Summary of: Experiential Learning Processes of Exploitation and Exploration Within and Between Organizations: An Empirical Study of Product Development

In this article, two standard and valuable ideas that are implicit and explicit in much contemporary conversation about organizational learning are examined. First, the idea that organizational learning involves dynamics of exploitation, i.e., processes by which organizations create reliability in experience through refinement, production, and focused attention (Levinthal and March 1993), and of exploration, i.e., processes by which organizations create variety in experience through experimentation, trialing, and free association (Marengo 1993). The second idea examined is that organizational learning is a multilevel phenomenon, involving dynamics of both intraorganizational learning, i.e., the learning that takes place within companies, government agencies, universities, hospitals, and other formal organizations (Argote and Ophir 2002), and interorganizational learning, i.e., the collective learning of organizations in formal interorganizational collaborations such as strategic alliances and networks (Larsson et al. 1998).

Reasons for examining dynamics of exploitation and exploration:
First, exploitation and exploration are crucial both to the stable ongoing operations of organizations and to organizational change (Crossan et al. 1999). Second, intraorganizational learning provides much of the experiential knowledge input that may be transferred between organizations as they collectively learn in networks, strategic alliances, and other forms of interorganizational collaborations (Powell et al. 1996). Third, the transfer and creation of knowledge between organizations provide additional input to the intraorganizational learning of the various collaborating partners (Oliver 2001). Fourth, the common tendency for modern organizations to extend their boundaries (Cooper and Rousseau 1999) suggests that “understanding the relation between experiential learning and routines, strategies, or technologies in organizations will require attention to organizational networks _ _ _ as well as to the experience of the individual organization” (March 1999, p. 86).

An organizational learning framework
Def: Organizational learning is the experiential production and reproduction of organizational rules, leading to behavioral stability or behavioral changes (Kieser et al.2001, Levitt and March 1988).

Because organizational rules reflect previous experiential learning (Hedberg 1981), learning is accordingly not random or blind, but directed.
Learning competence means that organizations become better at things they do repeatedly and successfully and that they become less competent at things they do infrequently and unsuccessfully. This self-reinforcing character of learning makes an organization prone to sustain its current focus, creating loops whereby a stable behavior is reproduced. Students of organizations have maintained that such “lock-in through learning” (Arthur 1989) and “competence traps” (Levitt and March 1988) are the cause of much inability to achieve organizational change.

Dissatisfaction with exploitation, due to excessive refinement and elaboration of experiences, may trigger opening-up learning when performance is below aspiration levels, as, for example, in the case of an organization that is generating obsolescence and thus needs to open up to alternative sources of experience. In the case of focusing learning, excessive exploration may lead organizational players to experience dissatisfaction when, for example, few returns on the organization’s knowledge are generated and focused attention to experiences therefore is needed.

The interplay of exploitation and exploration takes place both within and between organizations. Intraorganizational learning processes are concerned with the learning of single formal organizations—for example, the learning that takes place when groups, departments, and teams share experiences and jointly learn exploitative organizational rules of refinement and focused attention and explorative rules of experimenting and trialing (Argote and Ophir 2002, Edmondson 1999).

Interorganizational learning processes are concerned with the collective learning from experience, in the form of interorganizational rules of exploitation and exploration, achieved by formal organizations collaborating in strategic alliances and other interorganizational collaborations (Lane and Lubatkin 1998, Larsson et al. 1998).

Analogous to the traditional separation of individual and organizational levels of learning (e.g., Maier et al. 2001), interorganizational interactions constitute a unique learning entity in their own right, and one that is partly separated from the intraorganizational learning level (Zollo et al. 2002). Putnam (1988) described the relationship between such intra- and interorganizational processes as a “two-level game.” He argued that powerful dynamics occur within each level, but not necessarily between them.

Intraorganizational learning that generates interorganizational learning may be referred to as extension, a process whereby one organization extends its experience to others, for example, in a formal strategic alliance (Hamel 1991).

The goal is thus not just to exploit another organization’s experiences, but also to produce new experiences jointly with the other organization.

Interorganizational learning that generates intraorganizational learning can be termed internalization, which is accomplished by an organization internalizing experiences as retrieved in interorganizational rules (Larsson et al. 1998).
Through strategic alliances, single organizations may explore their experiences by collaborating with other organizations that are different enough to create variety in their experiences.

Thoughts: You don’t see yourself in the mirror, you see yourself through others!

*Opening-up extension* refers to intraorganizational exploitation that generates interorganizational exploration.

*Focusing internalization* is concerned with processes where interorganizational exploration generates intraorganizational exploitation.

*Opening-up internalization* refers to interorganizational exploitation that generates intraorganizational exploration, and operates according to the same mechanisms as are described above (cf. Larsson et al. 1998).

*Focusing extension* is about intraorganizational exploration generating interorganizational exploitation (cf. Hamel 1991).

**The research – Scandinavian PC Systems:**

**Opening-Up Extension**

**They came from**
This “ordinary” approach had been a core rule of Scandinavian PC Systems that had been successfully exploited over the years, whereby the company continuously refined its ability to produce products for ordinary business users.

**What happened**
With time, however, the company began to find that this behavior was no longer as effective as it once had been. According to the manager of the development department, Scandinavian PC Systems had encountered problems in expanding its sales. The company’s simple and easy-to-use programs no longer seemed as well suited to the needs of its customers as they had been previously. In various ways, for example through telephone calls and e-mails to the company or simply by choosing the products of its main competitor Hogia instead, customers communicated that they required more sophisticated products to manage increasingly complex administrative operations.

**What they did**
This feedback, conveyed to the company through continuous customer interaction, made the company dissatisfied with its present approach and ready to consider entering new market domains. In so doing, it initiated an alliance with one of Sweden’s major auditing firms at that time, KPMG, which Scandinavian PC Systems believed possessed valuable experience as many of its customers were also customers of KPMG. As the Chief Executive Officer of Scandinavian PC Systems put it in the company magazine: “This cooperation will give us new knowledge, which all our customers will benefit from” (*Scandinavian PC Systems* 1997a, p. 7), thus addressing customers’ concerns. After a contract had been signed with KPMG, a phase of intense bargaining with two of Scandinavian PC Systems’ other partners (P-Data and Jan-Erik Persson Råd) and KPMG followed. During this process, different experiences were ventilated and discussed that enabled the parties to create some variety in their experience by translating their individual languages into a joint understanding.
By combining their experiences in ways they were unable to do by their individual efforts alone, the parties eventually managed to produce some new and innovative ideas that were retrieved as particular interorganizational experiences in the form of collective rules for behavior.

Interorganizational exploration thus occurred on the basis of the collaborating parties’ intraorganizationally exploited experiences.

**Focus Internalization**

Most of Scandinavian PC System’s interaction with its partners was directly related to product-development activities, and highly explorative “brainstorming” meetings between Scandinavian PC Systems and partners initiated most of the joint product-development projects.

These meetings between Scandinavian PC Systems and its partners often forced the parties to reflect on their own taken-for-granted assumptions, thus contributing to interorganizational exploration.

In sum, the change in behavior from exploration to exploitation was triggered by a degree of dissatisfaction with explorative behavior. This experience created the basic conditions for focusing on certain activities that could eventually be exploited.

**Opening-Up Internalization**

Scandinavian PC Systems’ interorganization had learnt some behavior based on experience that was continuously reproduced and refined, making up some of the company’s interorganizational exploitation. This learning served as a useful template for many of the ongoing joint product-development activities, in that it generated homogeneity in the way a wide range of situations were experienced.

**Focus Extension**

Through past learning activities related to particular practices, the two departments had learnt their own intradepartmental rules for handling their daily work and had thus developed partly different understandings of how to experience customer feedback.

These particular rules create some intraorganizational heterogeneity when it comes to learning from experience. On the basis of each department’s unique experiences, this situation created much intraorganizational exploration in the shape of intense bargaining over how to experience customer feedback.

Thus, from an initial process of intraorganizational exploration between Scandinavian PC Systems’s departments, learning transformed into a process of joint exploitation with partners, focusing on particular customer experiences that should be applied in production. This latter process was the result of a translation of Scandinavian PC Systems’s experiences of market requirements into programming strategies and related procedures that could be jointly exploited.
**Dissatisfaction as a key learning**

The findings suggest that a key mechanism generating transformations between exploitation and exploration through opening-up or focusing is dissatisfaction with ongoing behavior of either an exploitative or an explorative kind.

Both behavioral stability and behavioral change appeared to stem from experiential learning, but they were generated by two different mechanisms.

In the first case, positive feedback between experience and competence prevailed; in the second, negative feedback between experience and competence prevailed.

In Scandinavian PC Systems’s process opened up from exploitation of “ordinary users’ needs” to an explorative phase of learning to appreciate other customers as well. Such challenges came from customers, who implicitly and explicitly suggested that new products were needed, and from the new partner KPMG, which was able to reframe some of Scandinavian PC Systems’s experiences. Likewise, it was Scandinavian PC Systems’s business partners that made the company aware that it had problems learning the correct lessons from customer experience, thus ending an essentially fruitless internal explorative behavior.

A distinct behavior could be rejected and challenged by organizational players identifying problems with the dominant rulelike approach. However, such challenges were only generated from a particular, already learnt behavior of either exploitation or exploration. It was these behaviors that were eventually perceived as problematic and that formed the basis for the dissatisfaction that was triggered by external players.

**Translation as a Key learning Mechanism**

Translation of intraorganizational rules into interorganizational rules, and vice versa, was needed if any behavioral changes in terms of exploitation and exploration were to follow.

In the interorganizational bargaining that ensued, each party had to articulate hunches and intuitions that typically stemmed from their tacit idiosyncratic ways of behaving and thus to translate them into the other party’s language. Likewise, Scandinavian PC Systems’s intraorganizational rules for addressing customers had to be translated into the language of its partners for them to be able to grasp Scandinavian PC Systems’s ambitions and thus change their behavior accordingly.

Scandinavian PC Systems and its partners had indeed improved their understanding of each other’s ideas, hunches, and intuitions through such “interlevel learning,” leading to significant behavioral changes.
Summary of: Inter-project learning: processes and outcomes of knowledge codification in project-based firms

A note on the codification debate

Two different assumptions
Information and knowledge are two different concepts

Dosi et al. consider information as “well stated and codified propositions about:

- States of the world
- Properties of nature
- Identities of other agents
- Explicit algorithms on how to do things

Knowledge is instead understood as including:

- Cognitive categories
- Codes of interpretations of the information itself
- Tacit skills
- Search and problem-solving heuristics irreducible to well-defined algorithms

Information is a symbolic code: a sign without meaning, whereas knowledge is meaning that can only be given by an observing system

Cowan and Foray (1997) defined the codification process as “The process of conversion of knowledge into messages that can be processed as information”.

Codified knowledge can be characterized as information-like and objectified.

When the codification process is done, codified knowledge can instruct machines, as is the case with computers, which then can substitute for people in certain situations. If followed accurately and precisely, codified knowledge, understood as rules, may instead imply rigidity. In the context of change, excess codification can stifle the development of new knowledge and inflict stability and inertia on systems.

Managing knowledge in project-based firms: a tentative framework

Zollo and Winter identified three learning processes, namely experience accumulation, knowledge articulation and knowledge codification.

They argued that the effectiveness of these processes depends on the characteristics of the tasks that the organization attempts to learn.
The frequency, heterogeneity and causal-ambiguity of the task render experience accumulation and knowledge articulation and codification more or less effective. The lower the frequency and the higher the heterogeneity of the task, the more effective are knowledge articulation and knowledge codification.

The distinction between the dimensions of outcome and process is fundamental to understanding the knowledge management strategies of project-based firms.

Knowledge codification is important because of the gains that can be made through new combinations of stocks of codified knowledge. Hence, incentive structures should be established, to encourage the codification of knowledge due to this outcome property.

**Experience accumulation**

Levitt and March argued that organization learning is target-oriented, is based on historical experience and stored in routines. As emphasized by Nelson and Winter, routines can be characterized by their tacit and programmatic nature. Such routines are an outcome of trial-and-error and reflect the accumulation of experiential wisdom. Experienced-based learning tends to be local, i.e. closely related to existing routines. Learning by doing and learning by using are based on experience from actions where actors either have difficulties in drawing or ignore inference causality.

Zollo and Winter: Experience accumulation and organizational routines are fundamental for firms’ capability development. First, the smooth functioning of routines creates the possibility for automatic behavior, which requires less attention and effort on behalf of the skilled worker. Second, organizational routines allow for efficient specialization and coordination.

Skilled labour that performs routinised activities can be partitioned using division of labour, hence giving rise to the benefits related to economics of specialization.

**Knowledge articulation**

Zollo and Winter: Articulation processes form a second important device of the cognitive dimensions of organisational learning process. Being able to articulate practical knowledge is an important facet of the reflective practitioner.

Zollo and Winter (2001) pointed out that articulation of knowledge performs two roles. First, it constitutes a context for justification (cf. Tell, 1997, 2000; Grand and Von Krogh, 2000). Second, it is a cognitive process that implies deliberation and carries the possibility that individuals and groups can come to grips with causality and feasibility in performing different tasks (cf. Nonaka and Takeuchi, 1995; Witt, 1998).

Zollo and Winter (2001) and Schön (1987) introduce a collective element of knowledge articulation. By dialogue and discussion knowledge can be articulated by organizational members and an arena can be created for double-loop learning (Argyris and Schön, 1978). Besides learning by reflecting and learning by thinking, the articulation process subsumes also learning by discussing and learning by confronting.
**Knowledge codification**

Codification (as an outcome) primarily serves the purpose of facilitating routine replication. The economic benefits of codification lie primarily in the re-use and diffusion of codified knowledge (*economics of information*).

Knowledge is dependent upon the cognitive abilities of actors and cannot be separated from the communication process through which it is exchanged.

Besides the substantial cognitive investment in the *learning by writing* and *re-writing* suggested by Zollo and Winter (2001), organizations *learn by implementing, replicating and adapting* codified knowledge.

Sense-making; sense-making processes become an explicit element of the learning processes involved when individuals and communities of individuals create representations which they can use to interpret and elaborate on experiences encountered (Choo, 1998).

**Project-to-project learning and learning landscapes: some empirical evidence**

![Diagram](image)

**The horizontal dimension** enables an assessment in relation to the identified learning processes (experience accumulation, knowledge articulation and knowledge codification) on which a firm focuses.

**The vertical dimension** enables an assessment of the approach that firms use to diffuse knowledge across projects and within the organisation. Firms may be more or less focused on the replication and diffusion of routines (or best practices) across the organisation.

**The analysis of the horizontal and vertical dimensions** combined enables the identification of what we have termed a firm’s *learning landscape* in relation to project-to-project learning. We
define a firm’s *learning landscape* as the mix of project-to-project learning mechanisms adopted and implemented.

Hansen et al. (1999) also argued that to use knowledge effectively, firms should focus on one dominant strategy and use the other in support of the dominant one.

**The research:**
Based on the empirical evidence gathered during our field study, we identified three main types of learning landscape (that is, the explorer or L-shaped landscape, the navigator or T-shaped landscape, and the exploiter or staircase landscape) and position them within the matrix.

**The explorer (L-shaped) landscape**
Firms that rely to a great extent on people-embedded knowledge are characterised by L-shaped landscapes. These firms emphasise experience accumulation processes and knowledge transfer through people-to-people communication, and are characterized by a strong and receptive culture. We class these firms as explorers, since we found that their relatively small size in combination with the features of their corporate culture, constitutes a strong enabling springboard from which to explore different routes to adopt and implement ‘project-to-project learning’ mechanisms based on knowledge articulation and codification processes.

**The navigator (T-shaped) landscape**
This landscape characterises firms that started implementing mechanisms for project-to-project learning based on a knowledge articulation process. Their focus was on the implementation and appreciation of these mechanisms not only at the individual and project levels but also, and mainly, at the organizational level. These firms navigate through a few evolving routes to improve their project-to-project learning that may become established at some point.

**The exploiter (Staircase) landscape**
Firms already involved in the advanced development of ICT-based tools to support their project-to-project learning are characterised by what we define the exploiter (or staircase) learning landscape. Their emphasis is on deliberate attempts to codify and store knowledge developed during the execution of a project and document it so that it becomes more easily accessible and exploitable for the rest of the organisation’s members. These firms are involved in the advanced development of ICT-based tools to transfer and exploit project knowledge.

**Discussion and conclusion**
Nelson and Winter (1982) suggested that a capability-based theory of the firm should scrutinize organisational routines. From an evolutionary perspective, such routines could be treated as the quasi-genetic traits of a firm, causing persistent differentials in firm behaviour and performance.

The literature on knowledge codification is characterized by a tendency to think that the costs of codification activities are justified by their outcomes rather than by the cognitive implications of the codification process as such (Zollo and Winter, 2001).

We defined a firm’s *learning landscape* as the mix of project-to-project learning mechanisms adopted and implemented. The concept of a learning landscape reflects the multidimensional nature of a firm’s approach to project-to-project learning.
We identified three main types of learning landscape, namely the explorer landscape (or L-shaped), the navigator landscape (or T-shaped), and the exploiter landscape (or staircase). Each of these learning landscapes is characterised by a different emphasis on specific inter-project learning mechanisms, which in turn are based on different learning processes (experience accumulation, knowledge articulation and knowledge codification), both at the individual and organisational levels.

**Result:** The results point to two interesting features concerning the learning dynamics of firms and the development of the firm’s organisational capabilities.

First, despite facing quite similar industry characteristics (for one thing they were all operating in so-called CoPS industries), we observed substantial variation with respect to the mechanisms used for the transfer of vital knowledge from project to project.

Second, notwithstanding the temporary and one-off nature of the tasks performed by project-based firms, these firms do develop a set of routines that define how to approach projects. The learning landscape as conceptualised in this paper represents an empirical example of the set of routines employed by project-based firms to manage inter-project learning.

These results also have a more pragmatic implication for managers, that is, a firm’s knowledge management strategy and the tools supporting it should be carefully selected and customised to the specific firm context.
Summary: The Myopia of Learning

The search for organizational intelligence
Strategic management is built on a search for organizational intelligence, an attempt to make actions lead to outcomes that are consistent with desires or conceptions of appropriateness.

Strategies for exploiting comparative advantage and competitive opportunities were built on a conception of calculated rationality

Learning from experience
Organizations and the individuals in them often improve their performance over repetitions of the same task

Learning has become a plausible mechanism substituting, or augmenting, calculative rationality in the pursuit of intelligent organizational action.

Learning from experience involves inferences from information. It involves memory. It involves pooling personal experience with knowledge gained from the experience of others.

Self-limiting properties of learning
Knowledge and the development of capabilities improve immediate performance, but they often simultaneously reduce incentives for and competence with new technologies or paradigms.

Two Mechanisms of Learning
Simplification – Learning processes seek to simplify experience, to minimize interactions and restrict effects to the spatial and temporal neighborhood of actions.

Specialization – Learning processes tend to focus attention and narrow competence.

Simplification and the construct of buffers
The relationship between the actions of individuals in the organization and overall organizational performance is confounded by simultaneous learning of other actors.

Disentangle the interactions introduced by multiple simultaneous learners - They can seek to generate enough experience so that they can fit relatively complicated models to the data. Alternatively, organizations can seek to control the effects of interactions by preventing multiple simultaneous adjustments.

Increasing the effectiveness of learning is to simplify natural experience by inhibiting learning in one part of an organization in order to make learning more effective in another part. Organizations seek to transform confusing, interactive environments into less confusing, less interactive ones by decomposing domains and treating the resulting subdomains as autonomous.

Decomposition and organizational structures
Departmentalization is, perhaps, the most basic mechanism to mitigate interaction effects in learning within a complex organization.
Less prominent in the normative literature on strategy and organization, but prominent in more descriptive accounts is the sequential allocation of attention to divergent goals. While the sequential allocation of attention is generally viewed as an outcome of goal conflict and bounded rationality, it also results in a simplification of experiments in organizational change.

Tightly coupled systems are relatively good for system-wide error detection, but they are relatively poor for error diagnostics. Loosely coupled systems make diagnostics easier but localize error detection, thereby making more general awareness of problems difficult.

**Decomposition and enactment**
Horizontal organization – is that it forces formerly buffered units of the organization to learn more about customer preferences. The argument is that standard organizational structures make an inappropriate decomposition of the problems of the organization.

The drawing of national boundaries or the departmentalization of organizations or the definition of markets creates self-confirming political, economic, technological, and social processes that convert relatively arbitrary units into real ones.

The reduction in knowledge leads to a reduction in salience. Ideas change about what is relevant and what is not.

**Specialization and the principle of learning substitution**
Assuming that the system avoids becoming unstable with simultaneous, interactive adaptations that confound all learning, the success of adaption by one part of a system has two major effects: It relieves pressure for adaption in another part. At the same time, adapting part of the system develops greater and greater adaptive competence relative to the part of the system that is not used. The two effects combine to produce specialization of learning competence.

**Multiple actors: Fast learners and slow learners**
In bounded rationality search models, an organization is seen as responding to success or failure by varying the intensity of search, the level of organizational slack, and the target (aspiration level) for performance (Cyert and March, 1992).

Success decreases search and increases slack and targets, while failure increases search and decreases slack and targets. Changes in search, slack, and targets function effectively as substitutes for each other.

**Multiple responses: Exit, voice and loyalty**
Hirschman's framework, participants who experience a decline in quality of organizational services or products have two possible responses: The first alternative is to exit from the unsatisfactory relationship and seek another. The second alternative is to try to fix the existing relationship.

**Multiple nested options**
Learning experience is nested. That is, learning occurs at several different but interrelated levels at the same time. An organization simultaneously learns which strategy to follow and how to operate within various alternative strategies (Herriott, Levinthal, and March, 1985).
A business firm learns which market to enter and how to function effectively in several alternative markets. When learning is nested, learning at one level is effectively a substitute for learning at another.

Learning at the operating level of an organization substitutes for learning at higher levels.

Lower-level adaptation is a sensible activity that tends to enhance an organization's position in its present environment. In the long run, however, such first-order learning cannot substitute for second-order learning of new routines and strategies.

**Problems of Myopia**

By simplifying experience and specializing adaptive responses, learning improves organizational performance, on average. However, the same mechanisms of learning that lead to the improvements also lead to limits to those improvements. In particular, we will note three forms of learning myopia:

The first form of myopia is the tendency to ignore the long run.

The second form of myopia is the tendency to ignore the larger picture.

The third form of myopia is the tendency to overlook failures.

**Overlooking distant times**

*Erosion of enactment*

Learning processes tend to enact environments that are sufficiently simple to permit inferences and incremental gains.

Learning creates a simplified world and specializes an organization to it. Such models are more likely to capture the central elements of past environments than the contingencies of current circumstances.

A strategic problem is created by the fact that the learning that yields a comparative advantage in one domain is likely to be rewarding in the short run, but it leads to a longer-run potential decay of adaptive capability in other domains.

*Traps of distinctive competence*

The differences in the frequency with which different activities are pursued translate into differences in the amount of experience at the various potential activities, which in turn translate into differences in competence.

Learners become increasingly removed from other bases of experience and knowledge and more vulnerable to change in their environments (David, 1985).

Since the degree to which firms or individuals learn about alternative opportunities is a function of their level of involvement in them (Cohen and Levinthal, forthcoming), knowledge about and use of old competencies inhibit efforts to change capabilities.

*Traps of power*

Organizational power is a short-run asset but potentially a long-run liability. Power allows an organization to change its environments rather than adapt to them.
In the long run, however, the use of power to impose environments is likely to result in atrophy of capabilities to respond to change.
Knowledge inventories and the problem of timing

The time between the anticipation of a problem and its arrival may not be adequate for an organization to identify and develop the knowledge, or accumulate the experience, required to respond effectively. As Dierickx and Cool (1989) suggest, there are time compression diseconomies in building organizational capabilities. As a result, organizations build inventories of competencies (Feldman, 1989).

Where situations or proper responses are numerous and shifting, it is harder to specify and realize optimal inventories of knowledge.

Knowledge that has clear, immediate uses is specialized to current technologies and markets.

Broader or deeper knowledge is less likely to have immediate pay-off but results in a greater ability to adapt to changes.

Organizations that have some competence in an emerging technological domain are better able to assess the potential importance of that domain and to evaluate possible investments in new knowledge in that domain (Cohen and Levinthal, 1990 and forthcoming).

Overlooking distant places

Selection among learners

Organizations that learn effectively become well-adapted to their environments, even as their environments become well-adapted to them.

Existing organizations are likely to die and be replaced by new organizations which will, in turn, become specialized to the new environment.

Knowledge diffusion

Research performs the dual role of both generating new knowledge and enhancing a firm's ability to absorb new knowledge generated by others.

As a result, organizations may find themselves in self-reinforcing spirals of knowledge-generating activity leading to high levels of organizational renewal and growth.

Overlooking failures

Confidence in control over outcomes leads to learning from expectations of consequences before the consequences are observed, and it leads to reinterpretation of results to make them more favorable (Bjorkman, 1989; March et al., 1991).

Confidence grows slowly in the early stages of refining competence, when there are relatively frequent failures. Confidence grows rapidly as learning produces increasing numbers of successes. Confidence is likely to become excessive when the experiential record of successes is a poor

Research on individual attributions of causality to events indicates that individuals are more likely to attribute their successes to ability and their failures to luck than they are to attribute their successes to luck and their failures to ability (Miller and Ross, 1975).
The exploitation/exploration balance
Organizations divide attention and other resources between two broad kinds of activities (March, 1991). They engage in exploration - the pursuit of new knowledge, of things that might come to be known.

The failure trap
Failure leads to search and change which leads to failure which leads to more search, and so on.

1. Most new ideas are bad ones, so most innovations are unrewarding.
2. The return from any particular innovation, technology, or reform is partly a function of an organization's experience with the new idea. Even successful innovations, when first introduced, are likely to perform poorly until experience has been accumulated in using them.
3. Aspirations adjust downward more slowly than they adjust upward and exhibit a consistent optimistic bias (Lant, 1992).

The success trap
Particularly with rapid rates of turnover of decision makers, the uncertain and distant returns associated with exploration are likely to have a high discount rate associated with them.

As a result, organizations discover the short-term virtue of local refinement and the folly of exploration (Levinthal and March, 1981). As they develop greater and greater competence at a particular activity, they engage in that activity more, thus further increasing competence and the opportunity cost of exploration.

The trap can be broken by rapid upward adjustment of aspirations or by false feedback as to the high value of exploration, but it forms a powerful consequence of learning processes.

Learning and competitive advantage
The first is that learning generally increases average performance.

The second feature of learning is that it generally increases reliability.

They use rules, procedures, and standard practices to ensure that the experiences of earlier individuals are transferred to newer members of the organization. This process of routinization is a powerful factor in converting collective experience into improved average performance. It is also a powerful influence on reliability and reduces the average amount of deviation from normative behavior as an individual or organization ages. Learning reduces variability.

The role of organization structure
The expected return is modest, and the most likely outcome is not exploratory behavior but a variety of uncoordinated exploitation. Organizations may also try to design structures that avoid excessive socialization of new members. In a socialization process, two things are happening at the same time:

1. The code of received knowledge is learning from the beliefs and practices of individuals.
2. Individuals are learning the code.
The role of beliefs
Studies of risk taking suggest there are two major ways in which beliefs affect risk taking. The first is by influencing risk preference, the propensity to engage in apparently risky behavior. The second is by influencing perceived risk, the estimates that decision makers make about the riskiness of the alternatives they consider.

When operating below the aspiration level, individuals seem to increase risk taking as they fall further below the target until they approach (and focus on) a survival point, when they become distinctly risk averse. Above the aspiration level, risk taking seems to rise slowly with success.

greater risk taking is associated with slower adaptation of aspiration levels and with slower improvement in performance. Slowly adjusting aspirations and performance allow performance and targets to diverge, tending on average to increase the taking of risky actions. On the other hand, where aspirations are tied to the performance of superior performers in a population, aspiration adjustment tends to make most actors fail and to take risks. In such a case, higher levels of risk taking are associated with those who learn slowly how to improve performance and learn rapidly to aspire for the performance of superior others (Lopes, 1987; March and Shapira, 1992).

Influencing perceived risk
Successful managers (and the journalists and folk-story artists who record their stories) tend to underestimate the risk they have experienced and the risk they currently face, and intentionally risk-averse decision makers may actually be risk seeking in behavior.

The role of internal selection
The learning consequence is that organizations systematically under-sample failure. High level managers are likely to anticipate a better world than they will experience, to assume that they are running fewer risks than they actually are, and to expect that they can control their destinies more than they actually can. In short, their past successes give executives an illusion of control (Langer, 1975). Their experience makes them confident in their ability to handle future events, leads them to believe strongly in their wisdom and insight (Einhorn and Hogarth, 1978).

Learning and strategic management
Strategic management is the art of dealing intelligently with three grand problems of decision making: 1. The problem of ignorance-uncertainty about the future and the past and the causal structure of the world. 2. The problem of conflict-multiple nested actors confronting multiple nested time perspectives with preferences and identities that are inconsistent across individuals and across time. 3. The problem of ambiguity-lack of clarity, instability, and endogeneity in preference and identities.

Designing organizations to learn from experience and to exploit the knowledge of others is possible, and such designs are major contributions to organizational intelligence.

The contributions of learning to intelligence are constrained by three major problems of myopia:

1. Temporal myopia. Learning tends to sacrifice the long run to the short run.
2. Spatial myopia. Learning tends to favor effects that occur near to the learner.
3. Failure myopia. Organizational learning over-samples successes and under samples failures.