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Acquiring Organizational Learning Norms

A Contingency Approach for Understanding Deutero Learning

Abstract *'The Learning Organization' is a configuration of learning norms (called a learning prototype here), which is seldom related to varying levels of learning needs. This article assumes that organizational environmental complexity and dynamics define four learning needs levels. Consequently, four learning prototypes exist that best treat the learning needs. The extent of match between learning needs (which are increasing in modern organizations) and required learning norms define an organization's learning capabilities. Deutero learning is the acquisition of these learning capabilities. Four case studies describe the accumulations and unlearning processes with regard to the related learning norms. These adjustments of the related policy, responsibility, action and procedural learning norms are enabled and constrained by organizational environmental factors. This article also suggests that Nonaka and Takeuchi's 'knowledge creation company' prototype may be effective at all learning needs levels, but inefficient in less than high learning needs situations.* ***Key Words:*** *deutero learning; knowledge creation; organizational learning capacity; organizational learning prototypes*

Organizational learning is nowadays a major topic for organization studies, because it is about how organizations can gain a better action repertoire in increasingly complex and dynamic environments by expanding their knowledge base (De Geus, 1988; Fiol and Lyles, 1985; Nonaka and Takeuchi, 1995; Levinthal and March, 1993; Meyer, 1982; Senge, 1990). For these environments it is not the knowledge itself, but the learning capabilities that determine effectiveness (Grant, 1996). These capabilities have been summarized under the concept of 'the learning organization' as organizational arrangements that (1) provide people with direct feedback on their performance, (2) decentralize and reduce bureaucracy to support initiatives and creativity, (3) emphasize expertise development, (4) get people to contribute to the organizational knowledge base, and (5) create

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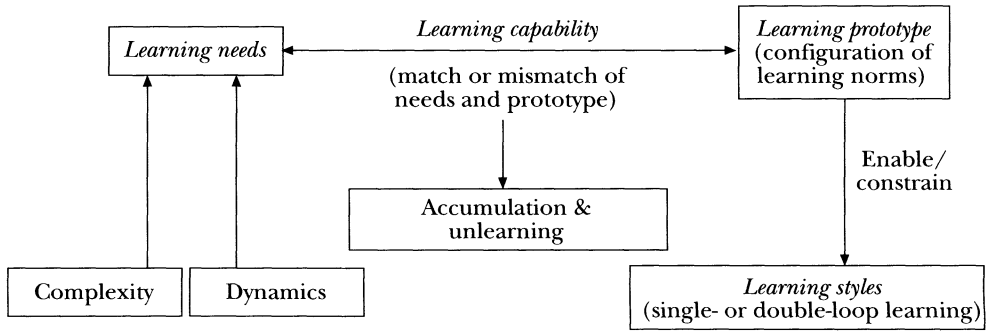
open communications with the minimum of defensiveness (Argyris and Schön, 1978; Day, 1994; Garvin, 1993; Nonaka and Takeuchi, 1995). Reviewing this list, the organizational learning literature seems to have discovered a new one-best way of organizing for all situations. Mintzberg (1983), however, has convincingly stated that any organizational configuration can be more or less successful in different situations. We adhere to this organizational contingency statement and propose, following Duncan and Weiss (1979), that *environmental complexity* and *dynamics* are the main sources of *learning needs* to cope with while developing effective learning organizations. These learning organizations, as organizations, consist of organizational norms that enable and constrain certain learning styles, being more or less single (error-correction)- or double-loop (innovation) learning (see Argyris & Schön, 1978; DiBella et al., 1996). Configurations of learning norms are called *learning prototypes* here. Organizational learning capabilities thus are appropriate matches of learning needs and organizational learning norms. The adjustment of learning prototypes to changing environmental learning needs is called *deutero learning* (Argyris & Schön, 1978). As a consequence of the organizing process that is involved in deutero learning (resulting in organizational structures, philosophies, cultural norms etc.; Meyer, 1982), adjustments of the learning prototype might become difficult (Weick, 1979). Therefore it is important to ask what problems organizations have in moving to another learning prototype when their learning needs change. Figure 1 summarizes the propositions mentioned here.

The following sections first describe the theory of matches between learning needs and learning prototypes, and the problems of acquiring learning capabilities by accumulation and unlearning of learning norms. How organizations acquire learning norms is further described by four case studies that correspond with the four levels of learning needs. It may be obvious from this that the article wants to add to existing insights in organizational adaptation (Meyer, 1982) by studying more permanent changes of an organization's environment and proposing organizational structural changes needed. Additionally, the focus is more on organizational design than on the organizational change techniques that have been studied extensively already (see Argyris and Schön, 1978; Senge, 1990).

Figure 1 Basic concepts related to learning needs and learning capabilities



Theory

Organizational Learning Needs and Styles

Although many authors on organizational learning show the importance of organizational learning, surprisingly the learning needs concept has not been explicitly defined. Four approaches to learning needs are recognized here: (1) *knowledge gap* analysis for identifying strategic knowledge needs (Helleloid and Simonin, 1994), (2) classification of *problems* to select operationally required knowledge and skills (Tampoe, 1994), (3) coping with organizational tremors and jolts by anticipation, response and adjustments of behavioral repertoires (Meyer, 1982), and (4) *decisional uncertainty* (contingency) measurement (Duncan and Weiss, 1979). The last approach will be further elaborated below.

Duncan and Weiss (1979: 84) state that the result and objective of organizational learning are the creation of *action-outcome* knowledge (explanations, predictions and means–ends theories). Two problems affect this action-outcome theory development process, namely the complexity (requiring adding factors to understand what is going on) and the dynamics of the environment (requiring frequent changes of factors in the action-outcome theory). The relation between complexity and dynamics versus learning needs is very direct. Table 1 provides a classification of learning needs based on the dimensions of dynamics and complexity. In this classification, dynamics is a stronger determiner of learning needs than complexity, because high dynamics in a low complexity situation will continuously require high learning efforts. High complexity in a low dynamic situation, however, will lead to declining learning needs because no changes of the action-outcome theory are required at a certain level of comprehension.

According to Argyris and Schön (1978), two *styles* of learning exist.[1] The single-loop learning (SLL) style aims at adaptation by effectively using existing action-outcome theories. This requires learning, because the decision-maker needs to recognize a problem and select an 'appropriate' mode of coping with it (Cyert and March, 1963), within the constraints set by the action-outcome theory (e.g. an optimization model). The double-loop learning (DLL) style wants to develop and fundamentally innovate existing action-outcome theories, based on the observation of the ineffective consequences of their application (see Meyer, 1982: 534).

Stable and simple environments do not require much DLL. The environment is low risk, and therefore discourages the search for innovations. When the environment becomes more dynamic and complex, more active development and innovation (DLL) is required, because too many unresolved problems will appear.

The need to retain and reuse existing knowledge (SLL) complicates the unlearning of obsolete knowledge, which is often required in DLL (Hedberg,

Table 1 Levels of complexity and dynamics and organizational learning needs

Dynamics	Complexity	
	Simple	Complex
Static	Low learning needs	Moderately low learning needs
Dynamic	Moderately high learning needs	High learning needs

1981; Levinthal and March, 1993; Weick, 1979). Nevertheless, it may contribute substantially to efficiency, reliability and quality of products and services (see Hansen et al., 1999). Additionally, DLL is enabled but also limited by (often tacit) learning norms. It has been stated that organizations might much more profitably invest in DLL instead of SLL, because of the higher returns for intellectual and creative activities (Quinn, 1992; Senge, 1990; Stewart, 1997). Unfortunately, according to Argyris and Schön (1978), reduced openness in communication, domination of some people over others, and tricks in protecting one from being hurt and evaluated negatively are dominant learning norms in western organizations that obstruct effective DLL. The organizational learning literature has put much effort into reversing this 'model I' (Argyris and Schön) set of learning norms (see Senge, 1990).

Learning Prototypes and Learning Norms

Learning prototypes Learning prototypes are configurations of learning norms that match a level of learning needs.

In *simple-static* environments organizations have to deal with a small number of similar factors and components that remain basically the same (Duncan and Weiss, 1979). In this environment the learning needs are low and consequently organizations do not need to put much effort into developing an explicit learning policy. High stability and simplicity mean that learning in small organizations can be done efficiently and effectively by one person or a small group, and that in large organizations it is useful to develop formal procedures of knowledge handling to divide the learning load (Hedberg, 1981). The dominant learning style is single-loop and the learning is task-motivated, well-structured, part of formal procedures, and planned. This prototype, called *bureaucratic learning* is illustrated later on by the case of a cardboard manufacturer.

Organizations in *complex-static* environments have to deal with large numbers and dissimilar factors and components that remain basically the same. In this environment learning needs are moderately low. The high complexity means that learning activities must be split up among several experts. Because the environment is stable, not many major changes (indicating DLL) in the action-outcome theories happen, or they happen only after extensive formal learning procedures. Because the role of experts is so vital here, the corresponding learning prototype is called *expert learning*. This learning prototype is illustrated later by the case of a bank.

In *simple-dynamic environments*, organizations have to deal with a small number of similar factors and components that are in a continual process of change. Consequently, the organizational learning needs are moderately high. The high dynamics require that people are given considerable support and individual responsibilities to detect and correct errors (SLL), but also to discover solutions for new and unknown problems (DLL). The required innovative capabilities and creativity can only be reached when people are not constrained by formal rules or hierarchies, and when learning may happen everywhere in the company. Because the problems are often not too complex, individuals can do a lot towards solving them when they are given sufficient latitude and problem solving autonomy. The

related learning prototype therefore is called *dispersed* learning, and has been described previously as a learning lab (Leonard-Barton, 1992). Later, a health care insurer is introduced that strongly equals this prototype.

In *complex-dynamic* environments, organizations have to deal with many and dissimilar factors and components in continual change. This environment has high learning needs and requires strong decentralization and high job specialization (Mintzberg, 1983). Because of the high complexity and dynamics, much DLL must happen (in R&D and innovation processes), in addition to the large amount of SLL gained by correcting errors in existing business (Nonaka and Takeuchi, 1995). The organizational learning policy clearly states how much attention to each one has to be given (Grant, 1996). The organizational structure (called hypertext organization) enables it to switch intentionally between learning styles, and management styles are such that all people at all levels in the organization are motivated and responsible regarding learning (called 'middle-up-down management') (Nonaka and Takeuchi, 1995). Because of the complexity of combining the sometimes conflicting demands of single-loop and double-loop learning, formal rules exist about the learning responsibilities, but at the same time enough flexibility exists. The related organizational learning prototype is called the *knowledge creating company* (see Nonaka and Takeuchi, 1995). Later on, a high-tech manufacturer is introduced that partially applies knowledge creation company concepts.

Learning norms Organizational learning prototypes may be designed by two parameters: learning needs and learning norms.

The *learning policy norms* consist of statements concerning (1) the development of an organizational learning infrastructure (e.g. information technologies, budgets and experts); (2) the development of core competencies; (3) the basic organizing principles for the learning process, like decentralization, internal democracy, and incentives for creative thinking; and (4) the role of organizational learning in relation to other organizational activities and priorities. The learning policies must be implemented in learning responsibilities, action and procedural norms.

Learning *responsibilities* have to be well established, as otherwise learning might not occur effectively in relation to the learning needs and policy (Grant, 1996).

Learning *action norms* are the incentives to act on basis of new insights. It is well known that great new insights can be difficult to put into action, often because learning activities do not necessarily lead to win–win situations for all people involved (see Fiol and Lyles, 1985; Huber, 1991).

Procedural learning norms concern the dissemination and handling of information for organizational learning, and influence the actual use of information systems and communication media for organizational learning (Huber, 1991). In this context, the effectiveness of formal (IT/rule-based) media is discussed against informal media (face-to-face and interpersonal understanding).

Table 2 summarizes the mentioned propositions about the learning needs, learning prototypes and learning norms.

Table 2 Expected effective patterns of learning needs, learning norms and learning prototype

Learning needs / Learning norms	1 low	2 moderately low	3 moderately high	4 high
Identity and policy norms	Centralized and formal learning aiming at SLL	Planned division of learning labor	Culture and budgets support innovation, creativity and innovativeness	Internalized SLL and DLL policies, carefully coordinating learning initiatives
Responsibility norms	SLL by specialists	SLL by many people, but functionally organized. DLL by experts	DLL by many, unorganized	DLL and SLL. Switch between both is well organized. Hypertext organization
Action norms	Task motivation	Expertise acquisition for payment and job security	Incentive system; extra rewards for knowledge creation	Internalization of learning policies
Procedural norms	Formal	Formal	Informal	Formal and informal
Learning prototype	Bureaucratic learning	Expert learning	Dispersed learning	Knowledge creation company

Learning Capabilities

The previous section has described organizational learning capabilities as matches of needs and norms. Because there is a trend for increasing complexity and dynamics in almost all industries, mismatches happen frequently and organizations have to acquire the appropriate learning capabilities. The required changes of the learning norms often are preceded by a sense of crisis. To solve this crisis new learning capabilities must be acquired (see Greiner, 1972). This requires the *accumulation* of learning norms as well as *unlearning* of inappropriate ones. Unlearning makes that the change process is irreversible, because the old habits will not be available any more.

It might be argued that any movement to another learning prototype aims at solving specific problems in the learning process. Starting with the bureaucratic learning prototype, the increase of complexity requires the introduction of experts, who concentrate and maintain the knowledge resources and can solve complex problems by applying more advanced knowledge (Bohn and Jaikumar, 1992). This solution of the *complexity crisis* might however lead to new problems when the complexity increases even more. At very high complexity levels, it is

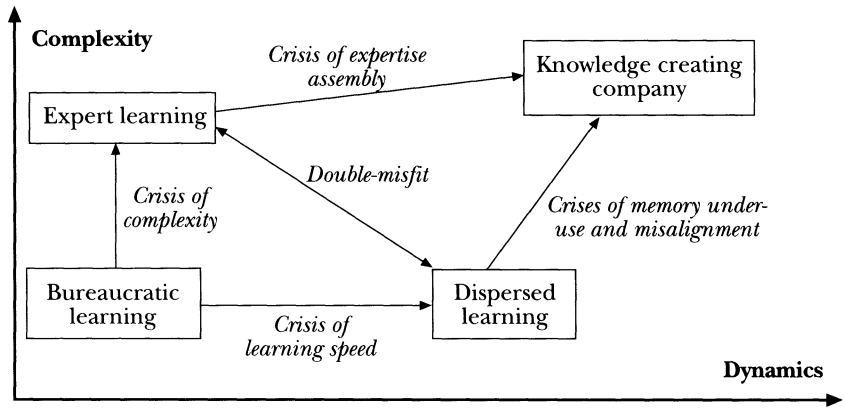
necessary to have several experts collaborating to solve one big problem. Collaboration of experts is a problem in itself when they are used to working individually or when it is hard to find out who has what expertise and how collaboration should be organized. Overcoming the problems of the *expertise assembly* thus requires combinative capabilities (Kogut and Zander, 1992) that for instance can be created by the explicit development and management of a shared organizational knowledge base (Nonaka and Takeuchi, 1995).

Starting with the bureaucratic learning prototype in simple environments again, the increase of dynamics requires a higher *speed of problem solution* than this prototype can provide. Decentralization of responsibilities and resources is a powerful method of realizing this (Galbraith, 1973; Gurbaxani and Whang, 1991) and leads to what we call the dispersed learning prototype. This dispersed

Table 3 Learning prototypes and indicators of learning needs mismatches

Learning need \ Prototype	Bureaucratic	Expert	Dispersed	Knowledge creation
Low	Match	Overhead. Knowledge adoption problems because of the mental distance of experts from the application field	Overhead. Inefficiencies in primary process	Overhead. Complex coordination and too frequent changes in work groups
Moderately low	Crisis of complexity	Match	Learning coordination problems (too much delegation, lack of overview)	Loss of concentrated expert groups
Moderately high	Crisis of complexity and crisis of speed	Crisis of speed	Match	Task force groups are not needed, because problems will be solved in the business groups
High	Crisis of complexity, crisis of speed, crisis of knowledge consistency and crisis of solution assembly	Crisis of speed, crisis of solution assembly, crisis of knowledge consistency	Crisis of knowledge consistency, crisis of solution assembly	Match

Figure 2 Levels of learning and learning prototypes



prototype, however, easily under-utilizes dispersed expertise and the learning activities may be poorly aligned with the business intent.

The knowledge creating company incorporates both managerial (middle-up-down) and structural (hypertext organization) aspects required to facilitate and coordinate learning in high complex and high dynamic environments.

The previous considerations all describe how organizations can become *effective* learning organizations, and it is stated that the knowledge creating company can handle high complexity *and* dynamics. In some cases, however, the learning needs may be lower and even decline. In such an environment the knowledge creation prototype may still generate the required knowledge (and thus is effective), but the knowledge creation could have been done in a more efficient way as well. Table 3 shows some other misfits and related problems, and Figure 2 summarizes the relations between learning needs, learning prototypes and learning crises.

Research Method

Aim and Objectives of the Case Studies

The aim of this empirical part is to present and analyze evidence about *matches and mismatches* of organizational learning needs and organizational learning prototypes. Most organizations face increasing (rather than declining) learning needs, and therefore attention will be paid to how organizations cope with the resulting learning crises by adopting another learning prototype through the accumulation and unlearning of learning norms. Some organizations also will have to unlearn learning norms that are inefficient. The objective is to describe the problems related to these accumulations and unlearnings.

Method of Data Collection and Analysis

Four cases are reported here, studied in 1993; a Dutch cardboard manufacturer, a UK health insurer, the Dutch branch of a French bank, and the Dutch branch of a US high-tech equipment producer. These cases differ in their learning needs, so

Table 4 Summary of observations

Case	Learning needs	Existing prototype	Required prototype
Cardboard Co.	Moderately low	Bureaucratic	Expert
The Bank	Moderately high	Expert	Dispersed
Health Co.	Moderately high	Bureaucratic	Dispersed (knowledge creation later)
Hitec	High	Knowledge creation; SLL only	Knowledge creation (also DLL

that the needs of acquiring different learning prototypes can be shown. For a comparative overview, see Table 4.

For each case studied, data have been collected on learning needs and learning norms, by structured interviews, document research and observations. To handle *construct validity* (control over observations; Yin, 1984) different people who were likely to have different views on the organization were interviewed. Interviewees were also asked for additional data sources for their statements, and statements of different interviewees were compared for consistency (Yin: 'chain of evidence'). Three researchers conducted the observations: Marc Hafkamp, Stephan Kordelaar and the author. The researchers critically discussed each observation and the key contact person for each case verified the case reports. *Reliability of observations* was controlled by checklists of issues related to the variables to be observed (complexity, dynamics, learning norms, accumulation and unlearning). The case study protocols were checked by the project supervisors (professors Van de Bunt and Stamper).

In the observation process, we applied a list of factors and components (based on Duncan and Weiss, 1979) to understand complexity and dynamics at organizational levels. The data on the organizational learning prototype were collected for each set of learning norms and compared with theoretical patterns expected from the theory (as mentioned in the cells of Table 3) ('pattern matching', Yin, 1984).

In the analysis, learning needs and learning norms are compared and theoretical matches and mismatches identified. The mismatches identify crises of learning, and a further analysis is made of the accumulation and unlearning process by which the company being studied tries to solve the crisis by developing a learning prototype with higher learning capabilities. The *internal validity* problems (Yin: 'controlled deductions') have been treated by the application of score card pattern matching (see Table 3). *External validity* (allowing for generalizations) has been checked by explicitly formulating propositions in advance of observations and searching for cases that would falsify the propositions. Consequently, the insights have been modified and extended several times after each case analysis. The resulting insights have been discussed with an expert in the field of organization science (Professor Van de Bunt) and an expert in the field of information and knowledge management (Professor Stamper), who have compared the gained insights against existing theoretical and practical insights.

Four Cases of Deutero Learning

Bureaucratic Learning Prototype: Cardboard Co.

Introduction to Cardboard Co. Cardboard Co. is a plant of the paper and cardboard division of a multinational operating in the office supplies business. It has about 150 employees. The plant uses recycled paper, and by applying different types of adhesive paper enables about 350 product variants to be made. Adhesive paper makes up about 30 percent of the manufacturing costs of an average type of cardboard, and the main goal variable for management is adhesive paper spoilage reduction.

Cardboard Co.'s learning needs and style The plant's environment is very stable. The division and top executives strategically minimize turbulence by acquisitions of production capacity and yearly delivery contracts with the company's customers. The delivery of raw material (used paper and adhesive paper) is very stable because there is an oversupply on the market. On the other hand, adhesive paper is very expensive, difficult to obtain on time, and frequently quality problems occur because the paper is vulnerable to mistreatment during transportation.

The complexity of Cardboard Co. (high volume, long batches) is very low. The production process reduces used paper to a pulp, and then converts this to cardboard. In general, the learning needs of Cardboard Co. are very low and the learning style is single-loop: focusing on the *efficiency* of the production process.

Cardboard Co.'s learning prototype Cardboard Co.'s management aims at reducing costs, increasing volumes produced and sold, and increasing returns on investments. Learning is not specifically an objective in this company. One director for instance stated that Cardboard Co. is a company of doers rather than of theorists.

Cardboard Co.'s management is confronted with a large list of authority limits set by the divisional management. Cardboard Co.'s management is only responsible for the detailed scheduling of the runs and the internal storage and distribution of the supplies.

Cardboard Co. is involved in 'project learning' and 'adhesive paper management learning'. Project learning concerns engineering, developing and discussing investment projects to improve cardboard production. Project learning happens occasionally, is purely technical in nature, and results in improving skills via training.

People on the shop floor have a defensive attitude to double-loop learning (innovations) because they do not have the training or ability to get another job. At Cardboard Co. two management reporting systems play an important role in single-loop learning: APMS and the Logistic Management Systems (LMS). For APMS, data are keyed in at the shop floor and analyzed by Administration. Finally the shifts receive feedback data and new instructions some days later. A big problem in this procedure is that the shifts often stay away for the weekend, and sometimes even for a week so that communication about what happened has to be based on good memories. The logistics manager also analyzes delivery data from APMS and feeds his insights back to the suppliers. Adhesive paper learning has been especially successful in the past three years by reducing spoilage from 16

percent to 8 percent. The number of learning issues measured is very limited: adhesive paper spoilage, materials, people and machine hours.

Cardboard Co.: From bureaucratic to expert Cardboard Co. is in a very stable and simple environment, and its bureaucratic learning prototype was clearly represented by Cardboard Co.'s centralized, formal, single-loop learning by experts and task motivated learning processes.

Cardboard Co's 'width loss' is substantially larger than its 'cut loss'. Width loss can be reduced by not accepting non-standard orders, improving planning processes by using an advanced planning module, or introducing flexibility in machine width. By anticipating these possibilities, Cardboard Co. will need highly trained experts to meet the increased complexity.

As a conclusion, *accumulation* in this case could be about acquiring additional expertise with new responsibilities and new procedures. *Unlearning* has to be about management that provides some learning responsibilities to experts, and unlearning some present planning methods.

Expert Learning Prototype: The Bank

Introduction to The Bank The Bank is the Dutch branch of a major European commercial bank. It has been particularly successful in the business market segment. The Bank aims at delivering full financial services and its explicit action-outcome theory states that its success depends on its public image, operational effectiveness and efficiency, and the stabilization of cyclical performance.

The Bank is divided into two commercial and support directorates. Most employees work in the commercial directorates (about 2000). About 1600 of these people work for the Branch Management Department. A further study was made of the branches. The Department of Branch Management is divided into six regions, managed by regional directors. Coordination between the Branches goes via the regional directors and the departments at headquarters.

The Bank's learning needs and style The banking business is extremely vulnerable to macroeconomic trends. This is particularly so with banks that have their roots in business services, like The Bank. At the time of our investigation (1992–3), a worldwide recession led to increased problems. Additionally, a trend of further deregulation, liberalization and globalization of the economy complicated the European banking business.

The Bank is well aware of the risks involved in its commercial activities. Therefore it has developed a method to treat prospects, to estimate a relation and to develop a cost-effective sales strategy. Because the Bank is a 'full service' bank, its complexity is considerable. Clients also demand more added value by a better customer fit, which requires more expertise and specialization. Simultaneously, information technology developments require constant innovation. Single-loop learning is insufficient to handle all these complexities.

The Bank's learning prototype However, central controls and bureaucratic rules are still important and are legally required, The Bank has recognized the need to encourage self-management (enabling dispersed learning and expert learning). In

line with this, training funds have been increased and a training center has been established. An information technology network project is underway to support collaborative learning.

The double-loop learning tasks and responsibilities are clearly divided among the departments. The departments Systems and Facilities, Administration, Financial Planning and Control, are in charge of learning about the operational processes. The departments of Organization Development and Human Resources are responsible for learning about the human resources. The departments of Product Management and Marketing and the regional directors and branches learn about markets. The department of Product Management and Marketing is responsible for learning about products.

The Bank's CEO's are now aiming to raise worker participation in management, especially at the local branch banks. After some years of centralization, the branch banks thus gain more autonomy, develop their own business plans, and are held increasingly responsible for their performance. The reason for this policy change was that local banks developed as regional market expertise groups.

There is no policy of rewarding people for learning, because (especially in commercial functions) the time lag between action and result is large (often more than two years) and ambiguous.

The Bank's services are measured in many ways, consequently it has an extensive list of management reporting systems. A branch director periodically receives 17 reports containing massive amounts of data. These management reporting systems however have no explicit connections to an action-outcome theory and many of the data are regarded as irrelevant details and difficult to analyze.

The Bank: from expert to dispersed learning prototype The Bank's double-loop and single-loop learning procedures are very formal and experts (in headquarters as well as in the branch banks) are focal in the learning process. Increasing complexity and increasing dynamics make this expert learning prototype ineffective. Most manifest is the crisis of *alignment* resulting from the large number of people involved in learning and the poor relation of management information systems with action-outcome theories. The *crisis of learning speed*, however, also requires delegation and empowerment of the branches.

With respect to *accumulation*, we see that The Bank has to develop shared action-outcome theories, delegation and new information systems. With respect to *unlearning*, The Bank has to unlearn hierarchical control of branches and batch (discrete) information supply. Going from expert learning to dispersed learning and knowledge creation is needed. To complicate matters, because of security and control reasons, partially prescribed by Dutch and international law, not all bureaucratic learning norms can be unlearned.

Dispersed Learning Prototype: Health Co.

Introduction to Health Co. Health Co. is a health insurance company, recently confronted with major problems because of its old-fashioned management style. The management style is called old fashioned because it was not commercially aware and was also based on managing the company as one family of people who have worked there for nearly a lifetime. Recent changes in the health insurance

industry (deregulation and competition) required considerable changes of the management style. As a result the management was replaced and fundamental organizational restructuring took place, combined with the introduction of innovative information technologies. In 1990 Health Co. had about 324 employees. This number was 240 in February 1993. In terms of its market share in the health insurance business, it belongs to the biggest in Western Europe. The organization consists of six business units that carry out the direct administrative interaction with a client and 12 service departments that support the business units with specific knowledge and activities.

The senior management's action-outcome theory consists of five principles: (1) planning and management on the basis of explicit targets in terms of volumes handled and time required for activities; (2) development of an organization structure that supports high speed and quality (so-called volvo teams); (3) the development of an incentive bonus scheme to reward improvements; (4) a program to measure training needs of individuals; and (5) the use of information technology to boost individual productivity.

Health Co.'s learning needs and style Health Co. has to introduce many new products to keep pace with competitors all working in a business with declining profit margins (double-loop learning). The organization also puts a systematic effort into education and training, and management information systems are established to improve efficiency of processes (single-loop learning).

Complexity increases because insurance products are becoming more complex and client groups are less homogeneous. New information technologies change the way of processing substantially and require some new competencies, but some processes also are eased by automation. The complexity in this company is not increasing much.

The learning needs are moderately high, because the dynamics are high and the complexity is moderate (it would be too much to qualify Health Co. as high-tech and it does not require very highly educated people). The learning style is both double-loop and single-loop.

Health Co.'s learning prototype Health Co.'s management does not see the use of a policy formulation. The influence of the hierarchical lines is strong, because the company is still redesigning itself and is in a strong competitive industry. Small work-groups on the shop floor (called 'volvos' after the semi-autonomous work groups in the Swedish Volvo factories) manage client problems at an operational level, but do not have authority for self-management. Project groups are sometimes created but their authority is weak in relation to the authorities in the line organization.

Management motivates people by setting targets and measurement of their time performance and delivery quality. Senior management holds the management accountable for performance and is keen on monitoring them. Management explicitly tries to create intrinsic learning motivation by training employees on awareness of the whole process. The incentives bonus scheme is developed to motivate people to learn and innovate by sharing the gained profits.

The Business Management Group (consisting of the general managers of the business units and the managers of the service departments) intends to meet once

a month but is not yet well established. Problems are therefore solved informally, resulting in a lack of overview on their nature. In the business units, the general manager, supervisors and volvo members meet each week for an hour and a half to discuss issues. The management information system has improved insights particularly on how to match work volumes and work capacities. This resulted in a total performance improvement of 30 percent in nine months.

The double-loop learning style happens only through the Business Management Group, and the single-loop learning happens through the business units. Double-loop learning is not sufficiently decentralized to call it a pure dispersed learning prototype. As a result it does not completely match the moderately high learning needs of the dynamic environment.

Health Co.: from bureaucratic to dispersed prototype The moderately high organizational learning needs require strong participation from the bottom of the organization in single-loop (efficiency) as well as double loop (e.g. product and process innovation) learning (dispersed). The management, however, is hesitant to delegate the related responsibilities. In the longer run, when complexity increases, this might lead to a *crisis of complexity*, and experts will have to be acquired externally and will be poorly aligned.

As a conclusion, with respect to accumulation, this company will have to accumulate dispersed double-loop capabilities. With respect to unlearning, the case study shows the need to unlearn control and unlearn the efficiency obsession.

Knowledge Creation Prototype: Hitec

Introduction to Hitec Hitec is a Dutch plant of a US high-tech manufacturer of electronic equipment for industry and the military. In 1980 it had about 700 employees, gradually reduced to 200 in 1993 with a constant output of 75 million US dollars. In the mid-1980s the company faced possible closure. A new management team (consisting of Europeans) was formed with a survival strategy, based on increasing worker commitment, aiming at top quality products, just-in-time (JIT) delivery and excellent internal communication. This resulted in an ISO certificate (1986), many other quality awards, an MRPA+ certificate and labor productivity increased by over 250 percent in the last three years for some processes. Despite the large budget cuts in the military in the recent years, sales have been constant.

The local plant is headed by the operations manager who is responsible for the work in seven departments, named Value Engineering, Manufacturing Technical Support, Instrument Manufacturing, Order Processing, Purchasing, Manufacturing Planning, and Warehouse, Customs and Shipping. This study focuses on the Instrument Manufacturing department.

Hitec's learning needs and style The company has stiff competition from companies in the Far East, not only because of the low price they offer, but especially because of their product quality. As a total quality plant Hitec tries to increase process quality continuously. Measurements of 'first part yield' have been developed to find out how frequently one product is made in one go and to find the causes of quality problems. Supplier instability is decreasing because of the plant's program to define supplier requirements precisely. Process innovations are particularly

important in this saturated and declining market, where product life cycles have been reduced from 10 years to just a few years.

The complexity is increasing because of the demands for higher quality, shorter lead times, cost reduction, and improved client delivery services. The plant has reacted by increasing organizational flexibility by (1) reducing 31 specializations to three skills levels and (2) removing departmental barriers by the introduction of work cells that have the authority to deal with specialists, staff members etc. when required.

In sum, Hitec's learning needs are high and learning since 1985 has been intensely single loop (quality-error correction).

Hitec's learning prototype Divisional management sets the targets for output volumes and costs unidirectionally. Of the 200 people employed, 10 work within the quality assurance department, and much operational quality assurance work is done on the shop floor in weekly meetings of a work cell and in projects.

At Hitec, learning is a responsibility for departments, management and work cells. The work cells have large responsibilities and discretion in analyzing and solving quality problems. Work feedback frequencies are mostly weekly or monthly and are valued highly because of the plant's desire for excellence. By detecting errors and the source of the mistake as soon as possible, it is hoped that people will connect them more easily with what they have done. For these purposes, testers give feedback to the shop floor, and the quality assurance group analyzes outgoing quality data and communicates problems. The company applies ISO 9001, 9002 and 9003 norms, but also follows continuous improvement (ISO 9004) by applying European Malcolm Baldridge Award criteria. Interdepartmental project groups are created frequently to research possible errors, improve quality and search for renewal for interdepartmental problems. Hitec helps suppliers (regarded as partners) to improve their quality by its supplier performance program, which provides delivery performance data and improvement suggestions. Although the client–plant relation is indirect (mediated via sales, marketing and services), the plant creates systematic feedback from clients via service and sales reports which are analyzed by the quality assurance department.

Divisional headquarters, however, centralizes design and engineering. Organization-wide task groups indicate interest in double-loop learning (process as well as product innovations) but the plant is not allowed by headquarters to think strategically about product and market development. Nevertheless new findings and technologies (e.g. a strongly work-replacing new soldering technique and a new logistic process) have been introduced easily.

All these observations indicate very low defensiveness and learning norms related to the knowledge creation prototype at the single-loop level. Double-loop learning, however, is poorly facilitated.

Hitec: from knowledge creation prototype to what? The divisional management defines learning responsibility limits, which makes it impossible for members of Hitec to put their insights into what the company needs into new products. This might lead to a *crisis of memory under-use and alignment.* Additionally, it might lead to a *crisis of learning speed* (a problem typical for the bureaucratic learning prototype), because it takes too long before problems are effectively communicated to headquarters

and improvements are implemented. Alternatively, from the point of view of headquarters, the environment might be more complex than the plant sees it, requiring stronger controls on learning and reducing the *crisis of expertise assembling*. Nevertheless, one can question if the local knowledge is underutilized so that after all Hitec is less effective in learning than a company with a knowledge creation prototype.

As a conclusion, as far as *accumulation* is concerned, Hitec has to balance local and divisional learning responsibilities. This will require *unlearning* with respect to the centralized management of divisional management if Hitec wants to put its learning needs perception into action.

Conclusions and Discussion

The first section of this article introduced *two levels of organizational learning*. The first level is about the single- and double-loop learning styles that generate, unlearn, maintain and use action-outcome theories in the practice of the organization. The second (called deutero) level is about the consistent development of organizational learning prototypes in relation to an organization's learning needs.

The article has focused on the *second level of learning*: deutero learning. This fills in organizational design insights in relation to existing organizational adaptation (Meyer, 1982) and learning techniques (Senge, 1990). One finding was that to understand the required learning norms, it is necessary to first assess the learning needs of an organization. This seemingly trivial insight has not been applied in the existing literature, probably because of the lack of a learning needs measure. This article proposed to continue previous work of Duncan and Weiss, consisting of a complexity and dynamics based learning needs measure. Additional measures have been mentioned as well. If we want to design learning organizations while coping with the specific type of knowledge required, knowledge gaps analysis and learning needs measures based on problem types are important too. This approach will make this theory more relevant for operational management levels. Particularly interesting in this respect too is that many knowledge sources are in the organization's external environment, thus requiring collaboration, acquisition, market procurement or external consultancy (Helleloid and Simonin, 1994). The prototypes defined here may still be valid but the inclusion of external partners requires some extra learning norms to motivate effective knowledge creation and avoid the risks involved (see Quinn, 1992). Additionally, it is known that knowledge is often a very heterogeneous asset, which implies that the maintenance and development of some action-outcome theories may require very different prototypes. These may nevertheless be governed by one over-arching prototype to keep consistency and realize effective collaboration of learning efforts.

A second finding is the systematic inventory of problems of moving from one prototype to another. Notably, problems of *ineffectiveness* were studied (effectiveness being defined as a situation where an organization has a learning prototype that belongs to a learning needs level lower than the one the organization has). In that case, the organization must either acquire learning capabilities or reduce learning needs (e.g. via mergers, regulation of the existing industry or codifying work

procedures; see Cyert and March, 1963; Hansen et al., 1999). Cardboard Co. showed insufficient development of its policy norms, which might lead to problems of adaptation to changing technologies. The Bank showed problems in procedural, action and responsibility norms, which were too much related to the bureaucratic learning prototype. Some part of The Bank's problems are caused by external demands to maintain a bureaucratic learning system (security demands) but the consequence was an inefficient learning process. Health Co. showed many problems in decentralizing learning responsibilities, because the high external competitiveness required top management to keep firm control over the organization. Hitec showed limitations of decentralization of learning responsibilities, possibly caused by the competitiveness of the market as well. All these cases thus clearly show that creating effective organizational learning prototypes (the optimal capability) is enabled and limited by *external factors* as well.

These external factors imply a *third level* of organizational learning: *creating conditions for learning capabilities.* These conditions can be defined through learning norms (see Table 5), but also include the organization's capability of making an appropriate assessment of its learning needs.

We should be well aware that *national cultures* and *economic situations* may play important roles in the likeliness of the implementation of these new norms. In this sense, copying seemingly brilliant innovations from different parts of the world is not by definition wise. Instead, organizations should search for learning needs first, and then analyze the required learning prototypes and the feasibility of their implementation. Studying learning prototypes is most valuable while developing new and consistent approaches to designing learning organizations.

Three remarks for the research agenda may be important to make at this point. First, the theory proposed here treats organizational environments as homogeneous, but different business units, departments, expertise areas and tasks may have

Table 5 Some environmental obstructions to implementing new learning norms

Learning norm	Environmental obstructions
Policy norms	Business context might require other priorities than organizational learning. Some slack is required for thinking about organizational learning and implementing it (see Meyer, 1982; Quinn and Rohrbaugh, 1983)
Responsibility norms	Constraints might be set by law, by a higher authority and by suppliers of resources (e.g. banks and sponsors) (Daft, 1989)
Procedural norms	Exchanging important information for learning might be too complicated because of distance, misinterpretations, lack of available data, lack of IT resources (Huber and Daft, 1987)
Action norms	Effective learning requires openness, which might negatively affect someone's position. It also requires resources that are inaccessible or job definitions that are politically or legally infeasible (Senge, 1990; Stewart, 1997)

very different levels of learning needs. This may mean that organizations will need a diversity of learning prototypes. This, however, may complicate the coordination and collaboration in learning processes in the organization. Consequently, organizations probably need one over-arching prototype to combine the learning activities in the different parts of the organization. Second, as Hitec has shown, the learning norms for SLL and DLL are very different. This means that learning norms are heterogeneous with respect to error correction (e.g. total quality management) and innovation (DLL). The prototypes need to be operationalized further by applying relevant literature on quality management, innovation management and knowledge management here. Third, the main parameters in the prototype design (learning needs and learning norms) are still in need of rigorous operationalization and measurement. These measures will help in assessing organizational learning capabilities and evaluating the propositions mentioned in this article. The idea of a 'one-best solution', like a knowledge creation prototype, may be unwise when it leads to the inefficiencies predicted by this theory. Research on these inefficiencies is, however, still scarce. But although effectiveness of learning is more important than its efficiency, inefficient learning may use too many resources, reducing the opportunities of effective learning in the end.

Notes

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1. Argyris and Schön talk of learning 'depth' instead of style. This terminology however leads to confusion, because it might be interpreted as different in value. This was not intended by Argyris and Schön (1978: 26). It is stated here that the value and priority of single- or double-loop learning is dependent on the context of learning needs.

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