Chapter 2
Organization Learning: A Theoretical Framework

2.1 Introduction

This chapter presents a theoretical framework for analyzing organizational learning that was developed in Argote and Miron-Spektor (2011). According to the framework, organizational experience is theorized to interact with the organizational context to create knowledge. The chapter discusses components of the framework, including experience, the organizational context, and knowledge. The organizational learning processes that translate experience into knowledge are also characterized. The chapter uses the framework to provide an overview of research on factors affecting organizational learning. Factors affecting knowledge retention and knowledge transfer are reviewed in subsequent chapters.

2.2 Organizational Learning Defined

Although researchers once debated whether organizational learning should be defined as a change in cognitions or in behavior, that debate has declined (Easterby-Smith, Crossan, & Nicolini, 2000). Most researchers agree with defining organizational learning as a change in the organization's knowledge that occurs as a function of experience (e.g., Fiol & Lyles, 1985). Knowledge includes both declarative knowledge or facts and procedural knowledge or skills and routines.

Researchers have measured organizational knowledge in a variety of ways. One approach measures organizational knowledge by measuring cognitions of organizational members (e.g., see Huff & Jenkins, 2002). Taking a behavioral approach, other researchers have focused on knowledge embedded in practices or routines and viewed changes in them as reflective of changes in knowledge (Gherardi, 2006; Levitt & March, 1988; Miner & Haunschild, 1995). Another behavioral approach that was described in Chap. 1 uses changes in characteristics of performance, such as its accuracy or speed, as indicators that knowledge was acquired and organizational learning occurred (Argote & Epple, 1990; Dutton & Thomas, 1984). Acknowledging that an

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organization can acquire knowledge without a corresponding change in behavior, researchers have defined organizational learning as a change in the range of potential behaviors (Huber, 1991). Similarly, Pentland (1992) defined organizational knowledge as the capacity of an organization to act competently. Researchers have also measured knowledge by assessing characteristics of an organization's products or services (Helfat & Raubitschek, 2000) or its patent stock (Alcacer & Gittleman, 2006).

The best approach to measuring organizational learning depends on the research question and empirical context. One limitation of current approaches to measuring learning by assessing changes in cognitions through questionnaires and verbal protocols is that these methods are not able to capture tacit or difficult-to-articulate knowledge (Hodgkinson & Sparrow, 2002). Physiological and neuroimaging techniques used to study individual learning (Keller & Just, 2009) might one day be adapted to study organizational phenomena, including learning (Senior, Lee, & Butler, 2011). With the exception of a few studies of dyads, these techniques are currently used on individual participants. Researchers using cognitive approaches—whether questionnaire, verbal protocol, or neuroimaging techniques—need to be sensitive to the distribution of cognitions. For example, every member of an organization would not necessarily need to show the same changes in cognitions for organizational learning to occur. Instead every member would need to know that certain members had experienced a change in cognitions and be able to access those members or the knowledge that they had acquired.

Approaches to assessing knowledge by measuring changes in practices or performance capture tacit as well as explicit knowledge. When using the latter behavioral approaches to measure learning, one has to be sensitive to control for other factors that might affect changes in behavior. For example, changes in routines might be driven by regulatory changes rather than experience. Changes in the speed or quality of performance might be driven by exogenous changes such as improvements in material that are not a function of the organization's experience. Thus, it is necessary to control for explanations of performance gains that are alternative to experience and to show that performance improvements are a function of experience when these alternative factors are taken into account. Organizational learning researchers taking a behavioral approach are typically not behavioral in the Skinnerian sense of not including cognitions in their theorizing but rather are behavioral in the sense of believing that changes in behavior at the organizational level are good indicators of organizational learning.

2.3 A Theoretical Framework

Figure 2.1 depicts a framework for analyzing organizational learning (Argote & Miron-Spektor, 2011). The figure portrays an ongoing cycle through which task performance experience is converted into knowledge through organizational learning processes. Task performance experience interacts with the context to create knowledge. The knowledge flows out of the organization into the environment and also changes the organization's context, which affects future learning.

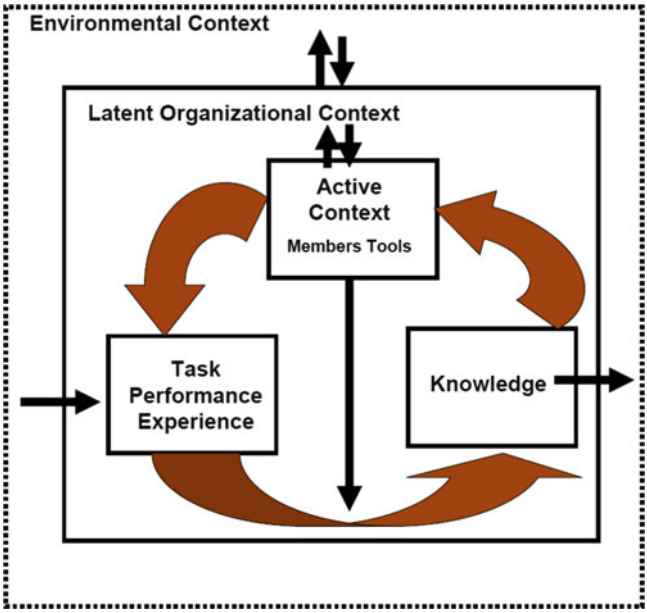

Fig. 2.1 A theoretical framework for analyzing organizational learning. Reprinted by permission, from Argote, L., and E. Miron-Spektor, 2011. Organizational learning: From experience to knowledge. *Organization Science*, *22*(5), 1123–1137. Copyright 2011, the Institute for Operations Research and the Management Sciences, 7240 Parkway Drive, Suite 300, Hanover, MD 21076 USA

Experience accumulates as the organization performs its tasks. The total or cumulative number of task performances is typically used as the measure of organizational experience. For example, in a medical device assembly plant, the cumulative number of devices produced would be a measure of the organization's experience. In a hospital surgical team, the cumulative number of surgical procedures performed would be a measure of experience. Because organizations learn from attempts to perform tasks that are incomplete or unsuccessful, I define experience in terms of the number of task performances rather than the number of task completions.

Organizational learning occurs in a context (Glynn, Lant, & Milliken, 1994), which includes the organization and the external environment in which the organization is embedded. The environmental context includes elements outside the boundaries of the organization such as competitors, clients, educational establishments, and governments. The environment can vary along many dimensions, such as volatility, uncertainty, interconnectedness, and munificence. The environmental context affects the experience the organization acquires. Orders for products or requests for services enter the organization from the environment. For example, a hospital emergency unit in one location would receive different kinds of patients than an emergency unit in another location, which serves a community with different characteristics. The organizational context includes characteristics of the organization, such as its structure, culture, technology, identity, memory, goals, incentives,

and strategy. The context also includes relationships with other organizations through alliances, joint ventures, and memberships in associations.

The context interacts with experience to create knowledge. Ella Miron-Spektor and I proposed differentiating the organizational context into an active context through which learning occurs and a latent context that influences the active context (Argote & Miron-Spektor, 2011). The active context includes the organization's members and tools, which interact with the organization's task. As the name implies, the active context is capable of taking actions to perform tasks. The latent context affects which individuals are members of the organizations, which tools they have and which subtasks they perform to accomplish the overall task of the organization. The difference between the active and the latent contexts is their capability for action. Members and tools perform tasks: they do things. By contrast, the latent context is not capable of action.

This conceptualization of the active context builds on a theoretical framework developed by McGrath and colleagues (Arrow, McGrath, & Berdahl, 2000; McGrath & Argote, 2001). According to the framework, the basic elements of organizations are members, tools and tasks, and the networks formed by crossing the basic elements. The member–member network is the organization's social network. The task–task and the tool–tool networks specify the interrelationships within tasks and tools, respectively. The member–task network, the division of labor, assigns members to tasks. The member–tool network maps members to the tools they use. The task–tool network identifies which tools perform which tasks. Finally, the member–task–tool network specifies which members perform which tasks with which tools.

These elements of members, tools, and tasks and their networks are the primary mechanisms in organizations through which organizational learning occurs and knowledge is created, retained, and transferred. Members are the media through which learning generally occurs in organizations. Individual members also serve as knowledge repositories in organizations (Walsh & Ungson, 1991). Further, rotating members from one organizational unit to another is a mechanism for transferring knowledge across the units (Kane, Argote, & Levine, 2005). Tools can aid learning, for example, by helping to identify patterns in data. Tools can be a knowledge repository. Moving tools from one unit to another is a mechanism for transferring knowledge (Galbraith, 1990). Tasks sequences or routines can also be knowledge repositories and serve as knowledge transfer mechanisms (Darr, Argote, & Epple, 1995).

The latent context affects the active context through which learning occurs. For example, contexts where members trust each other (Levin & Cross, 2004) or feel psychologically safe (Edmondson, 1999) promote organizational learning. A context with detailed process specifications enables knowledge retention (Ton & Huckman, 2008). A context where members share a superordinate identity facilitates knowledge transfer (Kane et al., 2005).

A significant amount of the organization's knowledge is embedded in its products or services, which flow out of the organization into the environment (Mansfield, 1985). For example, a patient might receive a new treatment from which the medical staff of other hospitals could learn. Or a medical devices firm might introduce a new product that other firms are able to "reverse engineer" and imitate.

In addition to flowing into the external environment, knowledge acquired by learning is also embedded in the organization's context and thereby changes the context. Knowledge can be embedded in the active context of members, tools, and tasks and their networks. Knowledge can also be embedded in aspects of the organization's latent context such as its culture. Thus, knowledge acquired through learning is embedded in the context and affects future learning.

The learning cycle shown in Fig. 2.1 occurs at different levels in organizations (Crossan, Lane, & White, 1999)—individual, group, organizational, and interorganizational. When analyzing learning at a particular level of analysis, the context for that level includes the higher levels. For example, when studying group learning, the organization in which the group is embedded is part of the group's context.

Individual learning is a mechanism through which group and organizational learning occurs. Individual learning, however, is not sufficient for group or organizational learning. In order for learning to occur at these higher levels of analysis, the knowledge the individual acquired would have to be embedded in a supra-individual repository so that others can access it. For example, the knowledge the individual acquired could be embedded in a routine (task–task network) or a transactive memory system (member–task network).

Major components of the framework for analyzing organizational learning shown in Fig. 2.1 are now discussed. Because organizational learning begins with experience, organizational experience is discussed first.

2.4 Organizational Experience

Because various types of experience can affect organizational learning processes and outcomes differently, researchers have characterized experience at a fine-grained level along various dimensions (Argote, McEvily, & Reagans, 2003). The most fundamental dimension of experience is whether it is acquired directly by the focal organizational unit or indirectly from other units (Argote, 2012). Learning from the latter type of experience is referred to as vicarious learning (Bandura, 1977) or knowledge transfer (Argote, Ingram, Levine, & Moreland, 2000), which is discussed in Chap. 6.

A unit of task experience can also be characterized in terms of its novelty, success, ambiguity, timing, and geographic location. The cumulative amount of experience can be characterized in terms of its heterogeneity and pace. Argote and Todorova (2007) reviewed the effects of different types of experience on learning process and outcomes. Major findings and recent developments are highlighted here.

2.4.1 Direct Versus Indirect Experience

Early learning curve studies investigated how organizations learn from their own direct experience (see Yelle, 1979, for a review). Although the rate of learning has been found to vary across organizations, considerable evidence that organizations

learn from their own direct experience has accumulated (Dutton & Thomas, 1984). More recently, researchers have investigated how organizational units learn from the experience of other units (Darr et al., 1995; Szulanski, 1996). This latter form of learning is also referred to as knowledge transfer.

An important research issue is the relationship between direct and indirect experience. Several researchers have found that direct experience and indirect experience are negatively related (Haas & Hansen, 2005; Schwab, 2007; Wong, 2004). That is, one form of experience seems to substitute for the other. By contrast, other researchers have found that direct and indirect experience relate positively to each other in complementary fashion (Bresman, 2010). Understanding the conditions under which direct and indirect experience complement or substitute for each other is an important question that would benefit from further research.

2.4.2 Novelty of Experience

Experience can be acquired on a novel task or on a task that has been performed repeatedly in the past. March (1991) distinguished between "exploitation," which involves learning from repeating the same tasks (low novelty), and "exploration," which involves learning from new tasks (high novelty). Researchers have investigated the relationship between exploitation and exploration. Although originally conceived as a trade-off, exploitation and exploration have been found to be independent dimensions in several studies (Katila & Ahuja, 2002). There is considerable evidence that organizations need to both explore and exploit in order to be effective (He & Wong, 2004; Katila & Ahuja, 2002; Knott, 2001). Research on "organizational ambidexterity" investigates how organizations can both explore and exploit (see Raisch, Birkinshaw, Probst, & Tushman, 2009, for a review).

2.4.3 Success Versus Failure Experience

A unit of task experience can be a success or a failure. Organizations learn from both successes and failures. Denrell and March (2001) argued that learning processes are biased because of the tendency of individuals to sample and replicate successful experiences. Organizations can learn from failed units of experience. For example, Haunschild and Sullivan (2002) found that airlines learned from accidents, a failure in their context. Similarly, Baum and Dahlin (2007) found that prior accident experience reduced the costs of future accidents reported by US railroads and Madsen (2009) found that organizations in the coal mining industry learned from their own accidents and the accidents of other firms.

Sitkin (1992) proposed that learning from failure is more effective than learning from success because failure motivates deeper search and richer understandings than success. Consistent with this argument, Madsen (2009) found in his study of

accidents in coal mines that the effect of minor accident experience decayed at a faster rate than the effect of disaster experience, major accidents in which lives were lost. Similarly, Madsen and Desai (2010) found that knowledge acquired from failure experience decayed more slowly than knowledge acquired from success experience in their study of orbital launches.

Other studies, however, have found that organizations learn more from success than from failure or learn from both success and failure. For example, Gino, Argote, Miron-Spektor, and Todorova (2010) found that laboratory teams learned more from other teams that developed a successful product than from other teams that developed an unsuccessful one. In a study of chains of nursing homes, Chuang and Baum (2003) found that organizations learned both from their own failures and from the failures of other organizations but that they learned less from their own failures when the organization was invested in the failed activity. Differences in motivation may reconcile these disparate findings on learning from failure. When the failure is very serious such as an airline (Haunschild & Sullivan, 2002), mining (Madsen, 2009), or orbital launch (Madsen & Desai, 2010) accident, organizations are very motivated to learn from the failures. On the other hand, if the stakes are not very high or if organizations are invested in the failed activity (Chuang & Baum, 2003), learning from failure occurs less frequently.

Learning from contrasting successful and unsuccessful experiences can be especially effective. Kim, Kim, and Miner (2009) found that learning occurred from both success and failure experience, at least after a threshold level of experience was obtained. Further, success and failure experience operated as complements, enhancing each other's value.

2.4.4 Ambiguity of Experience

Experience can be ambiguous (March, 2010) or easily interpretable. Causally ambiguous experience occurs when the relationship between causes and effects during task performance is unclear. Causal ambiguity makes it hard to interpret experience (Bohn, 1994; Carley & Lin, 1997) and can lead to "superstitious" learning (Levitt & March, 1988) in which participants draw the wrong inferences from experience.

Delays between actions and their effects contribute to causal ambiguity. Diehl and Sterman (1995) found that participants did not learn much from experience when delays between causes and effects occurred. Similarly, Repenning and Sterman (2002) found that in contexts where there were delays between making a process improvement and observing results, participants made attribution errors about the causes of results.

2.4.5 Spatial Location of Experience

An organization's experience can be geographically concentrated or geographically dispersed (Cummings, 2004; Gibson & Gibbs, 2006). Learning from

geographically distributed experience poses challenges to organizational learning but also provides opportunities for accessing new knowledge (Argote, Denomme, & Fuchs, 2011). Organizational units that are geographically dispersed have access to more knowledge than those that are geographically concentrated (Ahuja & Katila, 2004). Geographically distributed units, however, face challenges exchanging information and are more likely to encounter motivational and relational problems than collocated units (Cramton, 2001). Relative to geographically distributed unit, geographically collocated units are more likely to develop "common ground" (Fussell & Krauss, 1992) or shared understandings that facilitate information exchange and the interpretation of experience.

2.4.6 Timing of Experience

Experience can be characterized along several temporal dimensions, including its timing and recency. Experience can be acquired before doing, through activities such as training or experimentation (Carrillo & Gaimon, 2000; Pisano, 1994). Experience can be acquired during task performance through learning by doing. Experience can also be acquired after task performance through "after action" reviews (Ellis & Davidi, 2005).

The most effective timing of experience depends on the extent to which cause–effect relationships are understood and the knowledge base in an area is developed. Pisano (1994) found that if the knowledge base was well understood, experimentation and learning before doing contributed to more rapid product development. By contrast, if the knowledge base was not well understood, laboratory experimentation did not advance product development. Similarly, Eisenhardt and Tabrizi (1995) found that learning by doing was more effective for launching new computer products than planning or learning before doing was.

Recency is another dimension along which experience can vary. A unit of task experience could have been acquired recently or it could have been acquired in the distant past. There is considerable evidence that recent experience is more valuable than experience acquired in the distant past. That is, experience appears to decay or depreciate (Argote, Beckman, & Epple, 1990; Benkard, 2000; Darr et al., 1995). Further, the rate of depreciation varies across organizations with some organizations showing rapid deprecation and others showing little or no deprecation. The causes of depreciation are discussed in Chap. 3.

2.4.7 Rareness of Experience

Experience can vary in its frequency (Herriott, Levinthal, & March, 1985; Levinthal & March, 1981). Experience that occurs rarely or infrequently is hard to interpret and thus poses challenges to learning (Lampel, Shamsie, & Shapira, 2009; March,

Sproull, & Tamuz, 1991). Rare experience can lead organizations to draw the wrong inferences from experience and engage in superstitious learning (Zollo, 2009). Organizations, however, can realize significant benefits from learning from rare events (Starbuck, 2009), especially when they invest in developing lessons to improve how they respond to rare events in the future (Rerup, 2009). Further, rare events can interrupt routine activity and extend an organization's understanding of its capabilities and identity (Christianson, Farkas, Sutcliffe, & Weick, 2009).

2.4.8 Simulation of Experience

A dimension related to the timing of experience is the extent to which the experience is simulated. Simulated experience typically occurs after or before—but not during—task performance. Simulated experience might occur before performing the task through "preparedness drills" in which members practice their roles. Computational models that simulate how members and tools interact to perform tasks under various contextual conditions can also be used to facilitate learning before doing the task. Another form of simulated experience is produced through counterfactual thinking (Morris & Moore, 2000; Roese & Olson, 1995). Counterfactual thinking, which typically occurs after doing, involves reconstruction of past events and consideration of alternatives that might have occurred.

The usefulness of simulated experience depends on the extent to which it captures relevant features of the task performance context. Simulated experience can be a valuable complement to real experience, especially when that experience is sparse and/or the stakes are high. For example, disaster drills are conducted at hospitals to enable staff to handle real disasters effectively. Simulations can be especially valuable in revealing relationships and interactions among the elements of a task performance system.

The dimensions of experience discussed thus far can refer to a particular unit of experience or can refer to the overall distribution of experience when aggregated. For example, a particular unit of experience can be acquired in a collocated or geographically distributed fashion and the overall spatial distribution of cumulative experience can be obtained by aggregating the experience of particular units. Other dimensions, such as heterogeneity, make sense only as characterizations of cumulative experience. These dimensions are now discussed.

2.4.9 Heterogeneity of Experience

An organization's overall distribution of task experience can be characterized in terms of its heterogeneity. Organizations performing similar tasks would be low in heterogeneity while organizations performing varied tasks would be high in heterogeneity. Several studies suggest that some heterogeneity or diversity in task

experience facilitates organizational learning. Littlepage, Robison, and Reddington (1997) found that experience on related tasks enhanced group learning by increasing individual members' proficiency, while experience on comparable but not related tasks enhanced learning by increasing members' knowledge of who was good at which tasks. Similarly, Schilling, Vidal, Ployhart, and Marangoni (2003) found that related task experience improved learning to a greater extent than either identical or unrelated task experience. Boh, Slaughter, and Espinosa (2007) found that diverse experience in related systems improved the performance of software teams. Heterogeneity appears to be most valuable when it is introduced slowly so that members have time to master the different tasks (Pisano, Bohmer, & Edmondson, 2001).

Focusing on heterogeneity of outcomes, Haunschild and Sullivan (2002) found that heterogeneous accident experience was more conducive to organizational learning than homogeneous experience for specialized airlines. Kim et al. (2009) found that success and failure experience enhanced each other's effect on learning. Zollo (2009) found in a study of corporate acquisitions that heterogeneous acquisition experience weakened the negative effect of past success on the performance of a focal acquisition. Thus, heterogeneous experience reduced the likelihood of superstitious learning. Some degree of heterogeneity in task outcomes enhances learning by providing organizational members with a deeper understanding of what contributed to successful task performance.

2.4.10 Pace of Experience

Another temporal dimension along which experience can vary is its pace. Organizations can acquire experience at a steady rate or they can acquire experience at an uneven rate, with interruptions in production. Interruptions can lead to knowledge decay or depreciation (Argote et al., 1990; Benkard, 2000). Interruptions also provide opportunities for knowledge transfer (Zellmer-Bruhn, 2003).

2.5 The Organizational Context

As noted previously, Argote and Miron-Spektor (2011) developed a conception of the organizational context that includes latent and active components. The latent or background context affects learning through its effects on the active components of members, tasks, and tools. The background context determines the organization's task and the tools available to perform its task. The background context also affects members' abilities, motivations, and opportunities. For example, members' abilities are affected by contextual factors such as selection methods, training programs, and performance feedback. Members' motivations are affected by contextual factors including rewards, feedback, job design, and the organizational culture. Members' opportunities are affected by the organization's structure and social network.

Contextual factors that have been studied in relationship to organizational learning from direct experience are discussed in this chapter. These include the organization's specialization, its culture, its structure, the performance feedback it provides, its training practices, resources, and power distribution. Contextual factors related to knowledge retention are discussed in Chap. 4 and those related to knowledge transfer are described in Chap. 6.

2.5.1 Specialist Versus Generalist Organizations

A dimension of the context that has been empirically examined in relationship to organizational learning is whether the organization is a specialist or generalist. Specialist organizations have been found to learn more from experience than generalist organizations (Haunschild & Sullivan, 2002; Ingram & Baum, 1997). For example, Barnett, Greve, and Park (1994) found that specialist banks had higher returns on assets as a function of experience than generalist banks and further that generalist banks did not evidence performance increases as a function of experience. Similarly, Ingram and Baum (1997) found that "geographic generalists" that operated over a large physical area were less affected by their own experience than specialists that concentrated in a smaller number of areas. Thus, generalist organizations benefited less from experience than specialist organizations.

2.5.2 Organizational Culture

Another characteristic of the context that has received considerable research attention is the culture. A culture of psychological safety (Edmondson, 1999) that lacks defensive routines (Argyris & Schon, 1978) has been found to facilitate learning. When members feel psychologically safe and free to express their ideas, organizations are more likely to learn from experience than when members do not feel safe. A "learning" orientation has also been shown to facilitate the relationship between experience and performance outcomes (Bunderson & Sutcliffe, 2003). When team members emphasize learning in their unit rather than comparing their unit's performance to other units, they are more likely to learn from their experience. The shared language that members who work together develop enables the interpretation of experience (Weber & Camerer, 2003). Cohesion or liking among group members can also facilitate organizational learning (Wong, 2004).

2.5.3 Organizational Structure

The extent of decentralization in an organization has been theorized to affect organizational learning. Decentralization enables an organization to explore solutions

and thereby prevents it from prematurely converging on suboptimal solutions, which is especially valuable in uncertain environments (Ethiraj & Levinthal, 2004; Siggelkow & Levinthal, 2003; Siggelkow & Rivkin, 2005). Jansen, Van Den Bosch, and Volberda (2006) found in an empirical study that decentralization increased explorative innovation and had no effect on exploitative innovation.

Investigating different structures, Fang, Lee, and Schilling (2010) determined in a simulation that semi-isolated subgroups with moderate cross-group linkages promoted the greatest organizational learning. The semi-isolation of the subgroups fostered the diversity of ideas while the connections between groups fostered knowledge transfer across them. Bunderson and Boumgarden (2010) found that team structures characterized by specialization, formalization, and hierarchy increased team learning because they increased information sharing and reduced conflict. Jansen et al. (2006) found that formalization enhanced a unit's exploitative innovation and had no effect on explorative innovation, while densely connected social relations within units enhanced both explorative and exploitative innovation. Sorenson (2003) found that interdependence engendered by vertical integration slowed the rate of learning in firms in stable environments and speeded learning in volatile environments.

2.5.4 Performance Feedback

Research on the effects of performance feedback (Greve, 2003) on organizational learning has yielded somewhat mixed results. Several researchers have documented or theorized about the positive effects of feedback. Delays in feedback have been found to hinder learning from experience (Diehl & Sterman, 1995; Gibson, 2000; Rahmandad, 2008). When members' actions do not receive immediate rewards but occur in a sequence with an overall reward, learning can also be impaired, especially when turnover occurs (Denrell, Fang, & Levinthal, 2004). Although high-feedback specificity has been found to improve learning initially, high-feedback specificity dampens exploratory behavior over the long run (Goodman, Wood, & Hendrickx, 2004). Individual feedback has been found to amplify the negative effects of power differences on learning (Edmondson, 2002); group feedback has been found to turn the negative effects of power differences into opportunities for learning (Van Der Vegt, de Jong, Bunderson, & Molleman, 2010). In contrast to studies finding positive effects of feedback, Rick and Weber (2010) found that withholding feedback led to deeper deliberation and greater learning than providing feedback.

2.5.5 Training

Training structures and processes in organizations also affect learning (Bell & Kozlowski, 2008; Ford & Kozlowski, 1996; Grossman & Salas, 2011). Two dimensions

of training are especially relevant for organizational learning. One dimension is whether the training is conducted individually or in a group. Research has shown that group training is more beneficial for collective learning than individual training (Hollingshead, 1998; Liang, Moreland, & Argote, 1995). Training members of a group together promotes the development of a "transactive memory system" (Wegner, 1986), a collective system for encoding, storing, and retrieving information. Colloquially referred to as knowledge of who knows what, transactive memory systems enable the creation (Gino et al., 2010), retention (Liang et al., 1995), and transfer of knowledge (Lewis, Lange, & Gillis, 2005).

Another dimension of training systems is whether they include opportunities for members to observe experts performing tasks. Training through observing experienced members has been found to be more effective than training through lectures (Nadler, Thompson, & Van Boven, 2003). Through observing experts perform tasks, trainees can acquire tacit or difficult-to-articulate knowledge (Nonaka, 1991). Trainees also become members of a community and learn norms of behavior (Brown & Duguid, 1991). These advantages of observational methods contribute to the use of apprenticeship programs in a variety of professions, such as manufacturing and medicine.

2.5.6 Absorptive Capacity

Organizations that are high in "absorptive capacity" are able to recognize the value of external information, assimilate it, and apply it to develop innovations (Cohen & Levinthal, 1990). Absorptive capacity is facilitated by Research and Development activities that provide organizations with the background knowledge necessary to recognize and exploit external information (Cohen & Levinthal, 1990). Volberda, Foss, and Lyles (2010) reviewed the vast literature on absorptive capacity.

Not only do Research and Development activities facilitate learning from the experience of sources external to an organization, the activities facilitate learning from an organization's own direct experience. Lieberman (1984) found that investment in Research and Development increased the rate of learning among firms in the chemical processing industry. Similarly, Sinclair, Klepper, and Cohen (2000) found that Research and Development contributed to the productivity gains observed in a chemical firm.

2.5.7 Aspiration Levels

Aspiration levels affect organizational learning. Cyert and March (1963) theorized that when organizational performance falls below the organization's aspiration level, search occurs and organizational change is likely. This problemistic search is typically myopic so changes resulting from it occur near the problem. Considerable

empirical research has found support for the prediction that performance below the aspiration level leads to problemistic search (see Argote & Greve, 2007, for a review). Cyert and March (1963) further theorized that organizational aspiration levels adapt to the organization's own past experience and the experience of other comparable organizations. Many empirical studies have found support for this prediction (Lant, 1992). Baum and Dahlin (2007) extended the behavioral theory of Cyert and March (1963) and found in their study of accidents in US railroads that as performance deviated from aspiration levels, the organizations benefited less from their own direct experience and more from the indirect experience of other firms in the industry. Desai (2008) further elaborated the behavioral theory and predicted and found that risk taking after poor performance was low when organizations had low levels of experience and poor legitimacy.

2.5.8 Slack Resources

Slack search has been theorized to affect learning and innovation as a complement to problemistic search (Cyert & March, 1963). Several empirical studies have found the predicted positive association between organizational slack and organizational learning (e.g., Wiersma, 2007). Other researchers have found an inverted U-shaped relationship between slack resources and innovation or exploratory search: increases in slack initially increased innovation but too much slack reduced the discipline necessary to produce innovations (Gulati & Nohria, 1996). Combining problemistic search and slack search, Greve (2003) found that problemistic search was more effective when organizations had a buffer of innovations generated through slack search.

2.5.9 Power and Status

Power relations within a social unit affect learning (Contu & Willmott, 2003). Bunderson and Reagans (2011) reviewed research on the effect of power and status differences on group and organizational learning and concluded that the negative effects of such differences were due to the dampening effect they had on experimentation, knowledge sharing, and the development of shared goals. Bunderson and Reagans (2011) further concluded that the negative effects of power and status differences could be mitigated when individuals high in the hierarchy were collectively oriented and used their power for the benefit of the group or organization.

2.5.10 Social Networks

Social networks facilitate both the search for information and its interpretation. Researchers have investigated the effects of network position, network structure,

and tie strength. Ties that bridge "structural holes" or otherwise unconnected parts of a network increase exposure to information (Burt, 2004). Further, bridging ties that span structural holes are especially conducive to developing new knowledge when individuals who bridge boundaries share common third-party ties (Tortoriello & Krackhardt, 2010).

Focusing on network structures, Reagans and Zuckerman (2001) found that dense internal network structures fostered knowledge creation and transfer, especially when members had specialized expertise (see also Rulke & Galaskiewicz, 2000). Focusing on network strength, Hansen (1999) found that weak ties between members facilitated the transfer of explicit knowledge, while strong ties enabled the transfer of tacit knowledge. Reagans and McEvily (2003) found that dense internal networks with links to external networks facilitated transfer over and above the effect of tie strength. Phelps, Heidl, and Wadhwa (2012) reviewed the burgeoning literature on social networks and knowledge transfer, identifying points of convergence and divergence.

2.5.11 Member Diversity and Stability

Two characteristics of members have been investigated in relationship to organizational learning: member diversity and team stability. Several studies have examined the effect of diversity of members on organizational learning. Macher and Mowery (2003) found that team diversity moderated the relationship between experience and organizational performance in the semiconductor industry such that functionally diverse teams learned more from their experience than functionally homogeneous teams. By contrast, Ophir, Ingram, and Argote (1998) found that member diversity hindered organizational learning in Israeli Kibbutzim: diverse teams learned less from their experience than teams composed of similar members.

Several studies have examined the effect of team stability on organizational learning. Reagans, Argote, and Brooks (2005) found that team stability (the average number of times team members worked together) contributed positively to the performance of surgical teams. Similarly, Huckman, Staats, and Upton (2009) found that team stability was positively associated with the performance of software teams. Further, role stability or how long individuals remained in particular roles was also positively associated with the performance of software teams.

2.5.12 Tools

Tools can enable learning by facilitating the acquisition, storage, and sharing of information. Research on tools and organizational learning has primarily focused on information technology or knowledge management systems. Focusing on information technology, Boland, Tenkasi, and Te'eni (1994) described an information

system that facilitated idea exchange in organizations. Ashworth, Mukhopadhyay, and Argote (2004) found that the introduction of an information system in a bank increased organizational learning.

Focusing on a knowledge management system, Kane and Alavi (2007) used a simulation to examine the effect of knowledge management tools, such as electronic communities of practice or knowledge repositories, on organizational learning. The researchers found that the performance of electronic communities of practice was low initially but subsequently surpassed the performance of other tools.

Empirical studies on the effect of various knowledge management systems have yielded mixed results. Based on a study of consulting teams, Haas and Hansen (2005) found a negative effect of using a knowledge management system on team performance. The more documents from a knowledge management system teams used, the worse their performance. The negative effect was stronger for experienced teams than for teams with less experience working together and stronger for teams with many rather than few competitors. By contrast, in a study of retail grocery stores, Kim (2008) found a generally positive effect of using a knowledge management system. The positive effect was particularly strong for employees in remote locations, for employees with few alternative sources of knowledge and for employees who dealt with products that did not become obsolete quickly. Thus, the repositories in knowledge management systems seem more valuable when the task is routine and employees do not have other sources of knowledge than when the task is uncertain and employees have other sources of knowledge.

New generations of knowledge management systems enabled by Web 2.0 technologies have more affordances (Zammuto, Griffith, Majchrzak, Dougherty, & Faraj, 2007) than previous generations that were primarily document repositories. The knowledge that can be stored in document repositories is explicit knowledge. This knowledge can serve as pointers to who knows what, and thereby enable connections between members that facilitate the transfer of tacit knowledge. The connections, however, happen outside of the knowledge management system. Newer generations of knowledge management systems enabled by Web 2.0 technologies facilitate connections and interactions among individuals within the system through blogs and forums. These new technologies have greater affordances for transferring tacit knowledge than previous generations of knowledge management systems that primarily were document repositories. The realization of the affordances of these new technologies, however, is not automatic but rather depends on how they are used and supported in organizations.

2.6 Organizational Learning Processes

Organizational learning processes are represented by the curved arrows in Fig. 2.1. When knowledge is created from a unit's own direct experience, the learning subprocess is knowledge creation. When knowledge is developed from the experience of another unit, the learning subprocess is knowledge transfer. Thus, the curved

arrow at the bottom of the figure depicts either the knowledge creation or knowledge transfer subprocess. A third subprocess, retaining knowledge, is depicted by the curved arrow in the upper right quadrant of Fig. 2.1 that flows from knowledge to the context. It is through this process that knowledge is retained in the organization. Thus, organizational learning is conceived as having three interrelated subprocesses: creating, retaining, and transferring knowledge. These subprocesses are related. For example, some degree of knowledge persistence is required for its transfer. New knowledge is often created during knowledge transfer attempts (Miller, Fern, & Cardinal, 2007).

Several researchers have conceived of search as another organizational learning subprocess (Huber, 1991). In our framework, the curved arrow in the upper left quadrant of Fig. 2.1 represents search. The arrow shows that the active context of members and tools affects task performance experience. For example, members can choose to search in local or distant areas and search for novel or known experience (Katila & Ahuja, 2002; Rosenkopf & Almedia, 2003; Sidhu, Commandeur, & Volberda, 2007). A transactive memory system facilitates search by providing information about who knows what and who is good at what.

2.6.1 Mindfulness of Organizational Learning Processes

The subprocesses can be characterized along several dimensions. The dimension of learning processes that has received the most attention is their "mindfulness." Learning processes can vary from mindful or attentive (Weick & Sutcliffe, 2006) to less mindful or routine (Levinthal & Rerup, 2006). The former are what psychologists have termed controlled processes while the latter are more automatic (Shiffrin & Schneider, 1977). Mindful processes include dialogic practices (Tsoukas, 2009) and analogical reasoning, which involves the comparison of cases and the abstraction of common principles (Gentner, 1983; Gick & Holyoak, 1983). Less mindful processes include stimulus–response learning in which responses that are reinforced increase in frequency. Levinthal and Rerup (2006) described how mindful and less mindful processes can complement each other with mindful processes enabling the organization to shift between more automatic routines and routines embedding past experience and conserving cognitive capacity for greater mindfulness.

Most discussions of mindful processes have explicitly or implicitly focused on the learning subprocess of creating knowledge. The subprocess of retaining knowledge can also vary in the extent of mindfulness. For example, Zollo and Winter (2002) studied deliberate approaches to codifying knowledge, which would be examples of mindful retention processes (see also Zollo, 2009). Similarly the subprocess of transferring knowledge can also vary in mindfulness. "Copy exactly" approaches or replications without understanding the underlying causal processes would be examples of less mindful transfer processes while knowledge transfer attempts that adapt the knowledge to the new context (Williams, 2007) would be examples of more mindful approaches.

2.6.2 *Distribution of Organizational Learning Processes*

A learning process dimension that is especially important in organizations is the extent to which the learning processes are distributed across organizational members. For example, organizations can develop a transactive memory or collective system for remembering, retrieving, and distributing information (Brandon & Hollingshead, 2004; Ren & Argote, 2011; Wegner, 1986). In organizations with a well-developed transactive memory system, members specialize in learning different pieces of information. Thus, learning processes would be distributed in organizations with well-developed transactive memory systems.

2.6.3 *Improvisation of Organizational Learning Processes*

Learning processes can also vary in the extent to which they are planned or improvised. Planned learning occurs through structures such R&D programs or new product development projects (Benner & Tushman, 2003; Lieberman, 1984; Sinclair et al., 2000). Improvisation occurs during task performance and involves minimal structures (Barrett, 1998; Miner, Bassoff, & Moorman, 2001). Vera and Crossan (2005) identified conditions under which improvisation leads to learning. The conditions included high-quality teamwork, high levels of expertise, communication, training, and an experimental culture.

More research is needed on the organizational learning processes and their interrelationships. For example, there may be a relationship between the extent to which learning processes are mindful and the extent to which they are planned. In addition, the concept of mindful learning processes would benefit from further refinement. The concept is used both in the sense of deliberate processes and in the sense of processes that are in the moment and free from previous conceptions (or misconceptions). Research on attention might be helpful in refining the concept of mindfulness (Ocasio, 2011). Ideally, one would like to identify a parsimonious yet complete set of learning processes and understand the conditions under which they are invoked and their effects on learning outcomes.

2.7 Knowledge

Knowledge is the outcome of learning. Knowledge can manifest itself in changes in cognitions or behavior. The knowledge can be explicit or tacit and difficult-to-articulate. The knowledge includes both knowledge in the sense of a stock and knowing in the sense of a process (Cook & Brown, 1999; Orlikowski, 2002). Knowledge can be characterized along many dimensions (Alavi & Leidner, 2001). For example, knowledge can vary from explicit knowledge that can be articulated to

tacit knowledge that is difficult to articulate (Kogut & Zander, 1992; Nonaka & von Krogh, 2009; Polanyi, 1962). A related dimension of knowledge is whether it is declarative or procedural (Singley & Anderson, 1989). Declarative knowledge is knowledge about facts—what researchers have termed "know what" (Edmondson, Winslow, Bohmer, & Pisano, 2003; Lapré, Mukherjee, & Van Wassenhove, 2000; Tucker, 2007). Procedural knowledge is knowledge of procedures or "know-how."

Knowledge can also vary in its "causal ambiguity" or extent to which cause–effect relationships are understood (Szulanski, 1996). In addition, knowledge can vary in its "demonstrability" or ease of showing its correctness and appropriateness (Kane, 2010; Laughlin & Ellis, 1986). Further, knowledge can be codified or not (Vaast & Levina, 2006; Zander & Kogut, 1995; Zollo & Winter, 2002).

Characteristics of knowledge affect its retention and transfer. These issues are discussed in Chaps. 4 and 6. Managing knowledge is also a strategic issue for firms. For example, a fundamental issue for-profit firms face is how to facilitate the internal transfer of knowledge while blocking its external transfer to competitors. Strategic issues of knowledge management are discussed in Chap. 7.

2.8 Conclusion

The chapter presented a theoretical framework for analyzing organizational learning and used the framework to provide an overview of research on organizational learning. According to the framework, organizational experience interacts with the context to create knowledge. Because different types of experience affect organizational learning processes and outcomes differently, a fine-grained characterization of experience was advocated. The context was conceived as having both a latent component and an active component through which learning occurs. The latent component affects the members and tools that perform the organization's tasks and learn from task performance experience. Knowledge results from the organizational learning processes that interpret experience. These processes can vary in their "mindfulness," in the extent to which they are distributed over many organization members versus concentrated in a few, and in the extent to which they are planned or improvised. Knowledge both flows out of the organization into the environment and also is embedded in the organization. Knowledge embedded in the organization affects future learning.

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