Developing Performance-based Curriculum Architecture Using a Group Process

Using a Group Process to Create Performance Models and Knowledge/Skill Matrices

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Introduction

A Proactive Approach

Fire-fighting is common in training departments. As needs flare across an organization, training staff race back and forth dousing them with rationed resources. Unfortunately, the level of the "spotter" (e.g., vice president of marketing) usually determines the amount of resources allocated to fight the fire. As a result, training efforts cannot be systematically directed at those training needs that have the greatest potential impact on organizational performance.

Training departments can take a significant step away from this reactive mode by proactively soliciting organizational support in designing a performance-based Curriculum Architecture. This architecture can be designed for the entire organization, the various functions, or the jobs of the client groups they serve.

Based on an analysis of the work to be performed, a Curriculum Architecture organizes training needs into a logical sequence of courses of modules directly related to the performance requirements of the target audience. With this design in hand, the training department has an overall guiding framework. This framework allows them to systematically involve their various client organizations in providing input for the proactive planning and prioritization of the work to be performed in the development, delivery, and maintenance of training programs.

Although a Curriculum Architecture can be built in a variety of ways, this paper describes a group process methodology that provides three major benefits. First, the group process generates a performance-based Curriculum Architecture. This architecture focuses specifically on what the trainee needs to know to perform effectively the identified tasks of the job.

Second, the group process approach is much faster and, therefore, can be less expensive than other methods, thus meeting ever-present time and budget constraints.

Finally, the group process is particularly appropriate in situations where training department and user group relations are not as good as they should be. By involving line managers and employees in the curriculum design effort, the "we-they" syndrome begins to break down. User groups gain a sense of ownership of the results and start to perceive the training department as responsive to their needs.

Developing a Performance-based Curriculum Architecture Using a Group Process

Curriculum Architecture

A training Curriculum Architecture identifies the modular structure and typical, logical paths an individual would follow in the formal process of acquiring the knowledge and skills required to perform the assigned tasks of a job.

An identified Curriculum Architecture is advantageous in developing the broad strategies and specific plans to sort and prioritize the true training needs from the many organizational wants.

A Four-step Process

The group process method employs four steps.

1. Determine the scope of the Curriculum Architecture.
2. Establish a Curriculum Committee and select group process participants.
3. Conduct Performance Modeling and analysis meetings.
4. Design the Curriculum Architecture.

Step 1. Determining Curriculum Architecture Scope

The scope of the Curriculum Architecture project can be as broad as the entire organization or as narrow as a single job. Since the primary purpose of the Curriculum Architecture is to provide a framework for planning course development activities, training departments should select a scope that will ensure representation of the training needs of its major client groups.

One common approach to determining the scope of the Curriculum Architecture is to follow existing organization structures or functions. For example, Curriculum Architectures might be developed separately for the marketing, engineering, manufacturing, and management functions.

When a company is involved in a variety of different businesses (e.g., microprocessors and radios) or is highly decentralized, it may be necessary to develop functionally based Curriculum Architectures in each business or location. To the extent that the businesses or locations perceive themselves to be distinctly different from their counterparts, selling a single curriculum for all may prove politically difficult.

The target population of the trainees to be covered by the Curriculum Architecture is another scope issue. For example, the Curriculum Architecture could focus on the training needs of experienced hourly personnel. It might also address basic, advanced, or change-driven training needs. Decisions made in identifying the target population depend upon the charter of the training department, the level and distribution of the competencies in the workforce, current business plans and strategies, and existing training programs.

In general, two considerations should guide the selection of the scope for a Curriculum Design project. First, as the training needs of user groups become more diverse, a narrower project scope will usually result in a more accurate and comprehensive Curriculum Architecture. Second, since acceptance of the Curriculum Architecture is essential to its ultimate implementation, the willingness of user groups to own the design must be carefully considered.

Step 2. Establishing Participant Groups

Once the project scope has been determined, participants in the Curriculum Design effort must be identified and recruited. It is possible for three groups with different members and roles to be established. They include the Project Committee, Expert Group, and New Hire Group.

1. Project Committee

To guarantee the participation and involvement of clients in the process, key middle managers working in the organization, function, location, or job selected for study are recruited to serve on a Curriculum Project Committee.

This Project Committee oversees the Curriculum Design project—reviewing, critiquing, and approving all outputs. Also, the Curriculum Project Committee identifies subject matter experts and new hires who will participate in the group meetings in which performance will be analyzed and the Curriculum Architecture constructed.

Generally, the Curriculum Project Committee will meet twice during the project. They will meet once to review the project plan and select group process participants, and again at the end of the project to review and critique the results and set priorities for training development activities.

2. Expert Group

The roles of the Expert Group include developing a Performance Model, identifying knowledge and skill requirements, building the Curriculum Architecture, and (where relevant) critiquing the existing curriculum. Criteria for selecting group members include subject-matter expertise and representation of the organizations (both line and staff) and locations that will implement the training. Because it provides basic information on work performance and the knowledge

and skills needed to support that performance, this group is critical to the success of the Curriculum Design effort. Total time commitment for this group may be two or three days of meetings, depending on the scope of the curriculum to be designed. No outside work is required of group members.

3. New Hire Group

A separate group of new hires may meet to review the Performance Model and knowledge/skill requirements generated by the Expert Group. These new hires, preferably with 6-12 months of experience, add the perspective of the new employee whose view of training needs may be different from those of more experienced personnel. The Expert Group or the Project Committee may review any additions made to the model by the new hire group.

Step 3. Modeling and Analyzing Performance

In a typical two-day meeting, the Expert Group is led through a systematic process in which the target audience performance is modeled and analyzed. During the course of this meeting, a Performance Model is generated and posted in the meeting room for constant reference. The typical contents of a Performance Model are listed below.

- A *mission statement* for the function/job
- A list of the *major accomplishments or responsibilities* of the function/job
- A list of the *major outputs* produced per accomplishment/responsibility
- A list of the *major tasks* supporting each output
- *Measures* by which major outputs are evaluated (e.g., accuracy, timeliness)
- Typical *deficiencies* in the outputs
- Perceived *causes of deficiencies* (e.g., lack of knowledge, task interference)

An example from a Performance Model generated via this process is shown in Exhibit 1. A portion of Exhibit 1 is included below.

Draft
XXXXXXXXXX
Functional/Job Model
Service Sales

Meeting Date: April 18-19, 1983

Mission: Meet the needs of our customers through the profitable sales of company products and services, e.g.,

Service agreements
Price quoted
Non-installed
Time and materials

Major Duties:

I. Identify and Qualify Potential Prospects
II. Call on the Prospects
III. Develop a Solution/Proposal
IV. Present and Close
V. Follow-up

The Performance Model and analysis is central to the development of performance-based Curriculum Architecture in three ways. First, it establishes effective work performance as the ground and criterion for all training activities.

Second, in defining the major accomplishments, outputs, and tasks, it provides the basis for accomplishment/task-oriented training modules (e.g., how to develop a manufacturing plan).

Third, by analyzing typical deficiencies and their causes, it screens performance problems to find those that may have training solutions (e.g., skill deficits) rather than nontraining solutions (e.g., organizational reward system, poor equipment). Increasing the group's awareness of the fact that training is not a panacea for solving all performance problems is a valuable side benefit of that step.

The next step in the Expert Group meeting is to develop Knowledge/Skill Matrices. We begin building these matrices by showing the group a list of knowledge and skill categories. In working with engineering groups, for example, the following categories have been used:

- Introduction and Background
- Policies and Procedures
- Tools and Resources
- Product Technologies
- Process Technologies
- Technical Engineering Skills
- Generic Professional Skills
- Management Skills
- Theories and Concepts

The particular categories used are not critical. Their purpose is to stimulate, rather than restrict, the group's thinking about work-relevant knowledge and skills.

Specific knowledge and skill needs in each category are generated by tracking back through the Performance Model and analysis, looking particularly at deficiencies for which the perceived cause is a knowledge/skill deficit. When the group is satisfied that all major knowledge and skill needs have been captured in at least one of the categories, each specific need is cross-

referenced to the major accomplishments identified in the Performance Model. This results in a Knowledge/Skill Matrix like that shown in Exhibit 2. Part of Exhibit 2 is shown below.

* See above for explanation of code

XXXXXXXXXXXXXXXXXXXX
FIXED RATE PERSONNEL
Knowledge/Skill Modules

Knowledge/Skill Category: COMPONENTS	Comp Station Systems*																							Pipeline Systems*									Learn Diff*	Est. Hrs.	Type Train*	Pri-ority
	A		B							C		D				E			F	G		H				I	A	B		C			D	E	F				
	1	2	1	2	3	4	5	6	1	2	1	2	3	4	1	2	3	1	1	2	1	2	3	4			1	2	1	2	3						
1. High Pressure Gas Valves					X	X					X	X	X												X	X		X				X		X	2	8	Checklist M1/SA/GP	14
2. Gas Pipe		X	X		X	X	X	X	X	X		X	X					X							X	X	X	X				X			1	2	M1/SA/GP	8
3. Flanges		X	X		X	X	X	X	X	X		X	X					X							X	X	X	X				X			1	2	M2/GP	7
4. Fittings		X	X		X	X	X	X	X	X		X	X					X							X	X	X	X				X			1	2	M2/GP	7
5. Bolts		X	X		X	X	X	X	X	X		X	X					X							X	X	X	X				X			1	2	M2/GP	7
6. Gaskets		X	X		X	X	X	X	X	X		X	X					X							X	X	X	X				X			1	2	M2/GP	7
7. Insulators		X	X		X	X	X	X		X		X	X					X							X	X	X	X				X			1	2	M2/GP	7
8. Regulators					X	X					X	X	X					X							X	X		X				X		X	2	8	Checklist M1/SA/GP	7
9. Anodes									X																		X									1	2	M2	4
10. Silencer					X																				X	X									1	1	M2	0
11. Meter Tubes					X	X												X														X			1	1	M1	5
12. Rectifiers									X																		X									1	2	M1/GP/SA	7

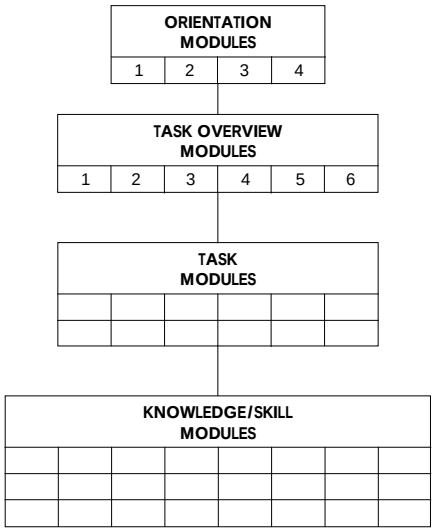
This cross-referencing of knowledge and skills to accomplishments serves three purposes. First it reaffirms the relevance of the particular knowledge or skill to the work itself.
Second, it provides specific direction for the individual who will ultimately develop a training program to teach the knowledge or skill. Rather than developing a generic program in oral presentations, for example, the training developer knows from the beginning that oral presentation skills are needed only in certain aspects of the job. The training program can then be designed to develop skills related to the particular kinds of oral presentations required by the work, for example, formal oral presentation of new product ideas to senior management.

The Knowledge/Skill Matrices also provide information useful in modularizing the curriculum and developing a strategy for training delivery. If a specific knowledge or skill is used in all major accomplishments, it may be appropriate to develop a single course to cover all its applications on the job. Where a knowledge or skill is relevant to only one or two accomplishments, however, it might be more efficient to teach that content in conjunction with a course or module dealing with that particular accomplishment or task.

Once the Performance Model and Knowledge/Skill Matrices have been developed by the Expert Group, the New Hire Group meets for one day to review the material and make additions based on their perceptions of the needs of new employees.

Step 4. Designing the Curriculum Architecture

In a two- to three-day meeting, the Expert Group reconvenes to review the work of the new hires and to design the Curriculum Architecture. At this time, it is helpful to add members of the training staff to the group. Their role is to contribute information on existing training programs, potential or existing delivery methods, and training delivery forecasts.



Designing the general structure of the Curriculum Architecture is the first step in this process. Although curricula can be structured in many different ways, the four-level structure shown below has proven useful for a wide variety of functions and jobs.

The top level in this type of Curriculum Architecture contains training modules designed to orient and introduce the employee to the company, its divisions, product lines, procedures, policies, etc.

At the third level, task overview modules provide trainees with overview of the major accomplishments/responsibilities and tasks identified in the Performance Model.
Task modules at the second level teach the employees the detailed procedural steps involved in completing each of the tasks.

Finally, first-level modules support the task modules by providing instruction on basic or advanced knowledge or skills. These supporting knowledge/skill modules are linked to task and task overview modules according to the group-developed Knowledge/Skill Matrices and would be completed prior to, upon completion of, or in conjunction with a particular task module.

Once the general structure of the Curriculum Architecture has been set, the group should organize all the training content into modules and identify sequential relationships between them. Modularizing the training content is a demanding and creative task, requiring the simultaneous consideration of a large number of variables. The variables that have the most significant impact on modularization are those relating to delivery of the training. These include

- Number of trainees who will need the training
- Geographical spread of trainee populations
- Optimal timing of training
- Optimal delivery mechanisms for different types of training content
- Estimated learning time for each type of content

- Acceptability of delivery method to user groups
- Existing resources—budget, staff, facilities, equipment
- Range of knowledge and skill levels within the target population

In considering these variables, the group will break the content up into modules of varying length. For example, we recently designed a Curriculum Architecture for a target population that was scattered across remote locations, could not be taken away from the job for significant periods of time, and was accustomed to on-the-job coaching as a primary delivery method. To accommodate this situation, a Curriculum Architecture was developed containing 212 mentor-delivered modules, each taking only about 30 minutes to complete.

With a modularized Curriculum Architecture in hand, the final design is for the group to

- Identify, where possible, which subgroups within the target population will need each module.
- Identify the impact of the content of each module on job performance (i.e., its criticality).
- Estimate the length of time necessary to complete each module.
- Make recommendations on priorities for developing the modules.

Summary

Risks and Benefits of the Group Process

What risks are involved in using the group process? Without a leader who has a clear understanding of what data must be generated to produce a Curriculum Architecture and who has excellent group dynamics and process skills, the group process methodology will probably not succeed.

Even with an outstanding leader, however, the group process will run into trouble if there are serious disagreements within the group that cannot be resolved. For example, if group members in a software development function disagree on whether a particular new computer language will or will not become the standard in their work, it may not be possible to produce a Curriculum Architecture that will be broadly accepted. Although we have not encountered such a situation, it must be recognized as a possibility.

Note, however, that this problem would not be unique to the group process method. If clients cannot agree on how the work will be done, it will be extremely difficult to design a satisfactory Curriculum Architecture, regardless of methodology. These risks must be taken seriously. However, use of the group process approach produces a number of important benefits. First, the active participation of the clients in the process produces ownership. The training curriculum no longer belongs to the training department, but rather it reflects actual client needs.

When people disagree on the nature of the work, the criticality of training modules, or development priorities, the group process provides a forum for conflict resolution. A capable group facilitator can guide the group toward compromise and consensus. This also contributes to the participants' sense of ownership of the resulting curriculum.

A third benefit of the group process is its speed. While each of the process steps described above could be accomplished in individual interviews, the total time involved in designing the Curriculum Architecture is much greater than with the group process. Another problem is that individual interviews must be integrated by someone. Typically, this is done by training specialists, thus reducing the clients' sense that the result is their own.

Regardless of methodology, a Curriculum Architecture provides a valuable, broad survey of the work-related training needs of its clients. As a client-driven database, the Curriculum Architecture can be used to estimate the resources necessary to actually develop and deliver the needed training. Rather than approaching senior management with wish lists, the training department can base its budget requests on solid data. Once clients have been involved in the curriculum design project, they often line up behind the training department to support its resource requests. These have become perceived needs, and they want to see them met.

In sum, a Curriculum Architecture designed through a group process can be a significant step toward building a proactive training department that is perceived as directly aligned with the attainment of organizational objectives.

A list of job functions that this process has addressed is provided in Exhibit 3.

Exhibit 1

Draft
XXXXXXXXXX
FUNCTIONAL/JOB MODEL
Service Sales

Meeting Date: April 18-19, 1983

Mission: Meet the needs of our customers through the profitable sales of company products and services, e.g.,

Service agreements
Price quoted
Non-installed
Time and materials

Major Duties:

I. Identify and Qualify Potential Prospects
II. Call on the Prospects
III. Develop a Solution/Proposal
IV. Present and Close
V. Follow-up

Exhibit 1

Draft
XXXXXXXXXX
FUNCTIONAL/JOB MODEL
Service Sales

I. Identify and Qualify Potential Prospects

Outputs	Tasks
List of potential prospects	Review existing customer base (installed jobs)
List of qualified prospects	Review facilities listings
File for each qualified prospect	Review department of energy applications lists
	Review system sales' quote register
	Review other listings, e.g., Dunn & Bradstreet Hospital listings School listings Etc.
	Prequalify potential customers based on local criteria (regional/in-branch)
	Search for existing files/information
	Identify initial contacts

Exhibit 1

Draft
XXXXXXXXXX
FUNCTIONAL/JOB MODEL
Service Sales

I. Identify and Qualify Potential Prospects (continued)

Measures	Typical Deficiencies	Causes
Quantity and quality of qualified potential customers on list	Chasing after unqualified prospects	Lack of aggressiveness
Percent turned into quotes	Lack of organization in qualifying/prospecting	Don't understand the importance
Percent CQB/PQB		Don't understand how to qualify
		Lack of information on qualification process guidelines/tools
		Lack of management involvement in teaching/coaching new sales personnel

Exhibit 1

Draft
XXXXXXXXXX
FUNCTIONAL/JOB MODEL
Service Sales

II. Call on the Prospects

Outputs	Tasks
Call strategy	Develop a call strategy
Key personnel identified	Call on prospect
Customer response sheet	Introductions and establish rapport – trust
Identification of customer situations/ needs	Self
An order (occasionally)	Company
	Products and services
	Identify decision-making process and authorities
	Probe for customer needs
	Clarify needs/reach agreement on needs
	Attempt to close (if appropriate)
	Set up next appointment
	Determine customer's past experiences with similar vendors
	Document calls
	Needs
	Agreements
	Appointments
	Etc.

Exhibit 1

Draft
XXXXXXXXXX
FUNCTIONAL/JOB MODEL
Service Sales

II. Call on the Prospects (continued)

Measures	Typical Deficiencies	Causes
Number and organization of calls	Not getting required information	Poor strategy/ organization
Number of quotes	Poor strategy/no objectives set	Lack of selling skills/ experience
Number of bookings	Not enough calls made	Poor probing/ questioning skills
Quality of call strategy Schedule/ organization	Missing the customer's real needs	Lack of knowledge of what information to get
Quality of call		Poor organization/ scheduling of calls
Quality/quantity customer information documented		Poor prospecting
Customer feedback		Excess paperwork
		Poor listening/too wrapped up in own presentation

Exhibit 1

Draft
XXXXXXXXXX
FUNCTIONAL/JOB MODEL
Service Sales

III. Develop a Solution/Proposal

Outputs	Tasks
Estimate form	Review call request
Economic constraints	Arrange and complete customer "walk-through"
Time frames and constraints	Identify problems/opportunities/constraints
Budget schedules and constraints	Identify general building systems design and intent
List of potentially required products/services to meet the customer's needs	Develop solution
Systems design	Identify and prioritize needs/constraints
Specifications	Go/no-go decision (risk assessment)
Proposal	Identify and cost-out alternative solutions
	Select best solution for recommendation and rationale
	Start high
	Features and benefits
	Complete basic systems design and bid estimates
	Review design and bid estimate with appropriate branch personnel
	Plan and prepare the proposal presentation
	Contact customers to review/pre-close proposal
	Features and benefits
	Reduce surprises
	Create need/desire

Exhibit 1

Draft
XXXXXXXXXX
FUNCTIONAL/JOB MODEL
Service Sales

III. Develop a Solution/Proposal (continued)

Measures	Typical Deficiencies	Causes
Quality (professionalism) and completeness of proposal	Inaccurate proposal	Lack of technical knowledge
Completeness/ accuracy of the interpretation of the walk-through	Technically not comprehensive	Poor follow-through
Identification of opportunities	Low percent of quotes to bookings	Poor qualifying/ prospecting
Percent of quotes	Low gross margin	Poor proposal preparation
Gross margin $	Poor repeat business	Market conditions
Repeat business	Poor customer feedback	Failure to review bid estimate/systems design
Customer feedback		Labor problems on the job
		Lack of follow-up during installation
		Engineering performance deficiencies
		Poor execution
		Poor communication with customer
		Poor team coordination

Exhibit 1

Draft
XXXXXXXXXX
FUNCTIONAL/JOB MODEL
Service Sales

IV. Present and Close

Outputs	Tasks
Presentation	Arrange meetings with key decision-makers
Proposal package	Deliver presentation
Cover letter	Obtain customer feedback
Drawings/schematics	Summarize features and benefits
Contracts	Close/ask for the order
Signed contracts/ proposal/PO	Get contract/proposal signed or get PO number

Exhibit 1

Draft
XXXXXXXXXX
FUNCTIONAL/JOB MODEL
Service Sales

IV. Present and Close (continued)

Measures	Typical Deficiencies	Causes
Amount of modifications/ revisions to proposal	Afraid to or never asks for the order	Lack of confidence
Orders booked	Bad proposal	Fear of rejection
Quality of presentation	Poor closing	Poor preparation
Completeness	Present to nondecision-maker	Bad closing technique
	Don't get the order	Poor prospecting/didn't identify the decision-maker
		Unforeseen circumstances
		Management changes

Exhibit 2

* See above for explanation of code

XXXXXXXXXXXXXXXXXXXX
FIXED RATE PERSONNEL
Knowledge/Skill Modules

Knowledge/Skill Category: THEORY/CONCEPTS	Comp Station Systems*																									Pipeline Systems*									Learn Diff*	Est. Hrs.	Type Train*	Pri-ority
	A		B						C		D				E			F	G		H				I	A	B		C			D	E	F				
	1	2	1	2	3	4	5	6	1	2	1	2	3	4	1	2	3	1	1	2	1	2	3	4			1	2	1	2	3						
1. Electrical Circuits DC	X	X	X	X	X				X		X		X	X	X	X	X	X					X		X								X	2	2	M1/SA/GP	12
2. Electrical Circuits AC	X	X	X	X	X		X		X		X		X	X	X	X	X	X	X	X	X	X	X	X			X		X	X	X	X	X	X	2	2	M1/SA/GP	11
3. Electrical Motors, Generators		X	X		X		X	X						X				X	X	X	X	X		X			X				X		X	2	2	MI1/SA/GP	7
4. Reciprocating Engines & Compressors		X	X																																2	4	M1/SA/GP	13
5. Turbine Engines & Compressors			X																						X	X						X		X	2	2	Vendor-tapes M1/SA/GP	13
6. Pneumatics			X	X	X	X		X			X	X	X	X				X	X	X	X	X			X										2	2	M1/SA/GP	
7. Hydraulics			X		X		X	X					X																									

Exhibit 2

* See above for explanation of code

XXXXXXXXXXXXXXXXXXXX
FIXED RATE PERSONNEL
Knowledge/Skill Modules

Knowledge/Skill Category: THEORY/CONCEPTS (continued)	Comp Station Systems*																								Pipeline Systems*									Learn Diff*	Est. Hrs.	Type Train*	Pri-ority
	A		B						C		D				E			F	G		H				I	A	B			C			D	E	F				
	1	2	1	2	3	4	5	6	1	2	1	2	3	4	1	2	3	1	1	2	1	2	3	4			1	2	1	2	3							
8. Basic Mechanical Theory	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X		X	X	X	X	X			X	X	X	2	4	M1/SA/GP	14
9. Gas Properties & Measurement			X	X		X				X	X	X	X	X				X			X	X			X		X					X	X	X	1	2	M1/SA/GP	7
10. Instrumentation—Engines		X	X	X	X	X	X	X			X	X	X	X				X							X											2	4	M1/SA/GP	13
11. Instrumentation—Turbines			X	X	X	X	X	X			X	X	X	X				X							X											2	4	M1/SA/GP	13
12. Instrumentation—Gas Compressors			X	X	X	X	X	X			X	X	X	X				X							X											2	4	M1/SA/GP	13
13. Instrumentation—Other Compressors																								X											2	4	M1/SA/GP	13

Exhibit 2

* See above for explanation of code

XXXXXXXXXXXXXXXXXXXXX
FIXED RATE PERSONNEL
Knowledge/Skill Modules

Knowledge/Skill Category: COMPONENTS	Comp Station Systems*																									Pipeline Systems*								Learn Diff*	Est. Hrs.	Type Train*	Pri-ority
	A		B						C		D				E			F	G		H				I	A	B		C			D	E	F				
	1	2	1	2	3	4	5	6	1	2	1	2	3	4	1	2	3	1	1	2	1	2	3	4			1	2	1	2	3							
1. High Pressure Gas Valves					X	X					X	X	X												X	X		X				X		X	2	8	Checklist M1/SA/GP	14
2. Gas Pipe		X	X		X	X	X	X	X	X		X	X					X							X	X	X	X				X			1	2	M1/SA/GP	8
3. Flanges		X	X		X	X	X	X	X	X		X	X					X							X	X	X	X				X			1	2	M2/GP	7
4. Fittings		X	X		X	X	X	X	X	X		X	X					X							X	X	X	X				X			1	2	M2/GP	7
5. Bolts		X	X		X	X	X	X	X	X		X	X					X							X	X	X	X				X			1	2	M2/GP	7
6. Gaskets		X	X		X	X	X	X	X	X		X	X					X							X	X	X	X				X			1	2	M2/GP	7
7. Insulators		X	X		X	X	X	X		X		X	X					X							X	X	X	X				X			1	2	M2/GP	7
8. Regulators					X	X					X	X	X					X							X	X		X				X		X	2	8	Checklist M1/SA/GP	7
9. Anodes									X																		X									1	2	M2	4
10. Silencer					X																				X	X										1	1	M2	0
11. Meter Tubes					X	X												X														X			1	1	M1	5
12. Rectifiers									X																		X									1	2	M1/GP/SA	7

Exhibit 2

* See above for explanation of code

XXXXXXXXXXXXXXXXXXXX
FIXED RATE PERSONNEL
Knowledge/Skill Modules

Knowledge/Skill Category: REGULATIONS/ POLICIES/PROCEDURES	Comp Station Systems*																							Pipeline Systems*									Learn Diff*	Est. Hrs.	Type Train*	Pri-ority
	A		B						C		D				E			F	G		H				I	A	B			C			D	E	F				
	1	2	1	2	3	4	5	6	1	2	1	2	3	4	1	2	3	1	1	2	1	2	3	4			1	2	1	2	3							
1. Safety Manuals	X	X											X							X					X	X									4	SA/GP	12
2. Emergency Procedures Manuals																Everywhere																			4	SA/GP	14

Exhibit 3

R.A. Svenson and Associates have conducted Curriculum Architecture projects for many clients in various fields. Below is a partial listing of types of jobs/functions addressed and a listing of clients we have performed this work for.

Jobs/Functions

- Exploration geologists
- Exploration geophysicists
- Chemical engineers
- Reservoir engineers
- Mechanical engineers
- Natural gas pipeline workers
- Engineering management
- Electronics design engineers
- Electronics manufacturing engineers
- Purchasing agents
- Materials managers
- Quality control personnel
- HVAC systems sales
- HVAC service sales
- HVAC design engineers
- HVAC service engineers
- HVAC technicians

Exhibit 3

Partial Listing of Clients

- Shell Oil
- Exxon USA – Exploration
- Exxon Production Research
- Amoco Refinery Operations
- Tennessee Gas Transmission
- Motorola
- Baxter-Travenol
- Commonwealth Edison
- Westinghouse Nuclear Fuels Division
- Westinghouse Public Systems Group
- Westinghouse Defense Center
- MCC Powers
- AT&T

Using a Group Process to Create Performance Models and Knowledge/Skill Matrices

The Stimulus

Have you been confronted with the difficult task of identifying all the critical component knowledge and skills required of your various training target audiences?

Have you ever had difficulty in gaining the organization's consensus on your priorities?

Have you had a hard time defining the parameters for a given project early enough to enable you to more accurately estimate the resource costs?

Are you struggling with the effort to keep the instructional objectives linked with the expected end-of-training performance?

Before you enter the realm of instructional technology, it might be useful to borrow a page from the performance technology handbook to help in the identification, prioritization, and direction of instructional development activities. The page to borrow is the one labeled "Conduct a Performance Audit Front-End Analysis."

The Response

One approach to front-end analysis our organization has had great success with is to use a group process to develop both a Performance Model of a single job or a "functional" organization, and a Knowledge/Skill Matrix. This group approach is relatively quick, involves the client organization, builds consensus, provides development parameters and directions, and creates support for the further required activities.

The Outputs

A functional or job Performance Model outlines the following:

- The Mission of the Job or Function
- The Major Accomplishments, or Areas of Responsibility
  - Outputs per Accomplishment
    - Tasks per Output
    - Performance Measures per Output
      - Typical Deficiencies per Measure
        - ... Likely Cause per Deficiency

A Knowledge/Skill Matrix identifies potential "training topics" by name, documents other needed data, and links this information back to the required performance via the model.

The Underlying Theory

A group process is used to achieve group consensus. The group facilitator must possess the skills to manage a dynamic group situation. The group participants should include the following:

- Subject matter experts
- Master performers
- Management of the target performers
- New hires from the target performer group

Each of the above participant groups brings a unique and valuable perspective to the analysis meeting. Subject matter experts can tell you almost everything you need to know (and more) about a given topic. Master performers can temper those ideals with the realities of day-to-day performance. Management can tell you what is important, what performance they really want, how it can be measured, and what they want in the way of training formats, delivery methods and flexibility, maximum lengths, and anything you choose to ask them while you've got them. New hires can provide a perspective on what prerequisite should be and provide input on what things are the easiest and the most difficult to learn.

The group process forces a field consensus on what the desired/ideal performance is. This is especially useful for complex work environments with multiple jobs such as design engineering or manufacturing engineering. Creating this consensus via a group of the right people will create organizational buy-in. Starting off down the road of training development with this kind

of credibility can lead to greater support for your activities in both the development and implementation phases. The field will have a greater comfort level because you've been set off on the right path, and it is one that's directed at performance first and subject matter second.

The trade-off made with the group process is in the depth and accuracy of the data given the typical time constraints. Even a group made up of varied and knowledgeable people can cover limited territory in a two- or three-day meeting. Of course with more time this is easily resolved.

Because the organization has probably never put itself down on paper in black-and-white as this process will, it has probably not got a consensus view of what it looks like, what it does. Each person involved probably looks at the job or organization quite differently. This is the charge of the facilitator—to build a consensus model of the performance in a potentially difficult situation. But once the group has this common reference framework established, the continued analysis of training knowledge and skill requirements becomes easier to do and easier to sell later.

Applications of the Output

The data gathered via this process has many uses, some of which include

- Development of job descriptions and selection instruments
- Development of support materials and tools for new hire orientation and induction of the job and organization
- Design of training Curriculum Architectures for multiple jobs and organizations
- Development of training delivery strategies
- Development of Project Plans for individual courses including scope, schedules and resource requirements; detailed analysis instruments and methodologies; end-of-course objectives and conceptual/broad design specifications; and end-of-course evaluation measures

Limitations

The data resulting from this process does not typically provide a level of detail allowing immediate development of enabling objectives, content, or detailed design specifications.

Process Overview

This process employs three major steps.

1. Establish a Steering Committee or Council to oversee the project, set project scope, and select participants for analysis meeting(s).

2. Conduct two- to three-day analysis meeting(s) with experts and managers to develop the Performance Model and Knowledge/Skill Matrix.

3. Conduct one- to two-day review meeting(s) with new hires to gain additional input.

Step 1. Establish Steering Committee

The Steering Committee should meet twice during the project. The first meeting is to review the plan put together by the training organization and select participants for the analysis meetings. The second meeting is to review and critique the results.

The first order of business is to establish the parameters for the Performance Modeling project. Using a group of upper- or middle-level managers acting as representatives of your organizational clients, you should identify the work environments and jobs to be addressed. Depending on the mix and complexity of the jobs and the level of detail you are looking for from the analysis meetings, the various jobs may be sorted into like work functions. These will sometimes parallel the existing organizational structure (or its natural subunits).

Next, participants for each job or function should be selected. These representatives should ideally be personnel with broad credibility across the organization.

Step 2. Conduct Two- to Three-day Analysis Meeting with Experts/Managers

This meeting begins with an overview of the project's purpose and the specific objectives for the meeting. Next, the participants are shown the data-gathering instruments (typically charts on doublewide flip chart paper) and the structure for the information to be gathered. It probably should be stressed to this group that although the goal is to identify training topics related to the job under study, that step would not be started until after they have built a model or picture of the work required. Only then are we interested in what training is required to support that work.

Performance Modeling

To begin the analysis, ask the group for a mission statement, "In 25 words or less, what is the performance mission of this job (or function)?" Document the response on the flip chart. Allow a discussion and make any appropriate revisions before posting in a visible spot. Ensure that you have a consensus. Charge the group with the responsibility for keeping the data accurate. If a consensus is impossible, note the group's alternatives and go on. It is always possible to take a fresh look at any issues later during the meeting.

Continue through all the knowledge/skill categories. Ask the group for their comfort level regarding the lists they have just created. Determine any weak areas and revisit. Ensure that

the group feels at least 75-90 percent comfortable that all the major items have been identified.

To create the matrix, you need to determine the dimensions you require. If the data is for a function, you'll want to matrix the lists of training topics against the jobs within the function. If the Performance Model is for one job, the lists can be matrixed against the accomplishment and tasks. The following additional data can be gathered depending on your needs and desires:

- A rating on the learning difficulty of the topic
- An estimate of the hours required to deliver the topic
- A desired delivery strategy, i.e., CBT, self-paced, group-paced, etc.
- Desired depth of coverage, i.e., conceptual overview, applications overview, hands-on applications practice exercise with feedback, etc.
- Priority rating via a vote by the individual participants
- Sources of content and performance expertise
- Existing training programs covering the topic
- Etc.

Step 3. Conduct One- to Two-day Review Meeting with New Hires

This meeting is simply a review of the outputs of the first group. Walk this group through the data in a manner similar to the sequence in which it was originally generated. The purpose is to capture a consensus of their perceptions regarding the

- Importance/priority of having the training available to new hires
- Difficulty of learning
- Estimated length
- Depth of coverage
- Etc.

Identify the outputs, tasks, measures, deficiencies, and causes for each of the Accomplishments or Areas of Responsibility originally listed. Sometimes the original list will have been shortened as the group proceeds through the process and incorporated some items within others. Review the mission statement. Does the group like it the way it is, or do they now see it differently?

Knowledge/Skill Matrix

Developing a Knowledge/Skill Matrix is a fairly simple procedure. You can begin this by reviewing with the group a list of potential knowledge/skill categories. These categories are

used only to stimulate the group's thinking, not to restrict them to an arbitrary categorization scheme. The advantage of keeping multiple groups for a broad functional analysis within a more strict and logical use of the categories you list is to enable you to analyze quickly all required training topics to determine whether similar labels between jobs will indeed have the same content. The identification of these core needs will probably impact your structuring and sequencing of content for delivery.

The following list of potential categories can be revised to suit the group's needs:

- Introduction and Background
- Policies and Procedures
- Tools and Equipment
- Information Sources
- Materials
- Theories and Concepts
- Technical Skills
- Personal Skills

The group should then be asked to list the training topics within each category. This should be done via a systematic review of the outputs, tasks, and causes of the Performance Model.

Begin by heading a new flip chart page with the first knowledge/skill category. Under the category on the extreme left, list all the responses from the group. Keep approximately the right two thirds of the page blank. This space will be used for a matrix later.

The next data to collect and post is a list of Major Accomplishments or Areas of Responsibility for that performance. A brief two- to four-word statement is all that is required. Examples include

- Sales calls planned
- Work assignments made
- Files updated
- Technical support provided

It's sometimes helpful to begin with a noun and end with a verb. This is not critical, and an attempt to stick to that method may anger your group. You need to portray your flexibility and willingness to go with what the group says. This is the tough part of facilitating the group—gently leading them, getting the data you need, but allowing them to word it in a way familiar to them. Most likely they've never done anything like this before, and the way you are asking them to look at their performance is probably quite alien.

Begin a new flip chart page and head it with the first accomplishment. Label the accomplishment with a Roman numeral. Below that, create two columns and label them left to right—Outputs…Tasks. If this model is functional rather than for one single job, you may also

want to leave a wider space on the right for the later addition of the third set of columns—a matrix of all the jobs within the function.

Ask the group for a list of the major outputs produced during the performance indicated by the accomplishment. Next, get them to identify the major tasks associated with each of the outputs and list them on the chart. Letter the outputs and number the tasks. Post this sheet in a visible spot and begin the next page.

Number the new sheet with the number of the accomplishment and create three columns, from left to right labeled—Measures…Typical Deficiencies…Causes. Then ask for the measures of the outputs—how can they tell a good one from a bad one? After you have listed the group's measures, ask them per the measures listed what are the most common deficiencies. Finally, have them identify the probable cause for the deficient performance. Put an asterisk or circle those that seem to be due to a deficiency of knowledge or skill versus those that seem to be due to a lack of environmental supports/resources such as information, tools/equipment, materials, time, etc.

Summary

This data, although somewhat limited due to the data-gathering method and sources employed, should help you to quickly and efficiently

- Identify all the critical component knowledge and skills required of your various training target audiences.
- Gain the organization's consensus on your priorities.
- Define the parameters for a given project early enough to enable you to more accurately estimate the resource costs.
- Keep the instructional objectives linked with the expected end-of-training performance.

Many of our clients have used this process to help them identify and organize their work efforts. One division from a major oil firm had a group of key professionals and managers working for more than six months trying to get agreement on the training requirements of all professional geologists and geophysists. They were not able to come to any substantial agreements. This process enabled them to identify more than 250 training topics, link them specifically to the work, identify the specific individuals and their geographical location requiring the training, and establish development priorities and delivery strategies.

The resulting training curriculum allowed the organization to identify operational resource plans, including the start-up of a centralized training development and administration department and a field delivery organization. The support of key field managerial and

professional individuals throughout the planning and implementation stages were most likely the result of their earlier direct efforts. It makes sense that a client involved in the design of products and/or services for themselves will be more responsive and supportive in making them happen.

# # #

Update 2011

The first national presentation of this methodology was at the 1985 NSPI Conference by Guy W. Wallace – a copy of that presentation is available here.

This also covered in Guy W. Wallace's books: lean-ISD (1999) and Performance-based Curriculum Architecture Design (2011). See the EPPIC Inc. web site for more information about those books.

www.eppic.biz