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The Context of Organizational Learning

The structural, cultural, psychological, and leadership and policy facets of the multi-facet model provide a basic set of tools for analyzing and instituting organizational learning. Managers can promote productive learning by instituting organizational learning mechanisms (OLMs), by nurturing the five norms of a learning culture, and by enhancing organizational commitment and psychological safety among their subordinates. Such actions, however, do not take place in a vacuum. Rather they are conditioned by the context in which they occur. The context includes characteristics of the organization and its environment. It determines to a great extent the likelihood that organizational learning will take root and be productive. Contextual factors are largely beyond management's control. Nevertheless, recognizing them is useful for assessing the likelihood that organizational learning efforts will succeed and for taking appropriate actions to increase their likelihood of success.

The specific contexts of different organizations vary infinitely. In this chapter, we focus on six contextual factors that research has shown to influence organizational learning. These factors include environmental uncertainty, task uncertainty, error criticality, task structure, proximity to the core mission of the organization, and the organization's structure.

❖ ENVIRONMENTAL UNCERTAINTY

We define uncertainty as a sense of doubt that blocks or delays action (Lipshitz & Strauss, 1997). Although uncertainty is affected by objective conditions such as the rate at which environmental conditions change or the novelty and complexity of the task to be performed, we define uncertainty as a subjective feeling. Different persons, experts as compared to novices for example, may experience different degrees of uncertainty in the same situation. People's actions, including the proclivity to learn, are influenced by perceived uncertainty rather than the uncertainty that can be measured by objective indicators.

The claim that uncertainty affects learning is based on the observation that people have little motivation to learn unless they experience doubt: Why spend time and effort on gathering and analyzing information when operations run smoothly or when problems that arise can be solved effectively by well-rehearsed solutions? Following Dewey (1933), who posited that reflection (and hence learning) begins with doubt, Srikantia and Pasmore (1996) suggest that organizational learning begins with individual doubt and ends with "collective consensus."

> Learning must begin with individuals who are willing to express doubt, and to examine alternative interpretations of reality. Once they have done so, for learning to become organizational in nature, these same individuals must be able to communicate their interpretations to others so that they may be adopted for consideration by others. (p. 44)

Organizations are open systems that import raw materials and other resources from the environment to which they also export their products or services. The ability to do this may be affected by environmental trends such as market changes, new technologies, economic shifts, political upheavals, and social transformations. Consequently, it is customary to attribute the objective uncertainty in which they operate to three attributes of the environment: its complexity (the number of elements that must be taken into account in determining the organization's strategy and the extent to which their behavior is well understood); the rate in which these elements change (for example, the rate at which new products are introduced into the market); and the intensity of the competition the organization faces.

The relationship between environmental uncertainty and organizational learning is widely accepted by theoreticians and researchers (Dodgson, 1993; Ellis & Shpielberg, 2003; Fiol & Lyles, 1985; Garvin, 1993; Goh, 1998). This is because organizations must provide products or services that are valuable to some people at a price and quality that are superior to the competition. If the environment changes (e.g., people change their tastes or the competition acquires a new technology), the organization must adapt, which means that it must learn. That is why there are relatively few examples of organizational learning in the public sector (in which organizations rarely face competition), and many examples of organizational learning in high-tech organizations, which operate in dynamic and competitive environments.

The perception of environmental uncertainty and potential strategic threats is a particularly important stimulus for learning (Stopford, 2001). For most managers, however, planning has been the traditional response to uncertainty. Many planning approaches aim at reducing uncertainty through forecasting and risk analysis. These approaches assume that future trends can be predicted, usually on the basis of past behavior, and that solutions to foreseeable problems are already at hand. Paradoxically, these approaches are unlikely to stimulate learning precisely because they reduce perceived uncertainty. Management is unlikely to invest time and resources in learning if it does not experience uncertainty about how the environment is going to behave and about how potential changes will affect their organizations. An investment in learning, on the other hand, is likely to happen when management realizes that past experience is not necessarily a good predictor of the future and that the future will demand novel responses.

Scenario planning was developed by the planning department of Royal Dutch Shell (an external OLM) specifically to align senior managers' perceived environmental uncertainty with actual conditions (Kleiner, 1996; see also Chapter 2). During the 1960s, planning departments in large corporations, including Royal Dutch Shell, used sophisticated forecasting techniques to predict the future price of oil and to guide their investments in exploration, production, and transportation. These methods worked well as long as the environment was relatively stable: Demand for oil rose steadily at roughly predictable rates, and the oil producing countries collaborated with the large oil corporations to meet occasional fluctuations that did occur in demand.

Toward the end of that decade, it became evident that this stability was about to change. Continued economic growth in the Western world and the Far East would drive demand beyond the capacity of known reserves outside the Middle East to meet the increases in demand. In addition, Middle East oil producing countries would use the situation to increase their revenues by hiking the price of their oil to undreamed of levels. By 1972 and the advent of OPEC, this change was clear to the managing directors of Royal Dutch Shell. Nevertheless, they did not make the required changes in the corporation's policies. Ted Newland and Pierre Wack of the Royal Dutch Shell Group Planning Department conjectured that the directors could not comprehend—and adapt to—the new environment. To change their basic worldview, which Wack called "microcosms," the future implications of the new environment had to be made tangible to them. To this end, Newland and Wack decided to adapt the scenario's method originally developed by futurologist Hermann Kahn as a tool for "thinking about the unthinkable."

Wack and some 20 members of the Group Planning Department who specialized in this method developed six alternative scenarios. Each scenario represented a version of how the future might unfold based on the trends in oil demand and changed political realities in the Middle East that were already in place. Five of the scenarios did not require a change in the directors' current worldviews: They told five stories in which the *certain* impending gaps between oil demand and oil supply would be met by different countermeasures such as controlling demand by increased oil prices, voluntary energy savings by the public, and effective collaboration among the governments of consumer states. As he presented these scenarios to groups of managers, Wack showed them to be "miracle stories" owing to the implausible assumptions on which they were based. For example, the "high-supply" scenario that some oil executives particularly favored suggested that increased demand would be met by aggressive exploration and development of new oil fields. This scenario, however, was based on a number of assumptions. First, companies would have to find and develop new fields at incredible speed in areas that were either unprepared for or closed to exploration. Second, OPEC would have to collaborate in meeting new demands with no financial incentive for acting this way. Finally, no sharp increase in demand could occur because of a war or an extra cold winter.

As they worked through the implausibility of the assumptions underlying all five scenarios, Wack's audience realized that their worldviews had to change to accommodate the sixth scenario: an energy crisis with a fivefold jump in the price of oil. They also became acutely aware that their current policies were not designed to respond to such a scenario. As the scenario group continued to disseminate this message throughout Royal Dutch Shell, it slowly began to take effect. Refineries were designed to handle different kinds of crude oil or to be converted to chemical plants. When the crisis following the 1973 war between Israel and Egypt and Syria came, Royal Dutch Shell was better prepared and reacted more swiftly than the other large oil companies and the scenario method was introduced in numerous corporations in addition to Royal Dutch Shell.

In conclusion, scenario planning represents a form of organizational learning aimed at generating knowledge about the potential behavior of an organization's environment in the future. As a result of its experience in the 1970s, Shell made the use of scenarios a permanent part of its planning processes. The group planning unit at Shell represents an off-line/external agent OLM because most of the research and scenario development is carried out by experts especially assigned to this function. However, scenarios can also be developed by the same managers who make and execute strategy. Indeed, other organizations have adopted the scenario method and applied it through various mechanisms for the purpose of organizational learning.

❖ TASK UNCERTAINTY

The complexity and novelty of the tasks that the organization's members have to perform constitute a second major source of uncertainty that may promote organizational learning. One example of this relationship is reported in the memoirs of the general who commanded Israel Defense Force units in the Gaza Strip during the Palestinian uprising there in the 1970s. When he realized that the Palestinians presented him "with a new kind of war with which he and his subordinates were not familiar," the commander initiated a vigorous process of organizational learning in which "the commanders were open to any useful idea or suggestion. . . . Every operation was thoroughly debriefed soon after its conclusion and the lessons learned were disseminated and quickly implemented by other units" (Maimon, 1993, p. 97).

The development of the IBM 360 family of computers provides an example of the effects of environmental and task uncertainties on organizational learning (Quinn, 1988a). In the early 1960s, IBM dominated the computer industry. Nevertheless, its top leadership felt that the company had to undergo a major change in direction in order to stay ahead when the industry would move, as was expected, into a new generation of computers. The change was fraught with task uncertainty because its exact nature was initially unknown and because it required the use of new technologies with which there was no prior experience, either in IBM or in other organizations and research institutions.

The search, and later on implementation, of IBM's new direction was managed by Vincent Learson, the head of the company's computer development and production operations. He and IBM's CEO Watson began by conducting a series of conversations with their top management team to identify a new strategy. When these conversations led nowhere, Learson appointed a committee composed of representatives from the various divisions and functions of the company to develop policy guidelines for determining the new direction. Based on an analysis of the company's current state and the current and future state of the market, the committee proposed a basic concept for a totally new line of computers, the 360 system, which was to replace all of IBM's existing lines of computers. This ad hoc task force constituted a temporary OLM that used IBM's available expertise to analyze the company and its environment in order to produce a new concept, not just for the 360 but for the company as a whole.

IBM emerged from the 360 development process as a very different company from the company that went into it. Learson convened other committees to decide on the 360 operating system and on the use of a new hybrid integrated-circuit technology. These committees can also be regarded as temporary OLMs because they relied very heavily on the experience that was garnered in previous development projects of large systems that failed.

There are obvious differences between the Gaza Strip and IBM examples. Nevertheless, they suggest a common strategy for dealing with the uncertainty that is produced by complex, ill-defined, and novel tasks: Divide the task into discrete subtasks and design OLMs to develop the knowledge that is required to perform them effectively, either from relevant experience that exists already in the organization or from experience that is produced by tackling the subtasks experimentally.

Error criticality refers to the severity of the costs of potential error. The more severe the consequences of error, the more effort will be invested in learning how to prevent it. This proposition is based on empirical findings that people are more likely to engage in learning after failure. Two social psychologists (Wong & Wiener, 1981) asked people to describe situations in which they ask themselves why events happened the way they did. The researchers found that failure rather than success induced a stronger tendency to look for causal explanations

(Wong & Weiner, 1981). Another study asked managers to rate the need for initiating a learning process when presented with vignettes that had either a positive or a negative outcome. These managers were also asked what kind of learning should take place for each vignette. The findings showed that the more negative the outcome, the greater the likelihood of a recommendation for learning *and* the more extensive the follow-up measures to ensure implementation of recommendations.

These empirical findings are consistent with the fact that many examples of organizational learning come from organizations that face potentially catastrophic, life-threatening errors. Such critical-error organizations include nuclear power plants (Carrol, 1995; Carrol, Rudolph, & Hatakenaka, 2003; DiBella et al., 1996; Weick, Sutcliffe, & Obstfeld, 1999), hospitals (Carrol & Edmondson, 2002; Popper & Lipshitz, 1998; Tucker & Edmondson, 2003), and airplane combat units (Ron, Lipshitz, & Popper, in press). A study that tested the relationship between error criticality and organizational learning (Ellis, Caridi, Lipshitz, & Popper, 1999) found that persons working in organizations with relatively high costs of error (air traffic controllers and managers in high-tech organizations) produced higher mean scores on a questionnaire measuring the values of integrity, transparency, accountability, and issue orientation than did persons working in organizations with relatively low costs of error (teachers, psychiatrists and physicians in a mental hospital).

The aftermath of the notorious *Exxon Valdez* accident provides a good illustration of the relationship between error criticality and organizational learning. In 1989, the tanker *Exxon Valdez* collided with a reef and spilled some 11 million gallons of oil into the Prince William Sound in Alaska. The immense environmental damage prompted the oil corporations that operated in the sound and the various state and federal authorities that regulate their operations to cooperate in the institution of two OLMs in an effort to prevent future disasters. The first OLM was the Regional Council Advisory Council (RCAC), which oversees the environmental management of the marine oil trade in the sound. The second OLM is the Best Available Technology review (BAT), which compares the safeguards employed in the sound to those employed in similar systems anywhere in the world. The RCAC initiates, funds, and organizes studies and symposia to develop proposals for enhancing safety in the sound and implements some of the proposals in collaboration with various public and business interests. For example, RCAC conducted a computer simulation and experimental study of the tanker escort and navigation system in the sound in collaboration with the oil industry, the Alaska Department of Environmental Conservation, and the Coast Guard. Based on the results of this study, RCAC proposed that the oil industry use new types of tractor tugs. The industry contested the necessity of these changes but acquiesced after a second collaborative risk assessment study and a BAT review demonstrated the superiority of the new tugs (Busby, 1999).

❖ TASK STRUCTURE

In addition to the complexity and novelty of tasks, the way in which the activities that are required for their performance are organized affects organizational learning in two ways. It determines the ease with which people can obtain valid feedback on their work, and it influences their motivation to cooperate and share information with others. The feasibility of valid feedback is determined by the extent to which the task is standardized and the delay that occurs between its completion and the reception of feedback. Adler and Cole (1993) compared the work systems in two auto plants: Volvo's plant in Uddevalla, Sweden, and Toyota-GM plant in Fremont, California. Workers in both plants were encouraged to suggest improvements and received feedback on their task performance at the conclusion of each work cycle. At New United Motor Manufacturing (NUMMI, the Toyota-GM plant), the work cycle was about 60 seconds, and work was rigidly standardized. At Uddevalla, the cycle was approximately 2 hours long, and workers were given freedom to introduce changes in how they perform the tasks. The results showed that the shorter cycle facilitated the detection of problems and that standardization facilitated both the diagnoses of their causes and the diffusion of changes among different production units.

Tasks that are well bounded in time or divided into clear phases also facilitate learning. The completion of each phase and of the complete task presents a natural unit for conducting after-action or midcourse reviews, and the availability of specific objectives facilitates the determination of success or failure. This is exemplified by Boeing, where an OLM called "project homework" was devised to capture lessons learned on the development of its 707, 727, 737, and 747 models to speed up the development of the 757 and 767 models (Barrow, 2001).

Task structure can also influence the motivation to share information through the degree of interdependence that it imposes on the persons who perform it. One of the pilots in our study of postflight reviews (Chapter 8) testified that he and his fellow pilots were intensely competitive and strove to become "Number 1" in everything they did. When asked why this intense competitiveness did not prevent pilots from disclosing their errors in public and helping others to improve, the pilot's answer was that "since we fly in duos and quartets, my chances of survival depend on their skills as much as on my own." This somewhat dramatic example, which illustrates the influence of error criticality as well as of task structure, confirms the simple rule that people will cooperate out of self-interest.

❖ PROXIMITY TO THE ORGANIZATION'S CORE MISSION

An organization's core mission is what the organization is designed to deliver. Some tasks that organization members perform are directly related to its core mission; others are in support roles. Tasks that are related to the organization's core mission are important for its survival. Naturally, they receive more attention and resources than other tasks. This means that the organization feels more compelled to improve on these tasks through learning and that OLMs that are related to the core task are more likely to receive necessary resources. In a study that we conducted in a university-affiliated hospital, we identified 14 different OLMs. All were associated with the hospital's core mission, the delivery of treatment and training of interns and students (Lipshitz & Popper, 2000). The influence of proximity to core mission can be tied to error criticality, as errors related to core mission are likely to be more costly to the organization than errors in the performance of noncore missions.

One way to ensure that learning receives attention and resources is to turn it into a core task of the organization. This is what happened at Chaparral Steel (Chapter 12), which set the dual mission for its production workers of producing cutting-edge products and continuously improving the production process. As a result, Chaparral Steel workers instituted online OLMs, such as online experimentation that produced continuous improvements, helping it to compete successfully with steel mills in developing countries that benefit from much lower labor costs than those possible in the United States.

❖ ORGANIZATIONAL STRUCTURE

Organizational learning requires the free flow of information and knowledge throughout the organization. To the extent that the organization's structure—the division of labor among different units and persons—erects barriers to this flow, it inhibits both learning and the dissemination of information and knowledge (Englehardt & Simmons, 2002; Miller & Mintzberg, 1983; Tan & Heracleous, 2001). Two other structural factors that inhibit organizational learning in the same way are size and geographical separation. Division of labor, size, and geographical separation inhibit organizational learning in three ways. First, they constrain the amount of time that people in different units spend together, particularly in large organizations, depriving them of opportunities to exchange information. Second, different units have different goals, different responsibilities, and different specializations. Consequently, people in different units have different learning needs and develop different kinds of knowledge. Thus, knowledge relevant to people in one unit may be irrelevant to people in other units. (Note, however, that diversity is, at the same time, a positive source of knowledge, albeit one that is not easy to harness, owing to the differences in experience, language, assumptions, and interests.) Third, people develop loyalties to their particular units that may lower their motivation to share information with people in different units, particularly when the two are competing for the same scarce resources.

Two methods can be used to counteract the difficulties that division of labor, size, and geographical separation put in the way of organizational learning. The first method is creating centralized OLMs that serve as hubs in which knowledge that is accumulated in different parts of the organization is collected, stored, and disseminated back to operations that it can help. This method is illustrated by the U.S. Army Center for Lessons Learned (CALL; Baird et al., 1997) and BP's Post-Project Assessment Unit (Gulliver, 1987). As discussed in Chapter 2, CALL sends teams of observers to study and conduct after-action reviews of major training exercises and actual combat operations (e.g., the invasion of Granada) and generates lessons learned that can be of interest to other elements of the Army. These observations and lessons are used to develop training exercises that prepare units for similar future operations and that are made available to the Army at large through the Internet. BP's Post-Project Appraisal Unit performs a similar function, evaluating a selected number of projects of general interest each year. Although the unit works primarily for the corporation's head office, the lessons that it accumulates are also available on request to managers who think that they can be helped by them.

The second method for counteracting size and geographic dispersion is developing a thick network of OLMs that facilitates the direct transfer of knowledge among different units. BP Global also employs this method. Since 1995, the corporation, which literally spans the globe, has invested a great deal of resources into improving its ability to transfer knowledge among its diverse units. John Brown, the CEO, championed this effort because he held two assumptions. The first was that because of the size of its operations, BP has more experience to draw on than smaller companies. The second assumption was that disseminating this experience effectively should be a key factor for its success in the increasingly competitive energy environment. The number of OLMs and dissemination mechanisms that BP employs, particularly in its project-based exploration and production business unit, is truly impressive and includes many of the OLMs that are discussed in Chapter 2 (survey of OLMs) and Chapter 7 (dissemination) (Barrow, 2001; Berzins, Podolny, & Roberts, 1998; Gulliver, 1987; Prokesch, 1997).

The OLMs developed by BP Amoco include the following:

- *Communities of practice*. Different business units that are engaged in similar tasks (onshore oil production) are formally integrated into networks (called peer groups) that cut across BP's business unit divisional structure. Peer groups collaborate in managing the capital allocated to the activities that form their common denominator and share know-how relevant to their common technological and strategic issues. Leaders of business units that belong to the same peer group function as communities of practice when they meet regularly to manage their capital program, review performance, and share knowledge. Other BP workers are also members of communities of practice (see the Connect system below).

- *Peer assists*. In addition, their subordinates spend between 3% to and 10% of their time working in a different business unit on problems about which they have acquired expertise. Peer groups and peer assists are lateral communication channels for sharing know-how directly and more efficiently than the alternative method of disseminating knowledge through corporate functional units.

- *Computerized knowledge dissemination technologies*. BP operates a Web-based corporate yellow pages system called Connect through which people publicize their personal profiles of skills and experience. The system serves to connect people who wish to form or join communities of practice. It allows every manager or member to find the knowledge or expertise she or he requires within the organization. A computer-supported visualization technology called HIVE (highly immersive visualization environment) allows teams of experts to examine physical systems (e.g., geological structures) from thousands of miles away, from different angles, and at different resolution levels. This enables highly specialized experts to advise a team in the field in real time without having to leave their offices. In one celebrated example, HIVE allowed a team of geologists, geophysicists, reservoir engineers, pipeline engineers, and drilling and facilities engineers to save more than 10% of the development cost of a new offshore field in the Gulf of Mexico.

Another example of using computerized knowledge dissemination technology to circumvent structural barriers to knowledge sharing is the K'Netix system developed for Buckman Labs. This system includes seven Web-based forums in which Buckman employees can post questions and receive answers from other Buckman employees who happen to have the relevant knowledge. According to Carol Willett of Applied Knowledge Group, Inc., K'Netix essentially flattened Buckman Lab's rigid hierarchical structure that impeded knowledge sharing prior to K'Nerix's installation (Willett, n.d.).

In conclusion, four of the contextual factors that we discuss in this chapter—environmental uncertainty, task uncertainty, error criticality, and proximity to the core task of the organization—drive organizational learning. Task structure and organizational structure can either drive or restrain organizational learning, depending on their particular configuration. The four driving factors do not ensure the success of organizational learning; they just increase its probability of success. The two restraining factors do not preclude its feasibility; they just make success more difficult and require that the design of the OLMs overcomes the difficulties that they create.

Although the six factors that we discuss present a very partial list of the diverse factors that influence knowledge dissemination, they present a useful set with which to begin to analyze the particular context in which organizational learning is to be initiated, or improved. Our aim was not to develop an exhaustive model but a conceptual framework that strikes a balance between exhaustiveness and parsimony—a useful tool in practice.