



Providing Vision and  
Leadership for the Future  
of the HVAC and  
Sheet Metal Industry

## **CREATING A LEARNING ENVIRONMENT**

**A TEMPLATE FOR CREATING  
AND CULTIVATING  
A LEARNING CULTURE  
IN THE HVAC AND SHEET  
METAL INDUSTRY**



*vision*  
*future*

# **CREATING A LEARNING ENVIRONMENT**

## **A TEMPLATE FOR CREATING AND CULTIVATING A LEARNING CULTURE IN THE HVAC AND SHEET METAL INDUSTRY**

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“The rate at which individuals and organizations learn may become the only sustainable competitive advantage.” – Ray Stata

## 1 EXECUTIVE SUMMARY

This report describes the research sponsored by the New Horizons Foundation (NHF) (an HVAC and Sheet Metal Industry Initiative) and conducted by Penn State University into creating and fostering a learning environment in the heating, ventilation, and air conditioning (HVAC) and sheet metal industry. The report has two primary objectives: (1) to define a learning culture for HVAC and sheet metal contractors, and (2) to explain how HVAC and sheet metal contractor organizations can create the environment to cultivate a learning culture.

Companies that possess a healthy learning culture are defined as those that are “skilled at creating, acquiring, sharing, and applying knowledge. This culture embraces change and innovation at all levels for optimum performance and maximum competitive advantage.”

The reasons for HVAC and sheet metal contractors to invest in a learning culture include (1) helping to nourish the company’s largest asset – its people; (2) regaining and maintaining the international leadership of the United States HVAC and sheet metal industry; and (3) enhancing company performance at delivering high standards of products and labor, consequently increasing profitability and repeat business. Research has shown employees who actively enhance their competencies throughout their careers feel more fulfilled at work, perform better, and retain employment with the same company longer.

Despite the benefits, learning cultures are not easy to establish and maintain. They require savvy management committed to creating the desired culture. With the busy requirements of project management and other demands, project managers and supervisors often have little time to invest in the level of management required for a healthy learning culture. Nevertheless, this report tries to help jumpstart such a culture. The first step is to define the standards that managers and supervisors of HVAC and sheet metal contractors must achieve. This can then allow evaluation of performance capabilities against this set of competencies. Finally, employees can then pursue targeted learning and improvement opportunities aimed at enhancing their competencies.

Market leaders Turner Construction and Siemens Corporation provide insightful knowledge about the benefits and impacts of creating a learning culture to the contracting organization. Even the National Aeronautics and Space Administration’s (NASA’s) system for a learning culture can show what HVAC and sheet metal contractors can do to be successful. These organizations invested heavily and over a sustained period of time in technology infrastructure and content development to enable an accessible learning environment for their employees. In the HVAC and sheet metal industry, Southland Industries is adopting a similar web-based infrastructure for their learning environment.

What does it mean to HVAC and sheet metal contractors to develop a learning culture? In essence, it means to shift your personnel development focus on developing discrete skills to bigger capabilities in employees such as how best to use skills, be proactive, solve problems, and exhibit leadership. These capabilities are known as competencies, which are different from skills. A competency means that the individual has a number of specific skills in a particular area and the ability to learn new skills and modify older ones in the same area in order to produce the desired outcomes. An example of a skill is conducting an interview, while an example of a competency is using this skill and others to be a good judge of talent.

Key competencies needed by HVAC and sheet metal project managers and supervisors are included in this report. These are categorized into industry-specific and leadership (which extend beyond the HVAC and sheet metal contractors) competencies. The importance of these competencies to HVAC and sheet metal contractors is evaluated by an industry survey.

An assessment tool has been developed to allow individuals to identify their competency strengths and weaknesses. This tool is included in this report (as Appendix B) for your use. This tool is to be used in a two-step process: first, individually reflecting on oneself; then second, with the individual's supervisor to gain perspective.

To create an organizational culture of learning it is important to identify the mission of the organization; identify the competencies needed to gain a competitive edge and to deliver the desired results; assess the competencies currently possessed and

those lacked; and last, to identify how the organization will cope with the necessary changes.

## Recommendations

To realize the benefits of a robust learning culture across the HVAC and sheet metal contracting industry, the following recommendations should be adopted by the HVAC and sheet metal industry:

1. Actively promote and invest in a learning culture in its contractor organizations. Companies that make this investment and commit over the longer term to creating a learning culture become leaders in their industries.
2. Recognize leading companies and individuals that pursue a learning culture by providing a national award similar to the **Malcolm Baldrige Quality Award** for quality management (<http://www.quality.nist.gov/>).
3. Promote competency-based descriptions of employment positions and ranks for use by HVAC and sheet metal contractors. Current position statements tend to be skills-based, not competency-based.
4. Use an industry standard set of competency-based descriptions of employment positions and ranks for use by HVAC and sheet metal contractors. Those identified in this report have been evaluated by the HVAC and sheet metal industry through an industry survey and thus have a relatively high degree of acceptance by many HVAC and sheet metal companies.

5. As a practical step towards promoting the development of learning culture, and as a way to improve the HVAC and sheet metal industry's language about lifelong learning, competency descriptors should be adopted in training programs offered to the HVAC and sheet metal industry.
6. Expand the NHF online knowledge structure to address competencies. This will further promote an industry-wide transition to learning cultures.

### Who Should Read This Report?

The target audience for this report is executive and human resources managers – those people in the HVAC or sheet metal company responsible for managing project managers and supervisors. Given this audience, a report is the most accessible means of conveying the results of this project.

The project itself is targeted at project managers and supervisors in HVAC and sheet metal companies. Senior executives and HVAC and sheet metal workers are not the focus of the competency sets developed and the learning culture methods proposed. However, the competencies and methods outlined in this report may well be relevant to these other audiences.

Consequently, this report should be read by HVAC and sheet metal executives and senior managers interested in developing a learning culture in their organizations. Others with an interest in cultivating a learning culture will also find this report useful.

## 2 WHY INVEST IN A LEARNING CULTURE?

Investing in a learning culture is the only sustaining way to assure your company's competitiveness. A learning culture helps a company nourish its most important asset – its people. It promotes improvement and betterment in individuals so that employees do more with less and provide better quality service to your customers. It enables technological changes to be implemented faster and with greater success. It promotes the generation of ideas to enhance your business. It provides employees with opportunities to extend themselves. It is a vital component to high-performance contracting. It allows your people to be more fulfilled and increase their satisfaction at work, and thus improves employee retention. The “bottom line” is that it affects your bottom line.

Recent changes to the global marketplace reveal how important it is for companies in the United States (U.S.) to adapt the skills and competencies of their employees. The heating, ventilation, and air conditioning (HVAC) and sheet metal industry might not be as technologically dependent as advanced information technology (IT) industries, biomedical industries, or aerospace industries, but nevertheless it is subject to international market competition that affects business activities and profitability. If U.S. companies are not going to be overtaken by developing countries, they need to keep advancing to the next level of market leadership. A major part of the strategy to do this must be to develop environments where learning is a common and vibrant part of the company culture.

Research has shown that learning cultures do not just happen. This means that HVAC and sheet metal companies need help in creating the environment that promotes a learning culture. Most companies conduct performance reviews. Most have ways to encourage cross-fertilization between employees at different stages of their careers. Many companies have mentoring programs. Training is common. But a learning culture does not necessarily exist in these companies. Clearly, then, there is more to creating and fostering a learning culture than these things.

This report describes the research conducted into what is a learning culture and how to create the environment to cultivate this culture in HVAC and sheet metal contractor organizations. It provides a template for HVAC and sheet metal contractors to create and cultivate a learning culture in their organizations. We explain the important elements of a learning culture. We report the research conducted on identifying the important competencies for HVAC and sheet metal contractors. A number of successful companies are presented as examples to help HVAC and sheet metal contractors successfully create the needed environment, and we discuss the impact it is having on those organizations. An evaluation tool is provided for individuals to assess their competencies. Further resources are suggested for implementation and ongoing maintenance of a learning culture.

## 2.1 Further Resources

Schwartz, Linda, David Skinner, and Dennis Sowards (2002). *Creating the High-Performing Contracting Company*. Sheet Metal and Air Conditioning Contractors National Association (SMACNA).

Ridge, Garry O. (2004). Learning in the Company of Maniacs, in *Creating a Learning Culture: Strategy, Technology, and Practice*. Conner and Clawson (eds.). Cambridge University Press.

Kocher, Karen (2004). Developing Talent in a Highly Regulated Industry, in *Creating a Learning Culture: Strategy, Technology, and Practice*. Conner and Clawson (eds.). Cambridge University Press.

## 3 WHAT IS A LEARNING CULTURE?

A vital dimension to achieving a learning culture is to create transparency in the steps to improvement. As the first step to transparency, our research examined the standards that managers in HVAC contracting companies need to achieve. Once this can be defined, the learning process can then be outlined and developed.

“HVAC workers make, install, and maintain heating, ventilation, and air conditioning duct systems; roofs; siding; rain gutters; downspouts; skylights; restaurant equipment...and many other products made from metal sheets” (U.S. Department of Labor). With a wide variety of services, it is necessary for managers and supervisors in the HVAC industry to have technical knowledge about many products and services. However, technical knowledge and job experience are not enough to sustain any industry. It is necessary to identify the core competences unique to managers and supervisors within the HVAC contracting industry.

Fundamental principles and motivators from outside industries were evaluated for their ability to contribute to the creation of a continuous learning culture at the managerial and supervisory levels in the HVAC and sheet metal contracting industry. In short, many exciting developments have occurred in industries outside HVAC and sheet metal contracting. These developments can be selectively used to support this research. Fundamental principles were selected based on their suitability to the work environment of HVAC and sheet metal contracting managers and supervisors.

### 3.1 Defining a Learning Culture

The Construction Industry Institute (CII) defines a learning culture as one that is “skilled at creating, acquiring, sharing, and applying knowledge. It embraces change and innovation at all levels for optimum performance and maximum competitive advantage.” (RT 201 – CII 2005)

A learning culture is also defined as one in which an organization’s values, norms, and practices promote personal development and provide an environment with continuous challenge for its employees (De Long 1997). The values of an organization influence what is worthwhile to pursue. The norms describe the expected pattern of behavior and are an indication of the shared belief of how members of the organization should behave. Practices are the formal and informal methods used to accomplish work (De Long 1997).

In creating such a learning culture, the practices and norms of an organization are more easily identified and modified than the values. The values of the organization are tacit and thus difficult to identify and

change. However, the organizational norms and practices may be developed or molded through the personal development initiatives. An employee’s personal development initiative may come in the form of training programs, mentor programs, or knowledge management networks within the organization and others.

### 3.2 Why Do People Want to Learn?

People learn for many different reasons. The most relevant for a learning culture are

- It will help me do things easier, better, cheaper, more safely;
- It will help someone else do things easier, better, cheaper, more safely;
- I want to appear smart and a winner to others, and not uninformed and a loser;
- It pleases others: others say I should do this;
- I’m afraid not to: out of fear, rejection, needs for security, safety;
- Out of curiosity;
- It will help me gain access to more responsibility, power, position, money for myself and perhaps others.

Note that most of these reasons lead to self worth, competence, and confidence. All are normal and essential basic human needs. These motivations, incentives, or satisfiers, though not often spoken, drive learning, and thus are needed in a learning culture.

### 3.3 Why Do Some People Not Want to Learn?

It is not uncommon to meet people who, outwardly, do not wish to appear that they want to learn, or that they are learning. The reasons are many and not complex. Here are some examples of why some adults particularly may not want to learn:

- Learning makes me appear that I'm not performing my job like I should;
- I've already learned from the construction school of hard knocks;
- I simply don't want the added responsibility that this learning requires;
- I'm afraid I will look dumb and/or not succeed in what is expected of me;
- If I have to go back to school, the company doesn't need me;
- This kind of learning doesn't work for me;
- Too much of it is irrelevant;
- The benefit isn't worth my time;
- People with too much learning aren't relevant to field needs.

All these objections to learning are very real to the individual and are not always at the conscious level of understanding. It is especially important to examine any reluctance to learning. The rejection is often of the idea of doing something that they are not favorably inclined to do.

### 3.4 Factors Inhibiting the Development of a Learning Culture

Market researchers have also identified common adverse characteristics of

organizations not committed to a learning culture. It is not clear the extent to which these characteristics exist in HVAC and sheet metal contractors, as many are in early stages of developing their learning culture (or have not yet begun). Nevertheless, understanding these inhibitors can help HVAC and sheet metal organizations in their circumstances. Inhibiting characteristics include “plateaued” leadership, unhealthy in-house competitiveness, and information hoarding. In the case of plateaued leadership, the organization's leaders are set in their ways; this attitude is usually accompanied by the thought that there is no need for continued learning due to the length of time already spent in the industry. This attitude discourages innovation and may cause employees to leave the job in frustration. Also in this situation the knowledge of the newer and younger members of the organization are overlooked and sometimes undervalued.

In organizations such as these, an unhealthy in-house competitiveness sometimes emerges “in which everyone wants to know more than the others and prove it” (Boomer, 2005). This organizational characteristic is linked with information hoarding.

Another telltale characteristic of an organization not committed to a learning culture is information hoarding. Individuals in the organization attempt to be irreplaceable by not sharing valuable knowledge with colleagues and subordinates.

### 3.5 Benefits of a Learning Culture to the HVAC and Sheet Metal Industry

Organizations having adopted a learning culture have benefited by attracting and

retaining highly competent individuals, increasing productivity, and enabling succession planning (Boomer 2005). An organizational learning culture also offers a “sustainable competitive advantage” (Conner and Clawson 2004).

Intelligent people are continuously in pursuit of knowledge and are thus attracted to organizations with opportunities for personal development and continued pursuit of education.

An organizational learning culture provides an avenue for continuity. Providing training and mentorship programs enables the organization to intentionally groom individuals for promotion within the organization. This also ensures that there are capable individuals for growth and future leadership roles.

Another advantage of an organization learning culture is that its employees become more skilled through training and thus are more efficient. The employees’ efficiency directly impacts the overall performance of the organization and its ability to make a profit. “By leveraging knowledge, employees can be trained more quickly, provide better support, and avoid costly errors” (RS 123 – CII 1997).

Organizations that have made learning a central component of their business strategy have the ability to respond to new opportunities with speed and intelligence. This ability encourages continued existence and growth for the organization.

### **3.6 Further Resources**

eLearning and Learning Cultures,  
<http://www.e-learningcentre.co.uk/eclipse/Resources/orglearning.htm>, Accessed 12/01/05

Learning Styles,  
<http://www.ldpride.net/learningstyles.MI.htm>,  
 Accessed 11/20/05

SMACNA Project Manager Training Program  
 Instructor’s Guide. SMACNA

## **4 EXAMPLES OF SUCCESSFUL LEARNING CULTURES**

Numerous organizations have successful learning cultures. Examples of these may be found in the architectural engineering, and construction industry: Turner Construction and Siemens. The cases below provide a general description of each of these organizations and their learning cultures.

### **4.1 Turner Construction**

Turner Construction Company, a subsidiary of the global construction organization Hochtief, provides several construction and pre-construction services. Offices for Turner Construction Company are strategically located throughout the U.S. and in other countries.

Turner Construction Company has an impressive learning structure with a combination of on-the-job training and an online training and knowledge sharing network (Turner University and Turner Knowledge Network [TKN]). Turner University provides courses in four main categories: business skills, technology, construction related courses such as safety (Occupational Safety & Health Administration [OSHA]), and finance.

TKN is an online learning tool available free of charge to Turner employees, Turner owners, project partners and architects, and to subcontractors for a nominal fee. TKN was developed as an easily accessible source of information and training tool to improve the skills, knowledge, and competencies of Turner staff, to add value to their customers.

TKN and Turner University have benefited the organization by providing the Turner project teams with the training courses and by sharing best practices throughout the organizations. “TKN offers access to information on a “just-in-time” basis, increasing efficiencies, providing better risk management and enhancing performance” (Turner 2005).

## 4.2 Siemens

Siemens is considered to be a “global powerhouse in electrical engineering and electronics” (Siemens 2005). Siemens is a global provider of a wide range of technological innovations and expert know-how in over 190 countries. Some of Siemens’ areas of service include information and communications, automation and control, power, transportation, medical, and lighting. Products include car navigation systems, multimedia systems, electrical installation systems, home appliances, hearing instruments, and mobile phones. Advances in technology have driven the demand for Siemens services and products; thus it is important for the company to stay ahead of the innovation curve. Siemens’ corporate sustainability is achieved through the strategic development and nurturing of a learning culture. The level of importance ascribed to having a learning culture is reflected in one of four corporate principles:

- We empower our PEOPLE – to achieve world-class performance.
- Our employees are the key to our success.
- We work together as a global network of knowledge and learning.
- Our corporate culture is defined by diversity, by open dialogue and mutual respect, and by clear goals and decisive leadership. (Siemens)

The learning structure adapted by Siemens is very complex and involves various educational methods. These methods are tailored to geographical requirements. In Germany, Siemens provides vocational programs for occupations in business, engineering, and IT (Siemens 2005). These training programs have dual focus, that is, the curricula include classroom training in technical college and practical, hands-on training in industry. These training programs are open to other companies.

In Brazil, Italy, Spain, and Canada, Siemens supports educational programs attended by company employees and develops new training programs for employees. Siemens has also “created a new form of tuition in Germany for secondary school students who choose to prepare for a career in IT rather than pursue a conventional university degree” (Siemens 2005).

## 4.3 Southland Industries

Southland Industries (SI) is the seventh largest mechanical contractor in the U.S. serving customers in the healthcare, education, commercial, microelectronics, and pharmaceutical industries. SI has the capacity to design and build mechanical systems. Services include HVAC, plumbing, process piping, controls and automation, and architectural systems for the clean room industry.

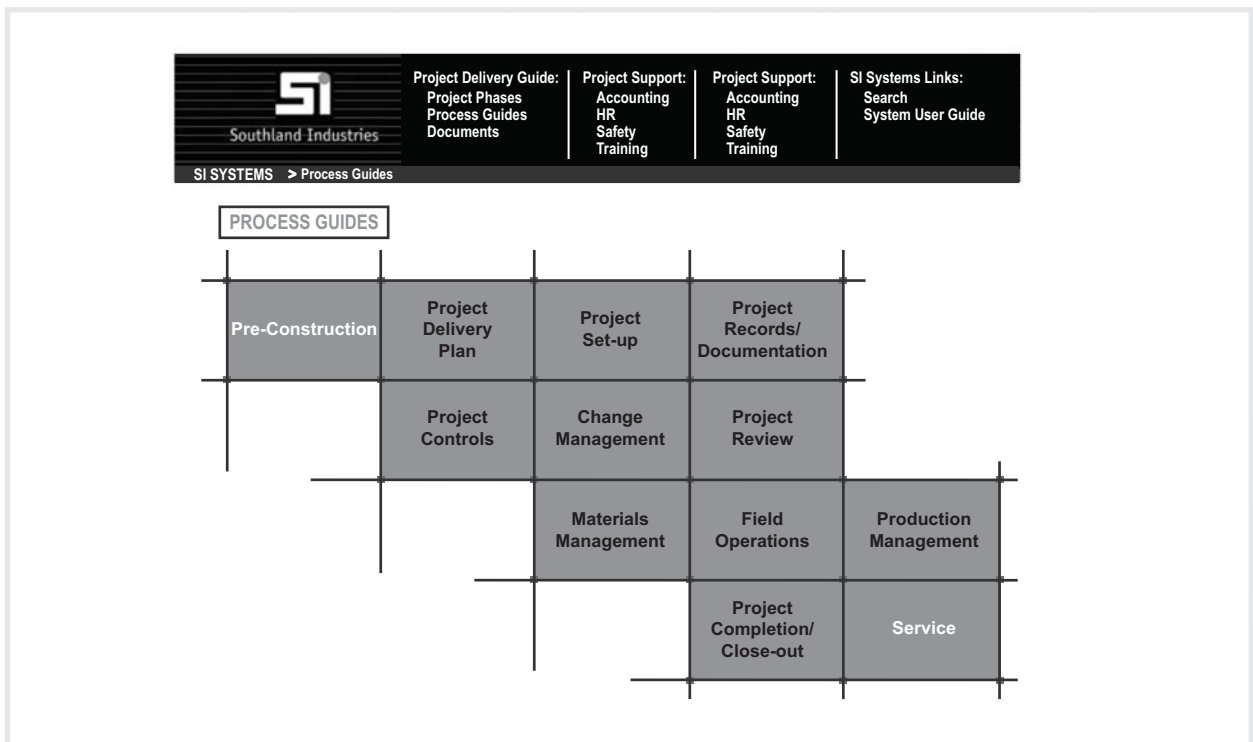


SI's training programs are a vital component of the company. SI has two main approaches to maintaining its learning culture: SI Systems (shown in the figure above) and SI University. SI Systems is the online knowledge system that is a learn-at-your-own pace information resource created from the compilation of the company's best practices. These best practices were identified and compiled by the SI project and operations managers using their experience on projects. This website is updated with Project Lessons Learned. Like Turner Construction, SI provides on-the-job learning coupled with training programs. These educational opportunities were developed to maximize the cost saving and quality adding results of the design-build delivery process.

The ample training program – SI University – displays the company's educational standard

for commitment, permanence, and a diversified selection of courses. SI University is an educational program that provides courses for the employees of SI. Access to the courses is determined by the role played in the company. All employees are required to complete 32 hours of training every year, being able to choose from over 20 courses in areas of engineering education, management, and computer programming. Some of the topics of focus in the SI University are: field, finance, high-tech mechanical construction, leadership, pre-construction, and project management.

The training programs at SI University have an emphasis on creating an environment of continuous learning and improvement of skills and experience through education. For each project the project managers and superintendents from SI observe and



rate the performance and behavior of the subcontractors. Each of these ratings is entered into the company's online information-sharing network for the use of other in-house project teams. The diligence paid to the development of a learning culture has greatly influenced SI's reputation as one of the safest, most progressive, and well-trained workforces in our industry.

New hires participate in a five-day intensive program that concentrates on an overview of all areas of the company. Two more one-week intensive learning programs are offered to employees as they develop in the company. One of the training opportunities for new project engineers, design engineers, project managers, foremen, and future leaders include "Boot Camp" and field experience. Boot Camp is to familiarize the new hires with SI culture, teamwork, pre-construction, planning, engineering, construction, and project management processes.

Andrew A. Fimiano, chief executive officer and president of SI, states "We believe long-term that all of the right things will happen if you continually educate and train your people. Training our employees lets them know we care about developing their skills and their careers."

#### 4.4 Further Resources

Turner Knowledge Network (TKN), <http://www.turnertalk.com/mk/training/tkn.asp>  
Accessed 12/23/05

Siemens Learning Valley, <http://training.siemens.be/slv/default.htm>  
Accessed 10/20/05

SI University, <http://www.southlandind.com/WhatWeBelieve/siuniversity.html>  
Accessed 03/12/05

## 5 COMPETENCIES FOR THE HVAC AND SHEET METAL CONTRACTING INDUSTRY

Managers and supervisors in the HVAC contracting industry must blend technical skills and knowledge of many different systems with critical project management capabilities needed for project success and people management skills. In this very demanding industry, managers need to have problem-solving skills and initiative and be able to work seamlessly as part of a group of diverse disciplines. To oversee processes and products, it is important for them to have experience and a grasp of the necessary technical knowledge. The many competencies are divided into two major groupings: *industry-specific competencies* and *leadership competencies that transcend industries*. Leadership competencies include the skills needed by managers and supervisors. These are defined below. The industry-specific competencies are those identified to specifically serve the needs of the highly technical and engineering-influenced HVAC and sheet metal contracting industry.

### 5.1 Competencies vs. Skills

In essence, skills are "specific actions and/or [behaviors] that allow an individual to transform one situation into another [often automatically, or without even really thinking about what they are doing]" (Tate and Klein-Collins 2004). Example skills in the HVAC and sheet metal industry include scheduling with company's software system, estimating, completing change orders, ordering HVAC systems. These are important skills that need to be developed in employees.

A competency, on the other hand, means that the individual has a number of specific skills in a particular area and the ability to learn new skills and modify older ones in the same area (Tate and Klein-Collins 2004). Lombardo and Eichinger (2001) define a competency as a “measurable characteristic of a person that is related to success at work.” Examples of competencies in the HVAC and sheet metal industry include knowledge of the entire fabrication process; knowing how to plan a project (not just being able to enter data into a scheduling software package to produce a chart); and knowing how to negotiate a change order with the owner/general contractor. An example of a skill is conducting an interview, while an example of a competency is using this and related skills to be a good judge of talent (Conner and Clawson 2004).

The close relationship of skills and competencies, unfortunately, result in their being used interchangeably, and this adds to the confusion about the difference between skill and competency.

It is vital, however, to make the distinction. Why? Because the essence of developing a learning culture in HVAC and sheet metal contractors is to hone the development of competencies. Skills development will always be important, but it is only a fraction of tapping and maximizing the top-dollar return on your valuable employees. It is also crucial to understand that competencies, like skills, can be learned. However, it is much more difficult to teach a competency than a skill. For example, the problem-solving competency of an experienced and seasoned superintendent is far superior to that of the first year foreman. Why? In large part, experiences of project successes and losses have developed the problem-solving competency.

## 5.2 Industry-Specific Competencies

A number of competencies are crucial to HVAC and sheet metal contractors:

- Excellent knowledge of HVAC processes and applications:
  - Architectural/sheet metal work;
  - Production lines/metal fabrication processes;
  - Building and construction applications;
  - HVAC fabrication;
- Balancing technical and human management needs (Bellinger 1997);
- “Commercially astute with good financial/business acumen” (Bellinger 1997);
- Excellent written and oral communication skills;
- Ability to “plan, coordinate, and direct research, design and production activities” (Engineering and Natural Sciences Managers 2004);
- Ability to develop the overall concepts of a new product and hence the competency to balance the big picture and details;
- Ability to identify technical problems preventing the completion of a project;
- Ability to determine technical goals within broad outlines provided by top executives.

This is a live list of competencies for HVAC and sheet metal contractors. They were initially developed through inspection of over 30 job postings for HVAC managers on

web-based job search sites such as Materials Edge and Career Builder. This research identified some recurring competencies required for managers or supervisors in the HVAC industry. In addition to this source, the *Occupation Outlook Handbook* published by the U.S. Department of Labor identified some of the competencies needed for engineering and natural science managers.

### 5.3 Industry-Transcendent Leadership Competencies

The competencies listed below are generally required at the management and supervisory level across many industries. The selection was based on identifying competences needed in a good leader within the company and thereby helping to sustain a good work environment and create a learning culture. The list below was compiled from a combination of sources including the U.S. Small Business Administration's publication *Leadership Traits*. These competencies include:

- **Emotional Stability** – A good manager must be able to handle high levels of stress and frustration. They should also have the “psychological maturity” and self control to deal with whatever situation may arise (Leadership Traits 2005).
- **Conscientiousness** – Managers and supervisors should have a strong work ethic. In addition to displaying diligence, they will “have a very high standard of excellence and...have a need for order and tend to be very self-disciplined” (Leadership Traits 2005).
- **Maturity/Servant Leadership** – These two characteristics work hand-in-hand in making good managers and supervisors.

The maturity to know that “more can be accomplished by empowering others than can be by ruling others.” Having an attitude of servant leadership to “work tirelessly to help employees grow and develop [by] assisting staff in their struggle to become the best they can be” (Leadership Traits 2005; Gilley and Maycunich 2000).
- **Leveraging Diversity** – The ability to interact well with people and ideas of different and varied backgrounds (Tate and Klein-Collins 2004).
- **Intuitiveness** – In new projects, the naturally occurring ambiguity requires managers to rely on intuition when making decisions.
- **Coachability** – Managers and supervisors who have a “high coachability” have a desire for growth and development, resulting in leaders in the company being “receptive to performance feedback” and “predisposed to reflective and critical thinking” (Gilley and Maycunich 2000).
- **Organizational Agility** – Eichinger and Lombardo describe a person with organizational agility as one who is “knowledgeable about how [the] organization work[s]; knows how to get things done both through formal channels and informal network; understands the origin and reasoning behind key policies, practices, and procedures; and understands the culture of the organization” (Eichinger and Lombardo 2001; Conner and Clawson 2004).
- **Charisma** – Managers with charisma are able to “[define] a vision which unites and captivates them”. With this vision, managers

will be able to motivate their employees to reach company goals “by tying the goal to substantial personal rewards and values” (Leadership Traits 2005).

- **Innovation** – The ability to “generate new ideas” is very useful for managers in planning, problem solving, and creating and implementing a strategy (Tate and Klein-Collins 2004).
- **Political Awareness** – The ability to discern the “emotional ties and power relationships within a group” (Tate and Klein-Collins 2004). This is important, for, with careful implementation of this knowledge, managers can create efficient teams.
- **Humility** – Managers who are humble have more influence and power since “employees are drawn to leaders who are approachable, open, and friendly” (Gilley and Maycunich 2000).

Rarely are all industry-specific and industry-transcendent competencies found in individuals. Individuals and companies need to develop them. Consequently, an environment of continuous development must be created to ensure that these competencies are developed.

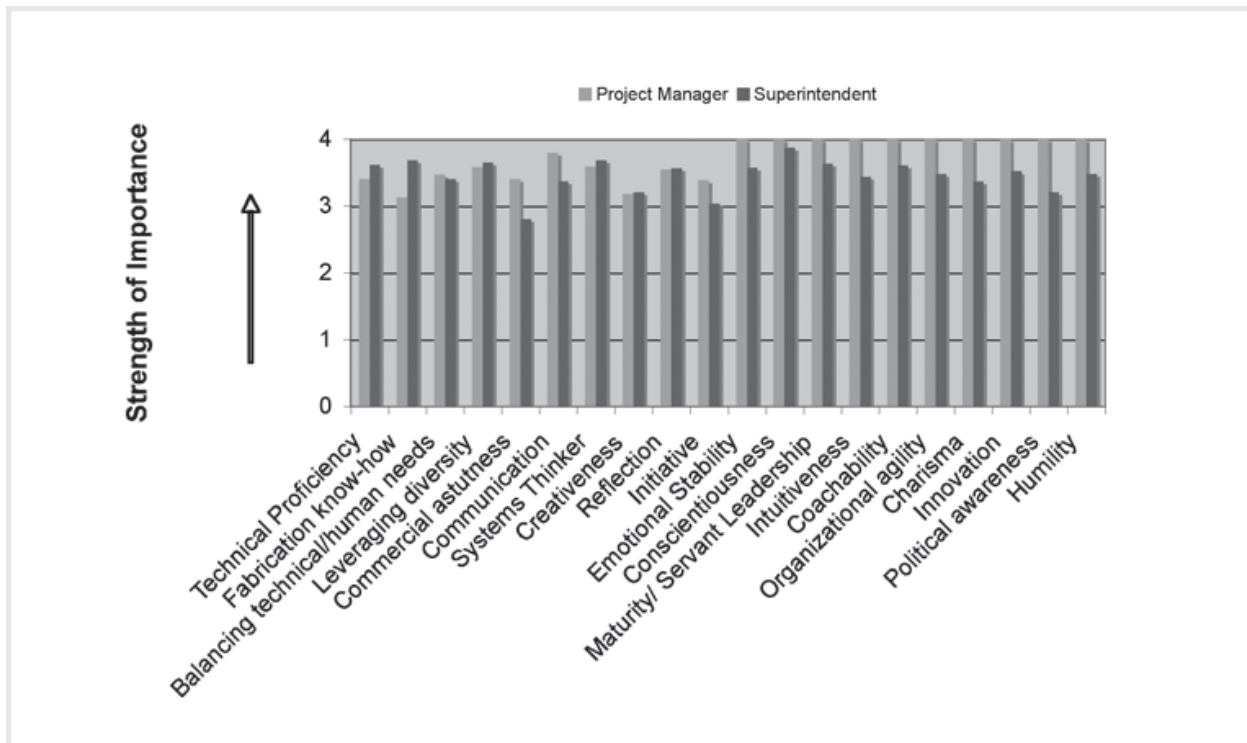
## 5.4 HVAC and Sheet Metal Industry Survey

To identify the most critical competencies for HVAC and sheet metal contractor project managers and supervisors, an industry survey was administered. Respondents were asked to compare their best project managers and supervisors and evaluate the importance of each of the above listed competencies. The survey is included as Appendix A to this report. Fifty-six responses were received.

The focus of this study is middle-upper management in HVAC and sheet metal companies. In particular, upper management and workers were excluded from the study. This left project managers and superintendents as the focus of the research. For the survey, respondents were asked to distinguish between project managers and superintendents due to significant differences in job function.

- **Project Manager** – Responsible for the overall profitability of the project and dealing with the owner.
- **Superintendent (Foreman)** – Responsible for jobsite productivity.

Figure 1 charts the 20 competencies identified in the previous chapter of this report for each of project managers and superintendents. The first 10 listed competencies relate to industry-specific competencies, and the latter 10 to leadership competencies.



**Figure 1:** Competencies for Project Managers and Superintendents

It is not surprising that the project management position has greater demands on leadership competencies than superintendents. In the words of one respondent: “PMs manage the job, superintendents just have to get it done.” In fact, almost all leadership competencies are rated as highly as possible for the project manager.

It is also not so surprising that the industry-specific, especially the technically related, competencies are amongst the lowest rated for the project manager, e.g., “fabrication know-how” gets the lowest rating.

For the superintendent, the industry-specific and leadership competencies are more evenly spread. The lowest ranked competency was “commercial astuteness.” Perhaps one surprising result is that the highest ranked competency for the superintendent is “conscientiousness.”

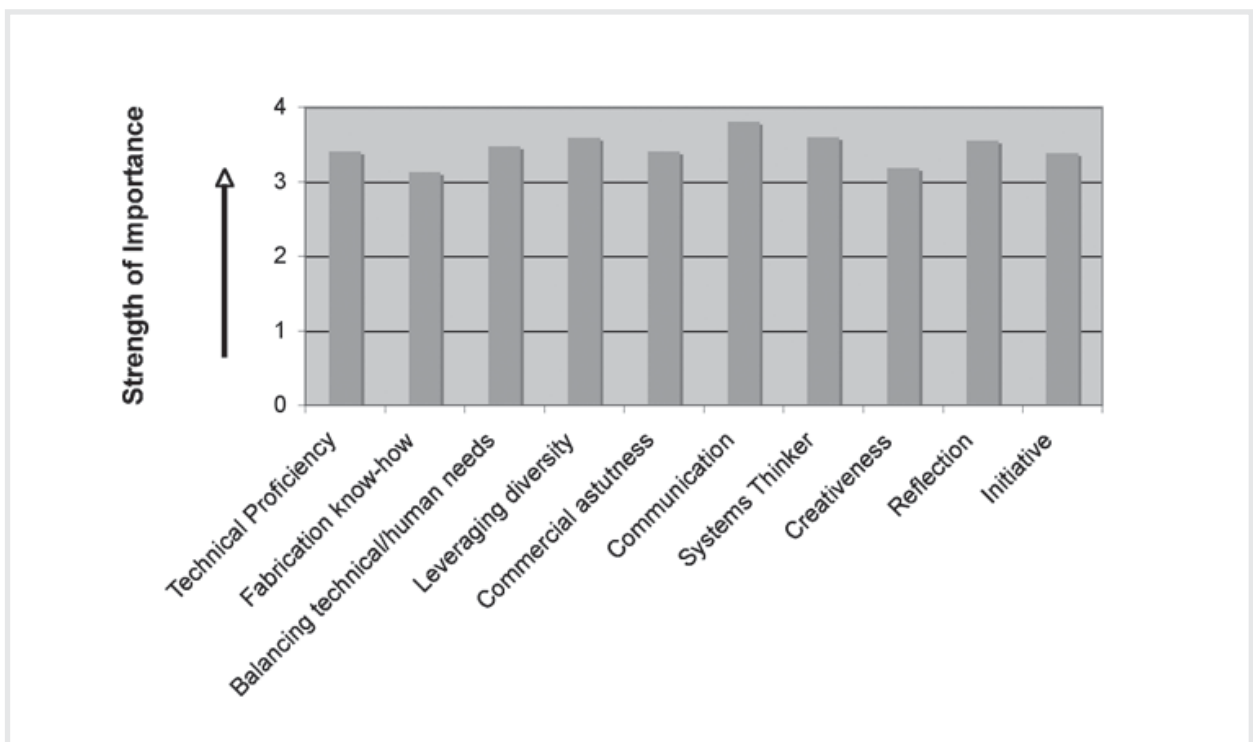
## 5.5 Competency Profile Templates

The survey results also provide the basis for competency profiles for project managers and superintendents. These profiles provide immensely useful information concerning at what project managers and superintendents need to excel in this industry. While every company possesses its own unique corporate competencies, these industry-based profiles provide a valuable starting point for your company to identify how your employees can achieve the company mission. These

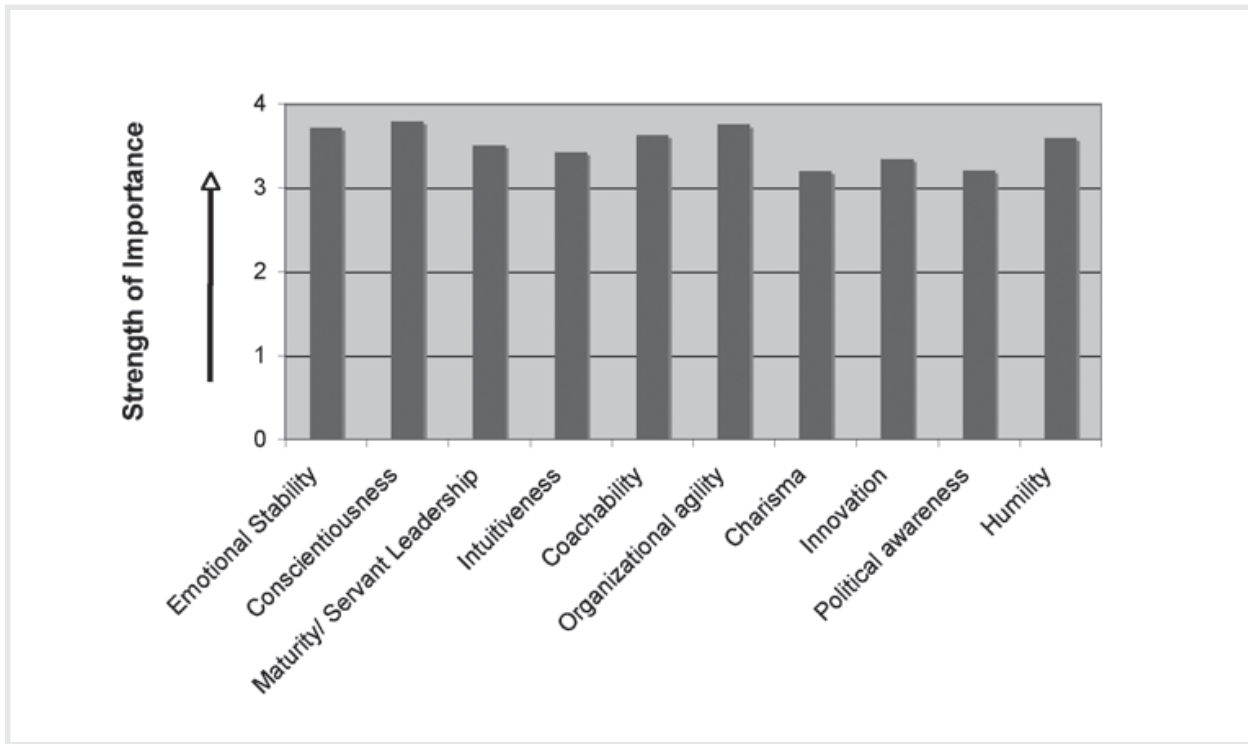
templates also provide some coherence across this diverse industry.

### 5.5.1 Project Manager

Figure 2 and Figure 3 profile the industry-specific and leadership competencies this industry believes it needs in its best project managers. The first figure refers to the industry-specific competencies, and the second to the leadership competencies. As noted earlier, the various competencies needed for leadership are vital for the best project managers.



**Figure 2:** Industry-Specific Competencies for Project Managers



**Figure 3:** Leadership Competencies for Project Managers

### 5.5.2 Superintendent

Figure 4 and Figure 5 profile the industry-specific and leadership competencies this industry believes it needs in its best superintendents. The first figure refers to the industry-specific competencies, and the second to the leadership competencies. While much more evenly spread between industry-specific and leadership than the project manager competency profile, the highest ranked competency (conscientiousness) is part of the leadership competency profile. Clearly, superintendents and project managers need to be given opportunities to develop and foster their leadership skills.



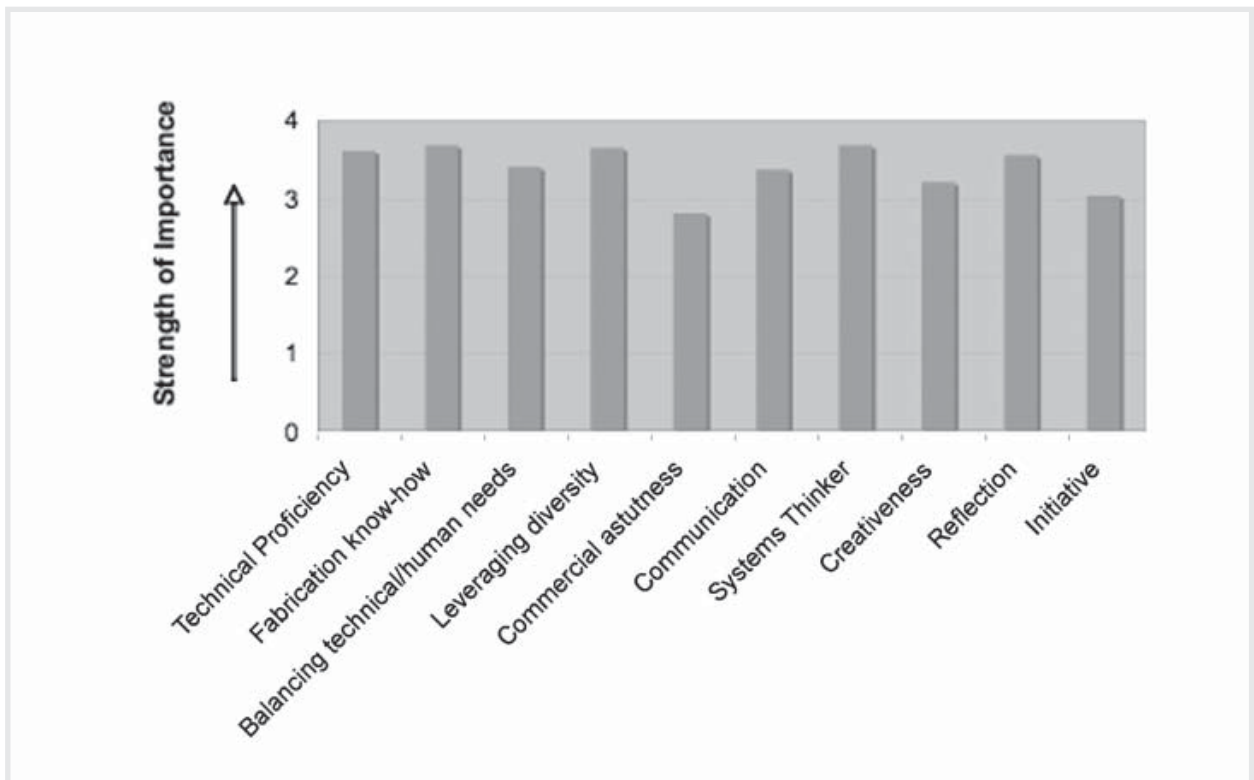


Figure 4: Industry-Specific Competencies for Superintendents

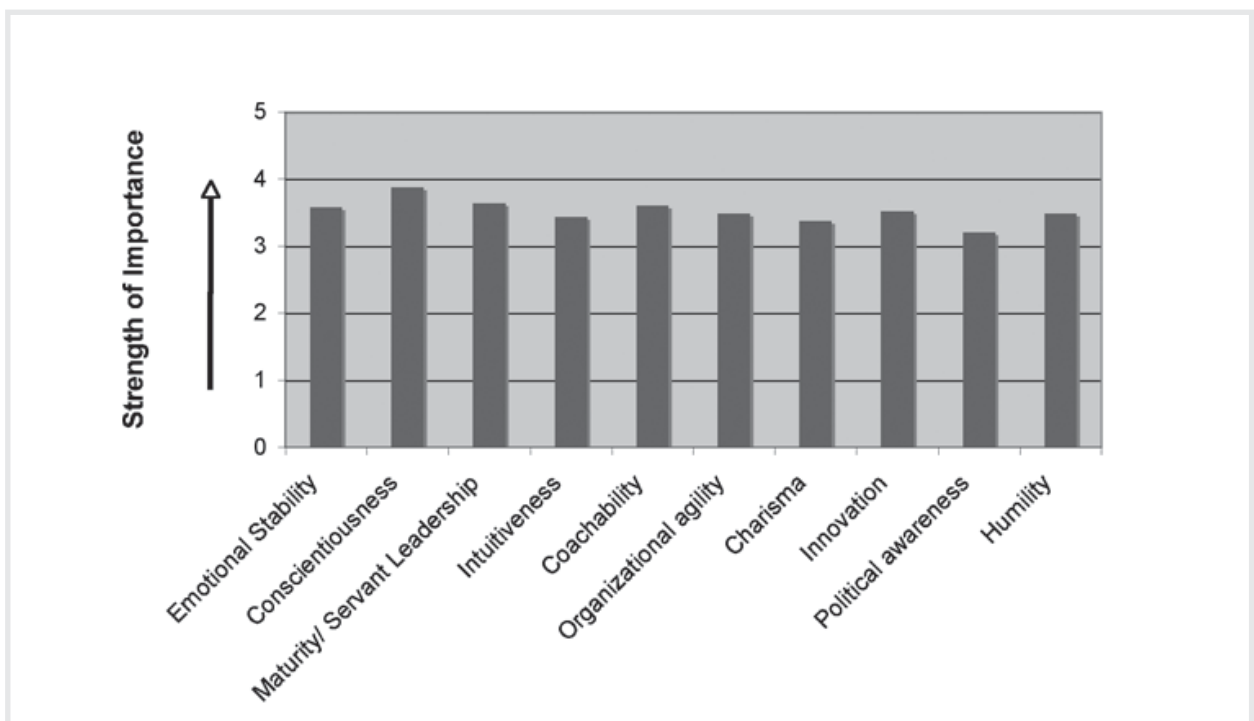


Figure 5: Leadership Competencies for Superintendents

## 5.6 Further Resources

Goleman, D., A. McKee, and R. Boyatzis (2002). *Primal Leadership: Realizing the Power of Emotional Intelligence*. Harvard Business School Press.

Lombardo, Michael M., and Robert W. Eichinger (2003). *For Your Improvement: A Development and Coaching Guide* (3rd edition). Lominger Limited Inc.

Lombardo, Michael M., and Robert W. Eichinger (2001). *The Leadership Machine*. Lominger Limited Inc.

Heifetz, Ronald A. (1994). *Leadership without Easy Answers*. Harvard University Press.

Parks, Sharon Daloz (2005). *Leadership Can Be Taught: A Bold Approach for a Complex World*. Harvard Business School Press.

## 6 CULTIVATING A LEARNING CULTURE

An organization with a learning culture is one with the ability to create, acquire, share, and apply knowledge (RT 201 – CII 2005). To create an organizational culture of learning it is important to identify the mission of the organization, identify what is needed to gain a competitive edge and to deliver the results, assess the competencies currently possessed and those lacked, and identify how the organization will cope with the necessary changes (Bellinger 1997).

## 6.1 Process for Cultivating a Learning Culture in Your Company

A learning culture does not just unfold within an organization. In fact, it takes considerable patience and savvy management to foster a learning culture in the organization. The following process is a pragmatic way to cultivate a learning culture. This is not the only means to achieving a learning culture, but this approach gives tangible concepts to consider in order to promote reflection, motivation, and improvement in employees.

1. Identify organizational mission and goals.
2. Identify core competencies to gain competitive edge.
3. Modify industry competency templates and position statements to meet organizational mission and goals.
4. Evaluate performance – assess competencies possessed and lacking... and do it often.

## 6.2 Identify Organizational Mission and Goals

The organizational mission identifies what the company stands for and what they are trying to achieve. Having this clearly defined is essential for it differentiates the company from its competitors as well as sets the tone for identifying the competencies required for the individuals and teams within the organization to achieve success. An organization performing design-build may require different competencies than a company that does plan and specification work.

### 6.3 Identify Core Competencies to Gain Competitive Edge

In order to cultivate a learning environment, tiers within the organization need to be addressed along with the global organizational efforts. These tiers are organizational, team, and individual. The organizational learning culture can be achieved only if driven by an individual and team learning culture. The competencies required for the organization overlap greatly with the competencies for teams. This overlapping is due to the relationship between groups of individuals and is reflected in the framework groupings below.

#### 6.3.1 Organizational and Team Core Competencies Framework

This research has helped identify the team and individual competencies required for successful HVAC and sheet metal contractors. The Society for Organizational Learning identified the five core capabilities of a learning organization. These core capabilities include shared vision, personal mastery, mental models, team learning, and system thinking (Senge 2000).

1. **Shared Vision** is essential to “creating the need for learning and the collective will to learn” (Senge 2000). In some companies, significant learning has occurred in crises. The crisis pulled the company together around the shared vision for survival. Research is studying why in some of these cases the learning stalled when the crisis ended. Interestingly, this phenomenon has led some like Senge to advocate “creating a crisis” to stimulate collective learning.

2. **Personal Mastery.** Having individual commitment to learning is a prerequisite to team and organizational learning.
3. **Mental Models** impart the ability to identify and improve upon assumptions/norms and the discernment to know when to challenge or accept the assumptions/norms.
4. **Team Learning** places priority on learning for the improvement and the advantage of the team.
5. **System Thinking** means “understanding wholes, not parts, and learning how our actions shape our reality” (Senge 2000).

#### 6.3.2 Individual Core Competencies Framework

Employing insight from other research, Table 1 shows critical competencies in a way that distinguishes between skills and competencies. Skills are often (at least partially) addressed in current employee improvement initiatives utilized by many companies. As already noted, competencies are more difficult to identify and evaluate in individuals, but they are critical to succeeding in the development of a learning culture. This list is a first step to addressing competencies in HVAC and sheet metal contractor management.

*Professional **skills** are valuable capabilities that are partially developed through current employee training programs.*

1. Technical proficiency	<ul style="list-style-type: none"> <li>■ Understands technical systems</li> <li>■ Communicates, designs, and details optimal systems</li> </ul>
2. Fabrication know-how	<ul style="list-style-type: none"> <li>■ Understands the advantages and disadvantages of prefabrication to project and business objectives</li> <li>■ Understands how to steer project designs to maximize prefabrication</li> </ul>
3. Innovation	<ul style="list-style-type: none"> <li>■ Identifies opportunities for and applies new solutions to challenges</li> <li>■ Promotes innovation in working teams</li> </ul>
4. Leveraging diversity	<ul style="list-style-type: none"> <li>■ Demonstrably embraces diversity</li> <li>■ Employs strategies to increase diversity where strategically advantageous</li> </ul>
5. Balancing technical/human needs	<ul style="list-style-type: none"> <li>■ Adheres to an appropriate set of values</li> <li>■ Considers ethical aspects in decision making</li> </ul>
6. Commercial astuteness	<ul style="list-style-type: none"> <li>■ Understands business needs of company</li> <li>■ Pursues and secures business opportunities</li> </ul>
7. Communication	<ul style="list-style-type: none"> <li>■ Understands mechanics of a presentation in a variety of settings, e.g., individual presentation, group, one-on-one. Particular attention is paid to the audience and structure of the presentation.</li> <li>■ Understands individual vs. group presentation skills</li> <li>■ Listens actively to others</li> <li>■ Asks appropriate questions</li> </ul>
8. Systems thinker	<ul style="list-style-type: none"> <li>■ Can identify problems and potential areas for improvement</li> <li>■ Can deal with ambiguity and change</li> <li>■ Uses an organized problem solving process</li> <li>■ Develops a critical approach/asking why?</li> <li>■ Identifies innovative solutions</li> </ul>
9. Reflection	<ul style="list-style-type: none"> <li>■ Actively takes time to plan activities</li> <li>■ Takes time to develop and implement lessons learned</li> <li>■ Seeks out feedback from others</li> </ul>
10. Coachability	<ul style="list-style-type: none"> <li>■ Actively listens to senior managers and mentor advice</li> <li>■ Makes realistic attempt to act on advice given</li> <li>■ Seeks out mentors and coaches for advice and feedback</li> </ul>

**Table 1:** Distinction between Skills and Competencies

<p><i>Professional <b>competencies</b> are higher order capabilities that impact professional success, but are not formally taught in ongoing educational and training programs. Competencies usually involve the mastery and use of multiple skills (i.e., those listed in 1-10).</i></p>	
11. Emotional stability	<ul style="list-style-type: none"> <li>■ Takes responsibility for own actions</li> <li>■ Seeks and accepts feedback</li> <li>■ Controls emotions in emotional situations</li> </ul>
12. Conscientiousness	<ul style="list-style-type: none"> <li>■ Works hard, seizes opportunities, not fearful of action, pursues with persistence</li> <li>■ Can overcome obstacles and seldom gives up in face of resistance</li> <li>■ Goal driven, not easily sidetracked</li> </ul>
13. Intuitiveness	<ul style="list-style-type: none"> <li>■ Can recognize that things are not always as they seem; seeks information</li> <li>■ Can overcome obstacles and seldom gives up in face of resistance</li> <li>■ Goal driven, not easily sidetracked</li> </ul>
14. Organizational agility	<ul style="list-style-type: none"> <li>■ Builds relationships and rapport</li> <li>■ Uses diplomacy and tact</li> <li>■ Understands and participates in the establishment</li> <li>■ Relates well with positions of authority</li> </ul>
15. Charisma	<ul style="list-style-type: none"> <li>■ Inspires others in the organization</li> <li>■ Speaks and acts consistently</li> <li>■ Provides positive insight to most or every situation</li> <li>■ Good judge of talent</li> </ul>
16. Political awareness	<ul style="list-style-type: none"> <li>■ Understands group dynamics</li> <li>■ Recognizes and seeks consensus in most group situations; adopts hard-headed leadership where appropriate</li> <li>■ Recognizes and uses the best traits of team members</li> </ul>
17. Humility	<ul style="list-style-type: none"> <li>■ Seeks expertise from external sources</li> <li>■ Inclusively celebrates successes; provides support to others during challenges</li> <li>■ Goal driven, not ego driven</li> </ul>
18. Initiative	<ul style="list-style-type: none"> <li>■ Identifies areas that need action</li> <li>■ Requires limited direction to get started; asks questions to obtain details where necessary</li> <li>■ Self-motivated: Sets and pursues goals</li> <li>■ Poses potential solutions to problems</li> <li>■ Works to deploy strengths and compensates for weaknesses</li> </ul>

**Table 1:** Distinction between Skills and Competencies (Continued)

### 6.3.3 Modify Industry Competency Templates and Position Descriptions

As part of this research project, standard industry competency templates and position descriptions were developed. The importance of an industry standard in these two areas is to provide coherence and a shared language across the diverse companies that make up the HVAC and sheet metal industry. The competency templates were introduced in the previous section on page 26.

Table 2 and Table 3 present the standard position descriptions for superintendent

(foreman), and project manager. Each description summarizes the position, lists the necessary duties and responsibilities, the position competencies, and a standard for how the individual is to be evaluated when his or her performance is being reviewed.

The best way to evaluate someone’s competencies is on the basis of “levels of accomplishment.” This is the approach used in the evaluation scorecard as a tool to evaluate specific competencies that is described in the next section of this chapter. Thus, the standard position descriptions and the evaluation tool adopt a consistent evaluation standard, further adding to coherence.

Position Title	Superintendent (Foreman)
Position Title of the Supervisor	General superintendent (responsible for all company jobsites) or company executive (owner, chief operating officer, or equivalent)
Summary of the Position	Manage jobsite productivity including worker performance, jobsite safety, worker start and finish times; coordinate jobsite materials orders with PM, manage jobsite deliveries; coordinate and liaise with other project superintendents (e.g., project’s electrical, concrete, and/or masonry subcontractors) and general contractor
Necessary Duties and Responsibilities	<ul style="list-style-type: none"> <li>■ Manage manpower needs of the project including projections, acquisition and deployment of manpower on the jobsite</li> <li>■ Closely plan and evaluate weekly jobsite activities, including acquiring materials, coordinating prerequisite work, especially by other contractors, and task scope</li> <li>■ Evaluate safety issues on the jobsite and then plan and implement safe work practices</li> <li>■ Coordinate and liaise jobsite activities with general contractor and other onsite contractors</li> <li>■ Coordinate materials, prefabrication, and equipment orders for the project</li> <li>■ Be responsible for all jobsite deliveries</li> <li>■ Monitor and approve worker jobsite hours</li> <li>■ Update company management system with progress (material installed and hours consumed)</li> <li>■ If relevant, liaise with union representatives</li> <li>■ Work with the PM on taking corrective actions if the actual labor costs exceed the estimated productivity</li> </ul>

**Table 2:** Standard Position Description for Superintendent

<p>Essential Position Competencies</p>	<ul style="list-style-type: none"> <li>■ Highly conscientious; adopt and convey a strong sense of personal pride and investment in the success of the project, and the workers for whom you are responsible</li> <li>■ High use of technical proficiency (fabrication know-how); especially to identify opportunities for use of the company’s prefabrication facilities</li> <li>■ Strong maturity/servant leadership; adopt the role to enable and empower workers to do their job; apply this to planning, safety, and coordination duties</li> <li>■ Effective emotional stability; able to operate effectively in fast-paced, high-pressure environments</li> <li>■ Strong verbal communication/motivation; able to effectively communicate with and motivate workers from diverse cultural and educational backgrounds</li> <li>■ High coachability/humility; prepared to take feedback (both positive and negative) and use this to inform personal improvement; continuously seek new knowledge and ways to enhance performance</li> </ul>
<p>Levels of Accomplishment</p>	<p>Level 1 (Needs Development) – Able to complete the duties and take the responsibilities to basic level; needs close mentoring and supervision by supervisor; competencies are present in individual but not particularly developed</p> <p>Level 2 (Competent) – Able to complete the duties and take the responsibilities up to an effective level; needs some mentoring and supervision by supervisor; competencies are present, and many are being developed</p> <p>Level 3 (Visibly Strong) – Able to complete all duties and responsibilities with high effectiveness; needs little or no mentoring and supervision; competencies are present and visibly strong</p>

**Table 2:** Standard Position Description for Superintendent (Continued)

Position Title	Project Manager
Position Title of the Supervisor	Project executive (responsible for all company projects) or company executive (owner, chief operating officer or equivalent)
Summary of the Position	Manages overall profitability of the project and liaises with owner; manages project finances and budgets, including change orders and contract adjustments; in coordination with superintendent, places jobsite materials, prefabrication, and equipment orders; prepares, updates, and revises project schedule; regularly communicates project status to supervisor; manages jobsite trailer office
Necessary Duties and Responsibilities	<ul style="list-style-type: none"> <li>■ Plan, coordinate, and communicate the detailed budget and schedule for the project working within the parameters determined in the project bid</li> <li>■ Closely monitor project progress and take required action to assure project success and profitability</li> <li>■ Diligently manage project scope to ensure that obligations are met and changes are managed through contractual mechanisms, e.g., change orders</li> <li>■ Submit and pursue progress claims and payment certificates</li> <li>■ Place and coordinate with the jobsite (through superintendent) material, prefabrication, and equipment orders, and deliveries</li> <li>■ Present regular project status reports (both written and verbal) to company senior management and project owner</li> <li>■ Be the primary point of contact for the owner for all correspondence and any jobsite visits</li> </ul>

**Table 3:** Standard Position Description for Project Manager



<p>Essential Position Competencies</p>	<ul style="list-style-type: none"> <li>■ Excellent commercial astuteness; recognize the key variables for project success and profitability, and manage for the maximization of these</li> <li>■ Highly conscientious/charismatic; adopt and convey a strong sense of personal pride and investment in the success of the project; convey this to the project team, the owner, and senior management</li> <li>■ Excellent and diverse written and verbal communication; able to effectively communicate, and, if necessary, negotiate crucial project challenges that might arise with the owner and senior management; able to communicate to both owners and jobsite workers with competence</li> <li>■ Rigorous balancing of human and technical needs; able to balance project team (human) and technical needs when developing and implementing project schedules and budgets</li> <li>■ High emotional stability; able to operate effectively (even thrive) in fast-paced, high-pressure environments</li> <li>■ High use of technical proficiency (fabrication know-how)/systems thinking; especially to identify opportunities for use of the company’s prefabrication facilities and in planning the project</li> <li>■ Highly innovative; able to use systems and “out-of-the-box” thinking to meet project challenges identified in planning and resolve others that arise during the project</li> </ul>
<p>Levels of Accomplishment</p>	<p>Level 1 (Needs Development) – Able to complete the duties and take the responsibilities to basic level; needs close mentoring and supervision by supervisor; competencies are present in individual but not particularly developed</p> <p>Level 2 (Competent) – Able to complete the duties and take the responsibilities up to an effective level; needs some mentoring and supervision by supervisor; competencies are present, and many are being developed</p> <p>Level 3 (Visibly Strong) – Able to complete all duties and responsibilities with high effectiveness; needs little or no mentoring and supervision; competencies are present and visibly strong</p>

**Table 3:** Standard Position Description for Project Manager (Continued)

While the competency templates and position descriptions are an industry standard, each can be modified for the specific organizational culture, mission, and objectives of your company. This would require senior management and the human resources department reviewing and adjusting the competency templates and position descriptions. For instance, a company may have decided it wants to embark on a revenue growth mission for its next five-year strategic plan. In this case, the company may want to emphasize the development of business acumen in its project managers by emphasizing “leadership and initiative in acquiring new work” rather than “technical proficiency.” In this case, the competency templates and position descriptions would be adjusted accordingly. The basic competency template and position description structure remains, but the types of competencies are adjusted to better fit the company mission and goals.

#### **6.3.4 Evaluate Performance – Assess Competencies Possessed and Lacking... And Do It Often**

An assessment tool has been developed to allow individuals to identify their competency strengths and weaknesses. Figure 6 is a sample of a self assessment form for reviewing competencies. The full version of this tool is included as Appendix B and is available for use by readers of this report. This form is the performance evaluation. The process starts with the individual completing a self-assessment. Once completed, the results are then reviewed with management, and, if possible, with subordinates. This is known as 360 degree evaluation. Leading performance

evaluation researchers and practitioners use this type of system as it represents the current state of the art. The complete assessment scorecard is included as Appendix C to this report.

*Assess yourself in the following areas. Try to base your assessment on specific examples of actions or situations that you can think of.*

**Section 1 Skills** \_\_\_\_\_

**1. Technical proficiency**

- Understands technical systems
- Communicates, designs, and details optimal systems

Visible Strength	Competent	Needs Development			I want to improve	
5	4	3	2	1	yes	no

**Section 2 Competencies** \_\_\_\_\_

**18. Initiative**

- Identifies areas that need action
- Requires limited direction to get started; asks questions to obtain details where necessary
- Self-motivated: sets and pursues goals
- Poses potential solutions to problems
- Works to deploy strengths and compensates for weaknesses

Visible Strength	Competent	Needs Development			I want to improve	
5	4	3	2	1	yes	no

**Figure 6:** Sample Self-Assessment Form

**7 MANAGING GROWTH PAINS**

Do not be alarmed when things start to change in the organization, and growth occurs in individuals, and people start to improve their performance. In order to maximize the benefits and minimize the aches, companies should be proactive about the change. Managing growth pains is part of a healthy learning culture.

**7.1 Company-Level Analysis of Learning Culture – Are You Part of a Learning Organization?**

Related research has focused on how companies learn. This research is called **learning organizations**. This contrasts with the approach taken in this project, which is how companies promote learning in its employees. Clearly, the relationship between

a learning culture and a learning organization can be, and usually is, strong. Recent research by the CII has developed a framework and related web tool for evaluating the maturity of companies at being learning organizations (CII, 2005). Using the web-based software tool LEONARDO (Learning Organization Rapid Diagnostic), corporate progress toward achieving a learning organization can be mapped. For more information on this software, go to <http://construction.colorado.edu/LEONARDO>. In this system, there are five levels of maturity, ranging from 1 as the least mature to 5 as the most mature.

## **7.2 Identify a Method for Your Organization to Cope with Changes**

In developing the core competencies of the individuals and the teams within the organization, it is important to develop a strategic process for implementing the changes required to achieve the organization's goals and mission. The Council for Adult and Experimental Learning (CAEL) has identified nine "Exemplary Practices" that may aid in an organization's ability to change:

1. Leadership commitment to developing and maintaining learning culture – The organizations' leadership team including the project managers and supervisors are the main drivers for elevating the importance of learning and development.
2. Alignment of business goals with employee learning – This is done by ensuring the company goals are clearly communicated throughout the organization. It is important that employees are encouraged to participate in educational opportunities that are aligned with these organizational goals.
3. Strategic positioning of learning and development within senior management – This is accomplished by including the human resources leader or the chief learning officer as a part of the executive management team.
4. Emphasis on leadership development at all levels of the organization; efforts should be made to develop talent from within the organization.
5. Commitment to developing well rounded individuals within the organization through personal development opportunities, tuition reimbursement programs, and on-the-job training.
6. Structuring informal learning opportunities at the workplace by intentionally integrating work and learning through team projects, cross-training, rotational assignments, and problem-solving exercises.
7. Use of technology as a tool for meeting learning objectives. These tools may be used to support and reinforce learning and to manage the organizations' education and training programs.
8. Development of strategic alliances with educational institutions to create and maintain learning culture.
9. Emphasis on the impact of personal and organizational learning on the performance of the organization (Tate and Klein-Collins 2004).

### **7.3 Checklist for Fostering a Learning Culture**

Abstracted from Wilson, B. G.; Jonassen, D. H.; and Cole, P., Cognitive approaches to instructional design. In: G. M. Piskurich (ed.), *The American Society for Training and Development (ASTD) Handbook of Instructional Technology*, pp. 21.1-21.22. McGraw-Hill; 1993.

1. Offer training within an overall culture that encourages cooperation, risk-taking, and growth.
2. Get learners' buy-in and commitment in achieving training goals.

#### **7.3.1 Motivate Learners**

3. Demonstrate the value of the training to the learners and cultivate their sense of confidence in their ability to master the objectives.

#### **7.3.2 Make Training Problem-Centered**

4. Draw on authentic needs and contexts; make requirements of learning tasks similar to important requirements of job tasks.
5. Encourage learners' active construction of meaning, drawing on their existing knowledge (Resnick 1983).
6. Teach multiple learning outcomes together (Gagne & Merrill 1990).
7. Sequence instruction so that learners can immediately benefit from what they learn by applying it to real-world tasks.

#### **7.3.3 Help Learners Assume Control of Their Learning**

8. Provide coaching.
9. Provide scaffolding and support in performing complex tasks.
  - a. Adjust tools (equipment), task, and environment.
  - b. Provide timely access to information and expertise.
  - c. Provide timely access to performance feedback.
  - d. Utilize group problem-solving methods.
  - e. Provide help only when the learner is at an impasse and only enough help for the learner to complete the task.
10. Fade support.
11. Minimize mean time to help (i.e., provide "just-in-time" training).
12. Encourage learners to reflect on their actions.
13. Encourage exploration.
14. Encourage learners to detect and learn from their errors.

#### **7.3.4 Provide Meaningful "Practice"**

15. Provide opportunities for learners to apply what they've learned in authentic contexts. If it is not feasible to practice on real tasks, provide cases or simulations.
16. Personalize practice (Ross & Morrison 1988).

## 8 INDUSTRY LEADERSHIP FOR A LEARNING CULTURE

While the most substantial progress in developing and maintaining learning cultures in the HVAC and sheet metal industry will occur at the company level, the industry as a whole can take leadership in sending messages to its constituents. This will most likely occur through current organizations such as SMACNA. Other industries have taken strong leadership at the industry level in the following four areas, and the HVAC and sheet metal industry can jumpstart itself by leading in these areas.

1. Industry-level recognition of leaders,
2. Alignment between competency approach to performance evaluation and industry training programs,
3. Structuring industry knowledge frameworks to account for competencies (not just skills), and
4. Actively conducting research that creates new industry knowledge.

### 8.1 Industry Recognition for Creating a Learning Culture

Business, manufacturing, healthcare, education, and their related industry sectors promote learning and quality improvement through the highly regarded **Malcolm Baldrige National Quality Award**. A similar award should be created for recognizing HVAC and sheet metal leaders in developing and maintaining a learning culture. The U.S. National Institute of Standards and Technology (NIST) administers

the Malcolm Baldrige award, which is given as a reward for quality performance and advancement. The President of the United States gives the award every year. SMACNA could administer the award for the HVAC and sheet metal industry, and the structure could be very similar to the Malcolm Baldrige award.

The original purpose of the award was to recognize quality achievements of companies, publicize successful quality strategies, and promote quality awareness. The companies are judged to be outstanding in the following seven areas:

1. Leadership,
2. Strategic planning,
3. Customer and market focus,
4. Measurement, analysis, and knowledge management,
5. Human resource focus,
6. Process management, and
7. Results.

These award criteria help improve organizational performance standards to facilitate construction and sharing of best practice information and to serve as a working tool for managing and sharing performance. The criteria are designed to help companies deliver improving value to customers and to improve their effectiveness and capabilities.

Another approach may be similar to the Mechanical Contractors' Association of America (MCAA), which has a "best practices" award, and the winner presents the award-winning practice at the MCAA convention each year.

## 8.2 Competency Alignment in Industry Training Material

Industries that have robust training programs offered through industry institutions will align these programs on a competencies basis. The advantages are twofold. First, companies can more easily identify and access programs that will enhance an individual's competency strengths and weaknesses. Second, training programs tend to be more widely used and relevant, helping to achieve a financially strong education and training program.

To elevate the current training programs offered by the industry, a retooling of the offered programs should be conducted to indicate the competencies engaged. This could be done as a part of the ongoing review and revision that occurs as a natural part of maintaining the currency of programs offered, i.e., over time and needing few additional resources.

## 8.3 Address Competencies in the New Horizons Foundation Online Knowledge Structure

A recent research project by the NHF reorganized its research program using an online knowledge structure to make new research project results more coherent and accessible to the HVAC and sheet metal industry. This has many other benefits including enabling web-based access and identifying holes in the knowledge base. Other industries extend these types of knowledge frameworks to incorporate competencies; this should be pursued in the HVAC and sheet metal industry as well.

## 8.4 Continue Creating Knowledge – The Research Process

Learning and teaching need to be continually updated as old knowledge is replaced by new knowledge. Thirty years ago, computers were just emerging into our world. They are now an indispensable tool for business and project management. With change comes the need for creating knowledge to keep at the forefront of business or industry.

The HVAC and sheet metal industry must invest in research – the process of creating knowledge – in order to sustain its learning culture. This can be accomplished through company-sponsored research, through industry initiatives, or specifically through financially and actively supporting the New Horizons Foundation.

## 8.5 Further Resources

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## 10 APPENDIX A – INDUSTRY SURVEY

### 10.1 Creating a Learning Culture for HVAC and Sheet Metal Contractors

#### 10.1.1 Contractor Survey

Penn State University, through a research project with New Horizons Foundation, has identified a number of potential core competencies for HVAC and sheet metal contractors. The goal of this survey is to obtain feedback on this list of competencies from leaders in the HVAC and sheet metal industry.

All information obtained in this survey is being used for research purposes only and will be kept confidential in accordance with Penn State's strict research protocols.

**Instructions:** Thinking about what you regard as an exceptional Project Manager and Superintendent, please indicate the level to which you agree that each of the competencies listed contributes highly to that level of excellence. Do so checking whether you by strongly agree, agree, disagree, or strongly disagree. These competencies relate specifically to your project managers and superintendents. Space has been made available for additional comments.

Once completed, please forward surveys to the fax number or address above, marked to the attention of Neviene Harding. Preferably, you can e-mail completed surveys to Michael Horman at [mjhorman@enr.psu.edu](mailto:mjhorman@enr.psu.edu).

Department of Architectural Engineering  
Penn State University  
104 Engineering Unit A  
University Park PA 16802  
814-863-2080, FAX: 814-863-4789

Thank you for your time.

#### 10.1.2 Definitions

**Competencies** – A measurable characteristic of a person that is related to success at work, often consisting of a set of skills. An example of a skill is conducting an interview while an example of a competency is being a good judge of talent.

**Industry Specific Competencies** – These competencies are crucial to the HVAC industry, e.g., fabrication “know-how” would be found in few other industries.

**Leadership Competencies** – These competencies would be found in many industries, not just HVAC, e.g., maturity.

The focus of this study is middle-upper management in HVAC and sheet metal companies. Think about these positions when responding to the survey, even though some companies may have different position titles defined in this survey. Most importantly, exclude upper management and workers from consideration.

**Project Manager** – Responsible for the overall profitability of the project and dealing with the owner.

**Superintendent (Foreman)** – Responsible for jobsite productivity.

### 10.1.3 Background Information (optional)

Name: \_\_\_\_\_

Position/ Title: \_\_\_\_\_

Company: \_\_\_\_\_

E-Mail Address: \_\_\_\_\_

Phone Number: \_\_\_\_\_

Project Manager	Superintendent
<p><b>Industry Specific Competencies required by HVAC and Sheet Metal PMs</b></p>	<p><b>Industry Specific Competencies required by HVAC and Sheet Metal Superintendentsms</b></p>
<p><b>Technical proficiency</b>  <i>(To have excellent knowledge of HVAC processes and applications)</i>  <input type="checkbox"/> strongly agree    <input type="checkbox"/> agree  <input type="checkbox"/> disagree        <input type="checkbox"/> strongly disagree</p>	<p><b>Technical proficiency</b>  <i>(To have excellent knowledge of HVAC processes and applications)</i>  <input type="checkbox"/> strongly agree    <input type="checkbox"/> agree  <input type="checkbox"/> disagree        <input type="checkbox"/> strongly disagree</p>
<p><b>Fabrication know-how</b>  <i>(The ability to understand production facility issues and how to maximize their benefits to a project.)</i>  <input type="checkbox"/> strongly agree    <input type="checkbox"/> agree  <input type="checkbox"/> disagree        <input type="checkbox"/> strongly disagree</p>	<p><b>Fabrication know-how</b>  <i>(The ability to understand production facility issues and how to maximize their benefits to a project)</i>  <input type="checkbox"/> strongly agree    <input type="checkbox"/> agree  <input type="checkbox"/> disagree        <input type="checkbox"/> strongly disagree</p>
<p><b>Balancing technical/human needs</b>  <i>(The ability to balance technical and human management needs)</i>  <input type="checkbox"/> strongly agree    <input type="checkbox"/> agree  <input type="checkbox"/> disagree        <input type="checkbox"/> strongly disagree</p>	<p><b>Balancing technical/human needs</b>  <i>(The ability to balance technical and human management needs)</i>  <input type="checkbox"/> strongly agree    <input type="checkbox"/> agree  <input type="checkbox"/> disagree        <input type="checkbox"/> strongly disagree</p>
<p><b>Leveraging diversity</b>  <i>(The ability to interact well with people of varied backgrounds)</i>  <input type="checkbox"/> strongly agree    <input type="checkbox"/> agree  <input type="checkbox"/> disagree        <input type="checkbox"/> strongly disagree</p>	<p><b>Leveraging diversity</b>  <i>(The ability to interact well with people of varied backgrounds)</i>  <input type="checkbox"/> strongly agree    <input type="checkbox"/> agree  <input type="checkbox"/> disagree        <input type="checkbox"/> strongly disagree</p>
<p><b>Commercial astuteness</b>  <i>(Commercially astute with good financial / business acumen)</i>  <input type="checkbox"/> strongly agree    <input type="checkbox"/> agree  <input type="checkbox"/> disagree        <input type="checkbox"/> strongly disagree</p>	<p><b>Commercial astuteness</b>  <i>(Commercially astute with good financial / business acumen)</i>  <input type="checkbox"/> strongly agree    <input type="checkbox"/> agree  <input type="checkbox"/> disagree        <input type="checkbox"/> strongly disagree</p>

Project Manager	Superintendent
<p><b>Communication</b>  <i>(To have excellent written and oral communication skills)</i></p> <p><input type="checkbox"/> strongly agree    <input type="checkbox"/> agree  <input type="checkbox"/> disagree            <input type="checkbox"/> strongly disagree</p>	<p><b>Communication</b>  <i>(To have excellent written and oral communication skills)</i></p> <p><input type="checkbox"/> strongly agree    <input type="checkbox"/> agree  <input type="checkbox"/> disagree            <input type="checkbox"/> strongly disagree</p>
<p><b>Systems thinker</b>  <i>(The ability to plan, coordinate, and direct design and construction activities)</i></p> <p><input type="checkbox"/> strongly agree    <input type="checkbox"/> agree  <input type="checkbox"/> disagree            <input type="checkbox"/> strongly disagree</p>	<p><b>Systems thinker</b>  <i>(The ability to plan, coordinate, and direct design and construction activities)</i></p> <p><input type="checkbox"/> strongly agree    <input type="checkbox"/> agree  <input type="checkbox"/> disagree            <input type="checkbox"/> strongly disagree</p>
<p><b>Creativeness</b>  <i>(The ability to develop the overall concepts of a new product)</i></p> <p><input type="checkbox"/> strongly agree    <input type="checkbox"/> agree  <input type="checkbox"/> disagree            <input type="checkbox"/> strongly disagree</p>	<p><b>Creativeness</b>  <i>(The ability to develop the overall concepts of a new product)</i></p> <p><input type="checkbox"/> strongly agree    <input type="checkbox"/> agree  <input type="checkbox"/> disagree            <input type="checkbox"/> strongly disagree</p>
<p><b>Reflection</b>  <i>(Identify technical problems preventing the completion of a project)</i></p> <p><input type="checkbox"/> strongly agree    <input type="checkbox"/> agree  <input type="checkbox"/> disagree            <input type="checkbox"/> strongly disagree</p>	<p><b>Reflection</b>  <i>(Identify technical problems preventing the completion of a project)</i></p> <p><input type="checkbox"/> strongly agree    <input type="checkbox"/> agree  <input type="checkbox"/> disagree            <input type="checkbox"/> strongly disagree</p>
<p><b>Initiative</b>  <i>(The ability to determine technical goals within broad outlines provided by top executives)</i></p> <p><input type="checkbox"/> strongly agree    <input type="checkbox"/> agree  <input type="checkbox"/> disagree            <input type="checkbox"/> strongly disagree</p>	<p><b>Initiative</b>  <i>(The ability to determine technical goals within broad outlines provided by top executives)</i></p> <p><input type="checkbox"/> strongly agree    <input type="checkbox"/> agree  <input type="checkbox"/> disagree            <input type="checkbox"/> strongly disagree</p>

Project Manager	Superintendent
<p><b>Leadership Competencies required by the HVAC and Sheet Metal Industry in its PMs</b></p>	<p><b>Leadership Competencies required by the HVAC and Sheet Metal Industry in its Superintendents</b></p>
<p><b>Emotional stability</b>  <i>(To have “psychological maturity” and self control)</i>  <input type="checkbox"/> strongly agree   <input type="checkbox"/> agree  <input type="checkbox"/> disagree   <input type="checkbox"/> strongly disagree</p>	<p><b>Emotional stability</b>  <i>(To have “psychological maturity” and self control)</i>  <input type="checkbox"/> strongly agree   <input type="checkbox"/> agree  <input type="checkbox"/> disagree   <input type="checkbox"/> strongly disagree</p>
<p><b>Conscientiousness</b>  <i>(To have strong work ethic; diligence)</i>  <input type="checkbox"/> strongly agree   <input type="checkbox"/> agree  <input type="checkbox"/> disagree   <input type="checkbox"/> strongly disagree</p>	<p><b>Conscientiousness</b>  <i>(To have strong work ethic; diligence)</i>  <input type="checkbox"/> strongly agree   <input type="checkbox"/> agree  <input type="checkbox"/> disagree   <input type="checkbox"/> strongly disagree</p>
<p><b>Maturity/Servant leadership</b>  <i>(The ability to empower others rather than ruling them)</i>  <input type="checkbox"/> strongly agree   <input type="checkbox"/> agree  <input type="checkbox"/> disagree   <input type="checkbox"/> strongly disagree</p>	<p><b>Maturity/Servant leadership</b>  <i>(The ability to empower others rather than ruling them)</i>  <input type="checkbox"/> strongly agree   <input type="checkbox"/> agree  <input type="checkbox"/> disagree   <input type="checkbox"/> strongly disagree</p>
<p><b>Intuitiveness</b>  <i>(The ability to rely on intuition when making decisions as needed)</i>  <input type="checkbox"/> strongly agree   <input type="checkbox"/> agree  <input type="checkbox"/> disagree   <input type="checkbox"/> strongly disagree</p>	<p><b>Intuitiveness</b>  <i>(The ability to rely on intuition when making decisions as needed)</i>  <input type="checkbox"/> strongly agree   <input type="checkbox"/> agree  <input type="checkbox"/> disagree   <input type="checkbox"/> strongly disagree</p>
<p><b>Coachability</b>  <i>(To have a desire for growth and development)</i>  <input type="checkbox"/> strongly agree   <input type="checkbox"/> agree  <input type="checkbox"/> disagree   <input type="checkbox"/> strongly disagree</p>	<p><b>Coachability</b>  <i>(To have a desire for growth and development)</i>  <input type="checkbox"/> strongly agree   <input type="checkbox"/> agree  <input type="checkbox"/> disagree   <input type="checkbox"/> strongly disagree</p>

Project Manager	Superintendent
<p><b>Organizational agility</b>  <i>(To know how to get things done through formal channels and informal network; understands culture)</i></p> <p><input type="checkbox"/> strongly agree    <input type="checkbox"/> agree  <input type="checkbox"/> disagree            <input type="checkbox"/> strongly disagree</p>	<p><b>Organizational agility</b>  <i>(To know how to get things done through formal channels and informal network; understands culture)</i></p> <p><input type="checkbox"/> strongly agree    <input type="checkbox"/> agree  <input type="checkbox"/> disagree            <input type="checkbox"/> strongly disagree</p>
<p><b>Charisma</b>  <i>(The ability to define a vision which unites and captivates fellow workers)</i></p> <p><input type="checkbox"/> strongly agree    <input type="checkbox"/> agree  <input type="checkbox"/> disagree            <input type="checkbox"/> strongly disagree</p>	<p><b>Charisma</b>  <i>(The ability to define a vision which unites and captivates fellow workers)</i></p> <p><input type="checkbox"/> strongly agree    <input type="checkbox"/> agree  <input type="checkbox"/> disagree            <input type="checkbox"/> strongly disagree</p>
<p><b>Innovation</b>  <i>(The ability to “generate new ideas”)</i></p> <p><input type="checkbox"/> strongly agree    <input type="checkbox"/> agree  <input type="checkbox"/> disagree            <input type="checkbox"/> strongly disagree</p>	<p><b>Innovation</b>  <i>(The ability to “generate new ideas”)</i></p> <p><input type="checkbox"/> strongly agree    <input type="checkbox"/> agree  <input type="checkbox"/> disagree            <input type="checkbox"/> strongly disagree</p>
<p><b>Political awareness</b>  <i>(Discerns “emotional ties and power relationships within a group”)</i></p> <p><input type="checkbox"/> strongly agree    <input type="checkbox"/> agree  <input type="checkbox"/> disagree            <input type="checkbox"/> strongly disagree</p>	<p><b>Political awareness</b>  <i>(Discerns “emotional ties and power relationships within a group”)</i></p> <p><input type="checkbox"/> strongly agree    <input type="checkbox"/> agree  <input type="checkbox"/> disagree            <input type="checkbox"/> strongly disagree</p>
<p><b>Humility</b>  <i>(Leadership with approachability, openness and friendliness)</i></p> <p><input type="checkbox"/> strongly agree    <input type="checkbox"/> agree  <input type="checkbox"/> disagree            <input type="checkbox"/> strongly disagree</p>	<p><b>Humility</b>  <i>(Leadership with approachability, openness and friendliness)</i></p> <p><input type="checkbox"/> strongly agree    <input type="checkbox"/> agree  <input type="checkbox"/> disagree            <input type="checkbox"/> strongly disagree</p>

Are there any other competencies required for HVAC and sheet metal contractors that were not addressed or defined in this list of core competencies?

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Additional comments:

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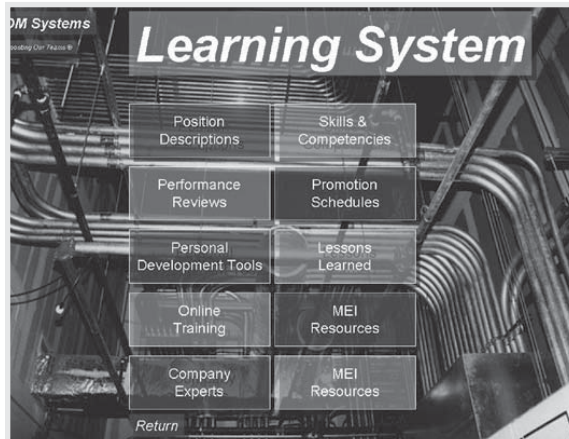
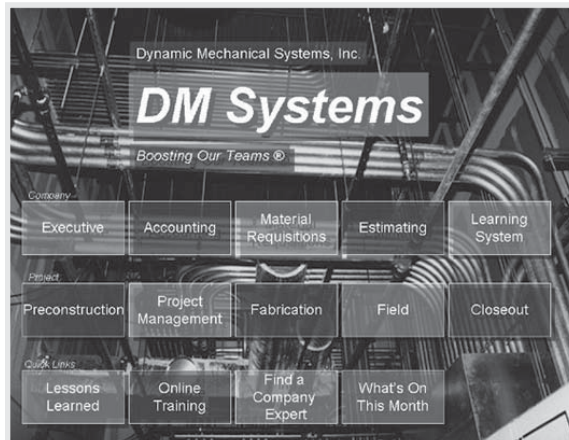
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## 11 APPENDIX B – EXAMPLE OF A WEB-BASED COMPANY LEARNING TOOL (COURTESY OF DYNAMIC MECHANICAL SYSTEMS, INC.)

### 11.1 Learning Tool (Courtesy of Dynamic Mechanical Systems, Inc.)



DM Systems  
 Position Descriptions

Senior Project Manager	General Superintendent
Project Manager	Project Superintendent
Project Engineer	Foreman

Return

DM Systems  
 Personal Development Tools

What's on the month

Join a Reading Group	Peer Activities	Ethics
Brown bag lunch presentations	Upcoming Seminars & Conference	Management 101
Company Sports Events	Online Training	
Online Training		

Return

DM Systems  
 Skills & Competencies

Senior Project Manager	General Superintendent
Project Manager	Project Superintendent
Project Engineer	Foreman

Return

DM Systems  
 General Superintendent

Description	Technical Skills
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Return

DM Systems  
 Performance Reviews

Senior Project Manager	General Superintendent
Project Manager	Project Superintendent
Project Engineer	Foreman

Return

DM Systems  
 Project Manager

<b>Strengths to Capitalize On</b> <ul style="list-style-type: none"> <li>Ethics</li> <li>Problem Solver</li> <li>Initiative</li> </ul>	<b>Available Action Items</b> <ul style="list-style-type: none"> <li>Attend Inhouse Event</li> <li>Run Training Session</li> <li>Set Up Peer Group Event</li> </ul>
<b>Weaknesses to Strengthen</b> <ul style="list-style-type: none"> <li>Negotiation</li> <li>Accountability</li> <li>Leadership</li> <li>Continuous Improvement</li> </ul>	<ul style="list-style-type: none"> <li>Attend SMACNA Seminar</li> <li>Develop New Group</li> <li>Participate in Developing Leaders WS</li> <li>Complete Resource List</li> </ul>

Return

# 12 APPENDIX C – COMPETENCY SCORECARD

## Professional Competency Scorecard

Name \_\_\_\_\_ Date \_\_\_\_\_

Assess yourself in the following areas. Try to base your assessment on specific examples of actions or situation that you can think of.

### Section 1 Industry Specific Competencies

#### 1. Technical proficiency

- Excellent knowledge of HVAC processes and applications

Visible Strength	Competent	Needs Development	I want to improve
5 4	3	2 1	yes no

#### 2. Fabrication know-how

- Ability to handle full production facility accountability

Visible Strength	Competent	Needs Development	I want to improve
5 4	3	2 1	yes no

#### 3. Balancing technical/human needs

- Balancing technical and human management needs

Visible Strength	Competent	Needs Development	I want to improve
5 4	3	2 1	yes no

#### 4. Leveraging diversity

- Ability to interact well with people of varied backgrounds

Visible Strength	Competent	Needs Development	I want to improve
5 4	3	2 1	yes no

#### 5. Commercial astuteness

- Commercially astute with good financial / business acumen

Visible Strength	Competent	Needs Development	I want to improve
5 4	3	2 1	yes no

#### 6. Communication

- Excellent written and oral communication skills

Visible Strength	Competent	Needs Development	I want to improve
5 4	3	2 1	yes no

#### 7. Systems thinker

- Plan, coordinate, and direct design and construction activities

Visible Strength	Competent	Needs Development	I want to improve
5 4	3	2 1	yes no

#### 8. Creativeness

- Develop the overall concepts of a new product

Visible Strength	Competent	Needs Development	I want to improve
5 4	3	2 1	yes no



**9. Reflection**

- Identify technical problems preventing the completion of a project

Visible Strength	Competent	Needs Development	I want to improve	
5	4	3	2	1
			yes	no

**10. Initiative**

- Determine technical goals within broad outlines provided by top executives

Visible Strength	Competent	Needs Development	I want to improve	
5	4	3	2	1
			yes	no

**Section 2 Industry Transcendent Leadership Competencies**

**11. Emotional stability**

- Has "psychological maturity" and self control

Visible Strength	Competent	Needs Development	I want to improve	
5	4	3	2	1
			yes	no

**12. Conscientiousness**

- Strong work ethic; diligence

Visible Strength	Competent	Needs Development	I want to improve	
5	4	3	2	1
			yes	no

**13. Maturity/Servant leadership**

- Empowering rather than ruling others

Visible Strength	Competent	Needs Development	I want to improve	
5	4	3	2	1
			yes	no

**14. Intuitiveness**

- Relies on intuition when making decisions as needed

Visible Strength	Competent	Needs Development	I want to improve	
5	4	3	2	1
			yes	no

**15. Coachability**

- Have a desire for growth and development

Visible Strength	Competent	Needs Development	I want to improve	
5	4	3	2	1
			yes	no

**16. Organizational agility**

- Knows how to get things done through formal channels and informal network; understands culture

Visible Strength	Competent	Needs Development	I want to improve	
5	4	3	2	1
			yes	no

**17. Charisma**

- Be able to define a vision which unites and captivates fellow team members and subordinates

Visible Strength	Competent	Needs Development	I want to improve	
5	4	3	2	1
			yes	no

**18. Innovation**

- Ability to generate new ideas

Visible Strength	Competent	Needs Development	I want to improve	
5	4	3	2	1
			yes	no

**19. Political awareness**

- Discerns emotional ties and power relationships within a group

Visible Strength	Competent	Needs Development	I want to improve
5	4	2	yes no

**20. Humility**

- Leadership with approachability, openness and friendliness

Visible Strength	Competent	Needs Development	I want to improve
5	4	2	yes no

**Competencies Goals**

Strengths – Competencies in which I excel and can promote about myself.

Identify two **competencies** from the list above that you feel are your key strengths, and that you can use to set yourself apart.

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Areas to focus my development

Identify one or two key competencies that you would like to improve with the help of your advisor

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