
Organizational Learning: A Review of Some Literatures

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Abstract

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Organizational learning is currently the focus of considerable attention, and it is addressed by a broad range of literatures. Organization theory, industrial economics, economic history, and business, management and innovation studies all approach the question of how organizations learn. A number of branches of psychology are also revealing on the issue. This paper assesses these various literatures by examining the insights they allow in three main areas: first, the goals of organizational learning; second, the learning processes in organizations; and third, the ways in which organizational learning may be facilitated and impeded. It contends that while the various literatures are revealing in particular aspects of organizational learning, a more complete understanding of its complexity requires a multi-disciplinary approach. The contributions of the different approaches are analyzed, and some areas are suggested where the transfer of analytical concepts may improve understanding.

Introduction

Conceptions of organizational learning are ubiquitous. Since Weber, organizational theory has addressed the issue, and as the recent (1991) special edition of *Organization Science* on 'Organizational Learning' shows, it remains a current concern. The lengthy history of the study of organizational learning is matched by the range of academic disciplines studying it. For example, economic historians have examined the importance of learning in the development of new industries and technologies (Rosenberg 1976), and of the development of formal Research and Development (R&D) as institutionalized learning mechanisms (Mowery 1981). Learning is argued by industrial economists to affect productivity (Arrow 1962), and industrial structures (Dosi 1988). Learning within firms has been a feature of the theory of the firm since Cyert and March (1963), and learning plays a central role in Teece et al.'s (1990) 'dynamic capabilities' theory of strategic management. The relationship between learning and innovation is increasingly examined at a strategic management level (Dodgson 1991a; Loveridge and Pitt 1990) and at a tactical management level concerned with new product introduction (Imai et al. 1985; Maidique and Zirger 1985). The idea of 'learning curves' is widely used in management education, and by commercial management consultants such as the Boston Consultancy Group.

A number of reasons can be suggested why the study of organizational learning is currently so fashionable. First, the concept of the 'learning organization' is gaining currency amongst large organizations as they attempt to develop structures and systems which are more adaptable and responsive to change. This development has been described and influenced by the work of a number of management analysts, such as Peters and Waterman (1982), Kanter (1989) and Senge (1990). It is increasingly appreciated that learning is a key to competitiveness (Garratt 1987). Second, and partly related, is the profound influence that rapid technological change is having on organizations. The turbulence engendered by technological change in products, processes and organization increases the uncertainties facing firms and the conflicts within them. The complexity of the new product development process (Rothwell 1992), and shortening product life-cycles, the transformation of production processes towards, for example, 'lean production' (Womack et al. 1990), and the growing use of computer-assisted organizational innovations such as Just-in-Time delivery systems and Materials Requirement Planning increases the need for firms to learn to do things in new, and often radically different, ways.

A third reason can also be suggested. The concept of 'learning' has a broad analytical value. This is shown in the breadth of academic disciplines using it. Contemporarily, however, this has increased in value, as on the one hand, normative approaches, such as those found in much of the management literature on the subject, seek to find a new language to deal with the changed circumstances facing firms. On the other hand, some academic analysis of organizations, for example, in economics, attempts to progress beyond existing static views of organizations as 'bundles of resources'. Learning is a dynamic concept, and its use in theory emphasizes the continually changing nature of organizations. Furthermore, it is an integrative concept that can unify various levels of analysis: individual, group, corporate, which is particularly helpful in reviewing the cooperative and community nature of organizations. An interdisciplinary approach to learning avoids the rather introspective and parochial views seen in some of the literature on the subject (seen, for example, in the recent edition of *Organization Science*).

What is Organizational Learning?

There is rarely agreement within disciplines as to what learning is, and how it occurs (Fiol and Lyles 1985), let alone agreement between disciplines. Economists tend to view learning either as simple quantifiable improvements in activities, or as some form of abstract and vaguely-defined positive outcome. The management and business literature often equates learning with sustainable comparative competitive efficiency, and the innovation literature usually sees learning as promoting comparative innovative efficiency. These various literatures tend to examine the *out-*

comes of learning, rather than delve into what learning actually is and how these outcomes are achieved. In contrast, it is a major concern of organization theory and psychology to examine the *processes* of learning. Learning, in the sense used here, relates to firms, and encompasses both processes and outcomes. It can be described as the ways firms build, supplement and organize knowledge and routines around their activities and within their cultures, and adapt and develop organizational efficiency by improving the use of the broad skills of their workforces. This broad definition incorporates a number of assumptions:

- learning generally has positive consequences even though the outcomes of learning may be negative, i.e. firms learn by making mistakes.
- although learning is based on individuals in the workforce, firms can learn *in toto*. While emphasizing the role of human agency in learning, corporate and group culture is influenced by individual learning and can assist the direction and use of that learning.
- learning occurs throughout all the activities of the firm, and, as will be argued later, it occurs at different speeds and levels. Encouraging and coordinating the variety of interactions in learning is a key organizational task.

Firms that purposefully construct structures and strategies so as to enhance and maximize organizational learning have been designated 'learning organizations'. The characteristics of the learning company are described by Pedler et al. (1989) who define it as 'an organization which facilitates the learning of all its members and continually transforms itself', and argue that it:

- has a climate in which individual members are encouraged to learn and to develop their full potential.
- extends this learning culture to include customers, suppliers and other significant stakeholders.
- makes human resource development strategy central to business policy.
- continually undergoes a process of organizational transformation.

While Pedler et al. argue that there is no blueprint for learning firms, students of large Japanese firms see many similar characteristics (Dore 1973; Dore and Sako 1989; Sako 1992), and there is considerable semblance with smaller, entrepreneurial high technology firms (Dodgson 1991b). The heavy emphasis in such companies on training and human resource development to facilitate learning is matched by efforts to consider the direction and effective utilization of learning activities.

Organizational learning is used by Pedler et al. in a metaphorical sense: the transformation of organizations is seen as being similar to individual learning. The use of metaphor is effectively used by Morgan (1986) who uses a number of them in his examination of organization. He does so as '*... the use of metaphor implies a way of thinking and a way of seeing that pervades how we understand our world generally*'. This paper will argue that individuals are the primary learning entity in firms, and it is individuals which create organizational forms that enables learning in

ways which facilitate organizational transformation. It will use organizational learning as a metaphor for individual learning, and the contextual and internal stimuli to learning in people will be examined for similarities in learning in organizations. The aim of doing this is to highlight the value of research from the established organization theory and psychology traditions, particularly concerning the process of learning for the emerging literature on learning in the innovation/management/economic fields. Concomitantly, this emerging literature is revealing, particularly concerning the aims of *technological* learning, and in some of the factors facilitating and impeding learning for more established bodies of work.

The Goals of Organizational Learning

Before analyzing the processes of organizational learning, the question should be posed: why do firms learn? Essentially, learning can be seen to have occurred when organizations perform in changed and better ways. The goals of learning are useful outcomes. Common explanations of the need to learn is the requirement for *adaptation* and improved *efficiency* in times of change. Psychologists, for example, see learning as the highest form of adaptation, raising the probability of survival in changing environments, and various other approaches also emphasize the need for adaptation. While organizational theory often assumes learning to be stimulated by the need for organizational adjustment in response to some rather ill-defined external stimulus, the management and innovation literature is much more clear. Learning is seen as a purposive quest to retain and improve competitiveness, productivity, and innovativeness in uncertain technological and market circumstances. The greater the uncertainties, the greater the need for learning. Amongst other factors stimulating environmental uncertainty and learning, two are particularly important at present: responses to technological change, and Western companies' response to the competitiveness of alternative forms of industrial organization (particularly Japanese).

Freeman and Perez's (1988) theory of changing 'techno-economic paradigms' describes the way that profound changes in technologies, most recently seen in information technology, cause considerable environmental turbulence for firms and other institutions as they attempt to respond to, as well as being part of, these radical changes. The goals of learning in these circumstances can therefore be seen as a response to the need for *adjustment* in times of great *uncertainty*. This theoretical analysis has some support in the more empirically-based analysis of Pavitt (1991), who argues that the strategies of large innovative firms are determined in part by attempts to learn in highly uncertain conditions. In an uncertain and rapidly developing new technology, biotechnology, Dodgson (1991b) argues that it is the differential ability to learn quickly about technological opportunities that has been responsible for the changing pattern of competitive relationships between large and small

firms which have been so important to the development of the technology.

Learning is a key feature in the process by which firms accumulate technology in order to compete. This is seen particularly clearly in Japanese firms, whose industrial organization is increasingly seen as a model to be replicated (Marceau 1992). Japanese firms place particular emphasis on learning (Pucik 1988b). According to Imai et al. (1985), Japanese firms possess 'an almost fanatical devotion towards learning — both within organizational membership and with outside members of the inter-organizational network. To them, learning is something that takes place continuously in a highly adaptive and interactive manner' (1985: 353). It is this ability to learn which is argued to explain the success of Japanese firms in continually introducing innovative products. The competitive success of Japanese firms based upon this high level of innovation has increased the need for Western firms to adapt their organization, and in industries such as automobiles, to attempt to emulate them (Womack et al. 1990). Firms are learning how competitor firms learn.

The efficiency goals of learning are commonly equated with productivity, the major focus of interest of industrial economists. For example, productivity is argued to be assisted through 'learning by doing' (Arrow 1962). This has been common parlance amongst economists in explaining how manufacturing-unit costs reduce over time, or with experience. Some of the more simplistic assumptions of this approach are highlighted by Bell and Scott-Kemmis (1990) who argue that learning by doing is often assumed to be passive, automatic and costless, yet it is none of these things. Adler (1990) provides a more sophisticated approach to manufacturing productivity improvements and argues that this is a feature of the accumulation of knowledge and learning across the development/manufacturing interface, sharing between the primary location and plants started up later, and continued sharing of knowledge amongst plants. In addition Rosenberg (1976) describes 'learning by using' based on the wealth of experience derived from using new products and processes.

In general, however, most economists' contribution to our understanding of organizational learning is limited to descriptive analyses of the outcomes of cumulative experience. There are some exceptions. Development economics, for example, has considered the processes by which firms in developing countries learn (Bell 1984), and recently, economists such as Cohen and Levinthal (1989) have begun to examine learning in R&D more broadly. They argue that learning occurs not only in the focus of R&D, but also in the process itself . . . 'while R&D obviously generates innovations, it also develops the firm's ability to identify, assimilate, and exploit knowledge from the environment . . . a firm's "learning" or "absorptive" capacity' (1989: 569). This article provides one of the first examples on the subject in the mainstream economics literature to consider the outcome of R&D as enhanced organizational *capability*, as well as new information.

The complexity in the goals of learning can be seen in its occasionally conflictual nature. Underpinning psychological theories on learning is the assumption that conflict (caused, for example, by error or contrary evidence) is an essential condition for learning, which acts as a motor driving the learning process. This has some resonance in some of the management and innovation literature which contends that although learning may be motivated by attempts to improve innovativeness/adaptability or productivity/efficiency, these may be conflictual. Clark et al. (1987) refer to the 'productivity dilemma' of a conflict between innovation and productivity, change and experience, (what economists sometimes refer to as the tensions between 'dynamic' and 'allocative' efficiencies; and organization theorists, the tensions between 'exploration' and 'exploitation'). They argue that an 'approach to resolving the contradiction between efficiency and innovation is contained in the concept of "learning", which highlights the dynamic interaction of the two dimensions'. This begins to describe the dialectic in organizational learning, mirroring that found in psychology. Piaget's dialectic in developmental psychology, for example, assumes that existing cognitive structures and the knowledge they engender (thesis) are continually challenged by new knowledge which does not fit (antithesis), and are eventually reorganized so that new knowledge is better integrated (synthesis and new thesis). In the analogy, productivity and 'exploitation' are thus challenged by conflicting innovation, which eventually leads to better productivity.

By building on the metaphor of individual learning, conflict, and hence learning, can be seen as inevitable in organizations as it is in individuals. It is a natural state. Organizational learning is as natural as learning in individuals as they attempt to adjust and survive in an uncertain and competitive world. Furthermore, just as psychologists distinguish various 'levels' of learning, progressing from biological or adaptive learning, the 'learning organization' can be distinguished as one that moves beyond this 'natural' learning, and whose goals are to thrive by systematically using its learning to progress beyond mere adaptation. It is an organization which attempts to develop what psychologists see in individuals as higher level, constructive or generative mental functions, and is reflected in strategies and structures purposefully being developed to facilitate and coordinate learning in rapidly changing and conflictual circumstances.

The Processes of Learning

Some of the complexity within the processes of organizational learning can be analyzed by continuing with the metaphor of individual learning. Corsini (1987) sees individual learning as involving five kinds of learned capabilities. Verbal knowledge (declarative knowledge) ranges from isolated 'facts' to bodies of organized information. Intellectual skills (procedural knowledge) enable the individual to demonstrate the application

of concepts and rules to specific instances. Cognitive strategies involve a number of processes such as perceiving, encoding, retrieving and thinking; they can be problem-solving, and can control and modify other cognitive processes of learning and memory such as attention, encoding and retrieval. Attitudes are 'learned states that influence the choices of personal action the individual makes towards persons, objects or events'. Motor skills are smoothly timed muscular movements enabling procedures to be undertaken precisely (this latter category will not be considered here, although there are obvious similarities between it and 'learning by doing').

The process of building declarative knowledge is akin to the economists' view of 'search' activities. It includes all the methods by which firms glean information: for example, through R&D, education and training, recruitment, and techniques such as patent watching and bibliometrics. The management and innovation literature is voluminous in this area. However, it is in the process of building procedural knowledge, cognitive strategies and attitudes that the major organizational challenge lies. As Corsini suggests, it is not enough to 'know what', it is also essential to 'know how'.

A number of studies into learning from a management studies perspective similarly distinguish various types and levels of learning. Fiol and Lyles (1985), for example, distinguish *higher* and *lower* level learning. Senge (1990) differentiates *generative* from *adaptive* learning. Dodgson (1991a) separates *strategic* from *tactical* learning. From an organization theory perspective, Argyris and Schon (1978) develop a three-fold typology of learning which they describe as single-loop, double-loop and deutero-learning, which has many similarities to approaches to individual learning.

'Organizational learning involves the detection and correction of error. When the error detected and corrected permits the organization to carry on its present policies or achieve its present objectives, then that error-detection-and-correction process is single-loop learning. Double-loop learning occurs when error is detected and corrected in ways that involve the modification of an organization's underlying norms, policies and objectives.' (1978: 3)

Organizations need to learn how to carry out single and double-loop learning according to Argyris and Schon, who call this deutero-learning.

'When an organization engages in deutero-learning its members learn about previous contexts for learning. They reflect on and inquire into previous episodes of organizational learning, or failure to learn. They discover what they did that facilitated or inhibited learning, they invent new strategies for learning, they produce these strategies, and they evaluate and generalize what they have produced.' (1978: 4)

The higher level 'double-loop' and 'deutero' learning compares with Corsini's (1987) categories of cognitive strategies and attitudes. How these translate from individuals to organizations critically depends upon

organizational *culture*. For Schein (1985), culture is a learned product of group experience. He defines it as . . .

'basic assumptions and beliefs that are shared by members of an organization, that operate unconsciously, and that define in a basic "taken for granted" fashion an organization's view of itself and its environment. These assumptions and beliefs are learned responses to a group's problems of survival in its external environment and its problems of internal integration.' (1985: 6)

The relationship between *individual* and *collective* learning has received a great deal of attention from within the organization theory perspective. Throughout the various literatures, firms' learning is commonly argued to be more than the sum of the parts of their employees' learning. Shared norms and values are agreed to be indicative of organizational rather than individual learning. According to Hedberg (1981), for example:

'Although organizational learning occurs through individuals, it would be a mistake to conclude that organizational learning is nothing but the cumulative result of their members' learning. Organizations do not have brains, but they have cognitive systems and memories . . . Members come and go, and leadership changes, but organizations' memories preserve certain behaviours, mental maps, norms, and values over time.' (1981: 3)

As Schein argues, it is the internal integration of individuals within a shared culture that facilitates learning, and this provides a major organizational challenge. Particularly important in the definition of this culture is technology. Schein argues that 'Occupations typically build their practices, values and basic self image around their underlying technology'. Technologically successful organizations, he argues, tend to base their self-image around their technology. The role that organizational culture plays in merging individual and collective learning warrants further interdisciplinary research.

There are a number of approaches within the management/innovation/economics literatures which refer to the centrality of identifiable and cohesive bodies of, often technologically related, knowledge and behaviour. Just as psychologists such as Corsini suggest that learned capabilities are dependent upon certain prior conditions, such as the presence of existing knowledge, and internal and environmental stimuli, so too do these other literatures. Three main concepts used to analyze the activities and behaviour of firms which direct and inform learning in a collective rather than individual sense are described here: 'knowledge-base', 'firm-specific competences', and 'routines'. These are conceptually different, although when discussing the impact and importance of learning for them, there are some similarities.

The term *knowledge base* is used to analyze the form of knowledge and the focus of its accumulation (Metcalf and Gibbons 1989). Organizational uniqueness is defined by knowledge bases and the processes of acquisition, articulation and enhancement of the knowledge over which it has control. There are some similarities between this approach and *firm-*

specific competences (Pavitt 1991); 'firm-specific capabilities' (Teece et al. 1990) and 'core competencies' (Prahalad and Hamel 1990). These approaches also argue the uniqueness of firms' knowledge and learning. For Pavitt, technological development is firm specific, cumulative, and differentiated. Teece et al.'s theory is based on the 'mechanisms by which firms accumulate and dissipate new skills and capabilities, and the forces which limit the rate and direction of this process'. Prahalad and Hamel argue that competitiveness in the 1990s depends on firms nurturing their core competencies, which they describe as the 'collective learning of the organization', and involves: 'harmonizing streams of technology; the organization of work; delivery of value; and, communication, involvement, and a deep commitment to working across organizational boundaries'.

For Nelson and Winter (1982), it is the establishment of *routines* which operationalize organizations' memories and knowledge bases. Routines in organizations are argued to include:

'... the forms, rules, procedures, conventions, strategies, and technologies around which organizations are constructed and through which they operate. It also includes the structure of beliefs, frameworks, paradigms, codes, cultures and knowledge that buttress, elaborate, and contradict the formal routine.' (Levitt and March 1988: 320)

Such a broad definition has limited value, and Nelson and Winter themselves use the term 'routine' flexibly. However, it has some value in that the concept of routine implies organizational action. That is, returning to Corsini's distinction between declarative and procedural knowledge, it is not only what a firm knows or what skills it possesses, but how it uses these which is important.

Conflating the terminology used above, we can equate single-loop learning with those activities which add to the knowledge base or firm-specific competences or routines of the firm without altering the nature of their activities. It can be seen as analogous to the development of Corsini's verbal knowledge. Double-loop learning involves changing the firms' knowledge base, firm-specific competences and routines, and is analogous to intellectual skills. Double-loop and deuterio-learning involves consideration of why and how to change, and hence the analogy with the development of cognitive strategies and attitudes.

These three concepts usefully illustrate some of the forms of collective learning and its importance for firms. The nature of the knowledge base or 'firm-specific competence' is individual to particular firms and is a crucial factor affecting their competitiveness. Collective learning is dynamic, but the way that it develops is constrained by existing ways of doing things, know-how and routines. Within the economics/innovation management literature there are broad analyses of the dynamic of collective learning in technology, describing the way it has its own trajectories (Dosi 1982) and how firms' learning is 'path dependent' (Dosi 1988). As Pavitt (1991) argues:

'... the range of possible choices about both product and process technologies open to the firm depends on its accumulated competence ... the improvement of these competences requires continuous and collective learning.' (1991: 42)

The centrality of technological and knowledge accumulation for the competitiveness of firms is something that is appreciated comparatively more keenly by recent management and innovation literatures. However, all these approaches take too little account of the importance of individual human agency and the complexity and problems involved in learning. Routines, for example, are argued to be independent of the individuals who operate within them and use them, and are capable of surviving considerable turnover in individual actors. Yet routines are responses chosen by individuals. Bandura (1977), for example, refers to the prominent role of 'self regulatory capacities' of individuals, and the way self-influence partly determines which actions one performs. 'By arranging environmental inducements, generating cognitive supports and producing consequences for their own actions, people are able to exercise some measure of control over their own behaviour' (1977: 13).

Furthermore, these analyses of collective learning tend to assume *uniformity* in learning capabilities within firms. In complex organizations many different learning processes can proceed at the same time in different directions and at different speeds. Marengo (1992) shows that even when all the members of an organization are characterized by a given and constant learning process, the way in which knowledge, information and communication flows are distributed in the system can give rise to very different patterns of organizational learning. This highlights the important role of coordinating mechanisms for learning considered in the next section.

Turning now to individual learning, a number of literatures point to the importance of key individuals in organizational learning. Included are those which act to bring information into the firm from outside — what the social psychology literature knows as 'boundary spanners' (Michael 1973), and the innovation literature denotes as 'technological gatekeepers' (Allen 1977). However, this says little of the factors, apart from their existence, which affect their own, and their organization's, learning.

Individuals' learning is constrained by their ability to interpret complex reality: Simon's (1957) bounded rationality problem. Furthermore, their learning is socially constructed inasmuch as what is learned is profoundly connected to the conditions in which it is learned. Simon (1991) argues that although all learning takes place inside individual human heads ...

'What an individual learns in an organization is very much dependent on what is already known to (or believed by) other members of the organization and what kinds of information are present in the organizational environment.' (1991: 125)

Schein (1985) refers to the need of organizations to socialize new entrants with its pivotal or central assumptions, and describes the importance of

culture 'to be taught to new members as the correct way to perceive, think and feel in relation to those problems'.

Learning is not only socially constructed, specific to particular firm and group cultures, and conflictual, it can also be conservative and unreliable. March et al. (1991) argue that what is learned from any particular kind of experience can vary substantially across time and across organizations. They describe the importance of experience, particularly of 'critical incidents' in shaping learning. However, . . .

'(b)because of the ambiguities associated with any single incident, responses and interpretations tend to be adopted more as a result of their temporal proximity; cognitive availability, or political convenience than by virtue of their obvious validity.' (March et al. 1991: 7)

They further contend that the learning process is generally conservative and sustains existing structures of belief (with obvious parallels with Kuhn's 'normal science'). They distinguish 'reliable' learning processes — which enable an organization to develop 'common understandings of its experience and makes its interpretations public, stable and shared' — and 'valid' learning processes which allow an organization to 'understand, predict and control its environment'. Organizations need both reliable and valid learning processes, although the two can conflict.

'Stable, shared knowledge interferes with the discovery of contrary experience from which valid learning arises, and the exploration of novel ideas interferes with the reliable maintenance of sharing of interpretations.' (March et al. 1991: 6)

March (1991) continues this examination of tensions induced by learning, and some of the resultant consequences, in his examination of 'exploration' and 'exploitation' in organizational learning . . .

'The essence of exploitation is the refinement and extension of existing competences, technologies and paradigms. Its returns are positive, proximate, and predictable. The essence of exploration is experimentation with new alternatives. Its returns are uncertain, distant and often negative. Thus, the distance in time and space between the locus of learning and the locus for the realization of returns is generally greater in the case of exploration than in the case of exploitation, as is the uncertainty.

Such features of the context of adaptation lead to a tendency to substitute exploitation of known alternatives for the exploration of unknown ones.' (March 1991: 85)

Another problem involved in learning is 'unlearning', or forgetting past behaviour which is redundant or unsuccessful. This is very important for firms (Clark et al. 1987), and is a crucial feature of Hedberg's (1981) analysis:

'Knowledge grows, and simultaneously it becomes obsolete as reality changes. Understanding involves both learning new knowledge and discarding obsolete and misleading knowledge. The discarding activity — unlearning — is as import-

ant a part of understanding as is adding new knowledge. In fact, it seems as if slow unlearning is a crucial weakness of many organizations.' (1981: 3)

A wide range of sources of firm learning have been suggested. R&D is a key source, and, additionally, from a development economics perspective, Hobday (1990) describes: learning via joint ventures; by installing capital goods, training, hiring key individuals, reverse engineering, designing, imitating inward investors; and through assembly and mass manufacturing, exporting and investment abroad. The implications of these analyses is that learning occurs in a number of functions within the firm: research, development, design, engineering, manufacturing, and marketing, and externally, and they suggest how important it can be to elicit and utilize information from all these sources. The sources of learning may vary over time with industry, technology and product life cycles, according to the aims of the firm (Mody 1990). Thus with the initial stages of industrial growth, and technology and product development and diffusion, learning may focus on overcoming uncertainties. In later stages, the focus of learning may be attempts to achieve benefits of scale. Beyond this, efforts may focus on regeneration or de-maturity.

Particularly important for innovation in firms is learning from customers and users (von Hippel 1988; Stinchcombe 1990; Rosenberg 1982). This 'external' learning provides an important learning process. Bandura (1977) emphasizes the way people learn by watching before they perform, the way they can profit from the successes and mistakes of others as well as from their own experiences. 'The capacity to learn by observation enables people to acquire large, integrated patterns of behaviour without having to form them gradually by tedious trial and error.' (1977: 12)

The innovation literature describes this when it distinguishes between 'leader' and 'follower' strategies (Freeman 1982), with some firms bearing high risks and costs in the expectation of super profits and others content to entertain less risky and profitable strategies. Recently, some of the research in this tradition which examines collaboration between firms, in its various forms — joint ventures; strategic alliances; R&D contracts — sees it as an opportunity to learn from partners (Ciborra 1991; Dodgson 1993b). Whipp et al. (1990) describe an example of the way managers and engineers in competing firms with shared values and aims learn directly from one another. There would, however, be considerable value in wider research to examine the ways in which vicarious learning manifests itself in organizational change. Such research would have significance for better understanding of organizational behaviour in a variety of relationships — customer/supplier and competitive — and may have some import for mergers and acquisitions.

When considering the processes of organizational learning, the metaphor of individual learning adds to our 'way of seeing' in Morgan's sense. The emphasis in much of the management/innovation/economics literature is that 'history matters', and what a firm can do in the future is strongly

influenced by its past and its collective learning. By examining the influences individuals have in creating their own cultures (and histories in this sense), a less deterministic view can be taken. Furthermore, as ideas such as vicarious learning and different levels of learning are introduced, some of the analytical tools for conceptualizing organizational transformation are presented.

Factors Facilitating and Impeding Learning

Throughout the above discussion the importance of environmental change as a stimulus to learning has continually been emphasized. It has been argued that the greater the uncertainty in the environment, the greater the need for learning. However, on the question of adaptation, for example, some approaches which see it *primarily* as a response to environmental change suffer from the reductionist tendency of behaviourism. Organizational learning cannot be created and eradicated by varying external stimuli. Organizations, and the forms of collective and individual learning within them, importantly affect learning processes and outcomes. Indeed, the role of human agency and individual goals such as the drive for self-actualization are almost completely ignored in many accounts of organizational adaptability.

Organizational learning is stimulated *both* by environmental changes and internal factors in a complex and iterative manner. Returning to the individual learning metaphor, Bandura's (1977) Social Learning Theory, for example, argues that . . .

'... people are neither driven by inner forces nor buffeted by environmental stimuli. Rather, psychological functioning is explained in terms of a continuous reciprocal interaction of personal and environmental determinants.' (1977: 12)

By using the individual learning metaphor, the complexity in the factors that encourage and constrain learning begin to be delineated. In addition to the levels of learning, and the complexity in the collective/individual learning relationship described in the previous section, the situation is further complicated by the environment/organization interface. One factor which can assist organizations to deal with this particular problem is *strategy*, and this is where the management/innovation/economics literature is particularly revealing.

Firms purposefully adopt structures and strategies to encourage learning. They are not totally reactive, and can proactively seek to influence the environment in which they learn. The relationship between strategy and structure, and the role of strategy acting as an intermediary filter between the environment and the organization has long been a focus interest in the management literature (Ansoff 1968; Chandler 1966; Snow and Miles 1983). However, recent insights into the challenge in creating organizational forms conducive to learning are provided by contemporary econ-

omic theory of the firm (Marengo 1992). This builds upon Coase (1937) and argues that the nature of the firm is to be found in the mechanisms (economic, social, political and psychological) which the firm itself implements in order to achieve the necessary *coordination* amongst the actions of its individual members. The firm is seen as a coordinating institution, and learning is one of the activities which needs coordination, and the mechanisms used to achieve such coordination play a central role in shaping the organizational learning process and determining its outcome.

Viewing the role of firms as coordinated learning institutions leads to a consideration of the role of organizational structure and strategy. Complex organizations are characterized by a multiplicity of learning processes: each individual and each group within the organization have their own knowledge base and their own learning capabilities. The structure of the organization defines the way in which these processes interact (Chandler 1990), and gives rise to the organizational learning process resulting from these interactions. Aoki (1988) describes the way in which the information structures and dense communication flows encouraged by Japanese firms encourage employees' integrative learning. Dore (1986) describes the importance of culture in influencing these structures. In this regard corporate strategy to encourage learning has its primary focus on creating such organizational structures and cultures. A feature of such a strategy and structure includes consideration of the way firms may *benefit* from the diversity and heterogeneity of learning. As March (1991) argues, there is value for organizations in having fast- and slow-learning individuals together. Although this creates complex problems of coordination, it also encourages the scope of organizational learning. Furthermore, it raises the critical question of *incentives* to learning (Aoki 1988), particularly the problem of designing incentive structures in such a way as to make conflicting and heterogenous learning compatible. Another question relates to the way interorganizational learning is facilitated by high levels of *trust* between firms (Sako 1992; Dodgson 1993a).

A feature of learning strategies is, of course, the level and direction of *resources* devoted to learning. The R&D departments of firms provide a major source of learning in an activity which is central to their continuing existence and prosperity. The development of formal R&D structures in firms has been argued to be a response to the need to learn effectively about developing science and technology (Mowery 1981). It is the R&D departments of firms that provide the major vehicle for learning about new technological developments. As a major source of learning is R&D, the size and focus of R&D budgets are likely to be a primary factor encouraging and constraining learning. This is obviously affected by decisions made by managers, and there is an extensive literature on the establishment of R&D budgets and project selection (Twiss 1986; Dumbleton 1986), and on organizational questions of obtaining creative efficiency in R&D (Hull 1988; Kolodny 1980). Learning is a costly pro-

cess (Cohen and Levinthal 1989). However, as Pucik (1988a) points out, traditional planning systems cannot assign a financial value to learning activities, and hence they usually go unfunded. What is more, the costs of learning are immediate and the benefits long-term. There is little consideration within the management/innovation/economics literature of the actual and opportunity costs of learning. Furthermore, given the *centrality* of R&D as an organizational learning mechanism, there is a surprising paucity of research across all traditions on the broad question of learning in R&D, its promotion and funding, and the subsequent *diffusion* of learning throughout the organization. The way that the processes and outcomes of learning have been facilitated by recent technologies, such as multi-media in communications, information and training provision, provide fertile ground for future research. Such research would necessarily need to be interdisciplinary and should include the range of insights from organization theory, which generally have been comparatively slow in addressing these issues.

The above approaches valuably describe some important sources of learning, and have implications for practical issues such as resource allocation. However, the difficulties in organizational learning remain, and these are often underestimated in the management/innovation/economic perspectives. Argyris and Schon's (1978) study found that most organizations do quite well in single-loop learning, but have great difficulties in double-loop learning. They could find no example of organizations which learned in a deutero fashion. Their general contention is that organizations *ordinarily* fail to learn on a higher level. One reason for this is because of what they describe as inhibitory loops. Primary inhibitory learning loops are a self-reinforcing cycle in which errors in action provoke individuals to behaviours which reinforce those errors. Secondary inhibitory loops are group and inter-group dynamics which enforce conditions for error (ambiguity, vagueness, etc.). They contend that organizations tend to create learning systems that inhibit double-loop learning, calling into question their norms, objectives, and basic policies.

Morgan (1986) also analyzes learning inhibitors. He describes how departmental structures focus the attention of their members on parochial rather than organization-wide problems; how systems of accountability frequently foster defensiveness in attitudes; and how, as Argyris and Schon argue, there is a gap between actors' rationalized statements of what they do and what actually occurs.

Although the problems of learning in organizations, such as the obstacles to unlearning, are considerable, learning, of course, can and does occur. Argyris and Schon do not rule out the possibility of higher level double-loop and deutero learning. Japanese organizations are argued to be capable of a continuous process of learning, to their distinct advantage (Imai et al. 1985). It is here that some of the research within an economics/management/innovation perspective has implications for organization theory. A number of major companies have transformed themselves. Examples would be IBM, changing from a traditional 'business machines'

company, and ICI using science and technology to move out of bulk chemicals. Without denigrating or underestimating the extent of the problems firms face when attempting to learn — a factor often overlooked by the management and business/economics/innovations literatures — firms manage, in practice, to move in radical new directions through higher level learning. Researchers in the organization theory tradition may find value in examining the rapid and extensive technological transformations undergone within companies, and the role of distinct strategies in shaping their learning environment, discussed in depth in these other literatures.

Conclusions

This review of some of the literature on organizational learning has argued that the strengths of analyses within an organization theory perspective, when supplemented by some concepts from psychology, lie in comprehension of the process and problems of learning. The strengths of the economics/management and business/innovations approaches lie in motives and sources of learning. It argues that a primary reason why firms learn is to deal with uncertainty in their markets and technologies, and while R&D is an important source of learning, learning occurs throughout the activities of the firm. These approaches valuably highlight the contemporary significance of the accumulation of learning for competitiveness, and the proactive role of strategy in its stimulation. Much of its analysis of learning is, however, limited to its outcomes, and it ignores or underestimates the problems and complexities in the processes of learning. Use of the individual learning metaphor shows how organizational learning is problematic — it may be conflictual and conservative — and why unlearning and higher-level learning is difficult. Together, the literatures reviewed contribute to the understanding of the complexity of factors that encourage and restrict learning.

The aim of this paper has been to illustrate the potential overlaps and synergies between the various approaches to learning; a concept which all the literatures reviewed agree has considerable analytical power. It has not attempted fully to integrate the approaches in any systematic manner. This may be an interesting thing to do. However, while there are areas of agreement, there remains a great disparity in the fundamental underlying assumptions of the different approaches, such as the differing focuses on outcomes and processes.

Synthesis of these differing approaches, and the development of an interdisciplinary perspective, will have particular value for the continuing study of 'learning organizations'. The characteristics of such organizations are only just beginning to be delineated. The competitive value of learning is very high, and research into the area is likely to increase in topicality. This review points to the value of using some of the concepts and sub-concepts in the various literatures in any future analysis.

Examination of concepts such as vicarious learning, differing levels of learning, and questions of the formulation and maintenance of culture and its relationship with individual learning warrant broader analytical attention. Additionally, it suggests that a deeper examination of technological learning, and some of the coordinating mechanisms that firms use through their strategies and structures, and, for example, the way they use incentives to learning, would be very valuable. Such enquiry would have both normative and theoretical value. For example, how do managers ensure the compatibility of individual learning with organizational aims? What are the aims and characteristics of learning strategies (what psychologists call 'metacognition')? How, once it has been generated or accessed, is learning diffused throughout organizations and shared by organizational means, such as personnel transfer, or technological means, such as electronic databases. Such enquiry would have considerable significance for the study of contemporary organizational behaviour.

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References

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| <p>Adler, P.
1990 'Shared Learning'. <i>Management Science</i> 36/8: 938-957.</p> <p>Allen, T.
1977 <i>Managing the flow of technology</i>. Boston, Mass.: MIT Press.</p> <p>Argyris, C., and D. Schon
1978 <i>Organizational learning</i>. London: Addison-Wesley.</p> <p>Arrow, K.
1962 'The implications of learning by doing'. <i>Review of Economic Studies</i> 29: 166-170.</p> <p>Bandura, A.
1977 <i>Social learning theory</i>. Englewood Cliffs NJ.: Prentice-Hall.</p> <p>Bell, M.
1984 '"Learning" and the accumulation of industrial technological capacity in developing countries' in <i>Technological capacity in the Third World</i>. K. King and M. Fransman (eds.), 189-209. London: Macmillan.</p> | <p>Bell, M., and D. Scott-Kemmis
1990 'The mythology of learning-by-doing in World War II airframe and ship production'. Science Policy Research Unit, University of Sussex.</p> <p>Chandler, A.
1966 <i>Strategy and structure</i>. Cambridge. MIT Press.</p> <p>Chandler, A.
1990 <i>Scale and scope: the dynamics of industrial capitalism</i>. Cambridge, Mass.: Harvard/Belknap.</p> <p>Ciborra, C.
1991 'Alliances as learning experiences: cooperation, competition and change in high-tech industries' in <i>Strategic partnerships and the world economy</i>. L. Mytelka (ed.), 51-77. London: Pinter.</p> <p>Clark, K., R. Hayes, and C. Lorenz
1987 <i>The uneasy alliance: Managing the productivity-technology dilemma</i>. Cambridge, Mass.: Harvard Business School Press.</p> |
|--|---|

- Cohen, W., and D. Levinthal
1989 'Innovation and learning: the two faces of R&D'. *The Economic Journal* 99: 569-596.
- Corsini, R.
1987 *Concise encyclopedia of psychology*. New York: Wiley.
- Cyert, R., and J. March
1963 *A behavioural theory of the firm*. Englewood Cliffs, N.J.: Prentice Hall.
- Dodgson, M.
1991a 'Technology learning, technology strategy and competitive pressures'. *British Journal of Management* 2/3: 132-149.
- Dodgson, M.
1991b *The management of technological learning*. Berlin: De Gruyter.
- Dodgson, M.
1993a 'Learning, trust and technological collaboration'. *Human Relations*: 132-149.
- Dodgson, M.
1993b *Technological collaboration in industry*. London: Routledge.
- Dore, R.
1973 *British factory-Japanese factory*. Berkeley: University of California Press.
- Dore, R.
1986 *Taking Japan seriously*. London: Athlone Press.
- Dore, R., and M. Sako
1989 *How the Japanese learn to work*. London: Routledge.
- Dosi, G.
1982 'Technological paradigms and technological trajectories: A suggested interpretation of the determinants and directions of technical change'. *Research Policy* 2/3: 147-162.
- Dosi, G.
1988 'Sources, procedures, and micro-economic effects of innovation'. *Journal of Economic Literature* 26: 1120-1171.
- Dumbleton, J.
1986 *Management of high technology R&D*. Amsterdam: Elsevier.
- Fiol, C., and M. Lyles
1985 'Organizational learning *Academy of Management Review* 10/4: 803-813.
- Freeman, C.
1982 *The economics of industrial innovation*. London: Pinter.
- Freeman, C., and C. Perez
1988 'Structural crises of adjustment: business cycles and investment behaviour' in *Technical change and economic theory*. G. Dosi, et al. (eds.), 38-66. London: Pinter.
- Garratt, R.
1987 *The learning organization*. London: Fontana/Collins.
- Hedberg, B.
1981 'How organizations learn and unlearn' in *Handbook of organizational design*, Vol. 1. P. Nystrom and W. Starbuck (eds.), 3-27. Oxford: Oxford University Press.
- Hobday, M.
1990 *Telecommunications in developing countries: the challenge from Brazil*. London: Routledge.
- Hull, F.
1988 'Inventions from R&D: organizational design for efficient research performance'. *Sociology* 22/3: 393-415.
- Imai, K-I., I. Nonaka, and H. Takeuchi
1985 In *The uneasy alliance: managing the productivity-technology dilemma*. K. Clark, R. Hayes and C. Lorenz (eds.). Cambridge: Harvard Business School Press.
- Kanter, R.
1989 *When giants learn to dance*. London: Simon and Schuster.
- Kolodny, H.
1980 'Matrix organization designs and new product success'. *Research Management* (September): 29-33.
- Levitt, B., and J. March
1988 'Organizational learning'. *Annual Review of Sociology* 14: 319-340.
- Loveridge, R., and M. Pitt
1990 *The strategic management of technological innovation*. Chichester: Wiley.

- Maidique, M., and B. Zirger
1985 'The new product learning cycle'. *Research Policy* 14: 299-313.
- Marceau, J.
1992 *Reworking the world: organization, technologies and cultures in comparative perspective*. Berlin: De Gruyter.
- March, J.
1991 'Exploration and exploitation in organizational learning'. *Organization Science* 2/1: 71-87.
- March, J., L. Sproull, and M. Tamuz
1991 'Learning from samples of one or fewer'. *Organization Science* 2/1: 1-13.
- Marengo, L.
1992 'Knowledge, coordination and learning in an adaptive model of the firm'. Unpublished D.Phil. dissertation, Science Policy Research Unit, University of Sussex.
- Maschup, F.
1982 *Knowledge: its creation, distribution and economic significance*. Princeton: Princeton University Press.
- Metcalfe, S., and M. Gibbons
1989 'Technology, variety and organization' in *Research in technological innovation. Management and policy*. R. Rosenbloom and R. Burgelman (eds.). New York: JAI Press.
- Michael, D.
1973 *On learning to plan - and planning to learn*. San Francisco: Jossey-Bass.
- Mody, A.
1990 'Learning through alliances'. Washington: The World Bank.
- Morgan, G.
1986 *Images of organization*. Newbury Park: Sage.
- Mowery, D.
1981 'The emergence and growth of industrial research in American manufacturing, 1899-1946'. Mimeo, Stanford University, Stanford.
- Nelson, R. and S. Winter
1982 'An evolutionary theory of economic change'. Cambridge, Mass.: Belknap Press.
- Pavitt, K.
1991 'Key characteristics of the large innovating firm'. *British Journal of Management* 2: 41-50.
- Pedler, M., T. Boydell, and J. Burgoyne
1989 'Towards the learning company'. *Management Education and Development* 20/1: 1-8.
- Peters, T., and R. Waterman
1982 *In search of excellence: lessons from America's best run companies*. New York: Harper and Row.
- Prahalad, C. and G. Hamel
1990 'The core competence of the corporation'. *Harvard Business Review* (May-June): 79-91.
- Pucik, V.
1988a 'Strategic alliances, organizational learning, and competitive advantage: the HRM Agenda'. *Human Resource Management* 27/1: 77-93.
- Pucik, V.
1988b 'Strategic alliances with the Japanese: implications for human resource management' in *Cooperative strategies in international business*. F. Contractor and P. Lorange (eds.), 487-498. Lexington, Mass.: Lexington Books.
- Rosenberg, N.
1976 *Perspectives on technology*. Cambridge: Cambridge University Press.
- Rosenberg, N.
1982 *Inside the black box: technology and economics*. Cambridge: Cambridge University Press.
- Rothwell, R.
1992 'The 5th generation innovation process'. *R&D Management* 22/3: 221-239.
- Sako, M.
1992 *Prices, quality and trust: how Japanese and British companies manage buyer-supplier relations*. Cambridge: Cambridge University Press.
- Schein, E.
1985 *Organizational culture and leadership*. San Francisco: Jossey-Bass.

- | | |
|---|--|
| <p>Senge, P.
1990 'The leader's new work: building learning organizations'. <i>Sloan Management Review</i> 32/1: 7-23.</p> <p>Simon, H.
1957 <i>Administrative behaviour</i>. New York: Macmillan.</p> <p>Simon, H.
1991 'Bounded rationality and organizational learning'. <i>Organization Science</i> 2/1: 125-134.</p> <p>Snow, C., and R. Miles
1983 'The role of strategy in the development of a general theory of organizations' in <i>Advances in strategy</i>. R. Lamb (ed.). New York: JAI Press.</p> <p>Stinchcombe, A.
1990 <i>Information and organizations</i>. Berkeley: University of California Press.</p> | <p>Teece, D., G. Pisano, and A. Schuen
1990 'Firm capabilities, resources, and the concept of strategy'. CCC Working Paper No 90-8, University of Berkeley, Berkeley.</p> <p>Twiss, B.
1986 <i>Managing technological innovation</i>. 3rd edn. London: Pitman.</p> <p>von Hippel, E.
1988 <i>The sources of innovation</i>. Cambridge: Cambridge University Press.</p> <p>Whipp, T., R. Rosenfeld, and A. Pettigrew
1990 <i>Culture and competitiveness: evidence from mature U.K. industries</i>. Warwick: University of Warwick Centre for Corporate Strategy and Change.</p> <p>Womack, J., D. Jones, and D. Roos
1990 <i>The machine that changed the world</i>. New York: Rawson Ass.</p> |
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