

## **2003 Excellence in Practice Citation**

Electronic Learning Technologies



### **Northrop Grumman Newport News**

Newport News, Virginia

### **Training Modernization Group**

Chesapeake, Virginia

## ***Production Trades Training Program***

### **SUMMARY**

Starting small and growing to the corporation is a winning eLearning strategy. Using the need to reduce overhead and increase the training throughput as the business driver, we began our training modernization effort in February 2001. Over two years later we have gone from a single 4 hour course to the development and early implementation of a corporation wide Training Transformation Strategy that is improving the way we acquire, train, and develop our employees. Starting at the core skill Welding School, we modernized its entire training process, procedures, programs, curriculum, and training content based upon the insertion of learning technologies and application of adult learning theory. The Modernization Program included a detailed Return on Investment analysis, a completely integrated and synchronized complex Program Management process, converted Instructor Led Practical Training curriculum to 40 hours of Computer Assisted Instruction; converted Classroom Training to over 10 hours of Computer Based Training; installed an Automated Support Tool (LMS); and implemented an continuous assessment and program improvement management process. The business and training results are impressive: Decreased Cost 16% per initial entry trainee; Maintained the Quality of Graduates; Decreased the Safety; Increased available Direct Labor hours to the Production Managers by 15,700 hours due to faster employee matriculation; and Increased initial entry trainee throughput by 3.6 times. We are now sharing the courseware with other corporate and technical schools improving their performance. Now the modernization model is being repeated so that over the next 3 years we will have attained the same scale results in 50% of our 18,000 person workforce.

### **BACKGROUND**

**Waterfront Trades Training Mission:** The Trades Training Program produces competent employees to meet the Trades production demands in the shops and on the waterfront.

**Business Challenge:** The business needs, which started this modernization effort in 2001, were:

- a. Increase the Training Programs throughput capacity to better meet production needs over the next decade.
- b. Reduce the cost of training
- c. Retain the quality of training
- d. Retain the high safety standard
- e. Improve support to the production Foremen

The first program targeted for Modernization was the Welding School. The Welding School Modernization process has been a six phased program beginning in February 2001. It is currently in Phase 6. The Fitter Training Modernization Program is in Phase 3, and the Electrician Modernization Program is in Phase 1.

Modernization Program Summary by Phase:

Phase 1: Analysis and Understanding (30 days)

Phase 2: Definition and Design (30 days)

Phase 3: Creation and Development (6 Months)

Phase 4: Pilot Implementation and Roll Out (3 Months)

Phase 5: Data Capture and Evaluation (9-18 Months)

Phase 6: Production and Continuous Improvements (On Going)

As the Modernization Programs roll out the process has become much more efficient and effective. We have become much smarter in our courseware development activities and the establishment of a Digital Media Library along with a Style Guide, and LMS Technical Integration Standards have all significantly increased our ability to modernize programs faster.

As a result of our initial successes, we developed a Long Range Training Transformation Strategy in 2003 that lays out the modernization efforts for the next five years to ensure we have a consistent funding stream to accomplish our goals. Since rigorous metrics and ROI data are kept budget justification has become much more robust.

The Welding and Fitting Training Programs are housed in three buildings totaling almost five acres of enclosed training facilities. The school contains more than 135 hands-on training stations and three classrooms, including one 18-work station computer classroom. However, with the development and integration of learning technologies into the Welding School Program of Instruction, we will be developing a "Virtual Welding School" able to expand its' offering outside of the "brick and mortar" and actually into the production areas.

The Welding and Fitting Training Program provides initial and life long training for almost 7,000 Welders and Fitters in a 18,000 industrial production corporation.

Resources committed. Please indicate the number and level of employees involved at various stages of this practice (needs assessment, design, delivery, evaluation, etc.), as

well as the cost incurred over the lifetime (past and future) of this practice. Screen captures **must not** contain the company name or industry preference.

Besides the over 30 full time staff members of the Welding and Fitting Training Program, Subject Matter Experts from across the Trades, the internal corporate training staffs of 30 employees, three Training Development vendors, a Learning Management System vendor, and a full time Program Management Team have supported this modernization effort. Total cost of a single fully qualified worker in the traditional model was from \$10,000 to \$12,000. Our target is to reduce that cost by 20%-40% and use those savings to fund the modernization efforts.

The Trades Training Modernization Program represents a unique application in the field of “hands-on” practical training of a skilled workforce focused on attaining specific business results. It represents a visionary and dedicated effort in the core skills of a large business of an actual implementation of a totally integrated learning solution operating at all four levels of evaluation. The targeted programs and all its support elements have completely updated their courseware, moved much of that courseware to computer based training or computer assisted instruction, and conducted a rigorous bottom up review of all of its operations. It has measured its performance both internally and externally with its corporate client. It is even more impressive when even during all of this activity the initial efforts at the Welding School did not miss one training requirement even as it more than tripled its throughput in the first half of 2002 while decreasing the cost of training by 18%.

2002 Welding Training Modernization Results:

- **Decreased Cost 16%** per initial entry trainee.
- **Maintained the Quality** of Graduates. **2000-01:** Graduate X-ray test pass rate **85%** **2003** to date pass rate **84.9%**
- **Maintained the Safety** incident rate. **2000-01: 1.53%** **2003** to date: **.99%**
- **Increased Available Direct Labor** hours in 2002 to the Production Managers by **15,700** hours due to faster matriculation through the Welding School.
- **Increased** initial entry trainee throughput by **3.6 times**. **2001: 153 Welders.** **2002: 555 Welders (plus 500 Leased Welders Qualification Training)**

## **DOCUMENTATION**

### **Needs Identification (15% of total score)**

1. *Describe the problem or need for which this practice is designed and implemented. How was this problem identified, and how was it determined that this practice is an appropriate response?*

Trades Training business challenge:

- Increase throughput capacity to better meet production needs over the next decade.

- Reduce the cost of training
- Retain the quality of training
- Retain the high safety standard
- Improve support to the production Foremen

Increasing student load, decreasing number of qualified instructors, and increased business need to reduce overhead expenses. Over the next decade, there will be an increase in student throughput due to company expansion by 25% and increased turnover due to aging of the workforce. Over the next 10 years, Human Resources estimates significantly increased hiring rates which will put additional initial entry training requirements. The budget will not support hiring new instructors to meet this training requirement using the traditional method. There has been a significant investment in computer networks and technology throughout the organization offering an opportunity to make significant change in a core training area.

### **Design Values (15% of total score)**

2. *Please describe how this practice takes into account the best interests of both the organization and the employees targeted.*

The Welding and Fitting Training Programs strategy impacts the entire corporation. Any changes to these cores training programs must take in consideration the “value propositions” of other players in the organization. There are many stakeholders in the shipyard with interests in the modernization of the Welding and Fitting Training Programs. The key stakeholders are the Welding and Fitting Programs staff themselves, the Trades, Human Resources, and the individual employees. Following is a simplified statement of the value proposition of these key stakeholders in the modernization of the Welding School:

- A. Welding and Fitting Training Program. Produce competent welders and fitters to meet the production demands of the Trades in the shops and on the waterfront within the resources allotted by the corporation.
- B. Trades. Qualified personnel will be available to accomplish tasks in support of production schedules.
- C. Human Resources. Sufficient new hires will be introduced to the system to ensure Trades are staffed to meet production goals.
- D. The individual employee to more motivated and productive earlier because of the high quality of training received from initial entry and more productive interaction with their first supervisor or instructor thereby increasing retention rate and decreased time to competency.

### **Alignment**

3. *How is this practice in alignment with the performance identified, as described in your answer to question 1?*

Welding and Fitting are the core skill in ship construction. Over 6,000 of the 18,000 employees actually perform welding and fitting tasks as their primary work.

The Welding and Fitting Training Programs provide complete welding and fitting skills training for new employees and certification training for existing employees. No welder or fitter works on production welds without passing through the Welding and Fitting Training Programs.

The practice from the modernization start was in complete alignment at all five levels of evaluation—from student reaction to improving the business performance of the organization by reducing cost and improving quality graduates.

*4. Please describe how this practice integrates other training, learning, and performance improvement practices, and aligns itself with organizational goals to achieve the desired outcomes.*

The success of this practice is because from inception it was designed and implemented as a fully integrated and synchronized project focused on attaining measurable business results when the following strategic opportunity presented itself in January 2001.

**Strategic Opportunity:** To explore opportunities to use existing technologies and the latest in learning research and expertise to meet this future skills demand in the most efficient fashion while retaining the excellent quality product to our production trades. We could not break the current system and we could not stop training while we modernize.

**Solution:** Conduct a “bottom up” review of the Welding School in its current mode of operation and design and execute a Modernization Program from April through December 2002 to prepare for a significant training student surge and in the near term gain 1<sup>st</sup> year positive Return on Investment through implementing a single pilot consisting of five synchronized and integrated interventions. Use the successes of the initial implementation at the Welding School to grow eLearning to other areas.

- A. Develop and Update a Single Source Program of Instruction
- B. Convert selected courses in the current Instructor Led Training to Web Based Training, Computer Based Training, Computer Assisted Instruction as appropriate and update those courses which analysis shows do not require conversion
- C. Develop alternative Training Strategies and Revised Program of Instruction
- D. Implement Key Skills Pre-assessments
- E. Develop and Synchronize automated training administration tools

*5. What evidence is there of partnerships within and outside the organization (e.g. with senior management, frontline supervisors, unions, external training suppliers, consortia)?*

The development of both internal and external partnerships is a key factor to the success of this practice. Internally, during the Analysis and Understanding phase a methodical strategic communications campaign was designed and implemented to ensure that all the key stakeholders (those that can kill your program) and the key influencers (those that can significantly help your program) were identified briefed regularly. Their value propositions were identified and considered throughout implementation. Internal partners included:

- Director of Production Trades
- Welding School Staff
- Director of Training and Education
- Director of Health and Safety
- Director of Quality Assurance and Inspection
- Manager of Curriculum Development
- Human Resources Hiring Staff
- Chief Information Officer and IT staff

External partners were also key to the process because they provided a capacity and expertise not found internally at the start. Since then however, the level of expertise by both the internal and external partners has improved considerably because of the teamwork required to accomplish the task. External partners included:

- Program Management Team (Including a Senior Program Manager, a Deputy Program Manager for Analysis and Assessment, and a Deputy Program Manager for Operations)
- Learning Management System contractor
- Learning Management System professional services contractor
- Computer Based Training contractors (x2)
- Computer Assisted Instruction contractors (x2)
- Digital Media Library software vendor

## Evaluation Strategy

6. *How is this practice evaluated? What factors are included in your calculations (e.g. time, costs, staff count, lost phone calls, customer satisfaction)? Are the financial costs of this practice calculated? If so, how? How often is this practice evaluated?*

During the Analysis, a Total Cost of Ownership study was conducted to determine actual cost of training. The results were the following:

- Student Labor: 45%
- Instructor Contact Time with Students: 22%
- Materials: 20%
- Classroom Instructor Labor: 5%
- Administrative Costs: 5%
- Other: 3%

Consequently, during the Design Phase every potential intervention was required to be focused on driving one of those cost factors down without threatening quality based upon these fundamentals.

Core Learning Event: Instructor Student Booth (Practical Area) Contact Time

Key Cost Driver: Student Time to Train

Our central hypothesis then was: “Maximize Instructor/Student booth contact time will reduce “time to train” per student.”

Each intervention then had its own Hypothesis, Plan of Action and Milestones that was synchronized and integrated by the dedicated Program Management Team.

### 1. Develop Single Source Program of Instruction

Hypothesis: If courseware is standardized, training objective lesson steps will mirror what is being taught, instructor institutional knowledge will be captured, “on loan” instructors will train to welding school standards resulting in a more efficient instructional process.

Action:

- Update and Standardize Program of Instruction.
- Consolidate and update current instructional sourcebooks

Benefits:

- Provide Instructional Standardization to reduce content variation and ensure at-risk students are adequately supported.
- Provide body of content for reuse as Instructor Led Training presentations, Learner Based Instruction / Reference, and for situational expert.

Expected Impact:

- Improve Safety
- Optimize Instructor Contact Time
- Allow greater access to critical information
- Reduce Rework
- Reduce Attrition
- Reduce Total Time To Train

### 2. Convert current Instructor Led Training (ILT) to Learner Based Training (LBT) (NOTE: LBT is defined as the “blend” between Computer Based Training, Computer Assisted Training, and Instructor Led Training.)

Hypothesis: If current ILT content is converted to LBT Welder School efficiency will improve by independent student ability to reinforce skills, by affording instructors more

student booth contact time, and the ability to export the content to other users outside of the Welder School. Result will be reduced time to certification.

Action:

- Develop Computer Assisted Instruction for Instructor presentations
- Computer Based Training for Learner Based Activity (Phased introduction)
- Electronic Trainee Guides for Learning Center
- Objective driven Student Pocket Handbook for ready reference
- Once the courseware is in a exportable eLearning format, the courseware can be distributed to local technical schools for their use to train potential future workers.

Benefits:

- Provide instructionally sound, organized, semi-automated instructor delivery of information.
- Provides Learner-Based delivery of training just-in-time.
- Maximizes learner access to critical information without overt instructor support.
- May be distributed to distant learners.
- Provides reinforcement of critical concepts and knowledge factors.
- Provides ability to dynamically assess learner progress.
- Provides immediate feedback to learner.
- If we then hire the graduates of these technical schools, we will expect to further reduce the cost of initial entry training by another 20%.

Expected Impact:

- Improve Safety
- Optimize Instructor Contact Time
- Improve welding project performance
- Reduce Rework
- Reduce Attrition
- Reduces time away from value added work.
- Reduce Total Time To Train

3. Develop alternative Training Strategies and Revised Welding School Program of Instruction

Hypothesis: If production welding school attendance is better aligned with the actual operational requirements the Welding School will produce more efficient welders qualified on the actual jobs they will perform. (Just in Time, not Just in Case). Result will reduce course length for new students and better align training with career progression. Additionally, significant reductions in time to train will be gained from procedural adjustments made as school transitions from paper based to electronic based record keeping.

Action:

- Develop Revised Welding School Program of Instruction and Training Procedures document based upon integration of planned interventions.
- Develop alternative Training Strategies/Models depending upon welding school surge requirements. (High, Medium, Low) Low is current model.
- Using student performance data during an Welding Basic Training we can then group the learners by Fast, Average, and Slow so they can be matched with instructors who employ tailored instructional strategies further improving learner performance and decrease overall time to train.

Benefits:

- Enables instructors to optimize use of available resources.
- Considers perish ability / degradation of skills for those qualifications not used in several months.
- Provides flow throttle points for surge periods.

Expected Impact:

- Optimize Instructor Contact Time
- Improve Safety
- Reduce Rework
- Reduce Attrition
- Reduce Total Time To Train.
- Improve welding production performance

#### 4. Implement Key Skills Pre-assessments

Hypothesis: Better screening will reduce attrition and identify early on potential at risk students who may need different training approaches and instructional skills.

Action:

- Identify, test and implement Pre-hire Assessment Screening Tools for: Hand-Eye Coordination, Vision Depth Perception, Manual Dexterity
- Develop Realistic Job Preview Video
- Use Work Keys to assess pre-hiring skills to better identify the most appropriate trade selection.

Benefits:

- Identifies ideal candidates for Vocational Welding
- Conversely, identifies at-risk employees
- Enables prescriptive remediation to be in effect earlier in process.
- Creates entry baseline for comparing demographic-based results and tailoring support in future curricula variations.

Expected Impact:

- Optimize Instructor Contact Time

- Improve Safety
- Reduce Rework
- Reduce Attrition
- Reduce Total Time To Train

## 5. Refine Instructor Training Program

Hypothesis: If permanent instructors receive regularly scheduled professional development training and procedural review this will reinforce standardized best practices and provide a peer forum for “on loan” instructors to become familiar the same standards resulting in more efficient instructional processes and safety procedures.

Action:

- Ensure as new tools and processes emerge the Instructor Training Program is updated and Lessons Learned captured for current Instructors and “On Loan” Instructors

Benefits:

- Provide instructionally sound, organized, semi-automated instructor delivery of information.
- Provides reinforcement of critical concepts and knowledge factors.
- Provides ability to dynamically assess learner progress.
- Creates a uniform training methodology that can be more readily evaluated and improved.
- Enables instructor’s effectiveness in motivation and reaching individuals within a group.

Expected Impact:

- Improve Safety
- Optimize Instructor Contact Time
- Improve welding project performance
- Reduce Rework
- Reduce Attrition
- Reduce Total Time To Train
- Reduces time away from value added work.

## 6. Synchronize automated training administration tools.

Hypothesis: Automated record keeping will increase efficiency by reducing frequency of documents changing hands, chances of error and loss, and increasing instructor/student contact time.

Action:

- Implementation of basic automated training administration/record keeping tools to capture both student performance data and the ability to better manage training production requirements with production trade skill needs.
- Transition Welding School from a Paper Based Record Keeping Systems to an automated Learning Management Center.

#### Benefits:

- Maximizes learner access to critical information without overt instructor support.
- Captures distributed learning events to quantify and qualify individual and group performance.
- Provides reinforcement of critical concepts and knowledge factors.
- Provides ability to dynamically assess learner progress.
- Provides immediate feedback to learner.

#### Expected Impact:

- Improve Safety
- Optimize Instructor Contact Time
- Improve welding project performance
- Reduce Rework
- Reduce Attrition
- Reduces time away from value added work.
- Reduce Total Time To Train

Frequency of Evaluation: The data on all of these areas is captured, evaluated, analyzed, and presented with recommendations on a monthly basis. Trend analysis is conducted to identify Issues for Resolution and then measure impact of short term adjustments ensure that adjustments are made when required

## Results

*7. What specific participant behaviors are observed as a result of this practice, and how do these behaviors contribute to the goals of the practice? Are the impacts of these behaviors short-term or long-term? How do these behaviors differ from the results of previous practices?*

The specific behaviors observed as a result of this practice fall in two categories, intended and unintended. First, we intended for students to move through the instruction at their pace and tempo because the instructors had been taken off the learning path and put into a coaching and mentoring role. Since the instructors had been relieved of most of the rote instructions and administrative duties of student management they could focus their time on the core learning event—student/instructor booth contact time was maximized thereby reducing student time to train overall. The students are also able to use the CBT as a review and remediation tool and they have done that with very positive feedback. Second, by transferring the eLearning based curriculum to local technical schools and then recruiting and hiring graduates of those programs we have further reduced the training costs by 20%. In 2003, from the pilot

school we hired 8 of 16 graduates. In 2003-2004, we have expanded the program to 5 other schools which when aligned with the hiring forecast may meet our total hiring needs in 2005. It is a true Win-Win. They get world class curriculum and jobs for their graduates and we get pre-trained employees.

The unintended results have been even more amazing. In fact, one of the key lessons learned is to be open to these innovative uses of the tools and implement them when they prove successful. The first is that we had such great usage of the CBT that our 20 computer lab was often too busy to handle more students. In these cases, an instructor would take a group of students in a classroom, select one student to "take the course", and lead all the students through the learning in a group setting. CBT then becomes a superb Instructor Led Training tool as well as a Learner Based tool.

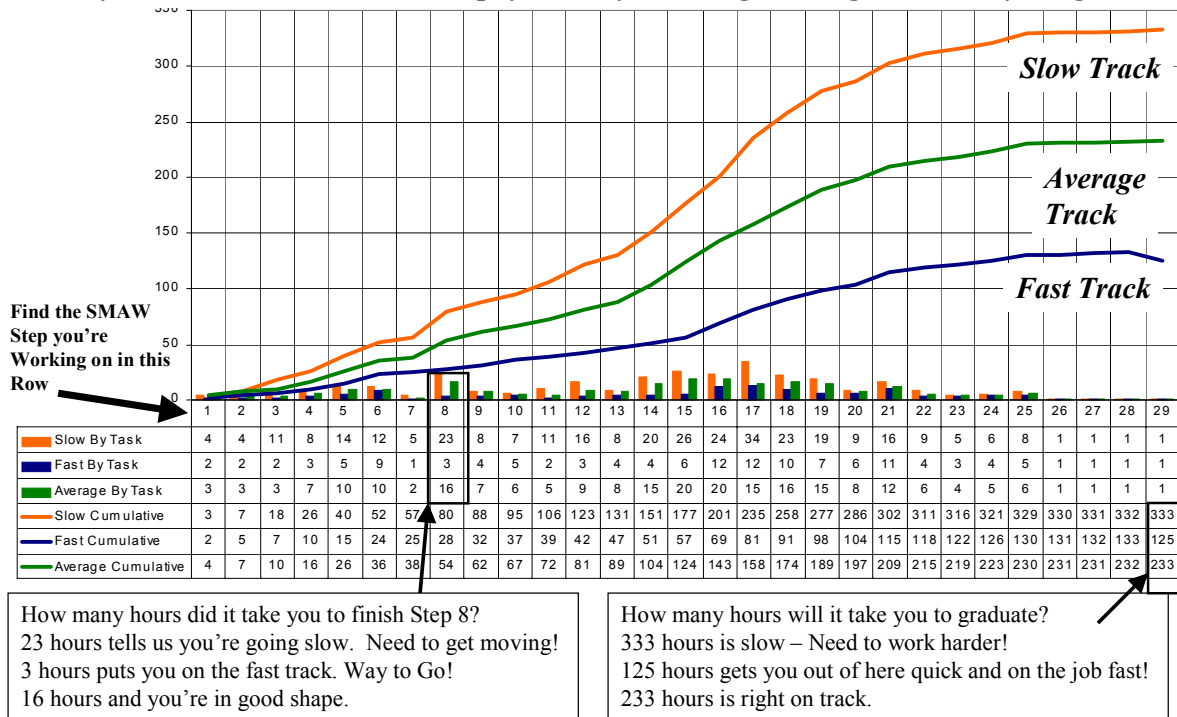
Another was the use of CD-ROMs. Reliability of the network is always a challenge in any organization. Any disruption of the on line service automatically shuts down training. Our instructors made an early decision that the training was more important than the ability to track learning externally so they pre-positioned stand alone CD-ROM versions of every course right next to the each computer and when the network goes down they automatically load the CDs and continue to train. Focus is always on training not the technology.

The third was use of the CBT as instructor/re-qualification training both in the Welding School and on the production floor. Because of the actual job requirements many experienced welders and welders who come back to the Welding School for short periods of time as instructors are required to perform tasks they know how to do but just have not done in a long period of time. The CBT serves as a superb refresher tool.

The core cost driver is student time to train. Student time to train is dependent upon welding instructors spending quality time with these students in the actual welding booth teaching them to weld. Our goal was to provide tools to allow students to move more quickly through the program in a learner centric model and allow instructors more time to facilitate the student learning and progression through the welding program. The following chart is an example of how we have tracked learner progression in fast, average, and slow groups. These charts are placed strategically around the Welding School so learners and instructors can monitor individual and group performance.

## Welders - How long is it taking you to graduate?

**Are you on the fast track to more pay or are you taking too long to achieve your goals?**



### *Compare your times with this chart – get in the Fast Lane!*

8. *What was the impact of the practice on your organization? Are the impacts of these behaviors short-term or long-term? (Wherever possible please include actual figures related to the practice.)*

The short term impact of the Program was:

2002 Welding Training Modernization Results:

- **Decreased Cost 16%** per initial entry trainee.
- **Maintained the Quality** of Graduates. **2000-01:** Graduate X-ray test pass rate **85%** **2003** to date pass rate **84.9%**
- **Maintained the Safety** incident rate. **2000-01: 1.53%** **2003** to date: **.99%**
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Additionally there are other tangible benefits including:

- Increased Available Instructor Direct Contact Time with Students in Welding Booth– THE CRITICAL EVENT to decreasing time to competency.
- Reinforces critical Safety Requirements in school and on production lines.

- Welding School showcases innovative training methods
- Serves as Training Modernization Prototype for the entire corporation which has now been approved with the Fitters and Electricians in 2003 followed by the Pipefitters and Machinists in 2004.
- Waterfront retains more expertise as reliance on “On Loan” Instructors decreases.
- Installs prototype Automated Training Support Tool package as model for the Enterprise.
- Immediate impact through Web and CD-ROM Distribution of Welder Program of Instruction to area Tech Schools

The long term impacts include:

- Created the need for the development of a Training Transformation Strategy that used the positive results of the program to justify future funding of other similar projects for the next 5 years.
- Spurred the development of a Life Cycle Skills Development Program that covers employee selection to retirement.
- Immediate impact through Web and CD-ROM Distribution of Welder Program of Instruction to area Tech Schools, our client, and other Shipyards.
- In 2002, we donated the CBT Courseware to the local technical High School who used the CBT to train their students. The corporation then hired 8 of 16 2003 graduates. To date these graduates have reduced time to train and additional 30%. In 2003, we have expanded that program to 5 other local technical schools.

## Shared Learning

9. *What have been some of the specific lessons learned from designing and implementing this practice for the purposes of continuous internal improvement? Please discuss whether and how this practice might be transferred and replicated both internally and external to your organization.*

Lessons Learned:

- Focus on the Business Case CONSTANTLY!
- Create an Environment that supports innovation and change. The senior leadership set the tone for the entire project from the very beginning, which was to consider everything and then decide where to change, focused on the knowledge already existing in the organization.
- Select a meaningful training program on the organization’s critical path. Selecting “fringe” programs means the program will always be on the fringe of the organization.
- Start with a small, well-defined project and grow to big as demonstrable results emerge and support solidifies.
- Include all stakeholders early and often...those who can kill your program and those who influence your success.

- Everything changes...be flexible in execution, aware of unintended consequences and exploit them.
- Partner with Best-in-Class Training Experts who understand the Business Case and Return on Investment Model.
- Establish a rigorous, dedicated Program Management process focused on the business case. This is full time work.
- Human Learning is the Bottom Line...not the software or computers.
- Get on with it...

This practice can be replicated because it represents a systems engineering approach to solving a specific business problem. Real learning change comes from a dedicated long term commitment to realizing the long term benefits of modernizing traditional workforce development training programs with near term demonstrable results.

Because of the development of the corporate Training Transformation Strategy along with the ROI data to justify future investments, we began the modernization of the Structural Fitter Trade in May 2003, will begin the Electrician Trade in the Fall of 2003, the Pipefitters and Machinists in 2004. Once all these programs are complete we will have modernized the training programs for the top 5 trades representing 50% of our workforce.

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