■ *Research Paper*

# Adaptation to Creation: Progress of Organizational Learning and Increasing Complexity of Learning Systems

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A brief survey of organizational learning literature shows that understanding of how organizations learn has proceeded along two streams: one based on progress function or learning/experience curve effect, and the other as a process facilitating organizational adaptation and growth, and development and sustenance of competitiveness. This latter stream presents three phases of evolution: initially it considered learning as adaptation through search and problem solving, followed by attempts at conceptualization of learning as an organization-wide, holistic phenomenon, and finally focusing on development of systems, processes, training tools, capabilities, etc., for building learning organizations. Learning is now understood as the development of organizational generative capabilities with a wide response range. The article identifies that the understanding of organizational learning from learning as adaptation to information processing and knowledge creation systems capable of generating a wide range of response patterns exhibits an underlying link of increasing complexity. This in turn holds an interesting correspondence to Boulding's hierarchy of systems. The article discusses the implications of this correspondence for research and practice. Copyright © 2001 John Wiley & Sons, Ltd.

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Concepts of *organizational learning* (OL) and *learning organization* have been dominating management literature, thinking and action in the 1990s, mainly popularized by Peter M. Senge's *The Fifth Discipline: The Art and Practice of the* *Learning Organization* (1990). This observation is testified by a plethora of journal articles, books, popular press writings, and even special issues of journals on these topics (e.g., Argyris and Schön, 1996; Chawla and Renesch, 1995; Crossan *et al.*, 1999; DiBella and Nevis, 1998; Easterby-Smith, 1997; Garvin, 1993; Huber, 1991; *Journal of Management Development*, 1993; Miner and Mezias, 1996; Moingeon and Edmondson, 1996; Nicolini and Meznar, 1995; O'Reilly, 1993;

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*Organizational Dynamics*, 1993; *Organization Science*, 1991; Tsang, 1997).

A journey back in time through the literature showed that the ideas of OL are not really 'that new'. Perhaps they began in a dominant way in the 1950s and 1960s (e.g., Cangelosi and Dill, 1965; Cyert and March, 1963; Hirschman, 1964; Simon, 1947/1997, 1953) with roots even earlier (e.g., Wright, 1936). The journey towards making some coherent sense of this vast literature was difficult and not linear in time. It took many to and fro swings between the 1950s/1960s and the present, with many stopovers in between, and revealed a perceptible shift in focus around the mid-1990s from *learning* to *knowledge creation* and *management* in organizations.

As reading progressed, an evolutionary pattern seemed to emerge, initially implicitly. Two streams of literature became significantly evident along which the understanding of how organizations learn appears to have proceeded. The first stream was based on *progress function* or the *learning* and *experience curve* effect. The second stream understood learning as facilitating organizational processes of *adaptation* and *growth*, and *development* and *sustenance* of *competitiveness*. Broadly, three phases could be distinguished in this stream. It progressed from a *problem* phase (beginning in the early 1960s) that considered learning as adaptation through search and problem solving, to a *conceptualization* phase (since the mid-1970s) where the dominant concerns were on defining and conceptualizing the phenomena, to an *action* phase (since the mid-1980s) that focuses on building learning systems and processes, and creating learning organizations. These phase demarcations are only rough indicators, and contributions from earlier phases continue to appear.

The two streams evolved, but did not seem to stop there. There seemed to be an underpinning link in the evolution. The understanding of OL from learning as adaptation to information processing and knowledge creation systems capable of generating a wide and complex range of response patterns seemed to exhibit an underlying link of increasing complexity. It then suddenly struck that this progression of OL systems did exhibit an interesting correspondence to

Boulding's (1968, cited in Pondy and Mitroff, 1979) hierarchy of systems.

This article presents the above evolution. It is organized in four sections. The two streams of OL literature are presented in the first two parts. Correspondence of OL systems to Boulding's hierarchy of systems is demonstrated next. The article ends with a discussion of the implications of this correspondence for research and practice.

## THE FIRST STREAM: ORGANIZATIONAL LEARNING AS *PROGRESS FUNCTION*

Progress function studies began as a functional relationship between productivity in terms of direct labour or cost and cumulative output, called the learning curve (Wright, 1936). Though in stricter terms 'progress function' differs from learning and experience effects, the former is preferred here with the simple understanding that all it means is 'improvement' or 'progress' made, and 'progress is a result of firms gaining knowledge' (Dutton and Thomas, 1984, p. 235). Further, the 'progress' is not an unintentional byproduct of the production volume, but is the outcome of deliberate actions aimed at improving yields and reducing costs (Hatch and Mowery, 1998).

Initially progress function was applied in military and industrial production activities, and essentially for cost-control (Yelle, 1979). Later it was applied to explain the experience effect in functions other than production such as managerial decision making, setting up new plants and purchase of equipment. It was also used for competitiveness analysis across firms (Boston Consulting Group, 1970), top management policy making (Abernathy and Wayne, 1974), organizational strategy formulation (Bodde, 1976), planning (Conley, 1992) and multi-product production planning (Mazzola *et al.*, 1998). Hirschman (1964) applied the learning curve to the US oil industry and showed that the improvements were not just because of labour learning but technological learning that involved organizational-level management processes, vision and leadership.

Consistent with prevailing thoughts of the time, Levy (1965) applied the learning curve to

organizational adaptation through an 'adaptation function' incorporating variables of firm-level learning, and identified three kinds of learning. *Planned* or *induced* learning occurs when firms adopt techniques for increasing output or reducing cost (e.g., planning, target setting, prototype development); *random* or *exogenous* learning takes place from improvements in firm-level processes due to acquisition of unexpected information from the environment; and *autonomous* learning is acquired by employees themselves working on specific tasks. Yelle (1979) in an elaborate review of learning curve literature concluded that at the microscopic level learning effect is due to both labour learning and organizational learning, and there is re-learning associated with technology or process discontinuities. Empirical studies have also addressed the preservation of learning acquired by organizations in their production activities over time, and the extent of its inter-plant and inter-shift transfer (e.g., Argote *et al*., 1990; Epple *et al*., 1991; Hayes *et al*., 1988).

Attempts were also made at developing OL theories from the learning curve phenomena (Muth, 1986; Roberts, 1983). However, such efforts have met with only limited success, as the approaches have been fragmentary in the sense of lacking a system-wide, holistic concern. These approaches were essentially rooted in 'search' behaviour of organizations in defined problem space or action domain with the objective of adaptation. The focus has been on narrow, though specific organizational action domains, without considering the multiplicity of their systemic interrelationships. This concern is evident in Bodde (1976, p. 59), who analysing the potential, limitations and prospects of learning curve wrote:

> The changing expectations of the production workers themselves is another powerful force affecting the experience curve phenomena... workers increasingly desire challenge, personal growth and influence on how things are run. It may no longer be viable to seek cost savings through traditional patterns of work specialization and task simplification. Managers searching to develop an experience

effect will have to consciously address the rising expectations of the workforce.

Further, progress function research has not been able to answer how exactly organizations learn. Hardly any consensus or strong empirical evidence exists on what factors contribute to learning. OL is possibly due to increased proficiency of individuals at all levels, greater standardization of procedure, improvements in areas and activities such as scheduling, flow of materials and tooling, better coordination, division of labour and specialization, incentives, leadership and learning from outside the firm (Epple *et al*., 1991).

## THE SECOND STREAM: ORGANIZATIONAL LEARNING AS A PROCESS FACILITATING *ADAPTATION* AND *GROWTH*, AND *DEVELOPMENT* AND *SUSTENANCE* OF *COMPETITIVENESS*

This stream sought to understand learning as a process facilitating organizational adaptation and growth, and development and sustenance of competitiveness in uncertain and complex environments. While adaptation could be a gradual process or a series of quick fixes, growth is a combination of adaptations and quantum leaps, the latter occurring by way of new product development, new market entry, merger, acquisition, etc. Organizations prepare for quantum leaps during phases of less environmental turbulence (de Geus, 1988), or commission parallel systems to analyse, reflect and share insights among members on a continuing basis. Learning enables organizations to adapt in the short term, build sustainable competitive advantage and 'invent' their future (Fulmer and Perret, 1993). And on their part, managers attempt to foster learning in their organizations through development of proficiency of their members (Itam, 1987; Lado and Wilson, 1994), and by creating learning systems, processes and culture (Ramnarayan and Nair, 1999).

This stream of literature exhibits an evolutionary trend. Based on the dominant concerns and approaches at different stages, three

phases could be identified, which are labelled here as the *problem*, *conceptualization* and *action* phases.

### *Problem* Phase (of Search, Problem Solving and Adaptation—Since Early 1960s)

Attention to the need for organizations to learn arose with contingency theory that focused on the 'organization–environment' fit. Here, organizations were considered as rational and open systems with purposive behaviour, and the whole gamut of organizing was predominantly viewed from the decision-making perspective. Hence we find OL interpreted as adaptation through a series of organizational decisions (Allison, 1971; Cyert and March, 1963; Thompson, 1967), enabling the organization to bridge its performance gaps (Cangelosi and Dill, 1965). Cangelosi and Dill (1965, p.196) observed that all attempts at 'a more general theory of OL sprang from the same roots—a view of organizations as adaptive system, of man as limited in rationality, and of goals as aspiration levels.' Organizations could distinguish between successes and failures better than different degrees of similar experience, and tended to draft their successes into well-defined routines (Cyert and March, 1963; Herriott *et al*., 1988; Levitt and March, 1988; March and Olsen, 1988), an orientation that is evident in Argyris and Schön's (1978) single loop learning of error detection and correction, and the cause–effect mapping cycle of Hedberg (1981) as well.

It may also be noted that the words 'learning' and 'adaptation' have been used interchangeably by authors. Reviewing 15 works on OL, Fiol and Lyles (1985) found that 12 of them used 'learning' and the rest 'adaptation'. Cyert and March (1963, p. 99) considered adaptation as a 'short run' process, dependent on 'external source of disturbance or shock to the system', with learning as one of the coping strategies. While it is true that organizations engage in learning to adapt to complex, uncertain and changing environments (Allison, 1971; Cyert and March, 1963; Thompson, 1967), organizations learn not just to adapt alone. As Lundberg (1989) points out, organizations 'adapt' to a changing environment, 'adjust'

their internal operations and systems to suit adaptation and engage in 'anticipatory' preparation to face future. Hence, OL as a construct has a *past* (memory), *present* (sense-making, stimulus–response generation, retrieval of response from memory when required, and encoding and storage of new experience in memory), and *future* (potential for generating appropriate response patterns to meet any evolving or new situation) dimensions. Adaptation is usually focused in the present, particularly on sense-making and stimulus–response generation, ignoring the future dimension almost completely. Adaptation may also neglect to encode current experiences suitably and store in organizational memory for future retrieval.

The concept of 'organization–environment' fit underwent radical change in the 1970s. Rather than considering environment as the 'decider' of organizational survival, capability of organizations to influence the environment was recognized (Child, 1972; Weick, 1969). Weick (1969) suggested that what really matters is how organizations interpret or enact their environments. Thus the beliefs, values, shared assumptions and mental maps of organization members became critical. Argyris and Schön (1978) proposed double loop learning to capture this as a form of OL where members introspect and critically examine their guiding norms, beliefs and assumptions and make fundamental changes in them and in their actions to derive desired outcomes. The 'conceptualization' phase began roughly from here.

### *Conceptualization* Phase (Since mid-1970s)

In this phase, theorists began to address learning as an organizational-level, holistic phenomenon with systemic interrelationships broader than mere adaptation. Issues such as definition of OL, its typologies, distinction between individual learning and OL, learning systems, practices and processes in organizations, organizational memory, etc., began to get attention. The underlying trend of inquiry was—How can and should organizations learn?—a normative stance, and to conceptualize OL as a system-

wide phenomenon where organizational processes, structure, systems, norms, belief patterns, leadership, etc., played crucial roles.

As mentioned earlier, I have marked the beginning of the 'conceptualization' phase with Argyris and Schön's (1978) action-based theory of how organizations learn, which perhaps could be credited as the first comprehensive approach to building a theory of learning at the organizational level.[1] Argyris and Schön's efforts were soon followed up by Hedberg (1981), who analysed the processes of learning and unlearning, and by Shrivastava (1983), who proposed a typology of OL systems on dimensions of who learns (individual or organization) and how learning systems are designed (evolutionary or designed). For Hedberg *et al*. (1976), and Morgan and Ramirez (1983), learning was organizing itself in a holistic and holographic manner respectively. Shrivastava and Schneider (1984) focused on the cognitive aspects of learning new frames of reference to interpret action–outcome relationships, similar to Simon's (1991) problem representation. Duncan and Weiss (1979) evaluated organizational designs conducive for learning under different environments and Fiol and Lyles (1985) differentiated learning from adaptation and mapped OL on cognitive versus behavioural dimensions.

Meanwhile some others looked at OL as processes of knowledge creation, management and transfer (Crossan *et al*., 1993; Duncan and Weiss, 1979; Nonaka, 1991, and 1994; Sackmann, 1992), an approach that is currently the dominant one (*California Management Review*, 1998). Nonaka (1994) conceptualized four combinations of 'tacit–explicit' knowledge creation in organizations: socialization (tacit–tacit), externalization (tacit–explicit), internalization (explicit–tacit) and combination (explicit–explicit). Knowledge is created when tacit learning by members is articulated for organization-wide sharing, and OL takes place when the interpretation and insights generated are internalized and practised, and stored in organization memory for future retrieval and use. The concept of organi-

zational memory itself has been attracting research attention (Huber, 1991; Roth and Kleiner, 1998; Walsh and Ungson, 1991).

Importantly, we find that two basic issues of OL have been hotly debated and discussed in this phase. The first is the question of whether organizations can learn at all (Cohen and Sproull, 1991). As Weick (1991 p. 119) attempts to answer, the confusion still persists:

> Perhaps organizations are not built to learn. Instead, they are patterns of means-ends relations deliberately designed to make the same routine response to different stimuli, a pattern that is antithetical to learning in the traditional sense. Organizations are fixed tools in search of new problems, and learning is a relatively minor part of this search. Or, perhaps organizations are built to learn, but they do so in novel ways.

However, considering that organizations are consciously coordinated activity of two or more people (Barnard, 1966), they are purposive in their actions. As rational and goal-oriented systems (Cyert and March, 1963; March and Simon, 1958), as interpretation (Daft and Weick, 1984) and information-processing systems (Tushman and Nadler, 1978), as bodies of thought and sets of thinking practices (Weick, 1979), and as cognitive systems with memories (Hedberg, 1981), possessing self-renewing capacity (Nonaka, 1991), there seems to be general consensus among theorists that organizations can undertake learning activities with deliberate intentions. de Geus's (1988) illustration of how Dutch Shell undertook planned learning activities with successful outcome is a case in point.

The second issue has been 'definitional'. Though there exists consensus that it is individual members in the organization who actually learn, and that individual learning is not the same as OL (Argyris and Schön, 1978; Dodgson, 1993; Hedberg, 1981; Kim, 1993), when and how exactly individual learning becomes OL still remains a grey, if not dark area. Effectiveness of any learning activity depends on how well the organization is able to link individual learning to OL (Glynn, 1996; Hayes and Allinson, 1998;

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[1]A recent article addresses Argyris as the 'father of organizational learning' (Fulmer and Keys, 1998).

Salner, 1999). Nonaka (1991) points out that successful Japanese organizations achieve this through effective management of information technology, and symbols and language, thus acknowledging the important role of organizational culture in facilitating OL (*Administrative Science Quarterly*, 1983; Peters and Waterman, 1982; Schein, 1993; Senge, 1990).

Related to this definitional issue has been the distinction between 'cognitive' versus 'behavioural' learning (Fiol and Lyles, 1985; Leroy and Ramanantsoa, 1997). Cognitive learning is said to have taken place when organization develops a shared understanding or awareness of the problem, context or situation, and knows what action plans may be feasible and appropriate, but has not acted. When action takes place, or when learning is manifested in appropriate behavioural response(s), behavioural learning is said to have taken place. The question is, 'Can we consider an organization to have learnt if it has learnt cognitively but has not exhibited it behaviourally?'

Another interesting area of attention in this phase has been on how individuals, groups and organizations deal with ill-structured decision situations such as a severe crisis (Hutchins, 1991; Weick and Roberts, 1993; Simon and Associates, 1992). These are situations where organizations don't have any pre-designed solutions or ordered action plans. Studies such as that of Hutchins (1991) show that the solution unfolds, partly by design but more by evolution, through progressive sense making of the problem as well as social reorganizing that happens in the process. As Hutchins (1991, p.38) puts it, the solution is 'discovered in the organization itself' before it is 'discovered by any of the participants'. Once the solution evolves in this manner in the first experience, then the organization has to appropriately capture and review it, make required modifications, and record it for future retrieval and use.

Towards the latter half of 1980s, attention turned towards developing tools, techniques, systems, approaches and processes that enable organizations to build learning capabilities. In other words, the 'action' elements to build learning organizations became the focus.

## *Action* Phase (Since mid-1980s)

Since the mid-1980s we find an increase in studies that focus on practical aspects of facilitating learning in organizations and building learning organizations (e.g., Beer and Eisenstat, 1996; Senge, 1990, 1992). Studies deal with aspects such as the nature and type of learning systems and processes needed and/or existing in organizations (Argyris, 1993; de Geus, 1988; March, 1991; Shrivastava, 1983), learning barriers and disorders in organizations (Bain, 1998; Snyder and Cummings, 1998), the role of leadership, experimentation, mistakes, failures, risk taking and innovation for learning (Cleese, 1988; Farnham, 1994; March, 1981, 1988), and how learning enhances organizational effectiveness (Anderson *et al.*, 1994; Sitkin *et al.*, 1994) and competitive advantage (Bogner and Thomas, 1999; Cahill, 1998; Fulmer *et al.*, 1998; Lei *et al.*, 1999).

Attention has also been on developing training tools and approaches, and managerial coaching strategies to prepare and equip organization members collectively for learning (e.g., Argyris, 1991; Ellinger and Bostrom, 1999; Kofman and Senge, 1993). Approaches and tools such as scenario planning (Bood and Postma, 1997; de Geus, 1988; Guttman, 1993; Wack 1985a; Wack, 1985b), interactive computer-simulated environments which present real problem situations called 'micro-worlds' (Brehmer and Dörner, 1993; Fulmer, 1993; Guttman, 1993; Senge, 1990), system dynamics and systems thinking (Senge, 1990; Senge and Fulmer, 1993; Sterman, 2000), dialogue (Hodgetts *et al.*, 1993; Isaacs, 1993; Schein, 1993; Senge, 1990), and 'process lab' techniques (Schein, 1993) are among them. March *et al*. (1991) elaborate on approaches such as 'experiencing history richly' and 'creating near histories' for learning from events that occur very rarely or have to be prevented from happening, like a nuclear disaster or air crash (see also Carroll, 1998).

Another area of attention in this phase has been on the critical role of teams in facilitating OL (Berggren, 1994; Cole, 1985; Kets De Vries, 1999; Maani and Benton, 1999; Peters, 1992; Sashkin and Franklin, 1993; Senge, 1990). Teams

with members possessing complementary skills, sharing leadership roles, engaged in active problem solving through dialogue and discussion, and producing collective outputs (Katzenbach and Smith, 1993), play significant roles in present-day organizational functioning. Senge (1990) counts 'team learning' as one of the five 'core disciplines' characteristic of a learning organization. It would be an interesting idea and an effective proposition to design a learning organization as a team of teams, which is now possible with the use of information technology.

Like teams, the crucial role of leadership in fostering learning has been another area of focus. The leader provides a vision as well as is a designer of policies, systems, climate and processes to foster learning (Coad and Berry, 1998; Kotter, 1990; Lenz, 1993; Senge, 1990; Stata, 1989). Nonaka (1991) observed that Japanese organizations managed their learning through managing symbols, slogans and language that Pfeffer (1981) calls the symbolic function of leadership. Experimentation, innovation and calculated risk taking, are the hallmark of any learning agenda (Campbell, 1969; Cleese, 1988; Drucker, 1992; Hedberg *et al.*, 1976; Sitkin, 1992), and the role of leadership is crucial here. Leaders need to be courageous and far-sighted enough to protect their creative members against repercussions of failure, extend visible support, enable career mobility and provide publicity (Sitkin, 1992). They also need to accommodate these members with their 'queer' behaviour, recognize their 'sensible foolishness' (March, 1981, 1988), and reward and direct them and provide feedback. It has also been opined that leaders who are creative persons themselves may be required to nurture creativity and experimentation (Farnham, 1994), and thus facilitate OL.

Attempts have also been made to measure OL during this phase (Garvin, 1993). Stata (1989) proposed the 'half-life' measure—time taken by the organization to reduce its 'erring' performance on any dimension to half as much. Benchmarking organizational practices and ways of transferring best practices have also been gaining research attention (Kogut, 1991; Berggren, 1994). Sector- and context-specific attention to OL is also evident, such as in health

care (e.g., Cathon, 2000; Davidhizar and Bechtel, 2000), in strategic alliances, inter-organizational networks and international joint ventures (Barkema *et al.*, 1997; Hanssen-Bauer and Snow, 1996; Inkpen, 1998; Liebeskind, Oliver, Zucker and Brewer, 1996; Powell *et al.*, 1996; Shenkar and Li, 1999; Simonin, 1997), in corporate diversification (Pennings *et al.*, 1994), and in geographical contexts such as Eastern Europe (Czegledy, 1996).

Thus we see that since the mid-1980s the focus has been heavily on the action elements, with the intention of building OL capabilities in organizations to derive and sustain competitiveness. Writings contributing to the action phase are continuing vigorously. Simultaneously, research and writings contributing to progress function stream as well as to the problem and conceptualization phases are also appearing. I summarize the above discussion in Table 1.

## Organizational Theoretical Underpinnings

A closer look at the above discussion reveals that the various approaches to understanding OL follows the progress in conceptualization about organizations itself (Table 1, last column). For instance, the 'progress function' approach has been overly concerned with task productivity and efficiency, which are central to Taylorism and bureaucracy. In the second stream of literature, the 'problem' phase is dominated by concern for adaptation to achieve 'organization–environment' fit through suitable problem-solving and decision-making processes, a direct derivation from contingency and decision-making theories. Systems theory finds application in the sense that organizations are conceptualized as open, rational systems, capable of maintaining internal differentiation through 'input–through-put–output' processes (Pondy and Mitroff, 1979). Attention to routine-based learning has bureaucratic underpinnings.

As we move to the 'conceptualization' phase, systems theory again applies, albeit in a different manner. Organizations are now conceptualized as collective human systems capable of higher-order functions. They are capable of processing information leading to sense making,

Table 1. Summary of organizational learning literature

| Basic themes of attention in literature | Some contributors | Influencing organization theory |
|---|---|---|
| **Stream 1: Organizational learning as 'progress function'** | | |
| ● Increased productivity | Wright (1936) | ● Scientific management (Taylorism) |
| ● Cost control | Levy (1965); Abernathy and Wayne (1974); | ● Bureaucracy |
| ● Price competitiveness | Hirschman (1964); Bodde (1976); | |
| ● Enhanced organizational efficiency | Yelle (1979); Dutton and Thomas (1984); | |
| ● Learning / experience transfer across contexts | Argote et al. (1990), Epple et al. (1991); Hatch and Mowery (1998); Mazzola et al. (1998) | |
| **Stream 2. Organizational learning for adaptation and growth and development and sustenance of competitiveness** | | |
| *Problem Phase* | Simon (1953); March and Simon (1958); | ● Contingency theory |
| ● Adaptation to environment | Cyert and March (1963); Cangelosi and Dill (1965); | ● Systems theory: |
| ● Goal setting, attention to 'action–outcome(s)', search, decision making and problem solving | Levitt and March (1988); March and Olsen (1988); Herriott et al. (1988) | ● Organizations as open, rational, adaptive, decision-making systems |
| ● Routine-based learning | | ● Bureaucracy |
| *Conceptualization Phase* | Hedberg et al. (1976) | ● Contingency theory |
| ● Definitional issues | Argyris and Schön (1978); | ● Systems theory: |
| ● Types of learning | Duncan and Weiss, (1979), Jelinek (1979); | ● Organization as open, rational, adaptive, decision-making systems |
| ● Individual and organizational learning linkages | Hedberg (1981); Shrivastava (1983); | ● Systems theory: |
| ● Learning systems and processes | Fiol and Lyles (1985); Senge (1990); | ● Organizations as cultural, interpretation, information processing, cognitive, learning systems |
| ● Learning culture | Huber (1991); Hutchins (1991): | |
| ● Role of reflection/introspection | Walsh and Ungson (1991); Kim (1993); | |
| ● Unlearning | Weick and Roberts (1993); | |
| ● Organizational memory | Nonaka (1991); Nonaka (1994) | |
| ● Collective mind | Glynn (1996); Argyris and Schoön (1996); | |
| ● Learning as knowledge creation | Leroy and Ramanantsoa (1997); | |
| ● Sustaining competitive advantage | Hayes and Allinson (1998) | |
| ● Developing basic human potential | | |

*Action Phase*
- Build learning systems and processes
- Training tools for fostering learning
- Team learning
- Leadership role
- Dialogue
- Sustaining competitive advantage
- Measuring learning capabilities
- Coaching/training strategies
- Experimentation, failures, etc.

Wack (1985a, 1985b); de Geus (1988); Stata (1989); Senge (1990); March (1991); March et al. (1991); Nonaka (1991); Argyris (1993); Garvin (1993); Isaacs (1993); Schein (1993); Pennings et al. (1994); Hanssen-Bauer and Snow (1996); Beer and Eisenstat (1996); Bood and Postma (1997); Coad and Berry (1998); Lei et al. (1999); Maani and Benton (1999); Ellinger and Bostrom (1999)

*Evaluation Phase*
- Stocktaking of learning activities, systems and processes
- Reviewing basic assumptions, definitions, and other conceptual issues and foundations of OL
- Evolution of new terminologies, theories, paradigms, etc.

Miner and Mezias (1996); Easterby-Smith (1997); Tsang (1997); Crossan et al. (1999)

abstraction, symbolic representation, idea generation, and development of shared frames of reference, thus possessing the potential for generating complex 'stimulus–response' patterns to guide their actions towards survival as well as sustaining competitiveness.

## ORGANIZATIONAL LEARNING SYSTEMS AND BOULDING'S HIERARCHY

Based on the presentation thus far, in this section I demonstrate that the understanding of OL from learning as adaptation to information processing and knowledge creation systems, capable of generating a wide range of response patterns in complex and uncertain environments, exhibits an underlying link of gradually increasing complexity. Interestingly, this progression resembles Boulding's (1968; cited in Pondy and Mitroff, 1979) arrangement of systems along the complexity dimension in a hierarchy of nine levels (Table 2).

Boulding's Level 1 represents static, structural frameworks. In terms of OL, this could mean the formalized rules and regulations, or 'routines' (Herriott *et al*., 1988; Levitt and March, 1988; March and Olsen, 1988), developed in organizations out of repeated experiences and which are

replicable in similar situations in the future. It could also mean mere structural modifications, for instance of adding a market research or corporate planning department as a solution to various organizational problems or demands from stakeholders, and transferring the burden of learning to them without emphasizing the required learning processes.

Boulding's Levels 2–5 characterize properties of adaptation systems. 'Clockworks' at Level 2 could correspond to the learning that occurs in a customary, periodic manner such as the instructions, information, knowledge, etc. that reach organization members through regular memos, circulars, letters, appraisals or reports. It could also represent learning from periodic planning and review meetings that are routine in organizations. Argyris and Schön's (1978) single loop learning system corresponds to Boulding's Level 3 (control systems) as well as Level 4 (open systems). Single loop learning occurs when the organization takes feedback on the outcomes of its earlier actions and maintains or modifies further action based on it. Single loop OL systems at Level 3 will respond only in a programmed manner, like a thermostat, with limited responses and within a specified response range. However, when the organization possesses capability to reconfigure its internal processes as

*Table 2.   Boulding's hierarchy of system complexity*

| Level | Legend | Description |
|---|---|---|
| Level 1 | Frameworks | Represents only static, structural properties |
| Level 2 | Clockworks | Non-contingent, time-dependent, dynamic properties (e.g., diffusion of innovation) |
| Level 3 | Control systems | Regulated system based on external criteria (e.g., thermostats) |
| Level 4 | Open systems | Internally differentiated input–throughput–output system |
| Level 5 | Blueprinted growth systems | Rule-based generative mechanism |
| Level 6 | Internal image systems | Detailed awareness of the environment acquired and organized into knowledge structure or image |
| Level 7 | Symbol processing system | Capable of generalizing, abstracting information into ideas and symbols |
| Level 8 | Multi-cephalous systems | Systems with elaborate shared systems of meaning—social organization |
| Level 9 | System of unspecified complexity | System possible in future |

Summarized from Pondy RL, Mitroff II. 1979. Beyond open systems models of organization. In *Research in Organizational Behavior*, JAI Press: Vol. 1, Staw BM (ed.). Greenwich, CT; 6–10.

well as its relationship with the environment based on feedback and come up with appropriate responses, it is acting as an 'open system' (at Level 4). Here the organization displays 'organic' characteristics (Burns and Stalker, 1961). Boulding's Level 5 is a blueprinted growth system that possesses the ability to regenerate itself based on certain rules. In OL terms, this indicates the ability of the organization to replicate its learning, partially or holistically, as in a new shift or in an entirely new plant (e.g., Argote *et al.*, 1990; Epple *et al.*, 1991; Tsang, 1999). In a deeper sense, this also means the capability of the organization to replicate itself, in required parts or in full.

Complexity deepens from Boulding's Level 6 onwards. Ability to generate awareness through organization of knowledge, abstraction of meaning and their representation as ideas, symbols and elaborate systems of shared meaning characterize these higher-level systems. Multi-cephalous systems at Level 8 possess the capability of organizing through collective action and shared meaning creation. This is noticeable in Hutchins' (1991) description of the ways in which the navigation team of a ship made sense of their crisis, a sudden failure of the ship's propulsion as well as navigation systems, and gradually evolved a successful solution. While solution to the crisis defied any prior designs mastered by the navigators, and while no single member of the team had the 'whole' solution in mind, collectively they arrived at a successful solution. Argyris and Schön's (1978) double loop learning systems where organization members introspect and reflect on their 'action–outcomes', abstract meanings from experience, evolve collective cognizance of 'stimulus–response' patterns, and question shared mental models to enable effective response generation also fall anywhere between Levels 6 and 8. Finally, Level 9 systems of unspecified complexity leave room for those OL systems possible in the future.

Thus we find that Boulding's conceptualization of systems on the complexity dimension holds association with the way in which understanding of OL and conceptualization of learning systems have progressed. Based on this discussion, the following propositions are put forward:

- *Proposition 1:* Organizational learning systems can be classified and ordered based on Boulding's conceptualization of systems on the complexity dimension.
- *Proposition 2*: Organizations proceed from less complex to more complex learning systems. The presence of a higher-level learning system implies that either the lower-level systems are present or that it incorporates their learning functions.
- *Proposition 3*: The higher the complexity of the OL system, the higher is the organization's learning capability.
- *Proposition 4*: The higher the complexity of the OL system, the higher is the creative potential of the organization.

However, a note of caution is necessary here. Propositions 3 and 4 suggest a positive, linear relationship between complexity of learning systems and OL capabilities. However, with increasing complexity, managing complexity effectively could become a serious concern. High degree of complexity can lead to conflicts, loss of direction, and people and interests pulling in multiple and opposing directions, leading to decline in organizational effectiveness even when higher learning potential exists. Hence, for OL capabilities to be transformed into organizational effectiveness, complexity of the learning systems needs to be effectively managed. Otherwise, with increasing complexity of OL systems, actual OL achieved and organizational effectiveness derived will most likely follow an 'inverted U' relationship.

In the above discussion, based on the review of some OL literature presented in the previous sections, I have endeavoured to identify the existence of a 'developmental sequence' (Jelinek, 1979, p. 142) in the understanding of OL and of OL systems, linked by a common thread of increasing complexity. Interestingly, this has resemblance to the hierarchy of learning systems proposed by Jelinek (1979, p. 133), the connecting link between levels in this hierarchy being 'progressively more inclusive frames of reference':

The systems deal with progressively more complex, abstract and generalized situations.

At the lower end of this spectrum, the focus is upon replication of concrete, specific actions. Once this is achieved, however, more inclusive coordination becomes possible; and, rather than specifying the *content*, higher-level systems focus upon *process*. At the higher end of the spectrum, it is suggested, the systems constitute rules for impounding new responses, for assessing and analyzing new situations. In this, they are qualitatively different from lower-level systems, which codify specific actions or limited ranges of response to pre-defined situations.

## DISCUSSION

This review sought to comprehend how different organizational theorists and others approached OL over time. Two distinct streams of inquiry have been identified—one based on learning or experience effect termed 'progress function', and the other rooted in processes of organizational adaptation and growth, and development and sustenance of competitiveness. Progress function research focused on improvements in various organizational action domains like manufacturing, cost control, decision making and planning, based on cumulative performance or output. Since this approach concentrated mostly on domain-specific progress, leaving out system-wide processes and complex systemic interactions, and was overly guided by 'output' concerns, it has not been able to explain learning in organizations in a holistic manner.

The second stream approached OL as facilitating processes of organizational adaptation and growth, and development and sustenance of competitiveness. It presents three distinct phases. In the initial phase (beginning in the 1960s), learning was considered as 'adaptation' through goal setting, identifying discrepancies in action-outcome relations, and problem solving through search and decision making. Attempts to conceptualize the phenomenon were undertaken in the second phase, beginning in the mid-1970s. OL was conceptualized as a system-wide phenomenon where organizational processes, structure, systems, norms, belief patterns, tacit mental models, etc. played crucial roles. In the third phase (since the 1980s), attention shifted towards action—developing OL potential in terms of member capability, learning systems and culture, processes like training, leadership, dialogue, conflict resolution, etc., and organizational designs most effective for fostering learning.

This review reveals that organization theorists now have a system-wide, holistic concept about OL. Some theoretical bases also exist. However, Shrivastava's (1983) observation that research and understanding of OL being in a state of having no rigorous theories but only interesting conceptualizations appears to be still largely valid. Though the focus is now on practical aspects like developing learning systems, processes and tools, a firm theoretical base for OL is still eluding researchers, and hence is of concern. There is also an alarming shortage of empirical investigations that could lead to rigorous modelling and theory building.

The discussion in this article presents some directions for research. First, exploring the mental models and assumptions of managers about what *organization* and *organizing* means to them can be a pointer to the kind of OL systems that they will create and maintain active in their organizations. Managers develop a mental picture of desired future state(s) of the organization which in turn may guide their strategies, decisions and behaviour (Shrivastava, 1983), and determine their attention pattern to different stimuli (Walsh, 1988). Their orientation, tacit assumptions and belief structures exert decisive influence on their style of functioning, and the nature and effectiveness of systems and processes built and maintained active in their organizations (Gioia and Sims, 1986). Hence, the kind of OL systems that managers create (or don't create) and sustain (or discard) could depend on the implicit assumptions and mental models of what organization and organizing really mean to them. Thus, for instance, managers with Taylorian principles guiding their behaviour may be thinking more of task- or domain-specific progress, based on a learning curve. A bureaucratically oriented manager is likely to develop rule- and routine-based learning systems.

Similarly, managers who consider organizations as thinking and creative systems are likely to emphasize experimentation and creativity, and facilitate questioning of established organizational beliefs, assumptions and practices, and develop learning systems and processes, such as the double loop.

Second, arranging learning systems in a hierarchy on the complexity dimension serves as a basis for their classification, and classification is one form of theory building. It enables organization researchers to gain a deeper understanding of the principles, design, functioning, deficiencies and effectiveness of these systems at various levels. As Jelinek (1979, p.142) wrote:

> What is the utility of defining so exhaustive a hierarchy? The distinctions facilitate a more precise discussion of organizational learning (as opposed to individual learning), and of organizational learning (as opposed to mere adaptation). Each level distinguishes a more far-reaching and thoroughgoing kind of change, with wider impact and longer-range consequences. Finally, this is a developmental sequence. Later levels rest upon the conceptual foundation of earlier levels.. . . .

Specifically, classification of learning systems can serve two purposes: for defining OL and for measuring OL. We have seen that one of the fundamental questions addressed in OL literature has been whether organizations can learn. One way of answering this question is by measuring OL. Conceptualization of OL systems on the complexity dimension could help in systematic development and establishment of dimensions and measurement systems corresponding to each level. In a related vein, this classification can also help evolve suitable conceptual and operational definitions of OL, which in turn could lead to a number of research questions.

For instance, in an abstract manner towards the higher end of complexity, OL can be defined as the development of shared cognitive maps in which organization members can continuously represent new, complex and ill-structured problems for effective response generation. This definition leads to a number of research ques-

tions, such as, (a) how are shared cognitive maps created among organization members, (b) can their existence be established, (c) can they be elicited, and if yes, how, (d) what kind of aggregation of individual maps leads to shared maps that indicate meaningful OL, and (e) do cognitive maps actually guide sense making, problem interpretation and response generation in complex, uncertain and evolving situations? Similarly, there could be appropriate definitions of OL and related questions and areas of inquiry corresponding to each level in the classification.

Third, this review reveals an alarming shortage of empirical investigations that could lead to rigorous modelling and theory building, and which in turn could guide managers and consultants to facilitate learning in organizations. Causal models capable of explaining the extent and nature of influence of individual, organizational, contextual and environmental variables that facilitate or impede learning need to be developed. OL, being itself a process, can best be understood through longitudinal process studies. They could provide insights into the actual processes through which organizations learn, unlearn or don't learn, and reveal learning deficiencies.

Finally for managers in organizations, the hierarchical classification can serve as an indicator to judge where their organizations stand in terms of the learning capabilities of their OL systems. As elaborated earlier, the orientation of managers and its influence on the design and functioning of learning systems and processes may explain why higher-order learning systems may not be existing or effective in some organizations. There could be incongruence between the orientations and preferences of their managers and the underlying learning principles of these systems. Thus managers can design systems suitable for their organizations, or attempt changes in orientations, personal and organizational, to implement higher-level learning systems. Classification of learning systems also enables managers to develop appropriate measures of learning.

The question that now arises is: What is the future of learning as an organizational-level phenomenon and construct? After the

'problem–conceptualization–action' phases of learning literature, the next phase could be 'evaluation' (Table 1), signs of which are already evident (e.g., Crossan *et al.*, 1999; Easterby-Smith, 1997; Miner and Mezias, 1996; Tsang, 1997). That would include thorough introspection and questioning on the state of the field, examination of effectiveness of learning systems and practices implemented, revisits to basic assumptions and definitional issues about learning, and probably even an inquiry into this very process of evaluation itself. These would be in perfect tune with double loop and deutero learning! A paradigm shift towards new conceptualizations and/or new terminology could emerge from the evaluation. Simultaneously, the urgent need of the hour is rigorous theory building through sound empirical investigations that also help practitioners in creating effective learning systems in their organizations.

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