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LEADERSHIP IN A KNOWLEDGE ERA:
ACHIEVING THE LEARNING ORGANIZATION

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Research Report 201-11

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ACHIEVING THE LEARNING ORGANIZATION

by

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A Report to
Construction Industry Institute
The University of Texas at Austin

Under the Guidance of
CII Research Team 201
Achieving Learning Organizations

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CONTENTS

LIST OF FIGURES	iv
EXECUTIVE SUMMARY	v
CHAPTER 1 - INTRODUCTION	1
1.1 Background	2
1.1.1 Learning	2
1.1.2 Knowledge Management	4
1.1.3 Organization Systems	6
1.1.4 Learning Organizations and the Construction Industry	7
1.2 Why a Learning Organization?	8
1.3 Benefits	10
1.3.1 Organization Level	10
1.3.2 Community Level	11
1.3.3 Individual Level	12
1.4 The CII Effort to Build on This Foundation	13
CHAPTER 2 - METHODOLOGY	14
2.1 Literature Review	15
2.2 Best Practices Review	16
2.2.1 CII survey	16
2.2.2 In-Depth Interviews	17
2.3 Matrix Development	18
2.4 LEONARDO	18
2.5 Validation	19
CHAPTER 3 - DATA ANALYSIS	20
3.1 CII Survey	20
3.1.1 Survey Results	21
3.2 In-Depth Interviews	25
3.2.1 Methodology	26
3.2.2 Case Study Highlights	27
CHAPTER 4 - THE LEARNING ORGANIZATION MATRIX	31
4.1 Entity of Learning	31
4.2 Characteristics	32
4.3 Matrix Responsibilities	33
4.4 The Matrix as a Maturity Model	36
4.4.1 How to Use the Matrix as a Model	36
4.5 Example Model Evaluations	39
4.6 The Matrix In Learning Organization Operations	42
4.6.1 Adding the Characteristics	43
4.6.2 Additional Elements	44
CHAPTER 5 – MODEL DEVELOPMENT AND APPLICATIONS	46
5.1 LEONARDO	46
5.2 How LEONARDO Was Developed	53
5.2.1 Development Indicator Questions for Learning Levels	53
5.2.2 Development of Learning Level Weightings	55
5.2.3 Development of Question Weightings	57
5.2.4 Tool Validation and Calibration	60
5.3 Conclusions	63

CHAPTER 6 - KEYS TO IMPLEMENTATION	64
6.1 Barriers to Implementation	64
6.2 Keys To Implementation.....	68
CHAPTER 7 - CONCLUSIONS	71
7.1 Research Synergy.....	72
7.2 Future Research	73
APPENDIX A – CII DATA COLLECTION SURVEY	75
APPENDIX B – LEONARDO	81
Contact Information:	82
Leadership.....	83
Processes and Infrastructure	85
Communication.....	87
Education	88
Culture.....	90
APPENDIX C – INITIAL LEONARDO QUESTIONS PRIOR TO VETTING AND WEIGHTING ...	92
Self Assessment Questions	92
APPENDIX D – PAIRWISE COMPARISON QUESTIONNAIRE FOR LEVEL WEIGHTING	100
Learning Level Weighting Form	100
APPENDIX E – DELPHI WEIGHTING FORM FOR QUESTION WEIGHTING	104
Question Weighting within Characteristic.....	104
REFERENCES	107

LIST OF FIGURES

Figure 2.1 – The methodology incorporated for the learning organizations	14
Figure 3.1: Do companies have formal lessons-learned initiatives?	21
Figure 3.2: Do companies have a formal method for capturing new ideas?	22
Figure 3.3: Does your company have an internal continuing education program?	22
Figure 3.4: When are companies modifying behaviors?	23
Figure 3.5: Are organization leaders passionate about establishing a learning culture?	23
Figure 3.6: Outline of Case Study Interview Questions	25
Figure 4.1: The Learning Organization Matrix is comprised of Learning Levels and Characteristics. When characteristics are applied at each level, specific responsibilities are developed for organization employees.	31
Figure 4.2: The learning organization matrix with the associated responsibilities.	35
Figure 4.3: Level 1 Learning Organization	37
Figure 4.4: Level 2 Learning Organization	38
Figure 4.5: Level 3 Learning Organization	38
Figure 4.6: Level 4 Learning Organization	39
Figure 4.7: Level 5 Learning Organization	40
Figure 4.8: Maturity model example 1.	41
Figure 4.9: Maturity model example 2.	41
Figure 4.10: Maturity model example 3.	42
Figure 4.11: The integrated learning organization operates like a machine, translating drivers into benefits through learning entities and characteristics.	46
Figure 5.1: LEONARDO Website	48
Figure 5.2: LEONARDO questionnaire, partial input for leadership	49
Figure 5.3: Report Card, Summary View with Color Coding.	51
Figure 5.4: Color Key for Report Card	51
Figure 5.5: Report Card, Summary View with Color Coding.	53
Figure 5.6: Example Indicator Questions	55
Figure 5.7: The Pairwise Comparison Scale (Saaty 1990b)	57
Figure 5.8: Example Delphi Weighting Form – Round 1	59
Figure 5.9: Example Delphi Weighting Form – Round 2	60
Figure 5.10: Validation and Calibration Test Case Results	63
Figure 6.1 – The barriers identified for learning organizations with their primary areas of impact on the characteristics.	67

EXECUTIVE SUMMARY

The transformation of organizations from production-oriented entities to proactive learning entities that continuously leverage knowledge to improve production is a primary objective of organization leaders and management researchers. The emergence of the “Knowledge Era” has significant relevance to the engineer-procure-construct (EPC) industry, where production has forever overshadowed organization development. Expectations of more creative solutions are driving this need for dynamic knowledge. Rather than a set of static processes and methods, constantly updated dynamic knowledge can serve as the basis for enhanced solutions. For the EPC industry, this dynamic knowledge is leading toward the development of knowledge-based services—services that reflect and leverage the ability of the organization to deliver solutions that are unique to each individual situation and customer. In 2003, the Construction Industry Institute established its Achieving Learning Organizations Research Team to study current organization learning techniques and technologies in the EPC and other industries. CII also tasked the research team to provide a method for organizations to evaluate their current state of learning organization development and means for the continued development of a learning organization culture.

The results indicate that EPC learning organizations are still in the developmental stage. Because of this, the research team moved away from traditional collecting and presenting of industry statistics. Instead, it began developing a new framework to assist organizations in achieving a learning organization culture. Specifically, the team developed the Learning Organization Matrix and the Learning Organization Evaluation Tool (or LEONARDO), a tool that evaluates an organization’s status as a learning organization from inception through the mature learning stage.

This publication provides an overview of the research. The research team suggests that EPC companies focus on leadership, champions, direction, technology balance, and resource allocation. In doing so, they will make themselves more adaptable to becoming a learning organization.

CHAPTER 1 - INTRODUCTION

The engineer-procure-construct (EPC) industry of the 21st century is undergoing significant changes as it addresses issues such as the introduction of advanced field and office technologies, the aging of the workforce, globalization, economic integration, and international partnering. These changes are initiating a looming crisis for the EPC 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 and owner organizations to evolve into learning organizations where continuous knowledge enhancement and improvement of processes becomes a fundamental element of the EPC business.

This move to a learning organization is a comprehensive transformation by an organization. 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 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 with an emphasis on issues such as globalization and automation 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 serving as the basis for enhanced solutions. In terms of the EPC 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 customer. 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 knowledge into solutions that may either break from previous solution patterns or leverage previous efforts into enhanced solutions.

1.1 Background

Although the concept of learning organizations may be new to EPC organizations, the concept is well-established in the management domain. Within this domain, three primary influences have merged to impact the development of learning organizations; learning, knowledge management, and organization systems.

1.1.1 Learning

The fundamental basis of establishing a learning culture is the requirement to enhance learning within the organization. Research within this domain divides learning into two distinct categories. Essentially, learning is categorized based on when and why it takes place and the effect that it has on those who are learning. The first type of learning can be thought of as incremental learning in which knowledge is gained in a piecewise manner as it becomes a necessity while the second is a dynamic process of continual learning in which knowledge is proactively sought out before it becomes a necessity.

Chris Argyris (Luthans et. al. 1995) describes learning as being either *single-loop* or *double-loop*. The fundamental difference between these two learning types is what they change. Single-loop learning changes a process in response to information from past experiences and focuses on the symptoms of problems. Double-loop learning uses symptoms only as indicators, shifting focus to the root causes of problems to change the underlying principles and theory behind a process. Essentially, single-loop learning takes place after a problem has occurred, making it a reactive process; whereas double-loop learning focuses on fixing processes before a problem occurs, making it a proactive process.

Similarly to Argyris, Senge categorizes learning into two separate categories: adaptive and generative. However, while Argyris' categorizations of learning center on what is changed during the learning process, Senge's categorizations focus more on when learning takes place. Adaptive learning is a company's method of reacting to a dynamic work environment so that a company making use of only adaptive learning remains stagnant in its knowledge until it is forced by some new experience to adjust. Contrastingly, generative learning *enhances our ability to create* (Senge 1990a). In this sense, generative learning is inspired by the possibility of change in the future while adaptive learning is imposed by actual change in the present.

Although different in name, Senge's and Argyris' categorizations of learning are fundamentally the same. Single-loop learning *is* an adaptive process and double-loop learning *is* a generative process. Companies which are engaging in single-loop or adaptive learning processes are at a minimum addressing the need to change and adjust business practices (Kululanga et. al. 1999). Additionally, Nevis points out that engaging in generative learning should not *negate the value of everyday incremental "fixes."* (1995) Companies will inevitably face problems which were not addressed in any generative learning processes and will be forced to adapt if they hope to survive.

Although the value of adaptive or single-loop learning should not be ignored, both Senge and Argyris view generative or double-loop learning as the key to successful learning. Argyris summarizes

the key difference between single- and double-loop learning by using the example of a thermostat set at 68°. A thermostat which utilizes a single-loop process detects when the temperature is below 68° and reacts by turning on the furnace. If the thermostat instead asked why it was set at 68° and whether this was the best setting for that particular environment, it would be engaging in a double-loop process (Argyris 2000). Companies that only “turn on the furnace” when a problem is encountered without identifying the root of this problem will continue to encounter similar problems in the future.

1.1.2 Knowledge Management

In previous research, CII determined that one of the largest barriers to successful implementation of a lessons learned program is the lack of a centralized management process. This acts as a bridge to the topic of Knowledge Management. The American Productivity & Quality Center (APQC) defines knowledge management as follows:

the conscious strategy of putting both tacit and explicit knowledge into action by creating context, infrastructure, and learning cycles that enable people to find and use the collective knowledge of the enterprise (2000).

In today’s dynamic business world, it is no longer enough for knowledge to be possessed at the individual level. New technologies and an abundance of competition require that knowledge be shared and utilized at an organizational level if a company hopes to survive.

Hendricks and Vrien suggest that the knowledge assets possessed by a company create the possibility for sustainable competitive advantage (1999). This being the case, a company that manages knowledge effectively will have a better chance of long-term survival than those which lack in the same area. An effective knowledge management program adapts individual knowledge into information that can be readily used to the benefit of the organization as a whole. Aside from extracting and clarifying

knowledge from the individual, knowledge management programs organize and provide structure to information so that it can be located and used effectively and conveniently.

The importance of knowledge management becomes transparent when considering the different forms which knowledge can take. Just as learning can be divided into the two distinct categories of single- and double-loop learning, knowledge can be classified as either *tacit* or *explicit*. Explicit knowledge is just what it claims to be – knowledge that has been explicitly *explained, recorded, or documented* (McInerney 2002). As explicit knowledge has, in some form, been communicated and can be formally documented, it can be shared relatively easily among individuals throughout an organization. The more difficult task of knowledge management then becomes that of managing tacit knowledge. Tacit knowledge may be considered intuitive knowledge guided by experience. This type of knowledge is based on experience, mental models and perspectives that are so deeply embedded in a person that the knowledge becomes second nature to an individual and, as such, is difficult to communicate. Central to the concept of knowledge management is transforming individuals' tacit knowledge into explicit knowledge, which can be used by the entire organization.

Failing to create explicit knowledge from tacit knowledge can result not only in losses to an organization but can also help to accelerate a competitor's advantage. Zack (1999) explains this concept as follows:

Potentially explicable knowledge that has not been articulated represents a lost opportunity to efficiently share and leverage that knowledge. If competitors have articulated and routinized the integration of similar knowledge, then they may obtain a competitive advantage.

In other words, by extracting an employee's tacit knowledge a company multiplies the value which that employee adds to the company. If one company is able to extract tacit knowledge in this manner, it will excel above competitors who may have the same knowledge within their grasp but fail to share it on a company-wide basis.

1.1.3 Organization Systems

In the 1990 publication of his book *The Fifth Discipline*, Senge writes that at that time, *learning organizations [had] been invented, but not yet innovated* (1990a). The intent of this statement is to convey that although the concept of learning organizations had been previously “invented,” it had not yet been discussed in a manner that would provide companies with guidance for implementation. Senge proposes the following five disciplines as the necessary components needed for a company to become a learning organization:

- 1. Systems Thinking**
- 2. Personal Mastery**
- 3. Mental Models**
- 4. Shared Vision**
- 5. Team Learning**

Systems thinking, the so-named *fifth discipline*, is described as the element that fuses the other four disciplines so that they develop simultaneously rather than as separate tools. As described by Senge, *systems thinking is a discipline for seeing wholes. It is a framework for seeing interrelationships rather than things*. A problem with management processes in many companies is the tendency to focus on fixing things or *symptoms* rather than underlying causes (Senge 1990b). This is essentially a form of adaptive or single-loop learning. If companies chose instead to focus on relationships between symptoms and their causes they would be practicing double-loop learning, or *systems learning*. Systems learning is a cornerstone to learning organizations as it is the means in which the interrelationships between the remaining four disciplines can be seen.

The remaining four disciplines are referred to as *core disciplines*. The first of these disciplines, *personal mastery*, is described as an individual’s personal commitment to continuous learning. The

second discipline, *mental models*, is aimed at overcoming previously held assumptions and beliefs of how the world works. Senge writes that often new ideas or theories are never actually incorporated into practice because they conflict with existing mental models of how things are or should be done.

Shared vision, the third discipline, is the idea of creating a common image among every individual of what an organization hopes to achieve. The final discipline suggested by Senge is *team learning*. The main focus of this discipline is *aligning and developing the capacity of a team to create the results its members truly desire*. In this sense, for team learning to occur, individuals should be working towards a common goal or shared vision. Team learning acts as a portal for individual learning to be transferred to the organizational level.

1.1.4 Learning Organizations and the Construction Industry

Despite a wealth of literature on learning organizations and organizational learning, a minimal amount of research exists on learning in the construction industry. In contrast, a significant amount of work has been published on the use of lessons-learned systems within construction organizations. This focus reflects the industry focus on single-loop or adaptive learning. Rather than focus on identifying issues before they arise, the construction industry is characterized by its focus on reacting to problems and striving to contain problem projects.

A research effort by Kululanga et. al. shows that UK contractors employ very few learning mechanisms as a means of creating new knowledge, and those that are employed are not developed to their full potential (1999). Fu et. al. suggests that the lack of intentional implementation of learning mechanisms or attempts at becoming learning organizations may be due to the high level of competitiveness within the construction industry (2002). As the construction industry is highly fragmented, many contractors focus only on short-term survival. This being the case, many companies do not have sufficient resources for developing a learning organization. Rather, the management

approach to learning seems to emphasize a technology-based approach. Specifically, organizations that have identified knowledge as a corporate asset are emphasizing the development of database systems, Intranets, and other distributed systems that allow individuals to access data when it is required. As highlighted by recent research, this technology approach is now being extended beyond the bounds of the construction industry to include participants throughout the design-construction interface (Messner 2003).

Although this 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 current research effort puts forward the following learning organization definition based on work by others and a focus on the needs of the EPC industry.

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.

1.2 Why a Learning Organization?

Changing an organization from a reactive learning philosophy to a proactive learning culture requires a significant expenditure of time and resources. However, achieving customer solutions that reflect a focus on the knowledge worker requires the organization as a whole, communities within the organization, and the employees as individuals to focus on the continuous obtainment of knowledge. This desire for learning and its application to change processes and behaviors lie at the heart of the learning organization and form 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 Knowledge Era through the delivery of knowledge-based solutions that better meet the needs of customers.

Additional drivers exist to promote this investment, including:

- 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 procedures.

- 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 — lies with the knowledge to find and generate new solutions. The implementation of a learning culture will enhance the probability that that this knowledge resides within the organization.

- Evolution (growth) of the organization — focus on change, not status quo. Specifically, the organization that is constantly evolving and adapting to meet new regulations, business environments, and customer challenges is one that will succeed, not just sustain. In contrast, the organization that remains reliant on static procedures and knowledge may find itself unprepared to meet sudden shifts in the business environment.

1.3 Benefits

The existence of drivers for adopting a learning organization approach provides the initial impetus for initiating an investment in this concept. However, the outcomes ultimately drive an organization to continue its investment into a learning organization culture. The following outcomes provide an overview of the opportunities that an organization has to leverage this investment at an individual, community, and organization level.

1.3.1 Organization Level

The benefits to the organization will be an economic indicator if the organization should continue its investment in a learning organization culture. The following benefits represent the core of the learning organization argument for investment.

- Capability vs. capacity — Any organization can build capacity for a project or client by adding resources to the organization. Given enough capital, the organization can display a level of capacity that may seem appropriate for any project. However, capacity does not equate to capability. Capability emphasizes having personnel with the knowledge to generate customer solutions effectively, and is developed over time with each member committing to enhance the overall knowledge of the organization.
- Sustainable advantage — An organization that continuously evolves based on knowledge retains a sustainable advantage by eliminating the threat of irrelevance. This advantage does not reduce over time, but increases as the organization continues to build its knowledge base.

- o Implement faster solutions with better customer fit — may be the most important to long-term organization success.

1.3.2 Community Level

The “community” (see next section) represents a group of individuals with similar technical or job responsibilities. Communities represent the basic working group within an organization. The following benefits to these groups are necessary to retain everyday support for the learning organization concept.

- o Enhanced solutions — Solutions generated through communities of practice (COPs) have the benefit of combining knowledge from multiple participants into a single enhanced solution, a “team solution.”
- o Create knowledge assets — The community that is continuously focusing on knowledge enhancement will be generating knowledge assets for the organization. In the Knowledge Era, the level of organization knowledge is directly parallel to the number of knowledge assets that the organization possesses.
- o Moderated knowledge — “peer-reviewed” – The development of knowledge communities will provide a filter for knowledge acquisition and storage in the organization. This filter will provide a level of quality control for the organization so that individuals will have confidence in the knowledge they are applying in the solution process.
- o Stair-step Productivity vs Roller Coasters – In a traditional approach to knowledge growth, organizations typically follow a “roller coaster” approach, where knowledge is obtained for an individual project, is often lost after the project, and then re-obtained when needed for a new project. In contrast, a learning organization eliminates

the loss of knowledge period and focuses on continuously building upon previous knowledge (the stair-step).

1.3.3 Individual Level

Since no organization initiative can succeed without the support of the individuals within the organization, specific benefits must be provided at that level. The following represent benefits to individuals arising directly from an investment in a learning organization culture.

- o Job satisfaction — The ability to generate better solutions that address a greater number of concerns will provide greater satisfaction to individual employees.
- o Personal growth — Learning is the foundation for personal growth. Just as an organization continues to evolve, individuals must focus on growth or risk becoming irrelevant to the organization.
- o Career advancement and security — Staying current with developments in multiple areas results in an employee having greater value to the organization.
- o Part of community — The development of communities of practice within the organization provides individuals with a sense of community and reduces the feeling of isolationism that can occur in a large organization.
- o Productivity increase — "spinning wheels reduction" – The greater access to knowledge will directly reduce the time employees spend searching for information and generating solutions that do not meet the customer's requirements. The knowledge to address new solutions will directly increase productivity at all levels of the organization.

1.4 The CII Effort to Build on This Foundation

One difference in the research effort that is summarized in this publication from traditional CII research efforts is the outcomes. The EPC industry is still in the developmental stage of establishing learning organizations. Therefore, the Achieving Learning Organizations Research Team moved away from the traditional CII model of collecting and presenting industry statistics to focus on the development of a new framework to assist organizations in achieving a learning organization culture. The research team had the following objectives:

1. Identify the critical characteristics of a learning organization.
2. Evaluate learning organization practices in both industry and research environments.
3. Capture the organizational issues that motivate or prevent the development of learning organizations.
4. Develop a model to assist organizations in developing a learning organization culture.
5. Develop a self-evaluation tool for organizations to evaluate their current state of learning organization development.

Chapter 2 addresses these objectives by detailing the methodology incorporated by the research team to achieve the objectives and develop the learning organization framework.

CHAPTER 2 - METHODOLOGY

Given the potential benefits of moving to a learning organization, the authors 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

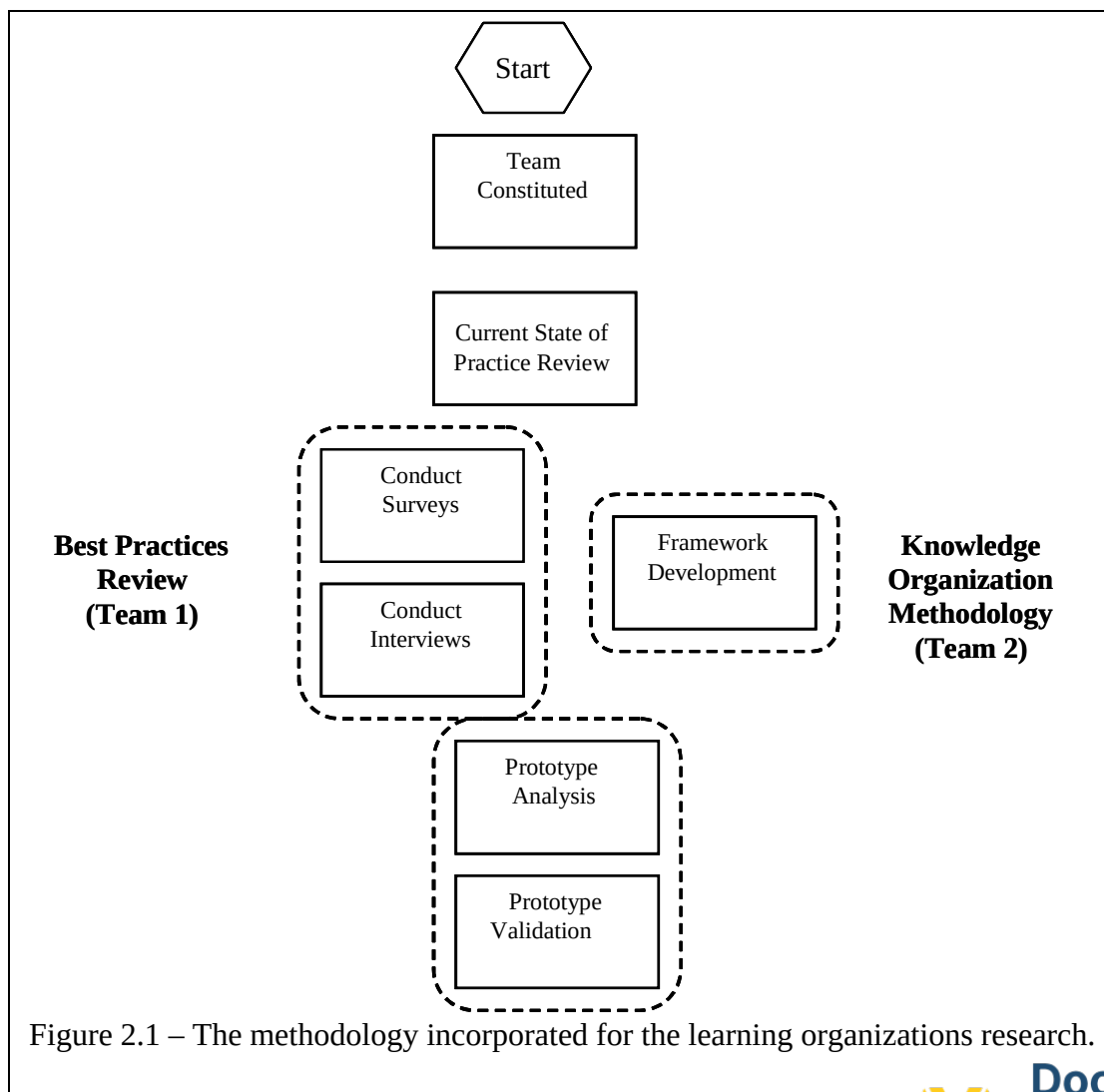


Figure 2.1 – The methodology incorporated for the learning organizations research.

assessment and implementation of the learning organization (Figure 2.1).

2.1 Literature Review

The literature review focused extensively on learning from what has been done prior to this effort in related fields. Specifically, works by Senge, Drucker, and others were analyzed to determine how the management community has introduced learning concepts into corporate culture. The overall results from this review are outlined in the Background section in Chapter 1. However, to summarize the findings from this effort, the following observations were obtained during the literature review:

Learning organizations adopt a double-loop learning approach to integrating learning concepts into the culture. The second loop being the use of collected knowledge to modify and improve existing processes (Argyris 2000).

Learning requires a combination of bottom-up and top-down support with both the individual and the management required to support the learning concept (Garvin 1993).

Communities of practice provide an intermediate level of support that is required to expand the learning culture beyond an individual group or project.

An organization needs to be viewed as a system with each member and group being an integral part of the overall success of the system (Senge 1990a).

The allocation of resources is a critical component of long-term success, both at the organization level and for individual learning efforts (Goh 1998).

Developing a learning culture is a change management issue. Barriers will be encountered during the adoption of a learning culture and these barriers must be anticipated prior to the adoption of learning implementation effort (Rowden 2001).

The development of a learning culture requires an extended commitment from the organization. The successful adoption of a learning culture will not occur in a single year and the organization must be prepared to incur the costs associated with this long-term effort (Gardiner and Whiting 1997).

The implementation of a lessons-learned program or a knowledge management program is not achieving a learning culture. While this is a first-step, it does not classify as a learning culture (Chinowsky and Molenaar 2005).

The results of this analysis provided the foundation for both the survey and the learning matrix presented in this report.

2.2 Best Practices Review

At the conclusion of the literature review, the team focused on two parallel tracks; a best practices review and a development of the learning organization framework. The first of these tracks, the best practices review, was intended to identify the current practices that CII companies were implementing to achieve a learning organization culture and then generalize these practices to provide a best practices summary. The details of this study are outlined in Chapter 3 - Data Analysis. However, the following sections provide an overview of the methodology used to implement the data analysis component of this research effort.

2.2.1 CII survey

Based on the literature review, a survey was developed that focused on analyzing CII member companies to determine where the membership currently stands in terms of achieving a learning organization culture. The survey included major topics related to lessons-learned, knowledge management, learning, and organization commitment to developing a learning culture (Appendix A).

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 learning organization framework discussed later. In summary, the results of the survey illustrated that EPC organizations were in the early development stage of establishing learning organizations. Specifically, the survey illustrated that few companies were currently in a mature stage of learning organization culture. Rather, most companies were currently attempting to implement learning initiatives, or were beginning to focus on specific areas to implement learning concepts.

2.2.2 In-Depth Interviews

The initial results from the learning survey indicated that a greater understanding of how and why individual organizations succeed in adopting learning cultures was required. In response to this need, a case study approach was determined to be an appropriate method for collecting data and analyzing a smaller set of organizations. Based upon the literature review and the survey findings, a case study protocol was developed and administered to ten organizations. The organizations were selected from inside and outside the construction industry to gain a broader perspective on implementing a learning culture. However, each organization had been documented as pursuing a learning culture. Therefore, the case studies focused on gaining an understanding of what was required to establish a learning organization culture.

In each case study, a team of RT 201 members interviewed organization personnel following the case study protocol developed from the survey. The information from the interviews was analyzed by the team for key similarities and differences to information obtained from other case studies and from the survey data. A summary of the findings is provided in Chapter 3.

2.3 Matrix Development

In a parallel effort to the data collection and analysis effort, the RT 201 team began to synthesize the results of the case study effort into the development of a learning organization maturity model. The matrix had three fundamental goals; outline the characteristics of a learning organization, identify the levels of learning entities within an organization, and provide a map of where an organization should place its resources during the development of a learning organization culture. The process of developing this matrix model relied on the collected expertise of the RT 201 members. Through a series of meetings, the members collectively refined the characteristics of a learning organization based on group knowledge, input from the literature review, and analysis of the case study results. In addition to the characteristics, the team focused on identifying the key levels of the organization where learning is supported and occurs. The results of these discussions are reflected in the three levels adopted for the model. Finally, the team refined the model by adding a temporal component to adopting the matrix. Through a series of discussions and an analysis of each location within the matrix, the team adopted a five-phase implementation model for the matrix. Chapter 4 contains a detailed explanation of the developed matrix and how it is to be used to develop a learning organization culture.

2.4 LEONARDO

During the course of the matrix development effort, the team determined that a computer-based tool would be helpful to assist in evaluating organizations' current state of learning culture development. The Learning Organization Evaluation Tool (LEONARDO) was thus developed to evaluate learning organization progress and investment. LEONARDO exists in two formats, a paper format and a web-based electronic format. The format of the tool is described in Chapter 5. At the core of this tool is the

survey developed to analyze progress toward the adoption of a learning organization culture. Using an Analytical Hierarchy Process (AHP) and a Delphi discussion format, the team developed a series of weightings and importance factors for each question in the survey. These values are reflected in the scoring system implemented in the LEONARDO tool. The result of this implementation is a tool that has the ability to provide an organization feedback on the learning level they have achieved and a reflection of the overall matrix scenario they have achieved based on total investment. Finally, the model provides feedback on next steps in the learning organization implementation process.

2.5 Validation

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 results of this process were used to adjust the questions and calculations in the model and develop the final version of the tool. Although the revisions to the model were minor, some scoring changes did occur and the resulting changes were used to retest existing case study data sets. Once the team was satisfied that the model accurately reflected the intentions of the team and the external reviewers, the model was made available for team members to analyze their own organizations. The result of this process was a matrix model that was determined by the team to accurately reflect their own opinions and analysis of their respective organizations. Finally, a second step of the validation process was implemented where a second set of in depth case studies with three additional companies was conducted using the maturity model framework to identify barriers to achieving a learning organization. The results of these findings are provided in Chapter 6.

CHAPTER 3 DATA ANALYSIS

The research team's first step in analyzing learning organizations was to gain an understanding of the current state of learning organizations within the EPC industry. This analysis was undertaken through the administration of a survey to the CII membership to obtain general information and a set of case studies to obtain specific input into learning organization policies and practices. The following two sections highlight these efforts with the information obtained from the survey and the case studies.

3.1 CII Survey

Although the overall goal of the CII survey was to analyze the state of learning organization progress, the survey also determined how many companies had taken initial steps along this path by developing knowledge management or lessons-learned initiatives. This data was important since these programs are the first loop in learning or the reactive component. Although they do not meet the requirements of a learning organization, they do represent an initial investment in organization learning. The first of these initiatives, knowledge management, has received much attention since the release of *The Knowledge-Creating Company*, a book that suggests 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, the type individuals gain through experience, and *explicit* knowledge, documented and stored in formats such as papers or drawings. The focus of knowledge management is how to organize this knowledge and make it available to others who may find it useful in developing solutions in other problem contexts.

The second of these initiatives, lessons-learned systems, gathers knowledge from project participants 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

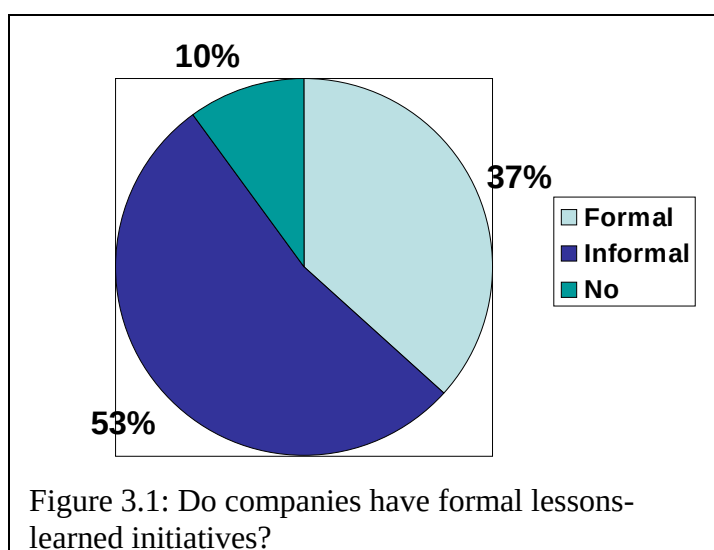
corporate intranets. As with knowledge management systems, the lessons-learned approach focuses on a reactive form of learning where individuals take knowledge from a project after a lesson has been learned and then transmit it to others in the organization.

As the following data illustrates, EPC organizations have taken significant strides towards building knowledge management or lessons-learned initiatives. However, it is the move from these foundational steps to the development of a proactive learning culture that remains a difficult transition.

3.1.1 Survey Results

The CII survey was provided to CII members through a Web page developed for RT 201. The survey questions are provided in Appendix A. About one-third of the CII membership responded to the survey. Although this result does not necessarily reflect the total membership position on learning organizations, it does provide a good indicator of the state of learning organization development in the EPC industry. Of particular interest to the team were three specific survey areas; were organizations investing in lessons-learned

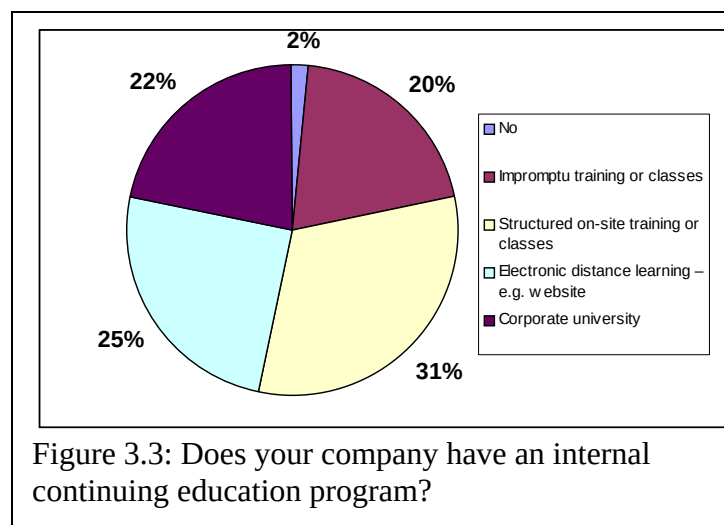
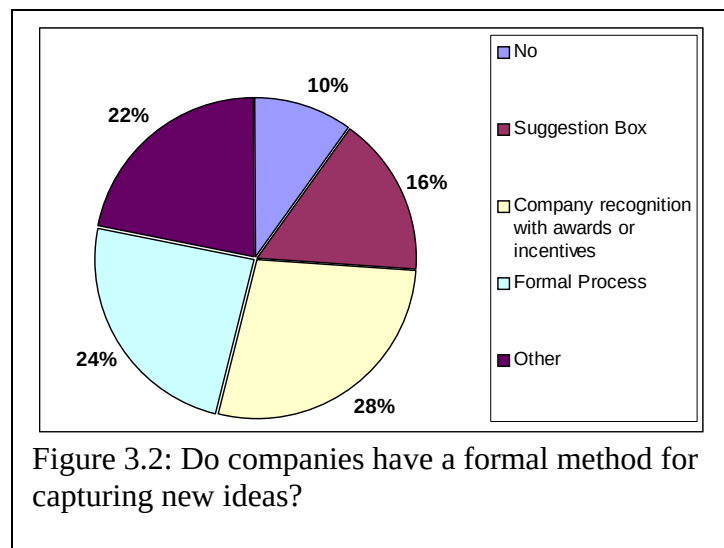
strategies, were companies becoming proactive learners, and was company leadership passionate about learning. The following results highlight these areas.



The first of the focus areas, lessons-learned, is of interest due to the fact that lessons-learned initiatives are an initial step towards a learning culture. Therefore, to determine if companies were taking initial steps down this path, the survey asked if companies had formal lessons-learned initiatives and if there was a formal method for capturing new ideas. As seen in Figures 3.1 and 3.2, the majority of respondents have informal lessons-learned initiatives. Although this is not as desired as a formal process, it is encouraging that 90

percent of the companies are pursuing lessons-learned in some manner. Similarly, only 10% of the respondents stated that no formal process was in place for capturing new ideas (Figure 3.2). This is a strong indication that the organizations understand the importance of obtaining input from the individuals within the organization.

The second area of interest in the survey was whether companies were becoming proactive learners. The manner in which the survey analyzed this



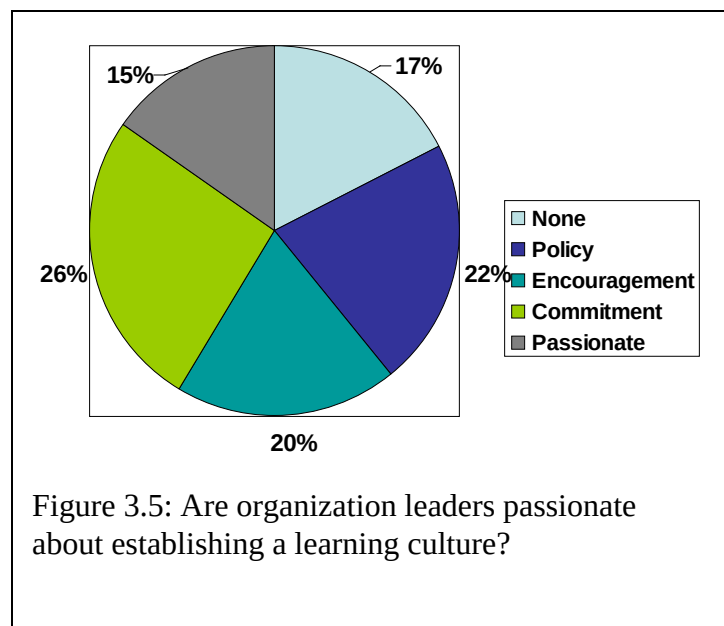
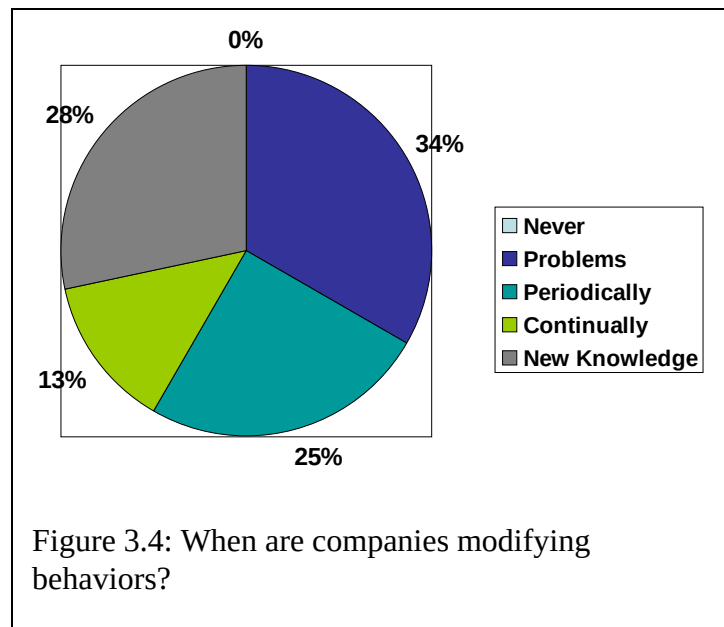
issue was to ask if companies had a continuing education program and when companies modified their processes or behaviors in response to knowledge gained within the organization. As illustrated in Figure

3.3, 78% of respondents indicated that they have some type of formal education program. This is significant because a formal education program is the first step towards acknowledging that the capture of new knowledge is an essential step towards becoming a learning organization. The question for these organizations is how they are using this new knowledge. To assist in responding to this question, Figure

3.4 highlights when companies are modifying their behaviors using new knowledge. As illustrated, 34 percent of the companies responded that they are reactive learners in that they only modify behaviors when problems arise. Only 41 percent of the companies are modifying behaviors either on a continuous basis or in response to new knowledge. This indicates that although the industry is acquiring new knowledge, the industry has not yet embraced a proactive learning position where the knowledge is put in place before problems arise.

The third area of interest in

the study was whether organization leaders were passionate about establishing a learning culture. This issue is important since culture begins with leadership and a commitment to learning begins with top



management. Therefore, if top leaders are not passionate about learning, then it is unlikely that members within the organization will adopt a learning culture. As illustrated in Figure 3.5, only 15 percent of the surveyed companies indicated that their leadership was passionate about learning. In fact a greater number, 17 percent, responded that there was no leadership support for learning. This result raises a red flag in that the first requirement for establishing a learning organization is not being met within the surveyed companies.

The result of the survey process was a conclusion that the learning organization research required a modification in its focus. Specifically, since a smaller percentage of organizations had actually implemented a learning organization culture than was initially hypothesized, the focus of the research needed to change from obtaining best practices to one of understanding the strategies and barriers to implementing learning organizations as well as developing a framework for implementing a learning organization culture. The first step in this revised process was to conduct a series of case studies with organizations that were identified to have learning organization initiatives.

3.2 In-Depth Interviews

Upon completion of the learning organizations survey, the research team conducted in-depth with individuals in organizations that were actively pursuing a learning organization culture. Ten organizations were involved, based on their documented development of learning initiatives. The companies selected included: NASA, U.S. Army Special Forces, Zachry Construction Corporation, Jet Propulsion Laboratory, General Motors, BP, Washington Group

International, ExxonMobil, and Fluor Corporation. This section highlights the methodology used in the case study process and some of the results obtained during the interviews. After completing the interviews, the team was able to extract clear points to both the successful implementation of and the barriers to a learning organization. Chapter 3 focuses on these issues as the Keys to Implementation.

Organization Name:

Date of Interview:

Organization Overview

This is a short overview of the organization studied. No more than 1 paragraph.

Learning Focus

Why is the organization focusing on becoming a learning organization? What do they see as the drivers and benefits? What are they doing as their primary effort?

Strengths of Effort

What are the key strengths of the organization's learning effort – tie to the five characteristics of a learning organization if possible.

Barriers to Implementation

What is the organization facing as key technical or managerial barriers to achieving a learning organization?

Maturity Model Evaluation

Where does the organization sit in terms of the maturity model? Try to be as specific as possible when answering this question. Try to give both an overall score and a level where the organization sits.

Figure 3.6: Outline of Case Study Interview Questions

3.2.1 Methodology

The first step in the case study process was to select the organizations that would be included in the process. Two key requirements were put in place for the selection process; 1) the organization must have a documented focus on developing a learning organization culture, and 2) the organization must have a record of pursuing a learning culture over a period of time that was sufficient to obtain insights into the barriers and opportunities available to this pursuit. As a secondary consideration, the team consciously decided not to limit the interviewees to EPC companies. Rather, it was decided that a broader range of experience would be valuable as a final population sample. Based on this criterion and the contacts that were available to team members, the ten organizations listed above were included in the final interview population.

Once the final organizations were selected, interviews were arranged with key organization personnel. The methodology employed for the case study process was a semi-structured interview process. In this process, two or more members of the RT 201 team interviewed key members of the learning organization team at the office of the interviewee. The topics and base questions used in the interview process are illustrated in Figure 3.6. As illustrated by the questions, the focus of the interview was to allow the organization as much opportunity as possible to elaborate on topics and provide input on their experiences in establishing a learning organization culture. The following sections provide highlights of the responses to the questions during the interview process.

3.2.2 Case Study Highlights

The following bullets highlight some of the responses obtained during the case study process. As can be seen in the comments, even organizations that are aggressively pursuing learning organization concepts have both strengths and weaknesses in their implementation.

Learning Focus

- They see benefits as being better prepared employees, better employee retention and increased profit.
- Recognizes that continuous improvement is essential to remain competitive in their industry. They have experienced some hard lessons in terms of what change and innovation can do to competitive position once perceived as secure.
- Their focus in terms of capturing knowledge is to document and integrate their lessons learned in an effective manner to manage the risk that is inherent in space exploration.
- An on-line system is available for people to input lessons and/or suggestions and then work process owners are responsible for assessing and implementing.
- The organization has very long duration projects and knowledge can be lost with staff changes.
- Realizes that safety and continuous improvement are keys to survival in their industry. The key drivers are reductions in lost time accidents and improvement in performance.

Strengths of Effort

- Culture – they have a very strong and well defined culture that is committed to training employees and creating a productive and safe workforce.
- Culture – The culture is open in terms of both sharing the strategic vision and sharing the problems that the company is having.

- Management and Leadership – Strong and consistent management and leadership exists.
- Management and Leadership – The CEO is very open about where the company is going and the problems. The CEO and the board make concrete efforts to communicate with all company members.
- Management and Leadership – Given the mission, the attention towards personal development and education is pervasive.
- Management and Leadership – management recognizes the need to apply lessons learned effectively and increase the knowledge of their workers.
- Management and Leadership - The Chief Knowledge Architect spearheads their knowledge management effort and is a sign that the organization is very focused on becoming a highly effective Learning Organization.
- Tools/systems/work processes – they have invested in the technologies required to capture lessons learned and provide communications.
- Tools/systems/work processes – Development of a centralized Knowledge Network to provide a structured approach to integrating distributed content systems shows that they are advancing their processes and infrastructure.
- Tools/systems/work processes – they have invested heavily in creating learning aids and educational tools for the individual.
- Education – They encourage continuous education and have established a corporate university.
- Education - The Learning process embeds lessons learned into their tools and communities
- Communication - strongly encourages forums for people to share their knowledge and publishes the best of them in their intranet