Leadership 2010
Improving Supervision

Final Report

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1. Project Summary.

The Leadership 2010 – improving supervision project was proposed and sponsored by the Crosscut Initiatives Panel. After project selection for funding, Alaska Ship and Drydock, Inc. served as the prime contractor.

This project goal was to adapt the historically successful Training Within Industry (TWI) program for use by the modern shipbuilding and repair industry. This program is a family of learning modules to teach supervisors three key skills at the core of lean production: how to deliver good on-the-job instruction; how to improve job methods; and how to achieve good job relations. A fourth module is for introducing managers and senior supervisors to methods for solving problems that are unique to their organization or workplace. The project designed, produced, and evaluated a blended learning (part on-line, part live) approach to instruction for new supervisors or for upgrade of current supervisors. A secondary use of project data is related to instructional design and delivery that can be replicated by most shipyards at relatively low cost.

The learning modules, and their testing within the shipbuilding and repair community, provided some additional background about how to deal with the looming demographic changes and challenges to workforce development and begin to tease out viable answers to the core question, "Who will build and repair our ships in 2010 and beyond?"

The project gathered a broad range of instructional and shipbuilding and repair information, related web links, still photographs, video clips, narrative stories of shipyard work and other useful information and assembled them in a section of the www.goships.com web site.

The learning modules, and their ongoing review/consideration process, serve as a lever for deciding if investment in generic training materials for shipyards makes sense. Lessons learned and recommendations for next steps are provided.

2. Project Background and Rationale.

This section of the Leadership 2010 final report is a summary of a realistic business case for improving supervisor training. There is a need and readiness to "Do It."

Need to "Do It"

American shipyards tend to have workforce development needs in one of these three categories. Shipyards are:

1. expanding their workforce numbers and skills because of new business and evolving technology; or,
2. sustaining a roughly steady workforce level in a competitive market that needs improved productivity; or,

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3. in workforce decline because of business or technology impacts where job portability to other shipyards may be needed.

The Crosscut Initiatives Panel Chair Dr. Gebhardt and Major Initiative Team Leader Dr. Boutwell presented a workforce system concept to the NSRP Executive Control Board in the summer of 2007. The workforce system concept, shown in the figure, is an important companion to shipyard business and production technical and process systems. An effective workforce system can develop an organization culture that
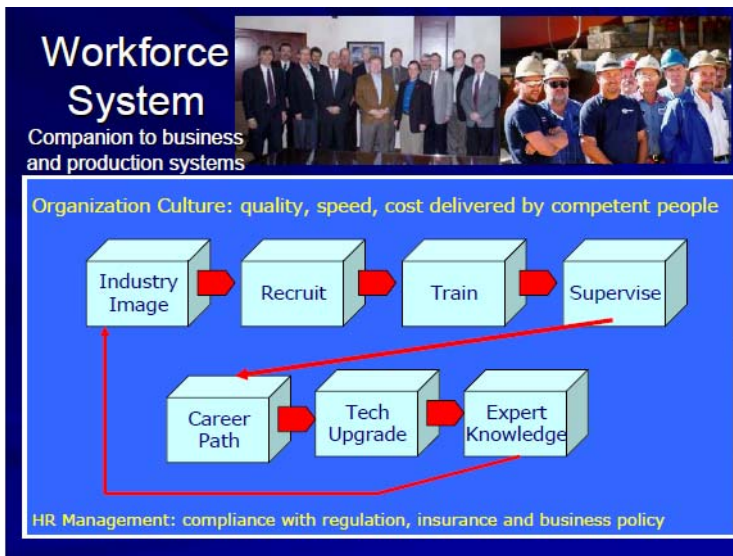
values quality, production speed, and cost delivered by competent people. A workforce system is critical for sustaining the numbers and competence of the people who design, build, and repair ships. Process blocks in the workforce system can be emphasized to serve one of the three development categories.

Central to an effective workforce system in expansion, steady-state, or decline is the supervisory role. Supervisors provide the leadership bridge between top management and shop floor workers or office staffs. Supervisors often make the difference in whether a

new hire is retained, how well a worker performs, and how fast an employee progresses on a career path that adds company and industry value. Studies reported by American Society for Training and Development, Society of Human Resource Management, various university researchers, and consulting firms report that the development and performance of new supervisors is often weak in organizations.
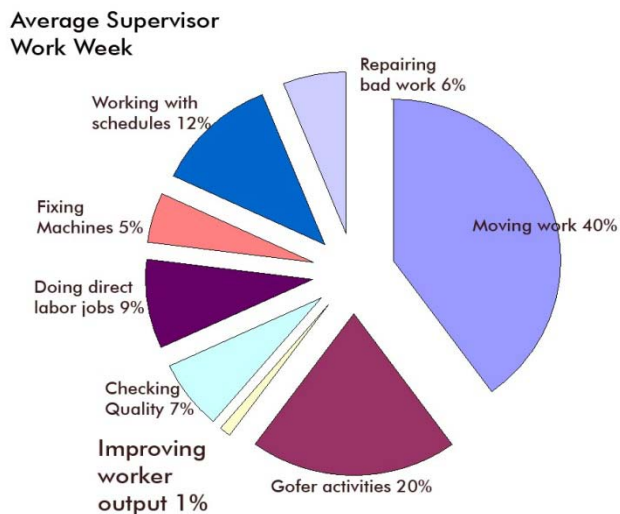
The figure titled average supervisor work week summarizes surveys conducted by *Industry Week* magazine. A key finding is that the average supervisor perceives he or she only uses one (1) percent of weekly time to improve worker output. The remaining ninety-nine (99) percent is time spent in operational processes or reacting when things go wrong. New supervisors will generally mimic those who taught them or those who perform supervisory roles around them. Without some fresh learning to change

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supervisory behaviors, the tendency is to maintain the *status quo*, what one Canadian shipyard executive said is a Latin term meaning the mess we are in.

The mess we are in is in two parts:

Navy and shipbuilding industry leaders recognize the unrelenting budget pressures on shipbuilding and repair costs as part of total vessel ownership costs as shown in the figure. Numerous studies analyze and compare cost factors. Most industry studies identify management and workforce experience and competence as cost factors. Quality, safety, and productivity errors can often be attributed to training and experience factors.

Index of Estimated Shipbuilding Costs (1939=100)
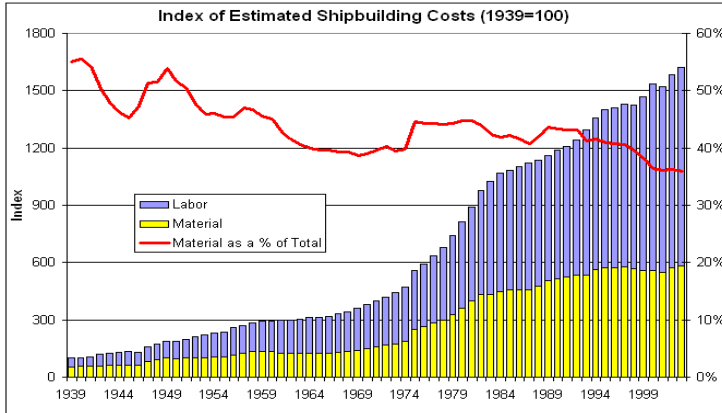
Source: Bureau of Labor Statistics (extended by MBS, using the same data sources) Graphic from Colton & Company

- Shipyard workforces are aging, with average age near 50. Presuming that the ship industry is to sustain its roughly 120,000 employees nationwide among some 150 shipyards that do steel-hull vessel work, then recruiting, training, and retaining will be needed elements of the workforce system.

Knowledge & wisdom gap

Secretary of the Navy Mabus responded to a fall 2009 news interview this way:

> Q: What is your assessment of the health of the shipbuilding industry?
>
> A: SECNAV Ray Mabus. The health of the industry is OK, but I am concerned about the future of the industrial base. To train a shipbuilder regardless of what their specialty is takes a good while. One of the things that I want the Navy to try to do is to give some stability to these shipyards so that they can make the investment in equipment and in people, so that they can get some stability and maintain the industrial base. You want America to be able to build its own warships and you want competition to the maximum extent and if you lose any more shipyards, both those propositions [may be out.]

Mike Petters, President of Northrop Grumman Shipbuilding summarized the workforce issues he faces by noting that most of his company's workforce is either less than 35 years of age and has less than five years of experience or more than 45 years of age with more than 20 years of experience That is, the industry faces issues related to both an

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aging workforce and "green labor." Other shipbuilders have raised similar concerns about the knowledge and wisdom gap in their yards.[1] [2]

In contrast, Asian shipbuilding captured global shipbuilding market share since the 1970s and demonstrated continuous improvement in workforce productivity. The figure plots increase in production per person in Japanese shipyards as reported by Office of Naval Research.

Analysts of lean production and competitive shipbuilding visited Japanese shipyards to learn the secret of productivity improvement. The general answer was a combination of state-of-the-art production equipment and processes along with design for production approach. This answer was accepted in the US so significant investment was made in production technology, information management systems, and software.
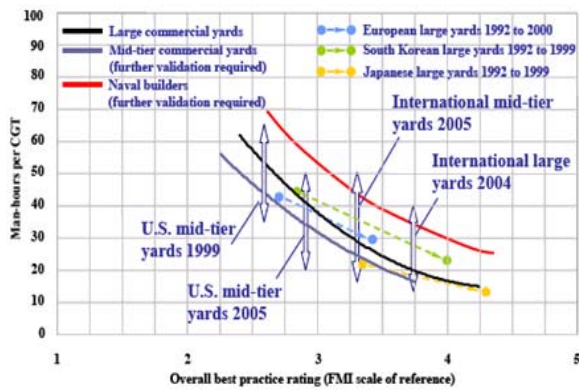
Yet since the end 1989s US shipbuilding productivity has not improved at the rate or absolute amount as in Japan, parts of Europe and other areas as reported by the Global Shipbuilding Industrial Base Benchmarking Studies.[3] GIBBS recommendations are shown in the following table.

Figure 4.1 – Best practice and core productivity

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[1] Arena, Mark V, Grammich, C. A., et al (2006). Why Has the Cost of Navy Ships Risen? A Macroscopic Examination of the Trends in US Naval Ship Costs Over The Past Several Decades. Santa Monica CA, RAND - National Defense Research Institute: page 54.

Frankel, E. G. (1996). "Economics and management of American shipbuilding and the potential for commercial competitiveness." Journal of Ship Production 12(1): 1-10.

[2] Frankel, E. G. (1992). "The path to US shipbulding excellence - remaking the US into a world class competitive shipbuilding nation." Journal of Ship Production.

[3] First Marine International (FMI), *Findings For The Global Shipbuilding Industrial Base Benchmarking Study, Part 1: Major Shipyards,* Written for the Office of the Deputy Under Secretary of Defense for Industrial Policy (ODUSD(IP)) and the Center for Naval Shipbuilding Technology (CNST). January, 2006, *Part 2: Mid-tier Shipyards,* February 2007

Readiness to "Do It"

The mix of budget pressures, changing labor demographics, and unrelenting global competition provided readiness incentive for US industry, including shipbuilding, to learn from the global best.

In the mid 90s, analysts curious about how Toyota and other Japanese automotive firms and German firms were exceeding US car companies in quality and productivity conducted additional studies. Japanese productivity experts who had advised earlier 'lean' studies had simply assumed that US firms would make parallel improvements in work organization, training, and motivation practices to align technology and people better which is the essence of GSIBBS focus on manpower and organization of work within a mix of other process and technology improvements.

Japanese executives revealed how their firms' founders had learned the fundamental principles of the human side of lean through Marshall Plan instruction. What the Americans shared with Japan and Germany was how the US war production effort developed its high quality-productivity workforce.

GSIBBS top ten recommendations for improvement of first tier and mid tier shipyard. Manpower and organization of work are highlighted. GIBBS report 6 February 2007 Table 7.2 page 37.

Rank	First Tier Priorities	Mid-tier Priorities
1	Ship design and design for production	Production engineering
2	Production engineering	Design for production
3	Master planning, steel and outfit scheduling	Master planning and steel and outfit scheduling and production control
4	Outfit module building, pre-erection outfitting and onboard outfitting	**Manpower and organization of work**
5	Dimensional accuracy and QC	Outfit installation and onboard services
6	Outfit parts marshalling and general storage and warehousing	Outfit module building, pre-erection outfitting
7	Pipe shop and other outfit manufacturing activities	Dimensional accuracy and QC
8	**Manpower and organization of work**	Outfit parts marshalling
9	Steelwork and outfit production information	Steelwork and outfit coding system
10	Steelwork and outfit coding system	Block assembly

Two programs were designed and set in practice in the early 1940s to help grow and replace workers who went to war. The stories of Wendy the Welder, Rosie the Riveter and Kilroy the QA inspector are legendary. When competent, experienced factory

workers went to war then women, blacks (who were not then allowed in combat) and others were recruited. The Bureau of Training, War Manpower Commission, enlisted the help of manufacturing firm leaders to design an approach to rapidly train and give experience to workers. The focus was on giving industrial managers and supervisors accelerated learning to improve their knowledge, skill, and abilities to teach, lead, and motivate. The knack of this program to function and produce results is part of the WWII 'greatest generation' story. Training Within Industry (TWI) and Management Training Program (MTP) is one saga.

The TWI program was effective. Of 600 participating companies and over 16,000 plants monitored during the war: 86% increased production by at least 25%; 100% reduced training time by 25% or more; 88% reduced labor-hours by over 25%; 55% reduced scrap by at least 25%; 100% reduced grievances by more than 25%.

The first TWI non-government publication was Walter Dietz's book *Learn by Doing* published in 1970, but the TWI story had little impact at that time in history. Economists and historians suggest that the understanding of and need for TWI and MTP declined after WWII because the US had no real global manufacturing competition until the 1970s, then by the 1980s the opportunity to import low-cost manufactured products from developing countries steadily reduced investment in US manufacturing. In contrast, Asian, German and other international manufacturers continued to use and improve the Training Within Industry program.

The need to revitalize US manufacturing to correct balance of trade and restore middle-class jobs has stimulated public and private policy and investment strategies. The TWI methodology has been re-introduced into US, accelerating since the publication of TWI history and practice books in 2005 and 2006.[4],[5] A companion industrial management training program (MTP) developed in WWII and shared with Japan and Germany remains to be revitalized in the US, however the book *Gemba Kaizen*[6] captures much of the workplace orientation of the MTP. Bob Wrona of the TWI Institute http://twi-institute.com/ spoke about TWI at a Crosscut Panel meeting in July 2006. Larry Gebhardt and Bob Wrona presented shipyard considerations for TWI at the NSRP Lean Forum IV in 2007.

3. Training Within Industry (TWI) Program Description

The Training Within Industry (TWI) program is a logical method to develop and train new supervisors or upgrade current supervisors. In order to explain to manufacturing plant leaders why the TWI programs were beneficial, TWI developed a philosophy which was delivered continually and became a standard part of the TWI Service. TWI had three main

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[4] Dinero, Donald *Training Within Industry – the foundation of lean,* Productivity Press, 2005

[5] Wrona, Bob and Patrick Graup, *The TWI Handbook*, Productivity Press, 2006

[6] Imai, Masaaki, *Gemba Kaizen - a commonsense, low cost approach to management,* McGraw-Hill 1997

criteria: simplicity, usability, and standardization. This philosophy evolved to be known as The Supervisor's Five Needs:

1. Knowledge of the Work
2. Knowledge of Responsibility
3. Skill in Instructing
4. Skill in Improving Methods
5. Skill in Leading

The first two needs, knowledge of work and responsibility, were considered plant or company specific to establish for the supervisor. Knowledge of work information covered terminology, production equipment and tooling, production processes, safety, quality, product parts and materials and the skills required to manufacture them. Knowledge of responsibilities included company policies, rules and regulations, agreements, schedules, communications, inter-departmental relationships, etc. Company orientation and training programs focused on knowledge of work and responsibility. The three TWI skills – job instruction, improving job method, and job relations or leading - were designed and taught to help companies accelerate transfer of knowledge, skill, and abilities in work and responsibility.

Crosscut Initiatives Panel past work addressed the knowledge of work and knowledge of responsibility factors in shipyards by publishing several guidance documents to develop Skill Standards for the industry. A NSRP-funded project completed in 2003 developed comprehensive guidelines for developing a shipyard training program, a basic set of industry skill standards, and guidelines for teamwork in an area/zone context integrating multiple skills and trades.[7] A database that covers manufacturing crafts, in a format that applies to a wide variety of shipyards, was developed and distributed to the industry in CD format and is available from the Leadership 2010 section of www.goships.com. More information on manufacturing skill standards can be found at www.msscusa.org. The database continues to be referenced by many shipyards, particularly when writing work and job descriptions. These efforts expanded and updated the database and worked toward affiliating the industry with national efforts in skill standards to ensure the database remains broadly applicable and accurate. The skills database incorporates new craft and professional positions and is reformatted to the universally accepted skill standard format of the National Skills Standards Board (NSSB).

The TWI program in WWII evolved from World War I training principles. Core among principles is that job training must be done within industry by instructors who are plant-experienced. Plant technical experts would need help in instructional methods, a methodology to improve standard jobs to make them safer, faster, better, and cheaper, and help in leadership skills. In-industry training emphasizing learning by doing develops worker loyalty and increased production so training is an investment with expected return. The ability to instruct is an important supervisory qualification. Job analysis or breakdown is an important preliminary step before instruction or method improvement.

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[7] Walker, L., & NASSCO. (1999). *Training Program Development for Shipbuilding and Repair* (NSRP-0527). Carderock, Maryland: National Shipbuilding Research Program.
Woods, B. (2000). *Leading and sustaining multi-skilled work groups* (NSRP Project 9-98-1). San Diego: National Shipbuilding Research Program.

In the war years, the factory workforce-experience distribution after men left for combat resulted in a model similar to the current shipbuilding and repair industry. Many senior workers are great craftsmen and women but have little leadership experience.

Percent of Workforce-Experience Distribution
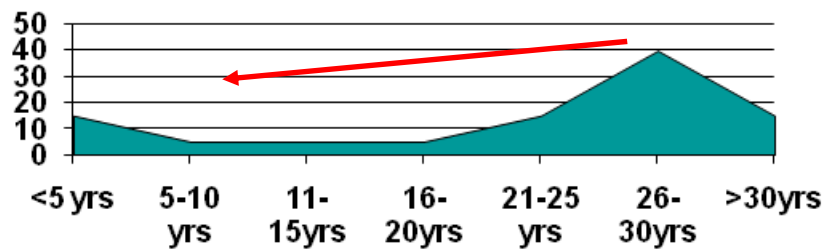
Transfer knowledge, skill, ability from experienced to new workers.

Many companies had traditional on-the-job training programs that increased competence over time, but needed acceleration to meet war production needs. There was a need to accelerate transfer of knowledge, skill, and ability from experienced to new or advancing workers.

The fundamental framework of the TWI program was practical implementation of a continuous improvement model based on a simple scientific method. Edwards Deming taught a four-step plan-do-check-act model. Each of the three main TWI J-programs, Job Instruction, Job Method Improvement, and Job Relations have at their core a 4-step approach illustrated in the 'onion' diagram. The tool for remembering important steps and key points of the TWI program was a simple pocket card. Copies of the current TWI Institute card set, included in The TWI Workbook, are shown below.
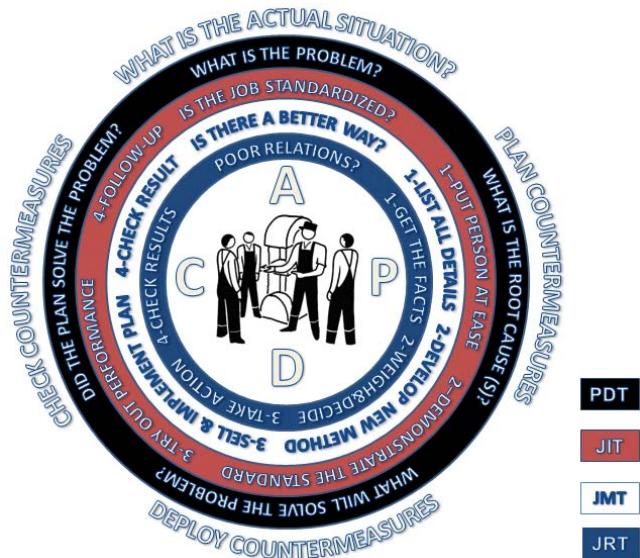
Job instruction. Skill in instructing is for increasing production by helping supervisors to develop a well-trained workforce which will get into production quicker; leave less scrap, rework and rejects; fewer accidents, and less tool and equipment damage.

Job Methods. Skill in improving methods is for utilizing materials, machines, and manpower more effectively by having supervisors study each operation in order to eliminate, combine, rearrange, ands simplify details of the job.

Job Relations. Skill in leading is for increasing production by helping supervisors to improve their understanding of individuals, their ability to size up situations, and their ways of working with people.

Program Development. The development of training plans to meet the plant's own specific needs is an in-plant job – no outsider can know the underlying causes of production problems

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The three J-programs and program development were designed to use a simple 4-step 'scientific method' illustrated in the onion diagram on page 10 and the following table. In the full program, each important step is explained and illustrated with key points and their reasons.

TWI Four-Step Method				
Steps	Job Instruction	Job Relations	Job Methods	Program Development
1	Preparation	Get the facts	Break down the job	Spot a production problem
2	Presentation	Weigh and decide	Question every detail	Develop a specific plan
3	Try out performance	Take action	Develop the new method	Get plan into action
4	Follow up	Check results	Apply the new method	Check results

These three basic J-skills must be acquired individually. Practice and experience in using them enable both new and experienced supervisors to recognize and solve daily problems properly.

Training Within Industry courses and methods assists companies in giving their supervisors a start in acquiring these skills through three roughly ten-hour programs. These skills, acquired through this training, must become a part of day-to-day operations. In no other way can production can be so quickly influenced and manpower conserved.

The TWI program was designed to be implemented in a consultant model. The TWI instructor was trained to deliver a standardized presentation in a classroom with very simple training aids. Each J-Program course was taught in five 2-hour sessions during a work week to minimize production impact. The classroom session included instructor presentations, learner participation, and group activities. TWI encouraged follow up practice and coaching until the new supervisors developed proficiency. Then each plant could select the most competent new supervisors to teach following groups of workers. In this multiplication method, TWI could rapidly cover an existing and expanding workforce.

Updates to TWI programs.

Since WWII, many social and technical changes have occurred. A modern analysis of lean production at Toyota recognizes the importance of TWI and how it is achieved.[8] *Toyota Talent* provides a most comprehensive review of work analysis and job breakdown for instruction and for job method improvement.

Adult teaching and learning has evolved with research and practice from cognitive psychology and teaching methods such as e-learning. The next section more fully describes these changes.

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[8] Liker, Jeffrey and Meier, David, *Toyota Talent – developing your people the Toyota way*, McGraw Hill, 2007
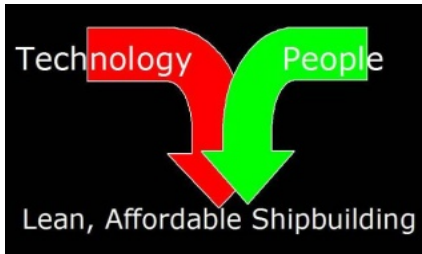
Program development is a collaboration between production, training administration and management to design and deliver training programs as needed. Over time, the TWI 4-step program development approach evolved to cover much more complex problems and solution techniques. The A-3 method is one of the tools for aligning people and technology to achieve lean, affordable shipbuilding and repair.[9] *Managing to Lead* is used as the text for the updated program development module.

4. Designing a Blended Learning Model

A goal of Crosscut Initiatives Panel research is to explore education and training techniques that accelerate learning to more quickly add value to production, or conversely, to find teaching and learning methods that minimize impact on production. When Crosscut Initiatives Panel folk have interviewed shipyard production leaders, they have frequently been told that training is important; however, taking groups of people away from production at the same time is difficult and is always a negative impact on production in the short term.
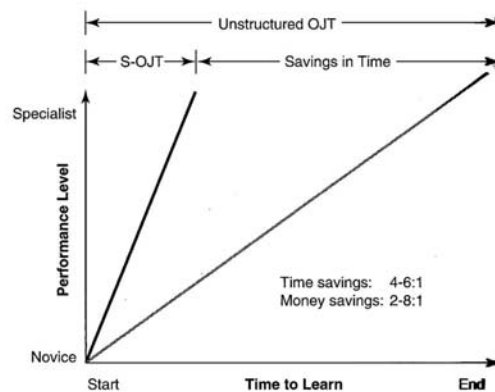

FIGURE 10.2. Comparing the Training Efficiency of S-OJT Unstructured OJT

Most workers gain 10-20 percent of the knowledge for work in classroom settings. Classroom learning is mostly knowledge of theory and principles that must be practiced and perfected in the workplace to get production results. The remaining 80-90 percent of total workplace knowledge, skill, and abilities (KSA) is learned in workplace learning laboratories such as a welding trainer but mostly in on-the-job settings.

Training costs have been reduced in other industries by implementing structured on-the-job (SOJT) learning programs. Structured OJT programs are designed to deliver training in a 'lean' manner, just what is needed and just in time. Traditional unstructured OJT typically assigns a worker to a team or mentor and assumes that over time appropriate KSA is learned. Numerous case studies of SOJT reveal significant time and money savings as shown in the figure 10.2 from Jacob's

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[9] Shook, John, *Managing to learn – using the A3 management process to solve problems, gain agreement, mentor, and lead*. Lean Enterprise Institute, 2008

book.[10] SOJT best practices in a shipyard setting is embedded in the NSRP-527 material, footnote 7.

Industrial adult learning practice shows that active learning is most effective.   The figure showing influences on remembering what we learn is based on research reported by Edgar Dale.[11] Therefore, if both classroom and OJT training emphasize activity, the learning and remembering should be most effective.

TWI has been historically presented in a consultant instructor model in a classroom with very limited modern learning technology. The expansion of computer and web-based learning provides alternative tools and

Figure . Influences on remembering what we learn.

methods to traditional instructor-presented classroom learning. Self-directed adult learners have long used books, manuals, videotapes and other references to find information. Yet learners always have some questions not found in the book or not understood solely through self study so the live instructor is important. Furthermore, the live instructor can help assess learning to be sure the worker 'gets it' adequately.
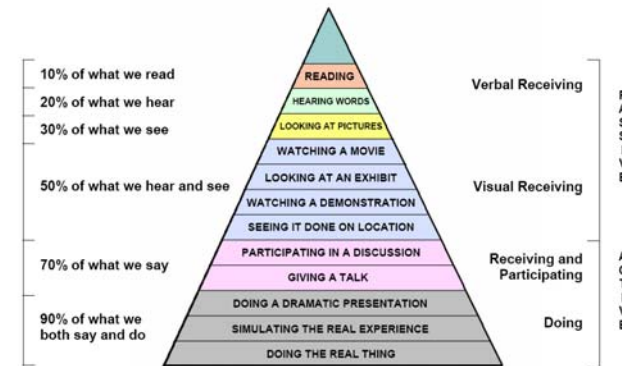
The concept of blended learning is to design instruction that delivers individual and small group information via web and computer methods blended with live learning by a qualified instructor in a classroom, learning lab, or on-the-job setting.

Cognitive teaching and learning theory, backed up by modern neuroscience research, confirms that we learn through all five senses. Most people receive 83 percent of their sensory information via sight; 11 percent through hearing; 3.5 percent by smell; 1.5 percent by touch; and 1 percent by taste. Industrial workers may need to use touch and smell senses more often than an office worker.[12]

Information that comes to a learner via the five senses is treated unconsciously by our autonomic systems. If the information is not perceived as vital to the learner's needs, it may simply not be perceived – no learning occurs. Information that passes our perceptual filters enters our short-term memory. The attention span of your average learner is only about as long as a TV commercial - 15 to 30 seconds.

Short-term memory is like a buffer that can hold five to nine items (chunks) of information for a short time – 15-30 seconds. Think about digits in a telephone number.

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[10] Jacobs, Ronald L, *Structured on-the-job training – unleashing employee expertise in the workplace.* Berrett-Koehler Publishers, 2003 - Figure 10.2, page 166.
[11] Dale, Edgar, *Audio-Visual Methods in Teaching* (3rd Edition). Holt, Rinehart, and Winston, 1969.
[12] Stolovitch, Harold and Keeps, Erica, *Telling Ain't Training*, ASTD Press, 2002

The size of a chunk that can be held in short-term memory depends on prior knowledge of the learner.

If the learner considers the information in short-term memory as important for storage (usually an unconscious decision) then the information enters long-term memory. You may remember a toy from your childhood but not a childhood neighbor's name. Distinct, highly unique memory may be retrieved years later, otherwise it may be blended and confused with other memory. Well-organized and stored information can be retrieved throughout your whole lifetime.

So a goal of instruction is to design and deliver instruction so important work-based information gets into short term memory then is stored in long-term memory and can be retrieved throughout your whole career.

The book, *Telling Ain't Training* by Stolovitch and Keeps, provides basic instructional design and delivery information. A comprehensive industrial instructional design workshop series presented by Dr. Dick Boutwell is available on www.goships.com web site employers' page.

The Leadership 2010 project explored extracting theory and principles of the TWI J-Programs (job instruction, job method and improvement, and job relations) and converting them to web-based learning modules with accompanying 'live' classroom work following the working text, The TWI Workbook.

Presentations on structured on-the-job learning and blended learning were prepared for and delivered at the Crosscut Panel Meeting in Biloxi, MS in February, 2009. The presentations are included in Leadership 2010 materials.

5. Technology for Instructional Design and Delivery

Crosscut Initiatives Panel has received sample material from large shipyard and commercial instructional course developers using a wide range of proprietary and general computer application software. The Leadership 2010 Project instructional design and delivery technology was chosen to be low-cost, common, and easy-to-use.

Web site. Technology transfer for Leadership 2010 is a project element so the Crosscut Initiatives Panel web site, www.goships.com/Lead2010 pages were set up to house project information. This web site is in common industry use and has been supported by NSRP for several years.

Learning Management System (LMS). LMS is also known as a Course Management System (CMS) or a Virtual Learning Environment (VLE). LMS is important to operate a blended learning system. Leadership 2010 Project chose the Moodle LMS (www.moodle.org), an open-source, free, common use system. Many universities, community colleges, and corporate learning programs use Moodle. Moodle provides a

wide range of features to host web-based courses along with resources, activities, quizzes, learning tracking and more. A summary of Moodle features is at Apppendix A. Moodle was installed on the Crosscut Panel website, www.goships.com/learning to host the Leadership 2010 course modules. Instruction to use Moodle LMS was provided as project cost share.

Microsoft Systems and Applications. Most shipyards use personal computer-server systems with Windows operating systems and Microsoft Office applications. Most shipyard training administrators and production subject matter experts are familiar with these systems and applications. Microsoft Word, PowerPoint and Excel applications were mainly used to prepare Leadership 2010 course modules and resources. This software was provided as project cost share.

Adobe Creative Suite Applications. The detailed design of training documents using solely Microsoft products is limited. Therefore Adobe Acrobat was used to standardize documents for instructor and learner use because of its ease of creation, viewing and download. Other Adobe applications including InDesign, Illustrator and other creative suite software was used in a limited way to illustrate ways to supplement instructional design. This software was provided as project cost share.

Articulate Studio 2009. http://www.articulate.com/ This software application suite includes Presenter software that converts Microsoft PowerPoint to a streaming flash technology for file compression and easy web viewing with free viewer applications. The Articulate Studio includes also software for producing quizzes (Quizmaker), for enhancing presentations (Engage), and for encoding videos to a format easily used in the presentation system (Video Encoder.)

Video and still camera, sound recorder. Imagery and audio recording technology enhances presentations. Standards used allow file conversion to formats compatible with Microsoft Office, Adobe, and Articulate applications. This equipment was provided as project cost share.

Videography and video editing technology and services were purchased from Studio Trifusion LLC because the pilot shipyard lacked sufficient skill and experience to produce the desired quality work. A portion of Studio Trifusion services were provided as cost share.

Traditional printed material is part of Leadership 2010 design including the two 'textbooks', course summary pocket cards, case study and other reading material. Learning center computers, white-boards, etc. were part of the technology mix.

The course was designed with standardization and modularity in mind. While not fully SCORM compliant, the Leadership 2010 material is based on common principles. SCORM stands for "Sharable Content Object Reference Model". SCORM was developed by the Advanced Distributed Learning laboratory, a Department of Defense initiative, beginning in 1999. "Sharable Content Object" indicates that SCORM is all

about creating units of online training material named "learning objects" that can be shared across systems. SCORM defines how to create "sharable content objects" or "SCOs" that can be reused in different systems and contexts. "Reference Model" reflects the fact that SCORM simply references existing industry standards and tells developers how to properly use them together. Application of SCORM principles and related learning management technology has been proven to reduce the cost of complex course integration by about 75 percent. SCORM and advanced distributed learning principles point toward access to the highest-quality learning and performance aiding that can be tailored to individual needs and delivered cost-effectively, at the right time and in the right place, a key concept for 'lean' learning organizations. The Moodle LMS is SCORM compliant.

The Leadership 2010 investigated two web-based support technologies. Contextware provided a web-based shell to house a comprehensive skill standard system sample using shipfitter scenarios and jobs as a basis. Aptima, Inc. provided access to its KEEL Small Business Innovation Research technology to capture expert knowledge, record, and access it. Both these technologies should be further explored in the context of workforce sustainability. A portion of this was provided as cost share.

6. Learning Module Design

This report section will use the TWI Job Instruction module details as a project example illustrating how training modules are prepared. Documents and resources for all course modules are posted on the www.goships.com web site. Copies of scripted PowerPoint presentations, video clips and other learning objects are included in the project DVD.

Leadership 2010 design began with program performance objectives in mind. The table summarizes a logical six-level needs-measurement model proposed by the Jack Philipps research organization.[13] Performance measurement comments are included in the lessons learned section.

NEEDS LEVEL – TYPES of MEASURES	MEASUREMENT FOCUS
1. Reaction and planned action. Were the participants pleased with the training?	Measures participant satisfaction with the program and captures planned action
2. Learning. What did the participants learn in the training?	Measures changes in knowledge, skills, and attitudes
3. Job Applications. Did the participants apply their learning on the job?	Measures changes in on-the-job behavior
4. Business results. Did the applied learning positively affect the organization?	Measures changes in business impact variables
5. Return on Investment. Do the benefits outweigh the costs?	Compares program benefits to the costs
6. Intangible Measures. Did the training improve organization culture?	Qualitative evidence of organization climate and other 'soft' measures such as emotional-social-successful intelligence.

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[13] Phillips, Patricial and Phillips Jack, The Value of Learning – how organizations capture value and ROI and translate them into support, improvement, and funds. Pfeiffer, 2007.

"Lean" learning should design and deliver highest-quality learning and performance aiding that can be tailored to individual needs and delivered cost-effectively, at the right time and in the right place. NSRP 527 guidance suggests an approach to accelerating learning for employment competence follows a three step "lean" process to:

1. Determine the critical knowledge to accomplish what customers (employers) will pay for. This is determining the 'real' work of the supervisor and the related technical (work) and responsibility competence to be achieved in education programs.

2. Determine the knowledge students have now. This is collaborative development of appropriate assessments that will inform the learner, shipyard training department and employer.

3. Educate and train the difference. For supervisors, this may be facilitating finding flexible entry and exit points in the career path learning process. Traditional education and apprentice systems often run on a time-based curriculum. Learning acceleration that leads to cost savings tend to teach and advance employees based on competence and experience.

The start point was to isolate and prioritize critical knowledge as the key learning points of the Training Within Industry program. The book *Training Within Industry – Foundation of Lean* provided history and background to supplement the 'original' TWI material that is all available as open source. *The TWI Workbook,* a Shingo Prize winning book was chosen as the student 'textbook.' Shipyard instructors and supervisor students will use the Leadership 2010 material to illustrate and summarize information in *The TWI Workbook* chapters.

TWI critical knowledge has been extracted by a 'job breakdown process. The results are summarized by the pocket card: four steps about how to get ready to instruct and four steps about how to instruct.

A course module outline was prepared to separate learning elements for delivery via Moodle presentations, for student reading, and for instructor-led group teaching-learning sessions.

TWI Course Outline

1. Information for production managers, superintendents, and training managers
2. Course introduction: 5 needs of the supervisor – 23 minutes
3. J-Modules (3 10 hour courses)   Text: The TWI Workbook: Graup & Wrona
4. Program Development Text: Managing to Learn: John Shook

Job Instruction	Job Method Improvement	Job Relations
Introduction course – 25 minutes – web – Supervisor's Five Needs	Introduction course – 25 minutes – web – Supervisor's Five Needs	Introduction course – 25 minutes – web – Supervisor's Five Needs

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Job Instruction	Job Method Improvement	Job Relations
Web-based forum – group questions, answers and discussion during the course Supplemental Reading TWI Workbook Chapters 1 and 2	Web-based forum – group questions, answers and discussion during the course Supplemental Reading TWI Workbook Chapters 1 and 2	Web-based forum – group questions, answers and discussion during the course Supplemental Reading TWI Workbook Chapters 1 and 2
Handout: Pocket Cards Read: TWI Workbook Chapter 3 – Four Steps of Job Instruction 19 pages. View: Web presentation 24 minutes – Chapter 3 Four steps of job instruction	Handout: Pocket Cards Read: TWI Workbook Chapter 6 – Improving sample jobs 9 pages View: Web presentation 25 minutes – How to evaluate current jobs	Handout: Pocket Cards Read: TWI Workbook Chapter 9 – Working with and through people - 7 pages View: Web presentation 24 minutes – Supervision and Individuals Supplemental web presentation – supervisory communications – 30 minutes Download and read case study
Handout: Job Breakdown form and Job Hazard Analysis Form filled in with one job Read: TWI Workbook Chapter 4 – Job breakdown for instruction 20 pages View: Web presentation 15 minutes – job breakdown for instruction	Supervisor group exercise: discuss what kinds of material handling, machine work, and hand work is done in the sample job and in shipyard jobs. 1 hour	Supervisor group exercise: discuss case study. Participants share other case studies of good and bad job relations.
Homework: each supervisor break down one job under their responsibility – estimate 1 hour	Read: TWI Workbook Chapter 7 – Four steps of job method improvement - 25 pages View web presentation: The four steps of job method improvement – 25 minutes	Read: TWI Workbook Chapter 10 – Four steps of job relations - 19 pages View: Web presentation 24 minutes The four steps of job relations. Download and read case study
Practice session – group 2 hours – each supervisor practice teach to the other supervisors about 30 minutes each plus discussion. Critique with pocket cards	Homework: each supervisor analyze one job under their responsibility and recommend improvements – estimate 1 hour	Supervisor group exercise: discuss case study using the pocket card steps and key points to evaluate and critique the case.
Handout: Training timetable	Practice session – group – 2	Read: TWI Workbook

Job Instruction	Job Method Improvement	Job Relations
form Read: TWI Workbook Chapter 5 – Get ready to instruct, make a training timetable, prepare the OJT training location 5 pages View web presentation – 15 minutes – preparing to teach – making a timetable	hours - each supervisor practice describe their "homework" to the other supervisors about 30 minutes each plus discussion. Master Instructor monitor and coach.	Chapter 11 – Problem prevention using foundations for good relations - 16 pages View web presentation: Foundations of Job Relations – 24 minutes. Homework: each supervisor write up a short case study of a problem they have been involved with and suggest how it might have been prevented or handled better – estimate 1 hour
Group discussion with Putting the training program together and administration – 2 hours Critique with pocket cards	Read: TWI Workbook Chapter 8 – Writing and selling the improvement proposal example - 25 pages View web presentation – writing and selling the improvement proposal – 25 minutes	Practice session – group – 2 hours - each supervisor describe their "homework" to the other supervisors about 30 minutes each plus discussion. Master instructor monitor.
Practice on the job: Supervisors teach their topic to an inexperienced worker or someone in cross-skill training and report on the forum how they did. Master instructor monitor and coach. Over 2-week period.	Group discussion with managers, project managers, and senior supervisors– choose one of the "improvement projects" to "sell" to General Manager and discuss how to get more employee involvement in continuous improvement. 2 hours.	Group discussion with with managers, project managers, and senior supervisors, – choose one of the "case studies" and present to the General Manager and discuss how to get more employee involvement in job relations improvements. 2 hours.

Draft presentations were prepared. PowerPoint slides were illustrated with important steps, key points, and examples including shipyard visual images, terminology, etc. Initial learning games and quizzes were designed. The draft material was presented to a cadre of inexperienced and experienced supervisors to pilot the module. A Moodle LMS was set up on the shipyard's training web site to introduce, familiarize, and evaluate web based learning.

Pilot job instruction classes were conducted in February, 2009 at Alaska Ship and Drydock, Inc. in Ketchikan, Alaska for ten prospective and current supervisors and managers.

This process included introduction to the TWI program using the draft version of Five Needs of the Supervisor and the Job Instruction course. Presentations, quizzes, and other course resources were placed on the company training web site in the Moodle learning management system. A version of the Moodle screen view is shown.

Films of students and instructors illustrate participation and key learning points. Shipyard subject matter experts were invited to present teaching examples as part of course instruction. This process helped the learners to relate the theory and principles learned through reading and the web-based presentations. Practice instruction sessions, and student assessment sessions were filmed. Edited segments of these film clips were included in final versions of learning modules or as resources for the course blocks.

7. Evaluation, Lessons Learned and Recommendations

Instructional Design and Delivery Features

The original TWI instructional design was a consultant model where the contract TWI instructor memorized, practiced, and delivered the J-series lessons from a standardized script. The Leadership 2010 version used the generic manufacturing training concepts from the open source material, but adapted them to shipyard settings with terminology, imagery, stories, and examples. All shipyard people and Crosscut Panel folk who have used the Leadership 2010 materials have reported they are clear and useful. Persons from other industries reviewed the materials at the TWI Summit Conference in May, 2009 with similar response.

Staff of the TWI Institute, that teaches TWI instructors using the consultant model, reviewed the Leadership 2010 methodology and course delivery. Institute staff perceived that deviating from the World War II classroom/chalkboard standard to use web-based and video techniques may detract from traditional learning value. Future comparison of the Northrop Grumman Newport News traditional TWI model and shipyards using the Leadership 2010 blended learning model will be followed up by the Crosscut Initiatives Panel.

A Leadership 2010 host person concept introduces each learning module. This image was designed to be a realistic supervisor character. It was decided to use a woman in this role because of the civil rights imperative to include more women and minorities in hiring. This concept was well received by men and women in the workplace.

It was discovered that most shipyard supervisors and managers have never used web-based learning techniques. Prior to using Leadership 2010 materials it is recommended that instruction in general Moodle learning management system use and Articulate Presenter controls be provided. The Moodle system can be set up for formal administration with learner registration and passwords, or for guest use. The version on www.goships.com is set for guest use.

Voiceover was incorporated into learning modules for web delivery. This was needed because some workers English language reading skills are low (English as a second language), and also because the slower pace of speaking helps learners make short-to-long term memory transfer. It was discovered that a woman's voiceover on learning modules seemed to gain better attention of men than a man's voice. Some of both men and women voices are included. Further research is needed to determine which voice is best.

Studio Trifusion, LLC videographers filmed training sessions. It was intended to have 'real' shipyard supervisors and prospective supervisors provide the 'acting' needed for the learning module film clips. Despite practice, shipyard workers were unable to consistently and clearly deal with scripts needed to illustrate teaching points. As a result,

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some professional actors were hired to simulate shipyard supervisors. Shipyards with large, developed training support organizations may have the actor-confident staff in-house; smaller shipyards may need to develop this talent if instructional design and deliver is to be done in-house. In contrast to difficulty with memorized or read scripts, shipyard subject matter experts showing and telling within their fields of expertise became very adept at presenting themselves in clear, articulate ways during filming, often on the first try.

TWI traditional practice in job breakdown for teaching or for job method improvement teaches subject matter experts to use standard forms to write down important steps, key points and their reasons. This approach was taught and is effective. It was discovered that filming a subject matter expert who has thought through job breakdown actually doing a job accelerates and clarifies the job breakdown process. The subject matter expert gets a high percentage of the job breakdown correct the first time, but when viewing himself-herself on video then omissions, errors, sequencing faults, and other tricks of the trade and knacks are quickly corrected.

Technology Transfer Features

Shipyard production and training staffs have expressed difficulty in transferring lean production theory and principles into practice.[14] Lean shipyards are differentiated by their various personalities, characteristics, and pools of knowledge, skills, and abilities. The barriers to change and reasons for failure among them, however, are very similar. The typical obstacles are underestimating the cultural and managerial impacts, the illusion of progress, conflicting measures, believing the excuse list, not remaining principle based, and using lean as a set of tools rather than a way of doing business. The countermeasures include embedding the lean principles in strategy, recognizing the realities of change, focusing efforts and getting immediate results, and assessing, acknowledging, and resolving cultural and managerial constraints. The TWI materials provide effective tools and methods to overcome lean barriers. Interviews with the Alaska Ship and Drydock, Inc. President and senior managers clearly articulated a vision of why barriers happen and how TWI helps overcome them.

Northrop Grumman Shipbuilding Newport News is implementing TWI for production supervisors. Company progress was presented at the 2009 TWI Summit by Rob Hogan, Director, Process Excellence. Rationale for using TWI technology and its preliminary results at Newport News parallel experience at the Ketchikan Shipyard. Newport News began its TWI implementation by hiring The TWI Institute to train and develop master TWI instructors at the shipyard. Mr. Hogan's presentation is included in Leadership 2010 materials.

Development of Leadership 2010 and demonstration of learning modules and related blended learning technology was presented at the Crosscut Panel meetings in Biloxi, February, 2009; San Diego May 2009; Philadelphia September, 2009. Dr. Gebhardt was

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[14] Boyer, Michael and Sovilla, Lisa, How to Identify and Remove the Barriers for a Successful Lean Implementation, *Journal of Ship Production*, May 2003, pp 116-121

invited to be a speaker on Leadership 2010 at the TWI Summit – the people side of lean conference in Mason, Ohio May, 2009. 160 persons attended. Copies of presentations are available on the NSRP website www.nsrp.org, and the TWI Summit site, http://www.twisummit.com. TWI pocket cards were provided to Crosscut and All Panel meeting attendees.

Technology Features

Shipyard internet bandwidth must be sufficient to stream video at good viewable resolution. What is sufficient resolution is a shipyard decision. Lower bandwidth supports smaller images viewed on a computer monitor; larger, higher resolution images are needed for screen projection. The Articulate software can produce output for CD-ROM (higher resolution) and web delivery (lower resolution) automatically. High resolution of shipyard filming for training is recommended, then lower resolution conversion to other formats can be achieved.

The Articulate Presenter software, which converts PowerPoint to flash media for web streaming, is an add-on to Microsoft PowerPoint. It was discovered that the PowerPoint-to-Articulate Presenter process currently gets best results when completed in the same computer operating system and same version of PowerPoint. If different versions of operating system and/or PowerPoint are used on the same basic PowerPoint files, then conversion is erratic requiring rebuild in a consistent system.

Use of video and still cameras in the shipyard provides excellent learning objects for training modules. Practice with lighting, audio, stability of camera or tripod use is essential to get good results. Tips and traps in using cameras were passed to shipyard training administration staff by the film production technical people resulting in much higher quality shipyard produced imagery after the Leadership 2010 project.

Video and still image editing software is recommended for shipyard use to get the most out of the camera equipment. Many brands are available with a variety of cost-feature mixes. The Adobe software used in the project was easy to use, mostly intuitive, and provided good results.

Performance measurement features

Don Bewley, former General Manager, Brownsville Marine, conducted a 3-day program review, evaluation, observation, and commentary. Results of his feedback are incorporated in program editing and the following performance measurement in the context of needs levels and six types of measures.

1. Reaction and planned action. Were the participants pleased with the training?

Initial reaction to planned and cheduled TWI training included typical barriers to lean interventions with comments like: Nothing is wrong here. Everything is fine; The time is

not right—too slow/too busy; This isn't new. It has all been done before; Business is overloaded—too many initiatives; The business is different. The principles don't apply; Constantly changing team members; Unable to participate in events or activities; Things are already being done; Constant questions and challenges—test after test; Decisions made so that this doesn't disrupt the real business; Multiple directions or competing initiatives; Unrealistic time expectations or project expectations; Narrow vision—short-term business orientation; Ineffective infrastructure; Approach confusion.

Some initial resistance had validity which was answered with planning and scheduling adaptation.

Once training began, the majority of supervisors and supervisor candidates actively participated in the lean learning events and brought colleagues with them. Word of the program spread. Persons who missed organized training events made arrangements to catch up, demonstrating the value of blended learning with web-based components.

2. Learning. What did the participants learn in the training?

Statements from participants about the Job Instruction course

- Before we improved our job instruction, it took a lot longer to get people trained.

- We made job instruction a standard practice at our shipyard. We cut training time a lot.

- I take more responsibility for teaching on the job. If I claim that my learner can do the job then I must teach and monitor the worker's performance until I'm sure he or she can do it properly.

- I am paying more attention to the neatness and cleanliness of workstations after I realized this is where people learn 80-90 percent of their job skills.

- When I began using job instruction completely, I discovered that new workers are more enthusiastic about learning and they are more reliable. I overheard one new hire say, "I think this company really cares about me."

Statements from participants about the Job Methods course

- I learned how to break down my jobs into all the steps we were doing. I discovered that many jobs are too complicated or have waste built in that we can fix.
- I found out that I can figure out ways to make all of my jobs faster, easier, safer, and better.
- I learned some great tips and traps about selling my job improvement ideas to my boss.
- I didn't realize how expensive it is to have a dirty, disorganized, and messy work station.

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- I learned that the way we've always done it isn't always the best. Now I know how to ask better questions about why steps are necessary, when and where they should be done.

Statements from participants about the Job Relations course

- The job relations course gave me good ideas about treating people as individuals. That's the way I want to be treated.
- I learned ways to let my team members know how they are getting along. It's easier to compliment good work and point out ways to improve.
- The point I got is giving my team and individuals credit when credit is due. Now I tell them right after a job is completed properly.
- The point on the job relations card about telling people in advance about changes that will affect them, and why, is really important.
- After the course I spent time thinking about all my people. I had overlooked some people's ability and new experience so had not been making the best use of them.

3. Job Applications. Did the participants apply their learning on the job?

Implementing TWI training spread to practice in shops, workstations and on vessels in construction and repair. There was a surge in individual supervisors designing training courses and recognizing when good on-the-job learning, job method improvement, and improved job relations was needed. Supervisors had these new tools to help make improvements. Managers and project managers took a more active role in coaching new and developing supervisors. Proliferation of pocket cards pulled out to check or emphasize important steps, key points and their reasons was noted.

4. Business results. Did the applied learning positively affect the organization?

The improving quality of supervision in general was noted by project managers and managers. The shipyard was in the midst of transition to a significant portion of business in new construction, not just in repair as in the past. Certainly the excitement of new and different work stimulated safety, quality, productivity, and reliability but the TWI tools and methods helped the process. The interviews with shipyard President, Production Superintendent, Senior Project Manager, and Director of Business Development included in Appendix E reveal more specifics.

5. Return on Investment. Do the benefits outweigh the costs?

The TWI learning module development was matched in part with cost share. As the program proceeded, more cost share than expected was contributed to the program. The TWI tools and methods, and impact on supervisors, helped enable the shipyard to continue its expansion and improvement program including new contracts, workforce expansion, beginning of a multi-skilled apprentice program and more. Use of TWI

underpinned acceptance of paid apprentice training included in a new vessel repair contract, a summary of which is included in Appendix E.

A detailed and comprehensive ROI calculation was not completed.

Cost share elements:

Alaska Ship & Drydock, Inc
- Management, supervision, and workforce participation in project
- Project management and accounting support
- Shipyard in-kind support for project team and subcontractors, training sessions, follow-on coaching
- Project Technical Lead labor in excess of project estimates

Studio Trifusion
- Services provided below market value

TWI Summit and TWI Institute
- Inclusion of Leadership 2010 in national conference for review and feedback, 160 participants

Other vendor and shipyard support
- Contextware.com development of web-based skill demonstration of shipfitter skill standards, knowledge, skill, abilities, and resources
- Aptima, Inc. participation to demonstrate KEEL SBIR project technology
- Participation of Crosscut Panel members and guests to review and comment on Leadership 2010 development and materials

6. Intangible Measures. Did the training improve organization culture?

In May, 2009, the Alaska Ship and Drydock, Inc. President conducted and all-hands full-day retreat to describe the changing and improving culture at the shipyard. The excitement of using TWI as a lever for company sustainment, expansion, and improvement was shared. An example vignette is the enthusiasm of older, experienced workers in having the opportunity to train new, entry level workers. In June, agreement had been reached to allow a summer intern program for 16 and 17 year old high-school youth. An example summary of learning by one student, Michael Jonte, is included in Appendix E.

Appendices

Appendix A: Statement of Work

Appendix B: Moodle Learning Management System description

Appendix C: Leadership 2010 material on www.goships.com/learning web site

Appendix D: TWI Pocket Cards

Appendix E: Digital Video Disc (DVD) Contents

Appendix A – Statement of Work

Leadership 2010 – Improving Supervision
(Training Within Industry courses adapted for shipyard use)
January 1 – September 30, 2009

Statement of Work

Prime Contractor: Alaska Ship & Drydock, Inc., Doug Ward, Director of Shipyard Development

PTR: Jerold Shepherd, VT Halter Marine; Crosscut Initiatives Panel AMITL

Technical Lead: Laurence P. Gebhardt, Ph.D., Crosscut Initiatives Panel, ASD Director of Research & Development

Subcontractors: Studio Trifusion (video studio); The TWI Institute (TWI Program Authority)

Industry involvement: Shipyards: *Brownsville Marine, Northrop Grumman Shipbuilding - Newport News, Alaska Ship & Drydock (ASD), Gulf States Shipbuilding Consortium – Audrey Smallwood, ATN, POC.*

Tasks:

The following will be accomplished to support project goals:

1. Prepare outlines for TWI learning modules on Job Instruction, Job Method Improvement and Job Relations consistent with *The TWI Workbook: Essential Skills for Supervisor*s by Robert J. Wrona and Patrick Graupp (2006). Prepare outlines for learning module on Program Development consistent with TWI Program methodology and *Managing to Learn* by John Shook (2008). (Complete by January 2009)

2. Design and create draft e-learning presentations for the theory-principles portions of modules listed in Task 1 along with instructional delivery guides. (Complete by March 2009)

    ▪   Identify photographs, diagrams, terminology, case studies and other learning objects appropriate for shipyards

    ▪   Prepare story-boards and screenplay voiceover for video clips for subcontractor use.

    ▪   Shipyard partners and TWI Institute review draft materials, suggest changes.

3. Synthesize existing and new video imagery, text, photographs music, voiceover or other audio into 10-30 minute presentations with learning games and summary quiz for web delivery on Moodle learning management system. Prepare course delivery guides. (Complete by June 2009)

    ▪   Video editing with music, voice, graphics integration. Instructor and learner guides, case studies, etc.

4. Test market the pilot course modules in participating shipyard(s) for employees (Complete by August 2009)

    ▪   Technical lead conduct courses at Alaska Ship and Drydock and make materials adjustments.

    ▪   Technical lead and Brownsville Marine conduct course trial and suggest adjustments.

    ▪   Provide materials and guidance for any other interested shipyard to test/pilot.

5. Modify draft materials and post as learning course on learning management system of web site www.goships.com and NSRP Crosscut Resources Center. Prepare final report (Complete by September 2009)

    ▪   The prime contractor technical lead and subcontractors will jointly prepare the report with inputs from participating shipyards and related firms

    ▪   Provide recommendations for future R&D to improve shipbuilding and repair industry image.

Deliverables:

1. Project Status Report – March 30, 2009
2. Project Status Report – June 30, 2009
3. DVD with all program materials developed – September 30, 2009
4. Final Written Report and recommendations for future R&D – September 30, 2009

Appendix B– Moodle Learning Management System

This appendix summarizes Moodle LMS capabilities. Not all of these capabilities were used for the Leadership 2010 project; however, the software provides extensive training design, delivery, and management features.

Overall design

Moodle's overall design:

- Promotes a social constructionist pedagogy (collaboration, activities, critical reflection, etc)
- Suitable for 100% online classes as well as supplementing face-to-face learning
- Simple, lightweight, efficient, compatible, low-tech browser interface
- Easy to install on almost any platform that supports PHP. Requires only one database (and can share it).
- Full database abstraction supports all major brands of database (except for initial table definition)
- Course listing shows descriptions for every course on the server, including accessibility to guests.
- Courses can be categorised and searched - one Moodle site can support thousands of courses
- Emphasis on strong security throughout. Forms are all checked, data validated, cookies encrypted etc
- Most text entry areas (resources, forum postings etc) can be edited using an embedded WYSIWYG HTML editor

Site management

- Site is managed by an administrator user
- Site is defined during setup. Defaults can be edited during setup or globally accepted
- Site can be modified by a robust Site administration block.
- Plug-in "themes" allow the administrator to customize the site colors, fonts, layout etc to suit local needs
- Plug-in activity modules can be added to existing Moodle installations
- Plug-in language packs allow full localization to any language. These can be edited using a built-in web-based editor. Currently there are language packs for over 70 languages.
- The code is clearly-written PHP under a GPL license - easy to modify to suit your needs

User management
Overview

- Goals are to reduce admin involvement to a minimum, while retaining high security
- Supports a range of authentication mechanisms through plug-in authentication modules, allowing easy integration with existing systems.
- Standard email method: students can create their own login accounts. Email addresses are verified by confirmation.
- LDAP method: account logins can be checked against an LDAP server. Admin can specify which fields to use.
- IMAP, POP3, NNTP: account logins are checked against a mail or news server. SSL, certificates and TLS are supported.
- Students are encouraged to build an online profile including photos, description. Email addresses can be protected from display if required.
- Every user can specify their own timezone, and every date in Moodle is translated to that timezone (e.g. posting dates, assignment due dates etc)
- Every user can choose the language used for the Moodle interface (English, French, German, Spanish, Portuguese etc)

Enrolment

- Teachers can add an "enrolment key" to their courses to keep out non-students. They can give out this key face-to-face or via personal email etc
- Teachers can enrol students manually if desired
- Teachers can unenrol students manually if desired, otherwise they are automatically unenrolled after a certain period of inactivity (set by the admin)
- External database: any database containing at least two fields can be used as an external authentication source.
- Each person requires only one account for the whole server - each account can have different access
- Meta courses can group together related courses so participants can interact with each other

Roles

- Roles for specific participants can be defined for each course
- An admin account controls the creation of courses and creates teachers by assigning users to courses
- Course creators can create courses, teach in them, and assign others to teacher roles.
- Teachers are a role in a specific course.
- Non-editing teacher roles are available for adjuncts, and part-time tutors.

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Course management
Overview

- A full teacher has full control over all settings for a course, including restricting other teachers
- Choice of course formats such as by week, by topic or a discussion-focussed social format
- Course Themes. A course can have its own theme of colors and layout.
- Flexible array of course activities - Forums, Quizzes, Glossaries, Resources, Choices, Surveys, Assignments, Chats, Workshops
- Groups - teacher(s) and students can be placed in one or more groups
- Recent changes to the course since the last login can be displayed on the course home page - helps give sense of community
- Most text entry areas (resources, forum postings etc) can be edited using an embedded WYSIWYG HTML editor
- All grades for Forums, Quizzes and Assignments can be viewed on one page (and downloaded as a spreadsheet file)
- Full user logging and tracking - activity reports for each student are available with graphs and details about each module (last access, number of times read) as well as a detailed "story" of each students involvement including postings etc on one page.
- Mail integration - copies of forum posts, teacher feedback etc can be mailed in HTML or plain text.
- Custom scales - teachers can define their own scales to be used for grading forums and assignments
- Courses can be packaged as a single zip file using the Backup function. These can be restored on any Moodle server.

Assignment Module

- Assignments can be specified with a due date and a maximum grade.
- Students can upload their assignments (any file format) to the server - they are date-stamped.
- Late assignments are allowed, but the amount of lateness is shown clearly to the teacher
- For each particular assignment, the whole class can be assessed (grade and comment) on one page in one form.
- Teacher feedback is appended to the assignment page for each student, and notification is mailed out.
- The teacher can choose to allow resubmission of assignments after grading (for regrading)
- Allowing resubmissions can allow the teacher to progress monitor student projects/assignments as they evolve.
- Advanced assignments can allow multiple files to be uploaded. This could keep together preplanning maps, outlines, research papers and presentations. (Not for beginners)

Chat Module

- Allows smooth, synchronous text interaction
- Includes profile pictures in the chat window
- Supports URLs, smilies, embedded HTML, images etc
- All sessions are logged for later viewing, and these can also be made available to students

Choice Module

- Like a poll. Can either be used to vote on something, or to get feedback from every student (eg research consent)
- Teacher sees intuitive table view of who chose what
- Students can optionally be allowed to see an up-to-date graph of results

Forum Module

- Different types of forums are available, such as teacher-only, course news, open-to-all, and one-thread-per-user.
- All postings have the authors photo attached.
- Discussions can be viewed nested, flat or threaded, oldest or newest first.
- Individual forums can be subscribed to by each person so that copies are forwarded via email, or the teacher can force subscription for all
- The teacher can choose not to allow replies (eg for an announcements-only forum)
- Discussion threads can be easily moved between forums by the teacher
- Attached images are shown inline
- If forum ratings are being used, these can be restricted to a range of dates

Glossary Module

- This is one of the modules that best illustrates the way that Moodle can fundamentally improve upon the experience of a traditional classroom
- When students contribute to a course in a public place like the glossary, their ideas are given weight and attention and often result in a greater pride or ownership of the assignment
- Allows participants to create and maintain a list of definitions, like a dictionary
- Student entries can be previewed by instructors before publishing
- Entries can be searched or browsed using alphabet, category, date, and author
- A glossary of terms can be easily referenced by students
- Almost any module of Moodle can be set to hyperlink - automatically - to any word or phrase that is stored in or added to the glossary
- Glossary items can be grouped in categories
- Participants can comment on glossary entries
- Entries can be rated using teacher-defined scales
- Glossaries can be easily exported and imported via xml
- Glossaries can be fully searched

- Glossaries can be viewed with different display formats

Lesson Module

- A lesson is a series of pages which can be presented in a linear fashion, like a slide show, or in a non-linear, branching manner, or in a combination of the two.
- Navigation through the lesson can be straight forward or complex, logical or random
- Pages have a content area for questions or explanations, with a HTML set of tools
- Pages can allow students to make choices by their answers to questions or by selecting a button with a description
- Each choice can be associated with jumps that link to other lesson pages and can be scored
- Offers different scoring and grading potentials
- Interfaces with Grade and Glossary modules
- Lessons can build upon each other through conditional dependencies upon one another
- Question pages include Multiple choice, Multi-answer, T/F, numeric, short answer and essay.
- Pages can be created one at a time or imported in variety of formats
- Student attempts, time limits, minimum score and retakes can be set.
- Students may see progress bars, running score, reinforcement to student questions
- Password, start and end times, and other restrictions can be placed on students.

Quiz Module

- Teachers can define a database of questions for re-use in different quizzes
- Questions can be stored in categories for easy access, and these categories can be "published" to make them accessible from any course on the site.
- Quizzes are automatically graded, and can be re-graded if questions are modified
- Quizzes can have a limited time window outside of which they are not available
- At the teacher's option, quizzes can be attempted multiple times, and can show feedback and/or correct answers
- Quiz questions and quiz answers can be shuffled (randomised) to reduce cheating
- Questions allow HTML and images
- Questions can be imported from external text files
- Quizzes can be attempted multiple times, if desired
- Attempts can be cumulative, if desired, and finished over several sessions
- Multiple-choice questions supporting single or multiple answers
- Short Answer questions (words or phrases)
- True-False questions
- Matching questions
- Random questions
- Numerical questions (with allowable ranges)
- Embedded-answer questions (cloze style) with answers within passages of text
- Embedded descriptive text and graphics

Resource Module

- Supports display of any electronic content, Word, Powerpoint, Flash, Video, Sounds etc. that are stored locally, or remotely
- Files can be uploaded and managed (zipped, unzipped, renamed, moved, etc..) on the server
- Folders can be created and managed on the server and linked to
- Internal web pages (html formatted) can be created with WYSIWYG editor and linked to
- Internal text pages (no formatting) can be created and linked to
- External content on the web can be linked to or seamlessly included within the course interface.
- External web applications can be linked to with data passed to them
- Linked MP3 audio files will display with elegant flash player

Survey Module

- Built-in surveys (COLLES, ATTLS) have been proven as instruments for analysing online classes
- Online survey reports always available, including many graphs. Data is downloadable as an Excel spreadsheet or CSV text file.
- Survey interface prevents partly-finished surveys.
- Feedback is provided to the student of their results compared to the class averages

Wiki Module

- Wiki is a web page that anyone can add to or edit
- It enables documents to be authored collectively and supports collaborative learning
- Old versions are not deleted and may be restored if required

Workshop Module

- Allows peer assessement of documents, and the teacher can manage and grade the assessment.
- Supports a wide range of possible grading scales
- Teacher can provide sample documents for students to practice grading
- Very flexible with many options.

Appendix C Leadership 2010 material on www.goships.com/learning web site

This course contains the modules and references for the Leadership 2010 Training Within Industry course for shipyard supervisors.
The resources below include:

- a management overview of the Leadership 2010 program
- NSRP recommended guidelines for a shipyard training program and related skill standards
- a history and overview of the TWI program
- a forum to post comments, ask questions, and share information.

The Leadership 2010 Project is implemented through the following topics.
Topic 1 Guidance for shipyard training managers and master instructors on how to use the course
Topic 2 TWI course introduction.
Topic 3 Job Instruction course
Topic 4 Job Method Improvement course
Topic 5 Job Relations Course
Topic 6 Program Development or Problem Solving Course
Topic 7 Principles of job coaching and training evaluation

- News forum
- Leadership 2010 Overview for Management - 15 minutes file
- History and Background of the TWI Program PDF document
- Training Program Development for Shipbuilding and Ship Repair NSRP 527 PDF document
- Production Competencies for Shipbuilding and Ship Repair - Introduction and Skill Standards Word document
- Skill Standards Core Competencies with associated Knowledge-Skill-Ability Listings Word document
- Administrative Competencies skill standards Word document
- Leadership 2010 Forum

 1
Guidance for shipyard training managers and master instructors on how to use the course.
Read the introduction, Chapter 1 Using TWI to Teach, and Chapter 2 Fundamentals of the TWI Program in The TWI Workbook.
Review the presentation: Guide for Training Managers and Master Instructors

- Guide for Training Managers and Master Instructors Draft July 6 file

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2

Course introductory modules

These are drafts customized for Alaska Ship and Drydock, Inc.

The 5 Needs of the Supervisor presentation summarizes the Training Within Industry core program design.

The Supervisor's Toolkit is a summary of reasons that supervisors should learn to use the five tools and where to get information.

Please review these modules and suggest changes.

The newer versions have more animation and graphics.

Thanks, Larry Gebhardt, Leadership 2020 Project Technical Lead

lpgebhardt@cableone.net

- The Supervisor's Toolkit - April 2009 - 13 minutes file
- The Supervisor's Five Needs - January 2009 - 23 minutes file
- Pocket Cards for JI, JM, JR courses PDF document

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3

Job Instruction (JI) Course - is about how to teach people to do a job correctly, safely, and conscientiously.

To complete this course:

1. Review the course outline to see what is expected. Have Job Instruction pocket cards from the TWI Workbook, or the link in topic 2 above.

2. Read Chapter 3 in the TWI Workbook and watch the presentation The Four Steps of Job Instruction. Watch the video: showing and telling the underwriter's knot. Use your pocket card that lists the 4 steps of job instruction to see proper and improper important steps and key points. Complete the Chapter 3 quiz.

   Group discussion after completing Chapter 3 study and learning module review.
      Share an incident when a person just 'told' them to do something or just 'showed' you to do something. The rest of this team exercise is on page 23 in the workbook.
      Each person on the team should choose a simple job that is actually done in his or her department. Give the job a name. It should be something that about anyone could do if they learn. Like making a cake. This will be your 'practice' job for discussion. Go over how they normally instruct and/or do these jobs in their department.
      Then go over the practice job reviewing the recommended four steps and details on page 29-39 to see where improvement can be made.
3. Read Chapter 4 in the TWI Workbook and watch the presentation - How to get ready to instruct - break down the job.

4. Read Chapter 5 in the TWI Workbook and watch the presentation - Make a timetable for training, get everything ready, arrange the worksite.

- 📄[Job Instruction Course Outline Resource](#)
- 📄[Chapter 3 - The Four Steps of Job Instruction - 22 minutes - Draft file](#)
- 📄[Chapter 4 - How to get ready to instruct - Break down the job - 14 minutes - draft file](#)
- 📄[Chapter 5 - how to get ready to instruct - Make a training timetable, get everything ready - 8 minutes - draft file](#)
- 📄[Showing and telling the underwriter's knot file](#)

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4
Job Method Improvement course.
his module is based on information in the TWI Workbook and two other books: Gemba Kaizen, and 5S for Operators. You can check out the books or take a more complete course at the ASSET Learning Center.

The introduction to this course reviews concepts of work and introduces the seven types of industrial waste and the 5S program for housekeeping.
Other modules include:

- Introduction to Job Method Improvement - TWI Workbook Chapter 6
- The Four Steps of Job Method Improvement - TWI Workbook Chapter 7
- Writing and Selling the Improvement Proposal - TWI Workbook Chapter 8

- 📄[Job Relations 1, Introduction, Industrial Wastes and 5S Housekeeping - 17 minutes - Draft June 2009 file](#)
- 📄[Chapter 6 -Job Methods Improvement 2 - Principles and a sample job - 20 minutes file](#)
- 📄[Job Breakdown Sheet Blank PDF document](#)
- 📄[Chapter 7 - Job Methods Improvement 3 - Four Steps of Improvement - 20 minutes file](#)
- 📄[Job Method Improvement Proposal Form PDF document](#)
- 📄[Chapter 8 - Job Method Improvement 4 - Writing and selling your proposal - 7 minutes file](#)

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5
Job Relations Course
The prerequisite to this course is the 5 Needs of the Supervisor.
Review The TWI Workbook, Chapter 3 pages 129-130 and then watch the five minute presentation, Introduction to the Job Relations course.

- 📄[Chapter 9 Job Relations - Part 1 Introduction to Job Relations Course - 6 minutes file](#)
- 📄[Chapter 9 Job Relations Part 2 - What is good supervision? - 19 minutes file](#)

- 📄[The Joe Smith Problem - Case Study - 2 minutes file](#)
- 📄[Chapter 10 - Job Relations 3 - Four Steps for Problem Solving - 20 minutes file](#)
- 📄[Chapter 11 - Job Relations 4 - Foundations of good relationships - 15 minutes file](#)

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6

Program Development or Problem Solving Course

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7

Principles and practice of job coaching and training evaluation

Appendix D – TWI Pocket Cards

JOB INSTRUCTION

HOW TO GET READY TO INSTRUCT

Before instructing people how to do a job:

1. MAKE A TIME TABLE FOR TRAINING

> Who to train…
> For which work…
> By what date…

2. BREAK DOWN THE JOB

> List **Important Steps**
> Select **Key Points**
> Safety factors are always Key Points

3. GET EVERYTHING READY

> The proper equipment, tools, materials and whatever needed to aid instruction

4. ARRANGE THE WORKSITE

> Neatly, as in actual working conditions

JOB RELATIONS
A SUPERVISOR GETS RESULTS THROUGH PEOPLE

FOUNDATIONS FOR GOOD RELATIONS

Let Each Worker Know How He/She is Getting Along
> Figure out what you expect of the person
> Point out ways to improve

Give Credit When Due
> Look for extra or unusual performance
> Tell the person while it's "hot"

Tell People in Advance About Changes That Will Affect Them
> Tell them why if possible
> Work with them to accept the change

Make Best Use of Each Person's Ability
> Look for abilities not now being used
> Never stand in a person's way

PEOPLE MUST BE TREATED AS INDIVIDUALS

HOW TO IMPROVE
JOB METHODS

A practical plan to help you produce greater quantities of quality products in less time by making the best use of the **Manpower, Machines and Materials now available.**

STEP 1 – BREAK DOWN THE JOB

1. List **all** details of the job **exactly** as done in the **Current Method.**
2. Be sure details include everything:
   — Material Handling
   — Machine Work
   — Hand Work

STEP 2 – QUESTION EVERY DETAIL

1. Use these types of questions:
   WHY is it necessary?
   WHAT is its purpose?
   WHERE should it be done?
   WHEN should it be done?
   WHO is best qualified to do it?
   HOW is the 'best way' to do it?
2. Question the following at the same time: Materials, Machines, Equipment, Tools, Product Design, Workplace Layout, Movement, Safety, Housekeeping

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HOW TO INSTRUCT

Step 1—PREPARE THE WORKER
> Put the person at ease
> State the job
> Find out what the person already knows
> Get the person interested in learning the job
> Place the person in the correct position

Step 2—PRESENT THE OPERATION
> Tell, show and illustrate one **Important Step** at a time
> Do it again stressing **Key Points**
> *Instruct clearly, completely and patiently, but don't give them more information than they can master at one time*

Step 3—TRY-OUT PERFORMANCE
> Have the person do the job — correct errors
> Have the person explain each **Important Step** to you as they do the job again
> Have the person explain each **Key Point** to you as they do the job again
> *Make sure the person understands*
> *Continue until you know they know*

Step 4—FOLLOW UP
> Put the person on their own
> Designate who the person goes to for help
> Check on the person frequently
> Encourage questions
> Taper off extra coaching and close follow-up

IF THE WORKER HASN'T LEARNED, THE INSTRUCTOR HASN'T TAUGHT

HOW TO HANDLE A PROBLEM
GET THE OBJECTIVE

STEP 1—GET THE FACTS
> Review the record
> Find out what rules and customs apply
> Talk with individuals concerned
> Get opinions and feelings
> *Be sure you have the whole story*

STEP 2—WEIGH AND DECIDE
> Fit the facts together
> Consider their bearings on each other
> What possible actions are there?
> Check practices and policies
> Consider objective and effect on individual, group, and production
> *Don't jump to conclusions*

STEP 3—TAKE ACTION
> Are you going to handle this yourself?
> Do you need help in handling?
> Should you refer this to your supervisor?
> Watch the timing of your action
> *Don't pass the buck*

STEP 4—CHECK RESULTS
> How soon will you follow up?
> How often will you need to check?
> Watch for changes in output, attitudes, and relationships
> *Did your action help production?*

DID YOU ACCOMPLISH YOUR OBJECTIVE?

STEP 3 – DEVELOP THE NEW METHOD

1. ELIMINATE unnecessary details
2. COMBINE details when practical
3. REARRANGE details for better sequence
4. SIMPLIFY all necessary details

To make the job easier and safer to do:

> – Put materials, tools and equipment into the **best position** and **within convenient reach** for the operator
> – Use **gravity feed** hoppers or **drop delivery** chutes whenever possible
> – Make effective use of **both hands**
> – Use **jigs** or **fixtures** instead of hands

5. Work out your ideas WITH OTHERS
6. WRITE UP the proposed new method

STEP 4 – APPLY THE NEW METHOD

1. SELL your proposal to the boss
2. SELL the new method to the operators
3. Get FINAL APPROVAL of all concerned on Safety, Quality, Quantity, Cost, etc.
4. PUT the new method TO WORK. Use it until a **better** way is developed.
5. Give CREDIT where credit is due

Appendix E: Digital Video Disc (DVD) Contents

Files on DVD
- Crosscut Panel Industry Leadership 2010 Presentations
    - Introduction to work-based learning & apprentice programs
    - Blended learning review
    - Structured On-The-Job Learning
    - Leadership 2010 Management Overview
    - Teaching old dogs – application of Leadership 2010 at the Ketchikan shipyard
    - NGSB Newport News TWI development – Rob Hogan
- TWI References
    - *The Roots of Lean*   Training Within Industry: The Origin of Japanese Management and Kaizen
    - *TWI Pocket Cards*
- Leadership 2010 Learning Modules
    - Topic 1 Guidance for shipyard training managers and master instructors on how to use the course
        - Management overview of Leadership 2010
        - Master instructor guidance
        - Interview with Randy Johnson, Alaska Ship & Drydock, Inc. President
        - Interview with Al Turner, Alaska Ship & Drydock, Inc. Senior Project Manager
        - Interview with Doug Ward, Alaska Ship & Drydock, Inc. Director of Business Development
    - Topic 2 TWI course introduction.
        - Five needs of the supervisor presentation
        - Supervisor's toolkit presentation
    - Topic 3 Job Instruction course
        - Pre and post instruction quizzes
        - Chapter 3, 4, and 5 presentations
        - Underwriter's knot teaching example
        - Shipyard instruction – changing wire in LN25 feeder
        - Shipyard instruction – basic safety for hand grinder
        - Shipyard instruction – respirator fit check

- - Assessment – student showing knowledge, skill, ability in fire watch assignment
  - Job Instruction forms
  - Topic 4 Job Method Improvement course
    - Pre- and post instruction quizzes
    - Chapter 6, 7, and 8 presentations
    - Microwave shield re-enactment video
    - Job methods forms
  - Topic 5 Job Relations Course
    - Pre- and post instruction quizzes
    - Chapter 9, 10, and 11 presentations
    - Joe Smith case re-enactment video
  - Topic 6 Program Development or Problem Solving Course
    - Presentations
    - Forms and handouts
  - Topic 7 Principles of job coaching and training evaluation
- NSRP Shipyard Training Program Development and Guidelines
  - NSRP 527 *Training Program Development for Shipbuilding and Repair* (NSRP-0527). Carderock, Maryland: National Shipbuilding Research Program.
  - NSRP Production Competencies for Shipbuilding and Ship Repair
    - Volume 1 – Introduction and skill standards
    - Volume 2 – Knowledge, Skill, Ability tables
- Other material
  - Statement of high-school intern Michael Jonte
  - Acceptance of Federal Highways training program contractual elements