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Managament in a New and Experimentally Organized Economy

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Management in a New and Experimentally Organized Economy[1]

by

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Abstract

The parallel development of management theory and practice over three phases of economic development is surveyed; (1) the pre-oil crisis experience 1969-1975, (2) the post oil crisis sobering up through most of the 1990s and (3) the emergence of new global production organizations , blurring the notion of the firm to be managed. The external market circumstances of each period dictate different structures of business operations ; (a) a steady state and predictable environment, (b) crisis, inflation and disorderly markets and (c) new technology supporting a globally distributed production organization. As a consequence structural learning between the periods has been of limited value and often outright misleading.

The influence of management theory on management practice and its origin in the received economic equilibrium model are discussed, and an alternative management theory based on the theory of the Experimentally Organized Economy (EOE) presented. The increased rate of failure among large firms is related to the increasing complexity of business decisions in globally distributed production and the decreased reliability of learning . It is concluded that successful management practice develops through experimentation in markets and that the best management education has been a varied career in many lines of business and in several companies.

Key words: Competence bloc theory, Experimentally Organized Economy (EOE), Management theory, WAD theory, Firm Dynamics, Learning.

JEL Code: A11, C44, C61, D21, D59, D83, G34, L23, M19**1.**

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1. Background

Management theory and thinking has to be based on some ”theory” of the firm and the economy at large. A standard argument of economic thinkers of the not too distant past was that the internal economy of the firm was fully known and controllable and that new information technology would soon make the real economy around us fully transparent and accessible for analytical understanding, optimization of individual and aggregate behavior, and the circumstances perfectly arranged for informed central planning. Such were the predictions of neo- walrasian analysts and their derived believers in management science and the business world (Eliasson 1976). ”Planning has become a fashionable subject in American management literature” writes Loasby (1967). Strategic models of management developed during the 1960s saw steady growth as the central objective to be achieved through market expansion and /or product differentiation, but mainly through organic growth (Ansoff 1965). These models were based on the Walras- Arrow-Debreu (WAD) static equilibrium model, the assumption that knowledge was identical to information, that information was an almost free resource and that the use of information required neither any particular competence nor any resource input.

The parallel development of management theory and practice over three phases of economic development has been followed through interviews; (1) the pre-oil crisis experience 1969-1975, (2) the post oil crisis sobering up period that lasted well into the 1990s and (3) the emergence of new global production organizations towards the end of the 1990s, blurring the notion of the firm to be managed. During the first period management theory based on the static WAD model of economics recommended central business economic planning based on analysis and forecasts (Eliasson 1976).

Post oil crisis economic development in the 1970s was, however, a brutal experience for the central planners of firms. Their planning practice was mostly gone from the large business bureaucracies by the mid 1980s. Management theory had moved one step into what came to be called” strategic management” (Ansoff 1975,1978) emphasizing a turbulent and unpredictable environment and early warning methods. Porter (1980, 1985, 1990) reoriented literature somewhat by emphasizing economies of scale and international expansion to achieve competitive advantage, emphasizing costs but neglecting the role of creative processes (Brandes-Brege 1990). Management practice, however, changed ahead of literature and more radically. A new conception of the dynamics of the economy at large was mirrored in management practice of the late 1980s and the early 1990s. The business world was seen as unpredictable or ”chaotic” and not to be made transparent by analytic methods using data from the past. In this *Experimentally Organized Economy* (EOE) management methods developed in practice were aimed at minimizing the economic consequences of unavoidable business mistakes. Business mistakes, therefore, had a significant learning content. Attempting to avoid them was synonymous to doing nothing in the EOE, and the most risky of all strategies. Since critical business competence is embodied in human beings top level management now took on an entirely new theoretical dimension, i. e. a shift away from the analytical approach and centrally conceived strategic directives towards working through people with creative capacity and operational competence and to discover and capture winning initiatives originating in the organization. Access to information and people with tacit competencies had become the key factor as reflected in business information systems (Eliasson 1984b, 1996a). Profitability was to be monitored centrally, but operations and even

initiatives could be delegated. A new, combined experimental and control mode, therefore, became typical management practice in the 1980s. There was, however, little guidance on how to do it neither from economic nor management theory. Quite in keeping with standard business and accounting theory the firm was , however, still regarded as a *given* and financially defined entity (Eliasson 1996b, Eliasson-Eliasson 2002).

On the verge of the New Millennium and a New Economy this assumption of a given hierarchy was, however, increasingly becoming a misconception. With intangible assets becoming the dominant capital endowment of advanced firms performance measurement and control became virtually impossible in some firms. With distributed global production becoming widespread and strategic acquisitions, reorganization and divestments becoming a common experimental mode of successful innovative firm development the whole notion of a given firm hierarchy to be controlled was becoming blurred. Even though a theory of the firm founded in Coase (1937) type contract and transaction cost analysis was beginning to take shape the production structure underlying the financial asset allocations was still assumed given. Thus, neither management nor economic theory had much guidance to offer and large advanced firms across the industrial world were beginning to experience failure on a larger scale than before. It appeared as if management experience from one period did not carry over to the next. Management learning from experience between periods was no longer a reliable transfer of knowledge and a management career within one firm an increasingly dangerous method of selecting people for the top competent teams of firms. While large firms had given up the demand of a broad based manufacturing experience for a career to the top in the 1980s and begun to increasingly recruit from a more narrow experience base in financial management new criteria for career recruitment clicked in during the 1990s. Even a varied internal career was no longer sufficient. A broadly based career within and between firms was increasingly found to be of critical importance (Eliasson 1990a, 1994, 1996a,c), but apparently too late to prevent large Swedish firms from getting into serious trouble. It had become more important than before to understand the nature of the knowledge or competence base to pass on between generations of managers.

2. The Problem

Between 1969 and 1975 I carried out some 80 interviews of 60 US, European and Japanese firms (Eliasson 1976) on their internal information and control systems. Then it was all short-term and long-range planning and a strong belief in a repetitive environment, forecasting and central ”analytic” leadership of standardized and well defined large scale production. The corporate planner made the strategic decisions, at least in management theory. Between 1975 and 1995 I carried out an additional series of some 70 interviews with 50 firms, several of them the same as in the earlier interview series, and also some 15 firms that had attempted in the early 1980s to establish themselves in the then hot business information systems market (Eliasson 1984b,1996a).

Two different intellectual worlds emerged. In 1970 it was all planning. In 1990 it was all decentralization, experiment, early warning, central profit control and access to information and people.

In between the two observation periods lay the great learning experience of the disorderly 1970s boiling down to one important fact; there was little to learn in the 1990s from management practice in the early 1970s and the management methods used then had been of limited value in the 1960s, and probably misleading

The late 1990s has seen the development of extensive distribution of product development and manufacturing over markets for specialist subcontractors and an increasing importance of strategic acquisitions, reorganizations and divestments to innovate large and small firms (Eliasson- Eliasson 2002). The endogenizing of the limits of the firm (Coase 1937) was thoroughly uprooting the notion of the firm as a given controllable hierarchy and requiring new approaches to management. During the first period mainstream economics offered guidance, although dangerously false guidance. During the second period the Austrian/ Schumpeterian theory of the EOE could have offered a nice theoretical foundation for management theorizing, but this theory was not ready at the time [2]. For the third period of post Coasian (1937) industrial dynamics there was no theoretical guidance at hand, so we have had to develop some for this paper.

The bottom line of the new development in industrial organization has been the merge of *computing and communications* (C&C) technology. Distributed production, integrated by an often temporary systems coordination agent, notably globally distributed production, offers great systemic productivity gains, and radically changes the whole notion of a firm requiring new entrepreneurial and organizational competence of the large businesses to the extent that large firms were beginning to fail in their organizational attempts to adapt to the new competitive conditions of a New Economy (Eliasson 1996b, Eliasson-Eliasson 2002).

A comparison of management practices in the three periods, therefore, is interesting both theoretically, empirically and practically. It not only illustrates how dependent we all are on the intellectual fashions of the day, but also how difficult it is to successfully manage the extreme complexity of a large, globally distributed business organization.

By the early 1970s many managers saw the world as predictable and locally (for the firm) plannable.

By the early 1980s, a decade of disorderly market experience had suppressed that view, but the rapidly innovating C&C technology made many managers still believe that technology and universal business information systems would soon overcome the complexity and provide top level management with general and highly flexible information tools.

I will demonstrate that the limited capacity for learning and knowledge transfer and the increased failure rate of large firms are straightforward predictions of the theory of the EOE. In fact, in the EOE there is no such thing as the invincible corporation of Schumpeter (1942) that survives for ever on routinized innovation.

[2] It was rather developed on the basis of observations in the interviews for these studies of the experimental economic process going on in the wake of the oil crises of the 1970s (Eliasson 2003b).

However, two additional problems related to the dynamics of micro (firm) and macro interaction in the EOE will be addressed:

1. The recurring phases of more or less chaotic (disorderly) market behavior where analytic management information and decision methods fail or are outright misleading , and
2. the fact that despite these shortcomings of individual agents´ intelligence capacity distribution of decisions over agents in markets is still the preferred and optimal production organization.

By 1995 (Eliasson 1996a) managers had, however, learned again. At this time new C&C technologies had made the world around them increasingly heterogeneous, complex and unpredictable. C&C technology had been constantly increasing managers´ capacity to gather, process and analyze information, but at the same time it was also constantly changing the nature of what actors had to be informed about, that is the internal business organization and its economic and technological environment. The total number of circumstances necessary to be informed about may even be increasing at a faster rate than the new C&C technology allows us to learn about them (Eliasson 1999a). The paradoxical outcome is that we may be becoming relatively (and increasingly so) more ignorant (Information Paradox I below). Thus out goes reliance on detached analytical thinking in the executive quarters. In comes rational, experimental behavior in the *Experimentally Organized Economy* (EOE), restoring the Knightian (1921) distinction between uncertainty and risk.

To derive the management theory from which such rational behavior can be characterized we first introduce the characteristics of the EOE to derive the particular problems of information processing a manager in such an economy has to face.

3. The Experimental Nature of Economic Behavior

The manager of each firm would prefer to look forward to a long and successful business life without having to seriously face the hazards of the real business world. Is there a fixture submerged under the violent seas of market life on which real managers can reliably navigate that a good manager with access to modern C&C technologies should be able to uncover? Such is the presumption of the standard neo- walrasian economic model, still being embraced by most economists, still being the foundation of modern finance theory, once being unknowingly embraced by the scientific management movement and by the strategic planners of large corporations in the West during the 1960s, and, not to forget, by many corporate executives. The answer in Eliasson-Sharefkin-Ysander (1983) was no, and part of this essay is devoted to explaining why this has to be the case.

The a priori postulate of an exogenous equilibrium for economic navigation, however, is deeply ingrained in economic thinking. In the first round of visionary information technology economics in the 1960s it was seriously believed even in the West that Soviet style central planning would work, and that western and eastern economies would converge onto a similar mode of national economic planning. A term used was the ”mixed economy”. The ”mature” Lange (1967) illustrated these beliefs when he as late as 1967 brushed away Hayek’s (1937) argument of complexity and the impossibility of central planning by saying (p. 158) ”what is the trouble? Let us put the simultaneous equations on an electronic computer and we shall obtain the solution in less than a second”. This discussion has now died out. Many

management researchers in the West, however, argued that the system would soon successfully take over many dominant top executive decisions (for a survey see Eliasson 1976). People would come and go. The system´s capacity to structure and analyze vast amounts of information would embody the management competence. Simon (1960, 1965) in fact argued that within 25 years high level management problems would be solved by artificial intelligence.

Neo-walrasian economics was the intellectual foundation of Soviet central planning even though its practitioners did not know it. When rephrased as competitive equilibrium analysis the same story sounded credible in Western market economies. To all central planners of the East and to most Keynesian policy makers of the West during the 1960s and the 1970s unpredictable disturbances in markets and the consequent decision mistakes were negative events and instances of undesired economic waste that should be eliminated by informed policy (Demsetz 1969, Pelikan ,1986, 1988). Such was also the foundation of management teaching, writing and practice in the late 1960s based on the idea of a possible full information market economy. When the right intellectual support tools had been made available all business situations would be under intellectual control.

This situation ended abruptly in the disorderly 1970s. During the post-oil crisis years many business mistakes were made and most long range planning departments in the large firms were shut down (Eliasson 1984b, 1996a). In the unpredictable environments of experimentally organized economies the business administration people now apparently needed better advice than what they got from mainstream economists (see Eliasson 1992). Joseph Schumpeter was dusted off, modified and gradually reintroduced into mainstream economics. Despite the costly learning experience of the 1970s the engineers in some 40, mostly large IT firms, however, set out in the early 1980s to design and market “universal” business information systems based on the full information idea. They all failed, some completely, to the tune of billions of lost dollars (Eliasson 1996a, Ch. VI and pp. 243 f). So it appears that economics is still dichotomized into static economics where actors are assumed to be fully informed and to make no mistakes and dynamic economics, the latter (Lamberton 1971a, p. 12) ” dealing with problems of information and knowledge”. To clarify the distinction between static and dynamic economics we have to clarify the role of information and knowledge in economic theory and that is best done by introducing the three information paradoxes.

The three information paradoxes

Economic or business failure depends on what is assumed about the space of business or investment opportunities, or what there is to know or be ignorant about. Is this state space (if you have a mathematical model) small and transparent or large, complex and non-transparent? The neo-walrasian model assumes a small and fully transparent state space and, hence eliminates business mistakes by assumption, barring sometimes a stochastic error. The theory of the EOE makes the exactly contrary assumption. The business opportunities space is assumed to be so large as to make it impossible to know more than a fraction of the opportunities, and in addition, by implication, that the different actors know different fractions of the whole. This means that if you have a fully specified model of the EOE, the

WAD model can be turned into a special theoretical case when you gradually diminish the complexity towards full transparency at no information and communications costs.

(Table 1 in about here)

My departure from the mainstream model, therefore, begins with the introduction of the *Knowledge Based Information Economy* and the three information paradoxes of Table 1 (Eliasson 1990b). The knowledge based economy establishes the assumptions for the theory of the EOE, namely the immense and non-transparent *investment opportunities set* that is impossible to survey more than fractionally by each agent from one point. This also establishes the critical role of information processing and communications in the theory of the EOE and any derived theory of management based on it.

I *first* assume that the state space of our model is initially so large that it is non-transparent to any economic actor from any place in that space. I argue that this assumption is empirically well established. It follows that all actors will then be boundedly rational in the sense of being ignorant about circumstances that may eventually become critical for their survival. If this ignorance is heterogeneous (differently composed over the population of actors) which I assume, tacit knowledge in the sense of limited communicability can be demonstrated to exist (Eliasson 1990a) and business mistakes will be a typical characteristic of economic dynamics.

Under the assumption of no information or learning (transactions) costs this state space will, however, eventually be fully explored at no costs and we will be back in the standard full information model[3]. To complete Paradox One , therefore, the situation of significant ignorance has to be made permanent. This is achieved by assuming that actors learn from experimenting and failing sometimes, and that such learning expands the state space to the extent (we add) that it may even expand faster than we are capable of learning. This completes Information Paradox One of Table 1 (Eliasson 1990b, pp 46 ff) or the so called Särimner effect from the Viking sagas. Särimner was the pig in Valhalla that the Vikings ate for supper. In the morning, however, it came back to life to be eaten again for supper. The difference in economics under the assumptions of Paradox One is that the pig, now the economy may be growing in the process. Exploiting the business opportunities space will expand the opportunities space. We have a positive sum game (Eliasson 1987 a, p.29).

Information Paradox Two refers to the increasingly intangible nature of inputs in and outputs from the economic process, qualities that cannot easily be quantified to the extent that we are beginning to know less and less about what is becoming more and more important (Eliasson 1990b,p.16).

[3] This is one of the problems that Baumol-Panzar-Willig 1982 had to assume away to make their contestable market theory an equilibrium model. Already Dahlman (1979) , however, observed that economic mistakes had to be accepted as a positive transactions cost that made the neoclassical model inconsistent (See also Eliasson 1992).

Information Paradox Three can probably be derived from the other two. Since nobody can take in the whole of the investment opportunities space of the EOE various simplifying information and interpretation devices (read theories/models) have to be resorted to, using information middlemen (“ consultants”) that sell the information output of their analytic methods, contributing more or less to a general misunderstanding of the whole. Already Ackoff (1967) recognized this possibility as a ” business misinformation system”. In the EOE such misunderstanding can however be demonstrated to be productive if sufficiently heterogeneous. It can be seen as part of the experimental innovation process generating business mistakes but also positive innovations that would never have been tried and discovered in a more regulated economic environment. Antonov-Trofinov (1993) demonstrate through experiments on a simulation model that centralized information processing according to one perception (model) of the economy only reduces innovations and growth over the longer time. Reasonably free experimentation, on the other hand, enhances economic growth because new opportunities are discovered that have been ” censored” by the centrally imposed interpretation model. This is also the basic idea of the theory of the EOE.

But the opportunities space is not infinite, and we want to avoid such an assumption. The *business opportunities space is always bounded from above,* but these bounds keep expanding from learning and (The First Information Paradox again, Eliasson 1990b, pp. 46f) may expand faster than all actors together are capable of learning, thus making each actor increasingly ignorant about all that can be learnt about. Mathematically this situation arises when large resources are used up in information processing and communications, so large that they have to be factored in as determinants of the process focus of the economic system (call it an equilibrium). The bounds are then determined by the unknown sum total of all knowledge of each actor in the state space and of all possible useful, but even more unknown combinations of the same knowledge, and strategic responses to that knowledge (Eliasson 1990b, 1992, 1996a) . This leaves each actor grossly ignorant about circumstances that will now and then be critical for its survival. Hence, *business mistakes* will be a normal phenomenon in the Experimentally Organized Economy. In fact, information processing and communications costs *have to* include the economic consequences of business mistakes, and this (G. Eliasson-A. Eliasson 2002) turns a number of standard theoretical predictions on their heads. But there is also a benefit. Search into the same state space for more investment opportunities will create new opportunities (new combinations, or data of the state space with so far not discovered combinations). This, for one thing, means that the economy will always be operating not only far below its production possibilities frontiers. The production possibilities frontiers and opportunity costs are not even determinable in the EOE. This is an implicit assumption in old Austrian economics, notably in Carl Menger (1971) and in the Joseph Schumpeter model I from 1911. The state space of the EOE grows from being exploited.

The Accounts of the Knowledge Based Information Economy

Adam Smith (1776) laid down the principal design of a decentralized market economy in which the division of labor makes economies of scale ”in the small” possible and the realization of large systems productivity effects at the macro level feasible. This benefit, however, came at a significant information and communications (market transaction) cost, a fact that advocates of the ”modern” mathematical representations of the ”invisible hand” took

a long time to understand.[4] The organization of the division of labor is an instance of innovative behavior and entrepreneurship (item 1, Table 2). This organization evolved gradually in the market. Once the necessary choices and selections had been made (item 2), however, economic activity had to be coordinated physically (transports) and through communication (item 3).

Once an innovative design has been accomplished, competitors would be on ”your doorstep” to learn (imitate, item 4). If your organization is large enough you would want to diffuse the knowledge throughout the organization. You would also want to sell your knowledge at a profit (consulting). Learning, hence, becomes a general and resource-using economic activity.

The number of possible solutions defines the size of the business opportunities space that each agent/ entrepreneur faces and has to explore in order to enact business experiments. In doing so the entrepreneur is directed by a limited vision of all possibilities (bounded rationality). This limited vision of the whole defines his or her ignorance. Hence, it becomes important to understand how agents access and interpret information being generated by the ongoing economic process, and to what extent this information can be used to predict the future. Since each agent, furthermore, has his or her particular vision as guidance, there will be limitations on communication because of limited and differently composed *receiver competence*. Much of the knowledge put to use in a firm, especially high-level knowledge, vested in the top competent team of a firm will be *tacit* in the sense of limited communicability in coded form as information (Eliasson 1990a, p.277). Tacit knowledge is acquired through on-the-job learning and filters through the economy (selection) through the acquisition of the whole firm, or parts of firms in the M&A market or through the mobility of people or teams of people with competence in the labor market (Eliasson 1991b, Eliasson-Eliasson 2002). I have now introduced the four information activities of the *knowledge-based information economy*: innovation, selection, coordination and learning (see Table 2 and Eliasson 1990b). Together they cover all information and communication activities in the economy and represent its intellectual superstructure (its memory) that controls all other physical activities.

(Table 2 in about here)

These four information and communications activities are all present in the firm as administrative processes, and in the market or in any combination of the two forming competence blocs (See section 4 below and Eliasson and Eliasson 1996) supporting the manufacturing of some particular set of related products. Together these intelligence activities have been shown to make up the dominant resource uses in the economy accounting for more than 50 percent of total resource use in the average Swedish manufacturing firm and around 75 percent at the GNP level (Eliasson 1986, 1990a,b)[5]. Hence, the transactions costs assumed to be zero or nearly so in the WAD model is the dominant cost item in the real world. These transactions costs are incurred as economic actors navigate to reach desired or targeted goals. The reliability of navigation again rests on the existence of some underlying and reasonably stable organizational structure to relate to. The more submerged and unaccessible by analytic

[4] When Gérard Debreu received the Prize in Economics in Honor of Alfred Nobel he was told that he got it because of his modeling of the invisible hand.

[5] or goods related service production. Machlup (1962) estimated that this must make up at least 29 percent of GNP. Lamberton (1971a) observed that that ratio must be on the increase. Wallis & North (1986) placed the number at at least 45 percent.

means that structure the more important it becomes to decentralize information processing and communications over markets. The larger the total costs in the economy that have to be devoted to information processing and communications the more submerged that organization structure obviously will be. Hence, there is no way to understand economic development without understanding the role of information and communications technology in production, and the matching knowledge capital. Since that technology is largely organizational, the underlying structure that guides the navigation of economic actors becomes endogenized being determined by the information and communications processes, and not the ”fix point” or economic lighthouse that would make navigation reliable (that conventional neo-walrasian theory assumes exists). To use the analogy of Eliasson-Sharefkin-Ysander (1983); the sea may be so violent that the broom buoy that has been somehow fastened to its bottom to guide the navigation of ships is dislocated by the waves. If sufficiently dislocated it will become outright misleading. Since the underlying submerged structure of the economy that functions as such a buoy for economic navigation is partly made up of all the actors that individually attempt to interpret that same structure there will constantly be situations when the decision machinery enters an infinite regress where economic actors will misinterpret the market signals. Such ”chaos” in the ” misinformation society ” (Eliasson 1990b, p. 34) easily arises in non-linear economic models. In fact, in the ”infinitely” large and complex state space (or investment opportunities space) of the EOE all actors will constantly be grossly ignorant about circumstances that may be critical for their survival and this situation is likely to occur now and then. Under these circumstances we can now present life in the EOE quite simply.

3. **Management under the Experimental Market Regime**

The three information paradoxes allow the characteristics of the EOE to be derived. Even simple tasks in the EOE (the entrepreneur will soon learn) can be solved to one´s satisfaction in a large number of ways.

The Unexplored Potential

The higher up, the more complex the total decision problem of a large business organization and the larger the number of possible solutions. Some of these solutions are better than others. The *first* characteristic of the EOE is that *the entrepreneur will never know them all, and willnever know how good they are until he has tried them.*

Second, since no actor, including Government, can survey the entire business opportunities space from one point business mistakes will constantly be made by all actors all the time. Such mistakes should therefore be regarded as unavoidable and a normal cost for economic development. *Third*, some actors may hit upon the absolutely best solution by chance, but they will never know, and nobody else either. Hence, *fourth*, the economy will always be operating far below its production possibilities frontier, thus violating a standard assumption of neoclassical theory.

Fifth, as a business actor you must always believe in your proposed business experiment. If not, you cannot act decisively and forcefully. However, whatever you have invented you know with almost certainty that there will be many potential solutions that are much better. You therefore (*sixth)* have to recognize that among your many competitors you cannot be alone with such a good idea as yours. You have to act decisively and prematurely on the basis of insufficient information and your competent judgment (*intuition*) before somebody else has acted successfully. Each new solution, therefore, has the character of a business experiment. In fact in the EOE it is more risky to be passive and do nothing than to act, because then you will certainly be overrun by a competitor. So you have to keep improving to the best of your knowledge. If you are not good you will be competed out of business anyway. Hence again, most decisions will be more or less in error, not infrequently a devastating error, but sometimes, perhaps often, a winner will be captured

The competence specification of a firm in the EOE

The competence of a business firm in the EOE can now be categorized as in Table 3 (Eliasson 1996a, p. 56, 1998, p. 87). The bottom line (item 1) is to possess the needed business intuition that allows you to structure the decision situation onto a calculable format (convert uncertainty into calculable risks, to use Knight´s (1921) terminology) and be guided in the right direction. Being in business you have to believe in your intuition. This means that the business risks you are taking on will appear small to you; you understand the situation intuitively. On the other hand, to the outsider (item 2) who doesn´t possess your understanding the situation may appear utterly risky. This establishes a rational foundation for the asymmetric understanding that characterizes the relationship between the entrepreneur and his resource provider or financier, the venture capitalist (See below).

Once you have acted on your intuition you still have to reckon with the possibility that you may be all wrong, a recognition that is extremely difficult to combine in the mind of one individual who has a strong belief in what he/she is doing. Such en entrepreneurial capacity, hence, is rare, and lonely entrepreneurs are naturally exposed to failure. In large firms, on the other hand this dichotomy can be solved through organization, i.e. by having different people responsible for different tasks, for instance innovation, execution and control. Then there will be a bias towards conservatism and caution or optimism and adventure depending on which group dominates the corporate top level decisions (Eliasson 1976, Eliasson-Eliasson 2002). Thus, for instance, Swedish Electrolux had the ideal top level competence configuration during its innovative development into a global giant in white ware goods during the 1970s and 1980s. It had a strong minded project filter in the form of its controller and an efficient operations head who rapidly realized whatever project came through the filter and an ”imaginative innovator”, Dr Hans Werthen as CEO, who got whatever still convinced him after the controller´s resistance through the filter (Eliasson 1984b, 1986). Large firms are, therefore, normally not as good as many individuals and small businesses in creating new ideas, but they are better in identifying and correcting mistakes (items 3 and 4) to the extent that they become overly cautious and non-innovative (Eliasson 1976,1996a). Hence, if they do not have the right staffing of competence at the top, as in Electrolux at the time, which will always be a temporary phenomenon they will eventually fail, and if the market is not sufficiently informed to deprive them of their resources they will dwindle slowly away, wasting large resources in the process. However, on those rare occasions when an innovative

talent stands at the helm of a large corporation enormous wealth will be created. The balancing act executed in the financial markets, therefore, is the most important allocation function in an advanced market economy. Its efficiency depends on the organization of hierarchies and markets such that each project is subjected to a maximum competent and varied evaluation (Eliasson-Eliasson 2002) thus minimizing the loss of winners. Competence bloc theory deals with this balancing act.

Firm Dynamics makes Learning Unreliable

If a project has finally been cleared through the first four items repetitive or routine operations (item 5) take over at least for some time. Then comes the final (item 6) *learning* stage. Standard wisdom has it that you learn from the business experiments to improve business intuition in the next round of business experiments (item 1). In my first survey of business practice this learning feed back was regarded as ”analytical” (Eliasson 1976).The past was useful and offered reliable indications of the future. The experience of the next period was the opposite. Learning from the steady state years of the 1960s was not reliable for the post-oil crisis adjustment of the 1970s (Eliasson 1984b, 1996a). Despite that the 1980s witnessed a number of successful innovative reorganizations of large Swedish manufacturing firms into global giants, Electrolux being one. The current situation is more problematic. Constant reorganization has made it increasingly difficult to integrate operations efficiency and dynamic orientation, especially within the already large corporations. As a consequence they are failing at a rate not previously experienced. In fact, the theory of the EOE tells us this must be the case. When the internal structure of the hierarchy is constantly changing as a consequence of ongoing operations the information signals generated within the organization will be telling unreliable stories when interpreted by the experience of the past. Under such circumstances learning and decision making within a hierarchy can never be reliable and should be distributed. Competence bloc theory explains how.

5. Competence Bloc Theory

In the EOE each agent sets up a business experiment that is tested in a confrontation with all other agents in the market. The business experiment is frequently found to be a business mistake. Sometimes a winner is identified and carried on to industrial scale production and distribution. The pace of development of the macro economy is defined by its ability to create, identify and commercialize the winners and get rid of the losers. Hence, the experimentally organized economy grows endogenously through competitive selection (Eliasson 1996a).

That selection occurs at all levels within firms, and between firms. Efficient selection in the EOE within and between firms is defined as the minimizing of the economic incidence of the two types of errors in Table 4A, i.e. of keeping losers on for too long and of ”losing the winners”.

Centralizing knowledge to one point requires that it can be coded and interpreted as standard information, and, hence, reduces the total knowledge that enters each decision to such codable knowledge, or communicable information. The narrow selection criteria within a hierarchy

thus increase the probability of losing the winners. Competence bloc theory, hence, explains how a different and distributed organization can be used to achieve a more efficient allocation of tacit, human embodied competencies on business problems. A competence bloc lists the minimum number of actors with tacit competence that are needed to successfully generate, identify, select, expand and exploit new business ideas (G. Eliasson – Å. Eliasson 1996). At one extreme all this competence can be distributed over markets, and at the other be internalized within one hierarchy. The less distributed the less varied the competence. *Competence bloc theory can therefore* also *be seen as a prototype structure for an extended* (over markets of subcontractors) *theory of the firm*. Once that is accepted we have also demonstrated that (within the EOE) the right mix between market coordination (competition) and hierarchical coordination (Management, See Table 2) will have to be an integral part of a strategic management problem; a dynamic version of Coase´s (1937) endogenizing of the internal structure and the limits of the firm. Organization competence becomes the critical strategic business competence and therefore also (as a consequence) determines the optimal mix between central control and delegation. Such internal reorganization, however, also disrupts the ”grammar of the language of the firms” and makes their internal information systems unreliable (Eliasson 1976, 1986 pp.64ff,1996a). The design of the internal information and business system of a firm has to recognize the constantly changing delimitations and internal structures of the firm. Competence bloc theory again is the prototype of that design.

Product quality is the paramount characteristic of innovative product competition in the New Economy. The perhaps most important quality demanded in an advanced market economy is product or quality *variation*. Only the customers can individually decide which variant he or she prefers.[6] This places the customer in core. One critical task of the competence bloc, hence, is to make sure that customers' preferences and competencies filter down to the actors in the competence bloc that create and select innovations. When ”efficiently” designed the competence bloc organization minimizes the economic incidence of the two types of business errors of Table 4A.

(Tables 4 A,B in about here)

In an efficiently organized and well staffed (with competence) competence bloc *potential winners are exposed to a maximum of varied competencies such that they experience increasing returns to continued search*. The innovation and selection process in the competence bloc (through Table 4B) is organized as follows:

First, the customer occupies a premier (key) position in competence bloc analysis. The products created and chosen never get better than what *customers* are capable of appreciating and willing to pay for. The long-term direction of technical change, therefore, is always set by the customers. This is so even though the innovator, entrepreneur or industrialist takes the initiative. But quite often the customer takes the initiative. Technological development, therefore, requires a sophisticated customer base, capable of appreciating new products (Eliasson 1998, G. Eliasson – Å. Eliasson 1996). The more advanced and radically new the product technologies, the more important customer quality becomes. The customers of the

[6] Product variation is a form of product quality. If the demand for variation is sufficiently large information paradox two applies. See Table 1 above.

competence bloc contribute (commercial) competence in the technological choice process. They accept or reject products offered them in the market, thereby signaling what they want. But they also actively look for products that they need, and they may be directly involved, contributing user knowledge, in some phases of the development of the product. This is often the case when it comes to very advanced and complicated products such as military and commercial airplanes (Eliasson 1996b, 2001). A rational strategy for a producer with sophisticated products that cannot find competent customers close by, therefore, is to actively look for more sophisticated customers and a better market elsewhere, a strategy constantly forgotten in standard textbooks in marketing. As already observed by Burenstam – Linder (1961) the customers of the rich economies contribute to the competitive advantages [7] of their firms. In terms of competence bloc theory, local access to competent customers is a strong regional attractor for advanced firms.

Second, basic technology is internationally available, but the capacity to receive it and make a business of it requires local competence. Part of this receiver competence (Eliasson 1987, 1990a, 1996a, pp. 8, 14) is the ability to create new winning combinations of old and new technologies (*innovation*).

Third, some actors or organizations are better than others when it comes to achieving intellectual order in a seemingly chaotic business situation. We call them *entrepreneurs*. The task of the entrepreneur is to identify commercial winners among the many suppliers of innovations and to get his/her *technology choice* on a commercial footing. The entrepreneur acts on the perceived business opportunity (*entre prendre* in French).

The entrepreneur, however, rarely has resources of his own to move the project forward. He, therefore, (*fourth*) needs funding from a *competent venture capitalist*, i.e. a provider of risk finance , capable of understanding innovators of radically new technology and being able to identify business needs and provide context. The money is the least important thing. *What matters* (G. Eliasson – Å. Eliasson 1996, Eliasson 2003a) *is the competence to understand and identify winners and, hence, provide reasonably priced equity funding*. Venture capital providers in competence bloc theory are defined and identified by their industrial competence.[8] Since the supplies of innovators are by their definition varied and outside the range of local industrial experience, and the supply of finance controlled by experience and ruled by caution, the supply of varied and industrially competent venture capital is by its very nature extremely scarce . It is the critical part of the overall selection process and, if lacking in performance, is liable to result in the ” loss of winners”. An innovative and entrepreneurial economy thus needs industrially experienced (competent) financiers. Without a rich endowment of such venture capital competence, you won’t see many entrepreneurs. Hence,

[7] Burenstam-Linder (1961) used the term ” comparative advantage” from standard international trade theory, but the implications of competence bloc theory are much broader than that.

[8] Hence venture capital is defined by its associated competence contribution. It is not sufficient to carry the name. In practice we are talking of very early financing , before the financial community understands what is going on. The observation made recently (2003, Eliasson 2003a) that Swedish so called venture capitalists are refocusing their funding to later stages in the entrepreneurial process when projects have already been recognized and established, therefore, is a sign of ”incompetence” The venture capitalists also contribute managerial, financing and marketing competence through their network, but this comes after the ”understanding”. Such services are normally available in the market and, consequently, are less critical.

the venture capitalist and his escape (*exit*) *market (fifth)* are the most important incentive supporting actors in the competence bloc. With no understanding venture capitalists the price of new capital will be prohibitively high, or funding will not be available, and winners will be filtered away. With badly functioning exit markets the incentives for venture capitalists will be small and, hence, also for the entrepreneurs and the innovators. *Completeness* of the competence bloc is, therefore, a necessary requirement for the viable incentive structures that guarantee increasing returns to continued search for winners, i.e. for new industry formation. None of the ”pillars” (the actors) of the competence bloc can be missing, or the whole incentive structure will fail to develop (G. Eliasson – Å.Eliasson 1996, Eliasson 1998).

Finally and *sixth*, when the selection process has run its course and winners have been selected a new type of industrial competence is needed to take the innovations on to industrial scale production and distribution. We cannot tell in advance what the formal role of the industrialist is (CEO, chairman of the Board, an active owner etc.). He or she figures in the competence bloc on account if his or her capacity to contribute functional competence.

The diversity of the opportunity set of the EOE means that the competence needed to identify winners cannot be specified in advance. Hence, an efficient project identification and selection in the competence bloc requires that a large number of each type of actor in the competence bloc be present. Such *horizontal variety* is a necessary condition for maximum exposure of each project to a competent evaluation. Compared to the internal project evaluation in a large firm transaction costs may be higher, since the evaluation is done in a distributed fashion, involving many independent actors in the market. Narrowing down the evaluation to an internal procedure within a hierarchy, on the other hand, raises the risk of losing a winner which constitutes the really large cost, and hence lowers the efficiency of project selection. This is not uncommon. Large firms, such as IBM internalized most of the competence for a long time and business history is full of near losses, the only ones that can be identified. The third phase of empirical observations in this study offers a similar example. Management in large firms distributing their production globally to gain competitive advantage has often lacked the experience to make the right strategic combinations and to operate constantly changing hierarchies and, hence, fail at a rate not previously experienced (Eliasson 2004).

The actors of the competence bloc can be chosen and organized in a large number of ways as a firm or an industry to achieve efficient project selection. Competence bloc theory, hence, is an analytical device to explain the dynamics of this organization and the development of an industry driven by the complex interaction of competent actors, the competence of whom to perform particular tasks (functions) cannot be defined (specified) as to content, only be characterized as to results (output). Since the competence bloc not only creates, identifies and selects winners, but also supports winners by directing (financial) resources to them it becomes the dominant resource allocator of the economy.

6. Learning in a distributed hierarchy

Introducing the competence bloc as a distributed or extended firm organization opens up analysis for new conclusions.

First, in the EOE firm management has to be organized to cope with variety (innovation) and focus (production efficiency) simultaneously. This is a scarce and ”split talent” in individuals and organizations alike that most people cannot cope with. In firms the task has been solved through organization, keeping the variety and focus people apart (Eliasson 1976), but with time, success and size (growth) of the firm focus on operational efficiency tends to take over. Firm management becomes conservative and narrow minded, and the firm often succumbs when its market is subjected to radical change. Attempts to prepare for this by maintaining a diversified portfolio of incubator activities within the hierarchy have bad performance records because top level management attention tends to be paid to core operations. The new mode of integrated production distributed flexibly over hierarchies and markets of subcontractors, and achieving variation through strategic acquisitions and divestment may be an organizational method of solving the internal innovation problem of large firms, but it has been extremely competence demanding in the sense that management often lacks the experience and competence to identify the right industrial combinations (Eliasson 1996b, 1999b, p. 31, Eliasson-Eliasson 2002).

Second, considering its limited awareness of the full content of the opportunities space firm management has to count on the possibility that its decision may be wrong. To understand this theoretically, think about a practically unlimited set of opportunities (Information Paradox One of Table 1) of which you know some. For a competent business leader/manager this subset should include many different items. Part of the competence to deal with variation is to be broadly aware of the possible outcomes. However, there is also the ability to choose, which requires an entirely different set of competencies. So there are two chances of being wrong:

- not being aware
- focusing on the wrong opportunity.

This in turn relates to the two fundamental errors of Table 4A of (a) keeping the wrong project for too long and (b) missing the winner. Scientific management did not recognize this problem. With the static equilibrium model as the bottom line it adopted a predictable planning mode for operations, expecting to be correct on the average. Such a firm (Eliasson 1976) would place confidence in the capacity of the strategic long-range planners on the staff to map the future and substitute detached analysis for business judgment. This led to monumental failure already in the disorderly markets of the 1970s.

Third, in the EOE a premium is placed on *flexibility*. Actors in the EOE are always grossly ignorant of circumstances that may become critical for their survival but still have to move prematurely on the basis of scant and unreliable information. Hence, they constantly commit more or less serious business mistakes and have to be prepared to change their strategy. Flexibility in the EOE is achieved in two stages. Most important is to be right in terms of Table 3. But if internal corrections fail to come off, the market clicks in to enforce change. During the last decades financial market development in combination with new technology has significantly enhanced flex*ibility* by making new combinations over competence blocs available and enforcing adjustment.

The competence of financial markets to correct misguided firm management is an increasingly pertinent question in view of the dramatic development in financial markets in recent years. Rybczynski (1993) distinguished between three financial regimes; the *industrial bank*, the *capital market* and the *securitized* regimes, being introduced in that order. Each regime had been more efficient than the former in enforcing hierarchical change (break up) on firms that were not performing up to the standards of the market and also in supporting the reallocation and recombination of the fractions of broken up firms being traded in markets. So far only the US and the international financial markets can be said to be operating full fledged securitized systems. Many, however, argue that the capacity of financial markets to enforce change is not matched by a corresponding understanding of what to do instead. Hence, incompetent management has been forced to leave early, which is of course good, but also competent management taking a long- term view and failure to show good quarterly results[9]. Against this could be said that broad based financial markets will always have at least some long-term investors capable of understanding such companies and taking profitable long-term positions (Wihlborg 1993). The industrial bank organization with a portfolio of firms associated with a commercial bank was a first attempt to introduce industrial competence in the financial community and prepare firms for new demands on broadbased hierarchical reconfiguration during the early parts of the 20th century The argument has been that the industrial bank organization has made industrially competent long-term strategic decisions possible (Dahmen 1993). Earlier, at least, the business configurations around Deutsche Bank in Germany and the Wallenberg controlled Stockholms Enskilda Bank in Sweden have been quoted as examples . The industrial bank organization is, however, struggling to survive in Germany and Sweden in the new and highly competitive global economic environment. But judging from the increased rate of failure among large German and Swedish firms its capacity to embody variation and flexibility in corporate decision making has not been sufficient (Eliasson-Eliasson 2002, Eliasson 2004).

Fourth, with constantly changing globally distributed and integrated production the experimental management mode of the firm in the EOE firm focusing on intuitive business judgment (item 1 in Table 4) and subsequent error identification and correction (items 3 and 4) will not be reliably supported by learning under item 6. This new situation is a challenge to learning, competence development and structured experience accumulation in large business organizations. It has been well recognized in the business community that a varied career in a large business hierarchy is the preferred substitute form of higher education over graduate academic training, even though the latter enhances intellectual flexibility and the capacity to learn on the job (Eliasson 1994,1996c). But a career experience from different functions within one hierarchy is no longer sufficient. Distributed experience from many hierarchies enhances the capacity to cope flexibly with the larger variety of business challenges in the New Economy.

The new C&C technology is, in fact, opening up an entirely new agenda for innovative management practice that should as soon as possible also be part of management theory. Management theory, accounting theory and business monitoring and control theory still view the firm as a coordinated, well defined and controllable financial entity. Beginning long ago (Eliasson 1986) firm production began to be distributed over and integrated through the market to begin with in the form of outsourcing of physical production. In the last decade or

[9] For a discussion see Day-Eliasson-Wihlborg (1993).

so C&C technology or virtual visualization has been rapidly making the distributing of product development a possibility. The next step, clearly manifest already in the biotech and pharmaceutical industry has been the sourcing of new technology in the markets for strategic acquisitions, diffusing the notion of a firm. The opportunity is the possibilities of integrating within the same business system the innovative capabilities of the small firm with the economies of scale of the large business organization (Eliasson- Eliasson 2002). The challenge has been the ability to integrate the systems coordination of both technology acquisition, product development and manufacturing over the market. Under such an organizational regime distributed over the market, efficient, transaction costs minimizing coordination will not be run through a monolithically controlled hierarchy but partly through arms length contractual arrangements in the market. Standard business control systems will not be applicable and the needed management model and competence will be entirely different from the one developed for the ” controllable” business hierarchy. Competence bloc theory points the way of how to develop both new organizational forms and new theory. The potential benefits for ongoing businesses are, however, so large that business organizational structures will certainly evolve that way. The interesting question raised here will be how long it will take for management practice to come on top of the practical problem and how much longer it will take for the theory of the firm and management theory to catch up with practice. It is therefore of interest to connect back to the art of theorizing in economics.

7. The Art of Choosing the Right Decision Model for the Occasion

Unstable and endogenously changing economic structures (”fundamentals”) are the source of unpredictability and what makes economic learning unreliable. While prediction and learning of (assumed) stable structures are the dominant business mode that we can derive from the economic theory of the firm, experiments and recognition of winners not experienced before dominate the business problems of the firm in the EOE.

Insurance companies base their business on trading in computable actuarial risks based on experience determined distributions. Such are also the assumptions of rational expectations and efficient market theory. Such theory, and reliable statistical inference are contingent on a stable and learnable set of information (stable and comprehensible ”fundamentals”). Such theory, as well as insurance business, has a problem if the learnable information set is influenced by learning itself. Knight (1921) realized that the real business world was rather of such a nature, dealing in difficult to define events, occurrences that could not be predicted as drawings from an empirically determined stable distribution of possible events. In general, Knight regarded business risks as principally and practically uninsurable. He furthermore suggested that the particular ability of the business manager was to convert such uncertainty into subjectively calculable risks on the basis of which he or she acted with confidence (LeRoy and Singell 1987, Eliasson 1990a). For the outsider then the risk level (item 2 in Table 3) might appear prohibitive. For the businessman, entrepreneur, being confident in his or her assessment of the situation, the subjective risks, however, appeared low and the business situation under subjective control. The entrepreneur, so to speak, converted a highly complex non-linear environment onto a subjectively computable format that allowed single valued decisions to be derived. So while the economic environment is a highly non-linear dynamic system, individuals and firm decision makers have to come up with single valued decisions to stay organized and ” mentally healthy”. They reconstruct their conceptualization

or approximation of reality as a linear equilibrium model (Eliasson 1992). This makes *the art of choosing the right business model for the occasion the dominant business problem* (Eliasson 1996a, p.89f, 101).

Modern finance literature on the other hand makes no distinction between uncertainty and risk and uses the terms synonymously. All business uncertainties are reduced to computable and insurable risks. Besides the absurd implications of such assumptions, they detract attention from the basic character of business life, namely true and individually experienced uncertainty. One consequence of this has been the plethora of attempts to analyze the results of *statistical learning theory* and the diffusion of information in the neo-walrasian type economic setting. If you know the functional form of the distribution of risks and if it is mathematically nice (for a survey, see Lindh 1993) statistical learning applies. Repeated observations of the data emitted from the distributions allow you to ascertain its coefficients with any desired accuracy. For this to hold it has to be assumed that (1) the underlying structure is sufficiently stable to allow for repetitive data generation, and (2) that information use carries no cost. If you don't know the functional form of the distribution, however, you still have a problem.

If the mathematical characteristics of the distributions are sufficiently non-linear (whether known or not) efficient statistical estimation techniques will not allow you to come up with consistent estimates of the underlying parameters.[10] Whether stable or not, under normal circumstances, the true underlying structure will forever remain unknown to you. If the environment is sufficiently complex any approximate estimable representation of the distribution will normally be unstable and the same results hold. In markedly non-linear economic environments there will exist no underlying exogenous and tractable structure that you can learn about and position yourself against in a reliable and stable way. Learning will have to be differently presented in such non-linear and experimentally organized environments than in statistical learning theory. The learning feed back in Table 3 is not reliable**.** This situation will arise under two circumstances:

1. Complexity
2. Significant and unpredictable learning costs.

Complexity was explained above. Learning costs increase with complexity but also increase with the instability of the underlying structures about which you aspire to learn. For instance, you incur costs while searching for the underlying fundamental structure. Once you have found it these information costs disappear, and since they have been codeterminants of the equilibrium, the equilibrium also shifts away, and you have to go on searching (Day 1993) for something that keeps evading you, and the more so the closer you come (Eliasson 1984a, 199la). This peculiar explanation is needed for the simple reason that we are all trained in static equilibrium analysis. Complexity, in fact, is all we need to reject the neo-walrasian static equilibrium model and its entire superstructure of literature. This was done already in

[10] This conclusion has two interpretations: (1) It may be practically impossible to process the data needed to estimate the model, or (2) the model may include specifications that make the process influence the underlying structure. Such non-linearities, characterizing path-dependent development, remove the repetitiveness needed to estimate the model. There will not be enough data to capture the structure. This time satisfactory estimation is theoretically impossible.

von Hayek (1937, 1940, 1945) long before the model was fully worked out mathematically by Arrow-Debreu (1954).

The Swedish micro-to-macro model MOSES (Eliasson 1977, 1985, 1991a, c, Ballot-Taymaz 1996) provides illustrations. We, its engineers, know its highly complex non-linear structure (its fundamentals). Hence, we can generate the data for outsiders to watch. Outsiders, however, have to guess on the specification of the model to understand its structure (Antonov-Trofinov 1993). Let me use that model to illustrate two critical points.

First, the highly non-linear structure of the micro-to-macro model can be approximated by a simple linear model from the economists' tool box. We impose as Walras did on the "Smith and Ricardo" models, an equilibrium market clearing constraint, forcing all actors to be in capital market equilibrium with the same rates of return. In the MOSES model this can only be achieved through repeated simulation of the dynamic competitive market processes pushing the entire economy, through enhanced competition, closer to the "approximate static equilibrium" so defined. The assumption is that with efficient competition firms will learn all the hard way, or perish. The results (Eliasson 1983, 1984a, 1985, 1991a) are significative. The more the actors learned (the more informed about the perceived equilibrium they became) and the closer to static equilibrium the economy was being pushed by market forces the more unstable the model economy became and the more unreliable the price and quantity signals emitted by the market processes i.e. the more unreliable learning feed back in Table 3 (item 6). Learning costs in terms of business mistakes escalated because of steeply decreasing returns to learning and the main learning cost was a chain reaction of business failure because of increasingly unreliable price signaling in markets. Eventually the economy collapsed.[11] The closer to equilibrium the more unstable the underlying structure, the more shifty the equilibrium and the more unreliable the information emitted by the economy. This result accords with the uncertainty principle in physics and with the frustrating results of statistical learning theory (Lindh 1993). Reliable and interpretable price signals are only emitted if the economy (or the model) features a sufficiently stable exogenous quantity structure (the fundamentals), to be revealed by the price signals. If firms act on the basis of unreliable price signals structure is liable to change through the differentiated quantitative performance created by the mistaken decisions, for instance entry and exit. Expressed in other terms; static equilibrium does not exist as an operating point of the economy. Hence, the ongoing economic processes could not reveal (through market price and quantity signals) its location.

Second, for an outsider to ascertain the unknown parameters of the fundamental structure of the micro-to-macro model some approximate model has to be estimated. Bounded rationality in Simon´s (1955) sense is introduced. Now economic theory enters. Antonov and Trofimov (1993), for instance, estimated a traditional Keynesian and neoclassical macro model on the data generated by the micro-to-macro model. These two linear approximations to the full model were constantly updated, as new data were being generated by the MOSES model and the firms in the MOSES model used the predictions of the econometric model approximations of MOSES in their planning. The mode of information generation, data collection and analysis of the agents in the MOSES model economy thus was allowed to influence total economic behavior and performance in the MOSES model. In some experiments firms were

[11] This could only be prevented (Eliasson 1991c) through a viable firm entry and exit process.

forced to use the predictions of one or the other econometric model (”central planning”). In other experiments they could choose individually what information to use on the basis of the individual predictive performance of prices, sales etc. predictions of the official econometric models or their own more primitive projections.

This is what we learned. The simple econometric approximations to the full model were of course incapable of uncovering anything interesting about the deeper structures of the MOSES model economy, since new business combinations were not embodied in the crude model approximations. When the firms individually used their own crude projection models the business error rate increased. But some firms also stumbled onto, and were able to identify superior opportunities and capture them. The implications are obvious; (1) the more active, broad based and unrestricted search and/or (2) the larger the number of individual actors capable of understanding and identifying the opportunities that come in their way the larger the probability that successful experiments will be realized. Pluralism is thus needed to make efficient use of the knowledge base of the economy, not centralized information processing. The other side of this coin is costs in terms of an increased incidence of business mistakes and exits. Competition, however, also weeded out the mistaken actors or reduced their resource use, and the commercialization competence of the economy (represented by the competence blocs) increased the capture rate of winners. Hence, an experimental management mode combined with complete and varied competence blocs could generate faster aggregate growth in the MOSES economy than did the planned information diffusion and analytical management mode. The explanation is a more efficient use of the total knowledge base of the economy achieved through a decentralization of decisions over actors in the market such that those most informed and capable of deciding also get an opportunity to decide. Since also the decentralization itself requires competence the transaction costs increased in the form of more business mistakes, notably in the form of lost winners. On balance, however, the larger, more varied and more complex the knowledge base of an economy the more capable of generating and discovering winners and the more economical it is to decentralize decisions.

This result illustrates the main theme of this paper. Comparing the statistical learning models with the experimental search model not only sets the centralized analytical mode of business management of the 1960s against the experimental mode of the 1980s, and for that reason theory against reality. It also demonstrates the impossibility of reliably informed decisions in the non -linear world of the EOE and the impossibility of identifying superior opportunities by analytical methods and to capture them.

8. Implications

The analysis has been abstract and theoretical, but the implications are practical. Every manager tries to overcome frustrating uncertainty through resorting to some simple and analytically comprehensible management method. For reasons clarified, belief in such methods will eventually lead him or her astray . If all firms resort to analytical management methods they, furthermore, reinforce the past and, if practiced generally, the economy, very much as Ballot and Taymaz (1998) have shown theoretically, may get locked into an inferior structure. For the economy to get out of that lock-in and develop ahead of what seems ”analytically possible” on the basis of the past, the economy needs many actors exhibiting

odd and analytically ”incomprehensible” behavior. This means viable new establishment (entry), a forceful exit of low performers and/or those unlucky ones that have made the wrong decision and are unable to reorient themselves in a new direction. When an innovative experimental entry process dominates the centrally managed large firms engaged in standardized production with the purpose of capturing increasing returns may get problems with competition. A dominance of repetitive management competence, furthermore, is likely to be detrimental to the development of the competence needed to manage radically new industry, notably the distributed production and the ”loosely structured” hierarchies we tend to associate with the New Economy (Eliasson 2002a,b).The economy may then experience an increased rate of failure among the large firms. This is what Glete (1998) suggests has happened to Swedish engineering over the past century. This has to be taken into account in theorizing about the firm or about rational management methods.

A theory of a firm or a hierarchy can only be defined in relation to the market in which it is supposed to operate. This is what Coase (1937) established. But Coase stopped short of concluding that with that relation constantly changing also the firm would become a loosely structured entity that would hardly be manageable as a hierarchy. The management teacher as well as the economic theorist needs a realistic model of the firm to support teaching and thinking. Since no realistic theory of dynamic markets, distributed production and endogenously changing hierarchical structures exists no good theory of the firm has been formulated. The moral, hence, is that so far we have excellent firms, not thanks to, but despite management teaching.

Bibliography

Ackoff, R.L, 1967, ” Management Misinformation Systems, *Management Science,* Vol 14: B 147-56.
Ansoff ,H.I. 1965, *Corporate Strategy: an analytic approach to business policy for growth an expansion,*New York:McGraw- Hill
----------, 1975, *Managing Surprise and Discontinuity- strategic response to weak signals,* Working paper No. 75-21 (April) European Institute for Advanced Studies in Management, Brussels
----------, 1978, *Strategisk Företagsledning,* Stockholm: Liber Förlag
Antonov, M. and G. Trofimov, 1993. Learning through Short-Run Macroeconomic Forecasts in a Micro-to-Macro Model, *Journal of Economic Behavior and Organization*, 21(2), June.
Arrow, Kenneth- Gerard Debreu, 1954, ”Existence of Equilibrium for a Competitive Economy”, *Econometrica ,* 22*(3)* (July), 265-290.
Ballot, G. and E. Taymaz, 1998. Human Capital, Technological Lock-in and Evolutionary Dynamics; in G. Eliasson - C. Green (eds.), *The Micro Foundation of Economic Growth*. University of Michigan Press, 1998.
Baumol,William J.- John C. Panzar and Robert D. Willig,1982, *Contestable Markets and the Theory of Industry Structure,* San Diego: Harcourt Brace Jovanovich
Brandes, Ove-Brege, Staffan, 1990, *Marknadsledarskap-strategi,organisation och styrning,* Malmö*:*Liber
Burenstam-Linder, S., 1961. *An Essay on Trade and Transformation.* Uppsala.
Coase, R.H., 1937. “The Nature of the Firm”. *Economica*, IV (13-16) (Nov.), 386-405.

Dahlman, Carl-Johan, 1979, ”The Problem of Externality,” *Journal of Law & Economics,* 2 :141-162.
Dahmen, Erik, 1993, ”Entrepreneurial Activity, Banking and Finance: Historical aspects and theoretical suggestions”, in Day-Eliasson-Wihlborg (1993)
Day, R.H., 1993. ”Bounded Rationality and the Coevolution of Market and State”; Chapter 4 in R.H. Day - G. Eliasson - C. Wihlborg, eds. (1993).
Day, R.H., G. Eliasson and C. Wihlborg (eds.), 1993. *The Markets for Innovation*, *Ownership and Control*. Stockholm: Industriens Utredningsinstitut (IUJ) and Amsterdam: Elsevier Science Publishers B.V.
Demsetz, H. 1969, ”Information and Efficiency: Another Viewpoint”, *Journal of Law and Economics,*12 (April),1-22.
Eliasson, G., 1976. *Business Economic Planning - Theory*, *Practice and Comparison*. London, New York etc.: Wiley & Sons.
----------,1977. Competition and Market Processes in a Simulation Model of the Swedish Economy, *American Economic Review*, 67 (1), 277-281.
----------, 1983, ”On the Optimal Rate of Structural Adjustment” in Eliasson-Sharefkin-Ysander (1983)
----------,1984a. Heterogeneity of Firms and the Stability of Industrial Growth, *Journal of Economic Behavior and Organization*, 5, (3-4).
----------,1984b. Informations- och styrsystem i stora företag (Information and control systems in large firms); in Eliasson - Fries - Jagren - Oxelheim (1984).
----------, 1985. *The* Firm *and Financial Markets in The Swedish Micro-to-Macro Model - Theory*, *Model and Verification*. Stockholm: Industriens Utredningsinstitut (IUI).
----------, 1986, *Kunskap Information och Tjänster- en studie av svenska industriföretag,* Stockholm:IUI
----------, 1987. *Technological Competition and Trade in the Experimentally Organized Economy*, Research Report No. 32. Stockholm: Industriens Utredningsinstitut (IUI).
----------,1990a. The Firm as a Competent Team, *Journal of Economic Behavior and Organization*, 13 (3), 275-298.
----------,1990b. *The Knowledge Based Information Economy*. Stockholm: Industriens Utredningsinstitut and Telia.
----------, 199la. Modeling the Experimentally Organized Economy, *Journal of Economic Behavior and Organization,* 16 (1-2), 153-182.
----------, 199lb. Financial Institutions in a European Market for Executive Competence; in C. Wihlborg - M. Fratianni - T.D. Willett (eds.), 1992, *Financial Regulation and Monetary Arrangements after 1992*. Amsterdam: Elsevier Science Publishers B.V.
----------, 1991c. Deregulation, Innovative Entry and Structural Diversity as a Source of Stable and Rapid Economic Growth, *Journal of Evolutionary Economics*, (1): 49-63.
----------, 1992. Business Competence, Organizational Learning and Economic Growth: Establishing the Smith-Schumpeter-Wicksell Connection; in F. M. Scherer and M. Perlman (eds.), *Entrepreneurship*, *Technological Innovation*, *and Economic Growth*. *Studies in the Schumpeterian Tradition*. Ann Arbor: The University of Michigan Press.
----------, 1994, *Högre Utbildade i Företag,* Rapport nr.14, Agenda 2000. Ds. 195:119.
----------, 1996a. *Firm Objectives, Controls and Organization*. Boston/Dordrecht/London: Kluwer Academic Publishers.
----------, 1996b. Spillover, Integrated Production and the Theory of the Firm, *Journal of Economic Behavior and Organization*, 6:125-140.

----------, 1996c, *The Use of Highly Educated People in Production; Swedish, German and US Practice,* (Extended and updated version of 1994 Above) ,Stockholm: KTH, TRITA-IEO 1996:1
----------, 1998, " Competence Blocs and Industrial Policy in the Knowledge Based Economy", *OECDE Science , Technology, Industrial (STI) Review*
----------, 1999a. The Internet, Electronic Business and the Euro - on information products, market transparency and Internet economics; in G. Eliasson (ed.) 1999, *Internet Economics and Internet Technology*, Stockholm: KTH, TRITA - IEO-R 1999:06.
----------,1999b. Teknologi, flexibilitet och sårbarhet, Chapter II in G. Eliasson -D.Johansson, 1999, *Dynamik och Flexibilitet* i *svensk IT-industri*. Stockholm: City University Press.
----------, 2001. "Advanced Purchasing, Spillovers, Innovative Pricing and Serendipitous Discovery". Paper presented at the E.A.R.I.E. 2001 Conference in Dublin 30th - 2nd Sept. 2001. KTH TRITA 2001:13, Stockholm.
----------, 2002a. *Den Nya och Omedelbara Ekonomin – ett Internet perspektiv*, Stockholm:Vinnova & Teldok, (Telematic).
----------, 2002b. "The Macroeconomic Effects of Computing and Communications technology – entering the New and immediate economy", Stockholm: KTH TRITA -IEO-R 2002-17
----------, 2003a, "The Venture Capitalist as a Competent Outsider, in Alho-Lassila-Ylä-Anttila , (eds) 2003, *Economic Research and Decision Making,* Helsinki: ETLA/Taloystieto Oy.
----------, 2003b, The Story of the theory of the EOE, mimeo, KTH
----------(ed), 2004 , *The Life and Death of Firms in a Growing and Experimentally Organized Economy,* a study prepared for the Nödfor Project at the Ratio Institute, Stockholm
Eliasson, G. and Åsa. Eliasson, 1996. The Biotechnological Competence Bloc, *Revue d` Economie Industrielle.*
----------, 2002, " The Theory of the Firm and the Markets for Strategic Acquisitions" paper prepared for the 9th Congress of the International Joseph A. Schumepter Society (ISS) Gainesville , Florida, 228-30. March, 2002. To be published in the conference volume.
Eliasson, G. (ed.), H. Fries, L. Jagren and L. Oxelheim, 1984. *Hur styrs storföretag*? (How are large firms controlled?). Stockholm: IUI.
Eliasson, Gunnar - Mark, Sharefkin- Bengt-Christer Ysander (eds) 1983, *Policy making in a Disorderly World Economy,* Stockholm:IUI
Glete, J., 1998. Entrepreneurs and Social Elites; some reflections on the case of Sweden; in G. Eliasson - C. Green (eds.), *The Micro Foundation of Economic Growth*. University of Michigan Press, 1998.
von Hayek, Friedrich A., 1937. "Economics and Knowledge", *Economica*, 4, 33-54.
----------, 1940. " Socialist Calculation" *Economica,* VII (26)
----------, 1945, " The Use of Knowledge in Society" *American Economic Review,* XXXV (4), (Sept.),: 519-531.
Knight, F., 1921. Risk, Uncertainty and Profit. Boston: Houghton-Miffiin.
Lange, O., 1935-36, " On the Economic Theory of Socialism" *Review of Economic Studies,*III
----------,1967. "The Computer and the Markets"; in Feinstein (ed.), 1967. *Socialism, Capitalism and Economic Growth*; Essays presented in honor of Maurice Dobb, Cambridge University Press, pp. 158-161.
Lamberton, Don, 1971a "Introduction" to Lamberton (1971b)
----------, 1971b, (ed), *Economics of Information and Knowledge,* Harmondsworth: Penguin Books
LeRoy, S.F. and L.D. Singell, Jr, 1987. Knight on Risk and Uncertainty, *Journal of Political Economy*, 95 (2), 3 94-406.

Lindh, T., 1993. Lessons from Learning to have Rational Expectations; Chapter 5 in R.H. Day - G. Eliasson - C. Wihlborg, eds. (1993).
Loasby, Brian J., 1967 ” Long Range Financial Planning in Perspective, *Journal of Management Studies,* Vol.4. 1967: 300-308, also in Lamberton 1971b
Machlup, Fritz, 1962, *The production and Distribution of Knowledge,* Princeton: Princeton University Press
Menger, Carl, 1871, *Grundsätze der Volkwirtschaftslehre,*Wien: Wilhelm Braumüller
Pelikan, P., 1986. Why Private Enterprise? Towards a Dynamic Analysis of Economic Institutions and Policies; in *The Economics of Institutions and Markets*, IUl Yearbook 1986-1987. Stockholm: Industriens Utredningsinstitut.
----------, 1988, Can the Imperfect Innovation Systems of Capitalism be Outperformed? In Dosi et.al.,1988, *Technical Change and Economic Theory,*London: Pintner Publishers Ltd.
Porter, Michael, 1980, *Competitive Strategy: Techniques for analysing industries and competitors,* New York: Free Press.
----------, 1985, *Competitive Advantage: creating and sustaining superior performance,* New York: Free Press.
----------, 1990, *The Competitive Advantage of Nations,* London: Macmillan
Rybczynski, 1993, ”Innovative Activity and Venture Financing: access to markets and opportunities in Japan, the US and Europe” in Day-Eliasson-Wihlborg (1993).
Salter, W.E.G., 1960. *Productivity and Technical Change*. Cambridge, MA: Cambridge University Press.
Schumpeter, Joseph, 1911 (English edition 1934). *The Theory of Economic Development*. Harvard Economic Studies. Vol. XLVI. Harvard University Press. Cambridge, MA.
----------, 1939, *Business Cycles- A Theoretical, Historical and Statistical Analysis of the Capitalist Process,* Volumes I-II, 1 st Edition, New York: McGraw Hill
----------, 1942, *Capitalism, Socialism and Democracy.* New York: Harper & Row.
Simon, Herbert, 1955, ”A Behavioral Model of Rational Choice ” *Quarterly Journal of Economics,* 69:99-118.
----------, 1960, ”The Corporation: Will it be managed by a machine?” in Anshen-Bach (eds) 1960, *Management and Corporations* ,New York*:* McGraw-Hill .
----------*,* 1965*, The Shape of Automation,* New York: Harper & Row
Wallis, John – Douglass North, 1986. “Measuring the transaction sector in the American economy”; in Engerman – Stanley – Gallman (eds), *Long Term Factors in American Economic Growth*. Chicago: Chicago University Press.
Wihlborg, Clas, 1993, ”A Note: On Business Myopia and Market Organization” in Day-Eliasson-Wihlborg (1993).

Table 1. The three Information Paradoxes

A. INFORMATION PARADOX I

Are we growing relatively less informed because the stock of knowledge we can know about is growing faster than we can learn?

Source: Eliasson, G., 1990. *The Knowledge Based Information Economy;* IUI and Swedish Telecon. Stockholm: Almqvist & Wicksell, 1990, pp. 46f.

B. INFORMATION PARADOX II

Are we becoming *less* and *less* informed about what is becoming *more* and *more* important?

Source: Eliasson, G., 1990, *The Knowledge Based Information Economy*, IUI, Telecon, Stockholm, p. 16.

C. INFORMATION PARADOX III

Are we moving from a knowledge based information economy towards a *misinformation* society?

Source*:* Eliasson, G, 1990, *The Knowledge Based Information Economy*, IUI, Telecon, Stockholm, p. 34f.

Table 2. The statistical accounts of the knowledge-based information economy

	Innovation	***Creating Business Opportunities***
	(exploring and expanding state space)	– customer interaction – innovation – experiments – technical development
2	**Choice and selection** (identifying business opportunities)	***Economic Filtering and Allocation*** – entrepreneurship/entry – venture capitalism – exit – mobility/flexibility – varied careers
3	**Coordination**	**Disciplining** – competition (in markets) – management (in hierarchies)
4	**Learning** .	***Knowledge transfer*** – education – imitation – diffusion – receiver competence

Source: Modified version of Eliasson, G., *Technological Competition and Trade in the Experimentally Organized Economy*, Research Report No. 32, IUI, Stockholm 1987, p. 12.

Table 3. Competence specification of the experimentally organized firm

Orientation

1. Sense of direction (business intuition)
2. Management of uncertainty (Risk Willingness)

Selection

3. Efficient identification of mistakes

4. Effective correction of mistakes

Operation

5. Efficient coordination

6. Efficient learning feedback to (1)

Source: Eliasson, G. 1996. *Firm Objectives, Controls and Organization – the use of information and the transfer of knowledge within the firm*. Boston/Dordrecht/London: Kluwer Academic Publishers, p. 56.

Table 4A. The dominant selection problem

Error Type I: Losers kept too long

Error Type II: Winners rejected

Source: G. Eliasson - Å. Eliasson, 1996. ”The Biotechnological Competence Bloc”, *Revue d’Economie Industrielle,* 78-4^{0}, Trimestre.

Table 4B. Actors in the competence bloc

1. Competent and active *customers*

2. Innovators who integrate technologies in new ways

3. Entrepreneurs who identify profitable innovations

4. Competent venture capitalists who recognize and finance the entrepreneurs

5. Exit markets that facilitate ownership change

6. Industrialists who take successful innovations to industrial scale production

Source: G. Eliasson - Å. Eliasson, 1996. ”The Biotechnological Competence Bloc”, *Revue d’Economie Industrielle,* 78-4^{0}, Trimestre.