Two Case Studies in a Systematic Approach to Structured On-The-Job Training for Accelerated, Verifiable Results

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Abstract

In a work setting, "Bob showing Judy" how to perform work is the most prevalent form of training. In its natural state, it works. We know that people learn to make and do things. We simply do not know how well it works and to what degree of mastery for each individual involved. In today's globally competitive world, change is inevitable and rapid. Changes in technology, product design, organizational structure and legal requirements all significantly impact the nature of work and, therefore, the make-up of on-the-job learning requirements. Changes in worker demographics compound the challenge so that the training process is like hitting a moving target with a marginally defined projectile. Establishing an accurate "baseline" for the work and the worker, and then managing the information for change, is vital to closing the gap between the work requirements and worker capabilities. A systematic approach to human resource development not only structures the "Bob/Judy experience" into a verifiable and repeatable process, but can structure the entire human resource development model into a highly effective and efficient process for competitive business models. An approach used for many companies of all industry types, in particular an aerospace manufacturer and a modernized steel operation, is illustrated below.

Background

Structured on-the-job training has come to mean different things to different human resource development professionals. "To structure" implies bringing a framework to something that has ambiguous form. In this case, that which is without form is the training occurring in the

workplace meant to bring a raw candidate to a level of proficiency and, hopefully, job mastery through the natural evolution of employment.

Without structure, we know one person showing another how to perform a task has been the most common type of training since the dawn of trades and crafts. Someone who knows how to perform work shows someone who does not, then monitors the fledgling's performance until an informal "qualification" is conveyed that the performance meets some intuitive standard. We also know that this form of work learning will occur whether or not someone bothers to structure it. Yet when structured, it is the most practical, cost-effective and cost-efficient form of workforce development.

Without structure, the informal process encounters many variables that profoundly impact the quality of the learning experience. An "expert" assigned to a new-hire is usually considered an expert because he or she no longer needs to consciously think when performing. The information fundamental to a new candidate's learning and understanding of the work to be done is suppressed deep inside the expert's mind, a difficult challenge when the informal trainer tries to recall. Other concerns manifest themselves as unknowns: Is the trainer a recognized expert? Does the trainer have the necessary characteristics of a good mentor? Does the trainer like to train and have the time to deliver training? These are important questions.

What about the learner? Does the learner have the capacity to learn (pre-requisite skills and abilities)? Does the learner want to learn? Can the learner understand the training in an unstructured environment? These are equally important questions. More significantly, can management recognize whether or not the learning experience is effective? Is the on-the-job training assumed to be effective until the learner struggles through the training, has difficulty performing, at which time the learner's ability to learn is viewed as the problem. How many

times have we heard, “I think there is something wrong with the new guy. He doesn’t seem to want to learn.”

Finally, what happens when the work and work environment change? If we introduce new technology to the work, or the product requirements change, what will happen to the skill requirements for the job classification? How will the company address the gap in skill levels of the people already in the job classification? What happens to the trainer, the learner, and the company if the change is not addressed?

The old, informal model may have worked many years ago when the work requirements were relatively static and technology advanced at a manageable pace. Today, however, companies are changing product lines several times in a year. Companies are merging, acquiring and divesting, and these constant changes are sometimes leading to unrecognizable organizational structures and role definitions. The technology to manufacture, assist in manufacturing, and provide product service and support, is advancing at a rate with which most HR professionals are uncomfortable. This applies to any position at all levels of the organization. HR managers find themselves quietly removing themselves from the responsibility of training once the hiring is completed. It is an unfortunate paradox: how can a company progress in an ever-changing direction and at an unpredictable rate when the traditional training paradigm almost requires the job to remain static for a long period of time?

The Basic Human Resource Development Model

The solution starts at basic truths of workforce development. No matter the nature of employment, every employer operates his or her own version of the “human resource development model” for each employee brought into the organization. The employer hires (with or without pre or post-hire assessment and remediation of core skills and competencies), trains

(most often “Bob, will you show the new person around”), qualifies or certifies the employee to work independently, allows the employee to perform, and gives feedback on a periodic basis. The model, found to some degree within every organization, works best when it is structured with current and accurate information. Unfortunately, the model is often incomplete and not recognized or fully implemented as a deliberate process.

[Insert Figure 1 here]

Each stage of the model is equally important to the process of workforce development. For example, if certification requirements are available but training is informal and ad hoc, eventually the certification requirements are lowered to allow workers to operate on the production or service line. If the job descriptions are obsolete, and in some cases they can be obsolete within months with the rapidity of change, then on-the-job learning may be difficult to impossible. Worse yet, the employer may spend many months and expend costly resources only to find out that the candidate selection was faulty. Finally, it is questionable if meaningful employee feedback can be given to a trainee who manages to emerge from this sort of haphazard approach. Numerous studies have shown that a supervisor or manager’s performance review of an employee is frequently limited to negative experiences remembered within the last two weeks before the review.

Structured on-the-job training is only one stage of any organization’s human resource development model, and should always be understood to be inter-dependent with the other model stages. Structured on-the-job training imposes structure not only on the training but indicates that some methodology was used to build the framework for the training. There are many methodologies for analyzing job classifications for the vital information in building the framework – some better than others, some not useful at all.

Managed Human Resource Development System Approach

The two companies described in the case studies approached their local university/college centers providing workforce development (Eileen Smith, Ohio State University and David Just, Community College of Allegheny County) seeking a methodology to meet each of their unique needs in the human resource development arena. In each case, the solution chosen to meet the company need was a human resource development system approach developed after extensive research by Dean Prigelmeier of Proactive Technologies, Inc.

Through discussions with the two companies, consultants of the corporate education centers of these schools determined that structured on-the-job training would be the best solution to each organization's needs. They further determined that the PROTECH method of job/task analysis represented the combined attributes of the best methodologies, which yielded a complete system of managed human resource development, including the framework for the training. Years of industry experience developing training and certification programs determined that the process should be: 1) streamlined to be practical for private, profit-oriented companies as well as efficient public sector employers; 2) comprehensive to gather data for all stages of the human resource development model; 3) built on a common language, common framework; 4) formatted to utilize computer technology to process the tools of the human resource development process automatically; 5) able to provide a wealth of processed information recommending suitable core skill ability assessments and remediation in support of the structured model; 6) able to facilitate effortless revision to ensure job data can be revised at any stage of the data collection – data utilization process, guaranteeing a high degree of content validity; and 7) able to structure the unstructured with minimal disruption to the employer's operations. The resulting system, PROTECH, is a system of data collection, a system of automated HRD instrument

development and generation, and a system of HRD instrument utilization – all designed to structure and support the naturally informal experiential (sometimes referred to as contextual) on-the-job learning process.

Job Task Analysis Process

In all cases, the process starts with a thorough job/task analysis. United States labor law considers any instrument which determines an employee's acceptance for employment, transfer, promotion, or pay increase a "test" and holds it to the legal standards for a test, requiring validation. For content validation to be met: 1) the test instrument must be created using data derived from a recognized job and task analysis methodology that is used consistently in all cases; 2) the analyst must have a system (does not have to be electronic) to manage the information collected; and 3) an effort must be made to keep the instruments "job relevant". All instruments generated automatically from the data met the employer's legal obligations for content validation. This approach allows any job to be analyzed from top to bottom in as little as one week.

The building block approach ensures that targeted training outcomes are always clear and relevant, helping to build worker acceptance of, and confidence in, both the process and the content. The analysis process centers on the current subject matter experts: those people currently considered an expert in the work to be trained. The process utilizes an initial task list development brainstorming session, but relies heavily on task performance observation to capture the procedure content. Each task is prioritized to place it in a rank listing of training importance. The requisite knowledge, skills and abilities, as well as the often overlooked, but significantly important, safety information, tools and equipment, problems that might be encountered along with the appropriate prevention or response, and required reference material

compliance are all critical for measuring mastery performance. Unlike traditional education, an employer cannot use a measure such as "seventy percent is passing" when it comes to task performance; a thirty-percent acceptable failure rate can result in thousands, if not hundreds of thousands, of dollars in scrap, rework and/or customer dissatisfaction. With mastery, the trainee learns to perform a task to the standard of performance defined by management and subject matter experts, or they do not. If not, training continues until the trainee can reach task mastery.

Once each task is defined, the entire data is circulated for review to direct stakeholders to refine the set further and build a consensus for any document or document utilization produced from the set. In the case of PROTECH, it is only when the consensus has been derived that all of the reports used in the human resource development process are generated and prepared for use. Since the software automatically creates all of the reports, costly time delays in developing the materials are eliminated and subjectivity injected into the materials is minimized. In essence, when the data collection is completed and approved, the human resource development tools are ready to use. Any revision to the data set updates all of the reports at once, making data maintenance easy and efficient, ensuring job relevance of the instruments used in the process (one of the legal requirements of content validity).

This process and overall system represent a "quality assurance" approach to workforce development that fits well with contemporary quality and process improvement programs in most industries. The approach can be used in any setting, for any type of classification. Two case studies are offered to show application of this systematic approach to structured on-the job training. The employer's represented have very different goals but the common thread is the need to train workers for work.

Case Study
Parker Hannifin/United Aircraft Products
Forest, Ohio

Organizational Profile and Issues

Parker Hannifin/United Aircraft Products (UAP) is located in north central Ohio. One of Parker's over 200 global manufacturing facilities, UAP employs around 147 manufacturing personnel, in a unionized environment. Their primary products are custom engineered heat transfer systems and components, electronic cooling systems and on board inert gas generation systems (OBIGGS) used primarily by commercial and military aircraft. The manufacturing environment is made up of component fabrication, machining, metalworking, assembly, TIG welding, vacuum brazing, quality control and product testing. The close tolerances, critical processes and small lot sizes combine to make the production classifications difficult to learn.

According to Ken Jackson, Human Resources Manager for the factory, "One of our biggest challenges is that nearly thirty percent of our technically qualified personnel will be eligible to retire in the next two years. These "experts" will be walking out the door with over 1,000 years of combined experience and expertise critical to our continuing operation. Not only will new trainees struggle through an unstructured learning experience, we are not sure if there will be trainers available for what we need them to learn."

Another important concern was that the labor union had repeatedly asked management over the years to provide training, and therefore personal growth, opportunities. Many of the local's members perceived the lack of training as a negative reflection of management's attitude toward them. In reality, management saw this as an operational necessity and area of common agreement with the union, but did not know how to proceed.

Performance Analysis and Action Plan

Parker UAP presented their need to The Ohio State University. After discussions with management and conducting a needs analysis, it was determined that the solution to the company need was to capture the information and expertise by performing a thorough job task analysis and designing a structured on-the-job training project. In 2000, Ohio State University initiated a pilot project, which was continued and expanded to assist UAP. The OSU corporate education centers on the Marion campus (Alber Enterprise Center) and Mansfield campus (Center for Corporate and Community Education) help companies improve the performance of their organizations, processes, and employees through training, consultation, and other performance improvement technologies.

The OSU corporate education centers asked Proactive Technologies to help capture the vital job information about to walk out the door, structure the job data into human resource development instruments, and train Parker lead trainers to utilize the materials to implement a system for quickly training replacement workers. The OSU centers were able to provide the company with funding from two agencies: EnterpriseOhio's Targeted Industries Grants from the Ohio Board of Regents and the Employer's Training Pool Grant from the Ohio Investment in Training Program of the Ohio Department of Development. The funding offset approximately half the cost of the analysis and training.

Ten of twenty-four job classifications were prioritized based on retirement dates of the subject matter experts and a detailed and thorough job/task analysis was performed. After overcoming the natural suspicions of outside consultants, the subject matter experts began to take pride in what was being developed. They could see the value of the effort, especially in job classifications which had only one subject matter expert and that expert was scheduled to retire.

Capturing the level of detail was characterized by some as writing the subject matter expert's memoirs.

Almost immediately management, as well as the subject matter experts, began to see how much of the work detail had been mentally suppressed and taken for granted. Likewise, the data collection process stimulated a long-overdue discussion of the correct way to perform certain tasks. Those in management who advocated a "quick and dirty" approach to work definition became allies once they could see the data evolving.

The data sets were completed and circulated for final review and comments. Not all employees actively participated in the data review, since not everyone overcame their suspicions or took the time to review the data sets. However, enough reviews were given to establish content validation, strengthen the support of the process and outputs throughout the company and give the project the necessary resources to implement. Later, as converts continue to emerge, additional reviews will encourage their participation and input.

Once the data sets were collected, final edits to the sets made and the baseline drawn, the final human resource development materials were generated and placed in binders for use. Although many other reports were available, the binders produced for the project consisted of:

- Miscellaneous Reports - Job Hierarchy, Job Hierarchy Survey, Job Description
- Job Profile Analysis
- On-the-Job Training Manual - Task Training Outlines, Plans
- Certification Manual - Certification Outline, Checklists, Checksheets
- Procedure Manual - Table of Contents, Task Procedures
- Data Collection Forms - Content Validation

Each binder supports a particular stage of the human resource development model. The "Miscellaneous Reports" binder is used for the recruitment, assessment and hiring, while the "On-the-Job Training Manual" and the "Certification Manual" are used for structured on-the-job training and documentation of task mastery, respectively. The "Procedure Manual" is a job-performance aid used as a reference guide in the performance of difficult tasks or tasks that are performed infrequently. The "Data Collection Forms" binder is a complete summary of the job data set used for content validation documentation and as a starting point for process improvement discussions. From the job data, core skill and competency training was identified to lay the foundation upon which to build task-related expertise.

Once the worker development materials are ready, the employees are "baselined." The PROTECH employee file database is used to set up a folder for each existing employee to capture the training and education background and the tasks already mastered by the individual, focusing training efforts on those tasks yet to be learned. In many respects, this represents the most valuable information rarely collected by employers: an inventory of what each worker can to do for the company and an indication of the value that worker adds to the organization.

[Insert Figure 2 here]

The next step is to train lead trainers in the use of the training materials and checklists, and in techniques to train one-on-one in the work setting. These trainers are asked to do what they have always done, train new and existing workers on work to be performed. They are asked simply to use the structure they helped create to ensure each employee receives the training the same way, no matter which shift and which trainer. Trainers are asked to cover all of the material for each task and, when ready, ask the trainee to perform the task un-aided by the instructor. When mastery is assured, through observation of task performance to the training

checklist, the trainer is asked to complete the checklist form and submit it for data entry. The information is added to the employee's file as one more thing they are known to be capable of performing to mastery.

For new hires, the top fifty percent of the tasks are the training target for the first ninety days of employment, commonly referred to as the "probationary period." If the employee can master the most frequent and most difficult tasks during this period, it is understood that the tasks become progressively easier to master. This process offers a focus that was previously lacking.

Results

Employees and management are both allowed to review the data for the job and employee. With clearer definition, work assignments are easier for supervision to make and training is easier to coordinate. Clearly established training programs are expected to get new operators up to speed quicker, reduce operator variability, scrap and rework, and thereby improve product delivery. Conflicts between labor and management should also decrease as roles and job performance expectations are better defined. While this project is just undergoing its implementation stage, a simple measure of success is the project's acceptance by both management and labor as the "way to do business."

The training of new-hires, cross-hires and job incumbents is an ongoing process that is not expected to reach an end. The jobs have already had significant revisions to them since the project was started, and new revisions are expected. One goal is to keep the data sets current and accurate through periodic review and validation. This will help maintain the program's validity, credibility and effectiveness.

Upon successful completion of the first ten job classifications, Parker UAP plans to analyze the remaining positions and ultimately will have all jobs in the system. All employees are baselined before they begin training, and in some cases cross training, which leads to certification. When employees require remediation of skills prior to learning the task, the Ohio State University centers will coordinate the delivery of core skill training on-site upon review of the Job Profile Analysis Report. Ultimately, a "Certificate of Job Mastery" will be conveyed to those individuals demonstrating task mastery and completing all other requirements of the job classification. The Ohio State University will award the Certificate upon review of the documentation. Because of the success of this model and the positive response shown by employer-clients, the model is currently being implemented with companies through Ohio State Marion and Mansfield's Corporate Education Centers, with plans to implement it with companies through the new OSU Delaware Center (see Table 1). One OSU Marion/PROTECH project, with Hydraulics, Inc., is highlighted as a success story of the EnterpriseOhio Network. According to the governor of the state of Ohio, in "Ohio's Economic Advantage" (Ohio Board of Regents, 1998), the University's Corporate Education Centers have been identified as one of Ohio's "success stories, responding to business and industry needs with innovative problem solving and effective partnerships."

[Insert Table 1 here]

Case Study
Steel Mill
North-East, Ohio

Organizational Profile and Issues

In northeast Ohio, a steel mill struggled to compete in an increasingly hostile steel market. The mill, founded in the early 1900's by a group of area iron and steel makers, is a producer of carbon, stainless, silicon and galvanized flat-rolled steel products.

Throughout the years, the mill was renamed and changed hands many times as it expanded operations. The owners installed new equipment such as open-hearth furnaces, a new hot mill, blooming mill, a high reversing mill, a heavy built coiler, a heavy-duty blooming edger, a 100-ton electric melting furnace and a 100-ton A.O.D. vessel. These additions allowed the mill to continue to upgrade and produce new products.

In March of 1994, the company idled its local steel plant. Approximately 1,100 people were laid off. This had a devastating impact on the local economy. In April, 1994, the steel mill announced that they would invest approximately 140 million dollars in a thin slab continuous caster and modernize other areas of the operation. When the plant was to reopen in April, 1995, employment was projected at approximately seven hundred people. The company was given the authority to operate the first unionized mini-mill in the United States. The plan was set and the following operational goals were developed:

- Begin caster production of carbon steel in April, 1995.
- Introduce automotive chrome into the mix third quarter of 1995.
- Hit practical capacity by end of 1995.
- Position the mill to increase plant capacity from 720,000 tons per year to over one million tons per year once caster was fully operational.
- Help retain at least 550 high-skilled jobs.

To meet these operational goals the training department established the following goals:

- Have all craft areas fully trained in their specific areas to be able to perform new job requirements by the proposed start up of the caster by April 1, 1995 (one year).
- Reduce craft areas through consolidation from 35 to 11.
- Create cross training opportunities in the blended craft areas.

The primary areas of training concern were:

- Maintenance
- Operator Caster
- Operator Cold Mill

The types of learning and training offered to achieve these goals were:

- Basic Skills
- Upgrader Program
- Expanded Skills (cross training)
- Certificates

Performance Analysis and Action Plan

The goals and objectives were set. The remaining 550 employees were to be laid-off while the mill was modernized and paid while being trained during the plant modernization process. The mill had already contracted with the local community college to provide classroom training to its employees to enhance their core and higher-order skill base. Through discussions with the mill's management, it was determined that a thorough job task analysis would be performed and a system of structured-on-the job training would be designed to train employees in needed skills in the eleven craft areas. The college asked Proactive Technologies to perform

job and task analysis on the new job classifications, which were hybrids (consolidated jobs) of the previous classifications (see Table 2).

[Insert Table 2 here]

Once the job classifications were analyzed and data processed, employees would have finished their core training and were to be ready for structured on-the-job training. All this had to take place and be completed, with fully functional personnel ready for the positions, within the one-year target period for modernization (see Table 3).

[Insert Table 3 here]

Results

Within twelve months, 432 employees completed the training and were re-deployed at the new operation. As the other employees finished their training they, too, were sent to the new operation. When the project was completed two follow-up surveys were conducted. One survey focused on measurable metrics of a successfully structured on-the-job training program from the employer's perspective to ascertain what the employer thought of the experience and how well the teamed efforts of the community college and Proactive Technologies, Inc. were received by management (see Table 4).

[Insert Table 4 here]

In addition, another survey focused on measurable metrics of a successful on-the-job training program from the employee's perspective, such as the impact on safety, efficiencies, and work quality (see Table 5).

[Insert Table 5 here]

Since the survey sample sizes were relatively small and fractured by job classification, the results are difficult to stratify by anything other than "labor" and "management". Although

residual animosities and distrust remained during this period between labor and management, due to the uncertain nature of operational changes, the survey indicated some key results. On three topics of interest to both the employer and the training providers, sixty to sixty-five percent of the surveyed employees from the eleven craft areas said:

1. The training "favorably to extremely well" prepared them for the new jobs for which they were trained;
2. The training "favorably to extremely well" prepared them for the jobs in their industry;
3. The trainee would "favorably to enthusiastically" attend additional training if asked.

Additionally, other anecdotal information derived from other sources within the company operations showed:

- Increased basic skill level of employees.
- Cross-trained workforce.
- Reduced maintenance crafts from 35 to 11.
- Detailed task analysis completed on seven crafts.
- Many processes now performed with fewer employees.
- Greatly reduced downtime.
- Reduced scrap rates.
- Increased productivity.
- Met all yearly safety goals.

The human resources manager for the steel mill said very proudly, "There was no way this [the retraining of their entire workforce within a year] could have happened without the

mill's partnership with the community college. Understanding how we could train workers for jobs that were still being defined was difficult to begin with, but our training partners did it and did it well."

The structured on the job-training model utilized has a successful track record with other employers. This model has been replicated with companies in the Pittsburgh, Pennsylvania, region for the Community College of Allegheny County, as well as at North Shore Community College in Danvers, Massachusetts, with the following client organizations (see Table 6).

[Insert Table 6 here]

Conclusion and Recommendations

In both of these case studies, the performance analysis by consultants from the schools determined a need to gather information about the jobs so that the training offered would teach the appropriate skills needed on the front line of the plants. The proposed solution was to first perform a thorough job task analysis. The data would help the schools select and update classroom training to build a core skill base and design a structured on-the-job training program to train employees to perform the work tasks to a level of mastery. The PROTECH system of managed human resource development was used to collect the job/task analysis data, structure the training, provide a system of automated HRD instrument development, generation and utilization – all designed to structure and support the on-the-job learning process and offer a high degree of content validation.

In both cases, management's commitment to structuring and maintaining not only the training process, but also the entire human resource development process, was clear and continuously demonstrated, a requirement for the program to remain strong and supported by the workers. In all cases, management must ensure that both front-line supervisors and employees

are doing their part to continue to make the program successful. Because of the rapidity of change in these plants, management must continually re-validate training materials to the emerging job requirements, keeping them current and accurate. They must ensure that all documentation and procedures are updated as the job changes.

Structuring the previously unstructured, informal on-the-job training experience offers tremendous cost savings to the employer by accelerating the process of learning. During training, the expert trainer is operating initially at around forty- to sixty-percent capacity, while the trainee is operating from about zero- to thirty-percent capacity. Since both employees are on payroll during this session, accelerating the learning process will cut costs and move the trainee toward a higher degree of productivity and capacity. Multiply the cost savings, alone, by the number of trainees and one can see why employers should, and do, demand a focus on the bottom line.

In the case studies illustrated, this process has been simplified for the employer with the PROTECH system of automated report generation now on site at Parker Hannifin and through the community college support at the steel mill. Both companies succeeded in accomplishing the immediate goals they set based on the solution identified to meet their specific needs. Each organization is pleased with the results they have achieved and have offered numerous testimonials to prospective clients of both The Ohio State University and the Community College of Allegheny County.

Footnotes

[1]Prigelmeier, Dean R. (1987-2000), PROTECH Job/Task Analysis Training Manual, Page 42, Denver: Proactive Technologies, Inc.

[2]Prigelmeier, Dean R. (September, 2001), Parker Hannifin/UAP Project Briefing by Proactive Technologies, Inc and The Ohio State University, Forest, OH

Questions for Discussion

1) Drawing on personal experience, name an example when on-the-job, task-based learning was more appropriate than classroom or other delivery methods?
2) Describe the change in skills required for a "secretarial" position before word processors, after word processors, and with today's computer technology. What other technology changes have affected the secretarial position?
3) The value of classroom training in a work environment is usually measured in contact hours. An appropriate dollar value can be linked to the time spent in the classroom. What measures could be used to measure the value of on-the-job training to the organization? What measures could be used to measure the value lost by unstructured on-the-job training?
4) There is a relationship between "structured on-the-job training" and "simulation." "Fidelity" of simulation refers to the closeness in resemblance between the actual work/work environment and the simulator. Describe how structured on-the-job training materials can be used to create a high-fidelity relationship.
5) Explain the relationship between the five stages of the human resource development model and the critical importance of including all in a systematic approach. One at a time, remove a stage of the model and describe what could happen to the model effectiveness and quality control.

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