1966, p. 375)) wrote: "By 'fallibilism I mean here the view, or the acceptance of the fact, that we may err, and that the quest for certainty (or even the quest for high probability) is a mistaken quest. But this does not imply that the quest for truth is mistaken. On the contrary, the idea of error implies that of truth as the standard of which we may fall short. It implies that, though we may seek for truth, and though we may even find truth (as I believe we do in very many cases), we can never be quite certain that we have found it. There is always a possibility of error; though in the case of some logical or mathematical proofs, this possibility may be considered slight." Popper (1966, pp. 384-386) mentioned valuational knowledge claims in connection with fallibilism, but he did not pursue the ideas he expressed there in very much detail. As we will show later, we think that fallibilism, and more broadly, critical rationalism may be applied to creating valuational knowledge claims and assessing their legitimacy through error elimination.

[2]"Justified True Belief" is the oldest and most common definition of knowledge. It can be traced back to Plato in *Theaetetus* 201, and *Meno* 98.

The main philosophical bulwark against skepticism and relativism until the 17th Century, however, was religious doctrine, which, of course, supported the idea of Justified True Belief and certain knowledge. Philosophical modern times begin, in a sense, with the 17th century writings of Descartes and John Locke. Descartes, the rationalist, who believed that self-evident knowledge, graspable by the intellect, lay at the foundations of all our knowledge, and Locke, the empiricist, who believed that all of our knowledge could be grounded on the indubitable foundation of sense perceptions, founded the Modern traditions of Rationalism and Empiricism, both instances of the view that knowledge is Justified True Belief. A list of great philosophers since that time, whatever their other differences on other matters shared this basic assumption, including: Spinoza, Berkeley, Leibniz, Hume, Kant, Hegel, Mill, Mach, Wittgenstein, The Logical Positivists, Russell, Whitehead, and Moore. In contemporary Knowledge Management, when they are explicit about it at all, theorists endorse the Justified True Belief point of view. See, for example, Nonaka and Takeuchi (1995). In philosophy, Justified True Belief has fallen on hard times. Much of American philosophy subscribes to one or another form of Pragmatism, which is fallibilist in character and largely opposed to Justified True Belief. Moreover, the work of Kuhn (1970) has given great comfort to skeptical and relativist approaches which deny that Justified True Belief is possible, and also to "floating foundationalists" (Notturno, 2000, 2003) who while denying that there are Justified True Beliefs, often act as though irrational commitments are just as effective in grounding knowledge as Justified True Beliefs. Finally, there is the approach of Karl Popper and his successors, which steadfastly deny skepticism and relativism, while still maintaining the impossibility and lack of desirability of Justified True Belief as a definition of knowledge.

[3]Notturno, 2000, p. 108. As Notturno says:

"If justification is impossible, then criticism is not the refutation of theories. It is the setting of problems for them. We set problems for a theory by showing that it contradicts other statements that we believe to be true. Since contradictory statements cannot both be true, we can force ourselves, in this way, to choose between a theory and our other beliefs. If our criticism is effective, then we may, at the minimum, have to refine our theory in some way so as to remove the contradiction. But the criticism itself never proves that our theories are false. And if this is what is meant by 'refutation,' then it never refutes them. The problems that we set may sometimes seem overwhelming, and they may even lead us to think that our theories have been shown to be false. But if they do, then we should remember that we are fallible human beings, and that our fallibility means that what seems

overwhelming at one moment may seem easy to deal with the next. We may, for example, learn something new that makes what once seemed obviously true seem obviously false."

THE OPEN ENTERPRISE

2

KNOWLEDGE AND KNOWLEDGE PROCESSING FRAMEWORKS

INTRODUCTION

What are the conceptual foundations of the Open Enterprise? They include diverse conceptual frameworks and theories including:

- Complex Adaptive Systems (CAS) Theory
- Social, psychological, organizational learning, and cultural frameworks
- The unified theory of knowledge, and
- The Knowledge Life Cycle (KLC) process framework describing the pattern of how knowledge is produced and integrated into organizations and how knowledge processing relates to business processing.

This chapter presents each of these frameworks to provide further background for our development of the Open Enterprise idea. We'll begin with the foundation of our thinking in CAS, sociological, psychological, organizational learning, and cultural theory. After that, drawing on the account of Critical Rationalism provided in Chapter 1, we'll develop our theory of knowledge, both in general terms and at the level of organizations. Last, we'll present our vision of the Knowledge Life Cycle, or KLC, a descriptive model of knowledge production and integration in organizations.

COMPLEX ADAPTIVE SYSTEMS

The theory of Complex Adaptive Systems (CAS) is one of the great intellectual developments of the past quarter of a century, bringing the General Systems Theory framework (von Bertalanffy, 1950, 1968; von Bertalanffy and Rapoport, 1956; Boulding, 1956, 1956a; Beer, 1966, 1972; Cannon, 1932; Miller, 1953, 1955; Ashby, 1952, 1958; Ackoff, 1963; Deutsch, 1953, 1963; Gerard, 1953; Hall and Fagen, 1956; Rapoport, 1953; David Easton, 1953; Selye, 1956; Klir, 1969; Laszlo, 1972; Nagel, 1961; Braithewaite, 1960; Hempel, 1959; Mesarovic, 1968; Simon, 1965, 1969, 1973; Meadows, et al. 1972, 1974; Maturana and Varela, 1980, 1987; Young, 1964) to a new level of relevance and achieving a much greater degree of popular awareness for it than it had previously enjoyed. The CAS approach (Gell-Mann, 1994; Holland, 1995, 1998; Kauffman, 1995; Waldrop, 1992) addresses the underlying factors needed to understand and account for organization in such non-deterministic systems as urban areas, business firms, ant colonies, and humans. These and other systems like them are built from *autonomous actions of agents* whose interactions result in emergent ***integration*** (see Sidebar 2.1). Each ***integrate*** constitutes a higher level agent or system.

Sidebar 2.1 Aggregates or Integrates? A Terminological Question

CAS theorists distinguish the process of aggregation from its outcome, the emergent ***aggregate*** resulting from this process. There is nothing inherently wrong with this terminology. It is, however, in sharp conflict with pre-existing usage in Sociology, a field in which CAS Theory may usefully be applied.

In Sociology, the term aggregation refers to computing an arithmetic value to be attributed to a variable used to describe a category based on values of an analogous variable attributed to individual members of that category. For example, average income of individuals in the U.S. is such an aggregate value, as is average income of working women in Democratic nations. However, these two examples of aggregation are different in an important respect. “Individuals in the United States” is not just a set named by a category, it is a set whose members also form a collective through their interactions. Thus, average income can be viewed as an aggregate property of that collective. On the other hand, “working women in the United States,” do not form such a collective, and therefore their average income is no more than

an aggregation of individual level values, an aggregate property of a category.

These examples illustrate that the use of "aggregate" in Sociology and its use in CAS Theory are different. Indeed, an "aggregate" in CAS Theory is a "collective" in Sociology, while an "aggregate" in Sociology is a category that may or may not be associated with a collective in CAS Theory.

We propose that the usage in CAS Theory be changed in view of the earlier and more broadly accepted usage in Sociology, which has also been carried over to Economics, Political Science, and other social sciences. Specifically, since the idea behind the CAS usage is that a collective emerges out of the individual level interactions among its members, we propose that this be viewed as a process of ***integration*** of the collective and that its outcome be called an ***"integrate"*** rather than an "aggregate."

John Holland's work on CASs is among the most outstanding work on this subject. A striking aspect of it is its success in showing that emergent behavior at the level of integrates can result from interacting agents motivated by relatively simple rules. ***Hidden Order*** (1995) and ***Emergence*** (1998), in particular, make the case that a system of simple agents can self-organize to create higher level integrates exhibiting emergent behavior. Research has identified a number of distinctive and important features of CASs.

CAS FEATURES

The first of these is coherence in the face of change, or "identity." Coherence refers to the maintenance of the characteristic pattern of organization of a CAS through time. Coherence in a CAS's overall pattern of organization persists in spite of the continuous change occurring in its agents, the materials it may use, the challenges it is called upon to meet, and the specific responses it produces. The process of maintaining coherence or identity in the face of environmental changes, also referred to as "self-making," is called "autopoiesis" by Maturana and Varela (1980).

Think of the changes occurring in any city in its commercial imports, the weather it experiences, the new people and personalities entering it, and the new historical events it must cope with. And yet the city maintains its identity over time. Its characteristic pattern and style of behavior remains constant. Think of the self and its identity. It is formed at an early age, and it persists through many years of diverse and not wholly predictable change into old age. Yet for most of us, our selves, our core identity, remains intact until death. Think of a nation. It may go through extremes of population

expansion, civil conflict, economic cycles, economic development and industrialization, immigration, and war, and yet its characteristic value orientations may persist so that its "national character" is recognizable even after hundreds of years.

Second, CASs are diverse in both form and capability. They range from adaptive software agents to ecosystems to the International Social System, and include one-celled living systems, minds, immune systems, central nervous systems, human individuals and organizations, cities, regions, nations, cultures and many other systems of diverse form, and varying capability and degrees of complexity.

Third, CASs are populated with agents (members) who learn, individually and collectively. The idea that individuals learn is easy to accept. But the idea of collective learning may be harder to visualize. Later on we will discuss collective learning in more detail.

Fourth, distributed problem-solving and knowledge processing is an important feature of CASs. Individual agents in CASs solve their own problems. In doing so, they contribute to solving the problems of CASs in a distributed, but organized fashion.

Fifth, CASs are marked by extensive interactions among their agents. It is the weight and density of such interactions that produces the pattern of organization that defines a CAS. Intermittent interactions are not sufficient to establish a CAS pattern with its complex patterning of feedback loops and reinforcements that maintains the CAS at "the edge of chaos" (Langton, et. al., 1992)

Sixth, CAS agents self-organize to produce emergent global behavior at the CAS level. This is one of the most important features of CASs. The key idea is that the agents comprising a CAS act in accordance with their own purposes and motives, in pursuit of their own goals, and that their actions produce self-organization, without any centralized planning or control, and in a way that we cannot model successfully, resulting in the recognizable pattern of global organization that identifies the CAS.

Seventh, CASs behave and learn partly in accordance with knowledge which can be modeled as 'rules.' Learning by means of rules is reinforcement learning (Sutton and Barto, 1998). That is, each time a rule is used to determine behavior and the behavior is followed by a positive balance of benefits to costs, the agents embodying the rule receive positive feedback, increasing the likelihood of future reliance on the rule. Conversely, if the behavior is followed by a negative balance of benefits to costs, the agents receive negative feedback, decreasing the likelihood that the rule will be used

in the future.

Eighth, CASs also adapt by developing and using new rules as they continuously attempt to fit themselves to their environments. The process of developing new rules is "creative" or "evolutionary" learning. It involves ***random generation of new rules and recombination of components of old well-established rules***. ***Once new rules are formulated, they are subject to selection through interaction among the agents of the CAS and interaction of the CAS with its environment.*** Selection establishes the "fitness" of the rules to the CAS's environment.

Ninth, the ability of CASs to successfully learn and develop new rules, or knowledge is greater to the extent that their constituent agents are operating in problem-solving and distributed knowledge processing environments marked by relative "openness". The more "openness" in the distributed knowledge processing environment, the greater the adaptive capability of the CAS, provided that the ability of its agents to learn remains constant. Also, "openness" must apply across the various phases of the problem-solving process identified in Popper's tetradic schema, specifically: problem recognition (P_1), finding or making tentative solutions (TS), and eliminating errors (EE) in selecting a solution. The kind of openness we speak of here has at least two important dimensions:

(1) the extent to which information about existing rules (general knowledge) governing or affecting their own behavior, as well as their performance in practice (specific outcomes), is available, visible, and not intentionally misleading, to members of the CAS;

(2) the extent (exclusive of (1) above) to which the CAS's structure provides each of its members an environmental resources/ constraints pattern necessary for it to optimally perform autonomous, distributed problem-solving and knowledge processing, and in this way to contribute to the collective learning processes of the integrate.

The first form of openness is ***internal transparency*** (availability and accessibility of information across CAS agents); the second is ***epistemic inclusiveness*** (CAS enabling of autonomous, distributed knowledge processing across agents). Both forms of openness are always found in high-performance adaptive systems.

Regarding epistemic inclusiveness, it is important to understand that we are not talking about inclusiveness in political or managerial decision making authority, a sense of the term most often associated with the notion of 'inclusiveness' in organizations. Nor do we mean to use the term to involve,

say, mere openness in membership on Boards of Directors or in other such institutions, although for some firms, that may be a step in the right direction. Rather, what we have in mind here is equal opportunity for all autonomous agents in a CAS to participate and interact in the problem-solving and distributed knowledge processing affairs of the system, so that the kind of distributed knowledge processing cited in the fourth attribute above can be effective. Let us consider an example taken from outside the human domain to help us see an illustration of the pattern of epistemic inclusiveness that is uncontaminated by the notion of inclusiveness in the political system of an organization.

In their very fine work, *The Ants* (1990), biologists Bert Holldobler and Edward O. Wilson provide many accounts of how ants produce emergent collective behavior, ***purely as a result of autonomous learning and decision making (action) by the individual and distributed members of a colony***. As individuals in ant colonies learn by performing random search behavior occasionally followed by discovery of new food sources, they communicate their knowledge to other members of the system by secreting *semiochemicals* known as *pheramones* as they return from the new food source to the ant colony. ("A *semiochemical* is any chemical used in communication…" [p. 227]). As individuals within a colony come into contact with one another's pheramone messages, their individual-level behaviors adjust in response. That is, they follow the pheramone trails, rather than engaging in random search behavior. As each individual uses the knowledge embodied in the pheramone trails, group-level behaviors emerge of a seemingly controlled and coherent kind. Holldobler and Wilson describe the bottom-up control system in ant colonies as "dense heterarchies" in the following way (p. 355):

> The colony is dense in the sense that each individual insect is likely to communicate with any other. Groups of workers specialize as castes of particular tasks, and their activities are subordinated to the needs of the whole colony. They do not act by a chain of command independent of the other groups of workers, however. They are open at all times to influence by most or all of the membership of the colony. An ant colony thus differs in basic organization from the "partitioned" hierarchies of human armies and factories, in which instructions flow down parallel, independent groups of members through two or more levels of command. The colony is also a heterarchy, a hierarchy-like system of two or more levels of units with activity in the lower units feeding back to influence the higher levels.

Thus, ant colonies illustrate 'native' CASs that rely on distributed knowledge processing informed by the individual experiences of their members, and global behaviors at the level of whole systems determined as a consequence of information flow among these members. There is no centralized planning or control producing collective behavior in such systems. All ant individuals are involved in making contributions to collective learning, in that their individually created knowledge contributes to the pattern of collective knowledge reflected in changed behavioral predispositions of the ant colony, and in the pattern of pheramone trails emerging at the level of the collective. Knowledge at the group (caste) or organizational level is entirely distributed or "bottom-up" in origin, as is the learning that produces it.

ORGANIZATIONS ARE COMPLEX ADAPTIVE SYSTEMS

That formal organizations are complex adaptive systems is clear since they

- are comprised of autonomous individuals and semi-autonomous groups and communities that both self-organize and produce knowledge in a distributed manner,
- produce emergent behavior through self-organization of agents in their own attempts to achieve goals, and
- provide the shared context in which their human agents produce knowledge.

Organizations produce knowledge in order to improve operating performance. In particular, they produce knowledge in the course of *solving problems* in order to improve their chances of success and survival in highly competitive environments (e.g., businesses in markets). In other words, organizations are fundamentally knowledge-based in that they adapt by creating their own world-views and rules (knowledge) on how to survive in their environments. As in life, all behavior in business is nothing more than knowledge in use.

Further, organizations are populated by agents who act in accordance with individually - and/or mutually-held knowledge (that is, they use knowledge) to make adjustments in their own behavior. These agents also *produce* their own knowledge in a systematic fashion, and rely on learning in such a way that we can say they ***use the new knowledge it produces***, rather than rote, rule-based responses to environmental challenges, as their primary adaptive

strategy. Figure 2.1 provides a social network view of an organizational CAS focused on an agent, its transactions with the rest of the CAS network, and inputs from and outputs to the environment.

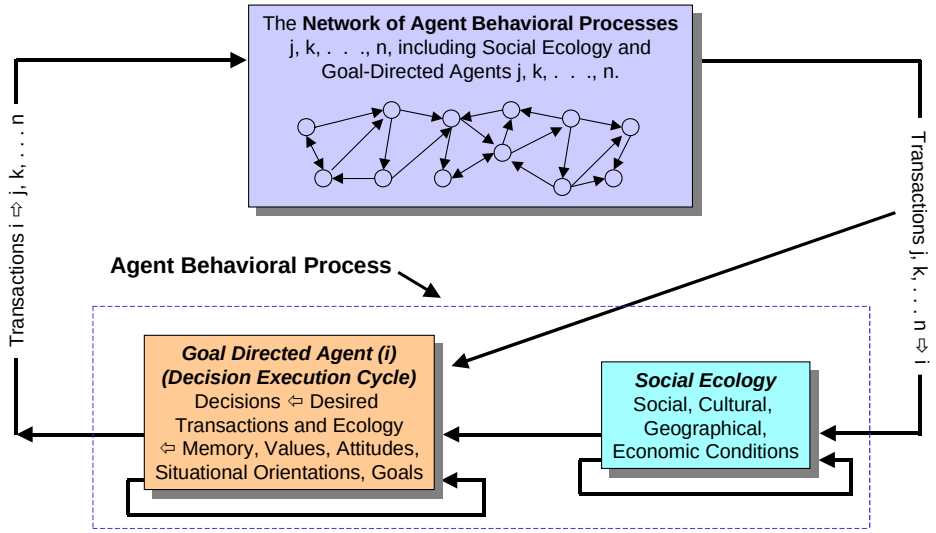

Figure 2.1
An Organizational CAS Network with Agents

Figure 2.1 is explained in detail in the next section. Here, note that its network representation doesn't distinguish among agents with respect to power, authority, or influence. In social systems, however, concentrations of such relations, and of the resources that are at the basis of them, are a natural occurrence, an emergent reality affecting CAS interaction. The existence of such relations, moreover, is an important factor distinguishing social CASs from other types of CASs.

Specifically, social CASs are subject to human attempts to change the patterns of interaction and outcomes that the CAS is predisposed to produce. In fact, management is frequently about attempting to treat organizations as though they were mechanical systems, subject to determinate cause-and-effect relations, rather than as CASs whose global behavior results from self-organization and distributed knowledge processing. Such attempts produce continual conflict and oscillations between system predispositions produced by interacting agents within self-organizing processes, and other predispositions produced by the efforts of the powerful and influential to realize their own visions of the future through command-and-control interventions. Thus, social CASs constitute a type we will call Promethean CASs or PCASs, because, in a manner of` speaking, their normal

predispositions toward behavior and distributed knowledge processing pattrns are subject to the "god-like" intervention of the powerful and the influential.

In stating the above, we do not intend to make the point that human efforts to purposefully change organizations and social systems through management are always and everywhere negative in their implications. Instead, we are simply pointing to the issue of analyzing, understanding, and predicting the impact of managerial interventions on existing self-organizing behavior and knowledge structures in organizations and enterprises. Because they are PCASs, organizational systems cannot be understood solely in terms of CAS theory and models developed to account for biological phenomena at the cellular level or in animal behavior. Instead, we need new models that will account for the impact of the interaction of predispositions toward self-organization arising out of distributed behavior and knowledge processing, and predispositions to new goal states introduced by hierarchically organized agents with disproportionate power and influence in commanding or otherwise influencing agent behavior.

The task of any CAS system is to maintain itself at "the edge of chaos." This task is difficult enough in the face of environmental influences that tend to transition CASs either to chaotic dynamics, or to closed systems inexorably driven toward a sterile mechanical equilibrium. It is even more difficult in the context of continuing management interventions that frequently may amplify the strength of tendencies toward one extreme or another by changing the internal environment affecting self-organization. Management in the context of the Open Enterprise is about implementing policies and programs that will support self-organization in distributed knowledge processing and problem-solving by maintaining openness in problem recognition, developing alternative solutions, and error elimination, as well as openness in communicating and diffusing new solutions across the enterprise. We will come back to this theme often in later chapters.

Finally, Figure 2.1 uses the languages of psychology (desires, memories, values, attitudes, situational orientations, and goals) and sociology (social, cultural, geographic, economic, and transactions) rather than the language of CAS Theory (rules, detectors, effectors, etc.). From here on we will mostly focus on such language rather than on the CAS vocabulary. Nevertheless, we will view organizations as CASs in developing our ideas about the Open Enterprise, and we will seek solutions to the problem of managing knowledge processing in such a way that the programs and policies involved support self-organization and distributed problem-solving.

SOCIAL AND PSYCHOLOGICAL FOUNDATIONS

A good place to begin developing our social and psychological perspectives is with Figure 2.1. The agent behavioral process is focused on agent decisions and is embedded in a social network. There is also a feedback loop at the bottom of the figure illustrating that decisions have an impact on psychology at a later time. Let's explore the agent behavioral process in more detail.

THE ORGANIZATIONAL LEARNING CYCLE (OLC)/DECISION EXECUTION CYCLE (DEC)

There are a number of examples in the organizational learning field of frameworks that conjecture a cyclic agent behavioral process of decision, action, experiential feedback, and then adjustment followed by new action. Such frameworks are not new. Ackoff (1970, p. 100), Kolb and Fry (1975), Kolb (1984), and Haeckel (1999, p. 75-92), offer similar four step frameworks which we call Organizational Learning Cycles (OLCs). Another slightly different three-step formulation of the OLC idea is Ralph Stacey's (1996): "Choose, Act, Discover."

Our version of the OLC is called the Decision Execution Cycle (DEC) (Firestone, 2000, 1998, 1997, 1997a). It is motivated by a perceived gap between an agent's goal state and the actual state of the world the agent is trying to manage. Figure 2.2 expresses the gap idea.

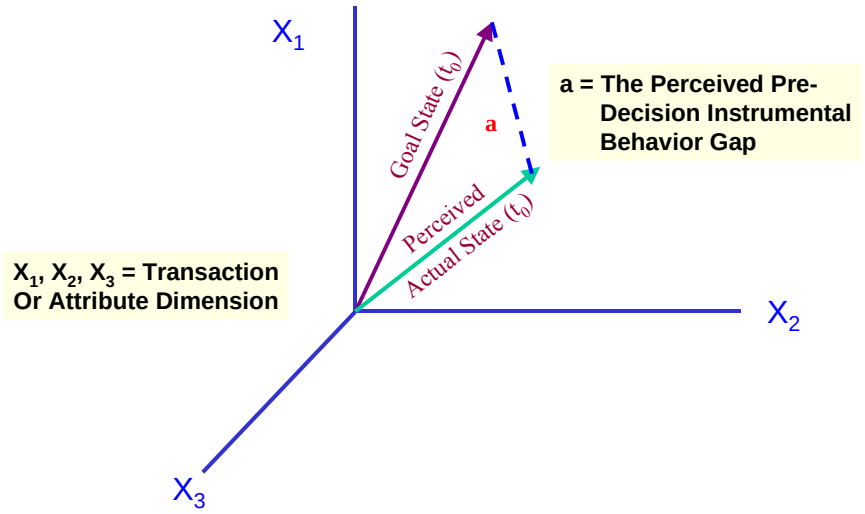

Figure 2.2
The Gap Motivating Action

The DEC produces instrumental behavior ('Acting') to close the perceived instrumental behavior gap. Figure 2.3 illustrates the DEC.

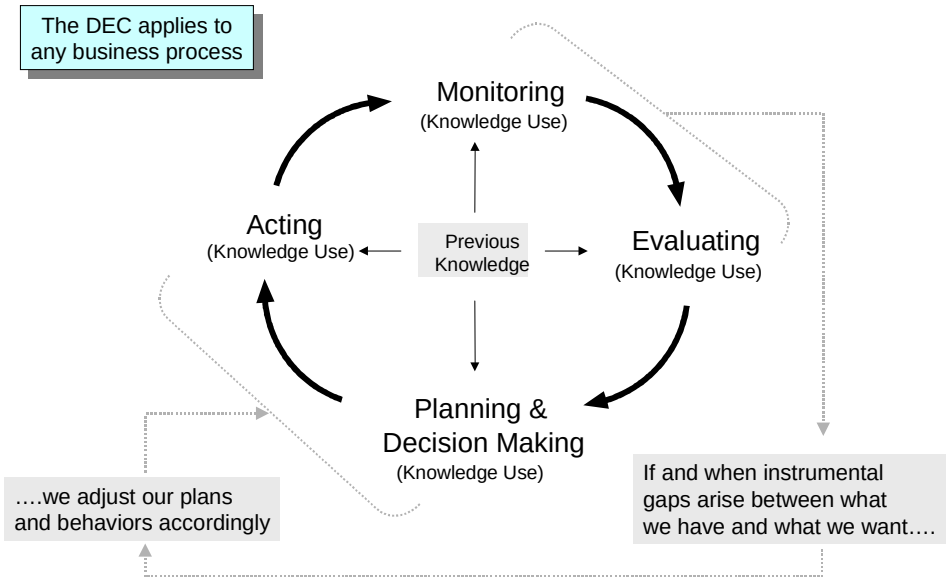

Figure 2.3
The Decision Execution Cycle

The generic task patterns or ***phases*** of any DEC are: Planning, Acting (including deciding), Monitoring, and Evaluating. **Planning** is a knowledge production activity. It means setting goals, objectives, and priorities, making forecasts as part of prospective analysis, performing cost/benefit assessments as part of prospective analysis, and revising or reengineering a business process. It involves capturing and using data, information, and knowledge to produce a plan, an instance of *World 3 planning knowledge*.

Acting means performing the specific *domain business process* (to be defined later) or any of its components. Acting involves *using planning along with other knowledge* to make and implement decisions, but acting does not, by itself, produce new knowledge.

Monitoring means retrospectively tracking and describing activities and their outcomes. Monitoring involves gathering data and information, modeling processes, and using previous knowledge to produce new descriptive, impact-related, and predictive knowledge about the results of acting. Monitoring is another activity involving knowledge production.

Evaluating means retrospectively assessing the previously monitored activities and outcomes as a ***value network*** (Allee, 2000, 2003). Evaluating means using the results of monitoring, along with previous knowledge to assess the results of acting and to produce knowledge about the descriptive gaps between business outcomes and tactical objectives and about the normative (benefits and costs) impact of business outcomes.

The DEC applies to any business process (in a manner to be discussed shortly), and monitoring, evaluating, planning and acting (including decision making) all *use* previous knowledge. Where does the previous knowledge come from? It comes most immediately from what we will call the Distributed Organizational Knowledge Base (DOKB). The DOKB is the combination of previous knowledge beliefs and belief predispositions of enterprise agents, artifact-based explicit knowledge claims, and meta-information (or meta-claims) stored in both electronic and non-electronic enterprise repositories. Figure 2.4 illustrates the DOKB.

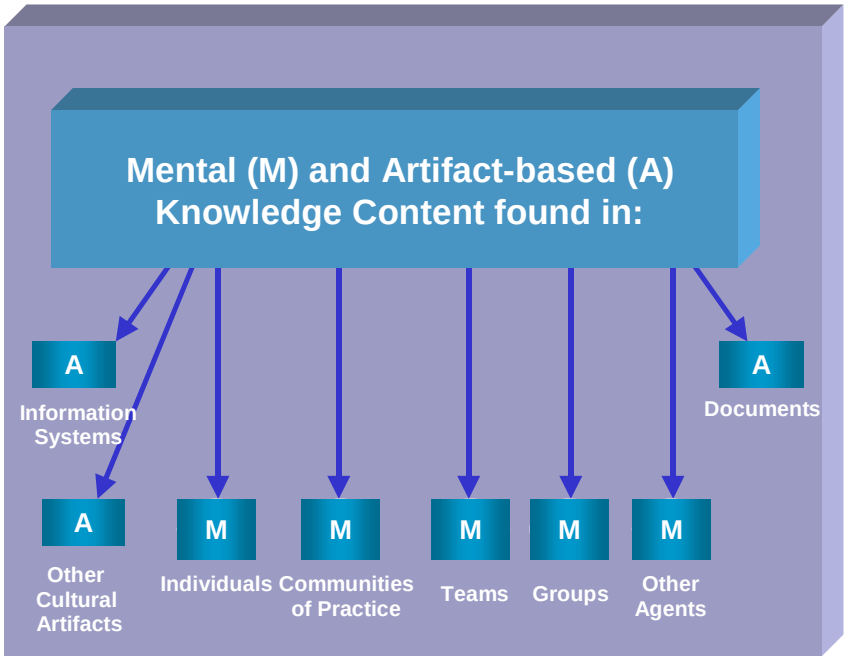

Figure 2.4
The Distributed Organizational Knowledge Base

The role of the DOKB may be expressed clearly using Argyris and Schön's notion of single-loop learning (1974). Figure 2.5 illustrates the idea that the DOKB provides the ***governing knowledge*** that agents use to adjust their behavior in the face of new knowledge about events and conditions,

based on monitoring, evaluating, and planning (following some previous action). The governing knowledge combines with knowledge gained from perceptions of events and conditions in the course of monitoring, evaluating, and planning, to produce what Argyris and Schön call single-loop learning.

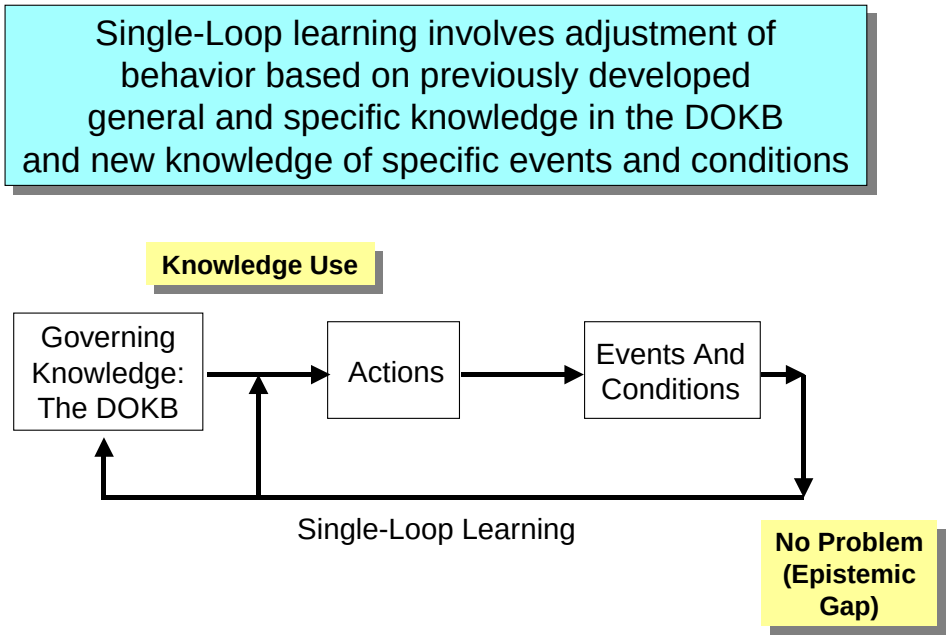

Figure 2.5
Single-loop Learning

The DOKB is an aspect of all knowledge-based structures. incorporating organizational knowledge such as normative business processes, plans, organizational cultural expressions, organizational strategy, policies, procedures, and information systems. Coupled with information from external sources, the knowledge in these structures impacts behavioral business processes through the *Acting* phase of the Decision Execution Cycle. ***The DEC, in turn, through its Monitoring, Evaluating, and Planning and Decision Making phases, generates new adaptive problems as well as new knowledge about specific conditions for later DEC iterations.***

NEW PROBLEMS, DOUBLE-LOOP LEARNING AND POPPER'S TETRADIC SCHEMA

Single-loop learning involves only the use of previously generated governing knowledge to produce new knowledge about specific events and

conditions and to make adjustments to actions. ***Frequently, the process presents no problems (i.e., epistemic gaps) to be solved***. ***But when single-loop learning using existing governing knowledge doesn't work in adapting to changes in the environment, epistemic gaps result – what we refer to in this book as 'problems' – thereby prompting agents to solve such problems by creating new governing knowledge and related derivatives.*** This process of arriving at solutions to problems and thus creating new governing knowledge is what Argyris and Schön called "double-loop learning" (DLL) (1974). The relevance of the double-loop metaphor is illustrated in Figure 2.6.

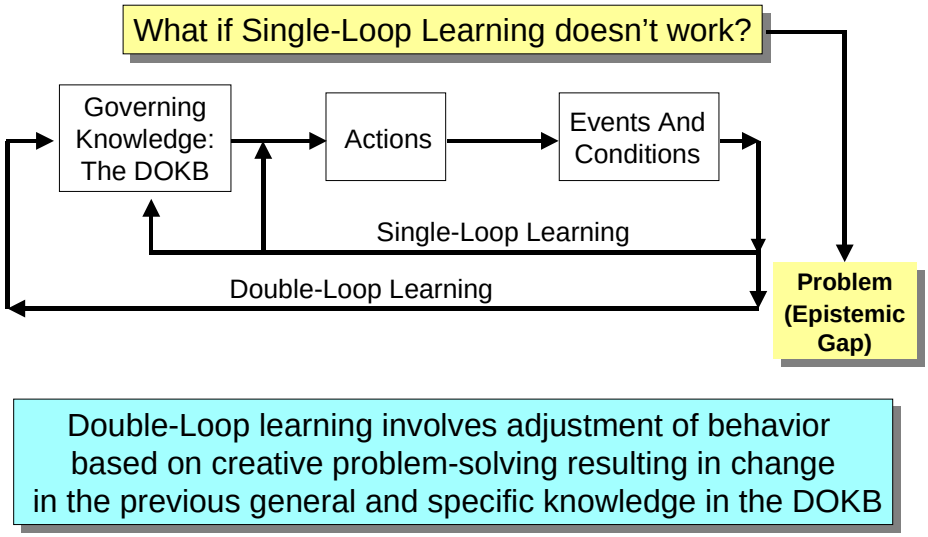

Figure 2.6
Double-loop Learning (Loosely)
Based on Argyris and Schön (1974)

Argyris and Schön's DLL concept doesn't tell us very much about how problems are solved and new knowledge created. For that, we turn to Karl Popper's problem-solving framework (See chap. 1, and Popper, 1972, 1994; Popper and Eccles, 1977). Popper saw the growth of knowledge as basic to human experience, to our nature as adaptive creatures, and as an emergent consequence of our trial and error efforts to solve adaptive problems while relying both on our previous knowledge and our experience. His view of knowledge production, illustrated in Figure 1.1, is simple but focused on essentials.

One begins with a problem (P_1), then through conjecture (we call it

Knowledge Claim Formulation) one arrives at a tentative solution (or, more typically, at *multiple* tentative solutions) (TS). When expressed in sharable, linguistic form, we call such tentative solutions Knowledge Claims. Next, one tests and evaluates the tentative solution in order to eliminate errors (EE), as Popper says, "before they eliminate us." We call this Knowledge Claim Evaluation.

The result is that some solution or solutions will have survived our testing and evaluation, our efforts at error elimination, better than others. These solutions are our new "governing" knowledge. But invariably, new knowledge gives rise to new problems (P_2) which, in turn, trigger successive episodes of Popper's schema. The measure of our progress is that the new problem resulting from our efforts is a better one to have than the old problem. So, over time, we observe the growth of knowledge and the emergence of more and more sophisticated problems.

An interesting implication of the distinction between single- and double-loop learning, and the focus on problem-solving as a process that is different from merely applying already existing governing knowledge, is the change in the immediate focus of motivation as we move from single-loop adjustments followed by immediate action, to double-loop problem-solving followed by new governing knowledge. In brief, instrumental behavior focused on action producing new governing knowledge ***represents a shift in motivation*** from instrumental behavior focused on action intended to close the original gap driving the DEC to a focus on action intended to produce new governing knowledge. Or to put this another way, the shift to problem-solving represents a shift to a second sequence of DECs, ***one focused primarily on problem-solving or knowledge production, rather than on the original instrumental behavior gap***. We will return to this idea shortly.

LEARNING AND KNOWLEDGE PRODUCTION: COMBINING ARGYRIS/SCHÖN AND POPPER

Though this has somehow escaped notice before, it is plain that Popper's tetradic schema fits nicely into Argyris and Schön's DLL idea, providing more flesh to its bare bones. Figure 2.7 combines the main ideas of Argyris/ Schön and Popper. It expresses the key idea that problems can arise out of the DEC that cannot be solved by mere single-loop adjustment, and that are solved through the double-loop problem life cycle and Popper's tetradic schema (rather than through the initial sequence of DECs focused on a direct

business goal or course of action).

Figure 2.7 also has important implications for an account of knowledge production. Knowledge is produced both in DECs focused on the instrumental behavior gap through single-loop learning and in Problem Life Cycles (PLCs) through double-loop learning. The kind of knowledge produced by DECs focused on instrumental behavior, once again, is knowledge about specific events and conditions including what they are (monitoring based on sensory perceptions and available technology), our assessment of them (evaluating based on available valuational perspectives), and how we deal with them (planning according to the routine application of pre-existing knowledge). The DEC, then, is the pattern we follow generally, in order to close ***operational gaps*** in our lives.

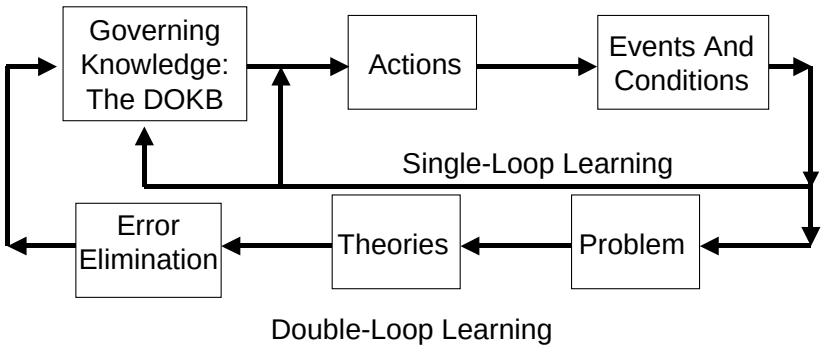

Figure 2.7
Double-loop Learning: Combining Argyris/Schön and Popper

The kind of knowledge produced by PLCs, on the other hand, is (1) knowledge about specific conditions based on new perspectives, and (2) generalized knowledge relating to new theories and models, new ontologies, epistemologies, and methodologies. It is knowledge produced and integrated in response to adaptive problems. It goes beyond knowledge about mere adjustments to behavior based on pre-existing knowledge available from the DOKB. Thus, the PLC is the process we follow in order to close ***epistemic gaps*** in our lives, not operational ones.

A TRANSACTIONAL CAS MODEL OF AGENT INTERACTION

We have presented the origin of the Problem Life Cycle as the response to a failure in single-loop learning to adjust behavior in the DEC to successfully meet the challenges of an agent's environment. But what is the context and motivational or incentive basis for problem-solving adaptive responses arising out of the DEC? First, it is the transactional and social CAS environment of agent behavioral responses illustrated in Figure 2.1 (i.e., Network of Agent Behavioral Processes). In the figure, all agents are viewed as part of the social network that is this social system. Within this network, ***all agents respond to Transactions and Social Ecology, constrained by their Motivational Hierarchies or Incentive Systems.***

THE MOTIVATIONAL HIERARCHY AND INCENTIVE SYSTEM

Take a closer look at the agent behavioral process from the viewpoint of the specific agent (i) highlighted at the bottom of Figure 2.1. Figure 2.8 illustrates the incentive system of an agent (See Birch and Veroff, 1966; Atkinson, 1964; Atkinson and Birch, 1978) by identifying two levels of motivational predispositions that intervene between the situational orientation, environmental stimuli, and behavior of any agent. Figure 2.8 views agent behavior as the product of an interaction of the agent's situation with a hierarchy of motivational predispositions, including value orientations (Kluckhohn and Strodtbeck, 1961; Morris, 1956), and one level of more focused attitudinal predispositions. These predispositions, the rules governing CAS agents, combined with the external situation, produce a situational orientation which is the immediate precursor of goal-striving, instrumental behavior, such as business process behavior, and which includes both the tacit and explicit knowledge responsible for decision making and behavior.

The three-level hierarchy in Figure 2.8 is an oversimplified view of incentive system hierarchies. Figure 2.9 is a step towards generalizing the idea expressed in Figure 2.8. It shows the interaction of the external situation with a motivational or attitudinal level defined at some arbitrary level of specificity "k." Figure 2.9 shows that for any attitudinal level "k," there will always be a level of greater situational generality distinguishable above it and a level of greater situational specificity distinguishable below it. Thus, the number of attitudinal levels between value predispositions and situational orientations is open-ended, because that number is a matter of the number of levels of specificity that turn out to be necessary in explaining and describing the reality of motivation and its impact on behavior. Currently, the number of levels that are necessary to provide good explanations of behavior is unknown, and may well differ across types of situations.

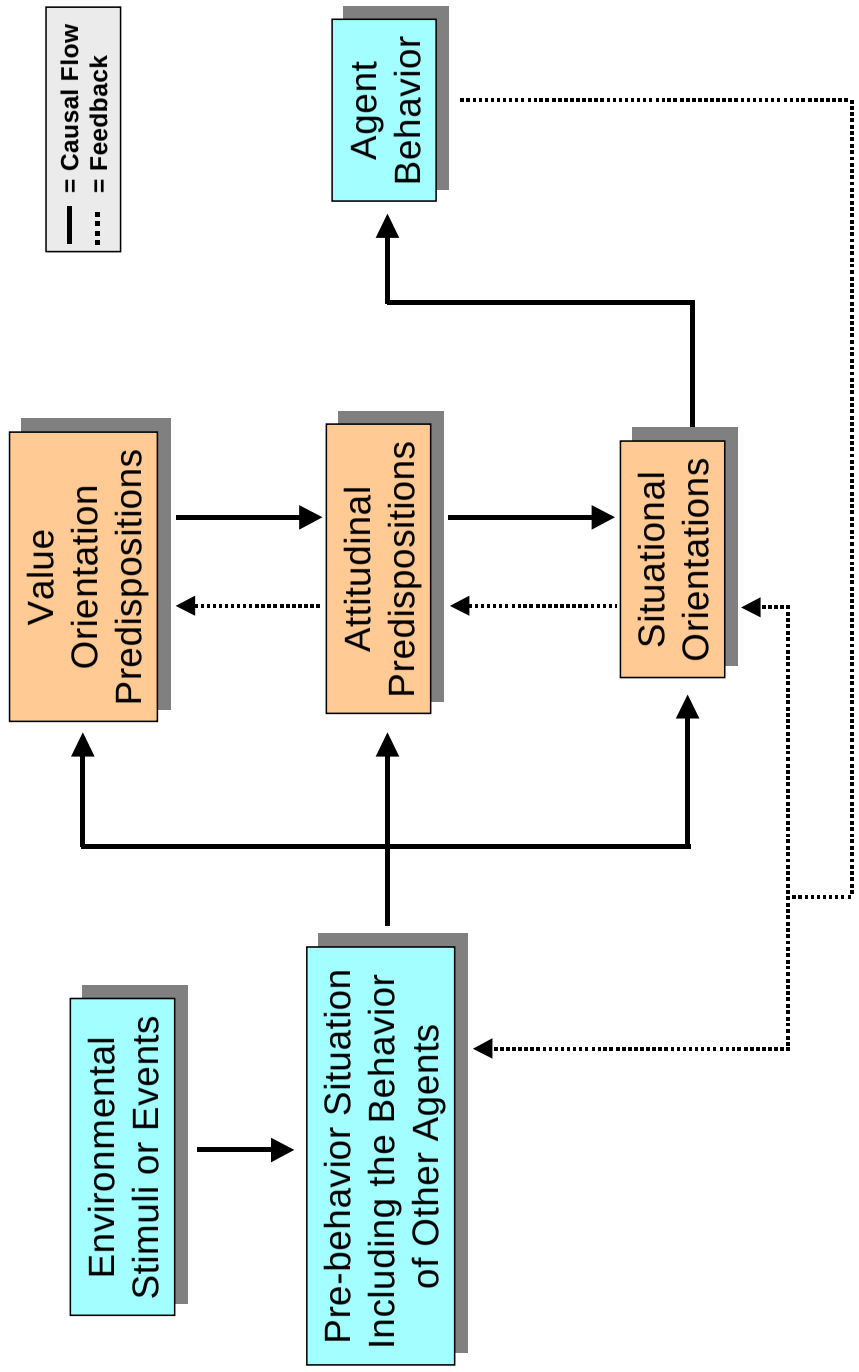

Figure 2.8 The Immediate Pre-Behavior Context:
A Three Level Motivational Hierarchy and Incentive System

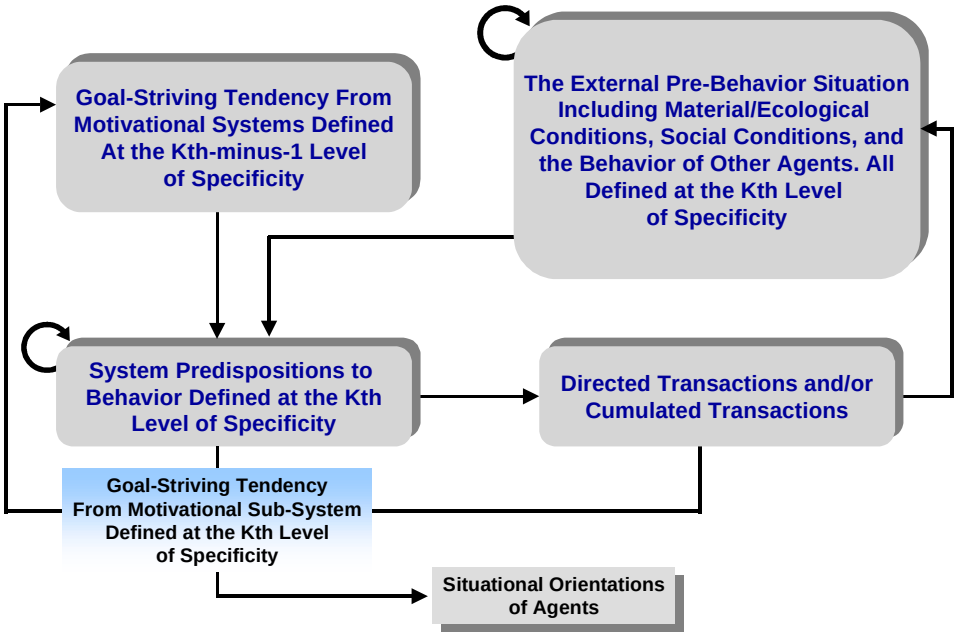

Figure 2.9
Generalization: A Motivational Subsystem

Figure 2.10 illustrates the motivational hierarchy in its most complete form, and highlights the availability, expectancy, incentive, and motive aspects of motivation. The availability and expectancy factors refer to an agent's predispositions to perceive certain classes of behavior alternatives and resources as available for acting (availability), and certain expected consequences as likely to result from implementing the various alternatives (expectancy). The incentive factor refers to the negative or positive attraction, the intensity of affect or emotion, which the perceived consequences of particular alternatives have for the agent. The motive factor is the strength of the goal-striving predispositions resulting from the interaction of the other three factors.

The availability and expectancy factors in this framework are cognitive in character and the incentive factor is emotional or affective***. Interactions of these factors are knowledge or belief predispositions of agents, and they are an essential part of the knowledge system of an agent.*** They play a vital role, not only in decision making, but in learning. And they provide a large part of the continuity of individual behavior and knowledge-seeking that we observe

in the Knowledge Life Cycle (see below) and other business process behavior.

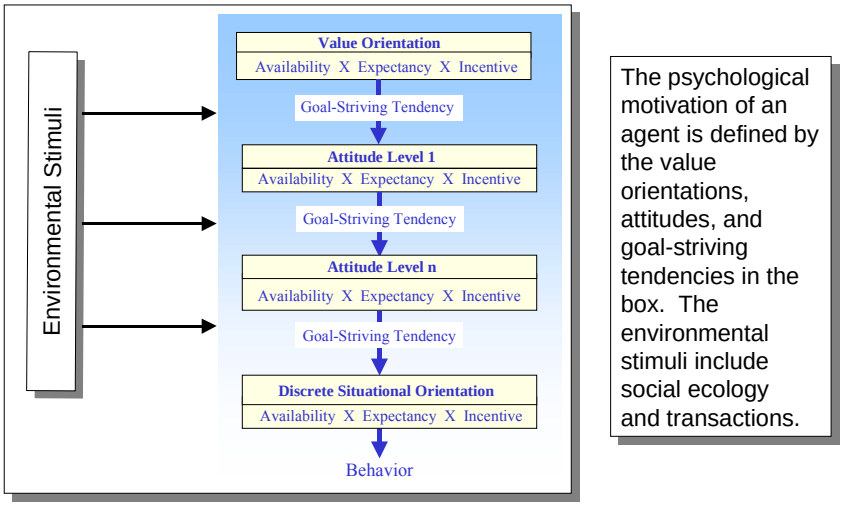

Figure 2.10
The Incentive System of an Agent

ASPECTS OF MOTIVATIONAL BEHAVIOR IN THE TRANSACTIONAL SYSTEM

What are the relationships among motivation, learning, knowledge and behavior? To understand these we need to consider how agents interpret the environmental stimuli they perceive.

- An agent interprets environmental stimuli in terms of whether they constitute resources and opportunities (social ecology) or cooperation (transactions). This is environmental *encouragement*
- An agent interprets environmental stimuli in terms of whether they constitute constraints (social ecology) or conflict (transactions). This is environmental *resistance* or inertia
- Any situation involving instrumental behavior has an environmental encouragement/resistance mix
- To environmental encouragement, the agent responds with goal-striving tendencies and transactions perceived as contributing to reaching the goal-state. This we call *steering* behavior.
- To environmental resistance, the agent responds in a variety of ways depending on its expectancy concerning the ease or difficulty

involved in closing the instrumental behavior gap in the face of environmental resistance. If resistance is seen as "moderate," the agent will respond with *coping behavior*.

- There are two classes of coping behavior:
  - A habitual pattern of regulatory behavior applying previous knowledge more or less according to a procedure, routine, or rule, ***and producing new knowledge about specific events and conditions*** based on such procedures, routines or rules. ***This is single-loop learning***.
  - A novel development and selection among tentative solutions and decision alternatives involving ***learning*** new ways of coping with the environmental resistance. ***This, of course, is double-loop learning and Popperian problem-solving.***
- Habitual/regulatory coping behavior continues instrumental behavior toward its original goal
- But problem-solving represents a temporary ***interruption*** of instrumental behavior in whose first step a new problem is defined***: a problem viewed in terms of a gap between what we know and what we need to know*** to cope with environmental resistance.
- So a problem-solving situation encountered in the context of coping behavior, with its gap between what we know and what we need to know, ***arouses its own incentive system***, the incentive to learn. And this motivation, reinforced by the initial motivation toward goal attainment, drives what we might call a Problem (or Adaptive) Life Cycle.

The Problem Life Cycle (PLC) is appropriately called that because it is about the birth and death of problems. Their birth occurs in the context of coping behavior when regulatory behavior fails and trial and error search behavior begins. Their death occurs when the problem is solved and the agent returns to the operational DEC with new governing knowledge. Problem Life Cycles are basic to the motivational response of all intelligent agents.

Figure 2.11 illustrates the DEC again, this time with the idea that the Monitoring, Evaluating, and Planning and Decision Making phases in the DEC may involve the selection of ***either*** regulatory or problem-solving coping behavior on the part of an agent. If regulatory behavior is selected, then single-loop learning applies along with use of the DOKB. If problem-

solving behavior is selected, that "kicks-off" double-loop learning and the Problem Life Cycle (also involving use of the DOKB).

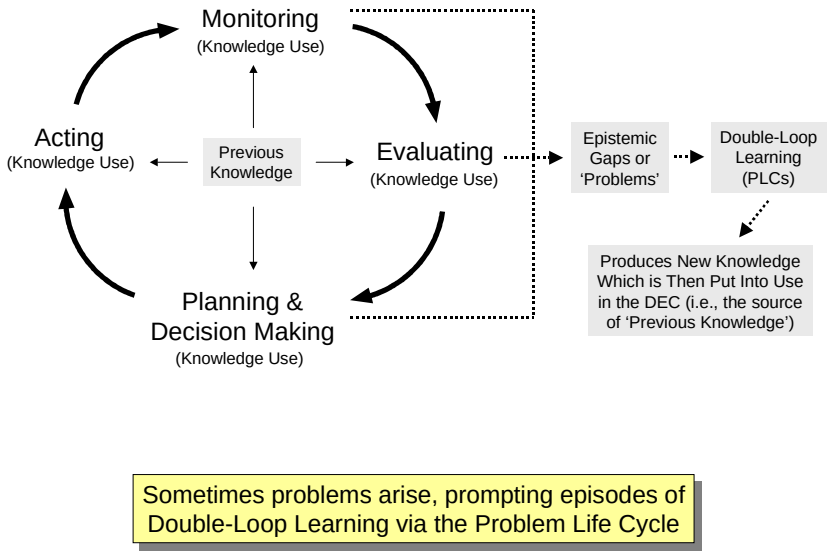

Figure 2.11
The Decision Execution Cycle
"Kicks-off" the Problem Life Cycle

The relationship of the PLC to the DEC is illustrated in Figure 2.12. *The Problem Life Cycle* ***is a process composed of many Decision Execution Cycles, all motivated by the learning incentive system!*** This view is suggested by Popper's tetradic schema (1972). The development of tentative solutions (Knowledge Claim Formulation), followed by error elimination (Knowledge Claim Evaluation) will clearly involve many different activities that must be generated by multiple problem-solving DECs. These are related to one another in that all are motivated by the motivational response aroused by the gap between what the agent knows and what it needs to know.

Since the PLC is made up of DECs, and since all DECs ***may*** spawn PLCs, we can ask whether DECs comprising a PLC may initiate higher-level PLCs? The answer is yes. DECs comprising Knowledge Claim Formulation, or Knowledge Claim Evaluation may themselves initiate new PLCs, that contribute to the primary PLC initiated by the original DEC motivated by the original instrumental behavior gap.

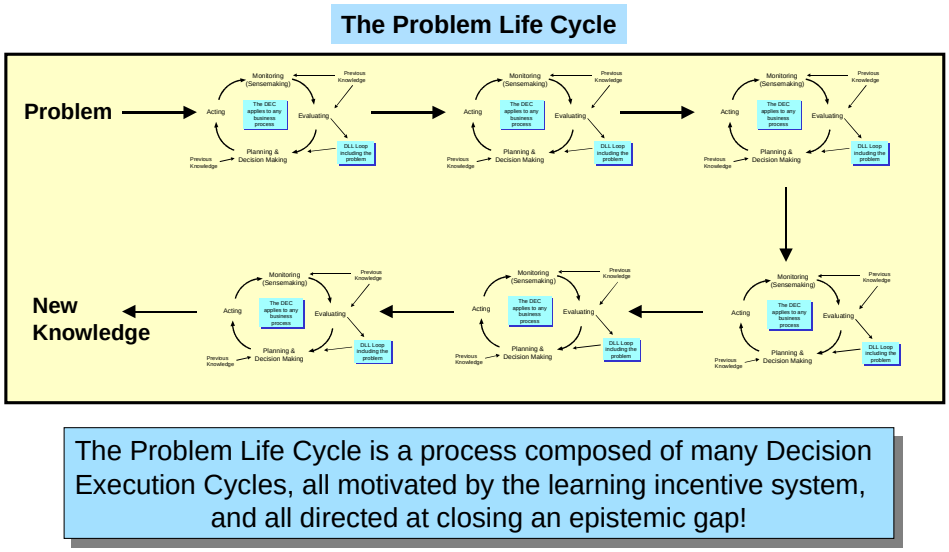

Figure 2. 12
Problem Life Cycles and Decision Execution Cycles

SENSEMAKING IN THE TRANSACTIONAL CAS

Recently, writers such as Ralph Stacey (2001) and David Snowden (2002) have begun to rely on ideas about "sensemaking" developed by Karl Weick (1995) over the past 30 years. These ideas are based on the outlook of those who believe that "reality is socially constructed" (Berger and Luckmann, 1967). While the perspective presented here is different in many ways from Weick's, it has many similarities to that perspective. In particular, the importance of the following characteristics is common to sensemaking and the transaction framework we rely on:

- Identity construction (the idea that agents and systems create their own identities in the process of adapting to their environments)
- Monitoring (sensemaking) after action (the idea that monitoring is a response to action and that it involves filtering and interpretation (including sensory perception) of external stimuli and is not a process that "mirrors" reality in any precise way)
- Sensemaking partly shapes (enacts) sensemaking environments (social interaction shapes social ecology) (the idea that sensemaking

considered broadly as monitoring and evaluating determines action, which in turn recursively impacts social ecology over time)

- Sensemaking occurs in social settings (monitoring occurs in the social interaction framework)
- Sensemaking (and DEC activity) is ongoing

In general, the transactional CAS framework differs with the sensemaking outlook on two points. First, we don't accept that reality is socially constructed. Our knowledge of reality is certainly mediated by our social networks, along with our psychological predispositions, and biological heritage, but it is also influenced by reality itself, which exists, we believe, apart from our social construction of it. And second, we also believe, in contrast to many who espouse the sensemaking orientation, that knowledge claims should not be validated by social consensus, but rather should be continuously tested and evaluated in order to eliminate error. Apart from these two very important departures, the outlooks of sensemaking and the transactional CAS approach are similar.

CULTURE

"Cultural" barriers are often held responsible for failures to share and transfer knowledge in organizations and "culture" will also certainly be viewed as critical in managing transitions to the Open Enterprise. It is frequently said that one must undertake the difficult task of changing an organization's culture to achieve the knowledge sharing and transfer necessary to realize the full value of its knowledge resources. But "culture" is one of those terms used loosely, in a multiplicity of ways, to cover a multitude of sins, so when we are told that the culture must be changed to solve a problem of knowledge sharing, we don't always know what that really means.

ALTERNATIVE DEFINITIONS OF CULTURE

Here are some alternative definitions of culture summarized by John H. Bodley (2000) of the University of Washington from a longer list of 160 definitions compiled in 1952 by the great anthropologists Alfred L. Kroeber and Clyde Kluckhohn (1952):

- **Topical:** Culture consists of everything on a list of topics, or categories, such as social organization, religion, or economy. [We don't think this definition is very relevant for KM]

- **Historical:** Culture is social heritage, or tradition, that is passed on to future generations. [This may be relevant to KM in that organizations may have traditions that are difficult to change. But to use this concept in KM, we need to be very specific about which traditions in an organization impact either KM practices or activities or Knowledge Processing activities, and we need to realize that "traditions" generally change very slowly, and most frequently as a response to behavioral change.]

- **Behavioral:** Culture is shared, learned human behavior, a way of life. [This definition is used successfully in the analysis of cultures at a societal level. To use it at the organizational level, we need to distinguish shared, learned behavior among individuals in an organization that results from *general* socialization to society at large, as opposed to shared, learned behavior that results from socialization to an organization. This may be difficult to measure. But its measurement may be important because learned behavior resulting from organizational socialization may be much easier to change than learned behavior resulting from general socialization.]

- **Normative:** Culture is ideals, values, or rules for living. [One could map organizational ideals, values, and "rules for living," but measurement is difficult. If you use behavior to measure these things, you have the problem of explaining KM, Knowledge Processing and organizational behavior in terms of such behavior, rather than in terms of ideals, values and rules for living. On the other hand, if you don't use behavioral measures, you pretty much have to do analysis of cultural products or surveys to develop measures (Firestone, 1972). In any event, ideals, values, and rules for living are emergent properties of social systems. They, like traditions, respond to changes in behavior, but do not change very easily in response to organizational manipulation.]

- **Functional:** Culture is the way humans solve problems of adapting to the environment or living together. [This definition is difficult for KM, because Knowledge Processing tempered by Knowledge Management is the way humans solve such problems. So this definition does not explain or predict Knowledge Processing and Knowledge Management as much as it equates culture with these things.]

- **Mental:** Culture is a complex of ideas, or learned habits, that inhibit impulses and distinguish people from animals. [This is the "psychologized" version of the normative definition. As stated, it is debatable because certain higher animals (e.g., primates and dolphins) also have learned habits and ideas, so this definition may not distinguish people from animals after all.

  - More importantly, this definition does not link the ideas or learned habits people have with any shared socialization. That is, ideas or learned habits resulting from individualized experiences are not distinguished from ideas or learned habits resulting from shared societal or organizational experiences. The term *culture* can only coherently be applied to the second class of ideas.

  - When this idea is used, it is important to recognize the importance of measuring such "subjective culture" as the result of shared organizational experiences, e.g., in "boot camps," organizational ceremonies, committee meetings, performance reviews, etc. That is, when claiming that culture is a factor accounting for characteristic patterns of knowledge processing, it is necessary to show not only that attitudes, cognitive orientations, and other mental phenomena are affecting knowledge processing behavior, but also that such phenomena result from some shared experiences the organization is implementing.]

- **Structural:** Culture consists of patterned and interrelated ideas, symbols, or behaviors. [We think this definition is too broad and doesn't distinguish between culture and other aspects of information, knowledge]

- **Symbolic:** Culture is based on arbitrarily assigned meanings that are shared by a society. [This is a societal concept. It is perhaps also useful at the organizational level, but this usage seems to us to be marginal.]

The upshot of this brief survey of "culture" is that when someone says that knowledge can't be shared or transferred due to cultural barriers, one really has to ask for clarification to know which sense of culture is being used. Is culture really the barrier it is frequently made out to be? The answer may well depend on what the questioner means by "culture."

CULTURE, OR SOMETHING ELSE?

Indeed, it is even possible that when someone talks about cultural barriers that they are not talking about culture at all. Thus, when organizational politics is opposed to knowledge sharing and transfer, that is not culture, and while it may be difficult to change, politics is easier to change than culture. Similarly, when the organizational incentive system affecting knowledge worker behavior must be changed to facilitate knowledge sharing and transfer, that is not "culture," and it is certainly easier to change.

In fact, the claim that knowledge sharing and transfer do not occur because of culture sometimes sounds plausible because of the tacit assumption that we must somehow make knowledge workers "altruistic" before they will share and transfer, and that this, in turn, requires a fundamental change in "culture." But the idea that we must make knowledge workers unusually altruistic to get them to share and transfer knowledge ignores the many examples of social systems and organizations in which collaboration is based on "normal" motivations including self-interest.

We believe that the problems besetting KM are not, primarily, cultural problems in the historical, behavioral, normative, or mental senses of the term discussed earlier (the only possibilities that apply). Instead, they are problems of structural organization and change that can be managed by political means. Structural changes can align individual motivational/incentive systems, whether of individual or cultural origin, with organizational incentive systems to affect behavioral changes without cultural change. In fact, in social systems, behavioral and structural changes frequently precede and cause cultural changes.

WHAT IS CULTURE AND HOW DOES IT FIT WITH OTHER FACTORS INFLUENCING BEHAVIOR?

As one can see from the above brief survey, there is great diversity in definitions of "culture." Is there a definition more or less consistent with previous usage and also useful for this analysis of the Open Enterprise? We will propose such a definition below and discuss its implications for the role of culture in establishing the Open Enterprise and the relationship of culture to knowledge.

It will help in defining culture if we begin by noting that for every group and for the organization as a whole, we can distinguish analytical properties, structural properties, and global properties. These distinctions were originally introduced by Paul Lazarsfeld in the 1950s (Lazarsfeld, 1958, Lazarsfeld and

Menzel, 1961), and later used by Terhune (1970) in a comprehensive review of the National Character literature. Analytical properties are derived by aggregating them from data describing the members of a collective (a group or a system). Examples of analytical attributes include:

- GNP
- GNP Per Capita
- Per Capita Income
- Average Salary
- Total Sales
- Sales per Sales Rep.
- Number of Accumulated Vacation Days
- Number of Lost Work Days Due to Injury

Structural properties are derived by performing some operation on data in order to describe the relations of each member of a collective to some or all of the other members. Examples of structural properties are:

- Extent of inequality of training
- Extent of inequality of knowledge base distribution
- Extent of inequality of knowledge access resource distribution
- Extent of inequality of knowledge dissemination capability
- Extent of inequality of power
- Intensity of Conflict Behavior
- Intensity of Cooperative Behavior
- Ratio of e-Messages Sent to e-Messages Received by an agent

Lastly, global properties are based on information about the collective that is not derived from information about its members. Global properties are produced by CAS interaction. They may be said to "emerge" from it. Examples of emergent global attributes include:

- Value Orientations (reflected in social artifacts) (Kluckhohn and Strodtbeck, 1961)

  - Achievement Orientation
  - Self-realization Orientation
  - Power Orientation
  - Mastery over Nature
  - Lineality (preference for a hierarchical style in social organization)
- Extent of democratic organization of the Knowledge Life Cycle
- Innovation Propensity (The predisposition of an organization to innovate)

The classification of social CAS properties into analytical, structural, and global attributes is exhaustive. To define culture, let's first ask whether we should define it as an analytical, structural, or global attribute – or some combination of these?

Culture, first, is not an analytical attribute. Culture is not an arithmetical aggregation of survey results or individual man-made characteristics. It is not the percent of knowledge workers who trust their fellows, believe in systems thinking, believe in critical thinking, or are favorably disposed toward knowledge sharing. Why not? Because, first, culture influences behavior, statistical artifacts, unless they are reported, in which case the interactions reported by them are global properties, do not. Second, analytical attributes are social-psychological, not cultural, in character.

Second, culture also should not be defined as a set of structural attributes derived from relations among individual level attributes. Why not? Because "culture" refers to something comprehensive and regulative that accounts for and determines structure, and also because if we define culture as structural in character, we are assuming that we can model the structural relations defining it. Do we want to assume that, or do we want to assume that culture is global in character and emergent, or some combination of the three types of attributes?

Third, the alternative of culture as a combination of attribute types may at first seem attractive, but the following considerations argue against it. (A) The character of analytical attributes as arithmetic aggregations of individual level properties is not changed by defining a construct that includes such attributes with structural and global ones. (B) Analytical attributes still are not reflective of process or system-level attributes that are regulative or

comprehensive. At best, they are indicators of conditions caused by structural and global level attributes and are not causal in themselves.

As for culture being a combination of structural and emergent global attributes, our objection to this idea arises from how we think we want to use the term "culture." If we want to use it as an explainer or predictor of structural patterns, we must avoid confounding structure with culture, that is, to confound the "form" of a social system or organization, with its predispositions or "spirit." In other words, defining culture as a global attribute rather than as a combination of global and structural attributes appears most consistent with previous usage, and also our strategic need to use "culture" as a tool to account for "structure" in our model of the Open Enterprise.

If culture is a global attribute of agents, we still must decide what kind of global attribute it is. Popper's (1972, 1994, Popper and Eccles, 1977) World 1/World 2/World 3 ontological distinctions are important here. He suggests that we may distinguish three types of object domains and attributes: physical/material, mental, and objects and attributes relating to the content of human expressions of various kinds, the products of the human mind. When distinguishing types of "culture," his ideas may be applied as follows:

- A key characteristic of all three types is that each is man-made (or generalizing this concept, made by an intelligent agent). World 1 man-made artifacts are material products, so we will call them ***material culture***.

- World 2 culture, we will call ***subjective culture*** (Triandis, et. al. 1972). The subjective culture of a group or organizational agent is the agent's characteristic set of emergent high-level predispositions to perceive its environment. It includes group or organizational level ***value orientations*** and high-level ***attitudes*** and the relations among them. It is a configuration of global attributes that emerges from group interactions – that is, from the organization and pattern of transactions among the agents within a group.

- The World 3 or ***objective culture*** of a group or organizational agent is the configuration of value orientations and high level attitudes expressed in the agent's characteristic stock of emergent problem statements, models, theories, artistic creations, language, programs, stories, etc. reflected in its documents, books, art galleries, information systems, dictionaries, and other containers. It is a configuration of global attributes expressing the ***content*** of its

information, knowledge, art, and music, apart from both the predispositions the group or its agents may have toward this content (World 2), and the material form of the artifact expressing the content (World 1). The objective culture of an organization is an aspect of the social ecology (See Figure 2.1) of its group agents, the cumulated effects of previous group interactions. As such, the perception of it by group agents (part of their subjective culture or psychology, depending on the type of agent) influences their behavior.

Subjective culture affects behavior within groups or organizations at two levels:

- It affects agents at the decision making level of interaction immediately below the level of the cultural group by predisposing these agents toward behavior
- It affects the behavior of the group itself by predisposing it toward behavior (See Figure 2.1)

The context of objective culture in social ecology and its relationship to interaction within a group or organization is also illustrated in Figure 2.1. The focus of the illustration is the decision making agent at the bottom left (i). The agent may be an individual agent or a group level agent, depending on context.

Looking at the right hand side of Figure 2.1, transaction inputs received from other agents, and previous social ecology (the feedback loop on social ecology), determine the current social ecology (including objective culture) affecting an agent's decision. Next, transactions, social ecology, and previous decisions (goal-striving outcome feedback loop) are viewed as "impacting" on the goal-directed typical agent, whose internal process then produces decisions which result in transaction outputs from agent (i) directed toward other agents j, k . . . , n. These transaction outputs are inputs into the decision processes of these other agents. The interaction within and among agents j, k . . . , n, illustrated by the *Network of Agent Behavioral Processes* at the top, finally, produces transactions directed at agent (i) at a later time, and thereby closes the loop.

What goes on inside the goal-directed agent (i)? So long as (i) is a group level agent and its components are also groups, then the interaction process may be viewed in the same way as in Figure 2.1, *but specified at a lower level*. But if one decides to *move from a transactional to a motivational perspective* on a group level agent (i), then the conception is somewhat different.

Figure 2.13 presents a group-level decision making process in a pre-behavior situation. Here, the pre-behavior situation is filtered through the decision-making system of a group level agent, specifically through value orientations and through attitudes existing at increasingly domain specific levels of abstraction. Subjective culture lives at the value orientation and higher-level attitude locations in this decision making system. The interaction between the external world and the agent's predispositional reality 'screens' produces a discrete situational orientation, a ***"definition of the situation,"*** which in turn feeds back to the predispositional (including the cultural) levels in search of choice guidance. This guidance then determines the final situational orientation, which leads to behavior and to new feedback to the situational orientation, and to attitude and value orientation predispositions.

The predispositions in Figure 2.13 represent psychological attributes when the agent involved is an individual, but when the agent is a group, *these are the group's characteristic set of emergent pre-dispositions to perceive its environment, including group level value orientations and high-level attitudes and the relations among them.* ***That is, the high-level emergent predispositions in Figure 2.13 are group subjective culture.*** Moreover, as in the case of the individual agent discussed earlier, the availability, expectancy and incentive elements of high-level predispositions in combination represent ***subjective cultural knowledge predispositions***.

DO GLOBAL CULTURAL PROPERTIES EXIST?

The objections of the critics of the global or collective properties view are at the level of ontology. They simply doubt the reality of global psychological predispositions or orientations. None of the critics, however, can account for research results positing group-level attributes (see for example Firestone, 1972) suggesting that there are such predispositions, by rigorously explaining them in terms of shared mutually-held individual predispositions. In fact, the doctrine of emergence suggests that such an explanation will never be possible. Therefore, the claim that group level predispositions don't exist and that "there is no *there* there" is simply a bias on the same level as the bias of some materialists who believe that "mind" really doesn't exist, and that mental phenomena will one day be explained entirely in terms of the brain.

We agree with Bateson (1972) and accept the idea of group-level consciousness, at least in principle. Recall Figure 2.13 illustrating the motivational system for both individuals and groups and the presence of situational orientations. Situational orientations with cognitive, evaluative and affective components cannot exist without thinking and, therefore, perhaps, "mind." The question is: How much "consciousness" is there?

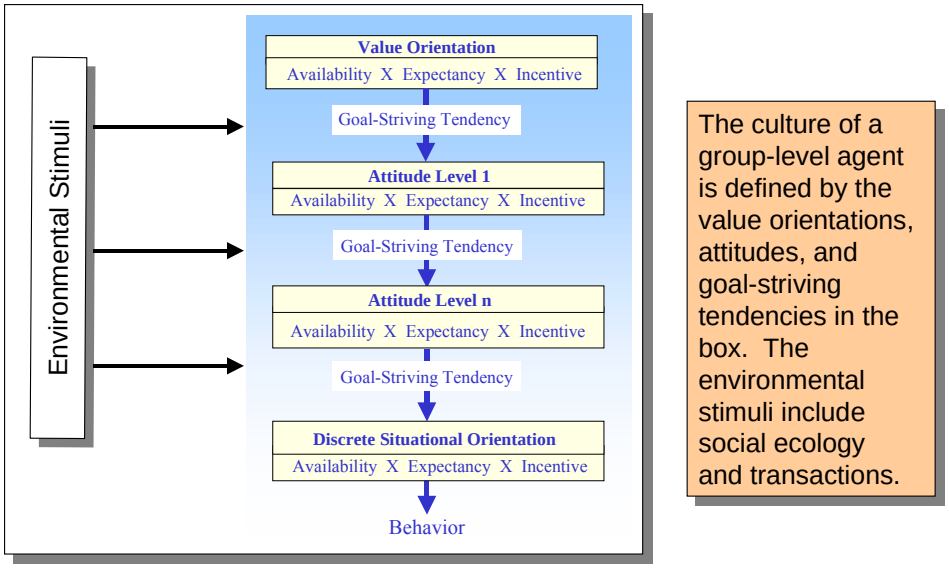

Figure 2.13
The Incentive System of a Group Level Agent

THE UNIFIED THEORY OF KNOWLEDGE

We have used the term "knowledge" frequently, and in different senses, in our previous discussions of the Open Society and the Open Enterprise, Complex Adaptive Systems, social and psychological foundations, and culture. But we haven't yet provided a formal definition to make clear how we have been using "knowledge" and to help us clarify how it fits into the conceptual framework we have been developing.

THE THEORY

Knowledge consists of tested, evaluated, surviving, and encoded structures (e.g., DNA instructions, beliefs or claims) that help the systems that produce them to adapt. Knowledge structures, that is, are adaptations to the environment. As Popper (1999, p. 64) put it:

> *All adaptations to environmental and internal regularities, to long-term situations and to short-term situations, are kinds of knowledge whose great importance we can learn from evolutionary biology.*

There are three primary categories or types of knowledge suggested by Popper's three-worlds ontology (Popper, 1972, 1994, 1999, Popper, 1982, Popper and Eccles, 1977):

- World 1 "knowledge" – structures in physical systems (such as genetic structures in DNA), developed through long-term evolutionary processes that allow those systems to adapt to their environment;
- World 2 "knowledge" – acquired structures of beliefs and belief predispositions (in minds) about the world, the beautiful, the right, the good, and other objects of thought, that we believe have survived our tests, evaluations, and experience;
- World 3 "knowledge" – structures of sharable linguistic formulations of intelligent agents, knowledge claims about the world, the beautiful, the right, the good, and other objects of thought that have survived testing and evaluation by the agent (individual, group, community, team, organization, society, etc.) acquiring, formulating, and testing and evaluating these knowledge claims.

Popper defined the distinction between World 2 and World 3 knowledge (1972, pp. 106-122, 1994, chap. 1) (Popper and Eccles, 1977, pp. 36-50). But he did not define either type of knowledge in precisely the terms we have used. It is comparatively easy to accept Popper's distinction between the World 1 (material and physical states) and World 2 "mental states including states of consciousness and psychological dispositions and unconscious states" (Popper and Eccles, 1977, p. 38), that underlies the distinction between World 1 and World 2 knowledge. It is much harder, however, to accept the reality of World 3 objects ("the world of the contents of thought, and, indeed, of the products of the human mind", ibid.) and therefore World 3 knowledge.

Following Popper, we propose that there are things that affect our behavior which (1) are not part of World 1 or World 2, (2) are *made* by intelligent beings, (3) are sharable among us in that they provide sharable stimuli for those exposed to them, and (4) are partly autonomous once created by us. Such World 3 objects include theories, arguments, problems, works of art, symphonies, constitutions, public policy statements, and all other cultural objects that express content.

While Popper called these objects "World 3," he was quick to recognize that such objects come in many varieties, and indicated that he thought that World 3 had many different regions. He had no strong feelings about whether

these regions should all be called World 3 products or whether we should break things out into a number of distinct worlds based on the differences among art, science, music, law, truth, beauty, justice, and other cultural products. We agree with his views and also think that it makes little difference how we label the different World 3 regions, as long as we recognize that all are cultural products, that humans create them, and that their function is to help us to adapt.

Among World 3 products, we have already named problems and knowledge claims as key objects. Thus, knowledge claims exist within any organization or social system and are among its World 3 products. Among World 2 objects we have distinguished belief predispositions and situational orientations (beliefs) of various kinds. In our earlier discussion of culture, we pointed out that beliefs and belief predispositions can be posited at the group as well as the individual level.

So in World 2, we have belief predispositions and situational orientations (beliefs), and in World 3 linguistic expressions in the form of knowledge claims. Where then is knowledge? As we indicated earlier, knowledge is found in both World 2 and World 3 in those beliefs, belief predispositions, and knowledge claims that have best survived our attempts to test and evaluate them against competitors. In terms of our transactional social CAS network, belief knowledge is found in the lower-left decision making box of Figure 2.1, while World 3 knowledge claims are found in the Cultural segment of what we have termed Social Ecology in the lower right. In our view, knowledge is a term applied to the best performing beliefs, belief predispositions, and knowledge claims of an agent – that is, in the individual or group that holds the belief or belief predisposition, or which expresses the knowledge claims in question – according to the results of the agent's performance evaluations.

Our definitions of World 2 and 3 knowledge do not require that knowledge be true. In fact, as we stated at length in Chapter 1, our position, the position of Critical Rationalism, is that knowledge claims are fallible and that all knowledge claims are open to criticism and revision. While a particular knowledge claim may be true, and while its function is to state what is true, even those claims that we call "knowledge" may prove false in the future if they fail to survive our tests. If knowledge need not be true, then clearly it cannot be called objective on grounds that it is true.

Further, World 2 belief knowledge, even though it has survived individual tests and evaluations, is also uncertain, fallible, and subject to internal questioning. It also has the problem that it is not sharable among agents. Thus, such knowledge is personal and psychological and the beliefs that

constitute it do not exist outside the knowing subject that holds them. In exactly this sense, World 2 *belief knowledge* is subjective.

On the other hand, World 3 *knowledge claims*, once created, do exist outside the knowing subjects that created them, do not die with these subjects and, in addition, ***are sharable and criticizable*** among these knowing subjects and others that may not encounter them until years after their creation. Further, the track record of testing and evaluating knowledge claims also exists outside the knowing subjects involved in creating it, and is sharable among knowing subjects interested in the knowledge claims and is also open to criticism by them. So this ***sharability and criticizability of knowledge claims and their track records of performance in the face of`criticism, makes them "objective"*** in a way that beliefs and belief predispositions are not.

If knowledge claims are "objective," what may be said about the objectivity of World 3 knowledge itself? We have already defined World 3 knowledge as composed of the best surviving knowledge claims of an agent. But this notion implies that knowledge is the product of a classification decision by the agent producing that knowledge. So what, exactly, is "objective" about this classification decision which may well be dependent on ideological or political criteria that are biased and therefore essentially subjective in nature? The answer is that in the general case there is nothing necessarily "objective" about such decisions, nor need there be to ensure that the knowledge produced by the decision is "objective."

The reason for this is that the classification decision need not be correct for the resulting "knowledge" to be objective. Nor need it follow a decision procedure that conforms to any recognizable notion of rationality (though the knowledge that emerges from it would certainly be higher in quality if it did, and therefore an "objective" decision procedure is certainly preferable to one that is not objective).

Rather, the objectivity of the knowledge produced lies in the sharable nature of the knowledge claims that have been classified as knowledge, and the meta-claims constituting the related track record of testing and evaluation. ***The sharable nature of these claims***, then, is what makes them objective. And because they are expressed objectively in linguistic form, they are subject to review and ***criticism.*** Thus, the designation of "knowledge" for a particular knowledge claim carries no greater connotation of "objectivity" than the objectivity that stems from a claim that has been shown to be false. True claims and false claims are all objective.

As we have said, the distinction between World 2 and World 3

knowledge, and particularly the use of the term "knowledge" for World 3, is frequently hard to accept. A particularly common objection to our characterization is the following:

> World 3 expressions of knowledge are not the same as knowledge in the World 2 sense because they are *expressions of knowledge*, not knowledge. They are vestiges of knowledge. To call them knowledge is a little bit like calling a person's shadow a form of 'person' because they express the shape of a person whose very essence can be deciphered from a study of the shadow. According to that logic, shadows are "objective" people.

This argument, though trenchant and attractive has many problems. First, we do not say that World 3 knowledge claims are the same as World 2 knowledge. World 2 knowledge is belief knowledge; most of it is not even reducible to language; most of it is predispositional in character and is not even conscious; and all of it is subjective in the sense that it cannot be shared with other agents.

Second, World 3 knowledge claims are not expressions of belief knowledge as claimed just above. It is a fallacy to think that we can faithfully express or copy our belief knowledge except in the most superficial sense. Rather than being expressions of belief knowledge, knowledge claims are simply products that we create in an effort to help us solve problems. They are one type of linguistic expression. What do they express? ***What the claims say***, not what the authors believe. We do not know the correspondence between what the authors say and what they believe. Nor does the truth of the expressions – the knowledge claims – have anything to do with the truth of a person's beliefs. Truth as a coherent philosophical construct is a relationship between linguistic entities and facts. *It is not a relationship between beliefs and facts*. It is not even clear what the analogous relationship between beliefs and facts is, but it is not truth

Third, World 3 knowledge claims are not "vestiges of knowledge." They are not because they are (See figure 2.1) a result of belief knowledge, situational forces, cultural and social structural influence, and individual creativity expressed in the creation of World 3 objects. So, much more goes into creating them than just belief knowledge.

They are also not vestiges because, as linguistic objects, they have an entirely different character than beliefs and are in no sense a "left-over" or "vestige" of them. They are also not vestiges because, while beliefs cannot be shared with others, these knowledge claims can be shared. This sharability

characteristic makes them more testable, more open to evaluation, more open to gradual refinement over time, and more useful in both solving problems and in generating new problems that can lead to further progress.

Finally, the ideas expressed in the passage:

> To call them knowledge is a little bit like calling a person's shadow a form of 'person' because they express the shape of a person whose very essence can be deciphered from a study of the shadow. According to that logic, shadows are "objective" people.

…. state an entirely false analogy. In the analogy, the person is the reality and the shadow is the representation of it we use to try to divine its essence. But in the World 2/World 3 contrast, reality is the system and environment within which we have to act, and our problem is to understand that reality so that we can achieve our goals in the context provided by reality. At any given time, our belief knowledge is the "shadow" of reality present in our minds and our problem is to refine this shadow, this understanding, so that we can use it to act more successfully. How do we do that?

We do it by combining with others to create linguistic expressions, cultural products that are representations of reality themselves, more shadows. But there are differences between these shadows and the belief shadows. First, unlike belief shadows, with these knowledge claim-based shadows, we can at least formulate the idea of truth correspondence coherently. Second, we can test and evaluate these knowledge claims in collaboration with other people, so that we can create shared organizational knowledge. Third, we can share these shadows with others in order to refine them and to test them against alternative shadows, so that eventually we can arrive at a shadow that has performed better in the face of our tests. Fourth, when our construction of our knowledge claim shadows is, for the time being complete, we can use these shadows to reshape our belief shadows, so that these "belief shadows" which we must rely upon to make decisions, provide us with better results.

This last point is of paramount importance. Following Popper's account (Popper and Eccles, 1977, Pp. 120-147), evolution begins within World 1 structures. When biological creatures evolve, they first develop ***genetic structures (World 1 knowledge)*** that allow them to achieve their goals through limited adaptive and learning capabilities. They have brains, but do not have minds. ***Minds (World 2 structures) evolve as "control mechanisms for the brain."*** And as we have seen, minds allow agents to develop ***belief "shadows" for tracking reality (World 2 knowledge)*** and enhancing adaptation. However, the shadows created by mind alone cannot incorporate

an objective shared perspective on reality. Therefore, their fit with external conditions is less than ideal.

So evolution proceeds further. It creates creatures that not only have brains, minds, and consciousness, but also creatures that have ***language and culture***. These creatures can use language and culture to create "shadows" that do incorporate a sharable perspective on reality, and this perspective, in turn, with continued inquiry, can produce "shadows" that benefit from this shared perspective and that can even correspond closely with reality. In other words, the creation of language and culture creates more objective "shadows" ***(structures of World 3 knowledge claims)*** that place constraints on the personal, subjective "shadows" (beliefs) of the mind. These subjective shadows, in turn, help it to better understand reality, which it must do if it is to fulfill its role as the controller of behavior.

This brings us to the end of our attempt to introduce the unified theory. We will now place it in the context of the rest of our framework.

TYPES OF MENTAL KNOWLEDGE (WORLD 2)

One implication of our psychological framework is that types of mental knowledge should initially be divided into beliefs or situational orientations, and belief predispositions. In the category of predispositions, we have distinguished value orientations and an indefinite number of levels of attitudes intervening between value orientations and beliefs, with these providing the framework for the occurrence of beliefs in the context of situations. We have also placed “subjective culture” in this framework by defining it as ***a group’s characteristic set of emergent predispositions to perceive its environment, including group level value orientations and high-level attitudes and the relations among them.***

In the category of beliefs (situational orientations), we distinguish explicit, implicit and tacit beliefs. Explicit beliefs are the focus of our attention and are formulated in minds using language. When we attempt to express beliefs in spoken or written language, it is these explicit beliefs we are attempting to express. Implicit beliefs are components of our conceptual framework providing the background context for explicit beliefs (see Polanyi, 1958, pp. 286-94). They may be formulated explicitly, and then we may attempt to express them, if and when they become the focus of our attention. Tacit beliefs, by contrast, are “ineffable” and are inexpressible in language. They coexist along with explicit and implicit beliefs and represent a belief substratum providing further context whose existence we must infer from explicit and implicit beliefs, and also from behavior. The typology of mental knowledge we’ve just presented is illustrated in Figure 2.14.

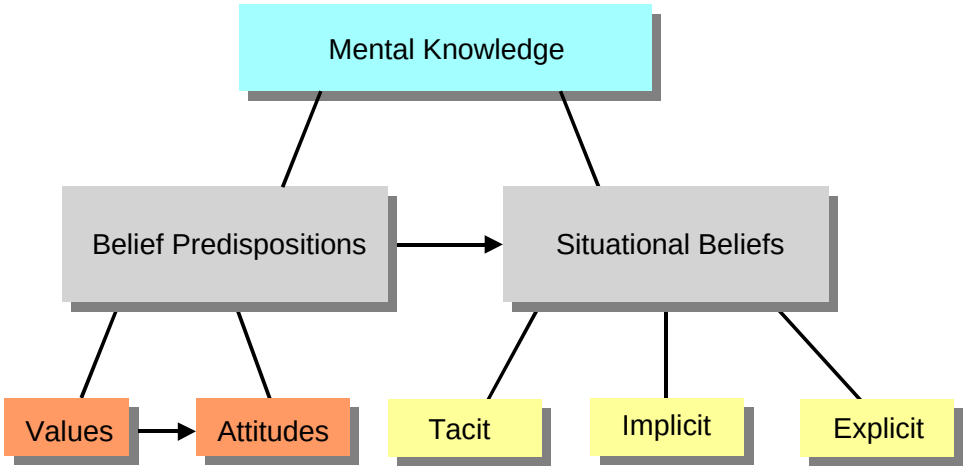

Figure 2.14
Types of Mental Knowledge

Our formulation of types of mental knowledge owes something to Polanyi's work (1958, 1966) on the distinction made between tacit and explicit knowledge and the definition of implicit knowledge. But it is different from both Polanyi's formulation and the tacit/explicit knowledge distinction as it is frequently formulated in the Knowledge Management literature (See, for example, Nonaka and Takeuchi, 1995; Saint-Onge and Wallace, 2003).

Our formulation is different from both Polanyi's and the KM literature in that, in order to avoid confusion, we never use the term "tacit knowledge" to refer to belief predispositions, but only to situational orientations. Polanyi seems clearly to be referring to both predispositions and orientations, and Nonaka and Takeuchi and other writers on Knowledge Management are either not clear in their position on this matter or also fail to make the distinction***. The reason for our formulation is that all predispositions are equally "tacit" simply because they are predispositions.*** To apply the term "tacit" to them therefore, is not to distinguish among them.

In the category of beliefs or situational orientations, our distinction among tacit, implicit, and explicit knowledge is drawn from Polanyi's work (1958, 1966). However, we restrict the use of these terms to mental phenomena alone, so that when we express knowledge claims, ***we no longer refer to the expressions as explicit beliefs, since beliefs are mental in character Instead, we refer to them as knowledge 'claims***.'

This view is also different from those normally expressed in the

Knowledge Management literature. There, explicit beliefs are frequently viewed as "codified expressions" rather than mental phenomena, while tacit beliefs refer to all mental phenomena. In our view, this is not Polanyi's distinction at all, but rather corresponds more closely to Popper's distinction, and our own, between World 2 beliefs and World 3 expressions (knowledge claims). We say this because there is a difference between linguistic statements, or claims, and the mental phenomena, or beliefs, that lie behind them. Beliefs are World 2 knowledge; statements or claims are World 3 knowledge.

KNOWLEDGE INTERACTIONS AND "CONVERSIONS"

Figure 2.1 suggests a relatively straightforward interaction process between World 2 and World 3 knowledge claims. World 3 knowledge claims contained in the category Cultural conditions are among the situational factors that affect changes in World 2 knowledge by interacting with the motivational hierarchy (Figures 2.8 - 2.10) and impacting situational orientations and attitudes. Attitudinal predispositions can be noticeably affected by World 3 knowledge claims in response to successive interactions over time with an expressed conceptual system, though such an impact is very dependent on whether the initial structure of attitudes is "open" to the specific World 3 knowledge claims interacting with it.

Attitudes are impacted by the cumulative effect over time of World 3 knowledge claims impacting explicit belief knowledge and implicit knowledge. The extent of this effect is a function of exposure, relevance, perceived truth, an open structure of attitudes, and numerous other psychological factors having to do with the content of an agent's incentive system. Moreover, it is a mistake to consider the effect of World 3 on World 2 as causal in character. Rather, World 3 products are part of the environment of the mind, but ultimately the mind is an emergent phenomenon. Partially autonomous with respect to both inputs from the brain and World 3, it creates World 2 knowledge in the course of adapting to this environment. Thus, the process producing World 2 knowledge may be called Belief Knowledge Creation (BKC).

World 2 predispositions, and tacit, implicit, and explicit belief knowledge, impact World 3 knowledge claims through DECs and those actions of DECs that produce World 3 products. Once these products are produced, they then become part of the cultural environment that may impact either their creator (s) or other agents at a later time. The process of producing World 3 knowledge claims is also an emergent one and may be called Cultural

Knowledge Claim Creation (CKCC). Cultural Knowledge Creation (CKC) is CKCC followed by error elimination.

The subject of World 2 and World 3 interactions in the context of DECs brings to mind Nonaka and Takeuchi's (1995) SECI (Socialization/ Externalization/ Combination/Internalization) Knowledge Conversion Model. It may help to clarify the importance of our framework by using it to analyze SECI. In SECI, processes of World 2 and World 3 knowledge creation are referred to as "knowledge conversion" processes. Moreover, they are conceptualized in a less granular interaction context than BKC and CKC. Here is an account of SECI stated in our own words and in as precise a fashion as we can manage. This summary is not entirely faithful to Nonaka and Takeuchi's (1995, pp. 56-73) formulation, but our attempt here is to strengthen their formulation by restating it in order to remove ambiguities. Here is what we think they are saying:

1. In the process of Socialization, Person A's performance of a task or series of tasks, assumed to be the result of "tacit" knowledge, is exhibited to Person B who acquires "tacit" knowledge sufficient to reproduce the performance as a result of this process. This is called "sympathized knowledge" because it consists of "shared mental models and technical skills."

2. In the process of Externalization, Person A uses his/her tacit knowledge to create an expression intended to represent this tacit knowledge. This "explicit" knowledge is then transferred to Person B who now has the "explicit" knowledge, but not the "tacit" knowledge that motivated it, as a result of this process. This is called "conceptual knowledge" because it consists of linguistic networks.

3. In the process of Combination, Person A works with Person B to combine Person A's "explicit" knowledge with Person B's "explicit" knowledge to create a new expression of "explicit" knowledge common to both as a result of this process. This is called "systemic knowledge" because it consists of systems of concepts.

4. In the process of Internalization, Person A provides "explicit" knowledge to Person B who "converts" it to tacit knowledge as a result of this process. This is called "operational knowledge" because it consists of mental knowledge learned from "indwelling" in explicit knowledge.

Looking at Socialization from the viewpoint of World 2/World 3

interaction, and our classification of types of mental knowledge, ***this process is an instance of a combination of repetitive and sequential transactions between Person A and Person B (See Figure 2.1).*** These transactions are the result of a combination of factors in our CAS framework, among them previous mental knowledge (attitudes and tacit, implicit, and explicit beliefs) of both Person A and Person B. These result in Person B learning a predisposition to execute a performance under appropriate conditions. World 3 knowledge may not be significantly involved. But this process is not merely a conversion from "tacit" knowledge in A to "tacit" knowledge in B. Rather, it is a conversion from all types of mental knowledge in A to all types of mental knowledge in B. It is a conversion that happens through a complex process of ostensive demonstration by Person A and absorption of that demonstration by Person B.

Moreover, in the case where "mental models" are learned, these are predispositional, as well. They are not expressed by those holding them, but are inferred by us based on performances. In short, the Socialization process involved here produces attitudinal predispositions and is based on all types of mental knowledge illustrated in Figures 2.10 and 2.14. These attitudes are "tacit," since all attitudes are "tacit," but rather than characterizing them that way we believe it is far more illuminating to recognize that Socialization to particular skills involves learning new attitudes, rather than acquiring "tacit knowledge."

From our point of view, Externalization is a process in which Person A uses World 2 tacit, implicit, and explicit knowledge, as well as attitudes and previous World 3 knowledge, to create new World 3 knowledge claims. These are then communicated to Person B. This is done in the context of DECs and results in actions that produce World 3 products from World 2 mental states (including explicit knowledge). In cases where problems must be solved before the products can be produced, PLCs are initiated and also use the full range of types of mental knowledge and previous World 3 knowledge to produce at least part of the necessary World 3 products.

In other words, we think that Externalization must use attitudes as well as all three types of situational beliefs, and previous World 3 knowledge to produce World 3 knowledge claims. To create World 3 products we need: (a) attitudes of various kinds, (b) tacit skill-knowledge of self-expression, (b) implicit knowledge brought to consciousness in the act of creation and (d) explicit belief knowledge as an immediate precursor to self-expression. The Nonaka-Takeuchi account of Externalization is incomplete in failing to recognize the roles of implicit and explicit belief knowledge, attitudes, and previous World 3 knowledge in producing World 3 outcomes.

Further, as envisioned by Nonaka and Takeuchi, Externalization, in producing "concepts," produces tentative theories or solutions, ***untested knowledge claim networks***, but not knowledge. To produce World 3 knowledge, error elimination based on testing and evaluation of new knowledge claims, along with some surviving new knowledge claims, is needed.

In SECI, the process of Combination is viewed as the conversion of "explicit" knowledge to "explicit" knowledge. But from the point of view of our framework, this is again incomplete, oversimplified, and misleading. When two or more people come together to combine "explicit" knowledge to create new "explicit" knowledge, they bring not only "explicit" or World 3 knowledge to the table, but also all of their mental knowledge (attitudes and implicit, tacit and explicit belief knowledge) to the process of Combination. The process of Combination, then, is one that combines much more than the previous World 3 knowledge of the participants. Rather, it combines, and in some degree changes, both their World 2 and World 3 knowledge. In addition, the process of Combination involves much more than knowledge. It also encompasses the remaining components of the framework in Figure 2.1, including the ecological environment with its various elements of technical and human infrastructure that provide the background of interaction. As Nonaka points out in other contexts (Von Krogh, Ichijo, and Nonaka, 2000; and Nonaka and Nishiguchi, 2001), an "enabling context" or "knowledge space," also called "ba" is important in facilitating World 3 knowledge production.

Lastly, Internalization is also a process that is oversimplified in the SECI model. From the point of view of our framework, Internalization is the production of all World 2 knowledge emerging from producing, receiving and using World 3 knowledge. This includes all changes in belief knowledge produced by interaction with World 3 and its physical embodiments and social environment, and all changes in attitudinal predispositions resulting from interaction with World 3. So Internalization is not limited to producing "tacit" knowledge alone.

In viewing the SECI model, we also mention that Nonaka and Takeuchi develop it further by specifying enabling conditions (intention, autonomy, fluctuation and creative chaos, redundancy, and requisite variety) for knowledge conversion, and also a "five-phase model of the organizational knowledge creation process" (ibid. 83-89). To consider these aspects of SECI would take us too far afield. But among the five phases is the third phase called "justifying concepts," a phase they associate with their Internalization knowledge conversion process. Here's what Nonaka and Takeuchi have to

say about "justifying concepts" (pp. 86-87):

> In our theory of organizational knowledge creation, knowledge is defined as justified true belief. Therefore, new concepts created by the individual or the team need to be justified at some point in the procedure. Justification involves the process of determining if the newly created concepts are truly worthwhile for the organization and society. It is similar to a screening process. Individuals seem to be justifying or screening information, concepts, or knowledge continuously and unconsciously throughout the entire process. The organization, however, must conduct the justification in a more explicit way to check if the organizational intention is still intact and to ascertain if the concepts being generated meet the needs of society at large. The most appropriate time for the organization to conduct this screening process is right after the concepts have been created.
>
> For business organizations, the normal justification criteria include cost, profit margin, and the degree to which a product can contribute to the firm's growth. But justification criteria can be both quantitative and qualitative … More abstract criteria may include value premises such as adventure, romanticism, and aesthetics. Thus, justification criteria need not be strictly objective and factual; they can also be judgemental and value-laden.

It is striking that "justifying concepts" ***as a basis for knowledge*** is about evaluating or screening World 3 knowledge claims in the process of converting them into "tacit" knowledge for the purpose of ***psychologically justifying them***. This is how we interpret the passage above. Though knowledge is characterized as "justified true belief," the above statement makes very plain that the emphasis in SECI is on belief and psychological justification ***and not on truth at all***. Where in "justifying concepts" are the epistemic evaluation criteria for selecting among contending knowledge claim networks? Where is the concern for seeking and finding true knowledge claim networks rather than false ones? Where is the concern with finding solutions to problems that reflect reality?

Upon closer inspection, we find that Nonaka and Takeuchi's theory of truth is more concerned with the proximity of beliefs and claims to positions held by managers, than with closeness to reality. Consider the following statement of theirs (p. 87):

> In a knowledge-creating company, it is primarily the role of top management to formulate the justification criteria in the form of organizational intention, which is expressed in terms of strategy or vision.

Earlier (p. 86), they contend that justification of "true beliefs" is measured "against the vision established by top management." It should be clear, then, that according to Nonaka and Takeuchi, truth has little to do with reality, and instead is a function of how close beliefs or claims happen to come to the beliefs or claims held or expressed by managers – who of course could all be wrong.

The important point is that in considering "justifying concepts" as an "Internalization" process, Nonaka and his collaborators in the three works cited above, have by-passed the process of 'open' Knowledge Claim Evaluation, a process that selects among World 3 knowledge claims on the basis of their defensible correspondence with reality, and which in the process never refers to, or relies upon, the authority or rank of a claim's proponents. Instead, Nonaka and Takeuchi seem to prefer a position which states that (a) beliefs or claims being transferred or "converted" in their SECI model are always true, (b) that a political/psychological process seeking certainty in World 2 beliefs or claims is valid, and (c) commitment to those beliefs or claims on the basis of the rank of their originators is a preferred and sufficient basis for the justification they seek.

Such a process may build consensus and commitment; it may produce justification of one's beliefs. But, as we have discussed at length in chapter 1, it does not produce severe tests and evaluations for alternative knowledge claims. It does not produce the strongest solutions to our problems. It does not produce the growth of knowledge. And finally, it does not eliminate our bad ideas before they eliminate us. In short, it is not a recipe for creating knowledge that will more closely approach the truth. Instead, it is a recipe for creating comfortable knowledge claim networks that we can all agree upon, whether or not these are the best networks for helping us to adapt to the challenges we will surely face.

In general, our analysis of SECI shows that it is an incomplete and oversimplified statement of knowledge interaction and conversion processes. This is a result of insufficient specification of the underlying theoretical framework of knowledge interaction, both in its psychological and sociological dimensions. Things are just much more complicated than tacit to tacit, tacit to explicit, explicit to explicit, and explicit to tacit. Instead, "conversion" processes almost always are ***from*** attitudes, tacit, implicit, explicit beliefs and World 3 products combined with ecology and

transactions, ***to*** resulting attitudes, tacit, implicit, explicit beliefs, World 3 products, ecology, and transactions. There are, we are sure, differences in knowledge conversion processes in the degree to which their initial states and final states are characterized by particular types of knowledge that are the focus of our interest. But this says very little about how some initial state will develop in the future or how some outcome state was arrived at. To discover that, we must model the dynamics of knowledge conversion processes, without assuming that there are cleanly defined starting states of explicit or tacit knowledge from which we can begin and end our analysis. There are, however, no such absolutes in knowledge processing.

THE CONTEXT OF KNOWLEDGE PRODUCTION AND USE

Both World 3 Knowledge Claims and World 2 mental knowledge (including tacit, implicit, and explicit beliefs and belief predispositions) are produced and/or used in the CAS, Organizational Learning Cycle, and motivational contexts illustrated earlier in Figures 2.1 – 2.13. In Figure 2.1, the beliefs and attitudes that contribute to situational orientations, and that, with them, are used in decisions, include predispositional knowledge, and explicit, implicit and tacit knowledge. World 3 knowledge is included in Figure 2.1 in the category of Cultural conditions. So, our CAS framework has a place for each type of knowledge we have distinguished previously, and each type plays a vital role in decision making and in CAS interaction.

In DECs, whether they are operational or problem-solving in motivation, 'governing knowledge' in the DOKB will include both previously created World 3 knowledge, and previously created World 2 mental knowledge including predispositions, and tacit, implicit, and explicit knowledge. Operational DECs will routinely produce new World 3 knowledge about specific circumstances and conditions and new mental knowledge of each of the types through direct perception and reinforcement learning.

Problem-solving DECs will produce such knowledge as well. But in addition, ***they will also create new mental knowledge through recombination of existing beliefs, and newly created beliefs, sometimes thought of as "random mutations," coupled with selection among these newly created beliefs.*** These new World 2 beliefs will then be used to create new World 3 Knowledge Claims in a complex process of dynamic interaction between World 2 beliefs and World 3 expressions, a process of mutual knowledge creation of both types. This process is itself composed of DECs, and is emergent in the sense that the World 3 and World 2 products of these DECs are not mere transcriptions to an alternative medium of previous World

2 beliefs or World 3 Knowledge Claims to new World 3 Knowledge Claims or World 2 beliefs. The move between the mind and the medium of expression of World 3 semantic and logical content is itself a creative act.

From the viewpoint of the DLL framework combined with Popper's tetradic schema, each process in the problem-solving loop (problem recognition, proposing tentative theories or solutions, eliminating errors, and new problem recognition) is comprised of DECs. And each DEC will generate both World 2 and World 3 knowledge of each type we've previously specified. So interactions between World 2 and World 3 knowledge will occur throughout the various DECs in the PLC.

Finally, World 1 knowledge is inherent in human genetic makeup. It manifests itself in predispositions to behavior built into human bodies and brains. These provide the foundation for our mental development and learning capabilities, as well as our capabilities in all other areas of behavioral functioning. Since this knowledge is biological in character, it is unchanging and unchangeable in the short-run, barring developments in genetic engineering. Nevertheless, World 1 knowledge, viewed quantitatively, accounts by far for most of human knowledge, and provides the foundation for social CAS networks. No discussion of the context of knowledge production and use in human systems can be complete without recognition of the foundational, if non-varying, role of World 1 knowledge.

THE KNOWLEDGE LIFE CYCLE AND ITS ORIGINS

The Knowledge Life Cycle (KLC), in an organizational context, is a description of instrumental behavior and motivation which, rather than being aimed at achieving an operational or business outcome goal-state, is focused instead on reaching a certain epistemic or knowledge outcome goal-state. Having provided a framework explaining in more abstract non-organizational terms how this shift occurs and how the PLC originates from the DEC, we will now explain how the DEC and the PLC relate to business processes, knowledge processes and knowledge management.

Business Processes ultimately break down to activities, and these, as we have seen, are produced by Decision Execution Cycles. Business Processes are performed and managed by agents. Agents, if they're groups, and as we have explained earlier, have an internal culture. At the same time, the Cultural component of Social Ecology also impacts the agent Decision Execution Cycles that ultimately comprise business processes**.**

Business processes and business management together constitute the

Business Processing Environment that produces business outcomes such as sales, profits, and ROI in an enterprise. Figure 2.15 illustrates this simple relationship.

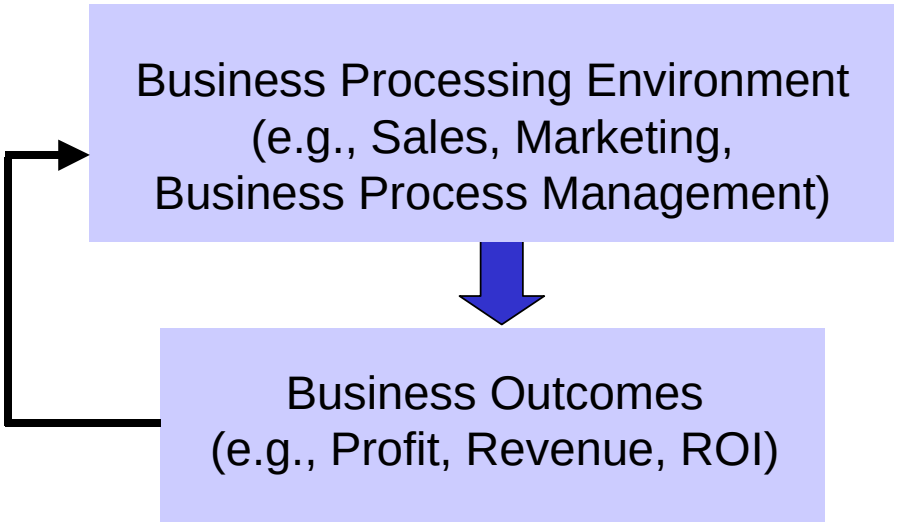

Figure 2.15
The Business Processing
Environment and Business Outcomes

Since Business Processing Environments are comprised of Decision Execution Cycles, ***they will, from time-to-time,*** and as illustrated in Figure 2.16, ***spawn problems***. These problems can be solved only through Problem Life Cycles (double-loop learning cycles). In the context of organizations, we call these knowledge processes (added in Figure 2.17) or Knowledge Life Cycles, or KLCs, (added along with the DOKB in Figure 2.18).

Figure 2.18 shows that the Knowledge Life Cycle is comprised of (1) problems, or knowledge gaps, generated by business processes, (2) knowledge processes, and (3) the DOKB containing the outcomes of knowledge processes, as well as knowledge about special events and conditions produced in the DEC. The DOKB is also used in the Business Processing Environment and this environment, in turn, creates new problems and new instances of KLCs. We have seen that business processes are comprised of DECs and that these processes spawn problems if the agents involved cannot adapt to environmental stimuli through regulatory behavior. When this happens, agents resort to Problem Life Cycles (PLCs), which as we have said in an organizational context are called KLCs. They too are comprised of DECs, that, in turn, can spawn their own problems and new higher-level instances of the KLC.

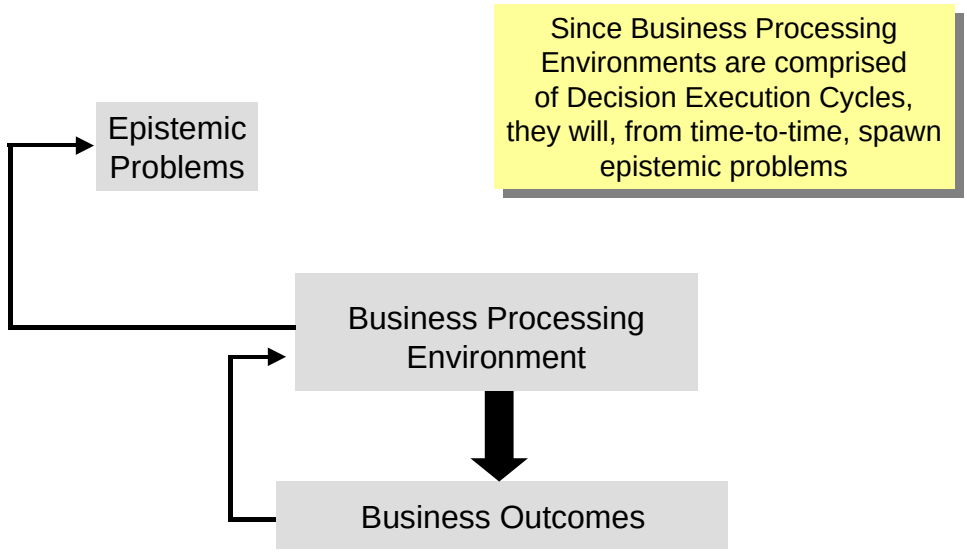

Figure 2.16
The Business Processing Environment and Problems

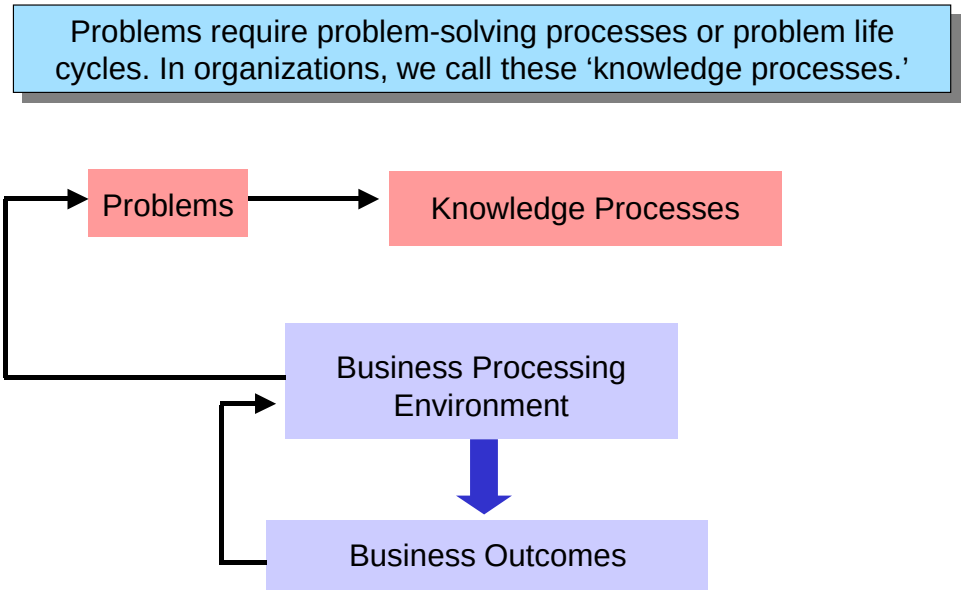

Figure 2.17
Knowledge Processes

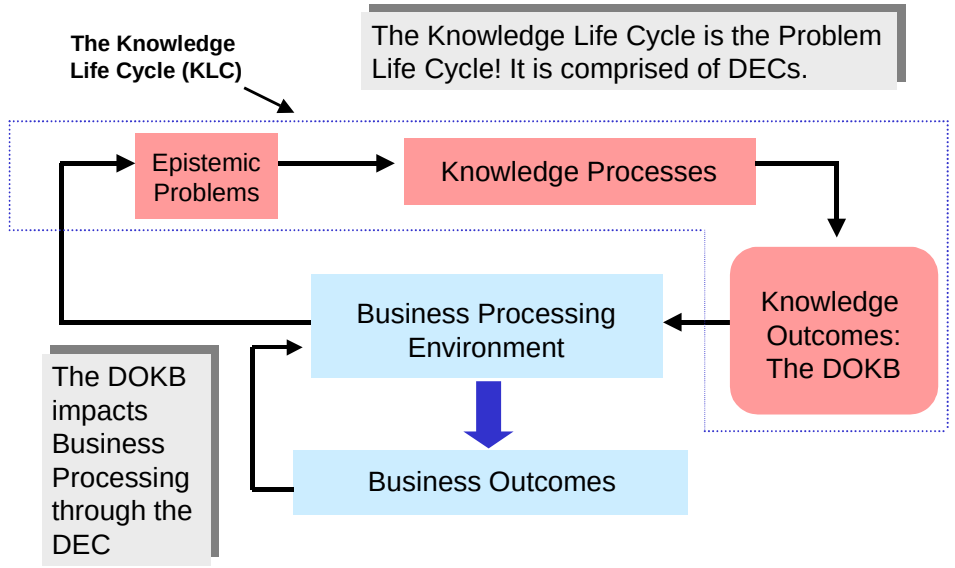

Figure 2.18
Knowledge Outcomes: The DOKB

Figure 2.18 shows that the Knowledge Life Cycle is comprised of (1) problems, or knowledge gaps, generated by business processes, (2) knowledge processes, and (3) the DOKB containing the outcomes of knowledge processes, as well as knowledge about special events and conditions produced in the DEC. The DOKB is also used in the Business Processing Environment and this environment, in turn, creates new problems and new instances of KLCs. We have seen that business processes are comprised of DECs and that these processes spawn problems if the agents involved cannot adapt to environmental stimuli through regulatory behavior. When this happens, agents resort to Problem Life Cycles (PLCs), which as we have said in an organizational context are called KLCs. They too are comprised of DECs, that, in turn, can spawn their own problems and new higher-level instances of the KLC.

A more granular view of the KLC is presented in Figure 2.19. The KLC consists of two major processes: Knowledge Production and Knowledge Integration. Knowledge Production is initiated in response to problems produced by decision cycles in business processes. It produces new Organizational Knowledge (OK), including Surviving Knowledge Claims (SKCs), Undecided Knowledge Claims (UKCs), and Falsified Knowledge Claims (FKCs), and information about the status of these (meta-claims). All of these are codified World 3 objects, not World 2 beliefs. Organizational

Knowledge (OK) is composed of all of the foregoing results of Knowledge Production. It is part of what is integrated into the enterprise by the Knowledge Integration process.

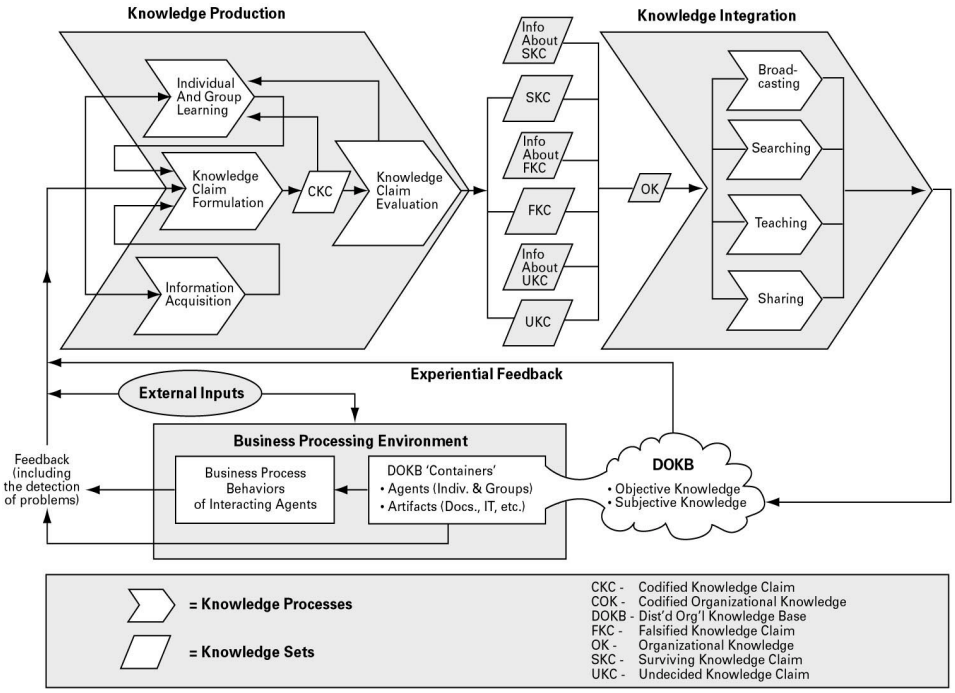

Figure 2.19
The KLC: A *More* Granular View (from McElroy, 2003)

The Knowledge Production process, in combination with previous agent predispositions, also produces ***beliefs related to the World 3 knowledge claims***. These are World 2 objects, predisposing various organizational agents to action. In some instances, they are predispositions that correspond to Organizational Knowledge, in other instances they are predispositions that reflect awareness of validated or Surviving Knowledge Claims but contradict them, or supplement them, or bear some other conceptual relationship to them. At the individual level, these beliefs are in part tacit, since all of them are not expressible linguistically by the individuals holding them, or implicit since some that are neither tacit nor explicit may not have been verbally expressed, but *can* be given appropriate conditions. Where these beliefs have been validated by individuals, or other intelligent agents holding them, they constitute World 2 knowledge. But they are not Organizational Knowledge. Rather, they are outputs of the organizational knowledge processing system

experienced at the level of individual agents.

The Knowledge Integration process takes Organizational Knowledge and by spreading and diffusing it within the organization, produces that portion of the DOKB constituting new knowledge produced by the KLC, in contrast to the portion of it produced by the DEC through single-loop learning. Integrating means communicating organizational knowledge content to the organization's agents with the purpose of making them fully aware of existing organizational knowledge. This also requires making the knowledge available in knowledge stores that agents can use to search for and retrieve knowledge. The result of Knowledge Integration is that the content of new codified Organizational Knowledge is available in both accessible and distributed knowledge stores and, in addition, is reflected in the predispositions of agents all across the enterprise. As we indicated earlier, the DOKB is the combination of distributed World 3 and World 2 knowledge content.

The DOKB, in its turn, has a major impact on structures incorporating Organizational Knowledge such as normative business processes, plans, organizational culture, organizational strategy, policies, procedures, and information systems. Coupled with external sources, these structures then feed back to impact behavioral business processes through the Acting phase of the operational DECs. These DECs, in turn, generate new problems in the Planning and Decision Making, Monitoring, and Evaluating phases to be solved in the next round of knowledge processing, i.e., in new KLCs.

"Drilling down" into Knowledge Production, the KLC view is that Information Acquisition, and Individual and Group Learning, in the service of problem-solving, impact on Knowledge Claim Formulation, which, in turn, produces Codified Knowledge Claims (CKCs). These, in their turn, are tested in the Knowledge Claim Evaluation task cluster, which entails a critical examination of knowledge claims including, but not limited to, empirical testing, which then produces new Organizational Knowledge (OK).

The Individual and Group Learning (I & G) task cluster or sub-process is ***recursive.*** That is, I & G learning is itself a KLC at the level of system interaction just below the global level, while I & G learning at the second level is itself a KLC at the level below, and so on until Individual Learning and Individual Knowledge Production are reached. KLCs, therefore, occur at the group and individual levels of analysis, as well as at the organizational level. They produce knowledge claims that have survived evaluation from the perspective of the individual or the group, as the case may be, but that from the perspective of the organization are not yet evaluated. Figure 2.20 illustrates the recursive nesting of KLCs, and the DECs that comprise them, in an organization.

The nesting of KLCs in organization is a similar idea to the "knowledge creation spiral" presented by Nonaka and Takeuchi (1995, p. 57, 72-73), with the exception that we don't emphasize the "spiral aspect" as much as we do the filter aspect. That is, the overwhelming majority of new knowledge claims are likely to be generated in lower level KLCs and refuted at these levels. Relatively few knowledge claims will survive to "spiral upward" and reach the organizational level. This is a good thing, since it is an organization's natural defense against information glut.

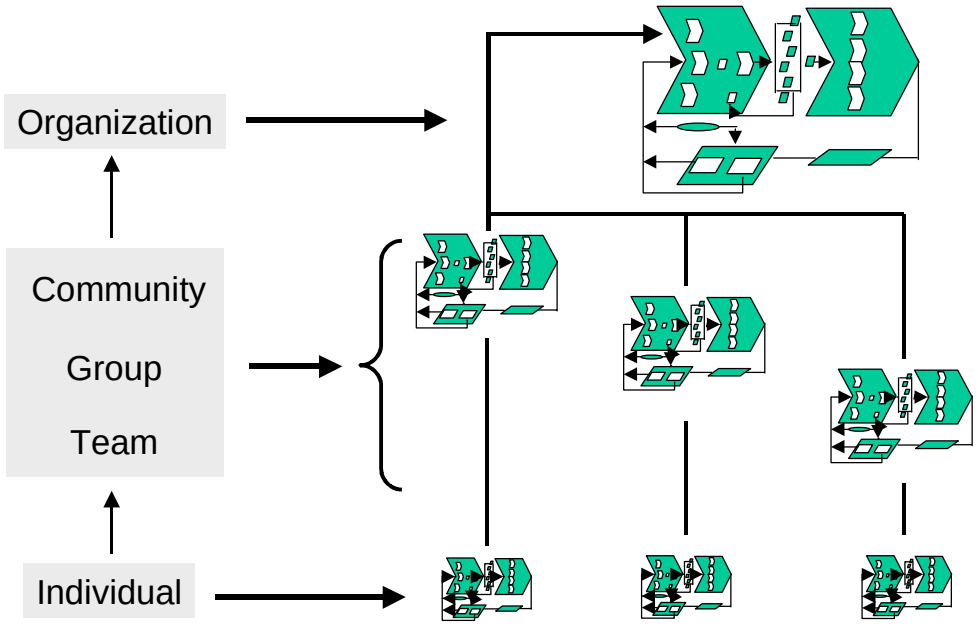

Figure 2.20
Nesting of KLCs in an Organization

The key task cluster that distinguishes Knowledge Production from information production is Knowledge Claim Evaluation. It is the sub-process of criticism of competing knowledge claims, and of comparative testing and assessment of them, that transforms knowledge claims from mere information into tested information, some of which passes organizational tests and therefore becomes, from the organizational point of view, new knowledge. In other words, the difference between World 3 information and knowledge can be found in understanding Knowledge Claim Evaluation. Similarly, the difference between World 2 information and knowledge stems from testing and evaluating one's beliefs. Testing and evaluation of knowledge claims is public and sharable in the sense that the claims themselves are sharable and criticizable, and the tests and their results (i.e.,

meta-claims) are sharable and criticizable as well. As we have said, it is in this sense that World 3 knowledge is objective.

Testing and evaluation of beliefs, on the other hand, is private and personal. Most belief knowledge cannot even be tested explicitly, because we may not have formulated implicit or tacit beliefs in such a way that we can evaluate them consciously. At an unconscious level, we do "evaluate" implicit and tacit beliefs and even our predispositions. But these "evaluations" are probably positive or negative reinforcements based on outcomes of using the beliefs. They are "evaluations" based on undifferentiated feedback and do not reflect an understanding of the causes of, or reasons for, either the positive or negative feedback received. They are also subject to our perceptual and conceptual filters. ***All of the above differences make World 2 knowledge subjective, and consequently, in the context of the enterprise, it is Knowledge Claim Evaluation that involves the testing and production of objective knowledge only, not World 2 belief evaluation.***

Knowledge Claim Evaluation is not the same thing as justification. Justification is the process of proving that a knowledge claim or a belief is true. Knowledge Claim Evaluation never proves anything with certainty. It simply provides (a) a record of how well competing knowledge claims stand up to our tests or (b) personal experience of how well competing beliefs stand up to our tests. Justification of knowledge claims and beliefs is impossible, but criticism, testing, and evaluation of them is not (see Chapter 1).

The practice of testing and evaluating knowledge claims or beliefs will vary across individuals, groups, communities, teams, and organizations. A particular entity may use KCE practices based on explicit rules or specified criteria to compare knowledge claims, but it need not. Agents are free to change their tests or criteria at any time, to invent new ones, or to apply ad hoc tests and criticisms. That is, KCE is a free-for-all; it is just the process by which knowledge claims and beliefs run the gauntlet of our skepticism and our criticism.

Looking at Knowledge Production from the viewpoint of agents at different levels of organizational interaction, and keeping the role of KCE in mind, it follows that Individual and Group Learning may involve Knowledge Production from the perspective of the individual or group. But from the perspective of the enterprise, what individuals and groups learn is information, not knowledge. Similarly, information acquired may be knowledge from the perspective of the external parties it is acquired from, but not knowledge to the enterprise acquiring it, until, that is, it survives KCE at the level of the enterprise.

Figure 2.20 also illustrates that KCE at the organization level has a feedback effect on Individual and Group Learning. This occurs because individuals and groups participating in KCE are affected by their participation in this process. They both produce World 3 Organizational Knowledge and also experience change in their own beliefs (i.e., they generate world 2 knowledge) as an outcome of that participation.

Drilling down into Knowledge Integration, Organizational Knowledge is integrated across the enterprise by the Broadcasting, Searching/Retrieving, Teaching, and Sharing task clusters. These generally work in parallel rather than sequentially. And not all are necessary to a specific instance of the KLC. All may be based in personal non-electronic or electronic interactions.

Knowledge Production and Knowledge Integration, their sub-processes, task clusters, etc., like other value networks, are, like the PLCs discussed earlier, composed of DECs through which agents execute their roles in these value networks. This means that Planning and Decision Making, Acting, Monitoring and Evaluating also apply to knowledge processes and to activity in the KLC, though here the instrumental motivation is focused on learning, rather than on primary business outcomes.

That is, KLC processes are executed by agents performing learning-related DECs, engaging in Planning and Decision Making, Acting, Monitoring, and Evaluating, oriented toward Knowledge Production and Knowledge Integration goals. But there is also an even higher level of knowledge processing. The higher level knowledge producing and knowledge integrating activities initiated by problems occurring in learning-related DECs are knowledge management-level knowledge producing and knowledge integrating task clusters. This is true because they address problems in knowledge processing about how to plan, how to monitor, how to evaluate, or how to implement activities in order to attain knowledge processing goals. These problems are solved by producing and integrating KM - level knowledge. Figure 2.21 illustrates the origin of KM knowledge processes in problems originating in KLCs and in other knowledge management processes that are goal-directed toward managing and enhancing knowledge processing.

SUMMARY AND CONCLUSIONS

We are at the end of our survey of the various conceptual frameworks underlying our coming development of the Open Enterprise Model. We began with CAS theory and pointed out the key role of knowledge in adaptation and in maintaining system coherence and also the importance of distributed knowledge processing in CAS interaction and self-organization.

We then went on to explain why organizations may be viewed as CASs, and then developed the idea of organizations as social CASs that we may visualize as transactional networks comprised of interacting agents.

The actions of agents in the transactional network occur through the Organizational Learning Cycle (OLC), which we have called the Decision Execution Cycle in order to emphasize its role in decision making. In describing the operation of the DEC, we discussed the organizational learning ideas of single- and double-loop learning, and also showed that the nature of double-loop learning could be further illuminated by integrating Popper's tetradic problem solving schema into the OLC. Next, we examined the psychological foundation of the DEC, and presented a hierarchical theory of motivation based on the idea of incentive systems viewed in the context of a transactional CAS model of agent interaction. We related that theory to the idea of coping behavior and problem solving and provided an account of how shifts in instrumental motivation, triggered by the recognition of epistemic problems, fuel the emergence of problem life cycles from operational DECs. We concluded our discussion of motivation by comparing our psychological framework to the framework of sense making originated by Karl Weick. The comparison showed strong overlap in the two frameworks, but also major differences in that our "realist" framework does not view reality as socially constructed, and also that we do not accept the notion that knowledge is that which has been validated by social consensus.

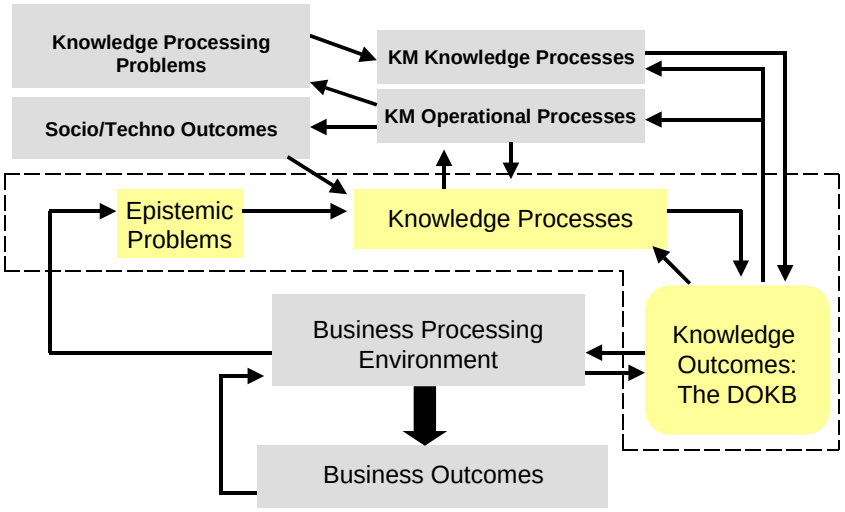

Figure 2.21
Knowledge Management

Having covered decision making, organizational learning, and motivation in a transactional CAS context, we then explained our view on the role of culture in organizational CASs. We explicated the term "culture" in order to make clear how we and others use the term, and showed that cultural factors have an important, pervasive, and very specific, but not dominant role in our transactional CAS framework.

With all of the preceding as background, we then presented our Unified Theory of Knowledge, a theory based very much on Popper's (1972, 1994, 1999, Radnitzky and Bartley, 1987) evolutionary epistemology and pluralist ontology. We characterized knowledge as:

Knowledge consists of tested, evaluated, surviving, and encoded structures (e.g., DNA instructions, beliefs or claims) that help the systems that produce them to adapt. Knowledge structures, that is, are adaptations to the environment.

We also distinguished physical/material (World 1), mental (World 2), and cultural (World 3) forms of partially autonomous knowledge, and related the types of knowledge to one another focusing particularly on the interaction between belief knowledge (World 2) and products of the human mind, such as knowledge claim networks (World 3). All three types of knowledge emphasize the contingent, fallible character of knowledge, the idea that there is no such thing as certain knowledge, and that all knowledge is tested by the environment. We emphasized particularly that World 3 knowledge is "objective," not because it is necessarily true, but because it is sharable and criticizable.

Next, we discussed a serious objection to the idea of World 3 knowledge and also developed a specification of types of mental knowledge distinguishing attitudinal or belief predispositions from tacit, implicit, and explicit situational orientations. This specification was then used to show that the well-known Nonaka and Takeuchi SECI model of knowledge conversions is incomplete and misleading, and that its associated view of "justifying concepts" is also untenable.

Having developed the various components of our foundational framework, we then pulled things together by addressing the context of the production of World 2 and World 3 knowledge in terms of the transactional CAS, OLC/DEC, motivational, cultural, and knowledge frameworks. In this account, we viewed operational DECs as producing knowledge according to pre-determined rules, while problem-solving DECs were viewed as participating in a more long-term process that produced new World 2 knowledge through a combination of random mutation, recombination of

existing knowledge, and selection among newly created beliefs. World 3 knowledge claims are then created from the new World 2 beliefs and previous knowledge, in the presence of situational factors, and then these new knowledge claims are subjected to testing and evaluation in an error elimination process.

The final section of this chapter applied our conceptual frameworks to Knowledge Processing at the level of organizations. We began with the DEC as the basic unit of the organizational CAS that produces activity. We then developed the idea that business processes are integrated from DECs that are linked by a motivation to close an instrumental behavior gap. We then explained that operational business processing DECs, when unsuccessful or perceived as likely to be unsuccessful, generate epistemic problems which give rise to other DECs linked by a motivation to close the epistemic gap defining the problem. These Problem Life Cycles are called Knowledge life Cycles at the level of the organization. DECs comprising Knowledge Life Cycles form Knowledge Production and Knowledge Integration Processes. Knowledge Production includes Information Acquisition, Individual and Group Learning, Knowledge Claim Formulation, and Knowledge Claim Evaluation. Knowledge Integration includes Knowledge and Information Broadcasting, Searching and Retrieving, Knowledge Sharing, and Teaching.

Knowledge Claim Evaluation is the important sub-process that performs testing and evaluation and error elimination. KCE produces World 3 Organizational Knowledge in the form of Surviving, Falsified, and tested but Undecided knowledge claims. All sub-processes produce World 2 knowledge resulting from the experience of their participants, but Knowledge Integration sub-processes aim at having an impact on the World 2 knowledge of all organization members. Both World 2 knowledge and World 3 knowledge, as well as other beliefs and knowledge claims, when produced by the various sub-processes comprise the Distributed Organizational Knowledge Base.

The Individual and Group Learning process was described as the recursive element in the Knowledge processing framework. The output of this process at the organizational level is knowledge produced by the next lower level of organizational interaction. Further, this output is produced by a KLC completed at that lower level, that itself has an Individual and Group Learning sub-process. This makes it clear that KLCs are nested at each level of organizational interaction down to the level of the individual, and that they provide an important filtering mechanism for overcoming “infoglut.”

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END NOTES

[1] This account of self-organization should not be taken as stating that there is no environmental impact on self-organization. Rather, we believe that self-organizing patterns involve an interaction between self-organizing agents in the process of forming an integrate and the environment in which the integrate is forming. The role of the environment is one of "downward causation" (Popper, 1987, p. 147).

[2] By "openness" here, we don't mean merely that the boundaries of CASs are permeable with respect to energy, material, and information. This kind of "openness" is the basis for the basic distinction between closed and open systems of General Systems Theory (Von Bertalanffy, 1950). All CASs already fall into the "open" category relative to it.

[3] This proposition has the form of a classic deterministic causal relationship. But it should be interpreted instead as stating a ***propensity*** relating "openness" and adaptive capability. By this we mean a tendency for greater adaptive capability to follow upon greater openness. This tendency would be observable in the relative frequency (probability) with which increases in "openness" are followed by increases in adaptive capability. See Popper's (1982a) discussion of the propensity interpretation of probability, and keep in mind that our development of Open Enterprise Theory in the context of the CAS approach assumes (a) indeterminism, (b) realism, and (c) objectivism (See Popper 1982, 1982b). That is, we believe the universe is open in the sense that there are events that are not pre-determined. In particular, the growth of knowledge itself is not pre-determined. We also believe that our purpose in inquiry is to explain and understand reality and that our theories of the Open Enterprise are not just instruments for prediction or application. Finally, we believe that the state of reality is not determined by our knowledge of it. That is, we do not construct reality. It is there and we interact with it, but we do not make it without limitation. Thus, probabilities are not about our degrees of belief in "A". Rather, they are about the propensity of "A" to occur under certain specifiable conditions.

[4] Of course, information transmitted to agents can only be intentionally misleading in CASs comprised of intelligent agents.

[5] The thrust of some forms of CAS Theory is to attempt to account for global attributes by explaining them in terms of structural patterns or relations. This orientation is the opposite of the one reflected in patterns of cultural explanation. Another form of CAS Theory shares the idea of "downward causation" with historical forms of cultural determinism (e.g., the work of Ruth Benedict, Margaret Mead, and other cultural anthropologists).

In this view, CAS structure and "self-organization" is at a middle-level, determined by both upward causation from the agent level and "downward causation" from global attributes such as culture. The idea of "downward causation" was pioneered by Roger Sperry (1969, 1973), Donald Campbell (1974) and Popper (in Popper and Eccles,1972, pp. 14-35, and 1987, pp. 146-147, 152-153).

[6] The notion that the mind is "a control mechanism for the brain" is part of Popper's more general formulation of the evolutionary development of a system of "plastic controls" for any organism. The basic idea is that higher order control systems emerge out of lower order ones and exercise a regulative function on them through "downward causation" involving selection of lower level functional activities. Thus, mental self-consciousness allows us to regulate and affect, without determining, impulses in the brain. And language-moderated social interactions and cultural products, in their turn, have a regulative effect on what we believe and more generally on states of mind. For more detail, see Popper (1972, pp. 235-255).

[7] Note, however, the tautological nature of the reasoning here. The hypothesis is that shared mental models result in similar skilled behavior across the individuals involved. But there is no independent measure of the mental models and skills that are supposed to explain the behavior. In the end, then, the presence of the behavior is used to infer the presence of the shared mental models and skills that one is relying upon to explain the similar behavior.

[8] The fact that it is called "conceptual knowledge" is another thing to wonder about. Concepts, after all, are beliefs, and we represent them by words. But networks of words form statements or propositions or theories. That is, they assert knowledge claims. So conceptual networks, when represented through language, are not just conceptual knowledge, either meaningful, or meaningless. Rather, they are theories, and as such they are hypothetical in character, and may be either true or false. Why do Nonaka and Takeuchi avoid the term "theoretical knowledge," rather than conceptual knowledge? Could it be due to a desire to avoid considerations of testing and evaluating our "conceptual knowledge" to see if it is true? The relationship of Concept Formation and Theory Construction is covered in some detail in Firestone (1971).

[9] The important question here, of course, is not what "ba" means, which expresses only a hope, but what attributes a place must have to fit the notion of "ba." At the organizational level, we contend that "ba" is really the Open Enterprise.