

Learning Organizations in Construction

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Abstract: The transformation of organizations from production-oriented entities to proactive learning entities that continuously leverage the knowledge of the workforce is a primary objective of management researchers. This focus has significant relevance to the construction industry where production-related research has predominantly overshadowed organizational development research. As one effort to change this emphasis, the writers present a research effort designed to study current organization learning techniques and technologies fielded by organizations both inside and outside of the construction industry. Through a series of exploratory case studies, the writers developed a maturity model together with the Construction Industry Institute that provides construction organizations with a framework for developing a learning organization culture. The maturity model focuses on learning organization characteristics of leadership, processes and infrastructure, communication/collaboration, education, and culture at the organization, community, and individual levels. This paper introduces the results of that effort including a presentation of the learning organization maturity model, framework application, and the overall characteristics of a learning organization.

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Introduction

The construction industry of the 21st century is undergoing significant changes as it addresses issues such as the aging of the construction workforce, globalization, growth of the organization, and “better” client solutions. These changes are initiating a looming crisis for the construction industry, the need to both retain knowledge within the organization and focus on continuous human resource development throughout all levels of the organization. Specifically, it is imperative for construction, engineering, and owner organizations to evolve into *learning organizations* where continuous knowledge enhancement and improvement of processes becomes a fundamental element of the construction business.

The move to a learning organization is a nontrivial transformation. However, the drivers for this move are well documented by researchers both within and outside the business domain (Goh 1998; McGill et al. 1992; Stata 1989). Primary among these drivers is the emergence of the knowledge worker and the knowledge era as the new model for an organization employee (Drucker 1993). The 1950s through the 1970s witnessed the strength of the

manufacturing era where the production of goods dominated the economy. Within this economy, the production worker had primary importance. These individuals had the primary responsibility to assemble components into the finished assemblies that drove the production era. In contrast, today’s economy is moving toward the knowledge era where the manipulation and application of knowledge takes primacy over the production of components. In parallel with this transformation has been the emergence of the knowledge worker who is expected to understand how to apply knowledge in unique scenarios and with greater imagination and efficiency. Creativity has overtaken process as the foundation for successful solutions.

The emergence of this knowledge era and the expectation for more creativity in solutions is creating the need for dynamic knowledge. Rather than a set of static processes and methods, dynamic knowledge is constantly being updated to create new practices and is serving as the basis for enhanced solutions. In terms of the construction industry, this dynamic knowledge is leading toward the development of knowledge-based services, or services that reflect and leverage the ability of the organization to deliver solutions that are unique to each individual situation and to each individual client. These services return us to the emergence of the knowledge worker. To provide knowledge-based services, organizations must now employ knowledge workers who have the capacity to leverage the knowledge into solutions, often without the benefit of guidance from previous efforts.

This paper introduces one effort to transform construction organizations into learning organizations as undertaken by the writers and the Construction Industry Institute (CII) (2006). The result of this effort is a learning organization maturity model and related assessment tools to assist organizations in the development of an institutional knowledge organization structure, and the initiation of a learning organization culture.

Background

Although the concept of learning organizations may be new to construction organizations, the concept is well established in the

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management domain. The foundation of the concept is rooted in work conducted by Peter Senge in the organizational systems domain (Senge 1990a). In this work, Senge emphasizes that organizations must focus less on day-to-day events and more on the underlying trends and forces of change that cause day-to-day events to occur. From this analysis, organizations can focus on learning new ways to address issues and adapting behavior to improve processes. This concept adopts the idea that both generative and adaptive learning must occur in a learning organization. Specifically, generative learning focuses on an organization creating new knowledge, while adaptive learning focuses on how an organization changes processes to adapt to changing environments (Senge 1990b; Garvin 1993). The adoption of both perspectives is the differentiator between active learning organizations and the related active or reactive concepts of knowledge management and lessons learned.

Knowledge management has received much attention since the publication of *The Knowledge-Creating Company* (Nonaka and Takeuchi 1995). The emphasis of this work is on the idea that companies of all sizes continuously create knowledge as they pursue their core business model. This knowledge falls into one of two categories: tacit knowledge, which is knowledge that individuals gain through experience and is kept in their heads; and explicit knowledge, which can be documented and stored in formats such as papers or drawings. The focus of knowledge management is how to store this knowledge and make it available to others who may find it useful in developing solutions in other problem contexts. Many organizations are expending significant resources on the ability to perform this capture, categorization, and dissemination process. As documented in one study, 40% of construction and design organizations in the United Kingdom already have a knowledge management strategy in place (Carrillo et al. 2004). Similar to this focus on knowledge management is the implementation of lessons-learned capture systems. In this focus, knowledge from project participants is gathered in an attempt to build libraries of lessons that were learned on individual projects. These lessons are in turn categorized and made available to organization personnel through avenues such as corporate intranets (CII 1997). As with knowledge management systems, the lessons-learned approach focuses on a reactive form of learning where individuals take knowledge from a project after a lesson has been learned and then transmit it to others in the organization.

The advantage of both the lessons-learned approach and the knowledge management approach to learning is that they can be classified as technology-focused problems or social network problems. Specifically, organizations that are actively pursuing these options can either take the approach of emphasizing the development of database systems, intranets, and other distributed systems that allow individuals to access data when it is required, or remain focused on the traditional one-to-one transfer of knowledge that characterizes social networks. As highlighted by recent research, the technology approach is gaining extensive attention as companies focus on finding a technological "silver bullet" to knowledge management. This focus is also extending to the potential of using technology to develop integrated solutions that extend beyond the bounds of the construction industry to include participants throughout the design-construction interface (Messner 2003).

Although this increasing focus on technology provides construction organizations with an entry point into the learning domain, it does not meet the requirements of the learning organization. Specifically, a reactive-based approach to learning does not drive the organization forward to continuously gain knowledge and update processes for improvement. Reflecting the need

to move in this proactive direction, the writers and the CII research team put forward the following learning organization definition based on work by others and a focus on the needs of the construction industry (CII 2006). A learning organization is skilled at creating, acquiring, sharing, and applying knowledge, and embracing change and innovation at all levels, resulting in optimum performance and maximum competitive advantage.

Why a Learning Organization?

Changing an organization from a reactive learning philosophy to a proactive learning culture requires significant expenditure of time and resources. However, achieving client solutions that reflect a focus on the knowledge worker requires the organization as a whole and the employees as individuals to focus on the continuous obtainment and dissemination of knowledge. This desire for learning and its application to change processes and behaviors lies at the heart of the learning organization and forms the foundation for the drivers pushing a learning organization culture. Thus, the primary driver for implementing a learning organization is the need to remain competitive in the new knowledge era through the delivery of knowledge-based solutions that better meet the needs of clients.

Although the move to a knowledge era is the primary driver for adopting a learning organization culture, additional drivers to promote this investment have been identified in the course of this research. Some of these drivers are as follows.

Performance

An educated workforce will work both smarter and more efficiently. These performance enhancements are directly related to employees being able to ask the right questions, find relevant knowledge and information, and identify community members who have the ability to support the solution process.

Aging Workforce

The loss of corporate knowledge through retirement is a concern of every organization. However, in the construction industry, this loss can be significantly greater since knowledge is not necessarily codified into standard practices or manufacturing processes.

Distributed Workforce—Globalization

The elimination of geographic boundaries results in teams that may not have the local knowledge available for specific problem scenarios. In these circumstances, the availability of a community of practice or organization knowledge base will significantly enhance the solution process.

"Better" Solutions

Every organization is continuously searching for better solutions to client problems. The key to these solutions lies with the knowledge to find and generate new solutions. The achievement of a learning culture will enhance the probability that this knowledge resides within the organization.

Evolution (Growth) of the Organization

The organization that wants to succeed over the long-term in terms of continued growth in profits and overall performance needs to focus on evolution, not status quo. Specifically, the organization that is constantly evolving and adapting to meet new regulations, new problem areas, and new client challenges is the organization that will succeed and not just sustain. A learning organization is focused on success by continuously evolving through new knowledge and preparation for the future rather than codification of the past.

Research Methodology

Given the potential benefits of moving to a learning organization, the writers focused on both the history and current thinking on learning organizations both within and outside the engineer-procure-construct (EPC) industry. These perspectives were obtained through a methodology that emphasized both the analysis of existing research and the development of new knowledge based on the research findings. The primary steps in the methodology were (1) literature review; (2) survey; (3) case studies; (4) maturity model development; and (5) validation. Additionally, the research team developed an automated assessment tool—learning organization rapid diagnostic (LEONARDO)—to assist in the assessment and implementation of the learning organization.

The literature review focused extensively on learning from prior research in related fields. Specifically, work by Peter Senge, Peter Drucker, and others was analyzed to determine how the management community has introduced learning concepts into corporate culture. The results of this analysis provided the foundation for both the survey and the learning organization maturity model presented in this paper.

The next step was to survey CII member companies to determine where the membership currently stands in terms of achieving a learning organization culture, which was a primary objective of this research. The CII membership is comprised the EPC industry leaders. Membership includes both public and private owners, engineers, and contractors. To achieve this objective, the CII membership was surveyed on topics relating to lessons learned, knowledge management, learning, and organization commitment to developing a learning culture. Thirty-five of the member companies responded to the survey, giving the project team a solid understanding of current learning organization implementation within CII. Although this response is limited in its scope by focusing on a specific demographic, the results provided the team with sufficient background to develop the model described in this paper.

The results of the survey illustrated that EPC organizations were in the early development stage of establishing learning organizations. Therefore, a case study approach was determined to be an appropriate method for collecting data and developing the maturity model. Based upon the literature review and the survey findings, a case study protocol was developed and administered to ten organizations. The case studies involved organizations both inside and outside the construction industry that had been documented as pursuing a learning culture. The case studies focused on gaining an understanding of what was required to establish a learning organization culture.

The results of the case study effort led directly to the development of a learning organization maturity model. The maturity model presents organizations with a path forward for achieving a

CHARACTERISTICS	LEARNING ORGANIZATION ENTITIES		
	ORGANIZATION	COMMUNITY	INDIVIDUAL
Leadership			
Processes and Infrastructure			
Communication/Collaboration			
Education			
Culture			

Fig. 1. Learning organization maturity model

learning organization culture. Specifically, the model outlines the characteristics of a learning organization and the levels of learning entities within an organization. The researchers applied this maturity model to the automated assessment tool LEONARDO, which also has decision-support functionality. While an explanation of the development and testing of this tool is beyond the scope of this paper, the model itself is explained in detail in the sections that follow.

The final step in the research methodology was to validate the maturity model with specific organizations and additionally to determine barriers to successfully implementing a learning organization. Validation was done in a two-step process. The first step involved eight companies answering questions about each cell of the maturity model. The research team assessed each company on the maturity model. These results were then discussed with the company to determine their accuracy. The second step of the validation was to conduct a second set of in-depth case studies with three additional companies using the maturity model framework to identify barriers to achieving a learning organization.

Learning Organization Maturity Model

The primary outcome of this research is a learning organization maturity model. The drivers motivating an organization to adopt such a learning organization culture were previously discussed. As the next level of detail, the components of the learning organization maturity model are presented. These components provide the foundation for an organization to move toward a learning organization through a series of planned activities that result in the maturing of the learning organization culture. Fig. 1 is a matrix that illustrates the maturity model for learning organizations as developed through this research. The learning organization entities form the horizontal axis of the matrix and the learning organization characteristics form the vertical axis of the matrix. As an organization matures, it moves from the top-right corner of the matrix to the bottom-left corner—ultimately achieving a learning organization culture as explained in the following sections.

Learning Organization Entities

The entities of learning across the top of the maturity model provide a reference point to the primary learning groups found within an organization. Each of these groups is dependent on each other to facilitate the exchange, development, and evaluation of knowledge.

- **Organization:** The organization is the overall corporate entity including all levels of management and staff personnel. The organization is a critical part of the learning organization concept since a learning organization cannot exist without the encouragement and endorsement of top executives as well as the buy-in from staff personnel throughout the organization.

- **Community:** The community is the entity that represents a group of individuals who are engaged in similar technical activities—referred to as a community of practice (COP). The COP has the responsibility for both encouraging learning within the community as well as acting as a filter for the knowledge generated within the community. In this filter role, the COP determines if the knowledge generated can be beneficial beyond the COP, if the knowledge should be translated into a new practice or procedure, and if all individuals are contributing to the sharing of knowledge. It is important to recognize that COPs can exist between organizations, with individuals joining together in a professional group. However, in the context of this research, the COP is limited by the boundaries of the organization.
- **Individual:** The individual is the cornerstone of the learning organization since it is the individual who is responsible for actively seeking new knowledge and in turn disseminating knowledge to the organization. However, it is also the individual who must be convinced that the learning organization concept has personal benefits.

Learning Organization Characteristics

The overall definition of a learning organization can be further defined by a series of five characteristics as follows:

1. **Leadership**—The ability to lead the organization toward implementation of a learning organization. Attributes include:
 - a. Championing the integration of new knowledge into the organization;
 - b. Encouraging experimentation; and
 - c. Taking proactive steps to achieve a shared vision.
2. **Processes and infrastructure**—The combination of the management processes and the technical infrastructure required to implement the learning organization vision within an organization. Attributes include:
 - a. Facilitating the exchange and management of knowledge;
 - b. Institutionalizing new knowledge through new processes; and
 - c. Transferring a resource commitment from executive management to implementation plans and proper organization design.
3. **Communication**—The interaction between both COPs and individuals within the organization that facilitates the free sharing of knowledge at all times and at all levels. Attributes include:
 - a. The sharing of knowledge in pursuit of organization improvement;
 - b. Supporting the establishment and continuation of COPs; and
 - c. Eliminating of barriers to communication.
4. **Education**—A commitment by both management and employees to continuous education opportunities is a foundation of the learning organization concept and the key to bringing new knowledge into the organization. Attributes include:
 - a. Seeing education as a value to both the individual and the organization;
 - b. Developing a systematic approach to obtaining education and disseminating knowledge; and
 - c. Developing a structured approach to promoting education.

5. **Culture**—The final characteristic of learning organizations is the development of a culture that supports, promotes, and rewards learning as a vital part of organization enhancement. Attributes include:
 - a. A receptiveness to new ideas and cultural integration with a culture that is open to change;
 - b. A desire to seek, initiate, improve, and generate new ideas and concepts; and
 - c. A belief that the individual is part of something larger and is pursuing goals that are greater than the individual.

Maturity Model Responsibilities

The combination of characteristics applied to each entity of learning generates the learning organization maturity model. Specifically, each characteristic of a learning organization can be applied to a specific entity of learning through responsibilities and actions that are required at that level. In contrast to job responsibilities, these responsibilities and actions are overall requirements that are placed on each member of the organization in an effort to establish a learning organization culture. The requirements underlie specific project responsibilities to outline the expectations that a learning organization is placing on each employee.

For example, when the leadership characteristic is applied to the organization learning entity, several responsibilities are defined for the organization as follows:

- Sets vision—responsible for setting a shared vision of learning that each member of the organization can adopt and follow.
- Creates proactive learning environment—establishes the environment that promotes the sharing, seeking, and adopting of knowledge.
- Empowers learning at all levels—promotes learning throughout the organization through resource commitment and reward.
- Allows/encourages risk—creates an environment where risk taking is not only acceptable, but encouraged when managed properly and is focused on enhanced performance.
- Builds culture—responsible for establishing the underlying culture that places learning as a foundational element of the organization practice.

Similar responsibilities are defined for each cell in the matrix and provide guidelines for the organization to set expectations for each member of the organization as the move toward a learning organization is achieved (CII 2006).

The development of a learning organization does not occur overnight or even in a single year. Rather, this research effort discovered that the development of a full learning organization culture requires a series of steps that often takes at least five years or more to complete. With this level of effort facing an organization, a structure is required to assist in determining the appropriate actions to take at each stage of the process. To assist in this process, the matrix described above can be used to monitor the development of a learning organization throughout the process. This monitoring is referred to as a maturity model and it evaluates where an organization is during the process from when it first started through to the mature stage. In this final stage, the organization is transformed into a learning organization complete with an associated learning culture.

Application of the Maturity Model

The evolution to a learning organization is defined in this research as a five-level approach with each level representing a stage of

CHARACTERISTICS	LEARNING ORGANIZATION ENTITIES		
	ORGANIZATION	COMMUNITY	INDIVIDUAL
Leadership	2	1	1
Processes and Infrastructure	3	2	2
Communication/Collaboration	4	3	3
Education	4	4	3
Culture	5	5	3

Fig. 2. Five levels of the learning organization maturity model

development towards a mature learning organization concept. Each level is defined as an organization having completed the implementation of specific concepts. The learning organization maturity levels are described in Fig. 2. As an organization achieves the complete range of implementation levels for each cell, the organization is considered to have achieved that level of learning organization maturity.

As illustrated in Fig. 2, the maturity model progresses from the upper-right corner of the matrix down to the lower-left corner of the matrix. This progression reflects the need for an organization to initially have individuals who are going to take the leadership of the learning organization and champion the cause within the organization. Once the leadership is established, process can be developed, communication enhanced, education programs introduced, and finally, a culture established. The failure to follow this path could lead an organization to expend significant resources without putting in place the foundation required for the learning organization. The following descriptions provide an overview of the five maturity levels and the associated matrix levels that must be achieved.

Level 0

At Level 0 it is assumed that the organization is just beginning the transformation to a learning organization concept. It is thus considered the base layer where all organizations begin. Although some activity may be occurring in individual maturity cells, the transition to a Level 1 organization is still occurring.

Level 1

A Level 1 learning organization is focused on establishing the leadership required to move the organization toward a learning organization concept. The idea that leadership is required to move the organization forward, starting from an individual level, is represented by the matrix completion evaluations. Additionally at this level, the organization will begin addressing the processes and infrastructure that will be required to implement the knowledge sharing concept that is a key component of a learning organization.

Level 2

A Level 2 organization has completed the leadership transformation as well as the individual and community levels of process and infrastructure development. Additionally, the Level 2 organization is actively addressing the communication aspects of learning and the initial stages of education and culture change at the individual and community levels. At this stage, the organization is actively moving toward and supporting a new focus on knowledge sharing and open communication.

Level 3

A Level 3 organization is distinguished by its full implementation of organization-wide processes to support learning as well as a new focus on the learning culture at the individual and commu-

CHARACTERISTICS	LEARNING ORGANIZATION ENTITIES		
	ORGANIZATION	COMMUNITY	INDIVIDUAL
Leadership			
Processes and Infrastructure			
Communication/Collaboration			
Education			
Culture			

Fig. 3. Level 3 learning organization: light gray—organization is actively addressing specific concepts; dark gray—complete implementation of specific concepts

nity levels. Learning is no longer viewed as a necessary human resources requirement, but is viewed as an integral part of an individual's job and career. A Level 3 organization is shown in Fig. 3.

Level 4

The Level 4 organization has almost achieved full learning organization maturity. Communication and sharing are now part of the corporate culture and standard operating procedures. Leadership is championing learning throughout the organization and at all levels. Additionally, the culture now reflects the strong focus on learning at the community and individual levels with the organization now focusing on moving that culture throughout the organization.

Level 5

The Level 5 organization has achieved maturity in the learning organization model. Each level has adopted the complete range of learning organization characteristics and the learning organization culture now characterizes the organization.

Example Model Evaluations

As previously stated, 10 case studies were conducted to develop the learning organization maturity model. These organizations included construction contractors, owners, and organizations outside of the industry that were known for their focus on learning. After interviewing key personnel from each of these companies, the team evaluated the respondents' answers to key questions and developed initial maturity models for the level of learning organization implementation. It should be noted that although these models reflect interviews with only a limited number of organization employees, the examples illustrate how the model can be used to both evaluate organization efforts and assist in setting priorities for future resource expenditures.

The organization illustrated in Fig. 4 is a large contracting organization. The organization expends significant resources on training individuals to perform their jobs better and more efficiently. This focus on training is embedded in the organization

CHARACTERISTICS	LEARNING ORGANIZATION LEVELS		
	ORGANIZATION	COMMUNITY	INDIVIDUAL
Leadership			
Processes and Infrastructure			
Communication/Collaboration			
Education			
Culture			

Fig. 4. Learning organization maturity model Example 1: light gray—organization is actively addressing specific concepts; dark gray—complete implementation of specific concepts

CHARACTERISTICS	LEARNING ORGANIZATION LEVELS		
	ORGANIZATION	COMMUNITY	INDIVIDUAL
Leadership			
Processes and Infrastructure			
Communication/Collaboration			
Education			
Culture			

Fig. 5. Learning organization maturity model example 2: light gray—organization is actively addressing specific concepts; dark gray—complete implementation of specific concepts

based on decades of implementation. However, the organization has done very little to establish a foundation for organizational learning. The expenditures on training have established a reactive approach to learning that is based on outside forces requiring individuals to train at specific times. These same individuals have not been charged to pursue proactive learning. Additionally, the concepts of COPs have not been addressed. This leaves each individual to approach learning without the support of peers or individuals with similar job requirements.

Fig. 5 illustrates a large construction owner. In this model, the organization is expending resources at many different levels, but fails to complete any individual matrix cell. This results in an organization with many initiatives, but little actual movement toward the final goal or accomplishments to build upon. Similar to the organization in Fig. 4, the organization has failed to address the concept of COPs and is placing its employees in the position of addressing learning as individuals rather than supportive communities.

Practical Application—LEONARDO

The realization of a learning organization requires planning and investment over a sustained period. The learning organization rapid diagnostic is a web-based tool designed to assist engineering, procurement, and construction organizations during this period by (1) providing a snapshot of the organization's achievement toward becoming a learning organization and (2) providing advisory information for its achievement. LEONARDO provides organizations with a means of strategically assessing their investment toward becoming a learning organization (Fig. 6).

LEONARDO accomplishes these tasks based on the research results described previously. Using a questionnaire format that reflects the original questionnaire developed by the learning organizations team, LEONARDO obtains input on current learning organization activities being undertaken by the organization. Grouped according to the five characteristics and three learning entities, the questions provide direct input on the current maturity level that the organization has achieved. The process is designed to prompt organizations to discuss the answers among representatives throughout the organization to arrive at a consensus on the answers. Based on the research completed by the team, this interaction is invaluable to an organization during the development of strategic objectives.

At the completion of the input process, LEONARDO provides feedback in two areas, maturity level and learning organization investment. In this evaluation, an organization is rated along two scales. First, the organization is rated along the maturity model levels. In this rating, the evaluation tool determines the maturity level at which the organization is operating (from Level 0 to Level 5). This rating provides the organization with the overall

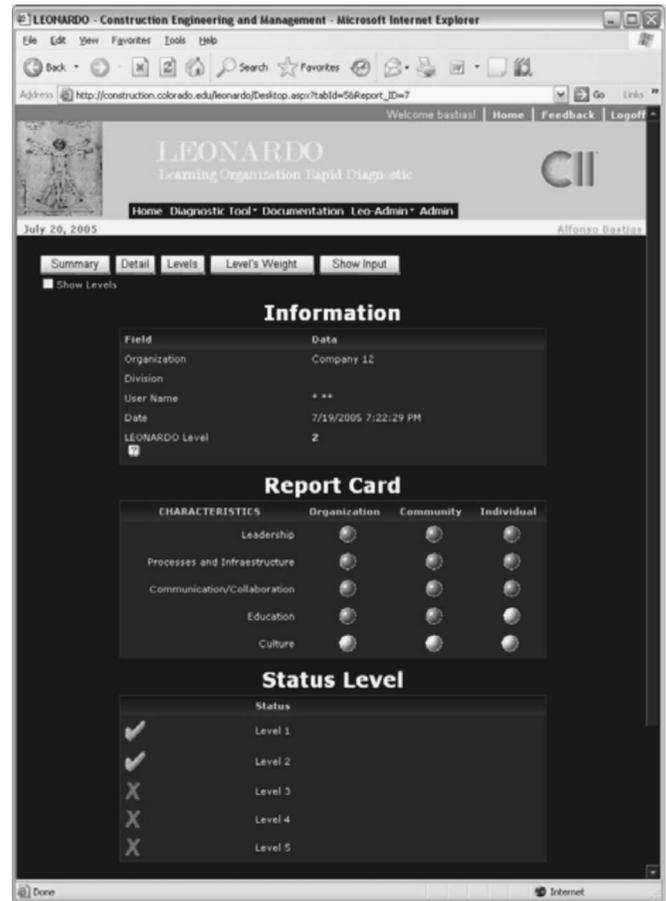


Fig. 6. LEONARDO report card

roadmap for progressing along the learning organization path. Second, the organization is evaluated for its efforts in individual areas of the model. This second evaluation is designed to provide recognition for efforts that organizations are making toward learning, but may not reside within the specific maturity model levels. For example, the organization illustrated in Fig. 4 is still not considered a Level 1 learning organization due to the fact that the foundational elements have not been addressed. However, this same organization should be recognized for its efforts in pushing education and an education culture at the organization level.

The recognition for such an investment is reflected in the LEONARDO scoring system. In this system, an organization is awarded 0, 1, or 2 points for each box within the matrix depending on their answers to the questions in the tool. In this manner, the organization in Fig. 4 may still be a Level 0 learning organization, but receives a point rating of 9 out of 30. The points recognize two important elements for the organization. First, the points recognize that resource investment has occurred and it should continue occurring because it is making a difference. Second, the points indicate that the organization is not starting from scratch in reaching the maturity model levels. Specifically, the points represent investment that will be leveraged at each step of the way to build the learning organization.

The combination of the two ratings provides an organization with a benchmark from which to proceed and an indication of how difficult it will be to achieve the next level in the maturity model. The greater the number of points that have been achieved, the greater the opportunity the organization has to leverage current expenditures. However, the lack of points in a given charac-

teristic will translate to a greater requirement to expend resources to achieve the next level of learning organization maturity.

In summary, LEONARDO is a practical tool developed for organizations to measure their progress along the extended journey toward achieving a learning organization. It is intended to provide organizations with both an opportunity to internally discuss where the organization is currently situated in terms of implementing learning organization objectives as well as a numeric measure from which the organization can benchmark progress.

Barriers to Implementation

The learning organization maturity model and the LEONARDO application are intended to provide a path for organizations to follow while undertaking a learning culture transformation. However, the path along this course contains barriers that every organization will be required to address. To obtain an indication of these barriers, the writers conducted case studies of three organizations in the construction domain that were at various stages of learning organization implementation. The focus of these case studies was to identify the barriers that were hindering or preventing the organizations from furthering the implementation of a learning organization culture.

Initially, interviews with a member of each company who was integrally involved with learning organization-type initiatives were conducted. These interviews were intended to establish what the company was attempting to do in terms of creating a learning organization culture. Following these interviews, interviews were conducted with management and project management personnel within each company. The intent of these interviews was to determine if initiatives conceived at the company's executive level were being translated to the project level effectively.

Prior to answering any questions relating to learning organizations, participants were asked to briefly describe their role in the company and provide any background information to the company that they thought may be helpful. The learning organization questions were developed based on the learning organization characteristics and levels defined by the learning organization maturity model. Participants were first asked how familiar they were with the concept of a learning organization and, if they were at all familiar with the concept, how they would describe a learning organization. Following this, questions became more specific and focused on actual programs that may or may not be in place at each organization and the barriers that were encountered while implementing the programs.

The result of this case study process was the identification of six primary barriers to the successful implementation of learning organizations:

- Executive support—The lack of support from senior executives prevented the organization from obtaining resources for the implementation effort and prevented employees from adopting a culture of learning.
- Employee support—The lack of support from employees prevented the organization from achieving a broad base of effort from individual employees.
- Time—The lack of time prevented organization personnel from dedicating resources to obtain new knowledge.
- Money—Similar to time, the lack of money prevented organizations from investing in learning organization programs.

- Value measurement—The lack of value measurements created doubts among senior personnel that value was obtained from investing in learning objectives.
- Knowledge sharing infrastructure—The lack of an infrastructure to support knowledge sharing significantly restricted individuals from exchanging knowledge and becoming a learning community.

Although these case studies represented a small sample of organizations pursuing learning objectives, they provide additional validation of the learning organization maturity model and an initial look at the barriers that organizations are facing in adopting a learning culture. Of particular significance from these studies is the finding that executive support is the key first step to a successful implementation of a learning organization culture. Similar to all change management efforts, this support is critical to both the allocation of resources and the continued support of the objective over an extended period of time.

Conclusion

Organizations as diverse as Motorola and Accenture have transformed learning organizations from a concept to an integral component of their business success. Researchers such as Peter Senge at MIT have written extensively of the benefits and challenges associated with adopting a learning organization culture. However, the existence of these resources and success cases does not automatically translate into cross-industry adoption. For the construction industry to adopt a learning organization culture the concept of *continuous learning and personal advancement* must become a fundamental operating concept within organizations at every level and throughout every project and business process.

Adopting this concept requires the construction industry to focus on a long-term outlook for learning. This paper introduced a new maturity model for organizations to follow while adopting this long-term outlook. The development of a learning organization culture requires investment at all three learning entity levels and in all five characteristics of the learning organization. The organizations that can objectively evaluate where they currently stand in the culture change process and can strategically invest in appropriate maturity levels will be the ones that achieve this culture in a successful manner.

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