

A NOTE ON THE THEORY OF THE BUSINESS FIRM

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ABSTRACT

The paper provides an overview of a number of theories of the business firm. It is set in the context of New Capitalism. Economic and managerial theories are surveyed. A particular feature is that business firms are seen as complex adaptive systems (CAS).

INTRODUCTION

There are many traditions in the thinking about the strategy of business firms. In this group of seminars (on the Theory of the Business Firm), three traditions are discussed:

1. The economic theory of the firm.
2. Managerial theories of the firm.
3. The firm as a complex adaptive system (CAS)

The context of the discussion is the capitalist system: capitalism itself is considered to be a complex adaptive system.

You should note that a little mathematics is used in the paper – merely as symbolism. If you are uncomfortable with this then just ignore the mathematics because reading this note could save you a lot of time when you read the references that you are given here and on other sections of the course¹.

The terms organization and firm are used more or less interchangeably: in new capitalism both are driven by competitive forces. The theoretical foundations of much of the note are based on rent seeking activity, which has developed from its Ricardian beginnings through to the Schumpeterian notion (Schumpeter, 1943) of creative destruction into the strategic notions of competitive advantage (Porter, 1991) and the competence or resource based view of organizations (Wernerfeldt, 1984). In turn, the competence approach is probably better seen as dynamic capability (Teece, Pisano and Schuan, 1997), a description that captures the idea that in a capitalist system, sources of competitive advantage are unlikely to be permanent and therefore must constantly be renewed, simply because competition (or its opposite, barriers to competition) is the essence of capitalism.

With respect to economic theory, the transactions cost approach views organizations as a set of necessarily imperfectly defined contractual arrangements (Coase, 1937; Williamson, 1985). The property rights approach focuses on the difficulties of designing rewards and contracts when activities are interdependent or complementary (Alchian and Demsetz, 1976). In turn interdependence (synergy, external economy, or network effect are synonymous terms) leads to a complexity approach or CAS approach, which I regard as more fundamental. The complexity approach is just sketched in this note. It forms part of the original research carried out in the Centre for

¹ Many people in strategic management are proud of the fact that they are unable to do simple things like draw a graph of $y = x^2$ or even $y = x$. For an opposite view see the paper Strategy is Mathematics and Meditation on my website.

International Business in the Business School. The complexity complex adaptive systems approach (CAS), is the basis of a later course in strategy.

NEW CAPITALISM

Perhaps for the first time ever a single form of economic organization dominates the world scene: global capitalism. A new form, new capitalism emerged in the late twentieth century. Capitalism is a self-organizing system with immense capacity for survival and evolution. Joseph Schumpeter recognized this in the 1940's: he wrote (1943) that the essence of capitalism is "*competition from the new commodity, the new technology....., the new type of organization,[which]... strikes at the foundations and the very lives of firms*". Capitalism has immense resilience; outmanoeuvring socialism, spawning and exploiting wonderful technologies: on the whole, but not invariably, being associated with democratic institutions, and free expression.

The main driver of capitalism is the opportunity of personal prosperity, and capitalism has created wealth beyond the wildest visionary Marxist dreams. Capitalism is driven by the incentive provided by the prospect of material wealth, so the rich necessarily outpace the poor both within nations, and between them: G7 countries are 30 times wealthier than poorest now, whereas they were 15 times richer in the 1960's. Individually, global businesses have sales that exceed the GNP of advanced nations: seen as part of a network of international partnerships, joint ventures, or alliances their influence far exceeds their individual assets. Whole nations and minorities within nations are marginalized in new capitalism, either because they are irrelevant in terms of purchasing power (demand), or resources, or skills (supply), and as a result perhaps the largest global business of all has emerged, the network of international criminality.

Who are the capitalists? Apart from the poor and there are plenty of them, it is no longer possible to think of capitalists as a distinct class (see Figure 1)², but as a network of stakeholders in an emerging system³.

The immune system, ecologies, the brain, are examples of complex adaptive systems: so is the global economy. CAS in the physical world have the capacity to learn from the past (experience) and adapt. What distinguishes complex systems in the business and social world is the extent of their dependence upon expectation and anticipations. Thus for example in mid March 2001, 38 of the 40 stock markets tracked by the Economist fell. A kind of financial contagion exists, in which a fall in the stock prices in countries where stocks (the USA) are overvalued, can cause a decline in confidence in stock markets of economies that appear to be healthy (Europe). One of the reasons for this is interdependence, a key characteristic of CAS. In 1999, the USA accounted for 21% of the demand for the products of European firms⁴.

² I have not reproduced figures in this note. They are however not complex and to check your understanding you might sketch them for yourselves and check with the versions provided in the lecture sessions.

³ See Castells (1996)

⁴ For this section see for example Economist March 24th 2001, (pages 107-8 and 114)

In Jungian terminology competition is an archetype and capitalism is one representation of the archetype (Matthews, 2002). Archetypes correspond to the a priori categories of Kant, or the universals of Plato. They are patterns or structures that determine a probability field, and encompass a variety of very different forms, "*pure structures comparable to the axial system of a crystal: just as individual crystals of water or carbon can vary endlessly as snowflakes or diamonds....., ideas in the Platonic sense, that perform and continually influence our thoughts feelings and actions*" (Jung, 1969). New capitalism has emerged from the archetype.

New capitalism is a pattern or structure that varies from one country to another¹. It results from complex interactions; between business, economics, politics, ideology, technology, demography, ideas, and religions. Figure 2 focuses on just three interactions that underlie new capitalism: interactions between economics, finance, and technology. Within new capitalism are oppositions, expressed interactions in the realm of beliefs, ideas or briefly, in *attitudes to what constitutes truth*. Such attitudes are expressed in the tensions that exist between modernism, postmodernism and faith, illustrated in Figure 2.

New capitalism emerges as a result of positive feedback or self-reinforcing mechanisms. Deregulation of financial markets in last quarter of the twentieth century funded the development of new technology industries. These BICT industries (biotechnology as well as information, computing and telecommunications) required massive investment (in research and development, that is, knowledge creation), involving high sunk costs that could only be recovered by high demand, thus creating the need for global markets. Ironically at the same time as governments abandoned Keynesianism (demand management), business espoused Keynesianism (demand creation in global markets) as the only way of offsetting the costs of technology.

Creating global markets requires major investment in marketing and promotion, thus reinforcing the need for global finance, and ever-larger profits, further stimulating technology in the new industries. Competition for higher profit feeds the Keynesian drive to create new markets and new products, thereby reducing the life span of existing products and markets, and inducing further technological change and the need for financial capital. So new capitalism emerges from positive feedbacks.

In the realm of ideas, new capitalism expresses a tension between three different paradigms; modernism and postmodernism (which I term reason and relativism respectively) and faith. Each represents different attitudes to truth; modernism asserting that unambiguous truth can be discovered by observation, postmodernism maintaining that there are competing (equally valid) truths, and faith which asserts that truth emanates from spiritual revelation (epiphany) and belief.

Modernism is the expression of a *renaissance project*, flowering in the sixteenth century, which seeded the development of modern science. Out of a worldview formed, for example, by Copernicus, Kepler, Newton or Descartes has sprung the development of science that permits the exploitation Nature's laws as the software as technology (hydraulics, mechanics, electromagnetism, binary or quantum codes for example). In reaction to this approach to life, postmodernist thinking of the late twentieth century distrusts the search for grand narratives or epistemologies that attempt to explain everything. Instead it emphasizes subjectivity, and rejects crude

positivism and cause effect relationships, especially in the social and business sciences. This view has been reinforced by the development of new science; including quantum physics that shows we cannot decompose the world into independently existing elementary units, and evolutionary biology which emphasizes chance and natural selection...

In the late twentieth century, religion especially in its fundamentalist form has grown rather than withered in the face of modern science. The foundation of fundamentalism is faith, upheld firmly in a full and literal form. Faith as presented in fundamentalism is a rejection both of modern scientific method and the postmodernist view.

Is new capitalism new?

What is new about the new capitalist economy? Everything and nothing. The answer is not trivial because literally both are true. When things are compounded together (or networked), sometimes something entirely new emerges: novelty emerges out of things that were familiar. Hydrogen and oxygen for example have two characteristics individually - they are gases and they are combustible: neither are properties when they are combined to form water. Similarly new capitalism, based on information emerged in the late twentieth century⁵.

In economic terminology information is a public good. The defining features of public goods are non-rivalry in consumption and difficulty of exclusion. One person's consumption of information does not reduce the amount available for others: information is in that sense inexhaustible. Further although information is expensive to create it is difficult to exclude non-payers - so how can future information creation be funded? These are the critical problems of the *public ness* of information.

Information has always been the ultimate resource⁶. What makes new capitalism new is interdependence and non-linearity⁷. Technology however primitive uses knowledge or information as the basic input: it uses nature's laws as software to enable goods and services to be produced (hydraulics, thermodynamics, electro-magnetism, gravitation, levers, and binary or quantum software). Products (and physical assets generally) can be seen as devices for locking in information, making it possible to exclude those who do not pay, and hence enabling the costs of generating the information to be recouped hence providing funds for information creation in the future. The information content of products has increased, not only in consumption and production of goods and services, but through increasing concentration on producing information for in the form of images, symbols, or *spin doctoring*.

Capitalism can be viewed as information or cybernetic systems. They represent the transmission of signals from one part of a system to another. Capital markets and the BICT sectors respectively signal that finance is available and is required to fund capital expenditures. BICT sectors signalling that global markets are required to spread overheads and leverage R& D and marketing expenditures: global markets

⁵ I define information as a signal that can be encoded as 0's or 1's.

⁶ The classic source on information is Hayek (1945). Hayek argued, presciently that a centrally planned (statist) economy would fail due the enormous information burden placed on central planners. Whereas he argued, market economies used the decentralized signalling through supply and demand.

⁷ See discussion below.

signalling that organizations have nurtured global demand. Global markets signal the need for an international financial structure to permit investment, saving, and consumption to cross national boundaries: financial sectors express the message that the global markets are scanned in search of the highest returns.

Ideas themselves constitute a feedback system. The interaction of rationality, faith and postmodernism, is rather like the game of scissors rock and paper: the scissors cut the paper, the paper wraps the rock, rock blunts the scissors.

THEORIES OF THE BUSINESS FIRM

Information transmission takes place at the aggregate or macroeconomic level (between sectors - finance, BICT, global demand). This section is concerned with the micro level - the organization or business firm. It begins with an overview of economic theories. A discussion of managerial theories and approaches to firms found in business strategy follows. Much of the discussion of economic theories of the firm is based on Hart (1996).

(a) Economic Theories

Neoclassical theories

In the traditional (neoclassical) economic theory of the firm firms try to minimize the cost of a given output. Costs are determined by the quantities of inputs (y_i) multiplied by their price (w_i). Suppose there are N inputs. Production is determined by a production function, written $f(y_i)$ that transforms inputs y_i into output x . Supposing that there are N inputs, ($i = 1, \dots, N$), we have

$$\begin{aligned} & \text{Min } \sum w_i y_i \\ & \text{s.t. } f(y_i) \geq x^8 \end{aligned}$$

Solving for every value of x generates a cost curve. Then the volume of output is decided by $\max px - C(x)$. The average cost curve is U shaped because there are some fixed costs, which at first causes average costs to fall as fixed costs are spread over larger and larger outputs (thus average costs fall). Average costs begin to rise because of diminishing returns to some scarce factor, for example management. If there are no particular limitations to firm's size then generally average costs will tend to fall (asymptotically or gently if you like) towards average fixed costs.

Economies of scale are important determinants of the size of firms. Given an upper limit on the demand for the products of an industry the degree of monopoly in that industry will increase if there are substantial economies of scale to be had.

Output and technique is sensitive to changes in input and output prices. Thus for example a rise in the relative price of labour will cause a substitution of capital for labour.

A number of questions arise:

- The theory says little about incentives (signals that motivate people), other than to assert that individuals are motivated by profit or rent maximisation.

⁸ When $f(y_i) \geq x$ holds as an inequality, production of x is inefficient

- Nor is the theory it concerned with the hierarchical structure of firms (bosses, leaders, layers of management).
- Why is management scarce? Why not just hire more managers?
- Why does it makes sense sometimes for additional managers to be hired outside the firm (contracting out) rather than hiring more of them to work inside the firm?
- What determines the boundaries of organizations?

Since there was no answer to this issue in the neoclassical theory, Coase, (1937) argued that it is consistent with domination of the economy by a single form in which every existing firm is merely a division, or with a situation in which every plant or division of an existing firm becomes a firm in its own right. In other words the theory has little to say about the boundaries of firms.

Agency theories

Agency theory examines the incentive problem (see for example Jensen and Mechling, 1976). A simple way of introducing incentives to decision makers is to split firms into two stakeholder groups, owners (principals) interested in profit and managers (agents) interested in any number of things including how hard they have to work, their working conditions, promotion prospects, status and so on, as well as the firms profit. Denote the non profit elements of managerial preferences L . The quality management x depends on the effort, h ,

(to some extent a declining function of L) of the manager and some random component, e .

$$x = x(h,e)$$

Similarly the firms profit Π depends on x and we can write

$$\Pi = \Pi(x)$$

An incentive scheme might relate payment Z to the quality of management x : that is $Z=Z(x)$: payment Z by results (related to the quality of input x).

Parties then face the tradeoff between (optimal) incentives and (optimal) risk sharing. The point here is that not only do principals and agents have different attitudes to profit; they have different attitudes to risk. Managers may be less risk averse than owners for example and put the company at greater risk than owners would prefer.

A high powered incentive scheme is good for management incentives (it is related to h – that is some form of payment by results) but it faces the manager with high risk (lower pay, or even getting fired) if it is not achieved. It may also face the principal with more risk. Consider for example the Enron (and many similar) cases where managers were awarded high powered incentive schemes in the form of stock options and they pushed the company into a high risk situation (through debt and other reckless strategies) that was eventually disastrous.

A low powered incentive scheme (a flat rate of pay with no incentives scheme) gives little incentive to effort, but involves more risk to the owner (principal).

A number of questions arise

- Agency theory says little about the boundaries of firms.
- It does not distinguish between situations in which we are dealing with divisions or plants within the same firm or transactions between different firms.
- Why if monitoring costs are important is it more or less difficult to monitor an employee than a contractor?
- Why do profit sharing schemes differ within and between firms?

Transactions cost theories

This tradition began with Ronald Coase (1937) asking the seemingly innocuous question: why do firms exist? Why he asked, if the price system co-ordinates the provision of goods and services, do we need firms and managers to supply still more co-ordination? And what determines the boundaries of firms?

The answer, elaborated by Oliver Williamson (1985), was in terms of transactions costs. Firms substitute hierarchical control systems for markets, and this is cheaper, given that it is expensive to write and police contracts.

Writing a good contract is costly. Three transactions cost issues surround principal agent theory:

- It is hard for people to think ahead in a complex world and plan for all contingencies.
- Even if plans could be made it is hard to negotiate contracts about plans (future states are difficult to specify and agree upon).
- Even if they can plan and communicate, it is difficult to write contracts in a way that they can be understood unambiguously by an outside authority like a court.

Thus contracts are incomplete. There are so many possible consequences that cannot be foreseen. There are substantial re-negotiation costs (ex ante haggling, and bargaining, ex post and ex ante asymmetric information that may block an efficient agreement), arising because there are switching costs associated with finding an alternative partner. Often in some ex ante relationship specific fixed costs exist: a prior investment that has value so long as the relationship persists but no value if it does not. Hence bargaining enters the picture. The ex post bargaining strength of the parties determines the division of surplus. Economic inefficiency (in the form of failure to invest in relationship specific assets) may result because one or the other party fears expropriation at the re-negotiation stage.

For these reasons it is cheaper to internalize decisions within organizations than to rely upon market transactions.

The property rights approach

Given that a contract does not specify all aspects of the usage of an asset, the property rights approach begins with the observation that it is the owner of the asset that has residual control over its use: over all uses not specified by contract, custom or law (Alchian and Demsetz, 1972). A merger is thought of in the property rights approach as a change in residual control rights: after a merger residual control rights are

delegated to the acquiring firm. Possession of residual control rights is the standard definition of ownership (rather than residual income rights).

Suppose some unforeseen event occurs. If ownership rights exist, contingencies can be met, if they do not then a Coase bargaining situation exists, with problems of division of the surplus. The benefit of integration is that it facilitates making relationship specific investments.

Workers can quit *en masse*. So the knowledge and learning capacities of human beings have to be locked into the non human assets of the firm or into the firm's routines. Non human assets may be as little as name, reputation, distribution network, files, contracts and so on. Routines describe corporate architectures, structures and generally the way things are done.

Game Theory

Game theory is a set of analytical tools designed to help us understand the phenomena we observe when decision-makers interact (see for example the classic book by Thomas Schelling, 1960). The assumptions that underlie the theory are that decision makers pursue well defined objectives and take into account their knowledge of other decision makers behaviour (Osborne and Rubenstein, 1994).

Interactive decision theory would perhaps be a more descriptive name for the discipline usually called game theory (Aumann, 1989). Results depend on the precise form of the underlying game. Key concepts in game theory are; system state, the tree of moves, and rules of the game.

(b) Management Perspectives

In economics the firm is very much a black box. The transformation of inputs into outputs is described by a production function as above.⁹ The idea of a value chain or supply chain, and analysis of the role of management in creating a surplus emerges from strategic management.

Surplus, rent and competitive advantage

Unless societies create a surplus above immediate needs and wants, they cannot invest and grow. This has long been understood. The surplus resulted in the generation of economic rent; initially seen as a return to the scarcity and fertility of land, and later as a return to any scarce factor.

In the modern texts¹⁰ the surplus is recast as competitive advantage. One way of viewing the purpose of organizations is that of creating a surplus, maintaining it against competition, and distributing it among stakeholders. Achieving competitive advantage means creating a surplus above normal for the risk class or sector in which the organization competes.

⁹ $f(y_i) \geq x$

¹⁰ See Porter (1991) for example.

Without a surplus, societies cannot grow. The surplus can be measured in monetary or psychic terms. It can be expressed in many ways financially; profit, return on capital, return on equity, sales, earnings per share, dividends and so on. It also takes non-monetary forms: good lives, security, care for the ecology, leisure, or an exceptional product. In other words, the surplus may be distributed to owners, customers, managers, or to the community in general.

Firms (players) compete for a greater share of the surplus created by the capitalist system brought about by financial and industrial capital, innovation, and the globalization of businesses seeking ever-cheaper resources and bigger markets. The process is Darwinian, in the sense that bankruptcy or the threat of bankruptcy deselected inefficient traits.

Resource based or competence theory

The competence or resource based view of the firm owes much to Wernerfelt's *A Resource-based View of the Firm*. Wernerfelt based his theory on Edith Penrose's *The Theory of the Growth of the Firm* (1959). The competence and the resource-based views are treated as equivalent here. The capabilities or dynamic capabilities approaches are treated as equivalent for the purposes of the note.¹¹ They dominate strategy literature at the moment.

Primary importance in achieving competitive advantage is ascribed to the resources and competences possessed by firms. Organizations are seen in terms of competences and their ability to accumulate, protect and deploy competences in search of long-run competitive advantage. Their endowment of competences determines the boundaries of organizations, and especially their degree of diversification. The problem for organizations becomes one of leveraging their competencies¹².

Closely related to the resource-based view, but with a more practical orientation, is the work of Prahalad and Gary Hamel's (1990) on the *Core Competence of the Corporation*. Work that is closely related to the resource-based or core competence work is the capabilities approach (Langlois, 1992), and the dynamic capabilities approach (Teece, Pisano and Shuen 1990).

The competence perspective is, in a sense, a rediscovery of Adam Smith's proposition that specialization yields productivity advantages. But Smith emphasized specialization in terms of products, in contrast to the competence perspective that emphasizes *specialization in idiosyncratic knowledge*, a form of capital that allows firms to perform activities and solve problems more efficiently than others. Because of its skill-like character, competence is partly tacit (based on a common understanding). The key point is that it is asymmetrically distributed, hence some firms outperform others. Competencies may reside in individuals, but they must become part of organizations rather than of individuals if they are to become instruments of competitive advantage (hard to imitate or replicate).

¹¹ An important capability is the ability to learn. This is stressed by the use of dynamic in the dynamic capabilities approach. In that sense dynamic capabilities are a subset of general capabilities (identified often with routines).

¹² Maybe we should speak about capability economies, as well as scale and scope economies.

The competence approach views organizational strategy as the accumulation and protection of resources that give Ricardian rents because of their superior inherent efficiencies.

A version of the competence approach exists in the evolutionary theory of the firm (Richard Nelson and Sidney Winter 1982). Here, firms are seen as essentially heterogeneous entities, characterized by their unique and path-dependent knowledge bases (rather than simply by scale).

Dynamic capabilities

Knowledge is largely tacit and embodied in organizational routines. Routines are a set of *patterned stimulus response reactions* (Nelson and Winter, 1982). Routines are building blocks. Linkages between routines can produce positive complementarities or synergies. Broad assemblies of routines may become distinct: as in Fordist or more recently Toyota systems.

Dynamic capabilities are composed of sub assemblies of routines. Architectures describe the capacity to design linkages between assemblies. Perhaps a core capability is an assemblage of routines. Routines themselves contain sub-assemblies. It might be a central assembly around which other routines are configured, or an architectural capability of to redesign linkages around subassemblies (Henderson and Clark, 1990), an external economy in the Marshallian sense, formed around alliances and other relationships.

Systems Theories

Systems theory and cybernetics developed as important fields in the 1940s (Ashby, 1958; von Bertalanffy, 1968; and Weiner, 1948). Applied to business firms the theory aims to show how control mechanisms can be used to reach some desired goal. Negative feedback mechanisms can be used to dampen the effect of fluctuations in the business environment and positive feedback mechanisms, which accentuate fluctuations, can be used to enhance and accelerate the effects of positive fluctuations.

Systems thinking led to viewing organizations as organisms (Morgan, 1986). They adjust to fluctuations or contingencies (Lawrence & Dyer, 1983). Organizations are not passive: they coexist with and shape their environment. Resulting change may be strategic, tactical, or cultural; for example, developing closer relationships with suppliers or initiating employee motivation programs.

Contingency theory

Contingency theory asserts that organizations must co-develop with their environment (Lawrence & Lorsch, 1967). Studying many different types of firms, Burns and Stalker (1961) found that

- In organizations with stable and certain markets (a textile mill), a mechanistic was most appropriate: with standardized methods, hierarchical structure, clearly defined lines of authority, communication and decision making, and clearly bounded roles.

- In unstable and uncertain markets (an electronics firm), an organic form was appropriate: informal and changing lines of authority, open and informal communication, distributed decision making, and fluid role definitions.

Mintzberg (1979) and Miller and Friesen (1978) investigated structural contingency by defining five structural forms along the spectrum of mechanistic to organic that the fit between structural form and environment was key to organizational performance

- machine bureaucracy,
- divisionalized form,
- professional form,
- the simple form, and
- adhocracy.

A hybrid structural form-the matrix organization, which distributes personnel both along functional lines as well as within project-related clusters, has become a popular way of structuring in uncertain environments (Mintzberg, 1979).

Ecological approaches

Rather than viewing the organization as adapting to the environment in a planned way, population ecology believes that organizational attributes are tested in a Darwinian landscape, in which firms with inferior structures and strategies die in a resource-constrained competition (Hannan & Freeman, 1989). Variations in attributes occur in random and planned fashion. A cycle of *variation-selection-retention* occurs, in which beneficial variations are retained.

Variation comes through

- institutionalized experimentation,
- direct and indirect incentives, and

Selection is a purposeful managerial choice of action, based on pre-established goals, values, criteria, check- points, or competition. Useful variations are *retained* via standardization and via institutional controls¹³.

The ecological view also generates a hereditary perspective on organizational behaviour. Organizational traits can be transmitted vertically forward (old to young), vertically backward (young to old), or horizontally (e.g., young to young) (Baum & Singh, 1994).

Population ecologists have often modelled *organization change* as the diffusion and adoption of both technical and managerial innovations. The basic models of diffusion are characterized by S shaped logistics growth curve that describes phases of rapid initial growth with subsequent saturation or decline. They are based on the assumption of *substitution*:

- growth in a new technology is linked to decline of the old, and
- technologies compete.

¹³ This can be seen as a kind of Lamarckian inheritance of acquired characteristics (competencies).

Innovations are at first adopted only by a few organizations, because only they find them economically advantageous. Organizations coevolve.

Innovation can also be viewed in terms of neo Darwinian evolution. Here innovations are treated as memes (cultural genes). Fitness is determined not only by monetary factors but also by the extent that the innovation is successful competes for the consciousness of society's members. The dynamics of innovation diffusion are best described by models of organic, self-organizing systems.

Information Processing

Herbert Simon's important concept of *bounded rationality posits that since individuals are limited in their information-processing capabilities, so too are organizations* (Simon, 1980). Organizations act on incomplete information, explore a limited number of alternatives, and do not necessarily develop accurate cause and effect models of reality. Heuristics dominate organizational decision making and thus organizational change.

There can be four steps by which the organization acquires knowledge and learns:

- knowledge acquisition,
- information distribution,
- information interpretation, and
- memory.

Discourse

Organizational discourse is coloured by its language and figures of speech¹⁴. The language of corporate strategy reveals the prestructuring of thought. Its images (*downsizing, reengineering, lean manufacturing and core businesses*) attribute corporate behaviour to impersonal global forces, and ironically denigrate alternatives (*overgrown, Luddism, obese manufacturing, and unessential businesses*). The anti competitive nature of competition has long been recognised, but imagery reflecting the darker side of competition (*cartel, restrictive practice, collusion, and entry barrier*) has been rewritten (*alliance, supplier agreements, networking, leveraging competencies*).

Distribution of the surplus to the stockholder is critical to the underlying mechanics of the modernist narrative of organizations; rational behaviour, signals, incentives, response. If the surplus is not distributed to stockholders, rent must be leaking into *inefficient* types of payoffs. Payoffs to stakeholders, other than stockholders take the form of costs that are inflated (as a result of overmanning, excessive wages, X inefficiency, or generally *non performativity*) or monetary receipts that are too low (customers are getting subsidized products, or staff taking their rewards as an easy life).

¹⁴ The metaphor of the joint stock company is applied to society in general (United Kingdom plc.), implying that society should be governed by the mores of business, rather than for example, that business should be governed by the mores of society.

According to the narrative, surplus that is absorbed by other stakeholders results in loss of competitive advantage and relative underperformance of stock. Quite rightly postmodernists point out that alternative narratives exist.

THE COMPLEXITY APPROACH

The concern of the academic study of business is with developing *Meta* theory and communicating it to practitioners, who will craft it to particular organizational problems that inevitably contain elements of uniqueness. *How much is generalizable? How much is specific to particular industries or firms?* Certain principles or building blocks underlie all business situations. A few such principles, arising from complexity, games and related issues of trust and commitment are outlined in this part of the programme.

A metaphor

Theory building begins and ends in mathematics (algebra, logic) only in scientific texts. Usually the process begins with a picture or metaphor. Only later is it transformed into a formal structure.

The metaphor underlying some parts of this course runs as follows. Consider the business environment including firms, industries, and organizations in general as a landscape¹⁵. The landscape is uneven, full of peaks and troughs, mountain ranges and valleys; all subject to change, perhaps continuous, perhaps consisting of periods of stability punctuated by violent transformations. The contours of the landscape are payoffs. Payoffs take the form of perceived costs and benefits and perceptions of payoffs and valuations of them differ from decision-maker to decision-maker. The task of decision-makers is to reach the highest level of payoffs, but they attempt do so with bounded rationality¹⁶; not knowing where they are on the landscape. Whether they have reached a local peak, or a summit or indeed whether they are in the right mountain range or not to reach a global summit.

The central hypothesis of these notes is that we can and do devise algorithms to deal with such situations. The questions are: *How do we do so? What are the limitations on our efforts? What is the relevant basis for critique?* The answers are provided via a complex systems methodology. Some elements of this methodology are now outlined.

Characteristics of CAS

Any number of characteristics of complexity exist, but I will focus on three:

- *Interdependence*
- *Emergence*
- *Ambiguity*
- *Anticipation and learning*

¹⁵ Kauffman (1995) describes landscapes in an evolutionary context.

¹⁶ The term comes from Herbert Simon in, for example, *The New Science of Management Decision* (1960) and refers to the limited information and powers of cognition possessed by decision-makers.

Interdependence

Complex systems are made up of interdependent interacting parts. In that sense they are like networks of interconnected nodes. Interconnectedness gives rise to non-linearity: the whole is very different from the parts. The cliché is synergy or $2 + 2 = 5$ or indeed sometimes $2 + 2 = 3$: when you link things together there are feedbacks (network effects, synergies or self-reinforcing mechanisms).

Thus new capitalism is an archetype made up of a network of interconnections structured hierarchically at many different levels. Webs of self replicating structures exist, beginning at the global level with international institutions (the EU, IMF, NATO, the UN), cascading down through international and national businesses, their divisions and sub units, through to teams, projects, and into the daily life of individuals and families. The structure is a fractal one in that the structure is replicated at every level, above and below, and if we were to open up the nodes (at the business project or international level) the same family tree structure would be revealed. Interactions in the form of partnerships, alliances, networks mean that it is difficult to define boundaries. New capitalist organizations extend indefinitely throughout the world economy.

Emergence

Interdependence and non-linearity gives rise to emergence: interdependence brings the possibility of the evolution of something entirely new. Not only is the whole more than the sum of the parts but the whole cannot be reduced to the parts. We see this everywhere in complex systems. They are irreducible in that they cannot be understood just by looking at the parts. The image of a network is useful. What makes one organization perform better than others is not just the assets it possesses, but how these assets are networked together.

Emergence is not inevitable. Organizations and economies can spiral upwards or downwards; consider the case of the performance of the US economy and whether spectacular growth will continue or whether it will sink into recession; or the natural life cycle of birth, growth, maturity and death followed by many organizations. Generally entropy, running down or decline of energy is a characteristic of systems as much as evolution.

Ambiguity

The third aspect of complex systems is intriguing: they include the possibilities of contradiction and ambiguity; order and disorder, randomness and chaos, determinacy and indeterminacy. They embody the kind of contradiction that we meet in life: albeit many of these contradictions arise from the fact that we operate at multiple levels of being; contradiction and ambiguity are essential features of the imaginal world or dream world, for example.

The surprising thing is that any order exists within organizations. As the number of activities increases in physical and biological systems, the problem spirals out of control. The reason that organizations manage is that control parameters exist: markets, boundedly rational behaviour, hierarchies, rulebooks, definitive documents, and behaviour norms. The problem with using *high-powered* market like incentives is

that they are often inimical to learning, cooperation, and ultimately payoffs. Trust and commitment become key control parameters¹⁷.

Anticipation and learning

A fourth characteristic of CAS is anticipation, expectation and learning by decision makers, or as some prefer to call them agents. Human agents do not accept a situation as given. They learn. They detect patterns in events on which they base their anticipations and expectations: exactly what you are doing now with respect to this course. You will change it as much as it changes you.

CONCLUDING REMARKS

It is difficult to predict in the social and business sciences prediction. This is partly due to the importance of expectations and anticipations (which create self reinforcing or self feeding mechanisms) in determining events. But qualification is required. Predictive difficulties are not uniquely associated with the social and business sciences¹⁸. Difficulties in that respect occur in all physical systems due to the phenomenon of Kalmogorov entropy: the fact that the utility of information dissipates as we look further and further ahead, either in time or space. One of the frequently cited difficulties with complexity models is the difficulty of prediction. A few points may be raised in this connection. Firstly most models relating to business policy are prescriptive rather than predictive: in this respect complexity based models which take account of interdependence and so on are more satisfactory than those based on alternative more simplistic cause effect explanations.

Further much scientific activity, especially in the social and business sciences is concerned with hermeneutics. Again, complexity based models provide the basis for wide ranging explanations and interpretations.

The considerations of this note may be summed up by the observation that social and business sciences are more closely related to biological sciences than they are to say the mechanical approaches of Newtonian science.

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¹⁷ Control parameters are akin to rules of the game in game theory. Part of strategy involves changing the rules of the game: part consists of acknowledging path dependence - rules and trajectories governed by past decisions.

¹⁸ See Prigorgine and Stengers (

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QUESTIONS FOR DISCUSSION

(Use examples from your own experience to illustrate your answers)

1. Link the traditions of competitive advantage with that of rent seeking activity. In what sense or senses does the search for competitive advantage provide dynamism for capitalist economies that is missing in Statist regimes.
2. Considering the characteristics of complexity (interdependence, non-linearity and the possibility of evolution) apply the concept to organizations.
3. In what sense (or senses) is the global business environment as an evolving complex system? Consider in terms of the landscape metaphor presented in the text.
4. Are high-powered market like incentives less effective than norms such as trust and commitment?

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ⁱ We will examine one source of variability, control schema later.