"Strategy and Tactics of Task Analysis," Journal of GXP Compliance, Vol. 11, No. 3, April 2007, pp. 26-34

By Gordon Welty, Ph.D.

Task analysis is the process of defining the discrete steps, or tasks that, when executed, will ensure the effective and efficient performance of a job. Careful task analysis can add substantial value to an organization's training courseware.

INTRODUCTION

This article reviews the place of task analysis in the process of developing a standard operating procedure (SOP) and the subsequent training module. Task analysis is the process of defining the discrete steps, or tasks that, when executed, will ensure effective and efficient performance of a job. We look initially at strategic issues and then review some tactical concerns. First, we will consider the strategic relationship between the analysis of training needs and task analysis; then we will examine how task analysis fits into the ADDIE model of instructional design. ADDIE is the acronym of a generic instructional design model, comprised of the following phases: Analyze, Design, Develop, Implement, and Evaluate. Turning next to tactical matters, we will review how an instructional designer plans and prepares for a task analysis, undertakes a task analysis, identifies best practices, and completes the task analysis and incorporates the data into the procedure. Throughout, we will pay special attention to the importance of standards in any SOP.[1]

Analysis of Training Needs

When we analyze training needs, we typically look at four levels of analysis: the organization, its facility, the employee, and the task. The organization includes organizational structure, business case, and supervisory factors; it also includes the employee's compensation and upward mobility. The facility of the organization includes such specifics as working conditions, workplace hazards, and utilities. The organization and its facility are situational levels – they impact on training needs but are not the object of training intervention. Should problems be identified with the facility or the organization, the typical remedy would not be training – it would either be a problem-specific (safety, environmental, etc.) corrective action [2] or it would be an organizational development (OD) initiative.[3] The organization and its facility are important for the analysis of training needs because they situate employees and the tasks they are to perform. The facility and organization can have a profound impact on training needs and training effectiveness.[4]

In considering the required attributes of the employee within the organization, we consider the skill-set and the employee's disposition. The skill-set is encompassed by the employee's curriculum and training plan, which indicate the employee's completed training as well as competencies and qualifications. The dispositions include the employee's personality, insofar as it impacts on work-related attitudes, which contribute in turn to motivations and, ultimately, behaviors. Two different and important motivations are an employee's motivation to participate in the company's established training program, and his or her motivation to transfer the training to the job.[5] The conjunction of skills and dispositions situated in a particular facility and organization creates the employee's work-place performance.

Finally, our analysis of training needs focuses upon the task. The task includes its component steps; the task itself is included in a larger process within a sequence of tasks. Of critical importance in an analysis of the task are the standards that define the acceptable levels of task performance, those levels that will allow the organization to attain its desired outcomes.[6]

Task Analysis and Performance Gaps

Careful task analysis can add substantial value to an organization's training courseware. The purpose of courseware – learning management system (LMS) software, structured on-the-job training (SOJT) module, etc. – is to close a performance gap for some group of employees. The term performance gap means that employee performance does not meet some standard.

Standards provide guidance for tasks and processes within manufacturing and quality control lab systems, as well as in clinical operations, Quality Assurance (QA), biometrics, and pharmacovigilance. As a result of task analysis, best practices are identified, and can be mandated as standards. These standards may be documented in procedures, protocols, manufacturing orders, packaging orders, etc. For example, if a manufacturing order in the pharmaceutical industry stipulates that tablet thickness should be X mm, the pressing cylinder height parameter of an appropriately qualified Fette Tablet Press is set to that standard. For brevity sake, all of these types of documents will be called standard operating procedures (SOPs).[7]

An SOP stipulates standards – and promotes consistent practice – for task performance. Once these standards are specified, it is possible to identify a performance gap, the gap between existing employee performance and the standard required by the SOP. Courseware can then be designed to address the performance gap.

Before the courseware has even entered the developmental process, the data derived from task analysis can be used to revise and improve the SOP that is the basis of the training. Thoroughgoing task analysis will of course add to the overall cost of developing the SOP and the subsequent courseware, but it is a cost that is well worth incurring, because the cost of quality training will be offset in fewer errors on the manufacturing floor.

TASK ANALYSIS AND THE ADDIE MODEL

The ADDIE model is a generic instructional design model. It provides guidance at a fairly high level for instructional designers, software engineers, etc as they author and revise courseware. As we have noted above, the elements or phases of the ADDIE model are Analyze, Design, Develop, Implement, and Evaluate. These elements are sequential – each element depends upon the successful completion of the preceding phase.

Moreover, the ADDIE model is an iterative feedback model, which means that the results of the Evaluation phase are fed back, closing the loop, facilitating further refinement of the courseware. If the evaluation shows that the training module has shortcomings, for example, that the sequence of learning tasks is incomplete, those shortcomings are fed back to the author(s) of the courseware to be analyzed again. Further design and development efforts follow, until the courseware meets the organization's needs. Thus the ADDIE model has an evident affinity with the DMAIC (Define, Measure, Analyze, Design, Verify)[8] cycle of Six Sigma improvement efforts .

It is important to stress that the iterations within the ADDIE model continue until management decides that organizational needs have been met. More generally, any relaxation or deviation from the ADDIE model, such as a "satisficing" level of performance [9] or the skipping of a phase, are management

decisions. These decisions can take the form of criteria established before a project is initiated (e.g. a stopping rule) or while the project is underway (e.g. "that product has been refined enough.") [10]

The initial phase of the ADDIE model, the Analysis phase, refers to the analysis of four aspects of the process that will be addressed by the courseware, be it a manufacturing facility, Quality Control (QC) lab, clinical operations, or drug safety process. These are the analysis of the facility or context, the analysis of the organization, the analysis of employee's skill-set and disposition, and the analysis of the task. These four aspects – facility, organization, employee skills and disposition, and task – are to be analyzed to identify the sequence of tasks, the sum total of the process, which will lead to the outcomes that the organization desires.

A process is a systematically organized set of inputs, tasks or activities, outputs and standards – that pertain to, and control, the inputs, tasks, and outputs.[11] There are several different types of process.

The manufacturing or lab process may be a person to equipment (or instrument) process, a person to paper process, or a person to person process; it may be some combination of the three types. An example of a person to equipment process would be a technician calibrating an instrument; a person to paper process would be a technician recording the as-found and as-left data from a given calibration on the appropriate log; a person to person process would be a line supervisor who is responsible to immediately inform a technician when an instrument is available for calibration. For each of these types of process, the standards are captured in a document.

An SOP documents the standards and tasks that make up a process.[12] A well-formatted SOP facilitates correct task performance and consistent practice. It has a column identifying personnel or positions that are responsible for tasks, a correlative "activities" column indicating the tasks and their sequence, as well as the standards that define the satisfactory completion of the tasks. Once standards are specified, the performance gap between existing employee performance and that required by the SOP can be addressed. The courseware can then be designed to close the performance gap; this remediation activity begins in the Design phase of the ADDIE model.

The question at this point is, How do we winnow through a number of possible standards and tasks to settle upon the best practices for that process, and then document those best practices? [13] How do we write good SOPs?

TACTICS OF TASK ANALYSIS

Clearly, we must analyze the tasks before we can document the tasks. Hence, task analysis comes first; a good SOP depends upon a good task analysis. Several questions about methods must be addressed before a facilitator can undertake a task analysis. How does the author structure the task analysis – will an informal approach or a more formal approach be employed? How will the author collect the data on tasks? There are several options – operator behavior can be directly observed, critical incidents can be reviewed (a case-study approach), questionnaires can be developed (and, if so, can be distributed to various employees), experts can be interviewed, etc. In this article, we will focus our attention on a less formal approach, involving the interview of experts. This approach is broadly applicable and relatively inexpensive.

There are a dozen steps to task analysis; we will discuss each in turn.[14] As with any well-planned project, we must first determine the scope of the task analysis. Once the scope is determined, employees who are experts in the task (called Subject Matter Experts, SMEs) are identified and contacted. Then existing documentation is reviewed; this prevents duplication of effort. Finally, the task analysis session is scheduled. These elements are the responsibility of the author of the SOP or courseware, the facilitator of the task analysis session.

Develop Project Plan

The first step is to develop the project plan for the task analysis. The project plan delineates the process to be analyzed, including its boundaries; the participants, including their levels of expertise, their responsibilities; and the intended outcomes of the task analysis, i.e. the expectations the participants

will have, stated in terms of behavioral objectives or S.M.A.R.T. (Specific, Measurable, Achievable, Relevant, and Time-based) objectives

Suppose, for example, the process to be documented was the manufacture of a petrolatum/wax-based topical ointment, with active ingredient X. The boundaries of the process would be *Dispensing* on the input side, and *Distribution Center* on the output side.

For this illustration, the participants would be SMEs who manufacture the ointment; their responsibilities in the task analysis include identifying relevant documents, generating a list of tasks, identifying the responsible parties, etc.

For the illustrative process, the outcomes might include: identify relevant procedures and manufacturing orders, develop list of tasks (e.g. obtain raw materials, set up equipment, clean and sanitize, prepare excipients, load excipients, load active ingredient, mix according to process parameters, transfer to holding tank, obtain product samples, fill tubes, seal tubes, inspect, package and store product, etc), develop criteria and protocols for identifying responsible parties, and so forth.

The finalized project plan has several uses. It will help to make the business case for the task analysis, direct the review of existing documentation, communicate with the participants – the SMEs – and help to ensure the continuing focus of the on-going task analysis.

Identify Subject Matter Experts

The second step is to identify the SMEs. The author of the SOP is not necessarily the expert, or even an expert, on the process to be documented. There may be several employees who are SMEs on this process. It is important to identify these SMEs, and to get the agreement of management, business owners, and other experts on the list of SMEs.

Among the criteria for identifying SMEs, the sum of their expertise should be comprehensive – it should cover the whole manufacturing or lab process that falls within the scope.[15] It is important to select several SMEs, to ensure that a range (and perhaps variability) of expert opinion is included. Moreover, there are several levels of expertise that should be represented – task analysis relates to proficiency at the task or sub-task level, while domain expertise relates to more comprehensive proficiency – the "big picture," if you will.[16] Also, a number of SMEs will make it more likely that the industrial safety, environmental, regulatory, quality assurance, and cultural aspects of the process are covered in the task analysis. And they should be covered! Once the SMEs have been identified, the list of invitees needs management approval.

Review Existing Documentation

The third step is the review of existing documentation. The project plan of the task analysis will raise several questions, including: Was there a prior version of the SOP? Are there similar SOPs with the same tasks and/or concepts? Are there pre-existing task analyses that can be utilized?

Sometimes the author of the SOP, or management, will suggest that the SOP can simply be a revision of the prior version, with no explicit task analysis. "Clean it up – add a few steps here, delete a few steps there." This is the "literary" approach to writing a SOP, which runs the risk that the successively cloned versions of the SOP will take on a life of their own, taking a tangent that becomes ever more distant from the tasks and process they are intended to document. This literary approach is sometimes called "writing a procedure without leaving one's desk." It is not to be recommended – it is a major source of bad procedures.

Prior versions of a procedure should be reviewed as a preparatory step in a task analysis, not as an alternative to the task analysis. The key source of information for documenting the process is the SMEs who work within the process all the time, not a prior version of the SOP.

Schedule Task Analysis

The fourth step is to schedule the task analysis session. This includes developing the agenda, sending invitations to the SMEs, reserving the room, and assembling all materials for the session.

To this point we have specified the scope of the task analysis; we have identified and contacted the SMEs; we have reviewed existing documentation; and we have scheduled the task analysis session. Now we are ready to undertake the task analysis session.

From this point, as we undertake the task analysis session, the SMEs must be readied. Next, the tasks included within the process must be identified; also task responsibilities must be identified. Then the tasks must be chunked and labeled to reflect the business process, and the business order must be established within and across chunks. Last, concepts need to be identified for each chunk

Prepare SMEs for Task Analysis

When getting the SMEs ready for the task analysis session, it is important to remember that they are the key source of information for documenting the process into an SOP. Treat them right! [17] Make the SMEs comfortable with the agenda, the room, and the building. Locate the restrooms, water fountains, etc. Review the Emergency Response Plan and evacuation routes. Discuss the project plan with them, and then finalize it.

Identify Tasks in Terms of Outcomes

Next, prepare the SMEs to identify the tasks in terms of the outcomes. This involves distinguishing between steps, tasks, and processes. A step is a discrete action (e.g. throw a switch). A task is a set of steps that achieve a specific outcome (e.g. shut down the tablet press). A process is a set of tasks that achieve a more general outcome (e.g. produce a batch of topical ointment). Once these have been clarified, the SMEs can begin to identify tasks.[18]

As the group identifies and lists tasks, bear in mind the role of the facilitator of this task analysis session. Facilitators should focus on getting information from the SMEs rather than contributing themselves. The facilitator should provide direction as well; the session should focus on tasks, not processes. The SMEs should, at a minimum, provide action verbs and a direct object for each task statement.[19] As SMEs identify tasks, begin to map out the process. Encourage the SMEs to review and correct the process map as the group proceeds; at this stage the process map is a work-in-progress.

Identify Task Responsibilities

Ask the SMEs to begin to identify task responsibilities. Which employee or position is responsible for each task? Be alert for ambiguous responsibilities – there can be no task without a unique responsible party. If it appears that a task has no responsible employee, or a number of responsible employees, it is unlikely that the SMEs will be able to resolve the issue. Each ambiguity should be noted for later resolution by management. There may be a need to add “swim lanes” to the process map to distinguish the various responsibilities and collaborations.

Be alert for disproportional task responsibilities. If a position has only one responsibility in a lengthy procedure, this may signal that the task should be moved entirely to another SOP. For instance, the task responsibilities of end users, data managers, and system administrators in a typical database SOP are quite disproportionate. End users log on, maintain the integrity of passwords, navigate the application, query, print pre-formatted reports, call the help desk with problems, and log off. In addition to these tasks, data managers enter, edit, and verify data, change fields, print customized reports, etc. In addition to all these tasks, system administrators maintain security, allocate rights, etc. Rather than including all these tasks in a single lengthy “Database SOP,” it is preferable to have several shorter procedures, one for each user group. The training implications are less formidable, and the possibility exists of consolidating SOPs, for instance an “End user SOP” for a number of applications.

In any case, identifying task responsibilities will prove useful for a preliminary Training Audience List of employees who must be trained on this SOP.

Chunk and Label Tasks

When the task analysis session is underway, begin to chunk and label the tasks to reflect the business process. Ask if the tasks can be aggregated. For example, “Sign the calibration log,” “Date the calibration log,” and “Have supervision review the log” might be aggregated as “Complete the documentation of the log.” At this stage of the task analysis, it is important to chunk from the employees’ perspective; use audience-focused words. Labels provide a rationale for the chunks. Aim for about seven tasks per chunk. Be alert for the need to map subtasks, as well as decision points (and associated

decision criteria), strategies, etc.

Also, establish the business order for the chunks. What is the flow within the process? If a clear logical order is not available, use a generic order. If a single order is not possible, establish a unique order for each of the main user groups. (This may be another signal that there are multiple SOPs involved.)

Identify "Chunk" Concepts

Finally, identify concepts for each chunk. Tasks describe how to do something; concepts provide the science for task performance. For example, "Completing the documentation of the log" might be conceptualized as "Making the calibration process 'Audit Proof'," ensuring that there is a complete audit trail for every calibration.

At this point, we have prepared the SMEs for the task analysis; we have identified the tasks related to the scope; we have identified the responsible party for each task; we have chunked and labeled the tasks to reflect the business process; we have established the business order within and across the chunks; and last, we have identified concepts for each chunk. Now we are ready to complete the Task Analysis.

From this point, a draft process map will be prepared that includes the tasks, chunks, and concepts. Next, we will highlight best practices by means of a peer review of the draft process map by the SMEs (perhaps a subset) or other experts. Next, we challenge the draft process map on the floor or in the lab, to stress its real-world applicability. Finally, we revise the process map in light of these critical inputs.

Draft Process Map

The tenth step is to complete the draft of the process map. Start at a high level and work down, in an iterative fashion, to the desired level of detail. Be sure to include the beginning and the end of the process; check back to the scope statement. Do not include anything that's outside the scope. Keep a relatively uniform level of detail; don't have some aspects of the process mapped out in great detail, and other aspects merely sketched. Step back from the map, as you're drafting it, to review its overall appearance, its coherence.

Submit Process Map to Peer Review

When the draft is ready, submit it to a peer review by some or all the SMEs, other experts, or the business owner. On the positive side, the reviewers should look for best practices, value-adding steps, flexibility in light of changing demands, and scalability in light of changing output targets, etc. On the negative side, they should look for bottlenecks in the process, duplication of effort, unnecessary steps or tasks, non-value-adding steps, role ambiguities (several positions responsible for a task, or no one responsible for a task), etc. Document all the points raised by the peer review.

Then, we test the process map's real-world applicability by challenging it step-by-step on the floor or lab bench. Select a seasoned employee within the scope – not a SME – and compare the process as mapped with the employee's activities. Do they align? Ask questions – look for evidence of resistance, repetition, human factors problems like task complexity. Document everything in the challenge.

Assemble, Evaluate, and Revise Process Map

The last step in the task analysis is to assemble all the data from this stage, evaluate it comprehensively, and revise the process map in light of it.

Now we have completed the task analysis. We have drafted the process map; we have highlighted best practices; we have challenged the process map in a real-world setting; and finally, we have revised the process map in light of all these inputs. It is time to seek management approval.

Once the task analysis has been finalized, and approved by management, the facilitator can translate the task analysis process map into the documentary form of the SOP, the actual procedure, protocol, manufacturing order, packaging order, etc. Many times, this translation will amount to the discursive writing out of the process map captured in Visio. Any time the documentary form deviates from the

Illustrative task analysis of the steps and sub-steps involved in copying a document on a photocopier. [20]

1. Prepare photocopier
– 1.1. Switch on
– 1.2. Wait for warm-up cycle to be completed

2. Select desired number of copies

3. Prepare first page of original for copying
– 3.1. Raise lid
– 3.2. Locate page in appropriate position on the glass
– 3.3. Close lid

4. Activate copying cycle
– 4.1. Press start switch
– 4.2. Ensure that the original does not move

5. Check quality of photocopy
– 5.1. If OK, go to step 6
– 5.2. If not OK, select appropriate corrective action
– 5.2.1. Put in more copy paper
– 5.2.2. Remove paper jam
– 5.2.3. Readjust position of original
– 5.2.4. Adjust toner setting

6. Remove copied original and replace with next page
– 6.1. Raise lid
– 6.2. Remove copied original
– 6.3. Replace with next page to be copied
– 6.4. Close lid

7. Repeat steps 4–6 until all pages are copied

8. Remove last page of the original

9. Check that all pages have been copied satisfactorily

10. Switch off photocopier

11. Gather up all materials and depart

process map, the latter will provide the guidance.

After the SOP has been developed, revised, and approved, the author can turn to the design of courseware that will close any performance gap(s) that are evident in employee task performance.

CONCLUSION

We have considered how SOPs – and associated standards that allow us to identify performance gaps – are developed out of task analysis. At a strategic level, we've examined the relationship between the analysis of training needs and task analysis. Then we considered the place of task analysis in the ADDIE model of instructional design. Turning to tactical issues, we've reviewed how the author of a SOP prepares for a task analysis, conducts a task analysis, and finalizes the task analysis and incorporates the data, including best practices, into the SOP. The SOP is then used as a point of comparison with employee task performance, to identify a performance gap. This points the way to the next phase of the ADDIE model, where courseware is designed to address that performance gap.

ABOUT THE AUTHOR

Gordon Welty, PhD, has been designing, developing, facilitating, evaluating and managing technical and regulatory training programs in the healthcare and Pharmaceutical Industries for more than twenty years. Most recently, he was Manager of the GMP Train-the-Trainer Program at Schering-Plough Corporation in New Jersey, where he had a central role in the development and rollout of the "New Training System" and associated learning management system in response to Schering-Plough's consent decree.

He is also the webmaster of the GMP Training and Education Association. Contact him at gwelty@wright.edu

ENDNOTES

1. We use the following terminology in this article: **Author** – an instructional designer, the originator of a procedure, the facilitator of the task analysis session, a technical writer, etc.; **Courseware** – a training module, LMS software, job aid, organizational development program, etc.; **Management** – can refer to either supervision in a line of business or the supervision of a given author; which one will be clear in context; **SME** – a subject matter expert in a task or process.

2. See the excellent case-study in James L. Vesper, Performance: The Goal of Training – or Why Training is Not Always the Answer, *BioPharm* (Eugene), (Feb 2001), Vol. 14, Part 2, pp. 44-46.

3. See R. W. Tuli and G. E. Apostolakis, Incorporating Organizational Issues into Root-cause Analysis, *Process Safety and Environmental Protection*, (1996), 74, 3-16.

4. Irwin Goldstein and Kevin Ford, *Training in Organizations*, Belmont, CA: Wadsworth, 4th ed. (2002).

5. Jason Colquitt, Jeffrey LePine, and Raymond Noe, Toward an Integrative Theory of Training Motivation, *Journal of Applied Psychology*, (2000), 85 (5), 678-707.

6. Kenneth Nowack, A True Training Needs Analysis, *Training and Development Journal*, (April 1991), 45(4), 69-73.

7. The FDA refers to these documents as "procedures" in 21 CFR 211, and as "standard operating procedures" in 21 CFR 58.35.

8. See Kevin Linderman, Roger Schroeder, Srilata Zaheerr, and Adrian Choo, Six-Sigma: A goal-theoretic perspective, *Journal of Operations Management*, (2003), 21, 193-203. Indeed, Kaliym Islam has recently suggested that the Analysis phase of the ADDIE model be preceded by Define, and Measure phases, to ensure that "true business requirements" are specified, and appropriate metrics are selected from the outset. See "Designing an Effective Certification Program," *LTI Newsline* (14 Dec 2005). The importance of identifying, and addressing, the his business case for a proposed revision of a SOP, or for the subsequent training intervention, can hardly be overstated.

9. See Herbert Simon, A Behavioral Model of Rational Choice, *Quarterly Journal of Economics*, (1955), 69(1), 99-118; Richard Day, Profits, Learning, and the Convergence of Satisficing to Marginalism, *Quarterly Journal of Economics*, (1967), 81(2), 302-311; Alex Michalos, Rationality between the Maximizers and the Satisficers, *Policy Sciences*, (1973), 4(2), 229-244; and Barry Schwartz, et al. Maximizing versus Satisficing, *Journal of Personality and Social Psychology*, (2002), 83(5), 1178–1197.

10. This consideration obtains within the phases of the ADDIE model as well. For example, the "P x C" rule for continuing (or concluding) a task analysis, where the probability "P" of performance failure times the cost "C" of performance failure, is estimated for a given level of granularity of the task analysis. If P x C is unacceptably large, the task analysis continues to a more fine-grained level; see Neville Stanton, Hierarchical task analysis: Developments, applications, and extensions, *Applied Ergonomics*, (2006), 37(1), 55–79; also Liu Xijuan, Wang Yinglin, and Jaing Shouwei, A metrics based task analysis model for design review planning, *Design Studies*, (July 2003), 24 (4), 375-390. Specifying the value of the estimates of P and C, as well as the criterion of acceptability itself, is ultimately management's decision, which highlights the importance of ongoing communication between the facilitator of the task analysis, the facilitator's management, and the business owner of the SOP.

11. Mary Benner and Michael Tushman, Process Management and Technological Innovation, *Administrative Science Quarterly*, (2002), 47(4), 676-706.

12. John DiLollo, The Use of SOPs in a Pharmaceutical Manufacturing Environment, *Journal of cGMP Compliance* (2000), 4(3), 33-35.

13. Yasar Jarrar and Mohamed Zairi, Best Practice Transfer for Future Competitiveness, *Total Quality Management*, (2000), 11(4), 734-741.

14. While it restricts itself to e-learning topics, Conrad Gottfredson, Rapid Task Analysis, *Learning Solutions e-Magazine*, (June 2002), Issue 160 is very useful.

15. Robert Gatewood and Hubert Feild, *Human Resource Selection*, Ft. Worth, TX: Harcourt, 5th ed (2001).

16. Charles Reigeluth, "Elaboration Theory," in C. M. Reigeluth (ed) *Instructional Design Theories and Models*, Mahwah, NJ: Lawrence Erlbaum (1999), p. 435.

17. Peter Zvalo, Writer and Subject-Matter Expert — Establishing a Positive Relationship, *Writer's Block* (Summer 2000); Dorothy Leeds, The Power of Questions, *Training and Development Journal*, (2000), 54(10), 20-22; Joseph Mattoon, Designing and Developing Technical Curricula: Finding the Right Subject Matter Expert, *Journal of Industrial Teacher Education* (2005), Vol. 42(2).

18. Brenda Sugrue, Performance-Based Instructional Design for E-learning, *Performance Improvement*, (2002), 41(7), p. 52 provides a Task Analysis Template that is useful for guiding and documenting the interaction with the SMEs.

19. Darin Hartley, Job Analysis at the Speed of Reality, *T + D*, (2004), 58(9), 20-22.

20. James Reason, Combating Omission Errors through Task Analysis and Good Reminders, *Quality and Safety in Health Care*, (2002), 11(1), p. 43.