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ABSTRACT

This document contains volume 2 of a four-volume report which describes the components of the Health Services Mobility Study (HSMS) method of task analysis, job ladder design, and curriculum development. Divided into nine chapters, volume 2 is a method manual directing use of the task analysis instruments. Chapter 1 covers the preparatory stages of task analysis and includes a brief HSMS glossary. Chapter 2 presents the HSMS definition of task and related concepts and rules for application of the method in the field. Chapter 3, addressed to job analysts, covers procedures for task identification and description. Chapter 4, addressed to project directors and job analysts, describes the process of writing HSMS task descriptions and task summaries and also covers review procedures. Chapter 5 presents the rules for application of the HSMS skill scales, and chapter 6 is the companion manual for analysts and also covers review procedures. Chapter 7 presents the rules for application of the HSMS knowledge classification system and knowledge scale, and chapter 8 is the companion manual for analysts, also covering review procedures. The concluding chapter, addressed to job analysts, is a manual for general field techniques for interviewing and is used to train job analysts. (The related document, volume 1, is an introduction to the method and the basic HSMS task analysis instruments.) (BM)

# THE HEALTH SERVICES MOBILITY STUDY METHOD OF TASK ANALYSIS AND CURRICULUM DESIGN

Research Report No. 11

Volume 2

## WRITING TASK DESCRIPTIONS AND SCALING TASKS FOR SKILLS AND KNOWLEDGE: A MANUAL

by
Eleanor Gilpatrick, Director
Health Services Mobility Study



Contract No. 82-34-69-34
EMPLOYMENT AND TRAINING ADMINISTRATION
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HSMS is sponsored by the Hunter College School of Health Sciences, where the author is an associate professor, and the Research Foundation of the City University of New York. The support, encouragement and faith given the project by Dr. Michael R. McGarvey, Vice President for Health Affairs at Hunter College, has made it possible to complete the work. The author is deeply grateful.

Major thanks go to some outstanding staff members, particularly Irene Seifer, who, as a senior research associate, helped develop the scales and trained the HSMS job analysts. Jeanne Bertelle, who was a senior job analyst, and Irene Seifer provided editorial review for this volume. Richard Preston did the typing.

It would be impossible to fully acknowledge all the other people who have been involved in the work. I thank everyone for their help and support. Any errors or controversial positions are solely the responsbility of the Health Services Mobility Study and the author.

Eleanor Gilpatrick

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## PREFACE

In September of 1967, the author became the director of the Health Services Mobility Study, a project funded by the Office of Economic Opportunity. The grant carried the charge that the project investigate the impediments to upward occupational mobility in New York City Municipal Hospitals and that it suggest means of overcoming obstacles to such mobility. It was a one-year grant.

Ten years later, the Health Services Mobility Study (HSMS) is ending its research and development activities. During that time, HSMS examined the occupational structure of New York City Municipal Hospitals and investigated the problems of skill shortages and credentialing.[1] It then undertook to design a method to promote occupational mobility by tying job requirements to curriculum design in a single system.

HSMS has developed, field tested and applied a method to analyze work (task analysis) and design job ladders. It moved on to develop a method for curriculum design using task data and for the design of educational ladders to parallel job ladders. It eventually expanded the method to show how to make job structures and curricula responsive to quality standards and the needs of consumers, and to show how occupational mobility can be economically attractive to employers. It then completed the system by showing how task data and curriculum objectives produced by the method can be used as inputs to the development of performance evaluation instruments and for the selection of content for, and validation of, occupational proficiency tests.

HSMS has made theoretical contributions to the fields of job analysis, curriculum development, and occupational testing. It has helped to promote the concepts of upward occupational and educational mobility, and has developed a design for a safe practice, quality assurance program in diagnostic radiology.

The HSMS method was pilot-tested in an ambulatory care community health center. It was given a full-scale application in diagnostic radiology. An abbreviated version of the method was applied to the technologist, technician and aide functions in radiation therapy and diagnostic ultrasound. A curriculum has been developed including the aide, technician, and technologist levels in diagnostic radiology.

Although these applications have been in health services occupations, all of the components of the method are generic and can be applied to any work activity in any industry.

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1 Eleanor Gilpatrick and Paul Corliss, The Occupational Structure of New York City Municipal Hospitals, New York: Health Services Mobility Study and/or Praeger Publishers (Research Report No. 2), 1970.

Now the time has come to share the method so that it can be used by others. This research report offers all the components of the HSMS method of task analysis, job ladder design, and curriculum development for use as a system or in part. It is offered to any institution that wishes to expend time and resources to rationally structure work, utilize its labor force, evaluate its work performance, develop job ladders, design job-related education, or create work-related test instruments. This material is reported as follows:

Research Rpt. No. 11 — THE HEALTH SERVICES MOBILITY STUDY METHOD OF TASK ANALYSIS AND CURRICULUM DESIGN.

Vol. 1 — Basic Tools: The Concepts, Task Identification, Skill Scales and Knowledge System.

Vol. 2 — Writing Task Descriptions and Scaling Tasks for Skills and Knowledge: A Manual.

(Also contains an abbreviated version of the task description method.)

Vol. 3 — Using the Computer to Develop Job Ladders.

(Includes technical material, computer programs, and scholarly review.)

Vol. 4 — Developing Curriculum Objectives from Task Data: A Manual.

The reader is directed to other documents for additional information not contained in Research Report No. 11 as follows:

Technical Rpt. No. 11 — HEALTH SERVICES MOBILITY STUDY: FINAL REPORT FOR THE PERIOD OCTOBER 1967 THROUGH MARCH 1972.

(Contains a review of the literature in task analysis and the derivation of the HSMS task analysis method.)

Working Paper No. 11 — THE DESIGN OF CURRICULUM GUIDELINES FOR EDUCATIONAL LADDERS USING TASK DATA.

(Earlier version of HSMS curriculum design method. Contains a review of the literature in occupational curriculum design and behavioral objectives, and other related material.)

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| Research Rpt. No. 7 | TASK DESCRIPTIONS IN DIAGNOSTIC RADIOLOGY. |
| Vol. 1 | Medical Tasks: What the Radiologist Does. |
| Vol. 2 | Radiologic Technologist Tasks Dealing With Patient Procedures. |
| Vol. 3 | Machine-Related, Patient Care and Administrative Tasks: What Radiologists, Technologists, Nurses, and Physicists Do To Run Things and Look After Patients and Equipment. |
| Vol. 4 | Index of Tasks by Code Number and Extended Name. |
| Research Rpt. No. 9 | THE TECHNOLOGIST FUNCTION IN FIELDS RELATED TO RADIOLOGY: TASKS IN RADIATION THERAPY AND DIAGNOSTIC ULTRASOUND. |
| | (Research Reports Nos. 7 and 9 contain HSMS task descriptions and task summaries which can be used as models for writing task descriptions or used directly when there are task overlaps.) |
| Research Rpt. No. 8 | USING TASK DATA IN DIAGNOSTIC RADIOLOGY. |
| Vol. 1 | Job Ladders: Assigning Tasks to Jobs. |
| Vol. 2 | Curriculum Objectives for Radiologic Technology. |
| | (Volume 1 contains a mini-manual for developing performance evaluation instruments and carrying out an analysis of an institution's occupational structure.) |
| | (Volume 2 contains HSMS curriculum objectives. These can be used to train job analysts in using the HSMS skill scales, the Knowledge Classification System, and the HSMS knowledge scale. They can also be used as models for writing curriculum objectives.) |
| Working Paper No. 12 | USING TASK DATA FOR PERFORMANCE EVALUATION AND PROFICIENCY TESTING. (tentative title) |
| | (Theory of criterion-referenced and norm-referenced testing; use of task data as inputs to testing. The HSMS theoretical document on occupational proficiency tests and issues of validity.) |

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## CHAPTER 1

## TASK ANALYSIS: GETTING READY

### INTRODUCTION

This volume is a manual for the use of the Health Services Mobility Study (HSMS) method of task analysis. It is addressed to the reader who is interested in using the HSMS method of task analysis in part or as a whole.

The reader is assumed to represent a hospital or other employer organization interested in structuring or restructuring jobs, designing a career mobility program, evaluating work performance, or evaluating the allocation of tasks to titles; an educational institution interested in developing or modifying an occupational program or designing an educational ladder; a professional association or governmental agency concerned with the quality and content of occupational performance; or a test development agency interested in the use of task analysis for the selection of content for occupational proficiency tests.

The four volumes of this report present the entire HSMS task analysis and curriculum design system. Volume 1 contains the HSMS skill and knowledge scales and the HSMS Knowledge Classification System. It is the companion document to this volume, which describes the work carried out by the director of a task analysis project and by its job analysts; it covers task identification, task description, skill scaling, and knowledge identification and scaling. Volume 3 presents the statistical analysis used to design job ladders, and Volume 4 presents the HSMS curriculum design method.

Volume 2

This chapter serves as an introduction to the work in task analysis. It covers the preparatory stages of task analysis, such as selection of what will be studied, preparation of analysts, literature search, and scheduling. It also includes a brief HSMS glossary.

Chapter 2 presents the HSMS definition of task and related concepts and rules for application of the method in the field. Chapter 3 is addressed to job analysts, and covers procedures for task identification and description. Chapter 4 is addressed to the director of the project and the job analysts. It describes the process of writing HSMS task descriptions and task summaries, and also covers review procedures.

Chapter 5 presents the rules for application of the HSMS skill scales in skill-scaling of tasks. Chapter 6 is the companion manual for analysts, and also covers review procedures.

Chapter 7 presents the rules for application of the HSMS Knowledge Classification System and knowledge scale in knowledge identification and scaling of tasks. Chapter 8 is the related manual for analysts, and also covers review procedures.

Chapter 9 is a manual for general field techniques. It is addressed to the job analysts, and is used to train job analysts.

## Options

This manual is written for the user who is interested in "normative" task descriptions which describe how work should be done; it assumes that nationwide practice is to be reflected, including work not necessarily done at the given location. Less work is involved if the user is only concerned with current practice at a given location. The user would simply omit those steps that deal with practices beyond those at the given location, and could omit outside expert review and inclusion of options and contingencies not relevant to the local situation.

If the user is concerned only with representative work for a given occupation or function, a sample survey or some other method of selecting from the universe of work can be used after task identification has provided a task inventory.

This manual offers the full-scale HSMS method for writing task descriptions. A briefer version is also presented for the reader who does not require full-scale descriptions for all the tasks.

## TERMS RELATED TO HSMS DATA COLLECTION

The HSMS method of task analysis is linked to the broad field of job analysis. Terms common to the field or used in a special way in the HSMS method are listed below:

Job Analysis: Any process of identifying and evaluating the work activities associated with given job title(s). Methods vary according to purpose. The industrial engineer is concerned with work sequences and time; the wage and salary administrator attempts to rate activities in terms of what they should be paid.

Task Analysis: A form of job analysis in which the work activities of a job are separately identified and studied. The unit of work activity is called the "task." Any given job is the sum of the work activities or tasks assigned to an individual or job title. Task analysis may include identifying and rating the skills and knowledges needed for each task, i.e., "skill and knowledge scaling."

The HSMS method of job analysis is a task analysis method. It is a way of looking at work activities in order to arrive at data which will result in job ladders or lattices and the design of parallel curricula and evaluation instruments. The chief focus of the method is on learnable skill and knowledge requirements and functional units of work activity.

The HSMS method is not designed for use by the industrial engineer, who is concerned with the efficiency of work flows and methods or time and motion analysis. It is also not designed to be used directly for wage and salary administration, as are job evaluation methods.

Task Identification: Study of all of a performer's work activities, and division of these into discrete units called tasks. In the HSMS method this is done by interviewing the performer (employee) about the work, by observing the performer at work, by reviewing relevant literature, and by applying the HSMS definitions and rules to the information collected.

Performer's Job: The sum of all the work activities (tasks) which are carried out by the given employee being studied.

Job Title: The name used by the institution for one or more performers' jobs; it is the sum of all the tasks of all the performers with the given title designation.

Occupation: The name of the performer's job as defined by a professional association or an educational program. The occupation may cover a wider set of activities than the job title.

Job Structuring or Restructuring: The assignment of tasks to job titles.

**Job Ladder Construction:** The arrangement of jobs into a promotional sequence from one level to another. The ladder concept refers to the relationship of jobs rather than individuals. When a job ladder leads from entry levels to skilled or professional levels, it may be designated as a career ladder.

## TERMS FOR PARTICIPANTS IN THE HSMS METHOD

In order to avoid confusion and to provide for a common frame of reference, HSMS uses a set of terms which refer to the functional roles of individuals who are involved in task analysis. These are presented alphabetically as follows:

**Director:** The person in charge of the work in task analysis and curriculum design. This individual designs and organizes the work, participates in task description writing and editing, supervises the job analysts, conducts the statistical analyses, interprets the results, and prepares or edits curriculum guidelines.

**Employee Representative:** The trade union steward or someone employed on the staff of an employee organization who is designated to represent a given performer's interests during the analysis of his job, if the employee so chooses. The term covers any recognized representative of a professional or an employee organization representing the performer's job title vis-a-vis the employer.

**Institutional Representative:** The person at the hospital or institution where the task analysis is to take place who, at the start of scheduling for the data collection, arranges for introductions between the job analysts and the appropriate supervisors or department heads.

**Job Analysts:** The persons who act as interviewers, observers and data gatherers in job analysis. They are trained in the HSMS method and interview and observe job "performers" involved in work activities; they identify and describe tasks, and scale tasks for skill and knowledge requirements; they participate in writing curriculum objectives. Job analysts also act as "schedulers" and set up appointments in the field.

**Performer:** The worker (employee, incumbent) whose job tasks are being analyzed; a person functioning regularly in the job title, and not a trainee. The term, performer, is used regardless of job title to avoid any judgment of the appropriateness of the assignment of tasks to titles.

**Resource Person:** An informed person at the hospital or institution who provides the job analysts with an orientation to the language and work in occupational specialties, and/or who reviews task descriptions for errors, incorrect language, or omissions.

**Resource Respondent:** An expert in a given occupational area, such as a leading practitioner, educator, or member of a professional organization or government agency, who reviews task descriptions for errors, incorrect language, or omissions, who indicates national practices and options, and who provides information on desirable practices.

**Spokesman:** The job analyst leading the questioning of the performer.

**Supervisor:** The person, regardless of job title, who has the closest supervisory work relationship with a given performer. Titles such as head, chief, director, manager, foreman, etc., are all covered by this term.

## PRELIMINARY TASK ANALYSIS DECISIONS

### Selection of Titles and Performers

Any undertaking of task analysis work involves initial decisions about which job titles and which incumbents ("performers") to study. If the reader will be applying this manual as a step towards job structuring or restructuring, or for the development of job ladders, task analysis data must include all the job titles and work activities related to the focus of the study.

If all the jobs and tasks in an institution could be studied, skill and knowledge relationships among tasks that were not immediately obvious could be uncovered. These might prove to be very valuable, and could suggest innovations in job ladder construction, providing linkages and options for movement across departments.

The method can also be applied to a more restricted part of the organization, such as a department or some other functional unit. The analysis could begin with a narrow area at first, and then broaden out over time to provide later linkage of ladders into lattices. Whatever the focus, it is important to cover the area selected exhaustively, including low-level and high-level job titles. If there are prior existing ideas on possible job sequences, these job titles should be included; in addition, all the related titles which overlap in function or impinge on aspects of the service involved should be included.

Once all the job titles to be studied have been selected, it is important to be sure that every work activity associated with each title is represented. Assignments often vary among the persons who share a common job title; they vary by department and shift, and often within a department and shift. The HSMS method usually covers at least one example of every task assigned to every title being studied, including out-of-title activities. The minimum number of performers to be studied is the minimum number needed to cover all the tasks assigned to all the titles to be studied.

If the purpose of the analysis involves nationwide or occupation-wide standards or coverage, more than one institution may be required for study, even if each activity is to be covered only once. This is because specialties develop within any occupational area; services vary by type of institution; practices differ by region or type of institution. It therefore may be necessary to carry out the work in more than one institution to provide exhaustive and nationally relevant coverage.

## The Senior Staff for Task Analysis

The director of HSMS is a doctoral-level labor economist with a strong background in sociology and social psychology. The talents brought to bear were largely analytic and taxonomic, with a taste for details. These attributes were obviously relevant for the development of the HSMS method. For purposes of applying the HSMS method, it need not be assumed that any particular academic background or degree of education is necessary. The requirements would still include analytic and taxonomic skills and a willingness to pay attention to details, but in applying the method, administrative and general intellectual skills are more important than a background in any given discipline.

The director supervises staff, must be intimately involved in the task analysis work, must be able to deal with computer-based analysis, and be able to identify with the needs and interests of employers, employees, educators, test developers, and the consumer. The director is also responsible for curriculum development and policy implications.

It is a good idea for the director to share senior-level responsibilities with someone able to work with the computer and direct the flow of work and/or be involved in review of skill and knowledge scaling and curriculum development. Another possible combination could include a director and a senior staff member who can train the analysts. The director and the senior member can work in tandem until the work diverges for training or computer work.

Job Analysts

The HSMS method is designed to be usable by persons who need not themselves be incumbents in the occupations to be studied. This makes it possible for the job analysts to study any type of job. Analysts must be trained in the HSMS method, including its definitions, procedures, and interview techniques.

A minimum of two job analysts is needed for a team. At HSMS it was found that more than three teams supply data faster than can be handled by the director.

A team must consist of two or more analysts to ensure reliable and accurate data. The analysts on a team are expected to agree on the data they submit. Use of only one analyst for data collection leads to unreliable results because there is the danger that the analyst will miss or distort data. A lone analyst is open to errors of oversight, fatigue, pressure, or bias. During interviews, the second analyst can add greatly to the quality of the questioning and the resulting data. One analyst is able to make notes while the other questions the performer. The team is able to share and compare information and opinions.

The best HSMS analysts had at least two years of college, had an interest in personnel, human resources development, or education; they were interested in people and were not ego-involved. Each was able to listen, take initiative, and was willing to put the quality of the work before any other consideration. They were at ease with professionals and entry-level staff, and enjoyed the field work. They generally preferred working in a not-for-profit environment. We found it essential that at least one member of the team be able to handle conceptual and abstract thinking. The entire staff was expected to be committed to paying attention to details.

It is important to avoid having as analysts persons who cannot follow the definitions and procedures prescribed, or persons who would be likely to cover up their own errors rather than call them to the attention of those relying on the data.

## Training[1]

HSMS suggests a method of training job analysts that combines reading manuals, in-house training, and supervised field work. This combination results in the most rapid exposure to the actual work, and also guarantees that accurate data are collected even while the analysts are still in training.

The job analysts are trained in three stages. First, there is didactic classroom activity using this manual and classroom discus-

[1] See Chapter 9 for further training comments.

sion. Included are practice sessions using task material already collected, such as in the HSMS reports described or presented elsewhere in this document. Next, there is in-house role-playing to develop the field skills involved. Finally, the new analysts go into the field as a single team under the leadership of the instructor, who may be the director or a senior staff member. They engage in regular data collection, with each new analyst preparing his or her data independently. The data submitted are edited and approved by the instructor. Thus, data collection and training can occur simultaneously. As the analysts demonstrate the ability to achieve reliable and accurate results, they are assigned to teams of two, and from then on they work independently in teams. Eventually a new analyst on the staff can gain practice by working with and being supervised by an experienced team.

Reviewers

If the task analysis is to be used for curriculum development, evaluation, or development of standards, it is essential to have the task descriptions reviewed by "experts" who are committed to quality performance, human resources development, and the other objectives with which the HSMS method is identified.

Early in the planning stage for task analysis, it is important for the director to make the work known to experts such as leaders of the relevant professional associations, staff in related government agencies, and/or educators. These should be people who have had "hands-on" work experience and who also have an overview of how the work is done nationally. These people are called on to review the task descriptions. HSMS calls these reviewers "resource respondents." The initial reviewer is usually someone at the institution where the material is being collected, other than the performer whose work is being described. This is the "resource person," who is also often requested to provide the project's staff with an introduction to the department or occupation being studied.

When possible, the director meets with the resource person and the resource respondents to present an overview of the project and to describe what will be needed. The director indicates that this is an opportunity to develop task descriptions for how the work should be carried out ideally, as well as task descriptions that reflect current work practices or standards. Experts are often enthusiastic participants, especially if they are interested in utilizing the curriculum guidelines which may be developed from the task data.

PREPARATION FOR TASK ANALYSIS: LITERATURE

Although the HSMS method is designed for use by laymen without special training in the jobs they will be studying, the director and analysts must learn as much as possible about the content of the work they are to analyze.

During the initial research phase the director and staff do a preliminary literature search to discover what is available in print related to the area to be studied. They determine what exists in the way of work descriptions, descriptions of equipment, manpower policy issues, issues regarding output quality, safety, consumer interests, curriculum requirements, and the educational disciplines involved.

Under the guidance of the director, the staff contacts educational institutions, professional associations, federal and state agencies, and employee organizations; they describe the task analysis objectives, and ask for bibliographies and/or current materials. The staff examines the textbooks available for the occupations. They determine which professional journals represent the various occupations, and learn what the journals report and how their articles are indexed. The staff determines from lists of U.S. publications which government agencies are involved with regulation, education, or policy concerning the various occupations. They determine whether any armed forces occupational series covers any of the occupations to be studied.

Staff examine government indexes listing research on manpower and education issued by the U.S. Department of Labor, the Department of Health, Education and Welfare, and other relevant agencies. Primary sources are the National Technical Information Service (NTIS), the Educational Resources Information Center (ERIC) Clearinghouse on Vocational and Technical Education, the ERIC Clearinghouse in Career Education, and the Human Resources Research Organization (HUMMRO).

The staff also refers to such standard occupational guides as the Dictionary of Occupational Titles and The Occupational Outlook Handbook for brief descriptions of jobs and some sense of the job titles in use.

## Literature Review

The literature is initially examined to determine which documents should be obtained for use by the staff. The criteria for acquisitions are as follows:

1. Most recent descriptions of how the work is carried out. Priority goes to explicit descriptions of the work. Best sources: training manuals, professional journal articles, professional textbooks directed to students of occupational programs or to practitioners of the occupation.

2. Conference proceedings on controversial issues such as safety and/or quality in which papers are presented describing how work should be done to achieve desired objectives. Best source: U.S. government-sponsored working conferences.

3. Descriptions of how the equipment is used, and equipment options. Best sources: operators' manuals and professional-level textbooks.

4. Federal or state legislation that prescribe safe practice and other occupational requirements.

5. Policy statements dealing with desirable practices.[2]

The choice of texts, reports, and journal articles are narrowed down to those that provide the most recent and the broadest coverage, describe the most options, and are the most detailed.

In many instances, there is little in the way of direct and detailed descriptions of occupational work. Much description has to be pieced together. Often the work of the technologist must be culled

[2] Exhibit A, at the end of this chapter, is an example of a policy statement that can be used to develop tasks and task descriptions. It is "A Patient's Bill of Rights," advocated by the American Hospital Association.

from descriptions of the work of the professional. Sometimes the descriptions of approved practices are buried in pages of rhetoric reporting conference proceedings or alluded to in case studies.

It is always necessary to obtain background texts such as scientific encyclopedias and specialized directories and glossaries.

Once the staff learns which equipment is in use in the field, the director contacts the manufacturers and obtains operators' manuals.

Initial Use of Literature

Once the basic literature has been obtained or purchased, copies are made that can be marked and cut up. The director and/or senior staff start with a perusal of the literature to obtain a broad idea of the scope of the functions and occupations involved, a sense of the technology in use and emerging, the current issues, the professional and technical terminology, and the job titles in common usage by professional organizations and accrediting agencies.

The staff attempts to obtain an initial sense of the kinds of work activities they are to cover, the basic divisions according to equipment, purpose, function, and/or focus, the probable job levels involved, and the likelihood of covering all the work at a given institution.

The material is then divided into three major parts. One is preliminary and introductory descriptions, the next is detailed descriptions, and the third is basic educational background materials, such as glossaries, dictionaries, and academic texts. If at all possible, the director and analysts should read the introductory material before scheduling begins.

Institutional Material

The staff should collect institutional material for use in familiarizing the analysts with the jobs and the context in which they are done:

1. The institution is asked to provide descriptive literature about its objectives and operations.
2. If job descriptions exist, they are collected.
3. Department heads and/or supervisors are asked to explain how the performer's work fits into the functioning of the department and the institution.
4. The supervisor is asked to list the performer's work assignments and to provide examples of any special institutional forms or documents used in the performer's job.

Literature about the institution provides the analysts with a context in which to understand the particular job title and the performer's job. For example, a health center specializing in family care or holistic medicine can be expected to focus on different activities than an out-patient clinic in a general hospital. Important specialties, advanced equipment, and experimental services will often be highlighted in the institution's literature.

Job descriptions represent the institution's efforts to codify its work assignments according to job title. The larger or more structured the institution, the more likely it is that job descriptions will exist; there generally are descriptions for civil service jobs. Job descriptions contain an overall summary of the work assignements attached to the title; they may include a detailed list of duties, and often include the employment requirements for the title, promotional lines if any, salary grade if applicable, and any special conditions. These provide a good initial idea of job content.

The job description should never automatically be considered a list of assigned duties, and certainly not a list of tasks. Job descriptions are often out of date and remain unrevised for years; they rarely reflect the inclusion of other, new duties and equipment, or the obsolescence of the old duties listed. They do not reflect out-of-title assignments.

The department heads or supervisors will be able to explain the relationship between the performer's activities and <u>institutional functions and goals</u>. This kind of framework will help staff see the performer's job as it articulates with those of other employees. This is useful for visualizing task boundaries.

A <u>Supervisor's List of Performer's Assigned Duties</u> is collected during scheduling. This list approximates the actual activities of the performer, but may be overly general or contain distortions and inaccuracies. However, the list may include technical terms with which the analysts should become familiar.

The supervisor is also asked to provide special data forms or documents used by the performer. These provide some idea of whether specialized knowledge is involved, and some indication of the difference between institutional names for forms and generic names.

The Resource Person

During scheduling the institution should be asked to designate a resource person(s) who can brief the analysts about highly specialized work and will review the task data for correct content and use of terminology.

A good way to find out about a job and the technical terms used in it is to ask someone working in the field to explain things. If a number of analysts are going to deal with jobs in a general technical area, they would benefit greatly from the help of a professional in this field. The resource person who is to review the task descriptions may be willing to make a presentation or conduct a question and answer session in which the director and the job analysts can obtain background information. Staff can prepare for such a session by defining the areas that need clarification.

It is advisable to have the resource person or someone else at the institution take the analysts on a guided tour of the premises. This helps to familiarize them with the atmosphere, the procedures in practice, and with the kinds of materials and equipment currently in use at the institution.

SCHEDULING

The initial scheduling period is critical to the success of the task analysis procedure because it is then that the method is first introduced to people in the institution on a personal level. The impressions made by the analysts who do the initial scheduling will be lasting ones. Everyone involved will be watching to see if proper channels of communication are being followed, if the analysts seem to know what they are doing, whether there is anything to be guarded against or feared, whether work will be disrupted, and what the analysts' attitudes are toward the people in the institution.

The initial scheduling period is also important because the scheduling procedures provide an opportunity for the analysts to collect needed background information about the job titles they will be studying.

Scheduling provides for an orderly introduction of the analysts to the personnel who will be involved in the job analysis and helps them anticipate the personal interactions that will occur. Job analysts should be as familiar with the scheduling procedures as with the task identification scaling procedures.

Preliminary Steps

At the inception, the director meets with the institution's administrative heads to present the plans for task analysis. This important step must be taken with the highest-level staff at the institution. After this, the early scheduling is best done by a pair of analysts, including at least one person who will be involved in all the subsequent interviews and observations with a given performer.

Once the task analysis gets underway, the teams are each responsible for their own scheduling.

A meeting including the director, the job analysts, and the middle and upper level staff who will be involved should take place as soon as feasible. Such a meeting is to provide a coherent overview of the job analysis approach, its purposes, expected results, and the time commitments likely to be involved. Staff questions should be answered, practical problems of scheduling should be raised, and solutions worked out. Where employee organizations are involved, it might be appropriate for representatives to be included at such a meeting.

Three kinds of documents have proved to be helpful in explaining the task analysis work:

1. A brief document describing the job analysis method.
2. A letter of introduction briefly conveying the purposes of the method, the events to take place, and the support of the institution.
3. If there are employee organizations, it is imperative to have letter(s) endorsing the job analysis and asking for the cooperation of members.

In scheduling, rules of the institution should not be violated; supervisory relationships and chains of command must not be ignored. One should not rely on one level of command to explain the job analysis work to other employees; it is too easy for inadvertent misrepresentations and misunderstandings to develop.

Each scheduler should prepare a checklist of scheduling activities for each person to be seen so that small but essential details are not overlooked. Failure to present an overview of the entire method, or trusting to chance that the department head will arrange to inform the supervisor that his or her cooperation is needed can have serious consequences.

## Adequate Time With the Performer

The major problem in scheduling appointments is to get adequate and uninterrupted blocks of time. If there are funds for the purpose and the performer and the institution are willing, interviews with the performer can be done over lunch, after the performer's working hours, or on the performer's day off, with the performer reimbursed.

In most cases the scheduler, in cooperation with the supervisor and the performer, must arrange to interview during regular work periods. The special arrangements listed below should be considered:

1. Relief time should be arranged where feasible; however, the performer is usually interviewed during slack periods in the regular work day.
2. Observation of task performance does not take the performer away from his job, but it must be acceptable to those involved. It can become a problem if patients or co-workers refuse to be observed or if the nature of the work makes it impractical.
3. In cases where observation is desired but not feasible, the use of video tapes which represent a performer's tasks (such as in surgery) could be used. In such cases the performer should be present at the viewing to provide a running commentary.

It is impossible to determine at the outset how much total time is needed for interviews with performers. This is a function of the type and range of work done by the performer, the analysts' skills, and the extent to which the performer's work is already covered by any existing task descriptions. However, analysts should always indicate that a large number of interviews are normally needed over a period of time.

Analysts should attempt to schedule interviews for periods of one to two hours. Less time is wasteful because of the warm-up time needed; more time is usually too tiring for the performer and the analysts. Observations are scheduled only for activities that are difficult to describe even after the performer has been seen in an initial series of interviews.

Scheduling Steps

The following scheduling steps refer primarily to the initial work in a given occupation or functional area; later scheduling is carried out by the team as long as there is a need to meet with the performer.

1. Arrangements are made for an institutional representative to assist the schedulers in setting up appointments with the appropriate department heads or supervisors who, in turn, will select performers and alternates within the designated job title and arrange for introductions.

2. Analysts assemble the materials needed for scheduling:

   a. A list of the titles to be covered and the number of performers who will be needed for each, if this information has been obtained in prior meetings.

   b. Letters of Introduction, to be left with supervisors, employee representatives, performers, and alternates.

c. Literature about the method (or reports related to the method), to show or leave behind (for staff who request more information about the job analysis).

d. Scheduling Sheets to be filled out in the field.

e. Note paper.

f. Appointment cards to be left with the performer and alternate. They should contain the time, date, location, and duration of appointments, and whom to contact in case of problems or cancellations.

g. A check list covering scheduling steps that is drawn up by the scheduler and used as a reference to make sure all necessary steps are covered.

3. Schedulers meet with the institutional representative:

a. The schedulers discuss the task analysis work with the institutional representative. The letters of introduction are shown, and the various job titles to be studied are reviewed. The appropriate department heads and/or supervisors are then identified, contacted, and informed of the request for interview time.

b. Unless already done, the schedulers inquire whether any of the job titles chosen are represented in collective bargaining or by other employee organizations. If so, the name of the organization and the relevant "local" is obtained.

c. The schedulers arrange to obtain a set of job descriptions, if these have not already been obtained, and any material descriptive of the operations of the institution and/or the relevant department.

d. The institutional representative is asked to recommend resource persons who can be called on to brief the analysts if necessary. (Resource person(s) to review the task descriptions may already have been selected in earlier meetings.)

e. If the analysts do not already have a work area, the schedulers arrange for an area which the analysts can use for their belongings, for editing data, and/or for interviewing. It is desirable to have an area that is quiet, private, and comfortable enough to be the scene of prolonged interview sessions.

4. Meetings with employee representatives and department heads if appropriate:

   a. The schedulers explain the job analysis work.

   b. The department heads (or supervisors) are asked to discuss their department's function and describe goals, objectives, and how the performer's work fits into the institution's functioning. The schedulers take notes on these discussions and transmit the information to other analysts. (Either the department heads or the supervisors are asked to designate performers who will be available for interviews and observation. See below.)

   c. The employee representatives are asked to cooperate and to encourage performers to participate.

5. At the interview with the supervisor the task analysis work is introduced and descriptive literature is provided. The purpose and design of the task analysis work is then explained in detail:

   a. A performer and an alternate are selected from the same job title once the supervisor understands all the conditions involved. They are selected based on the following criteria:

      i) The performer's and alternate's work and assignments are considered by the supervisor to be representative of the title, and both employees are considered to be adequate in their jobs and are not trainees.

      ii) They must do the same work and have the same hours of work so that the alternate can function as a substitute for the performer in cases of absence.

      iii) Work time will be made available for all anticipated interviews and for some observation.

      iv) The performer and alternate are expected to function in the same job circumstances throughout the full job analysis period.

      v) The performer and alternate are currently available for introductions. (They must be willing to cooperate and must concur in any special arrangements to be made for interviewing.)

b. The schedulers indicate that a considerable number of interviews will probably be needed for task identification, and that later interviews should be anticipated for skill scaling, knowledge identification, and knowledge scaling.

i) The various alternatives for providing blocks of interview time with the performer should be discussed. The schedulers also explain that there may be a request to observe the performer for a period of time during regular working hours.

ii) The schedulers should make clear that the blocks of time are to be no more than two hours, that the aim is for flexibility, and that the method requires privacy for the performer. The schedulers explain that interviews are solely for the performer and the analysts, with the exception that the employee representative may be present if the performer so requests; during observation, only those persons who would normally be present are allowed.

c. Unless there is a willingness on the part of the supervisor to cooperate during all of the stages that will be involved, scheduling cannot be considered adequate. The schedulers check on this.

d. Once there is general agreement on the individuals to be involved and the conditions to be expected, the names of the performer and alternate, their working hours and days, and the times they are available are recorded. A check should be made to ensure that these are the same for the performer and the alternate.

e. The supervisor is asked to provide a description of the department's function and the performer's role (if the department head has not done so). If there are special institutional data forms related to the performer's work, the schedulers ask to be provided with copies of these.

f. The supervisor is asked to provide a list of the duties which are assigned to the performer. This becomes preparatory study material for the analysts; it gives the schedulers some idea of the amount of time it will take to do full task identification, including the likelihood of the need for observation. The list should include:

i) Any assigned duty currently done by the performer in the current department or shift.

ii) Any assigned duty not yet done by the performer but assigned to him and expected to be performed by him in the current department or shift.

iii) Any out-of-title work currently being done by the performer.

g. The schedulers ask the supervisor for an introduction to the performer and alternate so that they can be told about the task analysis work. They should be seen in private at that time or shortly thereafter. The employee representative may be present at this meeting.

6. Preliminary Meeting with the Performer and the Alternate:

a. The schedulers explain why they are there and describe the overall design of the work in terms and language that will be understood by the performer and the alternate.

b. The schedulers make it clear that only the performer will actually be interviewed and observed by the team of analysts, and that the second person, the alternate, will be involved only in case of the other's absence.

c. The performer should be made aware of the fact that the analysts will be taking notes during the interviews and the observation period and that this is so they can clarify certain points and describe the work in detailed task descriptions.

d. During this preliminary interview the schedulers must <u>reassure</u> the performer that the purpose of the interviews and any observation is to learn about the kinds of work the performer does. The performer is assured that no evaluation is being made of his or her performance, that it is the work, not who is doing the work that is being studied. The performer is told that he or she may request the presence of an employee representative during any interview or observation.

e. It is essential that the performer realize that there will be a series of interviews, and that they will be spread out over time. The performer can become irritated with the large number of interviews and should understand at the outset that, once he or/she agrees to cooperate, the analysts will be dependent on the performer's presence for each meeting.

f. During the interview the performer can be asked to recommend relevant literature covering the work and/or equipment.

g. When agreement is reached, the date, time, duration and location of the first appointment with the performer are recorded. An appointment card containing the agreed-on appointment time and place is left with both the performer and the alternate. Any remaining doubts or questions should be dealt with at this time. Everyone must be clear about what is involved and the exact time and place of the interview.

h. When the performer and alternate have no further questions, the schedulers depart, thanking them for their cooperation.

i. The schedulers review and/or confirm with the supervisor the date and time of the first appointment with the performer and thank him or her for the cooperation given.

7. Scheduling is carried out by the team as appropriate throughout the period of task analysis. The following should be taken into account:

a. It is advisable to allocate interview time so that full days are spent at the institution with several performers being seen for about two hours each. Other full days should be set aside for writing, editing, and conferences at the analysts' home base.

b. It is unwise to schedule appointments far ahead. Cancellations are common. The team should be able to handle rescheduling during actual field work and be prepared to interchange planned events.

8. The following procedures must be scheduled during the work in task identification and description:

a. <u>Interviews with the performer for task identification.</u> The amount of time assigned to the first interview should be sufficient to permit broad questioning about all of the duties carried out by the performer. Additional interviews can be required if there are a large number of different duties. Further interviews are needed to obtain detailed information for task descriptions.

b. Editing time. Editing time is needed after each interview and observation so that the analysts can record data and prepare questions for the next interview.

c. Observation of the performer. The analysts should be able to choose the activities they feel they need to observe after the first or second interview. There should be an interview scheduled after the observation period during which questions can be raised to clarify what was seen.

d. Task identification conferences for job analysts. Analysts meet to discuss and agree on the data collected.

e. Preliminary scaling of tasks for skills and knowledge.

f. Interviews with the performer on skill scaling, knowledge identification, and knowledge scaling. After review of the task descriptions and prescaling, further interviews are needed to determine the skills and knowledges needed in tasks.

g. Scaling conferences for job analysts. Analysts meet to discuss and agree on their skill and knowledge scaling and on their annotations of task descriptions.

h. Periodic meetings with the director and/or senior staff to discuss the work, share information, develop benchmarks for scaling, and resolve differences.

AMERICAN HOSPITAL ASSOCIATION

# A PATIENT'S BILL OF RIGHTS*

*The American Hospital Association Board of Trustees' Committee on Health Care for the Disadvantaged, which has been a consistent advocate on behalf of consumers of health care services, developed the* Statement on a Patient's Bill of Rights, *which was approved by the AHA House of Delegates February 6, 1973. The statement was published in several forms, one of which was the S74 leaflet in the Association's S series. The S74 leaflet is now superseded by this reprinting of the statement.*

The American Hospital Association presents a Patient's Bill of Rights with the expectation that observance of these rights will contribute to more effective patient care and greater satisfaction for the patient, his physician, and the hospital organization. Further, the Association presents these rights in the expectation that they will be supported by the hospital on behalf of its patients, as an integral part of the healing process. It is recognized that a personal relationship between the physician and the patient is essential for the provision of proper medical care. The traditional physician-patient relationship takes on a new dimension when care is rendered within an organizational structure. Legal precedent has established that the institution itself also has a responsibility to the patient. It is in recognition of these factors that these rights are affirmed.

1. The patient has the right to considerate and respectful care.

2. The patient has the right to obtain from his physician complete current information concerning his diagnosis, treatment, and prognosis in terms the patient can be reasonably expected to understand. When it is not medically advisable to give such information to the patient, the information should be made available to an appropriate person in his behalf. He has the right to know, by name, the physician responsible for coordinating his care.

3. The patient has the right to receive from his physician information necessary to give informed consent prior to the start of any procedure and/or treatment. Except in emergencies, such information for informed consent should include but not necessarily be limited to the specific procedure and/or treatment, the medically significant risks involved, and the probable duration of incapacitation. Where medically significant alternatives for care or treatment exist, or when the patient requests information concerning medical alternatives, the patient has the right to such information. The patient also has the right to know the name of the person responsible for the procedures and/or treatment.

4. The patient has the right to refuse treatment to the extent permitted by law and to be informed of the medical consequences of his action.

5. The patient has the right to every consideration of his privacy concerning his own medical care program. Case discussion, consultation, examination, and treatment are confidential and should be conducted discreetly. Those not directly involved in his care must have the permission of the patient to be present.

6. The patient has the right to expect that all communications and records pertaining to his care should be treated as confidential.

7. The patient has the right to expect that within its capacity a hospital must make reasonable response to the request of a patient for services. The hospital must provide evaluation, service, and/or referral as indicated by the urgency of the case. When medically permissible, a patient may be transferred to another facility only after he has received complete information and explanation concerning the needs for and alternatives to such a transfer. The institution to which the patient is to be transferred must first have accepted the patient for transfer.

8. The patient has the right to obtain information as to any relationship of his hospital to other health care and educational institutions insofar as his care is concerned. The patient has the right to obtain information as to the existence of any professional relationships among individuals, by name, who are treating him.

9. The patient has the right to be advised if the hospital proposes to engage in or perform human experimentation affecting his care or treatment. The patient has the right to refuse to participate in such research projects.

10. The patient has the right to expect reasonable continuity of care. He has the right to know in advance what appointment times and physicians are available and where. The patient has the right to expect that the hospital will provide a mechanism whereby he is informed by his physician or a delegate of the physician of the patient's continuing health care requirements following discharge.

11. The patient has the right to examine and receive an explanation of his bill regardless of source of payment.

12. The patient has the right to know what hospital rules and regulations apply to his conduct as a patient.

No catalog of rights can guarantee for the patient the kind of treatment he has a right to expect. A hospital has many functions to perform, including the prevention and treatment of disease, the education of both health professionals and patients, and the conduct of clinical research. All these activities must be conducted with an overriding concern for the patient, and, above all, the recognition of his dignity as a human being. Success in achieving this recognition assures success in the defense of the rights of the patient.

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CHAPTER 2

# TASK IDENTIFICATION DEFINITIONS, CONCEPTS AND RULES

This chapter presents the definitions, concepts, and rules for task identification. These must be learned and applied by the job analysts who collect the field data. They must also be learned by the director, who reviews the task identifications and descriptions submitted by the analysts, incorporates the desiderata and the literature in the field, and may broaden the task identifications to encompass occupation-wide or nationwide practices.

## THE HSMS DEFINITION OF A TASK

In the HSMS method a task is defined so that it can identify a unit of work which can be moved from one job to another without disrupting other work activities. The task is conceptually smaller than a job as a whole, and generally smaller than the work needed to produce an entire product, such as a health service or a manufactured item. The task is part of a series of work activities which are steps leading to or assisting in the production of final products. The task is defined in terms of a performer's outputs rather than an institution's products; the latter are the units that are sold. The HSMS definition of a task is as follows:

> A task is a series of work activities (elements) which are needed to produce an identifiable output that can be independently consumed or used, or that can be used as an input in a further stage of production by an individual who may or may not be the performer of the task.

The first rule for applying the HSMS definition of task is as follows:

1. In principle, someone other than the performer of the task must be able to use or consume the output of the task.

The person who uses the output may be the person who is performing the task, but the output must be potentially usable by someone else, either a consumer or another performer.

The definition refers to an output being "consumed" or "used as an input in a further stage of production." Consumption of an output means that it is used up, sometimes at the point of production. For example, served food, an administered injection, or counseling are all examples of outputs which are consumed rather than further acted upon. An output is used as an input in a further stage of production if it is a changed condition or something which will be further acted on by other performer(s) in a series of activities that result in a final product. For example, a prepared procedure tray is the output of a task. It is then used in another task, a special procedure. After a sub-assembly is fitted together, it is used in the produciton of a television set. An output usable by someone else appears after a stage of production is completed; another performer is then able to carry on with the next stage of production.

The component steps of a task are its elements. They include the steps needed to initiate the task, carry it out, and terminate it. The elements are the individual small units of work, whether physical and/or mental, which produce the output. Elements do not have identifiable outputs which can be consumed or used independently, or which can serve as inputs in a further stage of production by anyone other than the person carrying them out.

An element has an output usable only by its performer. This concept is especially useful in distinguishing between a task and an element. When a surgeon scrubs before surgery, the washed hands are an output not usable by anyone except the washer of the hands, the surgeon. Washing hands is therefore an element. Reading a thermometer is an element in a task whose output is a recorded temperature. Only the person reading the thermometer has the information to transmit or record the reading. In contrast, a prepared surgical tray is the output of a task, since the person preparing the tray need not be the one to use the tray.

TASK BOUNDARIES

The HSMS definition of task is an abstract concept. In the actual work setting, a performer can only be observed carrying out a given instance of a task; not all the potential steps or contingency elements of a task are carried out in any given instance. The HSMS definition, however, is intended to cover the task whenever it is done. The definition includes all the contingencies or options that may ever be carried out by the performer to produce the output of the task. The general rule for defining the boundaries of a task is as follows:

A task includes all the elements which must be performed or chosen among by one and the same performer to produce an identified output, and only those elements which must be carried out by the performer to produce the output.

This general rule has been expanded as a guide for identifying the elements that enter into a given task's boundaries. Each of these is presented and elaborated below as Rules 2 through 8:

2. Theoretically, it should be possible for there to be an elapse of time between tasks.

If there can be no elapse of time in a sequence of activities, it is likely that the same person must do the next sequence, and the task should include the sequences as elements. For example, a patient may have a series of x-ray exposures (radiographs) made after an injection of a contrast medium. All of the exposures ordered are outputs of the same task. Since it is not appropriate to wait between exposures, the same person must carry out all the steps in sequence.

An air contrast study of the stomach is often done after a radiographic examination of the gastrointestinal tract with barium contrast. HSMS identified these as two tasks, because the air contrast study can be requisitioned and carried out independently; it need not immediately follow the barium study; and it can be carried out by a different performer. Even if the same performer sometimes carries out the tasks in sequence, two tasks are involved, because there is the potential for a time delay and for a different performer.

3. A task includes <u>all the possible conditions or circumstances with which a single performer is expected to deal</u> in connection with the production stage or the output involved.

The task identification should be broad enough to cover in one task all instances leading to a given type of output. The elements should reflect any likely situations or emergencies that will have to be anticipated or covered. This rule makes it possible to identify broad tasks in which the fine details of the work as they are carried out from one instance to another are largely non-repetitive.

For example, when patients enter an emergency room, someone must decide how urgently they need attention. The performer, and therefore the task's elements, must deal with all the possible conditions and patients who arrive to be evaluated, because it is impossible to predict in advance the cases that will arrive.

If, in the course of a task, the performer may have to decide the next steps based on the events of the task situation, all the contingencies and possible steps are parts of the task. For example, in conducting a fluoroscopic examination, the performer may have to decide which of the organs in the general area of interest should be examined, what type of contrast material to use, whether to order radiographs, and whether to carry out emergency care. All the possible steps are included in the task, even if they are not needed in every instance of the task. Therefore, the task covers all the organs that could be examined, all the types of contrast that could be used, deciding on and ordering the radiographs needed, and responding to emergencies. The decisions are elements of the task as well. Tasks should never be broken apart in such a way that the skills and knowledges needed for decision making and evaluation would be lost as a result of the manner in which the boundaries are assigned.

4. A task includes all the elements that require <u>continuous judgment or assessment by the same performer</u> in order to assure the quality of the output..

This is an especially important point in health care, because over-fragmented work assignments might endanger the patient. Many health care procedures need the judgment or assessment of a person who has seen or been in contact with the patient over a series of "production" steps. On this basis, setting up a patient for radiation therapy and administering the radiation dosage for a given area of the body was identified as a single task, because there is danger to the patient in having the two functions carried out by different individuals. For the same reason, some neuroradiology examinations include tomography as an element in the task rather than as a separate task, because the radiologist carrying out the original examination is cumulatively assessing the patient's condition and should be the one to direct the tomography.

A task may include elements in which the performer can decide whether to have someone else carry out specific steps; however, the task includes all such delegable steps if the same performer may be <u>required</u> in some instances to personally carry out the steps based on Rule 4. If Rule 4 does not apply, <u>separate</u> tasks are generated that are not part of the original task, whether or not the same performer decides to carry them out personally. Thus, delegable steps can generate separate tasks, and can still remain elements in the original task, or can be exluded from the original task, depending on Rule 4.

When a task involves diagnosis and/or decision making, the outputs are generally orders or requisitions for tests, treatments, methods of care, counseling, etc. Such decisions are outputs of the first task in a series. They delegate work to others, and in a full-scale task analysis, can be used as a guide to other tasks that must be accounted for in task identification.

5. A task includes all of the elements needed to produce an output which can be independently used or acted upon without special explanations to the next performer in the next stage of production.

6. A task includes all the elements needed to complete an output to a point at which another performer (who would continue with the next production sequence) would not have to redo major elements or perform extra steps in order to continue.

A task is not completed if the next steps in a sequence cannot be done by a different person without a major repetition of prior steps. For example, setting the technical factors for an x-ray examination is not a separate task because a radiologic technologist should never expose a patient to radiation without having personally selected and set the technical factors. Therefore, setting the factors is an element within technologist tasks which cover entire radiographic examinations. Similarly, if a person making a certain kind of repair must be the one to assess the problem and choose the appropriate means of making the repair, simply making the repair would inadequately define the task. The assessment and decision on what to do are also elements, since repetition would be necessary were someone else to make the repair.

Certain procedure tasks are the result of prior consultation or diagnosis tasks which have resulted in requisitions. The procedure tasks themselves often require a review of the appropriateness of the decision to carry out the procedure based on the patient's current condition. Such review is not to be construed as a violation of Rules 5 and 6 because the review is based on new information.

7. The task must include enough alternative minor elements to cover a variety of institutional arrangements so that another performer can continue with the next stage in a production sequence <u>within current institutional arrangements</u>.

In one institution the performer may record the results of a task on an institutional form; in another, the performer may have to report personally to another staff member. In one institution documents may be placed for filing; in another these may be given to a clerical worker. Such elements are minor institutional arrangements; and differences from one location to another should not be used to differentiate tasks as long as they do not imply different skills or knowledges or different scale values for skills or knowledges. Instead, tasks should include the range of such possible practices as contingencies.

8. A task must be sufficiently broad in statement that it <u>can be rated on its frequency of occurrence</u>.

Some jobs involve activities which may appear to take place only once. For example, a particular research undertaking, the design of a special piece of equipment, or the design of a program all seem to be one-time events. But, if they are one-time events, they cannot be anticipated, trained for, or repeated. In fact, these are instances of broad tasks for which the performer is prepared and hired. The tasks would be carrying out research in a given field, designing equipment as needed for a particular range of functions, making recommendations on a range of equipment, and designing, directing, evaluating, and revising a given program, such as in radiographic quality assurance. Such task identifications are broad enough to cover an array of particular instances; such tasks have elements, contingencies, and a frequency of occurrence. If a task cannot be rated for frequency, it has not been properly identified.

TASK BOUNDARIES AND DIFFERENTIATION OF TASKS

Tasks are differentiated from one another and identified in terms of (1) the outputs produced, (2) the things used and the ways in which the outputs are produced, and (3) the other individuals who are involved. These three features of a task's identity determine the skills and knowledges required to produce the outputs of tasks. Tasks that require different skills and knowledges are different tasks.

Since the task which is identified is an abstract entity, deciding how many different tasks a performer carries out and how many tasks are covered by an occupation is a conceptual problem. In actual practice, most work is repetitive. Yet, while activities are done again and again, no instance of an activity is exactly like any other. It is possible to call each work activity done each day a different task. Still, it is the fact that activities can be generalized and repeated that makes training and education possible. Naming what an individual must be trained to do creates the link between task identification, job structuring, and curriculum design. This section provides further guidelines for identifying tasks. It shows how task outputs, what is used, and who is involved in the tasks are used to group activities into tasks.

## Task Outputs

The concept of "output" reflects the idea that performers are engaged in production. An output is the result of the task activity of one or more workers who use physical and/or mental energy, equipment, and other resources. It is the result of a production stage in an overall production process as work is organized in an institution:

An output is an altered physical state of a thing or person, a changed mental state of a person, or a new item. It can be storable, or can be consumed as it is produced. It can be physical (tangible) or non-physical (intangible). Outputs can be used by consumers, such as patients, or can be used by other performers in the performance of their tasks.

A task is identified partly in terms of its having an "identifiable output that can be independently consumed or used, or that can be used as an input in a further stage of production by an individual who may or may not be the performer of the task." The output is the result of the elements grouped within the task's boundaries. Conversely, the decision about which elements are assigned to a given task reflects the identification of the output of the given task.

## Conceptual Grouping of Outputs

At one end of the conceptual continuum for task boundaries are cases where the performer functions in a mechanized production context such as on an assembly line. The work is broken up into minute stages; each performer has only a few steps to carry out, and each instance of the work is exactly like every other instance. If the work is organized so that the outputs go on to the next performer, it is clear what the task outputs are at the end of each production stage. Names for task outputs might be: "a wired front panel on a television chassis," or a "tightened left front bolt on a car door assembly," or "stacked clean sheets."

Although production lines vary in models and styles, still more minute output differentiations would not be made. Tasks are not identified as "wired front panel of a 16-inch television chassis," or "tightened left front bolt on a station-wagon door assembly,," or "stacked clean sheets for a single bed." One assumes that different skills are not needed when the size of the television set or the size of the bed changes. Thus, similar outputs have been grouped for the identification of a single task.

At the other end of the continuum for conceptual task boundaries are certain task activities so broad that it can be difficult to imagine that given situations are really instances of the same task.' For example, an individual is shot and is taken to an emergency room of a hospital. A staff member determines that emergency life support must be administered. A young woman gets something in her eye and also goes to the emergency room. The same staff member assigns her to a room and places her name on a list so that she can have someone remove the foreign object, perhaps after the gunshot victim has been attended to. The outputs are not "life support for gunshot victim," or "removal of foreign object in eye ordered."

Such statements of output imply that what results from the task activity ~~can be anticipated~~; but the conditions in which patients arrive at an emergency room cannot be specifically anticipated. Rather, the staff member's output may be "assessment of patient's condition, determination of priorities for attention, and notification of staff in emergencies." Such an output statement implies that the task can be repeated, even though instances of the task vary. It implies that the skills and knowledges needed by the performer must cover all the eventualities, because that is the nature of the activity. It is impossible to assign a performer to triage duty unless he or she can evaluate all patients who arrive. By way of contrast, it is possible to assign different patient care activities to different individuals after triage by virtue of the classification of the patients' conditions.

At an intermediary point in the continuum for conceptual task boundaries one finds sets of activities that have much in common with one another, yet vary in certain details. For example, there are many types of radiographic examinations, surgical operations, radiotherapy treatments, medications, psychological tests, etc. Here, the problem in task identification is to discriminate among the activities and decide how many tasks are involved.

Consider that, in daily practice, performers do not really "give patients injections;" they administer specified doses of particular medications ~~to particular~~ individuals. However, we identify tasks with names such as "Administering subcutaneous or intramuscular injection to any patient according to MD's orders," and, "Administering medication orally to any patient according to MD's orders." The implications are that administering medication orally, subcutaneously-intramuscularly, intravenously, or locally are different tasks; that following the MD's orders is common to instances of the tasks; that there are no major distinctions among patient recipients which call for further differentiation among tasks; and that the various ways in which medications are prepared for a given type of administration should all be known by the performer who administers the medication.

The two tasks named above reflect a grouping of activities that are similar in their steps and skill and knowledge requirements and/or in the options that must be chosen among. Any other differences are treated as instances of the same task. Such a decision is the responsibility of the job analyst who determines the salient points of similarities and differences for grouping activities into tasks.

The HSMS rule is that tasks are grouped to reflect what a single performer can be required to carry out with regard to a given type of output. This usually reflects the way the knowledge in the field breaks down and the way work is assigned. For example, in diagnostic radiology, it was clear that, for the radiologist, the examination tasks break down by system of the body and procedure type. We could easily distinguish that conducting a lower gastrointestinal tract barium enema examination was one task, and conducting bronchography was another task. Different radiologists could be asked to perform each; and doing one task does not involve or require doing the other, does not depend on the performer having done the other, nor are they alternatives during performance. On the other hand, since, in the course of the lower GI examination any component organs could be involved, no further breakdown was made by organs of the gastrointestinal tract.

In the case of radiologic technologists, the examination tasks were broken down by area of the body to cover all the parts likely to be listed on a single requisition sheet. When we found standardized orders for routine examinations, this was used as a basis for the grouping for a task; when we found requisitions that varied in how the areas of interest were included, we used broader grouping for a task. For example, radiographic examinations of adults were more routinized and could be broken down into more categories than those for infants.

An example from radiation therapy reflects a task grouping that takes Rule 4 into account, a breakdwon that assures the quality of the output. Some radiation therapy technologists are assigned to administer radiation treatments on the basis of the equipment used. There are technologists who administer treatment only on a linear accelerator or only on a cobalt-60 teletherapy machine. In other instances, technologists are expected to administer treatment to a given patient and to be prepared for the possibility that a treatment plan may combine treatment using cobalt-60 with electron beam radiation or some other modality. We could have differentiated the tasks either by reference to the equipment or by reference to the area of the body involved. We chose a breakdown based on the area of the body because we learned that the patient receives continuity of attention if the technologist is prepared to deal with the given patient regardless of the machine. The performer has a wider reference base and can monitor the patient's behavior and reactions to treatment over time; the patient benefits from a supportive human environment when there is continuity of attention. Thus, task identification has a policy aspect.

Another example of HSMS grouping is in relation to the preparation of procedure trays. At first we identified a separate task of tray preparation for each procedure task we identified. It seemed that there could be hundreds of tray preparation tasks. We realized, however, that the contents of procedure trays are prescribed and standardized, and that the performer really need only know how to follow the orders, handle sterile equipment, and examine materials while assembling the tray. We eventually identified only two tasks: one involves trays that require medications; the other is a more limited task in which the performer adds non-medicinal items to partly prepared trays.

## Guides for Identifying Outputs

1. Decisions, judgments, and evaluations can be outputs of separate tasks or outputs of elements within a task. If they are left in the head of the decider, the judge, or the evaluator, they are outputs of elements. If they are regularly expressed in transmittable form, such as spoken to someone or written down, they are outputs of separate tasks. Only then are the outputs usable by someone other than the performer.

2. When performers carry out activities that cover a variety of instances of a similar type of activity, such as administering a range of tests, exercises, or treatments, repairing objects or equipment, or doing other work activities which are neither sets of unexpected occurrences nor minute, regularly recurring functions, task grouping is required.

3. If the performer must choose among varieties of tests, exercises, etc., and does not make the choice as part of a separate task (by recording it or transmitting it), and must be prepared for all instances, one broad task exists which includes the decision and all the alternatives in the same task. Both the decision and the execution are outputs of the same task.

4. If the performer has a variety of similar activities to do, each of which is prescribed, the activities should be grouped; there are as many tasks as groupings according to the following rules:

   a. If the varieties of the tests, exercises, treatments, repairs, etc., can all be covered by the same set of skills and knowledge, then each is an instance of the same task, and the task is defined in terms of what the varieties of outputs have in common.

   b. If the varieties of the tests, exercises, treatments, repairs, etc., are covered by different skills and knowledges, then the varieties of outputs should be grouped according to their skill and knowledge requirements, and each task is defined in terms of the distinguishing characteristics of the output grouping.

## By-Product Outputs

Tasks can have more than one output. Some are by-products of the primary activity of the task. For example, in carrying out a given examination, the performer may reassure the patient, may decide whether to proceed with the examination, may carry it out or record why it was cancelled, may record the results, and may place the records for further use, such as for filing. These outputs are linked to the main one, a patient's being given the particular examination. Providing reassurance, deciding whether to proceed, and recording the examination all must be done by the same performer in the proper execution of the examination, and, therefore, are elements of the task and not separate tasks.

If the analyst does not notice that intangible outputs can be produced in addition to the main output of a task, tasks which produce the same main output can be confused with others which exclude or have different by-product outputs. An examination task in which emergency symptoms are reported to a senior staff member is different from a task covering the same examination in which the performer decides what to do to handle the emergency.

## Acquired Knowledge in Relation to Outputs

Some tasks require that the performer acquire certain kinds of knowledge in the course of performing the task. As the performer acquires the knowledge, he or she uses it in the task. The knowledge is not usable by anyone else but the performer in the execution of the task, and thus the acquired knowledge is the output of an element in the task. An example would be recommending what equipment should be purchased by a given department, or designing training programs for employees. The tasks require that information be gathered, assessed, and translated into a recommendation or a program. Such tasks should not be differentiated on the basis of the specific subjects covered in any instance of acquiring knowledge, but on the basis of the broad activity and general subject area involved.

What Is Used In a Task

Some outputs can be produced in a variety of ways. "What is used" in a task includes all the things which the performer is expected to be able to use or choose from to produce an identified output, even if particular instances of the task utilize only some of these. A task is identified partly in terms of what the performer must be able to use because this helps determine the skills and knowledges required for the task. What is used in a task can include machines, tools, data, and other materials. Thus, technology enters into the identification of tasks.

If the performer is expected to choose among the appropriate methods (things) to use to produce a specific output, the ability to use all the methods is expected, and the task requires all the skills and knowledges potentially involved. On the other hand, if what is used is prescribed, and the performer does not have options, separate tasks exist for each method, even if the performer works at some time with each of the alternative pieces of equipment. Once the equipment is prescribed, each individual task requires a more limited set of skills and knowledges than if the choice were made within the task.

While the task can cover a variety of methods and things used, this does not mean that the task includes <u>all</u> the methods available in society at large. The task covers only those things which the performer can be expected to use to produce the given output within the context being studied. However, the context may go beyond any single institution. HSMS task identifications have grouped two or more equipment options into the same task if the performer is expected to work with each, even if a given institution does not currently have all the pieces of equipment, provided that the same knowledge is involved. For example, in radiologic technology, equipment with or without automatic collimation, and with or without automatic density controls are covered within the same task; equipment with roll film and with cassette spot film devices are covered by the same task. "Taking mammograms of any patient" is a task that covers both xeroradiograhy and conventional radiography equipment, because positioning the patient, selecting the technical factors, and the interactions with the patient are the same.

On the other hand, we separate tomography tasks from conventional radiography tasks except when a radiographic examination starts with conventional radiography and then the <u>same</u> performer must proceed to tomography. This is because there are differences in the specialized equipment that differentiate the skills and knowledges involved.

## Guides For Identifying What Is Used

1. The range of things used in the task must correspond to the range of contingencies and options covered by the task's output.

2. Tasks are not differentiated by minor differences in what is used if these have no effect on skill or knowledge requirements. Differences in brands, sizes, colors, and similar details are minor unless they require different skills and knowledges.

3. If the performer must choose among the things used to produce a given output and does not make the choice as part of a separate task (by recording or transmitting it), and must be prepared to use any of the materials or equipment chosen among, one broad task exists which includes the decision and all the alternative methods.

4. If the performer has a variety of materials and/or equipment to work with to obtain a given output, and each is prescribed, the things used should be grouped; there are as many tasks as groupings according to the following rules:

   a. If the varieties of things used can all be covered by the same set of skills and knowledge, then each is an instance of the same task, and the task is defined in terms of the output and what the things have in common.

   b. If the varieties of things used require different skills and knowledges, the things used should be grouped according to their skill and knowledge requirements, and each task is defined in terms of the output and the distinguishing characteristics of the groupings of things used.

## Kind of Task Recipient, Respondent or Co-Worker (if any)

The "recipient, respondent or co-worker" involved in a task reflects the special characteristics or condition of the people with whom the performer must be trained to deal. If the performer of a task gives or does things to a person, a recipient is involved. If the performer must get information or talk to another person, a respondent is involved. If a task must be done with the help of, or in conjunction with, another employee, a co-worker is involved.

A task is identified partly in terms of the kind of recipient, respondent or co-worker who may be involved. The word "kind" is meant to imply the characteristics or the condition of the person(s) involved in the task which require knowledge or skill on the part of the performer. Work assignments, and, therefore, tasks, are differentiated on the basis of such requirements. Performers without appropriate special knowledge may be restricted to providing a given type of output and using a given set of things only in connection with persons who do not require special considerations or behavior. For example, teaching children, retarded persons, deaf children, or foreign-born adults to read imply different tasks based on differences in the recipients.

Two activities may be the same in their main output and things used, but be different tasks as a result of the kind of recipient, respondent or co-worker involved. (This generally also means that there will be some differences in by-product outputs and some of the things used, as well as in task elements).

In its work, HSMS has differentiated "pediatric" from "non-pediatric" tasks, "infant" from "non-infant" tasks,[1] and "male patient" from "female patient" tasks when a given procedure with a given output

[1] HSMS assumes that "pediatric" varies in its age cut-off reference as appropriate to a given procedure. HSMS uses "non-infant" in cases where the cut-off between tasks groups children older than infants with the rest of the patient population.

and things used varied in its specific elements and skill and knowledge requirements as a result of the kind of patient involved.

If a performer has an assignment in which it is impossible to anticipate the kind of recipient, respondent or co-worker who will be involved, such as patients in a triage task, then the range of patients does not result in different tasks, because the nature of the task requires the ability to deal with all such contingencies; "any patient" would be involved.

A task can have minor variations in who is involved which bear little on the content of the task. For example, in a patient examination task, records may be given to a staff member; at the end of a task a clerical co-worker may be informed of the completion. In such cases a single task exists even if one instance includes a co-worker and another instance does not, as long as the co-worker is not an intrinsic part of the task. For example, if a task involves delivering or picking up supplies or materials, a co-worker may or may not be involved without the task being radically different. If someone writes a letter and gives it to a secretary while someone else writes and leaves the letter on a desk to be picked up, the task would not be radically different, and, all other things being equal, these are instances of the same task.

If the performer deals with a specific "kind" of recipient, respondent, or co-worker by virtue of the department he or she works in, and this does not differentiate the task from instances in another department, the "kind" is actually more general than the name in the departmental situation. For example, preparing a patient for an examination or treatment may be activities whose recipients need no further designation that the term "any patient," even if the performer comes into contact only with ambulatory care or diagnostic radiology patients.

Guides For Identifying Recipients, Respondents or Co-Workers

1. If a task activity requires the performer to deal with a range of recipients, respondents, or co-workers as an intrinsic aspect of the task activity, a single task is identified that covers the range.

2. If a task procedure relating to a given output and things used is carried out differently depending on the age, sex, condition, or status of the recipient, respondent, or co-workers involved, and the differences reflect differences in the skills and/or knowledges required, there is more than one task involved. There are as many tasks as there are significant variations in the way the procedure is done as determined by the kind of individuals involved, provided that the differences in the individuals can be anticipated before the tasks begin.

3. Minor variations in the total number and kinds of recipients, respondents, and co-workers that do not result in different skill or knowledge requirements should not be used to differentiate tasks. Such minor variations should be treated as instances of the same task.

SPECIAL CASES OF TASK IDENTIFICATION

This section brings together some additional concepts and rules to cover specific problems that can be encountered during task identification.

Non-task Activities

Task identification does not include activities which the performer volunteers to do which are not required by the employer.

Non-task activities include running personal errands for co-workers, making personal calls, taking coffee breaks, attending classes on a voluntary basis, helping others to do their work as a favor to them, and practicing other employees' work so as to qualify for a new job.

Overlap Tasks

Two tasks are the same if their elements result in the same output, require the same things to be used (including the alternatives to be chosen among), if the recipients, respondents or co-workers involved are the same (in terms of what the performer needs to know in order to deal with them), and require the same skills and knowledges.

If they appear in the same performer's job they are instances of the same task and are counted in determining task frequency. If they appear in different performers' jobs, different job titles, different occupations, or different institutions, they are overlap tasks.

Simultaneous Tasks

Simultaneous tasks are two or more separately identifiable tasks which are performed at the same time because one task provides a convenient vehicle for the performance of the other task. Tasks such as giving a patient general reassurance, or observing and reporting symptoms and concerns of a patient to a physician, are carried out while the performer is carrying out other regular tasks. These activities have clearly identifiable outputs that are separate from those of the task with which they appear once one is aware of their purpose.

These activities very often can be done only in conjunction with other tasks, such as serving food, or taking blood pressure. The particular association of the tasks with each other is really not necessary for each of the activities to be done, as would be the case with elements in a single task. The food can be brought and the blood pressure taken with an appropriate level of friendliness, but without the observation of other symptoms or the provision of reassurance; the latter activities take different levels of skill. Conversely, symptoms can also be observed while tidying the patient's bed or bathing the patient, and reassurance can be given while checking a patient in or helping a patient to change clothes.

It should be noted, however, that some tasks, by their very nature, require that symptoms be observed, or that the patient be reassured. In changing dressings or otherwise dealing with wounds, symptoms are observed as part of the task. Certain examination or treatment procedures require that the patient be reassured and be encouraged to cooperate. These are examples of tasks whose performance require giving reassurance or noting and reporting symptoms as elements.

The HSMS method provides for separate identifications of simultaneous tasks because they usually require different skills and knowledges. It would be a mistake to assign skill and knowledge requirements for two tasks to a single task and thereby obscure the skills and knowledges actually required for each. The rules for dealing with simultaneous tasks are as follows:

1. Simultaneous tasks appear with other tasks which provide opportunities to achieve their outputs.

2. Such tasks are distinguishable by virtue of having unrelated outputs; the simultaneous task can be (and probably is) linked with other, different tasks which also provide opportunities to achieve its output. The frequencies of the simultaneous tasks and the ones it appears with will be different.

3. Two activities do not involve simultaneous tasks if, by virtue of the nature of the main activity, the provision of outputs such as reassurance or observation and reporting of symptoms, etc., are a necessary part of the main activity.

## Conferences and Deliberations With Co-Workers

In cases when performers ask other co-workers for opinions, or are asked by others to evaluate a problem in a procedure, or when performers attend meetings, some confusion can arise about which tasks, outputs, and kinds of recipients or respondents are involved for each of the performers.

In the case of questioning other co-workers, the performer has a primary activity such as a procedure to carry out. The performer may, as an element of the task, ask others for their opinions, but it is presumed that the performer is responsible for all the procedural steps of the task. In the case of giving opinions to other co-workers, the same skills and knowledges are involved as in the case where the performer must deal with the issues in his or her own tasks. Thus, in "reading and interpreting" radiographs, the elements really cover radiographs taken personally by the performer and radiographs about which co-workers seek opinions. In both cases, the questioning is not a primary aspect of the task that is identified. Similarly, evaluating an output covers evaluating one's own output or the outputs of others.

When various performers' tasks require attendance and participation at a staff meeting or conference there are as many tasks as kinds of contributions to the particular kind of meeting involved. The tasks should be differentiated by and should reflect the skills and knowledges required for the performers' specialized contributions. In a conference to evaluate a patient's progress, for example, the physician may draw on one kind of knowledge and the family health worker on another. Two separate tasks would be identified, one for the physician and one for the family health worker.

Similarly, when performers teach or instruct, the output and the recipients of the task should reflect the areas of competence involved. An output would never be, "an instructed employee." It could be, for example, "physical therapy student instructed in exercise techniques," when the performer is a specialist in physical therapy.

The division of teaching tasks into separate tasks should reflect breakdowns and groupings of knowledge similar to those discussed under task boundaries, outputs, what is used, and recipient, respondent, and co-worker.

# CHAPTER 3

## TASK IDENTIFICATION AND DESCRIPTION: JOB ANALYSTS' PROCEDURES

This chapter is a procedure manual for job analysts. It describes the field work for task identification (task ID) and description. The steps enumerated in this chapter begin after the analysts have been trained in the task identification method, have become familiar with the basic data about the occupation to be covered, and have read the background information about the institution. The steps also assume that scheduling, described in Chapter 1, has been carried out.

### PREPARATORY STEPS

Each job analyst prepares a data collection kit which includes scheduling information, letters of introduction, note paper, appropriate HSMS data forms, manuals, such as this one, for use as a guide, and laboratory coats or identification badges if either are called for in the field situation.

The analysts should establish a set of rules for communicating with one another and the institution:

1. On data collection field work days, the analysts should have a clearly defined place to meet beforehand.

2. If the analysts are part of a central office or consortium staff, they should have each other's phone numbers and a place to call or leave messages during the day.

3. Each analyst should notify a designated person before the morning of an appointment if he or she is to be dealyed or cannot be present. In a two-person team the absence of any analyst makes rescheduling necessary.

4. The analysts should meet before joining the performer and allow enough prior time to arrange materials and go over plans for the day and the meeting with the performer. The spokesman of the day should be selected. (Each analyst should have experience in being spokesman of the day.)

5. If the performer is not at the appointed meeting place, one analyst should be involved in locating the performer and should try to keep from disrupting institutional activities.

If not already done, the spokesman introduces all the analysts to the performer.[1] Ground rules are set up during the first appointment with the performer and, if necessary, are reviewed at subsequent appointments:

1. The work should not begin until the performer and the analysts agree about what is to occur. The spokesman should always clarify the purpose of the session and give a rough idea of the kinds of things which will be asked, the length of time involved, and any special arrangements which may have been made. If any of the arrangements have been misunderstood or are challenged, these should be cleared up.

2. Interviews are conducted privately in the presence of the team of analysts and the performer. No others should be listening (except the employee representative, if requested by the performer).

3. The presence of the supervisor is only allowed during observations if this is a regular part of the way in which the work being observed is done. The performer may have the employee representative present.

4. During interviews, a spokesman leads the questioning. The other analysts ask questions on topics as they arise. This continues until all of the analysts are satisfied with respect to the information they need about the tasks.

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[1] In introductions, a simple exchange of names would take place. The analysts, unless otherwise requested, should address the performer as Dr., Mr., Mrs., Miss and the surname. Chapter 9 deals with issues such as gaining the performer's cooperation.

5. Before observations, the performer should be requested to introduce the analysts to any patients or co-workers who will be involved in the work and inform them about the purposes of the observation. The spokesman should be prepared to reassure anyone who is concerned about being observed.

6. No person should be forced to undergo observation. If the performer or a patient refuses to be observed for part of the sequence planned for observation, this part of the work must be dealt with through the interview alone.

## TASK IDENTIFICATION INTERVIEWS AND OBSERVATIONS

### The First Few Interviews

The primary focus of the first interview with each performer is to give the analysts a broad view of all the performer's current work activities. Once this is done, the analysts attempt to discover all the options, decisions, things worked with, kinds of people involved, and the range of conditions which the performer is expected to handle as part of his or her assignments.

The spokesman first attempts to have the performer enumerate all the work he or she does, and may ask:

> Would you list for us all the things you do on your job? We want to be able to cover everything, from the things you do all the time, to the things you do only once in a while.

The purpose here is to develop an exhaustive list of activities which can be used as a check list, so that the performer can be asked all the relevant questions about each, permitting the list to be divided into tasks. The performer, of course, does not think in terms of the HSMS definition of "task." Therefore, the list will contain elements, tasks, activities covering several tasks, duplications of tasks, and extraneous, non-task activities. These are the "raw materials" of task identification.

One technique to elicit the list is to have the performer verbally walk through a normal work day. The spokesman can ask the performer to tell exactly what he or she does from the time of arrival until the end of the day. This is supplemented by questions such as, "Do you do anything special weekly, monthly, annually?" "What might occur which would vary this routine?" This approach is particularly useful with performers who seem to have difficulty in verbalizing or describing their work and whose activities are fairly routine.

The spokesman should not cut off the performer's listing of activities unless he or she believes that all the duties done by the performer are covered. If the performer ends the listing before the spokesman is satisfied that everything has been mentioned, he or she should ask:

> Anything else?

If the answer to this question is that everything has been named, corroborating questions are asked:

> Have you left out anything that you may do only once in a great while, or only in special circumstances? Are there any kinds of emergency situations you did not mention yet? Are there things you do at a later point such as follow-up activiites?

The analysts take notes on the information provided by the performer in order to have information for task identification and for later stages of the task analysis process. Fully descriptive and legible notes are more valuable than short-hand scribbles and vague phrases. If the analyst knows all the questions to be answered for task identification and understands the other stages of the method yet to come, he or she can develop a style of note taking that will meet the needs of the method.

As the performer talks about his or her work, a pattern will emerge. There will be one or more kinds of central activities that represent the purpose of the job, such as examinations, treatments, tests, giving care, or doing manual production activities. There may also be a series of administrative, housekeeping, and/or clerical activities. It is best to question the performer separately about each group to see how the work breaks down.

The work of professionals can offer difficulties because it is often highly technical, detailed, and non-routine. There can be endless contingencies for a single task. In order to make order out of this kind of situation, the analyst should consider the possibility of further groupings. Questions to discover which activities are actually variations of a given assignment will help. Relating things in terms of what happens when things go right, and what happens when there are problems, can help identify the variations or contingencies of a given task.

As the performer describes the work, the analysts should compare the performer's list with the work in the field as a whole, as covered in the earlier literature review. The spokesman or other team members may use references to the literature in developing the list of activities by questions such as:

> I am aware that your occupation sometimes covers ____; Do you do that in your job? Does anyone at this institution? Who? (or) What is the reason this isn't done here? Do you know where it is done?

These questions will provide a check on whether enough performers have been identified to cover all the work, will uncover the need to go to additional institutions, or will add to the list of activities. It may also uncover information on new equipment and obsolete procedures and equipment.

The analysts follow all the questions and answers, taking notes and listing questions. Each analyst is given the opportunity to pose questions at appropriate points in the proceedings. Only those questions which have not already been fully covered should be asked.

Questions to identify task boundaries, outputs, what is used, and recipients, respondents, or co-workers are raised once a preliminary list of activities has been developed. This may not occur until the second interview. It is helpful if the analysts edit their notes beforehand. When the list has been developed, the spokesman questions the performer about the listed activities in order to obtain a preliminary idea about the task boundaries and the elements involved.

The analysts should note that new work items may appear as the performer is questioned about the items already on the list. These should be written down and added to the list.

During this phase of the interviewing the analysts should use pointed questions to assist them in applying the HSMS definition of task and the rules for task description. The questions below are suggested to help the analyst in this probing:

1. Questions For The Performer to Help Determine Task Boundaries:

What steps do you take when you ____?

What other things things like that do you do?

Does the same person have to do (1) and (2) and (3), or could someone else do (2) when (1) is done and then go on with (3)?

If someone else were to do the next step, would the first person have to make any explanations? Would the work have to be reorganized? Would he have to redo anything?

If the work were broken up in ____ (way), what effect would that have on the patient? What effect on the work?

Can that be set aside before the next step is done?

Which of these things need the attention of the same person to know what's going on (or what to do), (or be aware of complications)?

When you ____ what do you have to be prepared for? What might happen? What might arise? What would you do then? Would there be anyone else you would call?

I noticed that you said you (1) while you were doing (2). Do you have to do (2) only at these times, or is (1) an opportunity for you to do (2)? Do you do (1) at other times? When?

2. Questions For The Performer About Outputs:

What result are you expected to come up with? Are you expected to ___ (reassure, decide what's wrong, decide what to do, decide how to do it)?

You do a lot of ___(s). In your mind, do you group them? Are some really almost the same sorts of ___? Which ones? Why do you group them that way?

Do you decide whether or how to ___? Do you write that down or tell someone? What is your assignment in regard to that?

Are you expected to know about ___, or can you find out about it? Do you go to other co-workers? Do you teach yourself?

When you ___, are you making any judgments or decisions beyond just doing that? Are you choosing? Are you deciding what's wrong? Are you deciding what has to be done?

What are you expected to contribute in such a situation? What are you expected to do?

3. Questions For The Performer About What Is Used:

What do you use when you ___? What other things would you use to ___?

Do you do that any other way? Are there other ways to ___ common to this type of work? What is used? How do you do this the other ways? Do you decide which way to do it?

Do you decide what to use or is it already decided?

You use a variety of ___ to do that. What makes one more appropriate than another? Are some interchangeable? Which?

If you know how to use one ___, are there others you are likely to know how to use? Which ones? What do they have in common? Which ones do you use here? Which ones must you use?

How do you group the things you use for this? Why do you group them that way?

4. Questions For The Performer About the Recipient, Respondent or Co-Worker:

Is there any special kind of ____ (person) you do that to (with), or do you do that to (with) anyone?

When you ____, are you limited to any particular type of patient (recipient)?

Would you do this the same way for all ____?

Is there any kind of ____ (person) you are not allowed to do that to (with)? What sort are they? Is that because you need more knowledge or a license for that other type? Any other reason?

Must it be only that kind of ____ (co-worker) you do that with? Why?

Do you deal with anyone in such a case? What kind of person?

5. Bear in mind the following guidelines:

a. The analysts should be sure that they are not picking up what the performer knows how to do, rather than what is done. The performer may know more than a task requires or that a job requires. He or she could be asked, "I know that you know how to ____, but does this actually call for it?" Should it be done to achieve quality results?

b. When there are optional activities which the performer does because he or she knows how, and these become part of the job, they should be included.

c. When there are activities which the institution prefers to have the performer do, and he or she does them, they should be included.

d. When out-of-title work is done by the performer because of short staffing, this should be included.

e. When there are activities the performer does which are not required and not asked for, but are done because the performer wishes to do so for personal reasons, they should not be included.

f. A line of questioning should be changed if there is evidence that the performer is becoming defensive. He or she may feel inadequately trained to do an activity, or may believe personal judgments are being made. If the analysts sense this, the question can be shifted to, "When you were given this assignment, what was asked for?"

In order for the analysts to properly question the performer they must be sure of their objectives. They should focus on information needed to group the performer's work activities into tasks, or details needed to describe the tasks. Thus, the analysts should be aware of the technical language in the occupational area and attempt precise usage during each step in task identification and description, not just in the final writing of task descriptions. The performer should be asked to explain unfamiliar terms.

Once all the analysts are satisfied that they have had their questions answered and have complete enough notes for preliminary task ID editing, each should indicate this to the spokesman, who then terminates the interview. In some cases completion of this phase of analysis requires several interviews. Whenever another interview is needed, the performer is informed, and a tentative date is set, subject to the supervisor's approval.

Once the spokesman has ascertained that there are no additional questions or that the time is up, he or she thanks the performer for the cooperation given and reconfirms the arrangements for the next appointment.

Editing

Editing follows each interview and/or observation. It is done in the analysts' assigned area or at their home office, depending on the scheduling arrangements. There are three purposes for the preliminary editing after interviews; the first two also apply to post-observation editing:

1. To make detailed and accurate judgments on the identity of tasks, based on the information which has been gathered.

2. To note what ~~questions~~ still remain to be asked in order to come to final conclusions about the task identifications. Later, to note what questions remain in order to write detailed task descriptions.

3. To identify which work activities need to be observed for the sake of clarity.

During editing, an analyst reads through his or her notes and corrects language or rewrites illegible sections so that content will not be lost and someone else can read the notes if necessary. Then the analyst attempts to identify tasks by applying the HSMS principles. The analyst must account for all the work activities of the performer; all the work noted must be assigned to tasks.

The analyst attempts to decide the boundaries of tasks, judging when broadly stated task content is involved, when minutely circumscribed task content is involved, etc. The analyst notes the areas in which the performer's help will be needed in grouping outputs, things used, or kinds of persons involved.

The form used by the analysts throughout the period of preliminary task identification and description is Figure 1, the Task Identification Summary Sheet and its continuation page. Analysts go through various stages of task description, constantly adding to and refining the information on these sheets. In order to keep track of the work, the analysts fill in the information at the top, including the performer's name, job title, analysts' names, the institution, department, and the number of the task within the total identified for the performer's job. The date can be used to mark the stages of the task's development. The director generally assigns the Task Code Number.

For each task tentatively identified, the analysts attempt to establish the basic sense and scope of each task by answering questions 1 through 4 on Figure 1. The questions are also used by the analysts as a check and as a basis for formulating questions for additional interviews with the performer:

1. "What is the output of this task? (Be sure this is broad enough to be repeatable.)"

   What has the performer accomplished? What does the consumer or the next person to use the output have when the task is done?

   Is this output broad enough to be produced or achieved again? Is this a specific instance of an output that results from a broad activity? If so, what is the range or type of outputs to be included?

2. "What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)"

Figure 1. HSMS FORM FOR PRELIMINARY TASK ID MATERIAL

TASK IDENTIFICATION SUMMARY SHEET

This is task ___ of ___ for this performer.
Code — This is page 1 of ___ for this task.

Performer's Name ________ Analyst(s) ________ Dept. ________
Job Title ________ Institution ________ Date ________

1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

3. Is there a recipient, respondent or co-worker involved in the task? Yes...( ) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

List Elements Fully

6. Check here if this is a master sheet..( )

Figure 1. (continued)

TASK IDENTIFICATION SUMMARY SHEET (continued)

Code

This is task ___ of ___ for this performer.
This is page ___ of ___ for this task.

| | | |
|---|---|---|
| Performer's Name ______ | Analyst(s) ______ | Dept. ______ |
| Job Title ______ | Institution ______ | Date ______ |

| List Elements Fully | List Elements Fully |
|---|---|
| | |

Does the performer have a choice of what to use? If so, include the full range of options. If the performer can or must choose what is used after assessing the particular circumstances, all the things from which the choice is made should be noted.

3. "Is there a recipient, respondent or co-worker involved in the task?"

   Check "yes" or "no." If "yes," answer question 4.

4. "Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the person is not allowed to deal if relevant to knowledge requirements or legal restrictions."

   The "kind" named should describe the relevant nature of the patient's condition in patient care tasks, the relevant nature of the respondent's function in interview tasks, the relevant professional or subject area of specialty in co-worker tasks--if these determine the knowledge which the performer must possess to carry out the task.

   Restrictions should be part of the name used for "kind" when these reflect knowledge-related requirements relevant to the task or legal restrictions on who can be involved.

Each analyst can review his or her own list of task identifications. The check list below is suggested:

1. Does the task identified result in something which can be used as a building block for a job? Does the task contain all the activities needed to complete the output or for assignment to a different performer or job title?

2. Does the task take account of the continuity needed to assure the quality of the ultimate product? Is the task too simplified to produce the desired output?

3. Do the task identifications differentiate activities which require higher levels and/or several kinds of knowledge from similar tasks which do not require these levels or varieties of knowledge?

4. Do the tasks account for such intangible activities as giving reassurance, making decisions, assessing progress, contributing to a meeting, designing, or evaluating?

5. Do the identifications have as separate tasks the narrow, repetitive activities which occur?

6. Do the identifications group under broad task names the kinds of activities which differ markedly in their details from one instance of the task to another?

After preliminary editing and task identification for a given performer, the analysts in the team meet and discuss their preliminary breakdown of tasks. They determine which areas remain to be clarified. These meetings are also used to plan for subsequent interviews and observations.

Observations

The purpose of observing the performer is to permit the analysts to deal with work which is more easily understood when seen. Observations are used to save time and to clear up confusions. This type of situation is most likely when complicated equipment or complex procedures are involved or if the performer has difficulty in describing the work.

Some time after the initial interviews the analysts decide which activities they need to see performed. The following list is an aid for deciding which activities should be observed:

1. If the activities involved utilize highly specialized equipment or complicated procedures which are unfamiliar, they should be seen.

2. If the performer is not articulate enough to express the nature of his activities, the ones most unclear should be seen.

3. If the performer appears to be distorting the nature of the work (either consciously or unconsciously) some of the work should be seen.

4. If the performer appears to take much of what he or she does for granted and the analysts cannot get details, it may help to see some of the activities.

5. If the performer has little time for interviews but will be less constrained while actually working, or if the performer is clearly uncomfortable with the interview situation, a shift in focus to observation may be warranted.

In some cases, seeing the performer carry out the task as a "dry run," for example, without a patient present may be useful. Such a situation can be treated as an observation in the following discussion.

The analysts make notes and decide on which work elements need to be clarified through observation. The scheduler for the team has the responsibility of arranging for observation appointments. The following is necessary:

1. There must be willingness on the part of the performer and the supervisor to allow the observation.

2. The observation period should be a long, continuous block of time, if possible.

3. All the appropriate scheduling steps must be followed for observations.

The analysts join the performer at the work site and go through any introductions needed there. The performer's cooperation is enlisted to make the observation as fruitful as possible. The performer is asked to provide a running commentary on what he or she is doing and using and to answer brief questions. The performer should be assured that such help is not expected if it will interfere with the work (or the patient). The performer should be encouraged to tell the analysts when they are getting in the way or preventing the work from being done properly.

The analysts try to make the situation as relaxed as possible. They should be close enough to see everything that the performer does and yet not so close as to interfere in any way with the work.

There is little time to think critically during observations about what to include in taking notes; the analysts should write about everything seen. Questions should be noted down as soon as they occur. If they are asked aloud during the observation period (they may be, if they are brief, do not disrupt, and require only brief answers), the answers must also be noted. The following should also be borne in mind:

1. What is seen at any given time may be only one instance of a task which involves alternative things to be used, or a task for which a wide variety of different but related events must be included. This could be true, for example, when the performer repairs a wide range of objects, or in emergency room tasks, or in operating room tasks. Probing questions can clarify these points.

2. Analysts might see tasks which are interrupted. The task rules and definitions should be kept in mind to avoid confusion.

3. If the performer is using a machine or instruments, care must be taken to differentiate between what the machine does and what the performer does.

Before terminating the observation the spokesman thanks the performer and confirms the time and place of the next interview.

After an observation, the spokesman sets aside the first part of the next interview session for questions about the observation. When this is done, the questioner should introduce the questions with phrases such as, "When we saw you ____".

After a period of questioning the spokesman asks, "Does anyone have any other questions about what we saw?" If there are questions, the process continues. If not, the spokesman proceeds to the next subject for questioning.

## Groupings For Task Identification

Analysts may have difficulty in grouping outputs, things used, or recipients, respondents or co-workers. This problem can come up at any of the task ID interviews. The problem is dealt with by enlisting the help of the performer:

1. There will be situations when the job analysts know something about the items or activities which may warrant being grouped. For example, a performer may administer a variety of psychological tests. The analysts may believe that several of the tests call on the same kind of knowledge for their administration. The analysts should ask the performer if this is so, and ask for a name to give to the grouping. The analysts then ask the performer to state the criteria for the grouping.

2. When the analysts do not know enough about the content of a work activity to perceive similarities among instances, they must rely on the performer. To aid in this, the analysts should give examples of the type of grouping to be done:

   Some things, like foods, can be classified into broad categories such as solids and liquids, or categories such as starches, proteins, etc. In your case, you deal with ____. Can you put these into groups in such a way that, to ____ to (or with) them-you would be using almost the same kind of knowledge?

The analysts should be sure to question the performer about the criteria for the grouping.

3. The performer can be asked to make more than one sort of grouping, especially if the criteria for a grouping seem inadequate. The analysts should take notes on all of these so that they can make a selection later, or be prepared to discuss the alternatives at the Task ID Conference.

## The Task ID Conference

The purpose of the Task Identification Conference is to reach team decisions about task identification. The reliability of the method is enhanced if there is identification based on team consensus rather than judgments based on any single analyst's opinions.

The conference begins by having one of the analysts indicate his or her division of the performer's work into tasks, covering the sense and scope of the tasks, and the outputs, things used, and recipients, respondents, and co-workers involved. The other analysts respond in terms of whether they agree about the sense and scope of the items and the general content of each task.

If there is no general agreement, the team attempts to determine the basis of disagreement and refers to this manual for guidelines. The resolution may involve narrowing or broadening terms, and/or developing criteria for groupings.

The procedure continues until all the analysts' tasks have been discussed. Any remaining work activities not accounted for are discussed until each analyst is satisfied that all the performer's work activities have been accounted for by the identified tasks.

Once there is a general agreement on the sense and scope of the tasks, the team assigns a member to check the tasks just identified against a listing of tasks which have already been identified in prior studies (HSMS Research Reports Nos. 7 and 9, for example).

## Overlap with Existing Task Data

The designated analyst reviews a listing of all the tasks already identified and described, regardless of location. He or she makes note of any such tasks which seem exactly the same or similar to any that have been newly identified, and obtains the task descriptions involved.

The analysts present these task descriptions to the performer by summarizing them or allowing the performer to read them prior to the interview or during the interview.

1. If the performer indicates that he or she carries out any of the tasks, the analysts have an instance of an "overlap task." The Code Number assigned to the original task is recorded as covered by the performer. The task's description and skill and knowledge requirements are already known, and no more field work is required for the task.
2. If the performer indicates that any of the task descriptions are similar to work carried out by the performer, but with some differences in specific elements (and/or skills and knowledge), the prior descriptions are used as models for the new task descriptions, but new Code Numbers are assigned. (The language that applies to the new tasks is pinpointed and used in the new task descriptions.)

Grouping Tasks By Function

Once a full list of task identifications has been agreed on, the analysts group the tasks into major divisions by function and similarity of steps. The analysts use the information from the literature and from their interviews with the performer for this purpose. The objective is to first develop a detailed task description to be used as a "model" for each functional grouping of tasks. This facilitates the writing of task descriptions for all the other tasks in the group and/or is a basis for the abbreviated HSMS task description method.

The analysts first determine how the tasks can be grouped by function, and what the functions are. For each major function, the analysts decide the basis on which to differentiate one task from another.

In the abbreviated method the analysts determine how many models must be written for a group of tasks if the remaining tasks in the group are to be summarized in terms of the models.

TASK DESCRIPTIONS

The analysts prepare for writing task descriptions by returning to the literature. It is a good idea to deal with one occupation or functional area at a time. The analysts read the literature covering the detailed descriptions and review the glossaries and background material relating to the work to be described.

The purpose of this preparation is to be able to understand what the performer describes and to be able to develop full descriptions of how the tasks are done, including contingencies, alternative approaches, and emergencies that could arise in the tasks. As part of this preparation, the analysts meet with the director who has, by then, become familiar with the basic "desiderata" or desirable practices that relate to the field. The analysts add this information to their notes.

## Task Description Interviews

The team of analysts interviews the performer about one group of tasks at a time. The objective is to have the performer describe in detail and proper sequence every step (element) taken, all the options and contingencies that may arise or are to be anticipated, and all the alternatives that have been included as part of the task's identity.

During these interviews the analysts should be attempting to write a basic list of task elements (steps); and should be covering the following:

1. All the things the performer does, uses, and the specific information and objects involved.
2. Whether the performer has variations on how to do this task, under what other circumstances, and involving what other people; any decisions to be made regarding these, and whether they are separately recorded or transmitted.
3. If there is a series of steps which are performed, whether judgments are made by the performer about whether to do them all, and in what order.
4. All circumstances which will be encountered or with which the performer is expected to deal.
5. Mental activities, such as deciding what is wrong, what to do, making evaluations, designing, planning,

etc., including activities with intangible results such as reassuring, building confidence, observing symptoms, etc.

6. Common practices done elsewhere even if not done by the performer.

7. Desirable practices even if not currently done by the performer.

8. New or advanced equipment not present at the institution.

9. Reasons for absence of certain known procedures or equipment such as obsolescence or professional determinations that they are not useful or are dangerous.

The team of analysts writes a preliminary model task description.[2] It is typed, duplicated, and a copy is brought to the performer. The analysts retain copies for themselves. The analysts read the task description to the performer, wait while the performer reads it, or leave a copy for the performer to review at a later time. The performer is asked for additions, modifications, or changes. The analysts consider the performer's comments and revise their own copies in accordance with their judgments and the rules of the HSMS method. The revised description is retyped and used as a preliminary model.

Once a model task has been developed, the analysts use it as a guide to obtaining task description information about all the other tasks in the given group of tasks. The preliminary model provides a check list of steps:

1. When steps are the same, the same language is used.

2. If there are different steps, a detailed description of each is obtained.

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[2] Writing task descriptions is described in Chapter 4.

3. Interviews about the later tasks may uncover steps left out of the model that should be included. Analysts should always question the performer about how widely given steps apply to other tasks, and necessary revisions of earlier descriptions must be made.

4. If any of the task descriptions generate related support tasks, these tasks must be identified and described.

The analysts continue until they have enough information to write the preliminary task descriptions or summaries for all the tasks, and proceed through preliminary review of each task by the performer. When the analysts have agreed that a task is ready to be submitted to the director, they check item 6 in the lower right-hand column of page 1 of Figure 1.

Preliminary Review

HSMS follows a procedure in which the analysts are responsible for writing preliminary task descriptions, having them typed on Figure 1 Task Identification Summary Sheets, and checking and revising them based on the performer's response and any additional research.

The analysts submit copies of the task descriptions to the director, usually for one functional area within an occupation or department at a time, such as radiologic technologist examinations tasks by specialty, all nursing tasks in radiology, etc. This permits the director to evaluate the broad groupings decided on, to see what has been covered, and to check on omissions.

During the director's review, the analysts are called on to explain decisions made, to clarify points, and to provide additional information. The analysts are expected to obtain any new information needed from their notes, from the performer, or by research and finding additional literature.

During this period the job analysts brief the director on policy issues and desirable activities they have discovered, information on further work to be described, new technologies, and practices now considered obsolete. This period also provides the analysts with major feedback on the quality of their work. Misconceptions or problems with the definitions can be clarified and further errors avoided.

After the task descriptions are edited by the director, the job analysts may be asked to bring the revised task descriptions to the resource person (in-house reviewer) who will provide the first major critical review. The resource person receives instructions for carrying out the review. At this stage the copy of Figure 1 that is sent for review contains the task's Code Number. The performer's name and job title are omitted during retyping to provide the performer with privacy and prevent any repercussions from the review. This also results in a neutral review, freeing the reviewer from any association of the task description with a given job or occupational title.

After review by the resource person and outside reviewers (resource respondents), the analysts may interview reviewers or provide any follow-up work required to cover task areas that were omitted, or to describe the use of new equipment. This can take the analysts to new performers and even additional institutions; it often means obtaining additional literature.

Once all the tasks for a given functional area or occupation are in their final form, i.e., ready for publication as "normative tasks," the analysts are provided with the "approved" final version of the task descriptions for use in skill and knowledge scaling. The review stage is indicated in the lower right-hand column of page 1 of Figure 1; "OK-RP;RR;RR," means that at least three reviewers have approved the task description.

The form on which the approved full-scale task descriptions appear is Figure 2. When a task description is in its final form, after reviews by experts and final editing, the top of Figure 1 is cut off so that all the identification information is removed. The rest of the form is mounted on prepared sheets giving the Task Code Number and the page number. This transforms Figure 1 to Figure 2, the Task Description Sheet and its continuation page.

Abbreviated Version of The Task Description Method

Once the performer has approved a model task description for a group of tasks, the analysts use it as a check list and interview the performer on what is the same and what is different for the other tasks in the group.

The analysts develop the language to be used in a list of general steps which refer back to the model for details. They then interview the performer to provide details for those steps that are unique to particular tasks. All the other steps of task identification and description are the same. Much time is saved by not having to

Figure 2. HSMS FORM FOR APPROVED TASK DESCRIPTIONS

TASK DESCRIPTION SHEET

Task Code No. ____

This is page 1 of ___ for this task.

| | |
|---|---|
| 1. What is the output of this task? (Be sure this is broad enough to be repeatable.) | List Elements Fully |
| 2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.) | |
| 3. Is there a recipient, respondent or co-worker involved in the task? Yes...( ) No...( ) | |
| 4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions. | |
| 5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words. | OK-RP;RR;RR |
| | 6. Check here if this is a master sheet..(X) |

Figure 2. (continued)

TASK DESCRIPTION SHEET (continued)

Task Code No. ___

This is page ___ of ___ for this task.

| List Elements Fully | List Elements Fully |
| --- | --- |
| | |

interview about, write, and type those steps that carry over across large numbers of tasks.

The form on which the approved task summaries appear is Figure 3. This is created by a simple modification of Figure 1. The Task Code No. is put at the upper left; "OK-RP;RR;RR" appears at the lower right; and all the identification information is removed from the headings except the task's pagination. The word "fully" is removed from the columns headed "List Elements Fully" on page 1 and the continuation sheet. Figure 3 is now a final "Task Identification Summary Sheet," and is used for publication and in skill and knowledge scaling.

Figure 3. HSMS FORM FOR APPROVED TASK SUMMARIES

TASK IDENTIFICATION SUMMARY SHEET

This is task ___ of ___ for this performer.
Code This is page 1 of ___ for this task.

Performer's Name ____________ Analyst(s) ____________ Dept. ________
Job Title ____________ Institution ____________ Date ________

| | |
|---|---|
| 1. What is the output of this task? (Be sure this is broad enough to be repeatable.) | List Elements |
| 2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.) | |
| 3. Is there a recipient, respondent or co-worker involved in the task? Yes...( ) No...( ) | |
| 4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions. | |
| 5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words. | OK-RP;RR;RR |
| | 6. Check here if this is a master sheet..(X) |

Figure 3. (continued)

TASK IDENTIFICATION SUMMARY SHEET (continued)

This is task ___ of ___ for this performer.
Code This is page ___ of ___ for this task.

| | | |
|---|---|---|
| Performer's Name ________ | Analyst(s) ________ | Dept. ________ |
| Job Title ________ | Institution ________ | Date ________ |

| List Elements | List Elements |
|---|---|
| | |

# CHAPTER 4

## WRITING TASK DESCRIPTIONS AND SUMMARIES

This chapter is a guide for writing task descriptions and summaries. It is addressed to the job analysts who first submit preliminary task descriptions and to the director, who is responsible for editing, rewriting, and for the final form in which each task description or summary appears.

Certain sections of this chapter deal with the use of the literature, the inclusion of desiderata, and the assignment of Code Numbers. In the HSMS experience, most of this type of work was done by the director. However, the work could probably be handled by job analysts who are trained in these techniques and have had the opportunity to practice.

At the end of this chapter are four examples of approved Task Descriptions (Figures 4 through 7) and one example of a Task Summary (Figure 8). The tasks cover work at the level of the physician (Figure 4), the technologist (Figures 6 and 8), and the technician (Figures 5 and 7). The various sections of this chapter make reference to these as examples of the style developed by HSMS. The reader is directed to Research Reports Nos. 7 and 9 for other examples covering most job levels.[1]

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1 Eleanor Gilpatrick, <u>Task Descriptions in Diagnostic Radiology</u> (four volumes), Research Report No. 7; and <u>The Technologist Function in Fields Related to Radiology: Tasks in Radiation Therapy and Diagnostic Ultrasound</u>, Research Report No. 9, New York: Health Services Mobility Study, 1977.

## USE OF THE LITERATURE, DESIDERATA AND PRIOR DESCRIPTIONS

This section is directed to the job analysts and/or the director, depending on who does the work and at what stage it is done. Job analysts may be asked to write task descriptions to reflect only their interviews and observations with the performer; in this case the director would be responsible for developing broad models and descriptions which incorporate the literature and the desiderata. On the other hand, job analysts can be asked to include these from the outset; then the director would be responsible for critical review and editing.

At an early stage the tasks are grouped according to their function and similarities. The grouping of tasks makes it possible to deal intelligently with the literature and to develop models for one group at a time without keeping extraneous material in mind.

Figure 4 is an example of a diagnostic radiologist's "procedure" task. The specialty is the gastrointestinal tract, and the recipient grouping is "any non-pediatric patient." In this case the writing of task descriptions began after all the "procedure" tasks for radiologists had been identified and a breakdown (partly by specialty) had been determined.

Figure 5 is an example from a "patient care" grouping; Figure 7 is an example of an "equipment-related" task in diagnostic radiography. Figure 6 is an example of a radiologic technologist "procedure" task, reflecting a breakdown by part of the body and the use or nonuse of a contrast medium; it is also a "non-infant patient" task.

Figure 8 is a radiation therapy technologist "simulation" task; it is differentiated from "treatment" tasks. It is also an "any patient" task.

## Using The Literature To Develop Elements[2]

At HSMS, the director developed a technique of working with the literature designated earlier as detailed descriptions, and with aids such as glossaries, dictionaries, and academic texts. The procedure is to go through photocopies of all the relevant literature and mark out all passages that provide any of the following:

1. Lists or descriptions of the steps taken in particular procedures or generalized across procedures.

   The types of steps become headings for pages on which excerpts and descriptions are cut out and mounted. The headings provide an outline for ordering the elements of the tasks in a given grouping.

2. Detailed descriptions of particular steps, references to alternative ways of doing things, and desirable practices.

   These are cut and mounted on the appropriately headed pages for a given task. When several versions are available, these are mounted side by side to differentiate steps commonly agreed on from those whose appropriateness may be controversial and may have to be checked with experts.

3. References to earlier steps in a procedure that the text assumes to have been already carried out.

   The literature is rarely sequential in its presentations. These references are cut out and mounted on the relevant pages for task(s) in their appropriate places in the sequence of events.

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[2] It is possible to write task descriptions using prior model tasks and the literature without interviewing a performer, provided that there is sufficient subsequent review by experts who have first-hand work experience.

4. Indications and contraindications for procedures.

This provides information for the initiating elements of the task, may indicate, validate, or rule out the "type-of-patient" grouping for the task, and suggests the types of contingencies that the performer must rule out or be alert for.

These "cut-and-glued" outlines provide a general context for the refined task descriptions. The next step is to draw on the additional desiderata that have been uncovered in discussions with experts, that were brought to the director's attention by job analysts based on their discussions with the performer, any relevant existing legislation, and other similar sources.

At this time the desiderata are turned into "task language." That is, the writer must visualize what actual performers would have to do to carry out each objective, and then writes the description of each activity. Each tentative description is then cut and mounted in the proper place(s) in the cut-and-glued outlines for the tasks to which they apply.

Examples of such descriptions appear in Figures 4 and 6. Element 2 in Task Code 3, and elements 1-j, 2, and 4-h in Task Code 363 express the safety desideratum that exposure of a known or possible fetus must be ruled out before exposing a patient to ionizing radiation. Figure 4 shows this in the case of a radiologist's task, and Figure 6 shows this for a radiologic technologist's task. These elements appear in every task where they are appropriate.

## Using Preliminary and Related Task Descriptions

The next step is to make photocopies of the preliminary task descriptions submitted by the analysts, based on their interviews with the performer and their research. These are cut and arranged in the appropriate sequence developed in the cut-and-glued outline along with the mounted excerpts from the literature and the desiderata.

At this point it is helpful to read the material developed thus far. The reader is then in a position to note whether any of the work to be described has already been written in approved form in similar tasks collected at an earlier time. For example, in dealing with "pediatric patient" tasks, the reader may be aware that there are "non-pediatric patient" tasks that have much in common with the tasks in question. Sometimes only a single element has already been described, but it saves time to locate the approved language even for a single element, especially if the element is repeated in all the tasks of the grouping being prepared. These elements are cut out and placed in their appropriate locations in the outline.

## Review of Task Identifications

During the process just described the director is able to review the way the tasks have been grouped and broken down into separate tasks by the job analysts. Sometimes the director will override a division and regroup the material, producing a different set of tasks. For example, "pediatric" and "non-pediatric" tasks may be turned into "infant" and "non-infant" tasks, to better reflect the basis on which procedural distinctions are made. A task covering upper and lower extremities may be divided into one for the upper extremities and one for the lower extremities, based on the judgment that the performer is unlikely to have to deal with both for a given patient, and that the knowledge for one is different from the knowledge for the other.

Such decisions are always discussed with the analysts because their original reasons may be valid, if not immediately apparent.

If the writer of the descriptions is the director, questions may arise that only the job analysts can answer. For example, gaps may suddenly appear in how one goes from one point to another in a procedure. When tasks include options, it may be clear what to do in one case but not in another. This is the time that the analysts are enlisted to provide or obtain further information. During this process the analysts recieve the kind of feedback that improves the quality of their work.

Outlines For Task Groupings

The assembled materials may now suggest a general outline for each task grouping. The general outline for the task examples at the end of this chapter can be discerned by following the logic of the elements. For example, the outline for Figure 4, a radiographic contrast study of the upper GI tract of a non-pediatric patient, carried out by a radiologist is as follows:

- Initiating element. How the task comes to be done by the performer.

1. Determining what is involved.

2. Greeting patient and deciding whether to proceed.

3, 4, 5. Preparing to proceed and giving orders.

6, 7, 8, 9. Conducting examination.

10. Deciding what to do next.

11. Examining radiographs and deciding what to do next.

12. Continuing.

13. Emergency contingency.

14. Termination of task. Where everyone and everything winds up.

The outline for a radiographic examination (Figure 6) carried out by a radiologic technologist is as follows:

Initiating element. How the task comes to be done by the performer.

1. Determining what is involved; checking.

2. Reporting problems.

3. Preparing ahead.

4. Relating to and preparing patient.

5. Finding out about details.

6, 7, 8. Setting up.

9, 10. Selecting and setting exposure factors.

11, 12. Positioning patient.

13, 14. Final set-up.

15. Emergency contingency.

16, 17. Making exposures.

18, 19. Continuing.

20. Terminating with patient. Where patient winds up.

21. Termination of task. Where data and things wind up.

These general outlines are guides for all similar and related tasks. Once a task description has been written as a model for a task grouping it can be copied, cut up, and arranged in the appropriate sequence of an outline. It serves as an embodiment of the outline. The material collected for each specific task in the grouping determines what new writing must be done, what existing writing can be copied without change, and what variations in sequence are appropriate.

WRITING TASK DESCRIPTIONS

This section covers the steps of writing task descriptions whether in preliminary form or after submission to the director for review. The writing proceeds for one task at a time, one item at a time, following the general outline for the tasks of the given grouping. At every step in the writing process the writer decides on the best language to use and incorporates all the necessary information from the material mounted on the cut-and-glued sheets.

The purposes which the HSMS task descriptions and summaries are meant to serve have influenced the writing style developed over the years by HSMS. Since the task descriptions are used as a basis for scaling tasks on their required skills and knowledges and as inputs to the preparation of curriculum objectives, the HSMS method requires that the tasks contain sufficient detail to permit the reader to see how the skills and knowledges are applied in the tasks.

A good many HSMS task descriptions state explicitly what are actually lightning-fast thought processes on the part of the performer when he or she considers what to do, interprets, draws conslusions, or makes selections. Some of the performers we interviewed and some of our reviewers found these explicit statements annoyingly drawn out and self-conscious. This style is used because we rate the tasks for the skills (some of them intellectual or decision-making skills) required to carry out each task. This explicitness of language is needed for writing curriculum objectives and can prove useful for instructional purposes.

By way of contrast, much of the explicit knowledge applied or drawn on in the tasks is not specified. The use of knowledge is alluded to by such words as "considers," "evaluates," "determines," "selects," followed by the word "appropriate." This reflects the fact that the HSMS method incorporates a Knowledge Classification System. The tasks are eventually rated for the knowledge categories required to carry out each task, and the task language provides the "pegs" to which the knowledge categories are attached and scaled.

Since the job analysts and curriculum analysts are usually not practitioners of the occupations being studied, the method requires that the task descriptions be comprehensible to the intelligent lay reader. Thus, brief definitions are often included in parentheses next to technical terms.

Since the task descriptions are to be used as a basis for job structuring, curriculum design and as instructional materials, the method requires that appropriate technical language be used and used correctly. We also attempt to incorporate professional rather than lay usage with regard to occupational titles and terms. For example, the layman talks about having "x-rays" made by "x-ray technicians." The field itself refers to "radiographs" taken by "radiologic technologists."

Since HSMS provides suggestions for job restructuring and job ladders, the full-scale version of the method requires that each task description be self-contained, so that the user need not read beyond the given task description to have a full listing of all the steps of the task, its options, and its contingencies. In the abbreviated version of the method this is not the case, and the reader is "sent" to other tasks.

Since the task descriptions are used in the preparation of curriculum objectives, the method requires that, wherever the same activity appears, in whatever number of tasks, the same language is used as much as possible. This makes it much easier to later identify and consolidate these sections within curriculum objectives (wherein tasks are grouped together by factor and job level).

<u>List of Elements</u>

Figure 1 is the first form used for task descriptions. After <u>task identification</u> is done, the <u>task descriptions</u> are written in the columns headed by the words, "List Elements Fully." These continue as many pages as are needed, on "continuation sheets," which are numbered.

The List of Elements starts with an initiating element which introduces the task and indicates the range of circumstances under which the task arises. This can vary from one instance or location of the task to another, and does not determine whether or not two tasks are overlaps. The initiating element indicates the range of contingencies to be expected in the task. Figures 4 through 8 provide examples of how the initiating element is presented. (The initiating element includes all the material up to the first numbered element.) In the case of Figures 6 and 8 the initiating elements contain explanatory and definitional material that pinpoints what is being referred to and helps the reader comprehend what will follow.

The task elements are presented in appropriate sequence, covering the task's range of options and contingencies; they include desirable procedures (even if not commonly practiced) which help ensure accuracy, safety, concern for the patient, and/or other desiderata.

Every choice of method or decision to delegate an aspect of a procedure, any assessment or any evaluation which must be decided by the performer is reflected in a task element. Any reference to delegated work generates a task, and these should be noted so that a check can be made later to make sure that all such additional tasks are represented by task descriptions.

There is always a final element which indicates what happens to the output(s) at the end, and/or which indicates any recording done by the performer.

The figures presented at the end of this chapter indicate the style, punctuation, and system of notation used by HSMS. As the work progressed, HSMS developed certain language conventions. These are briefly described as follows:

1. The person doing the task is always referred to as the "performer" regardless of his or her usual job title or rank. This provides a standard format and delays until a later stage any controversy over who should do what.

2. Any words which can have a variety of interpretations even in the same task context are avoided.

3. Administrative and nursing tasks are often generic and can be found in many departments. They are intentionally written in broad terms so that they can be picked up and recognized wherever they may appear. (See Figure 5, which was identified in ambulatory care, diagnostic radiology, and radiation therapy.)

4. Each task in the full-scale method is written so that it is complete within itself. Therefore, when an activity is carried out in more than one task, its description is repeated for each task. (In the short-cut method, such repetition is minimized in "Summary Tasks.") The same or similar activities are described with the same or similar language to assist analysts to locate elements that overlap from task to task for curriculum development purposes.

5. When the task iteself generates other tasks, certain phrases are used to signal this. Phrases such as "performer arranges...," "performer has...[done]" are examples.

6. When a task may either be done by the performer or delegated, a separate task is generated. The signal for such tasks are phrases such as, "...or decides to do personally," "performer plans to...," or "performer may decide to...".

7. When a particular part of a task represents an element that may or may not be done depending on institutional practice, personal preference, the state of the art, or the patient's condition, the phrase, "per-

former may" or "may" is used before the description. Where the performer must make a choice as part of the task, this is made explicit: "performer decides," "performer considers whether...".

8. The specific content of some steps in a task, such as the choice of materials, or equipment, or information considered, may vary as the state of knowledge in the field changes or as new technology develops. There may be variations which reflect the condition of the patient, the equipment used, institutional facilities, or what was already done. There may also be variations in choices or steps reflecting current controversy or personal preference. The method does not attempt to present all the alternatives or to resolve these problems. It simply acknowledges this situation in such steps by the phrase "as appropriate."

9. Some aspects of task activity are totally a function of the choices made by the institution to adopt procedural steps, equipment, or the way records are made or kept. The performer does not make the decision. This is reflected in the list of elements by the phrase, "depending on institutional procedures, performer may...," or by the use of the phrase "based on institutional procedures" after a list of options preceded by "Performer may...".

<u>Abbreviated List of Elements</u>

Task summaries differ from task descriptions only in the List of Elements. When detailed task description models have been developed and are applicable to groups of similar tasks, the summary refers the reader to the details in the models; it provides details only in those areas that are unique to the particular task involved. After a model task description has been approved, a general outline is written which summarizes the model. This is used in all the task summaries for the group of tasks related to the model.

Figure 8 is an example of a task summary. The initiating element is unique to each task. The summary of the model is presented in elements 1 and 3. The specific and unique details of the task are presented in element 2. (The order of elements 2 and 3 can be reversed according to taste.)

## Outputs, What is Used, Persons Involved, and Task Name

After the List of Elements has been written, the left-hand column of page 1 of Figure 1 is filled in. Unlike the task identification stage, the purpose here is to list everything that may be included as outputs, things used, and persons involved. Figures 4 through 8 provide examples to help the reader follow the rules established for writing these parts of the task description. Examples of completed items 1 through 5 can be found on page 1 of each task description or summary at the end of this chapter. The questions below are the questions which appear on the forms.[3]

1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

The outputs of the task include the main output, by-product outputs, any decisions and/or records made, any intangibles, and the results of contingencies. The form used for outputs are noun or noun-forms that require the past form of a verb to describe the result of,

[3] There is a "secret" to note here. Sometimes the space allotted to items 1 through 5 on Figure 1 is not sufficient for a given task. For example, Figure 8 has a very long list of things used and a very long extended task name. The solution used by HSMS is to cut and glue the forms to expand the space where needed. Further space can be found by eliminating some wording on the form. This latter option is reflected in Figure 8, and is indicated in this section where appropriate.

the work activity. HSMS usually treats this as a single sentence, with outputs separated by semi-colons.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

or

2. What is used in performing this task?

What is used in the task should cover all the things chosen among or possibly used. Such a list is best obtained by going down the List of Elements and enumerating all the things mentioned. Generic terms are used rather than brand names.

3. Is there a recipient, respondent or co-worker involved in the task? Yes...( ) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

or

3. Is there a recipient, respondent or co-worker involved in the task? Yes...( ) No...( )

4. If "Yes" to q. 3: Name the kind of recipient respondent or co-worker involved.

The listing here includes generic terms such as "co-worker" or "clerical worker" when it is clear that the person is involved due to particular institutional procedures and is not an essential part of the task's identification. The correct, specific occupational term for the co-worker, or the condition of the recipient is used when this has been used to determine the task's identification.

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

HSMS evolved a style for writing the task name which produces a coherent description and also incorporates a still briefer name. This is done by naming the chief output and recipient of the task and adding the word "by," followed by the chief elements and things used.

The "name of the task" summarizes the task in a paragraph-length sentence. This is the "extended task name." The underlined portion of this statement, which begins the extended task name, is a brief identification of the task called the "abbreviated task name."

The extended task name lists the chief elements of the task in order, reflecting the range of outputs, things used, and persons involved that identify the task and make it unique. The elements are separated by semi-colons. It should be possible, simply by reading the extended task name, to see if two tasks are the same or similar.

The abbreviated task name presents the key activity verb, output, things used, and person(s) involved. It is written with enough clarity and focus to differentiate tasks. For example, "conducting" a radiographic examination (Figure 4) can be differentiated from "taking" radiographs (Figure 6). In the HSMS usage, physicians conduct examinations and technologists take radiographs.

Other Identification Information

As indicated earlier, the reader is told the number of pages that the task runs in the statement, "This is page __ of __ for this task," at the top right of Figure 1. Task descriptions are checked at the lower right as master sheets when they leave the analysts and are submitted for review.

At an apporpriate point after task identification is completed and before review the tasks receive their Code Numbers.

REVIEW OF TASK DESCRIPTIONS

After the analysts get complete information for the tasks and the tasks are revised and approved by the director, tasks are submitted to the appropriate "resource person" at the institution. The "resource person" is asked to evaluate the task descriptions for correct use of terminology and presentation of procedures, for the correctness of sequences, and for omission of activities. A final check with the performer may also be involved.

The outside reviewers (resource respondents) are asked whether the task descriptions incorporate all the work activities in the specialty area involved, include acceptable alternative methods for the work and equipment, and cover contingencies which can occur. They are also asked if any steps of the work are left out, whether sequences are correct, whether language is appropriate, whether the work is described as it should be done, and whether national practice is reflected. (Figure 9, at the end of this chapter, contains excerpts from

HSMS instructions to the reviewers). If any steps or procedures are left out, the analysts go back to the field, to an institution in which it is in use, or obtain further descriptive literature. The reviewers' suggested corrections and changes are reviewed by the director and/or the analyst-writers and incorporated into the final task descriptions.

Throughout the writing, editing, and review procedure, the director must be aware of errors caught in one task description that must also be corrected in every other task that uses the same or similar language and information. This overview or follow-up on corrections is an essential part of the director's function.

Additional tasks are collected and described when necessary, and any new or totally revised tasks are resubmitted for review as described here. After a task description has been reviewed by a minimum of three reviewers (outside of the performer and the director), and when all corrections have been made, the task is referred to as a "normative" or "N" task and is ready for scaling. The letters "OK-RP;RR;RR" are entered on page 1 of Figure 1.[4]

When a task description is in its "N" version, it is converted to a Task Description form, such as Figures 2, 4, 5, 6 and 7, or to a Task Summary, such as Figures 3 and 8.

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[4] RP stands for resource person, i.e., the in-house reviewer; RR stands for resource respondent, i.e., outside reviewer. In actual practice, more than three reviewers may be enlisted, but additional reviewers are not recorded on the sheet.

Copies of each task go to a central office file, to each analyst who will be involved in skill and knowledge scaling, and the "masters" are preserved for eventual publication if appropriate. The Task Code Numbers and abbreviated task names are recorded in a log book for use as a reference source.

Figure 4. EXAMPLE OF RADIOLOGIST TASK DESCRIPTION

TASK DESCRIPTION SHEET

Task Code No. 3.

This is page 1 of 4 for this task.

<table>
<tr>
<td>

1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Decision made on whether to go ahead with barium study of upper GI tract; pt. reassured; barium mixture administered; upper GI tract observed with fluoroscopy; spot films, cine films taken with pt. erect, prone, supine, with pressure cone attachment, and with barium pill if so decided; radiographs ordered; complete set of radiographs approved; decision made and recorded on delayed films and/or air contrast study of stomach; medical impressions and follow-up care recorded; MD notified of emergency signs.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

X-ray requisition form, patient's chart; scout film; view boxes; prepared barium colloidal suspension; barium pill; cup; straw; cone attachment; cine camera; fluoroscope, TV monitor, spot film device with cassettes or roll film; pen; telephone; cancellation forms; protective lead garments; shielding

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Any non-pediatric patient to have upper GI barium study radiography; radiologic technologist; referring MD; radiologist

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Conducting a radiographic barium study of upper gastrointestinal tract of any non-pediatric patient by deciding whether to go ahead based on pt.'s condition and scout film; reassuring pt.; supervising oral administration of barium mixture; viewing on TV monitor; taking spot films and cine with pt. in erect, prone, supine positions, with pressure applied by cone attachment, with barium pill swallowed if so decided; ordering radiographs; deciding when examination is completed by viewing radiographs; deciding whether to order delayed films and/or air contrast study of stomach; recording medical impressions; follow up care and/or delayed films and/or air contrast study; notifying MD of emergency signs.

</td>
<td>

List Elements Fully

Performer receives the x-ray requisition form and medical information for a patient scheduled for a study of the upper gastrointestinal tract (esophagus, stomach, and small intestine) using a barium sulfate colloidal suspension as the contrast medium.

1. Performer reads the patient's requisition form and relevant information to become familiar with the case if study was routinely ordered, or to review materials seen earlier.

Notes any medically relevant history, requests from referring physician, recommendations on technique. Notes whether patient should have followed preparatory procedures prior to the examination, and whether patient has an infectious or communicable condition, whether female patient may be pregnant. May call referring physician to discuss or to obtain needed information.

2. Performer greets patient in examination room. Attempts to reassure patient and explains what will be done. Answers patient's questions. Performer may question patient about symptoms in relation to the condition being studied. May collect additional medical history; asks female patient if she thinks that she is pregnant.

OK-RP;RR;RR

6. Check here if this is a master sheet...(X)

</td>
</tr>
</table>

Figure 4. TASK DESCRIPTION SHEET (continued)

Task Code No. 3

This is page 2 of 4 for this task.

| List Elements Fully | List Elements Fully |
|---|---|
| Performer questions patient about the preparatory regimen prescribed to see if it was followed (e.g. not having breakfast). If performer finds that the regimen has not been followed and will interfere with the study, performer cancels examination, records reasons and any recommendations on cancellation form or has appropriate co-worker arrange for cancellation; has patient rescheduled if appropriate.<br><br>3. If performer decides to proceed, checks for proper shielding and orders scout film. Views when ready or views scout film already prepared by technologist:<br><br>a. Performer decides whether the technical quality of the radiograph adequately demonstrates the organs to be studied for purposes of interpretation; if not, performer indicates the needed technical adjustments or changes in position to technologist, or records on requisition form.<br>b. Performer inspects scout film to see whether there is evidence of barium remaining from any earlier study, thus interfering with current examination. If so, performer cancels; orders rescheduling as described.<br><br>4. If performer decides to proceed, dons protective lead garments. Makes sure patient and anyone to remain in room is properly shielded. If spot film attachment uses cassettes, performer has cassette inserted. Chooses full, half or quarter format and sets as appropriate. (If roll film attachment, checks that attachment is loaded with film or has this done.) Has technical factors set for fluoroscopy. If available, checks that 16mm. cineradiography equipment is ready and technical factors set.<br><br>5. Performer has the patient positioned for the portion of the examination done with the patient erect: | a. If patient is unable to maintain an erect position, performer notes this on requisition form and proceeds to the portion of the examination done with the patient in prone position.<br>b. Performer places fluoroscope unit in front of patient. Has patient or technologist hold cup containing barium sulfate mixture and await orders from performer.<br>c. When ready for fluoroscopy, performer may have lights in room dimmed; turns on fluoroscope or has this done. Adjusts unit for viewing on TV monitor.<br><br>6. For erect portion of examination, performer indicates to technologist (or patient if patient is holding barium mixture) when patient is to sip mixture, hold in mouth, when to swallow, what positions to assume, when to hold steady, and when to hold breath.<br><br>Performer may assist patient on table or unit or may have technologist assist.<br><br>a. If the patient is totally unable to swallow or is not tolerating the procedure, performer may decide to cancel. If so, cancels as described above, noting any relevant observations on appropriate form.<br>b. If the patient is able to swallow, performer observes the flow of the barium through the patient's esophagus, esophago-gastric junction, stomach, and duodenum on the TV monitor. Performer instructs patient in frequency and size of swallows. Performer continues, observing the structures and movement with swallows repeated until the performer has sufficient information.<br>c. While observing on TV monitor, performer decides what to record as spot films and/or on cine film. |

Figure 4. TASK DESCRIPTION SHEET (continued)

Task Code No. 3

This is page 3 of 4 for this task.

| List Elements Fully | List Elements Fully |
|---|---|
| Performer activates spot film attachment and x-ray button. If cassette attachment, may have technologist remove cassette as spots are snapped and insert additional cassettes, or performer does so personally. Activates cine camera when decided.<br><br>7. Performer prepares for pressure spot films of the gastric mucosa and the duodenal bulb with the patient erect:<br><br>a. Performer has pressure cone attachment moved into place. Performer positions cone so that there is pressure exerted on the area of interest.<br>b. Performer observes on the TV monitor. Has patient drink additional barium mixture as required for visualization.<br>c. Performer observes response to pressure, pliability and rigidity of the area.<br>d. Performer decides what to record as spot films, and activates spot film attachment when decided as described above.<br>e. Performer repeats procedure for areas of the stomach as decided and for spot films of duodenal bulb. Performer has patient drink additional barium mixture as needed.<br>f. Performer removes pressure cone when all the required pressure spot films are taken.<br><br>8. Performer has the patient positioned for the portion of the examination done with the patient lying on horizontal examination table.<br><br>a. Performer has patient positioned in prone-oblique position. May assist and/or reassure patient. May adjust table or fluoroscope unit.<br>b. Performer has patient sip barium mixture as appropriate. If patient has not been able to sit or stand | for erect positions, performer may assist patient to drink barium mixture or have technologist do this by supporting patient and providing a straw through which to sip the mixture.<br>c. Performer observes the flow of the barium mixture through the esophagus, esophago-gastric junction, stomach and duodenum. Takes spot films and/or cine films; repeats other procedures as described above with patient in prone-oblique position.<br>d. Performer repeats appropriate steps as described above after positioning patient in supine-oblique position.<br><br>9. If patient has history of difficulties with swallowing or if patient is currently complaining of pain or difficulty in swallowing, performer may decide to use barium pill for final portion of examination with patient erect or on table tilted to erect position:<br><br>a. Performer has technologist prepare barium pill and explains to patient what is to happen.<br>b. When patient is properly positioned, performer indicates to patient or technologist when to have patient swallow pill, using sip of barium mixture to wash it down.<br>c. Performer watches on TV monitor while patient swallows the pill. Performer observes the swallowing action, the ease with which this is accomplished, and the course of the pill, noting any interference or blockage.<br>d. Performer takes spot films when deemed appropriate and/or cine film as described above.<br>e. Performer may compare the known size of the pill with any observed |

Figure 4. TASK DESCRIPTION SHEET (continued)

Task Code No. 3

This is page 4 of 4 for this task.

| List Elements Fully | List Elements Fully |
|---|---|
| obstructions to estimate size of obstacles or growths. May make notes on requisition sheet.<br><br>10. Performer determines when the fluoroscopic portion of the examination is over and turns off the fluoroscope.<br><br>a. Performer decides, based on observations during fluoroscopy and requisition sheet, whether to have radiologic technologist take only standard series of overhead radiographs or whether to order additional exposures and/or positions, with or without the patient swallowing additional barium. Explains what is needed to technologist and/or enters on requisition sheet.<br>b. Performer may record preliminary medical impressions at once on requisition sheet or delay until the radiographs are processed.<br><br>11. Performer looks at the processed spot films and radiographs on view boxes as soon as they are ready:<br><br>a. Determines whether the radiographs are technically adequate to demonstrate the area and condition under study and provide sufficient information to make possible a competent medical interpretation. Performer may ask opinion of clinician or another radiologist.<br>b. Performer decides whether to order additional views or a change in the technical factors and a repeat of portions of the radiographic examination, and/or whether to order delayed radiographs.<br>c. Performer notes whether the problem area could involve the top or the distal stomach (areas blocked from view by the rib cage). If so, performer decides to order air contrast study to distend the stomach. | i) Performer decides whether to have air contrast of stomach scheduled for a later time or done immediately.<br>ii) Performer fills out requisition sheet for air contrast study for scheduling as appropriate, or arranges to proceed immediately with air contrast study.<br>d. In deciding to order additional views or studies performer considers the information already available on the radiographs, the way in which the patient responded to the procedure, the patient's condition, and his or her cumulative exposure.<br><br>12. If the performer decides to repeat any of the radiography with changes in the technical factors, to order additional views or delayed radiographs, informs technologist what is needed, including use of additional barium solution; may record. Performer examines additional radiographs as described above (except for delayed films).<br><br>When performer has determined that the current examination has been completed, informs technologist that he or she can terminate the procedure and have the patient sent home, back to room, or to next procedure. If appropriate, orders decontamination and/or sanitary clean up procedures.<br><br>13. If performer judges that any emergency signs are in evidence, performer notifies patient's physician at once.<br><br>14. Performer may record impressions of procedure on patient's chart:<br><br>a. Preliminary findings.<br>b. How patient tolerated procedure.<br>c. Any special nursing follow-up recommended, delayed films or air contrast of stomach ordered.<br>d. May sign chart, requisition sheet. |

Figure 5. EXAMPLE OF PATIENT CARE TASK DESCRIPTION

TASK DESCRIPTION SHEET

Task Code No. 182

This is page 1 of 2 for this task.

1. What is the output of this task? (Be sure this is broad enough to be repeatable.)
Patient and suction machine readied for suctioning; tracheal passageway cleared or machine turned on and off as ordered; patient cleansed and/or machine cleansed; matter removed shown to MD.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)
MD's orders; patient's chart or check list; suction machine; antiseptic soap, water; tubing and sterile catheter(s) for suction machine; trap and drainage bottles; cup; gauze, saline solution; sheet; clock or watch

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.
Any patient to be treated with use of suction machine; physician; co-worker

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.
Setting up and using suction machine to clear airway or to assist with gastric lavage, by obtaining materials and machine, preparing patient, checking machine, turning machine on and off as ordered for gastric lavage, or inserting catheter into tracheal opening and clearing airway; cleaning up afterwards.

List Elements Fully

Performer uses suction machine for purposes such as gastric lavage (when MD inserts catheter) or with patient who has had a tracheostomy performed for the insertion of a tube for breathing. Performer uses suction machine as result of:

a. Verbal or written request of physician.
b. Own decision based on observation of patient's need.

1. Performer reads physician's orders on chart or check list, listens to verbal orders, or considers own decision.

2. Obtains necessary materials from storage area or checks that these are with machine. If obtained separately, performer places on table near patient or machine.

3. Performer wheels suction machine near patient or wheels patient to machine if stationary wall unit. (May check that machine is clean; may decide to clean or have cleaned). If not already done, plugs machine's cord into wall outlet.

4. Performer may explain to patient what will be done. May drape patient with sheet.

5. Performer checks machine by turning on suction and checking suction outlet with finger to feel suction. If machine is not functioning, decides to report; obtains another (portable) machine or wheels patient to another machine.

OK-RP; RR ; RR

6. Check here if this is a master sheet..(X)

Figure 5. TASK DESCRIPTION SHEET (continued)

Task Code No. 182

This is page 2 of 2 for this task.

| List Elements Fully | List Elements Fully |
|---|---|
| 6. Attaches prepackaged tubing and catheter set to machine by connecting tubing to machine and catheter to tubing.<br><br>7. If gastric lavage, performer turns machine on and off at physician's orders after he or she has inserted catheter. Stands by during process.<br><br>8. If patient has had a tracheostomy and needs passage cleared, performer inserts the suctioning catheter with appropriate force to enter the tracheal opening. When inserted to appropriate level, performer turns on suction and attempts to clear mucus from the passageway. Turns off machine when done.<br><br>Performer may reassure or comfort patient during process; determines whether passage has been cleaned.<br><br>If not, performer uses fresh catheter(s) and repeats suctioning until the airway is clear.<br><br>9. Performer may clean the area surrounding the tracheal opening with gauze and saline solution.<br><br>10. After use, performer discards the tubing and catheter(s). May place some of the matter removed from the patient in a cup, pouring it from the drainage bottle or glass, and may show to physician (if requested to do so).<br><br>11. Discards cup or matter in bottle; may decide to wash machine and bottles or have subordinate wash (using antiseptic soap and water). Returns machine or has it returned (if portable).<br><br>12. Records what was done and time on patient's chart or check list, or informs physician that task is completed. | |

Figure 6. EXAMPLE OF RADIOLOGIC TECHNOLOGIST TASK DESCRIPTION

TASK DESCRIPTION SHEET

Task Code No. 363

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1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Requisition reviewed; pt. reassured, positioned; parts measured; films identified; technical factors selected and set; exposures made; radiographs sent for processing and evaluation; procedures repeated as appropriate for full set of views; patient returned; examination recorded; radiographs placed for use.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Pt.'s x-ray requisition sheet, ID card, ID bracelet, technical history; pen; x-ray machine control panel(s), tube, bucky, table, collimator, extension cones; technique chart; charts for conversion of technique, standard examination views, dosage, tube capacity; loaded cassettes; vertical film holder; leaded rubber shielding; R-L and ID markers; immobilization devices; stool; calipers; tape; scissors; protractor; compression band; stretcher or wheelchair

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Non-infant patient to be radiographed; radiologic technologist; radiologist; nurse

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Taking plain film radiographs of abdominal contents of non-infant patient by reviewing request; reporting observed contraindications; reassuring pt.; measuring part; selecting and setting technical factors; identifying film; positioning pt. and equipment for erect or recumbent exposure; providing shielding; collimating; making exposure; having radiographs processed and reviewed; repeating for full set of views or as ordered; having pt. returned; placing radiographs for use; recording examination.

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Performer receives or obtains the x-ray requisition form, patient's identification card, and any appropriate medical-technical history for a non-infant patient scheduled for radiography of the abdomen, including the liver, spleen, kidneys, bladder, diaphragm, abdominal aorta and intra-abdominal cavities:

a. After checking assignment on schedule sheet.
b. From co-worker.
c. After having arranged requisitions in order of priority.

The plain films of the abdomen may be to determine whether there is evidence of free gas and/or fluid levels, intra-abdominal tumor masses, calcifications, and/or foreign bodies. The plain films may be part of an abdominal series or a KUB (kidneys, ureters, bladder) series. The plain films may serve as preliminary "scout" films for contrast studies such as of the urinary system, abdominal fistulae or sinuses, biliary system, intestinal obstructions, etc.

1. Performer reads the requisition sheet to determine the examination called for, purpose, the patient involved, special considerations, and to check the completeness of the information provided:

   a. Performer checks the examinations called for and the purpose, noting whether air or fluid levels, foreign

OK-R[redacted];RR

6. Check here if this is a master sheet..(X)

Figure 6. TASK DESCRIPTION SHEET (continued)

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| body, tumor mass or calcifications are to be examined, whether routine series, and/or particular organs are to be examined, such as kidneys, liver, spleen. Notes the affected areas; the patient positions and projections called for, the number of exposures, the central beam angulation, the areas of interest and parts to be included. Notes whether the use of a grid or bucky will be involved. Checks the name of the referring physician.<br>b. Performer reads patient's name, identification number, sex, age, weight. Notes whether patient is in-patient, out-patient, or emergency patient. Notes any special information that will affect patient positioning, technique, or handling of the patient, such as presence of acute abdominal signs, known pathologies.<br>c. With patients who are to undergo subsequent contrast studies, performer may note whether orders for prior preparation such as evacuation or emptying bladder (or keeping bladder full) have been given and carried out; if not already done, may arrange to have orders carried out or informs appropriate staff member.<br>d. Performer notes whether there are special orders for use or nonuse of compression devices.<br>e. If patient is acutely ill, performer checks whether use of erect position is expressly ordered. Checks with radiologist if unclear; does not plan for erect positioning without express permission.<br>f. Performer checks whether patient is suffering from a collateral condition requiring special handling, such as heart disease, communicable or infectious condition, infirmity, incoherence; whether patient has IV | drip, oxygen supply, urinary catheter, colostomy, T-tube or similar device in place; notes whether patient will be accompanied by nurse or other staff person, whether there are orders for removal of dressings from the abdominal area.<br>g. If performer is not already assigned to examination room (and a particular machine) notes the room or machine involved. Goes to examination room or control room for machine involved.<br>h. Performer makes sure that the request is properly authorized, that information on requisition sheet is complete. Checks whether any special orders on exposure factors are in keeping with the usual rad exposure involved for the examination.<br>i. Depending on institutional procedures, performer may review patient's radiation exposure history, prior record of techniques used, and cumulative exposure. Notices whether examination has been done elsewhere in recent past, whether number of radiographic exposures ordered or done in past should be reported to radiologist.<br>j. Depending on institutional procedures, performer notes whether female patient is pregnant, reviews date of female patient's last menstrual period, or notes any other indication that there is no danger of exposure of a known or possible fetus. Notes shielding needed.<br>k. If patient's record indicates orders for sedation or any other prior medication, performer may check timing to be sure a proper elapse of time has occurred for medication to take effect. May arrange to delay examination if appropriate. |

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| 1. If referring physician has requested that films already on file be sent with current radiographs, and if not already with patient's jacketed material, performer arranges to have prior films delivered.<br><br>2. If the performer determines that the request is not properly authorized, is incomplete, or that sufficient information is lacking for performer to select technique or to properly position or care for patient, or if performer considers that there may be contraindications to going ahead with the procedure, performer notifies supervisor, radiologist, or other designated staff person, depending on institutional procedures. Explains the problem if appropriate, and proceeds after obtaining needed information, signature, or orders.<br><br>3. When performer is clear about what will be involved in examination, he or she prepares ahead so as not to keep patient in examination room longer than necessary:<br><br>a. Performer reviews the technique chart for the machine to be used and takes note of any newly posted changes in technical factors (to reflect accommodation for change in machine output or a policy decision).<br>b. Performer washes hands as appropriate; depending on patient's condition, may decide to arrange for or carry out isolation or decontamination techniques.<br>c. Performer makes sure that x-ray equipment is ready for use. Goes to control panel for x-ray generator and checks that indicator light shows that machine is "warmed up," or turns on main switch as appro- | priate to equipment and allows time for machine to "warm up." If appropriate, performer may set radiography mode selector and set collimator control for manual operation.<br>d. Performer checks that appropriate immobilization devices such as sandbags, wedge sponges, compression band, are present and that there is a mattress, pads, pillows, and/or blankets for comfort of patient if patient will lie on table. If appropriate, obtains protractor, cardboard triangles, device to support erect patient, objects to stand on to compensate for limbs of unequal length.<br>e. Checks that there is leaded rubber shielding available in room to be used to protect the patient, and/or to place beneath the film holder, as appropriate.<br>f. Performer prepares for identification of the films using equipment provided by institution:<br>i) May obtain lead numerals and tape and prepare identification strip for placement on film holder(s) giving appropriate patient identification information.<br>ii) Performer may prepare for use of flashcard by checking that there is piece of lead on film holder surface; may write or type out ID information on card if not received with requisition.<br>iii) Checks identification against requisition sheet.<br>iv) Performer makes sure that right (R) and left (L) markers are available for use.<br><br>4. Performer has the patient called from the holding area and prepared for the |

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| examination (if not already done), or decides to do personally.<br><br>a. Depending on institutional arrangements, performer may decide to escort out-patient to or from dressing room. May decide to assist in transporting patient from holding area or have this done.<br>b. Performer greets patient and any accompanying staff person and introduces self. Checks patient's identity against the requisition sheet. With in-patient, checks hospital identification bracelet or other identifier. If patient is accompanied because of seriousness of condition, performer checks with accompanying staff member on any special precautions necessary during procedure.<br>c. Has patient assume a comfortable position seated on table or chair. If patient is in wheelchair, moves patient in chair into position next to table. If patient is on special stretcher, places stretcher into position so that radiolucent stretcher can be lifted with patient on it from wheeled base to x-ray table. May arrange to move patient to table. With acutely ill patient uses upright film holder with patient remaining on stretcher.<br>d. Explains to patient what will be involved in the procedure; indicates positions patient will be asked to assume, the cooperation that will be asked of the patient. May ask patient to refrain from swallowing if possible.<br>e. Performer answers patient's non-medical questions honestly; attempts to reassure patient and develop confidence. Treats patient with dignity and concern regardless of patient's behavior. Remains aware that patient may be frightened and/or in pain. Performer explains when asked medical questions that it is | not appropriate for technologist to answer these; encourages patient to speak to physician.<br>f. If patient has an IV drip in place performer checks that needle has not become dislodged and that the fluid is dripping at an even rate. If there are any problems, performer clamps tube and notifies appropriate staff person at once.<br>g. If patient has a wound, colostomy, ileostomy, or T-tube with dressing to be removed, performer checks whether zinc or iodoform paste or radiopaque gauze is being used. If so, has appropriate staff member remove dressing or tube or decides to do personally (if appropriate). Checks that radiopaque paste or gauze is completely removed.<br>h. If appropriate and not already done, performer questions female patient of child bearing age regarding possible pregnancy. If there is any possibility that patient is pregnant and this has not already been recorded, performer informs appropriate physician and proceeds only with approval.<br>i. Makes sure that all garments except gown are removed down to below the area of interest. Keeps body covered until ready for positioning and exposure. Reveals only as much of body as necessary. Treats young patient with as much courtesy as adult.<br><br>5. Performer questions patient and/or RN or MD present on what movement is possible to determine what positions are available for use.<br><br>a. For abdominal series, especially for air or fluid levels, notes whether routine use of erect position is possible. May plan for use of supine position followed by |

Figure 6. TASK DESCRIPTION SHEET (continued)

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| upright filming (if possible) or, if not possible, by patient in lateral decubitus position. May plan to employ semierect position for patient who cannot assume either position by using footrest and compression so that patient can be brought to almost upright position on table.<br>b. Performer notes the patient's body type, whether the area of interest is heavily covered by muscle or soft fat, whether the palpation points will be easy to find. Notes whether the lower extremities are of unequal length. Notes whether tall patient will require two exposures for views ordered, one centered to include the diaphragm and the second centered to include the pelvic area. Notes whether thin patient will need padding under bony prominences.<br>c. Performer considers whether conventional positioning can be utilized or what alternative x-ray tube and patient positions to use to accomplish the equivalent radiography with a minimum of movement by the patient.<br>d. Performer considers the number and types of projections ordered for the examination and the patient's condition. Performer may consider a change from standard projections to better accomplish the purpose of the examination, or deletion of a position, or a change in technical factors. Depending on institutional arrangements, performer may obtain permission from appropriate radiologist or decides personally to alter the standard procedure.<br><br>6. Depending on whether a bucky or table top technique will be used and standard institutional practices, performer selects speed and type of film, grid, and cassette combination. | a. Selects size(s) based on the area (s) to be included, the patient's size, and whether two exposures (and cassettes) will be needed to present a given view.<br>b. Performer makes sure that an adequate supply of loaded cassettes of the types and sizes selected are available in the examination room. If not, arranges to obtain or decides to obtain personally.<br><br>7. Performer prepares for the examination:<br><br>a. Performer obtains the appropriate size loaded cassette for the first projection.<br>b. Performer attaches identification information to the cassette or table top:<br>i) Places right or left marker on film holder or table-top as appropriate to the study and projection or depresses appropriate R or L button for automatic marking.<br>ii) If patient's identification information is in the form of lead numerals, performer places on appropriate corner of cassette.<br>iii) If patient identification information is to be entered by use of flasher, sets flash-card aside for later use with space created by piece of leaded rubber on appropriate edge of cassette.<br>iv) Performer may place patient's card into card tray for equipment using automatic film marking device.<br>c. If cassette is to be used with bucky (under tabletop or in upright holder) performer may manually pull out bucky tray and open |

Figure 6. TASK DESCRIPTION SHEET (continued)

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| retaining clamps. Inserts cassette into bucky tray and pushes back. Makes sure clamps are closed. Moves cassette into appropriate "stored" position or inserts cassette tray into bucky slot and centers.<br>d. If a bucky is not being used, performer places cassette in a position that can be comfortably reached by the patient in final positioning. If appropriate to make possible minimal movement of patient, performer may place cassette in upright holder at right angles to table top or in other position selected.<br>e. Performer provides patient and everyone who will remain in room during exposure with protective shielding. Explains if necessary that this is not cause for alarm but a general precaution to minimize unnecessary radiation exposure.<br><br>8. Performer has patient assume a comfortable recumbent or seated or standing position depending on the positions to be employed, so that the part(s) to be radiographed can be measured.<br><br>a. If appropriate, places mattress, pillow, or clean linen on x-ray table.<br>b. Performer may decide to assist patient from wheelchair or stretcher to table or has this done. May obtain help. Makes sure that no equipment is in the way and may be collided with by patient. Locks chair.<br>c. If assisting patient to step on footstool in order to get on table, helps patient turn into position, step backwards on stool, and then sit and/or lie on table.<br>d. Performer uses centimeter calipers to measure the thickness of the part(s) to be radiographed in the direction in which the central ray of the x-ray beam will pass through | the centered part from tube to film. Records for use in determining exposure factors.<br>e. If patient has a urinary catheter in place, performer turns patient toward the catheter and tubing to prevent separating it from drainage bottle and breaking sterile system and to avoid causing pain.<br>f. After measuring, has patient rest in as relaxed a position as possible. May place pad, blanket or pillow under bony prominences to provide comfort.<br>g. If patient is to be examined (next) in the lateral decubitus or erect position, performer has patient remain in that position for an appropriate amount of time before making the exposure(s).<br><br>9. Performer selects the exposure factors for the first projection by consulting the technique chart(s) posted for the machine:<br><br>a. Locates the information needed for the body part and projection involved according to the centimeter thickness of the part as measured and the collimated field size to be used. Makes sure that technique relates to the combination of film type and speed and use or nonuse of other radiographic accessories (such as screens, grids, bucky, etc.).<br>b. Makes note of the kVp, mA, T(seconds of exposure time), focal spot size, and the focal film distance (TFD or FFD) called for.<br>c. Once the standard kVp, mA and time have been determined, performer notes whether any conversions are necessary to account for the pathological condition being studied, change in TFD, extreme fat or muscularity, preference of the radiologist involved, and any |

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| other conversion needed, Performer looks up numerical conversion factors and calculates, or uses conversion charts to ascertain the appropriate new exposure factor (kVp, mA and/or time). Multiplies, divides, adds, or subtracts as appropriate.<br>d. Performer checks any new or unfamiliar exposure factors against the posted limits of the x-ray tube on a tube rating chart to be sure that technique does not exceed the heat capacities of the tube for the focal spot size to be used. If appropriate, performer reconverts the technique to an equivalent output using higher kVp and lower mAs.<br><br>10. Performer sets exposure factors as selected:<br><br>a. Enters control room. Makes sure that indicator light shows that x-ray generator is ready for use. Makes sure that all circuits have been stabilized.<br>b. If appropriate, checks line voltage meter and, if needed, turns compensator dial until needle is aligned properly on line meter.<br>c. For conventional exposure control:<br>i) Performer sets milliamperage by choosing selectors for the correct focal spot size; sets the mA selected.<br>ii) Performer selects and sets the exposure time that will produce the mAs desired.<br>iii) Performer sets the kVp selected by choosing the combination of major kilovoltage and minor kilovoltage settings to produce the desired kVp.<br>d. For automatic phototimed exposure control:<br>i) Performer selects and sets the category corresponding to the type of study and use or non- | use of screens, bucky, etc., and, if appropriate, focal spot size.<br>ii) Selects and sets a control corresponding to the field size (as listed on technique chart for phototiming).<br>iii) May select and set a kVp range button (if called for with equipment) corresponding to range for examination.<br>iv) Sets a density selector corresponding to the usual (or special) requirements for the study.<br>v) Makes sure backup timer is not likely to terminate exposure before phototimed exposure is made.<br>e. Depending on the equipment, may set controls to provide for use of bucky, manual tableside adjustment of table and tube height, position, and of collimation.<br>f. Performer returns to overhead unit and sets the focal-film distance. Operates controls or manually moves the x-ray tube into place over the film holder (or at right angles to upright holder). Checks the focal-film distance by reading indicator scale in the tube housing; adjusts up or down until the required FFD (TFD) is obtained.<br><br>11. Performer prepares patient for the final position selected for the first (or next) exposure. Makes sure that correct side is being positioned when appropriate.<br><br>a. May explain or demonstrate to patient what is required. May obtain help in positioning or has MD position in accident or acute cases.<br>b. Performer centers part and keeps the long axis of the part par- |

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| allel to the film holder. When using a bucky, centers patient to midline. With cassette on table top, centers film to part. With upright holder adjusts height of holder to part and centers part to film.<br>c. When positioning a patient with a balloon catheter in place, performer makes sure that the clamp is not lying over a part to be exposed or that patient is not lying on the clamp.<br><br>12. Performer positions as follows (unless nonconventional positioning is being used to avoid having patient move):<br><br>a. For studies of <u>abdominal contents (or KUB)</u>, performer notes the purpose of study and sequence of positions selected. For conventional abdominal series makes supine AP projection of abdomen, followed by erect AP or PA projection of abdomen, or erect lateral projection of abdomen. For demonstration of air or fluid level, makes supine AP of abdomen, followed by an erect or lateral decubitus view. For frontal AP projections of abdomen, performer selects the supine AP and the erect PA position unless otherwise specified (such as with kidney examination or acutely ill patient). For acutely ill patient performer substitutes semierect position for erect.<br>i) For supine AP projection (posterior view) of abdomen (or KUB), performer aligns patient in supine position, with the median sagittal plane of the body centered to the midline of the table. Supports knees and immobilizes ankles. Adjusts shoulders so that they lie in a single transverse plane, with arms at sides. Centers a single cassette | high enough to include the diaphragm (estimates location from patient's body type) at the level of the iliac crests, and includes the pelvic area. Centers the first of two cassettes (for tall patient) high enough to include the diaphragm; centers second cassette about two inches above the upper border of the symphysis pubis. May apply compression band. Performer directs central ray at right angles to midpoint of film.<br>For erect AP projection performer positions as described above, with patient standing or seated in front of upright cassette holder, centered to midline, facing away, and with weight distributed equally. Supports the shorter extremity if of unequal length.<br>ii) For erect PA projection (anterior view) of abdomen, performer has patient stand facing erect vertical cassette holder or table, centered to the midline, and with weight equally distributed. Has patient extend arms along sides of holder and grasp edges. Centers cassette about one inch above the crest of the ilium or as described above; includes the diaphragm. May apply compression band. Performer makes sure that patient is maintained in erect position long enough before exposure for air or fluid levels to be accurately demonstrated. Directs central ray at right angles to center of film.<br>iii) For lateral decubitus positioning (for frontal or lateral projections), performer notes which side of the patient's body is to be next to film holder and |

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| has patient lie on that side in a lateral recumbent position. Has patient flex knees comfortably, and centers abdomen to midline. Places supports under and between knees and ankles. Has patient flex elbows, place lower hand under head, and has patient grasp side of table with opposite hand. For fluid level study, elevates the torso.<br>For lateral projection, performer centers cassette in bucky or on table under patient. For frontal projection, performer centers cassette in upright holder in front of patient (for PA projection) or behind patient (for AP projection). Centers film at the level of the iliac crests or as described above in (i).<br>For lateral projection directs central ray vertically at right angles to midpoint of film. For frontal projection directs central ray horizontally at right angles to the midpoint of film through the median line of body. For air or fluid levels allows patient to maintain position long enough before exposure for air or fluid levels to be accurately demonstrated.<br><br>For acutely ill patients who cannot assume erect or lateral decubitus position, performer adjusts patient in semierect position by starting with supine position as in (i), above. Attaches footrest to end of table and secures patient. May use compression bands. With patient on table, performer moves it to almost vertical position. For AP semierect projection, centers as above with cassette in bucky; for lateral projection, centers cassette in vertical film holder on right or left side of | patient (depending on the side of interest). Directs central ray horizontally to the midpoint of the film, regardless of the angulation of the table. Allows time for air or fluid level to be properly demonstrated as described above.<br>b. For studies of the <u>liver and spleen</u>, performer does not use compression.<br>i) For AP projection (posterior view) of liver and spleen, performer positions patient in supine position as described in (a), above. Has patient flex elbows and abduct arms. Centers a single cassette so that about one inch of the iliac bones are included on lower border of film. If patient is too tall for a single cassette, centers first cassette to include the diaphragm and second to include the iliac crests. Directs central ray at right angles through the xiphoid process<br>ii) For oblique AP projection of spleen, performer starts with patient in supine position and elevates right side of body about 40° to 45° so that spleen is nearest to film. Supports elevated shoulder and hip, with arms comfortably placed and shoulders lying in a single transverse plane. Centers film at or just below the level of the xiphoid process. Directs central ray at right angles to midpoint of film.<br>iii) For PA projection (anterior view) of liver, performer notes whether a preliminary film or a diagnostic examination is involved. Has patient assume a prone position with |

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| the median sagittal plane of body centered to midline, and elbows flexed comfortably. Adjusts shoulders to lie on a single transverse plane. Supports ankles. Performer centers cassette to the central ray. Reminds patient (if diagnostic study) that two exposures will be made.<br>For preliminary or general survey examination, directs central ray at right angles through the xiphoid process. For diagnostic examination directs central ray through the xiphoid process at 25° caudad for first exposure, and at 10° cephalad for the second exposure.<br>c. If, during positioning, patient shows signs of severe pain, performer may notify appropriate physician at once and await orders, or may decide on alternative positioning to avoid movement of the affected part.<br>d. Performer checks final positioning by using light in collimator. Activates the collimator light and points the light beam towards the part. Adjusts the collimator opening to correspond to the film size. Uses cross-hair shadows as reference for center of field. Uses the collimator light to center the patient to the x-ray field, or centers the part to the film holder and uses the collimator light to center the tube to the part. Checks that primary beam will enter the center of the area of interest at the selected angle to the film so as to project the view desired. May readjust tube position lengthwise or crosswise to provide better centering.<br>13. Once the patient has been positioned and immobilized, performer adjusts the collimator. Either collimates so that a small unexposed border will appear around the edge of the film or collimates further so as to expose only the | area of interest (and thus provide maximum protection and detail). For small fields performer attaches an auxiliary extension cone to collimator to further reduce the primary beam. Adjusts primary beam to minimum size needed to cover the part(s) of interest.<br>14. Performer adds lead shielding to areas that will be in the primary path of the beam but are not included in the areas of interest. Makes sure that proper protective shielding has been provided to patient and everyone who will remain in room.<br>15. Throughout procedure performer observes patient for any signs of emergency and/or to prevent or respond to an accident. Is alert to signs of nausea, dizziness, or sweat suggesting faintness. Performer may have patient lie down, lower head, or raise legs. Notifies nurse. If patient shows any other emergency signs, loses consciousness, or has an accident, performer calls appropriate physician or staff member at once. May decide to provide emergency first aid as well. If a patient's catheter becomes disconnected, performer clamps it and immediately notifies nurse. If catheter should come out, notifies nurse at once.<br>16. When everything is ready for the exposure, performer explains to patient what breath control will be used for exposure. Rehearses breathing out when told to do so by performer and holding breath until told to relax. If appropriate, instructs patient not to swallow before and during the examination. Reminds patient about those exposures in which position is to be retained for a second exposure. Observes the patient's movement until the moment that the exposure is made. Readjusts position if warranted. |

**List Elements Fully**

17. The performer returns to control room. Makes sure controls are properly set and patient is still in position. Tells patient when to breathe out and hold still by calling or using intercom. Performer may wait one or two seconds after suspension of respiration. Initiates exposure by pressing hand trigger or exposure control button.

    a. While exposure is underway performer checks that mA meter records appropriate current as set, that kVp meter dips slightly.
    b. May watch for evidence of malfunction such as line surge or excessive drop; may listen for sound of normal functioning of equipment. If there is malfunction may decide to report; anticipates need to repeat exposure.
    c. With phototimer notes whether backup timer has been involved in terminating exposure before phototimed exposure was completed. If so, anticipates possible need to repeat exposure (due to underexposure if premature cut-off, or overexposure due to faulty timer).
    d. After exposure is completed tells patient that he or she can relax.
    e. If the exposure is terminated by a circuit breaker, rechecks technical factors for possible overload or checks for overload elsewhere on circuit. Anticipates need to repeat exposure.

18. Performer returns to patient. Removes cassette or film holder from table, holder, or bucky.

    a. Removes any markers for further use. If so requested, performer arranges to have the first exposure(s) processed at once and brought to the appropriate radiologist.
    b. If the first radiograph(s) are preliminary (scout) films, performer

**List Elements Fully**

brings the processed radiograph(s) directly to the radiologist in charge or places on view boxes and informs radiologist that the scout (s) are ready. If the radiologist indicates that there is any problem with the technical factors or the patient positioning, performer records or notes for later use in the examination and/or repeats preliminary radiography as ordered.

    c. Depending on whether radiologist will evaluate radiographs before completion of all possible exposures for the series, performer arranges to process film(s) and evaluate for quality control personally, have this done, or bring to darkroom for processing and later evaluation, based on time available, institutional arrangements, or specific instructions. Attaches ID card for use with flasher if appropriate. May sign requisition.
    d. While films are being processed and/or evaluated performer has patient relax in examination room or holding area. Explains what will happen next.
        i) Performer determines whether patient should remain on table and/or in room or requires observation. May consult requisition sheet or attending RN. If appropriate, makes sure that patient will be attended while waiting.
        ii) If appropriate, moves x-ray tube and any protruding film holder away from patient before patient rises.
        iii) May decide to assist patient to chair or stretcher or from table. Makes sure patient is reminded of any footrest in stepping off table.

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| iv) If patient is to switch to erect position or lateral decubitus position for fluid or air level study, has patient take and maintain that position for the required amount of time prior to next exposure.<br><br>19. When (or if) performer learns from the radiologist the extent of the injury and/or whether further conventional views and/or positions can be undertaken, eliminated or altered, performer proceeds as appropriate according to instructions.<br><br>a. For further exposures performer repeats appropriate steps for next view(s) including identification of film holder or cassette and use of R-L marker, selection and setting of technique for next view (if different), positioning patient and equipment for focus-object-film alignment, proper collimation and shielding, breathing instructions, and making exposure, as described above.<br>b. Performer refrains from commenting on the films or providing any interpretation.<br>c. If performer is asked to repeat any exposures, makes sure that the additional exposures are warranted medically, since additional radiation will be incurred.<br>i) Notes whether need to repeat is due to performer's own negligence or lack of attention so that performer can avoid future "retakes."<br>ii) If request for retakes reflects malfunctioning equipment, performer reports malfunction to appropriate staff member.<br>iii) If request for retakes reflects the preference for density or contrast of a radiologist, performer notes for future work | done for the given radiologist so that retakes can be avoided.<br><br>20. When performer is sure that the examination has been completed, performer may have patient transported back to holding area or next location, or decides to do personally, as appropriate. Makes sure that none of the equipment is projecting over the patient before allowing patient to rise from stool or table, and assists patient as described above.<br><br>21. Performer carries out termination steps for the examination:<br><br>a. If appropriate, arranges to have fresh colostomy and/or dressing applied (if removed for radiography).<br>b. Performer has equipment and examination table cleaned after use or decides to do personally, depending on institutional arrangements.<br>c. Performer records the examination according to institutional procedures. May include date, room, examination type, the views taken, the technical factors used and film sizes; may record the number of exposures made of each view including retakes; may enter the estimated radiation dose to which patient was exposed (using posted information on dosage); may record any problem with equipment, any special care provided patient. If any views called for in the initial request could not be obtained, performer may record reasons. Signs requisition sheet.<br>d. If performer will only carry out preliminary "scout" filming and another technologist will continue with examination, performer records the approved technical factors used for the scout, and the accessories |

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|---|---|
| employed, or informs technologist who will continue. Performer gives the requisition sheet, name card, and any notes to technologist who will continue with procedure.<br>e. Performer may decide to jacket films, requisition sheets, and related materials and/or have information recorded in log book personally or have this done, depending on institutional procedures.<br>f. May indicate to appropriate staff person when the performer is ready to proceed with next examination. | |

Figure 7. EXAMPLE OF QUALITY ASSURANCE TASK DESCRIPTION

TASK DESCRIPTION SHEET

Task Code No. 533

This is page 1 of 2 for this task.

| 1. **What is the output of this task? (Be sure this is broad enough to be repeatable.)** | List Elements Fully |
|---|---|
| Phototiming device checked for automatic exposure termination at constant density; test films measured for density; density control accuracy calculated and compared with given acceptable limits; decision made to refuse equipment, repair; test results recorded. | Performer checks the automatic exposure termination device of diagnostic x-ray equipment which has been newly installed, or checks current equipment periodically, as a result of:<br>a. Regular assignment.<br>b. Request.<br>c. Decision to do.<br>1. Performer determines reason for check and type of equipment. May proceed as follows:<br>a. Performer notes whether test will be made for three kVp settings at a normal density control setting and mA range, or at a fixed kVp with three phantoms of different densities at the normal density control setting; depending on type of equipment. Checks manufacturer's specifications.<br>b. Obtains appropriate phantom(s) and densitometer.<br>2. Performer sets up for test:<br>a. Obtains cassettes loaded with uniform type of test film (from same batch) and screen combinations.<br>i) Identifies cassettes as appropriate for test using radiopaque markers.<br>ii) Inserts first cassette in bucky tray of x-ray unit or spot film unit, or advances film as ap-<br>OK-RP;RR;RR |
| 2. **What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)**<br>Requirements for diagnostic radiography phototiming equipment; manufacturer's specifications; cassettes; radiopaque markers; diagnostic radiography unit, controls; test descriptions, forms; pen; pencil; test phantoms; densitometer; out-of-order sign; phone | |
| 3. **Is there a recipient, respondent or co-worker involved in the task?** Yes...(X) No...( ) | |
| 4. **If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.**<br>Supervisor; radiologist; repair service personnel or installers | |
| 5. **Name the task so that the answers to questions 1-4 are reflected. Underline essential words.**<br><u>Checking automatic exposure termination of diagnostic radiography equipment</u> by making test exposures at constant density settings with different kVp's or different phantom thicknesses; using densitometer to measure density of exposed films; calculating accuracy; determining whether automatic timer needs replacement, repair; recording test results; arranging for repair. | 6. **Check here if this is a master sheet.** (X) |

Figure 7. TASK DESCRIPTION SHEET (continued).

Task Code No. 533

This is page 2 of 2 for this task.

**List Elements Fully**

propriate (such as for automatic changer).

b. Places phantom (or first of three phantoms) on tabletop, and centers to film using appropriate optical system. Sets tube to appropriate target-to-film distance.

c. Sets technical factors as appropriate to type of automatic exposure termination system.

   i) Sets for automatic exposure mode and normal density setting.

   ii) If appropriate sets test A or first kVp setting.

3. Performer makes first exposure as appropriate and continues with test:

   a. Removes cassette.

   b. Inserts new cassette in tray and either sets kVp to a lower test position or places a second phantom on table. Makes exposure.

   c. Removes cassette. Inserts a new cassette and either sets kVp to a higher test position or places a third phantom on table. Makes exposure.

   d. Performer has exposed test films processed under standard conditions.

      i) May personally check that standard processing conditions are met.

      ii) Uses densitometer to measure density on exposed test films.

      iii) May use control test film to subtract background density.

      iv) Records measurements from densitometer.

4. Performer determines whether the densities of the three films are the same or within an acceptable range of each other. Refers to test standards.

**List Elements Fully**

a. For new equipment, determines whether the unit should be refused or whether service staff should be required to make adjustments or replace phototiming unit.

b. For existing equipment, determines whether problem requires shut down of unit until adjustments or repairs are made.

c. Performer may discuss results of test with supervisor and/or radiologist in charge before determining what to do. May explain effect of problems and deviations from acceptable standards in terms of patient exposure, diagnostic reliability, legal requirements.

d. If performer decides that the test results indicate a major fault, performer informs repair service by calling in-house repair personnel or manufacturer's repair service. Indicates the results of the test and the unit involved. May place out-of-order sign on unit.

e. If not already done, performer marks test records with date; may record evaluation of results and what was done. Performer places records in appropriate location for filing. Returns test equipment to storage or has this done.

Figure 8. EXAMPLE OF RADIATION THERAPY TECHNOLOGIST TASK SUMMARY

TASK IDENTIFICATION SUMMARY SHEET

Code 566

This is task ___ of ___ for this performer.
This is page 1 of 3 for this task.

Performer's Name ________ Analyst(s) ________ Dept. ________
Job Title ________ Institution ________ Date ________

**1. What is the output of this task? (Be sure this is broad enough to be repeatable.)**

Simulation and initial set-up for proposed treatment plan carried out;localization,grid films,wire films verification portal films made,approved;treatment fields,triangulation marks,areas to be blocked laid out and marked on pt.;blocking ordered with use of wire films;measurements made;compensating filter ordered;final verification films of blocks,fields, shielding,field arrangements made,approved;dimensions,geometry recorded;pt.reassured,given explanation,instructions;records entered for use.

**2. What is used in performing this task?**

Pt.'s proposed treatment plan,requisition sheet, ID card,bracelet,medical-technical chart,prior radiographs,scans;view boxes;simulator or treatment machine,controls;intercom;distance,beam angle indicators;table;light system;collimator;beam accessory holder;blocking tray;mantle board;scales,rulers; x-ray film,holders,cassettes;wax markers;immobilization devices;metal grid,grid plate,metal cross; radiopaque markers,strips;wire,wire plate;ID markers; beam blocks;blocking bridge;male gonadal shielding; side lights;tape;scissors;dye,ink,sticks;pen,pencil; pt.instructions;stretcher,wheelchair;forms;soap,water

**3. Is there a recipient, respondent or co-worker involved in the task?** Yes...(X) No...( )

**4. If "Yes" to q. 3:** Name the kind of recipient, respondent or co-worker involved.

Any radiotherapy patient;radiotherapist; co-worker; physicist; family member; nurse

**5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.**

Carrying out simulation and initial set-up for any pt. to receive external beam radiation therapy of the lymph nodes with mantle and/or "inverted-Y" field techniques or variations using simulator or treatment machine by reviewing proposed treatment plan;preparing equipment;reassuring,preparing,explaining procedure to pt.;positioning,immobilizing pt. for treatment using proposed geometry;laying out direct,anterior mantle, "inverted-Y", or component fields,parallel opposed fields using SSD or isocenter technique; taking field localization grid films;having fields, areas to be shielded marked out;making wire films; taking measurements based on approved wire films; marking field outlines,centering,triangulation marks on pt.;having compensating filter,lung block molds fabricated;and/or preparing beam blocks in plate diagram;making verification portal films of final set-up;recording field dimensions,separations,blocks, geometry;explaining self care,after-effects,danger signs to pt.;disassembling approved set-up;recording.

**List Elements**

Performer carries out simulation and initial treatment set-up procedures for any patient scheduled to receive external beam radiation therapy of the lymph nodes with "mantle" and/or "inverted-Y" technique (treatment of all major lymph nodes above and/or below the diaphragm; i.e., total nodal irradiation, including the lymph node chains above the diaphragm and/or the para-aortic, spleen or spleen pedicle, pelvic, inguinal femoral regions, or a variation).

1. General initial steps include finding out what is being requested, who is involved, purpose of simulation, equipment for simulation, the treatment machine, proposed treatment plan, proposed fields, arrangements, locations, areas to be blocked and/or shielded, set-up techniques to be used, outputs required from this particular simulation, and special considerations.

2. This task is similar to Task Code 564 except as follows:

   a. Notes whether this simulation is to verify the treatment fields and provide approved films from which lung blocks, other blocks and/or compensatory filters will be fabricated, whether it is to verify the adequacy of the fabricated blocks, field designations and set-up, whether to retailor blocks

OK-RP;RR;RR

6. Check here if this is a master sheet..(X)

Figure 8. TASK IDENTIFICATION SUMMARY SHEET (continued)

This is task ___ of ___ for this performer.
Code 566 This is page 2 of 3 for this task..

Performer's Name ______ Analyst(s) ______ Dept. ______
Job Title ______ Institution ______ Date ______

List Elements

as the disease regresses, to correct error found during course of treatment, based on treatment verification films.

b. Notes the field arrangements, such as mantle, inverted-Y field, use of individual aortic and pelvic fields, whether parallel opposed or modified posterior mediastinal field, whether splenic bed will be included in inverted-Y field, whether a small posterior portal will be used for spleen.

c. Notes equipment to be used, such as linear accelerator, betatron, cobalt-60 megavoltage. Notes whether patient will be maintained in supine position and isocenter technique will be used to treat posterior fields from under the table (with treatment head rotated).

d. Notes areas to be blocked and/or shielded, such as cerebellum, larynx, trachea, heart-lungs, and humeral heads for mantle fields; spinal cord for posterior fields; kidney(s), liver, normal tissue, surgically transposed ovaries, testicles, for inverted-Y fields or modifications of inverted-Y field.

i) Notes whether a mantle board will be used for positioning.

ii) Notes type of blocking and shielding to be used, such as styrofoam molds filled with lead for lung blocks, use of lead, beam-shaping shadow tray blocks, and/or conical gonadal cups for testicles, bridge with lead bricks for protection from any leakage.

iii) Notes what combination of lung blocks are required to provide for anterior and posterior fields.

e. Notes whether measurements are required so that compensating filters can be custom made to be used in treatment to achieve dose homogeneity.

f. Depending on the purpose of the simulation and stage of preparation for treatment, performer checks that patient markings to indicate field boundaries, isocenter, anatomical landmarks and/or areas to be blocked have been made by radiotherapist.

g. May arrange for injection of radiopaque iodine-based contrast to make kidneys visible on portal films. May instruct patient in need to breathe shallowly and hold as still as possible during filming and/or treatment.

h. May assist while more senior staff member positions patient for grid and/or wire films.

i. Positions patient for anterior mantle portal in supine position, with head extended and immobilized, arms above head and immobilized in precise, duplicable predetermined position.

j. Depending on stage of simulation and set-up, may cover the following steps:

i) With tentative field boundaries and anatomical reference lines marked on patient and localized with radiopaque markers and IVP, makes field localization grid films with simulator or treatment machine in treatment position using treatment geometry. Sets SSD or SAD as prescribed or at height allowing the entire field to be covered by the collimated central ray as shown by light system.

ii) Has radiotherapist change and/or approve field dimensions; marks field borders, isocenter, triangulation marks on patient and/or has radiotherapist tattoo.

Figure 8. TASK IDENTIFICATION SUMMARY SHEET (continued)

This is task ___ of ___ for this performer.
This is page 3 of ~~3 for~~ this task.

Code 566

Performer's Name ______ Analyst(s) ______ Dept. ______
Job Title ______ Institution ______ Date ______

**List Elements**

iii) Has radiotherapist draw in on the grid film the outlines of the areas to be blocked (from which styrofoam mold and/or beam blocks will be fabricated after wire films are approved), and mark level at the lateral border of the lung image where the lung block will not require a tapered edge (to ensure complete shielding of areas not being treated).

iv) Transfers pattern to grid plates or has this done.

v) Makes wire films on which the pattern has been traced with wires, with patient and treatment machine or simulator in treatment position using treatment geometry.

vi) Repeats as appropriate for posterior (parallel opposed or modified) fields.

vii) Once wire films are approved, makes appropriate measurements; records. Has beam blocks, other blocks and/or shielding fabricated; may have compensating filter fabricated.

viii) Once all the blocks and/or shields and/or molds are prepared, positions patient and simulator or treatment machine in treatment position with treatment geometry. Makes verification portal film. Repeats for each anterior field and each posterior field.

ix) Makes sure to provide appropriate shielding for testicles, beam blocks for transposed ovaries.

x) Has radiotherapist approve final set-up. Has photographs taken.

3. Task follows the general outline of the models:

a. May check that incision is recorded as completely healed if prior surgery was done; checks that consent form has been signed.

**List Elements**

b. Performer checks that everything to be used is ready. Reviews diagnostic radiographs, scans.

c. Checks that staff to assist or direct set-up procedures, inject contrast, approve or modify portal films or set-up arrangements are ready or available.

d. Checks that patient is identified, available, and properly prepared.

e. Greets patient; explains what will be done; makes note of patient's condition, behavior, general state.

f. Readies patient for simulation and initial set-up. Positions for first field.

g. Takes any localization and/or grid films; has them approved. Receives further information on first field dimensions, beam angulation.

h. Outlines first field. Takes verification portal film; has it approved. Receives further information on blocking, shielding.

i. Either uses standard blocks and/or makes wire films based on marked-out areas on portal films to prepare blocking or have the blocks or mold, and/or any needed bolus fabricated. May have contour made.

j. Continues with all other fields.

k. Marks on patient approved field dimensions, triangulation marks, center of field, beam directing marks.

l. Measures, records field dimensions, SSD or SAD, beam angulation; may make blocking diagram.

m. Makes final verification portal films; sets up as for treatment. Obtains signature approving set-up. Has photographs made.

n. Provides patient with instructions on self care, care of treatment markings, danger signs to report.

o. When procedures are completed, disassembles equipment; sees that patient is escorted or directed to next location; places materials and and records for use.

Figure 9.

INSTRUCTIONS TO RESOURCE RESPONDENTS FOR TASK DESCRIPTION REVIEW

On the attached pages you will find task descriptions of work performed at one of the locations studied by the Health Services Mobility Study (HSMS). Each task has been identified by use of the HSMS task definition.

[Enclose copy of HSMS definition.]

Our concern in collecting the task data is not only to describe what is actually being done by performers of tasks, but to be sure that we have task data which describe generic and acceptable procedures as they should be taught. To that end you are being asked to evaluate whether the task procedures as represented in our descriptions are appropriate in normative terms.

Each task is represented on a Task Identification Summary Sheet. On the Summary Sheets which follow, The List of Elements is found in the right-hand column and describes the steps of the task in detail. The steps are presented in the sequence in which they are performed. (In a complicated or high-level task, the List of Elements can be long and is continued on additional pages.) The elements include the initiating events bringing the task about, the terminating actions, and any decisions to perform other tasks, record keeping, or delegation of duties which are part of the task. The elements include any alternative sequences when there are choices.

The major characteristics of the tasks, for identification purposes, are found on the left-hand side of the Task Identification Summary Sheet. Items 1, 2, 3 and 4 cover the output, what is used, and the recipient, respondent or co-workers involved in the task.

The "Name of the Task," item 5, provides a brief but full summary of the task in one or two sentences listing the key steps. The underlined portion is the abbreviated name of the task.

No performer's name or job title is listed. We wish to have the tasks evaluated solely for function, with no influence from their association with job titles. We would like you to do the following:

1. Read the name of the task first (item 5 on the Summary Sheet) to get an overview of the task.

2. Consider the output(s) (item 1) to focus on the purpose.

3. Read the List of Elements for the procedures and their sequences.

4. Review what is used (item 2) to pinpoint the equipment used.

5. Decide whether the task includes all the appropriate equipment to achieve the output(s) of the task. If not, indicate what changes are necessary on the Summary Sheets.

6. Decide whether the task, as described, presents an accurate description of current procedures and includes all the appropriate equipment to achieve the output(s) of the task, including optional and alternative equipment and steps. If not, indicate what changes are necessary on the Task ID Summary Sheets or use separate blank Task ID Summary Sheets (which are provided).

7. Correct any spelling errors, misuse of terms, inversions of sequences, or omissions right on the Task ID Summary Sheets. (Use a colored pen if possible.)

8. If you consider the task totally inappropriate, please recommend an alternative task.

9. If the set of tasks represents a complete category of tasks (such as nursing, or a series of procedures for a specialty), please indicate whether any tasks that should be represented are missing. If you think that whole tasks have been omitted, or if you have questions, indicate these on a sheet of blank paper so that we can check them out.

10. If the task is acceptable as described, please sign your name or initials at the top of the Summary Sheet.

11. If you do not feel qualified to evaluate the task, please arrange to have this done by someone who is, or write "not qualified" at the top of the Summary Sheet.

12. If you have any questions, please feel free to call.

13. Please mail back the entire set together with your comments in the envelope provided.

Your cooperation will aid us greatly.

## CHAPTER 5

## USING THE HSMS SKILL SCALES

In the HSMS task analysis method task descriptions and task summaries are evaluated for their skill and knowledge requirements as a basis for grouping tasks and designing job and educational ladders. This chapter presents the basic concepts underlying the HSMS skill scales; it includes rules for applying the scales to the task descriptions, and offers suggestions for obtaining the information needed to scale the tasks for their skill requirements.

This chapter and Chapter 6 do not contain the HSMS scales. They are presented in Chapter 2 of Volume 1 of this report, and must be studied in conjunction with this chapter. Chapter 6 of this volume deals with the skill-scaling procedures carried out by job analysts and the review procedures carried out by senior staff. The end of Chapter 6 contains examples of HSMS skill scaling which can be used for training purposes. Thus, in order to scale tasks for skills, the user must work with Chapter 2 of Volume 1 and Chapters 5 and 6 of this volume.

### CONCEPTS

#### Skills

The HSMS task analysis method identifies sixteen skills. It defines a skill as a teachable, behavioral attribute that is displayed when an individual carries out a mental or physical activity in performing a task. We assume that the activity can be evaluated for the degree or amount of skill it requires. We also assume that skills can be learned incrementally.

While skills and knowledge are both teachable, skills require practice if they are to be learned. Knowledge is learned primarily through didactic instructional means. Skills may first be presented in a didactic instructional setting, such as in a classroom or lecture room, but actual learning does not take place until there is practice.[1] Applying or using knowledge in a job task requires skills.

## Scales

A scale is a measuring instrument. Just as a ruler measures length, the HSMS skill scales measure skill levels. The chief difference between the ruler and the skill scale is that the job analyst is required to judge skill levels by more imperfect means than using the ruler.

Each of the HSMS skills is represented by a scale. Each scale has a name, an overall statement of its content, and an indication of the criteria (scaling principles) which differentiate each of its levels. Each level has a numerical scale value (which can range from 0.0 to 9.0) accompanied by a statement (descriptor) that indicates the behavior warranting that descriptor's scale value. The descriptors are arranged in rising combinations of the scaling principles. They use generic language, and thus can be used to scale any task.

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1 "Aptitude," in contrast, refers to the ease with which an individual can learn a skill, or the level of the performance he can achieve in exercising the skill.

To apply the scales the HSMS method requires that the scaler learn the scaling principles for each scale and the minimum condition required before a task can be scaled above the zero point descriptor on a given skill scale. The scaling principles are contained in the paragraph describing the skill and are underlined within each descriptor.

Each descriptor's scale value is expressed in terms of the scaling principle(s) for the skill. In scales where more than one principle is involved, there are three levels described for each principle. The descriptors define combinations of the levels of the two (or more) principles in combinations which can be expected to be found applicable to tasks.

The job analyst uses the information included in the task description and further interviews with the performer to decide which descriptor on a scale best applies to each task being scaled.

HSMS developed scales for task frequency and sixteen skills. Of the skill scales, three are manual, two are interpersonal, three relate to precision in the use of language, two deal with decision making, four cover ~~general~~ intellectual skills, and two are responsibility skills which relate to the recognition of the consequences of error in task performance. These seventeen scales are described in this chapter. The reader should turn to the appropriate scale in Chapter 2 of Volume 1 as each is discussed.

## TASK FREQUENCY (Scale 1)

The Task Frequency scale is the only one of the seventeen scales discussed in this chapter which is not a skill. The frequency with which a performer carries out a task is one of several aspects of a task's local identification information. It can vary for the same task from performer to performer or from institution to institution; frequency is of interest only for the purposes of assessing the centrality of a task in a job in a specific institutional setting.

Each scale value refers to a range describing how often a task is done over the course of a year, a month, or a day. The scale goes from a value of 1, when a task is done as infrequently as once per year or less, to a value of 9, when a task is done fifty times per day or more.

The numbers in parentheses in the descriptors apply to tasks done sporadically and give such tasks weight equivalent to tasks done on a more regular basis. The numbers are conversions based on a normal work year assuming 228 work days per year (allowing 137 days for weekends, vacations, holidays and sick leave), and assuming 45 work weeks and 11 work months in the year.

### Rules

1. Tasks which the performer carries out on a regular basis are always scaled with the descriptor wording which appears outside of the parentheses.

2. The numbers in the parentheses in the descriptor statements for scale values 3 through 9 are for use only when the performer carries out the task many times in a concentrated period, and does not do the task on a regular daily, weekly, monthly, or yearly basis.

3. When task inventories are developed a scale value of 0 is used if a performer has never done the task and will not be doing it. A scale value of -1 can be used if the performer has never done the task but is expected to be able to do it, or is about to be responsible for it. The user should decide on the convention to use for such circumstances.

4. Regardless of whether the task is done frequently or infrequently, it is important to rate a task in terms of its actual performance frequency, and not in terms of the official view of the assigned frequency.

5. The analyst should be careful to assign frequency scale values which represent the performer's experience in the shift or department in which he or she is currently employed and not on past experience.

## Questions For The Performer

1. For tasks regularly assigned, it should be possible to use the scale value descriptors as the basis for questions such as, "Do you do that once a day, or more often than that?" "As much as five times a day?"

2. In situations in which the task is done in a concentrated period, ask, "When do you do (the task)?" During special times in the year?" "About how many times in a year do you do that?" "Do you do that at any other time of the year? Are you sure?"

3. The analyst can use rounded frequencies for questioning the performer. For example, "During a normal year, would you do that as much as 100 times?" "As much as 1,000 times?" The analyst can question further to find the descriptor that most closely approximates the performer's view of frequency.

4. The performer could be asked, "Is this as often as you're supposed to be doing this, or is this as often as you really do this?" or, "Is this usual, or do you actually do this more often or less often?"

Special Problems

When a task covers conditional elements which arise infrequently, or elements which arise in varying frequencies the analyst may be confused about which frequency to assign to the task. The analyst should decide what is essential to the task as a whole, and should assign the frequency to the number of times the essential elements of the task occur.

For example, if a task involves "deciding on the type of radiographic procedure to order" for a patient, the decision is the essential aspect of the task, and the frequency would cover all the times the decision must be made, including times the decision is to order no radiography. In a task where the performer evaluates a suture wound and removes sutures or reports the condition, the task's frequency covers all the times that a suture wound is presented for removal of sutures, whether or not they have actually been removed.

In some tasks there are alternative methods for doing a particular activity. For example, a task can include two different methods for testing a patient's urine sample for chemical content, or more than one way of preparing an injection dose. In instances of this sort the analysts determine from the performer how often he or she does the task including all the alternative methods. If necessary, this can be done by obtaining the frequency for each method and summing them to arrive at the correct total frequency.

Another problem can occur when the performer's tasks have been grouped by function and a breakdown has resulted in several tasks. Even though the performer may think of all of the tasks as instances of the same task, the analyst must arrive at frequencies for each. The only way to avoid confusion and save valuable interview time is to actually name each of the tasks and explain that the objective is to rate frequency separately for each. The analysts must make sure that the performer is focused by a question such as:

"How often do you do _____? I don't want you to count any other kind of _____."

It sometimes happens that a performer is required, as a part of his or her regularly assigned duties, to fill in for another performer. An example would be when a supervisor takes over the work of a subordinate when the latter is absent. When such tasks are included among the performer's tasks, the frequency assigned should be the probable number of times the performer carries out the task, and not what it would be if the performer did it all the time, or if the subordinate were never absent. In such cases the analysts use the frequencies within the parentheses on the scale.

MANUAL SKILLS

A performer's task may require manual activity. The HSMS method identifies three manual skills which appear to be learnable through practice. They each deal with precision and coordination in the use of the body or its parts, and are essentially psycho-motor skills. Locomotion deals with the body's movement through space; Object Manipulation deals with the movement, control, and placement of objects, and Guiding or Steering deals with the control of objects moving in space in relation to external stimuli. The scaler should consider the following:

1. A task cannot be scaled above zero on any of these three manual scales unless it requires that some sort of predetermined standard be achieved.

2. Speed requirements are not relevant as scaling principles for the manual skill scales.

3. Two or more manual skills may often be found together. The analyst should be careful to scale each task for each skill separately.

LOCOMOTION (Scale 2)

If a task ever requires the performer to move his or her body, torso, and/or limbs through space, following predetermined standards of body movement or position, the task can be rated for Locomotion. The skills are involved when the performer is required to achieve a desired sequence of motions or a particular position.

The scaling principles involve the complexity of the predetermined standards and the degree of body coordination required. The standards set for the motions or the position to be achieved help determine the degree of coordination required. External circumstances also influence the degree of coordination required.

For example, standards of balance or grace for the gymnast or the ballet dancer involve predetermined motions which, when carried out through an extremely high degree of coordination, result in achievement of the positions or movements called for. In contrast, the tightrope walker or the waiter in a crowded restaurant are forced by the external circumstances of their tasks to use coordination to achieve their predetermined movements or positions. The degree of coordination called for in the latter two instances differ according to the complexity of the predetermined standards and the constraints of the environment which influence the degree of coordination required.

The predetermined standards, such as those used to judge grace, accuracy, proper sequence or form in movement, etc. can be memorized by the performer or may be set by the performer himself, depending on the task situation. Whether or not they are memorized has no effect on the scale value, per se. The external circumstances which determine the coordination needed can include narrowness of pathway, restrictions on movement, or a series of obstacles which must be avoided.

Rules

1. Locomotion skills are needed above zero when the performer is required to coordinate the movement through space of his body, torso, and/or limbs so as to achieve a predetermined standard with respect to a desired sequence of motions or a particular position.

2. More than casual walking from one place to another must be involved before a task rates above zero on this scale.

3. In order to evaluate a task's scale value for Locomotion the analyst must consider the scaling principles and decide on (a) the nature of the standards that must be achieved (whether simple, somewhat complex, considerably complex, or extremely complex), and (b) the degree of body coordination required (whether a small, moderate, high, or extremely high degree). The combination determines the scale value.

4. Movement of the arms or legs in a predetermined way is to be treated as locomotion just as though the entire body were moving through space.

5. The scale value is not determined by the strength required to perform the task, the knowledge which may be involved, or guiding and steering skill requirements.

## Questions For The Performer

If there is any doubt about whether the performer's movement of his or her body through space in a task warrants non-zero scaling on the Locomotion scale, the answers to a few simple questions will help. If the answer to either or both questions is "no," the scale value is probably zero:

1. Are there any predetermined standards you have to achieve? What are they?

2. Does the body coordination involved require sufficient learning to be included in a curriculum? Does it require practice?

## Special Problems

In health occupations, non-zero levels of Locomotion skills can be found in work situations which involve the teaching of exercises by demonstration, or the administration of exercises which require the performer to achieve predetermined standards, such as in "range of motion" exercises. The type of walking generally done in task situations usually does not require the achievement of standards for locomotion and would not scale above zero.

OBJECT MANIPULATION (Scale 3)

If a task ever requires the performer to directly handle objects in a coordinated fashion so as to achieve a predetermined standard through manipulation, it can be scaled for Object Manipulation. This skill involves the concept usually referred to as dexterity.

The level of the skill rises with increases in the precision or control which the performer must exercise through the use of fingers, hands, or limbs, and with increases in the fineness of the manipulation involved. The scale value is determined by the control exercised by the performer, rather than by any control which may be exercised by intermediary objects. Thus, when the performer manipulates a tool or instrument in order to manipulate another object, the scale value should reflect the manipulation involving the performer's fingers, hands, or limbs directly. Included as an "object" would be parts of an animate being when treated as an object (such as a part of the body being manipulated).

Rules

1. Object manipulation is a skill required for the task only if there are predetermined standards of precision required to get the task done. Therefore, even if the performer uses precision, if the task does not require it, it would not scale above zero on the scale. The predetermined standards for doing the task and/or the constraints of the situation determine the level of or need for precision in the task.

2. The absolute size of the object does not always determine the fineness of the motion. One can have a fairly gross movement using a small object, such as in the use of an eyedropper. A larger object, such as a knob, may involve finer motions when precise settings are to be obtained through tiny movements of the knob.

3. The analysts should avoid confusing the Object Manipulation involved in a task with the other manual skills, with Figural skills, or with the knowledge needed to manipulate objects.

Questions For The Performer

1. If the analysts are uncertain of the grossness or fineness of the motions in an element of the task, the performer should be asked to demonstrate.

2. The analysts should ask the performer about the standards, constraints, and precision involved.

Special Problems

1. Handwriting does not scale above zero on Object Manipulation unless fine penmanship is required or if what is written must fit into a very limited space. In this case writing would scale at 1.5. Activities that require motions which are less fine (more gross) than this, or which require less control and precision, or for which there is no predetermined standard would not scale above zero.

2. The motions required in making a bed, for example, are more gross and require less precision and control than the handwriting standard set above; therefore, this activity would not scale above zero on the Object Manipulation scale, even though the output (the made bed) is subject to standards.

3. In health care tasks recording actions taken on a patient's chart, or paper-shuffling (leafing through a case folder), or the delivery of materials or forms to another department are at zero on the scale unless there are special standards to achieve. HSMS analysts developed benchmark standards for this scale including the following:

1.5 Most positioning of non-infant patients for radiography; collimation.

3.5 Positioning of infants for radiography; handling unexposed x-ray or other film.

5.0 Making intravenous injections; spinal tap; probing with catheter in large vessels; inserting airway.

7.5 Moving small catheters in small blood vessels.

GUIDING OR STEERING (Scale 4).

If a task ever requires the performer to control an object so that it moves over a predetermined pathway or holds steady on a moving target in three-dimensional space, it can be scaled for Guiding or Steering. This skill involves the coordination of perceived external stimuli (which inform the performer of his position) with control of an object in relation to a desired position or movement. The skill is called for in driving vehicles, in sighting on moving targets, and in similar activities in three dimensional space.

The skill is required when there is a predetermined pathway or moving target to be followed. "Predetermined" means that the performer must know what path to follow, even if this is decided by the performer, or the performer must know the moving target on which he must hold steady. The pathway or target may be physically delineated or may be visualized. The skill is exercised as the performer, while manipulating the object, attends to external stimuli so as to move on a desired path or hold to a desired position. The performer responds to the sensory feedback by adjusting controls and correcting his position.

The skill rises as the degree of precision needed rises (or as the margin of error narrows), and as the complexity of the set of stimuli to which the performer must respond increases. In the case of Guiding or Steering skills, the precision increases as the performer has less and less relative latitude in which to move. That is, as the relative margin of error in movement of the object narrows, the more precise is the guiding or steering required.

Complexity of stimuli refers to the number of sensory stimuli or the number of spatial directions which must be taken into account by the performer in order to judge his or her position relative to the objective. The more stimuli, such as traffic, lights, or sounds, or the more directions, such as forward-back or altitude, the more complex the set of stimuli. The stimuli may be visual, auditory, or verbal, but not tactile.

Rules

1. The skill does not refer to the arm-hand steadiness required in drawing or following a line such as tracing or making incisions, since three-dimensional guiding is not involved. The skill is not involved in activities such as threading a needle or putting on shoes, since these instances do not involve coordination with external stimuli or a predetermined pathway.

2. The skill is not involved if the performer can adjust one dimension or direction at a time with other dimensions held constant.

3. To rate above zero on the scale there must be the need to move over a predetermined pathway or hold steady on a moving target.

4. The scaler should not confuse the Object Manipulation required in controlling the object being moved with the scale value for Guiding or Steering. Similarly, knowledge of what to do to guide or steer the object, or the Figural Skills involved should not be confused with scaling for Guiding or Steering.

Special Problems

1. If the performer is ever required to wheel something through a crowded area, such as a patient in a wheelchair, or on a stretcher, or to wheel a loaded cart, the task could be scaled above zero for Guiding or Steering. If the performer must avoid collisions or must not jostle the patient the skill is involved.

2. By comparing the size of the object with the perceived size of the pathway or target, the analyst can ascertain the relative margin of error; the performer can be questioned about how precise he must be.

INTERPERSONAL SKILLS

The HSMS method includes two interpersonal skills. One is Human Interaction and the other is Leadership. Human Interaction is exercised whenever a task requires the performer to come into contact with or interact with other persons. Leadership is exercised when a task requires the performer to relate to subordinates so as to influence their work behavior. A task may involve both skills.

Both of these scales have scaling principles which describe the conditions under which the skill must be exercised, rather than the way the skills are manifested or the nature of the skills. This is because interpersonal skills can be exercised in ways which are unique to the performer and reflect individual personality. However, the skills require behavior which can be learned by precept and practice regardless of the specific manner in which they are displayed.

HUMAN INTERACTION (Scale 5)

If the performer is required to have personal contact or interact with others in order to perform a task, the task can be scaled for Human Interaction. Human Interaction is involved when communication or cooperation takes place among people in a task situation or when a personal service is performed. The activities requiring Human Interaction may include instructing, questioning or obtaining information, persuading, influencing behavior, providing therapy, or in other ways exchanging ideas or feelings or transmitting or presenting ideas.

The chief characteristic of the Human Interaction skill is that the performer must display sensitivity to and perception of the relevant characteristics, or condition, or state of being, of other person(s). The performer must pay attention to feedback from the other person(s) as the interaction takes place, and must adjust his or her behavior accordingly so as to meet the needs of the situation and accomplish the task.

The scaling principles are the degree of perception of the other person's relevant characteristics that is required in the task and the degree of subtlety of the feedback to which the performer must attend.

The requirements of the task situation determine which characteristics of the other person are relevant. The performer is required to utilize varying degrees of sensitivity to or perceptiveness of the other person's relevant characteristics or state of being in order to accomplish the task. The performer then knows what to expect, what the other person's needs are, and what he or she must do to facilitate the performance of the task.

Feedback refers to the verbal or nonverbal cues which the other person is transmitting during the interaction. Such cues tell the performer of the changing state of the other person and whether he or she is communicating well. Therefore, they help the performer to determine whether he must adapt his behavior in order to accomplish the task. The scale rises as the feedback that must be attended to becomes more and more subtle.

Rules

1. Human Interaction skills are involved in activities as varied as selling a product, providing psychotherapy, feeding a patient, or persuading a board of directors. The motivation of the performer in relation to the task's output does not determine the skill level required. Tasks which have commercial outputs may rate higher on the scale than tasks which have therapeutic outputs.

2. The level of Human Interaction needed may vary from one instance of the task to another. The scale value chosen should be the highest one necessary for any likely instance of the task.

3. Interaction and feedback must be possible for the skill to be required. For example, the handling of a corpse, although a highly sensitive situation, does not involve Human Interaction unless live persons such as relatives of the deceased or co-workers are involved in the task.

4. The analyst should not confuse Human Interaction with Oral Use of Language. Interaction and feedback can be nonverbal.

5. The analyst should not confuse the knowledge required in categories such as in the behavioral sciences with the Human Interaction skills required in the task. It is possible for a task to be rated low in one and high in the other. For example, the Human Interaction skills required to give reassurance or provide pragmatic counseling may be higher than those needed to score tests for behavioral disorders, depending on the circumstances. The first two instances may not require much formal knowledge of psychopathology, but may require high levels of the skill in dealing with people. The third instance may require a fairly high degree of specific training in psychopathology, but may not need a very high level of skill in dealing with people.

## Special Problems

1. Normally, if task identification indicates that a recipient, respondent, or co-worker is involved, the task will require Human Interaction at a scale value of 1.0 or more. The simple acknowledgement of information or an order would scale at 1.0, as would cases where other people must simply be taken into account as the task is performed. For example, the patients in a ward where an aide is cleaning, or the persons present in a room undergoing renovation may require that a performer exercise Human Interaction skills even though they are not directly involved in the task.

2. Teaching tasks invariably involve Human Interaction skills. However, the nature of the teaching situation determines the scale value. Each type of instructional setting should be considered separately if several teaching tasks are to be scaled. Lecturing to a group of students without classroom discussion or when there is no evaluation made of their level of comprehension would scale lower than a task in which the lecturer evaluates the progress of each student's learning. Clinical instruction might involve even higher levels of the skill.

LEADERSHIP (Scale 6)

If the performer has a hierarchical relationship with other co-workers in which any are subordinates, some tasks may be scaled for Leadership skills. Leadership is required in a task when the performer must relate to or interact with subordinates so as to influence their work behavior in order for the performer to accomplish his or her work objectives in the task being scaled.

Three aspects of the performer's relationship with the subordinates involved in the task determine the level of Leadership required, as follows:

1. Although the performer must have some power over the subordinates' conditions of employment, the degree of Leadership needed declines as the performer's power over the subordinates' conditions of employment increases. The more power, the less the need for Leadership. "Conditions of employment" include hiring, firing, promotions, raises, transfers, overtime, and special privileges. In this context, de facto power such as the power of senior employees over new employees should not be overlooked.

2. The degree of Leadership needed declines as the channels of communication between the performer and the subordinates are increasingly defined or formal. The more formal the communication channels, the less the need for Leadership. "Channels of communication" include the ways in which interactions occur, the mechanisms for giving orders, and the methods used in evaluation and review.

3. The degree of Leadership needed declines as the nature of the tasks which the subordinates must perform to fulfill the objectives of the performer's task increase in specificity and clarity. The more clear and obvious the subordinates' assignments, the less the need for Leadership. Clearly defined work assignments mean that little discretionary judgment is required of the subordinates and little leadership is required in the performer's task.

These three aspects of the performer's relationship with the relevant subordinates can each be rated as high, medium, or low with respect to the level of Leadership called for. The three sub-scales are applied separately by the scaler in arriving at a value on the Leadership scale. Any combined score of high, medium, or low on the sub-scales is represented in the descriptors. For example, a rating of "low" on each sub-scale would provide a value of 1.0 on the Leadership scale. Two ratings of "medium" and one of "low" would result in a scale value of 3.0. A rating of "high" for all three sub-scales would result in a scale value of 8.5. Other combinations are listed.

De facto leadership exists in special situations such as when someone is temporarily in charge of a peer. For example, when a performer is asked to orient a new worker, de facto leadership is involved; when, in a cardiac arrest situation, a physician takes charge of a team, the task is scalable for Leadership.

Leadership is involved in both formal and informal teaching situations when the teacher and students are part of the same institution and the information being taught is relevant to the work of the institution. If the performer-teacher has any power over the students' conditions of employment, Leadership is involved. (The performer is dependent on the students' behavior in order to accomplish his own teaching task.) The students' (employees') tasks in such instances always require a great deal of discretionary judgment, since they have control over the extent of their learning, classroom behavior, and the application of their learning in their job tasks.

## Rules

1. If the performer is required to deal with co-worker peers or other persons in the task as though he or she were in a supervisory relationship, and as though they were his subordinates, the task could be scaled above zero on Leadership skills.

2. The Leadership scale is applicable only when co-workers are involved, and never when only patients or clients are involved. It is not usually required when co-workers transmit information in a normal work flow.

3. The scaler evaluates the task for the three subscales separately for a score of high, medium, or low on each, and then assigns the appropriate scale value as indicated by the scale descriptors.

4. In considering the conditions of employment, the scaler should not overlook the question of informal evaluations and recommendations. A doctor may not have any say in the hiring or act of firing a nurse aide, for example, but his opinion may carry a great deal of weight in the final judgment.

5. In a case in which the performer asks a co-worker to perform some part of a task as a help to the performer, leadership is involved only if the performer has some power over the co-worker; this is usually not the case unless the performer is acting as a teacher. Otherwise, only Human Interaction is involved.

## LANGUAGE SKILLS

A performer's task may require communication with other individuals orally, or require writing or reading. In such instances the performer is called on to exercise language skills. The language skills deal with the precision with which the performer must use language to convey or comprehend meaning, aside from any knowledge of technical vocabulary, specific languages, grammar, semantics, linguistics, or literary from that may be involved.

What is involved in the skills, and what is learned with practice, is precision in the use of language to transmit or understand the meaning involved. There are three HSMS language skills, Oral Use of a Relevant Language, Reading Use of a Relevant Language, and Written Use of a Relevant Language.

The scaler should consider the following:

1. A given task need not require all three of the language skills, and need not scale at the same level on the language scales. Each task should be scaled separately for each skill.

2. Technical language, the particular language involved, the mechanics of writing English, or use of literary form are accounted for by use of the Knowledge Classification System, and should not influence the scaling of tasks for language skills.

3. When more than one language is required in the performance of a given task, the analyst chooses the highest level of the skill that is called for in the task, regardless of language. The languages are noted for later use in knowledge identification and scaling.

ORAL USE OF A RELEVANT LANGUAGE (Scale 7)

If a task ever requires the performer to speak to anyone or to understand what is said by anyone the task requires Oral Use of a Relevant Language. The "relevant language" is the one (or ones) required by the task situation. The skill includes both orally communicating meaning and comprehending the meaning of what is being communicated by someone else.

Oral Use of a Relevant Language rises with the degree of precision of meaning the performer is required to comprehend, or the degree of precision needed to choose language in order to ~~convey mean-~~ ing. Precision in this context is independent of the use of technical terms or the choice of correct numbers, such as in formulas or directions. Precision refers to the selection of words to communicate meaning or the comprehension of meaning conveyed in words. Precision may be as important in situations involving common speech as it is in technical speech. In fact, choosing the language appropriate to the situation is exactly what the skill involves.

Rules

1. The language(s) required should be noted by the analyst for later knowledge identification.

2. The analyst should avoid confusing the level of oral language usage required by the task and the performer's personal level of articulateness.

3. The analyst should avoid confusing the skill level required in the given task with that associated with the job as a whole.

4. The skill should not be confused with Human Interaction skills or with oral delivery, such as in oratory or acting.

Special Problems

1. The aspect of comprehension is extremely important in some patient-related tasks when understanding what the patient is saying may be important.

2. Precision in the selection of words may arise when instructing a patient in self-care, when dealing with a child, when tact is required to bring a contraindication to the attention of a supervisor.

3. HSMS generally assigns a scale value of 2.0 to routine communications among peers, such as asking for supplies, informing staff that something is ready for use, or reporting work-related information. Ex-

plaining to the patient what will happen in a procedure is usually assigned a scale value of 4.0. Explaining the use of radiation safety shielding to a patient or informing a senior staff member of possible contraindications to carrying out a procedure are scaled at 7.5.

## READING USE OF A RELEVANT LANGUAGE (Scale 8)

If a task ever requires the performer to read and comprehend the meaning of any printed or written material, the task requires Reading Use of a Relevant Language. The "relevant language" is the one (or ones) required by the task situation.

Reading Use of a Relevant Language rises with the degree of precision of meaning which must be grasped from the material, and the complexity of the language to be read.

### Rules

1. The language(s) required should be noted by the analyst for later knowledge identification.
2. The analyst should avoid confusing the performer's personal reading level with the level required in the task, with the level required in other tasks, or with the level required in other language skills.
3. The level of this skill should not be confused with the knowledge contained in the language being read.

### Special Problems

1. HSMS assigns a scale value of 2.0 to reading check lists, identification information, and other simple records.

2. Reading case histories requires reading phrases which could be construed as "simple" language. However, the comprehension of what is conveyed within the written structure of case history records warrants a scale value of 5.0.

3. Depending on the complexity of what is read, reading operators' equipment manuals would scale at 5.0 or higher.

4. In testi[illegible] or maintenance tasks or elements, if the list of "things used" for the task includes an operators' manual, the task should be scaled for such reading, even if the language of the task has not shown that the performer refers to the manual to determine what to do in case of a problem. (The task description should make this clear.)

WRITTEN USE OF A RELEVANT LANGUAGE (Scale 9)

If a task ever requires the performer to write language in order to convey meaning, the task requires Written Use of a Relevant Language. The "relevant language" is the one (or ones) required by the task situation.

Written Use of a Relevant Language rises with the degree of precision of meaning which must be conveyed through writing and the complexity of the language to be used.

Technical language is accounted for by the appropriate knowledge categories, and does not determine language complexity. "Simple language" means writing phrases or brief sentences[illegible] language" means writing longer, connected passages and paragraphs where the meaning is conveyed by the whole. Thus, complex language [illegible] require the use of simple words. The other scaling principle to keep in mind is that the more precision required in the choice of language to convey meaning, the higher the scale value.

## Rules

1. The language(s) required should be noted for later knowledge identification.

2. Mechanics of writing English, a knowledge category, may also be required. It should not be confused with this skill scale. Precision in the choice of language may be independent of the knowledge of writing mechanics, grammar, and composition.

3. The level of this skill should not be confused with the knowledge of the subject matter contained in the material being written about.

## Special Problems

1. The critical distinction between scale value 5.0 and 6.5 is between "moderately complex language" and "complex language." "Somewhat precisely" is not meant to convey much less precision than "fairly precisely."

2. When the task requires the performer to dictate material such as letters and reports, the performer speaks aloud. However, since the object is to compose the words and ideas for their appearance in written form, Written Use of a Relevant Language is scaled and not Oral Use of a Relevant Language.

3. When a task requires the performer to copy material, no writing skill is involved. Reading skills may be required if there are instructions to follow.

4. HSMS uses scale value 2.0 to cover recording what was done in a procedure, or filling out a chart. Scale value 5.0 is used for simple reports; 6.5 is used in tasks when the radiologist writes his or her interpretation of a patient's radiographs.

## DECISION MAKING SKILLS

Performers have varying degrees of latitude in how they do their tasks, and varying degrees of latitude in the quality of their performance or the outputs they produce. These degrees of latitude are largely determined by the nature of the task situation. In this sense, tasks require decisions on how they are to be done or on the level of quality to be attained. Tasks therefore can involve decision making responsibilities. Exercising such responsibilities requires skills.

The HSMS method includes two decision-making skill scales, Decision Making on Methods and Decision Making on Quality. If the performer is required to decide how to do a task, and/or has latitude within which he or she can affect the quality of the task's output, HSMS decision making skills are involved.

### DECISION MAKING ON METHODS (Scale 10)

If the performer has any choice about how to do a task or what to use in the task, the task can be scaled for Decision Making on Methods. The scale is not applicable when the output is achieved in a manner over which the performer exercises no choice.

Tasks should be described in such a way that it is obvious that Decision Making on Methods is involved. In such cases the decision to be made appears as an element. The performer may have to assess each situation when the task is performed and decide what to do or when to do certain elements depending on the situation; he or she may have to decide whether to assign parts of the task to others; the performer may have to decide to get more information; he or she may have to decide what method from a range of alternatives is most appropriate, or what things are appropriate to use from a range of alternatives. The performer may have to assess the nature of the problem or the situation in order to choose. In each case, Decision Making on Methods is involved.

The level of skill in Decision Making on Methods is determined by two principles. One is the extent to which instances of the task that affect the choice of methods vary. The other is the extent to which the appropriate choice of method is obvious or specified.

At low scale values, task instances for which appropriate methods must be chosen vary little. At higher scale values, the task instances present the performer with a wide set of possibilities within which to decide the appropriate method. In the case of urethral catheterization, for example, instances relate to the patient's sex and condition; on the other hand, in administering first aid, the range of possible instances include all the patient circumstances that could require first aid.

The extent to which the performer has obvious options about the method to use is the second scaling principle. At low scale values, once the situation is assessed, the choice may be obvious or specified; the choice may be memorized or easily determined, or it may be essentially trivial, such as choosing a pencil or pen, or a correct size. At middle scale levels the performer may apply known guidelines, and this may narrow the range of choices. For example, guidelines may indicate, "use the fastest method," "use the safest method," "use the method indicated for infants," "use the method indicated for patients suffering from _____ condition." At the highest scale values the performer is required to determine his or her own guidelines, and these determine the method chosen. In tasks where the method chosen is controversial or innovative, the performer's choice may be based on guidelines he or she determines personally.

Rules.

1. For this scale to be applicable the performer must make a <u>conscious</u> choice (or choices) about how to do the task, and the choice must be <u>required</u> in the task situation.

2. The analyst should avoid confusing the complexity of the task with the scale value for this skill. A task may require high levels of skills and knowledge but have a narrow range of instances that affect choice of methods, and the choices may be obvious.

3. The analyst should be alert for task situations in which the decision about how to do the task is determined in a separate, prior task. In this situation the method for the task being scaled has been predetermined, and there is little latitude within the task.

4. There may be several elements of a task which require Decision Making on Methods. The analyst should scale the task for the highest level required and should note <u>all</u> the elements that require that same level.

5. The analyst should be careful not to scale the task for the level of knowledge required to make decisions on the method to use.

Special Problems

1. HSMS scaling generally uses scale value 3.0 for the performer's decision on whether to carry out elements personally or delegate to a subordinate or co-worker. However, when the choice is a matter of institutional ~~arrangements~~, so that it is actually prescribed in a given location, the element is not scaled for this skill.

2. HSMS uses scale value 7.0 for deciding what procedures to carry out in providing first aid or emergency care when the performer also determines the nature and severity of the symptoms.

DECISION MAKING ON QUALITY (Scale 11)

If the performer can choose to affect the quality of a task's output within the framework of acceptable performance, the task can be scaled above zero for Decision Making on Quality. The scale is not applicable when the performer cannot affect the quality of the task's output beyond minimum standards for acceptable performance. In most task instances performers have varying degrees of choice in the quality of their performance and varying degrees of responsibility for that choice. To exercise the choice is to use a decision making skill.

The level of skill in Decision Making on Quality is determined by two principles. One is the extent to which the performer can personally affect the quality of the task output above minimum standards for correct performance. The second is the extent to which the performer's output is subject to review by others before it is used.

The performer's "latitude beyond minimum acceptable levels of task performance" means that the scale is applied after establishing the acceptable standards for the task. If the performance or the quality of the output can be further improved, the scale is applicable. Such latitude is greatest when the output is a service and requires human interaction, or when the output requires general intellectual skills. There is often a good deal of latitude with respect to safety and thoroughness in health services tasks. At the highest levels of the skill the performer decides personally whether the output is acceptable based on personally determined standards for quality.

"Review or inspection by others" before the task's output "is used" does not mean periodic evaluation of the performer's work. It means that the performer must show the output or it is automatically reviewed before it is passed on or consumed. Examples of such review are showing a prepared medical dosage to a physician before it is administered to the ~~patient, or~~ having a machine check the accuracy of an operation before the output moves to the next production point. "Before it is used" implies that the review is done during the same production stage as the task, and not after the output has been passed along. In many health services tasks the outputs are consumed at the point of production and are not subject to review or inspection before they are consumed.

Rules

1. To apply this scale the analyst must first decide what constitutes minimum acceptable standards for performance and/or the output of the task. The analyst then determines whether the performer can decide to improve the output or task performance above this; and, if so, to what degree.

2. For the task to be subject to review or inspection by someone else before it is used, the review must take place during the performance of the task or before it proceeds to the next stage. This eliminates review by another performer after a passage of time. If the performer can decide whether to ask for review or someone else's opinion about the task's output, this indicates that the task is <u>not</u> subject to review, and asking for review is itself scalable for decision making on quality. The performer must be able to assume that the output will be or is being reviewed for the task to scale at 1.5, 2.0, or 5.5.

3. When the output of a task is an evaluation or an inspection of an output, the scale is applied to decision making on the quality of the evaluation or the inspection.

## Questions For The Performer

Since the scale is applicable only after the assumption that minimum acceptable standards are met, it is not appropriate to ask, "Can you make errors in this task?" Rather, the analyst asks, "What is considered acceptable when someone does this?" "Can someone do better than that?" "Could you improve on that if you decided?" "How much could you improve on the way you do that?" "Could you do this less carefully and still do it correctly?"

## Special Problems

1. Some HSMS "desiderata" are highlighted by this scale. HSMS task descriptions include elements that deal with safe practice or treating the patient with dignity, etc. To the extent that some of these behaviors are <u>options</u> they are scalable on Decision Making on Quality.

2. HSMS scales tasks in which the performer personally assists a senior staff member at 1.5, 2.0, or 5.5. Readying a patient for an examina-

tion, reporting personally, or preparing anything that is personally delivered for immediate use are treated as "subject to review," as well.

3. The outputs of "consultation tasks" are not subject to review in the sense implied by the scale. While most medical procedure tasks start with a review of the requisition, the "consultation tasks" which produce the requisitions for the procedures are scaled at 3.5, 7.0, or 9.0, because there is no review at the same production stage as that of the consultation task.

GENERAL INTELLECTUAL SKILLS

Certain task activities may be conceived of as using intellectual or mental skills. Just as tasks can be scaled for manual skills independently from the specific objects or materials involved in the task situation, they can be scaled for intellectual skills independently from the specific knowledge or subject matter called for in the task situation.

The HSMS method includes four general intellectual skills: Figural Skills, Symbolic Skills, Taxonomic Skills, and Implicative Skills. These do not represent the totality of general intellectual skills or mental activities. Rather, they represent skills which seem to be independent of one another, which seem to be observable and scalable in the task situation, and which seem to be relevant for the purpose of grouping tasks.

The scaler should consider the following:

1. Since general intellectual skills are usually learned and exercised in the application of knowledge, they can easily be confused with knowledge. The knowledge actually serves as a vehicle through

which the skills are learned and practiced. Analysts should be careful to avoid confusing the level of any general intellectual skill called for with the level of knowledge required for the task.

2. The tasks should be scaled according to the skill levels actually required in the performance of the task and not the personal capabilities of the performer.

3. Tasks should be rated for each of the four general intellectual skills separately.

FIGURAL SKILLS (Scale 12)

If the performer's task ever requires work with material which must be dealt with in terms of size, shape, form, or similar dimensions in relation to space, the task may be scaled for Figural Skills. Figural Skills are involved when the performer is required to deal physically or mentally with the figural properties of visual or mental images and interrelationships, when some predetermined figural standard or objective must be achieved.

This skill deals with such figural properties as size, shape, form, color, density, and texture in their physical or compositional aspects and arrangements in space. The forms may be static or may be in motion. Color and texture in their non-spatial aspects and other sense modalities such as sound, taste, touch, etc., are excluded. The performer may deal with objects which are physically and/or mentally manipulated, or mental images which are mentally manipulated.

To scale above zero on this scale a task must require the performer to achieve a figural objective or standard; simply dealing with figural properties is not enough. A figural standard or objective would express norms or criteria for size, shape, form, etc., or their arrangements. The skill includes responding to, creating, or arranging figural relationships, patterns, or compositions. The figural standard may be imposed by external requirements, by the task situation, or may be personally determined by the performer. The standard or objective is the reason for the figural manipulation.

The level of Figural Skills is determined by two principles. The first is that the more complex the figural standards to be achieved, the higher the skill. Thus, if the performer must achieve simple standards of symmetry, parallelism, or linearity of arrangement, a low level would be involved. Standards such as balance, harmony, or elimination of needless shapes might be intermediary standards; standards which involve a set of complicated rules such as those involved in building design or cinematography would be at a high scale value.

The second principle is that the more complex the figural relationships whose aspects the performer must deal with, the higher the skill level. Thus, if the performer must attend to simple, static patterns in two dimensions with little interrelationship between the forms being dealt with, a low value on the scale would be involved. For example, following or tracing an outline, arranging squares on a page, or hanging pictures on a wall would all probably involve low levels of the skill. High levels of the skill could include the design of a floor lay-out which must contain moving machinery and passageways while at the same time providing for maximum light flow.

## Rules

1. The scale is involved when there is visual and/or mental manipulation of objects in any number of dimensions and a standard for the arrangement.

2. The scale is involved if there is a comparison to be made between objects with reference to their figural aspects.

## Special Problems

HSMS established guidelines for this scale as follows:

1. Standardizing an ECG machine and adjusting oscilloscope displays, evaluating and/or comparing densities on test radiographs using test tools, centering radiographic equipment to test objects, etc., was scaled at 1.0.

2. Placement of equipment to monitor patient x-ray exposure rates or for a radiation survey, positioning patients and equipment for radiography, or selecting alternative positions was scaled at 3.5.

3. Evaluation of radiographs and positioning for tomography was scaled at 5.0.

4. Use of cine, fluoroscopy, or videotape to evaluate dynamic functioning or to assist with the passage of catheters through vessels was scaled at 7.0 on the scale.

## SYMBOLIC SKILLS (Scale 13)

If a performer's task requires the use of abstract, symbolic material such as numbers, music, codes, or other systems of notation, the task can be scaled for Symbolic Skills. The skill is needed when the performer is required to use or mentally manipulate abstract symbols in terms of their symbolic properties.

To scale above zero, the task must require the use of, or the manipulation of, symbols which are part of an abstract, non-representational system of notation in which the symbols stand for characteristics, relationships, or operations. The use of single, one-to-one symbolic representations such as traffic signs, stop/go signals, and labels (such as a skull and crossbones for poison, or a red light used as an exit sign) are not covered by this scale. Examples of systems of abstract symbolic notation are mathematical notations including numbers and signs, computer languages, codes, and music. Thus, adding and subtracting in a task involves symbolic skills, but responding to a warning sign does not.

The symbolic properties of a symbol are not the same as the properties for which the symbol stands, or the figural properties of the symbol. For example, the letter E, in the formula $E = mc^2$ stands for energy. The symbolic properties of E are not the properties of energy, nor the size, shape, or form of the letter E. The symbolic properties of E are its characteristics within the equation.

In each system of notation the performer must learn and memorize what each symbol stands for. The skill is exercised in the mental manipulation of the symbols to meet the needs of the task. In dealing with the symbolic material the performer may make actual notations, may use or carry out notations, or may conceive of notations. The skill is the use of, or manipulation of, the symbols in terms of the abstract characteristics, relationships, or operations for which they stand.

Symbolic Skill scale values are determined by two principles. One is the complexity of the symbolic properties of the symbols being used or manipulated. The other is the complexity of the use made of the symbols; that is, the complexity of the manipulation of the symbols in the task.

<u>Complexity of symbolic properties</u> refers to the number and kinds of relationships being expressed by the symbol. A simple number such as 2 in a column of figures has simple symbolic properties. So, too, does the symbol for a half note in music or the word "WRITE" in a FORTRAN statement. A plus sign (+) would also have simple symbolic properties, i.e., the operation of addition. In the equation $E = mc^2$, more complex symbolic properties are involved. The use of 2 as an exponent and the relationship represented by the equal sign add to the complexity. The notation for a musical phrase would be more complex than a single note; an "IF" statement in FORTRAN would also have fairly complex symbolic properties. The most complex properties are in symbols that represent numerous complicated characteristics, relationships, or operations within a given system of notation.

<u>Complexity of manipulation or use</u> refers to the mental operations which must be undergone in dealing with the symbols. Adding or subtracting would be simple symbolic manipulations; solving a first degree equation would be a more complex use or manipulation, and expressing a complicated set of mathematical relationships using mathematical notation would be an extremely complex use of symbolic material.

Notes

1. In scaling tasks for Symbolic Skills, the analyst determines the most complex symbol with which the performer would deal in the task situation. This might be individual numbers, a portion of an equation, an entire formula, a line of music, a FORTRAN statement, or an entire FORTRAN program.

2. The analyst then determines the complexity of the manipulations or operations called for with respect to the symbolic materials.

3. The analyst should note that what might seem to be a highly complex operation could be a fairly routinized series of simple operations performed in sequence. For example, solving a complicated equation might be done in predetermined separate steps without requiring very complicated mental manipulation of symbols.

4. The analyst should avoid confusing Symbolic Skills with knowledge or Figural skills. Subject matter content is accounted for by knowledge categories; the visual properties of symbols, such as size, shape, form, etc., are accounted for by Figural Skills.

Special Problems

HSMS has assigned scale value 1.5 to cover addition, subtraction, multiplication, or division, and calculating averages, percentages, and percentage changes using arithmetic manipulation and numerical symbols. Solving simple equations using arithmetic manipulations and algebraic symbols are also scaled at 1.5.

TAXONOMIC SKILLS (Scale 14)

If the performer's task ever requires the creation or application of conceptual organizing or classifying principles in order to accomplish a task, it can be scaled for Taxonomic Skills. Taxonomic

Skills are involved when the performer must consciously use existing organizing or classifying principles to deal with unclassified or unorganized material, or must consciously create classifications or organization to meet the needs of the task.

To be scaled above zero for this skill a task must require that the performer make conscious use of classifications or organizing principles. The skill is not called for if the task requires intuitive judgment or only the one-to-one matching of obvious characteristics with class designations. The task must require the performer to think about the principles of classification involved. For example, the skill is used in tasks calling for diagnosis only if it is necessary in the task for the performer to consciously bear in mind the principles used to assign symptoms to categories. The simple, routine matching of a set of obvious symptoms to a diagnostic conclusion does not require the skill above zero on the scale.

The scaler should note that the skill refers to conceptual organizing or classifying principles, and not the use of simple [illegible]ral or symbolic characteristics for classifying. For example, the librarian who is required to read a book and assign it to a bibliographic subject area for indexing uses the skill, but the person stacking the books by size does not.

When the performer must apply existing classifications or organizing principles the scale rises as the complexity of the principles being applied rise. For example, assigning books to a subject index may be lower on the scale than determining task identification using the HSMS method.

When the performer must create classifications or organizing principles to meet the needs of the task, the skill rises with the complexity of the purpose which the classification system must serve. For example, designing the subject matter categories for classifying books in a special research project may be lower on the scale than designing a set of task performance skill scales which are independent, identifiable, cumulative, and learnable.

Rules

1. The analyst should be careful to determine from the task description and/or the performer whether principles of conceptual organization or classification must be consciously applied or created. Unless the task requires the performer to think about the principles of classification involved, the task would be at zero on this scale.

2. The analyst should note that taxonomic skills are more likely to be needed when the performer is being confronted with situations that are not anticipated. The more routinized the instances of the task, the less the need to decide what is involved or what is needed by reference to or creation of classifications.

Special Problems

HSMS uses this scale sparingly. Determining the nature and severity of symptoms of a patient who is to receive first aid or emergency care and deciding on the care is considered to be at 2.0 on the scale. Scale value 5.5 does not appear until the activities such as designing a quality assurance program or evaluating new diagnostic equipment are involved.

IMPLICATIVE SKILLS (Scale 15)

If the performer ever draws implications about a set of information in a task situation, the task may be scalable for Implicative Skills. Implicative Skills are involved when the performer must come to non-routine conclusions or must draw non-routine inferences. For the skill to be involved the performer must go beyond the routine association of simple cause-and-effect or obvious relationships to come to conclusions, to foresee consequences, or to draw inferences while performing the task.

The requirement for Implicative Skills may be ascertained by examining the task description to find whether instances of the task require that conclusions be reached or inferences be drawn which take more than the memorization of simple associations. To scale above zero, the task must require that the performer consciously deduce or draw a conclusion, consider alternatives, or visualize consequences.

There are two scaling principles that determine this scale. One is the extent to which the kinds of information from which conclusions or inferences are drawn vary from one instance of the task to another. The other is the complexity of the information with which the performer must deal in drawing conclusions.

The more varied the type of information to be dealt with, the less routinized or obvious the conclusions or inferences. For this reason, a task identified in broad terms, such as "analyzing research data," would scale higher than a task identified in narrower terms such as "analyzing the results of a standardized questionnaire."

The complexity of the information with which the performer must deal affects the scale value because the more aspects of information which must be taken into account, the less obvious the conclusion or inference.

Rules

1. The analyst first determines the elements in which the performer must draw conclusions or inferences, and then determines how much the instances of the task vary with respect to the information from which the conclusions must be drawn. After this has been done, the analyst then determines the complexity of the information to be dealt with.

2. The analyst should not confuse the complexity of a task and the various instances of the task with the number of instances of the elements within which the conclusions must be drawn. A task may be broadly stated and varied in its instances, and yet the kind of information from which conclusions are drawn may not vary.

3. The analyst should not scale a task above zero for this skill unless the conclusions drawn require more than "the memorization of cause-and-effect relationships or simple associations." The less obvious the conclusions or inferences are, the higher the Implicative Skills involved.

4. The scale value of Implicative Skills is not determined by the seriousness of errors which could result from coming to wrong conclusions or drawing incorrect inferences. These aspects of the task are dealt with in the error consequences skills or in Decision Making on Quality.

5. The descriptors for Implicative Skills reflect gradations in the amount and complexity of the information which the performer must take account of, rather than the specific manner in which the skill is exercised.

ERROR CONSEQUENCES SKILLS

A task normally carries with it the danger that the performer will make errors in carrying out the task. The performer's awareness of the seriousness of possible errors serves to keep him or her alert in the performance of the task. This sense of responsibility is learnable and, as such, is treated as a skill.

The HSMS method includes two such skills. One is Financial Consequences of Error; the second is Consequences of Error to Humans. Both ~~scales~~ describe levels of seriousness of the consequences of error. They are dealt with separately for each task. A special procedure for scaling a task for each of the two error consequences skills is presented below:

Special Procedure for Error Consequences

1. Each of the error consequences scales is dealt with separately for each task. The analysts should be sure that they and the performer have in mind the given task and the appropriate error consequence scale.

2. Having established which error consequence scale is being referred to, the analyst asks the performer to imagine the most serious error which it is likely that a qualified performer could make with respect to that scale.

3. The analyst makes clear that the most serious likely error is one which can be expected from a performer qualified to do the task. It should not be a student or trainee error. Errors of omission can be as serious as errors of commission, and this should be pointed out.

4. The analysts should bear in mind that the most serious likely error named for each scale may be different.

5. When the most serious likely error is determined for a scale, the error should be written down.

6. The analyst questions the performer about the error in order to scale it, making sure that the particular error is being kept in mind.

## Special Problems

1. When the analyst introduces questions to scale for error consequences, caution should be used so that the performer does not become defensive. It should be made clear that the task, not the performer, is being evaluated. However, while the analyst must not associate the error with the performer personally, real dangers should not be glossed over.

2. In leading up to questioning on error consequences, the analyst might ask whether things could go wrong in doing the task being discussed. The answer will probably be "yes." Then, in focusing in on the most serious error, the analyst should indicate that it is the most serious likely error, rather than one which would take a great act of imagination to think of.

3. The analysts may have difficulty in getting the performer to keep in mind that errors can be made by qualified persons, not trainees. The performer may tend to think of errors in terms of trainees or new performers. The analyst [illegible] emphasize the focus of the quest[illegible]til the performer fully understands. It may [illegible] to explain that the purpose is to determine the [illegible] of responsibility that the task carries with it. Using a task from the job of another performer as an example is often helpful.

## FINANCIAL CONSEQUENCES OF ERROR (Scale 16)

If a properly trained performer can make an error in the task which can result in financial damage to the institution, the task can be scaled for Financial Consequences of Error.

The scale rises as the relative amount of financial damage to the institution rises. The error chosen for scaling is the one considered to be the most serious likely error (in terms of financial consequences) which can be expected from a performer qualified to do the task.

Errors can include forgetting as well as mistakes. Financial consequences can be expected to result from damage, bad output, repair or replacement costs, lost time, costs of disrupted operations, or loss of customer orders. Errors may affect material outputs, equipment, or service outputs. The only financial damage to be excluded from consideration on this scale is damage suits resulting from the error's harm to humans.

The scale's descriptors do not refer to dollar values; equal dollar damages may have different impacts on institutions of different size. The scale deals with the relative impact of errors on the finances of the institution involved.

Rules

The error selected should be written down by the analyst. The analyst should carefully avoid confusing this error and its scale value with those for Consequences of Error to Humans.

CONSEQUENCES OF ERROR TO HUMANS (Scale 17)

If a properly trained performer can make an error in the task that can result in mental or physical harm to a human, the task can be scaled for Consequences of Error to Humans.

The scale rises as the seriousness of the harm increases and as the remediability of the damage declines. The error chosen for scaling is the one considered to be the most serious likely error (in terms of physical or mental effect on humans) which can be expected from a performer qualified to do the task. The harm can be to the recipient or co-worker in the task, to the performer, or to the public.

The seriousness of the harm is determined by considerations such as inconvenience, pain, loss of ability to function, and their durations. The remediability of the harm ranges from conditions so trivial that remediation is not needed, to cases where treatment can be given, and, finally, to effects which are largely non-reversible. The most irreversible harm is death. Errors can include forgetting as well as mistakes. This scale does not deal with the financial costs of the harm to humans.

Rules

The error selected should be written down by the analysts. The analyst should carefully avoid confusing this error and its scale value with Financial Consequences of Error.

Questions For The Performer

An example can be used to help the performer visualize an error that could be made by a properly trained performer. HSMS has used the following:

When a doctor or nurse is doing a pelvic examination and pap smear, a speculum must be inserted into the patient's vagina in order to examine her. If the performer is properly trained he or she probably won't insert an unclean or contaminated speculum. But the performer might select the wrong size speculum, or fail to relax the patient properly, or might push the speculum too hard. Such errors can cause the patient some discomfort. This might be the most serious likely error. A more serious one would be taking a tissue sample from the wrong site. Such errors are likely because even trained people can be careless.

Special Problems

When a task involves radiation exposure to the patient or performer, possible errors include: (1) not shielding the gonads or radiation-sensitive organs, or (2) giving excessive radiation due to improper collimation or having to redo the x-ray examination. Physicians may use fluoroscopy longer than needed. When an examination must expose the gonads or sensitive organs, the error could be excessive exposure of the patient due to improper collimation or the need to redo the examination. When an examination should not expose the gonads or sensitive organs, the error would be failure to use shielding.

If these errors are possible in the task, or if any other error exposes a person to unnecessary radiation, the error consequences may not be immediate, but the effects can be radiation sickness, cancer, and/or genetic mutation due to exposure of the gonads. Under these circumstances, the scale must take account of possible but unknown future effects. HSMS devised the following guidelines:

1. For equipment giving high dosage, such as in radiotherapy, if the error results in excessive exposure once or over time, and the unnecessary dose is massive, the scale value would be 8.0.

2. For diagnostic procedure tasks or related tasks such as monitoring performer's own exposure, when the result of the error is unnecessary exposure to sensitive organs (including gonads (ovaries, testes) lungs, brain, spinal cord, eyes, kidneys, children's bones), the scale value would be 7.0.

3. For all other diagnostic-type procedures where cumulation of exposure increases the dangers to the patient, we assume that, even if the probabilities are low, the person's chances for damage are increased due to the unnecessary exposure, and the scale value would be 5.5.

CHAPTER 6

SKILL SCALING PROCEDURES

The HSMS method specifies procedures for scaling tasks for their skill level requirements and procedures for annotating the task descriptions as a check on the scaling and as preparation for curriculum design. This chapter is a procedural manual for such skill scaling. It is addressed to job analysts and to senior staff who review the scaling and/or carry out curriculum design.

Skill scaling takes place after the job analysts have received copies of the approved, final versions of the task descriptions. The analysts work with the HSMS skill scales (which appear in Chapter 2 of Volume 1 of this report) after having been trained in their use (see Chapter 5 and this chapter).

This chapter covers preparation, pre-scaling, preliminary annotation of task descriptions, scaling rules, establishment of scaling benchmarks, skill scaling interviews with performers, final scaling and annotation of task descriptions, and review of the skill scaling and annotations.

PREPARATION FOR PRE-SCALING

In order to scale the task descriptions, the analysts begin by preparing them for annotation. The preparation provides room on the description sheets for information showing the tasks' scale value for each skill and the part(s) of each task in which each skill is manifested at the scale value selected. The analysts make copies of the task descriptions in such a way that a blank column appears next to each column containing the List of Elements. Figures 16 and 17 (at the end of this chapter) indicate how this looks. These copies are called "annotation sheets."

1. Copies of the Task Description or Task Summary Sheets are divided in half vertically, by columns, and are glued on blank sheets or photocopied so that one column appears on one side of the sheet and a blank margin appears on the other half.[1] Each resulting annotation sheet should contain the Task Code No., the page number of the task, and the number of pages for the task.

2. A second set is prepared at this time for later use in knowledge identification and scaling.

The Skill Scaling Sheet

Figure 10 is a blank copy of an HSMS Skill Scaling Sheet. It is used by the analysts to record their scale values. A separate Sheet is filled out for each task to be scaled.

At the top is space for the abbreviated task name, the Task Code No., the name of the institution, and the names of the analysts on the team. When a sheet is considered to be in final form and ready for review, it is checked on the last line, making this a "master sheet" for the given task.

The HSMS Skill Scaling Sheet includes the number and abbreviated name for each skill scale (and the Frequency scale for use by

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1 This is why the task description forms are divided into double columns.

Figure 10

HSMS SKILL SCALING SHEET

Task Name ______________________________ Task Code No. ____

Institution ____________________ Analysts ____________________

Circle Appropriate Scale Value for Each Scale

| Scale | 0 | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 | 4 | 4.5 | 5 | 5.5 | 6 | 6.5 | 7 | 7.5 | 8 | 8.5 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 Frequency | 0 | 1 | | 2 | | 3 | | 4 | | | | 6 | | 7 | | 8 | | 9 |
| 2 Locomotion | 0 | | 1.5 | | | | | | | 5 | | | | 7 | | | | 9 |
| 3 Object Manipulation | 0 | | 1.5 | | | | 3.5 | | | 5 | | | | | 7.5 | | | 9 |
| 4 Guiding or Steering | 0 | | 1.5 | | | 3 | | | | | 5.5 | | | 7 | | | | 9 |
| 5 Human Interaction | 0 | 1 | | | | 3 | | | | 5 | | | | 7 | | | | 9 |
| 6 Leadership | 0 | 1 | | | | 3 | | | 4.5 | | | | 6.5 | | | | 8.5 | |
| 7 Language: Oral Use | 0 | | | 2 | | | | 4 | | | | | | | 7.5 | | | 9 |
| Insert name(s) of language(s): | | | | | | | | | | | | | | | | | | |
| 8 Language: Reading Use | 0 | | | 2 | | | | | | 5 | | | | 7 | | | | 9 |
| Insert name(s) of language(s): | | | | | | | | | | | | | | | | | | |
| 9 Language: Written use | 0 | | | 2 | | | | | | 5 | | | 6.5 | | | | | 9 |
| Insert name(s) of language(s): | | | | | | | | | | | | | | | | | | |
| 10 Decision: Methods. | 0 | | 1.5 | | | 3 | | | 4.5 | | | | | 7 | | | | 9 |
| 11 Decision: Quality | 0 | | 1.5 | 2 | | | 3.5 | | | | 5.5 | | | 7 | | | | 9 |
| 12 GIS: Figural | 0 | 1 | | | | | 3.5 | | | 5 | | | | 7 | | | | 9 |
| 13 GIS: Symbolic | 0 | | 1.5 | | | | 3.5 | | | 5 | | | | 7 | | | | 9 |
| 14 GIS: Taxonomic | 0 | | | 2 | | | | | | | 5.5 | | | 7 | | | | 9 |
| 15 GIS: Implicative | 0 | 1 | | 2 | | | | 4 | | 5 | | | | | | 8 | | 9 |
| 16 Error: Financial | 0 | 1 | | | | | | 4 | | | | 6 | | | 7.5 | | | 9 |
| Insert error: | | | | | | | | | | | | | | | | | | |
| 17 Error: Human | 0 | 1 | | 2 | | 3 | | | | | 5.5 | | | 7 | | 8 | | 9 |
| Insert error: | | | | | | | | | | | | | | | | | | |

Check here if this is a master sheet . . . ( )

Circle the pre-entered scale value chosen for each scale.

the institution). Next to each skill name are the scale values of the descriptors for each scale. The analysts circle the appropriate scale value based on their scaling judgments. Only predetermined scale values can be circled; the pre-printed form avoids numerical errors that might occur if scale values were entered rather than circled.

Practice Training

The best training for job analysts in skill scaling (after presentation of this and the prior chapter) is practice with approved task descriptions and scale values. The task langugage to which scale values have been applied can serve as benchmark references for the later work with which new analysts will deal. Chapter 9 of Research Report No. 8, which presents HSMS curriculum objectives, is a rich source for such reference and practice.[2] These objectives present excerpts from HSMS task descriptions in which the skills are manifested at the scale values indicated.

Figures 11 through 15, presented at the end of this chapter, provide examples of skill scaling. The figures are offered as benchmarks and as training aids. These filled-in Skill Scaling Sheets show the scale values assigned to the five task examples presented in Chapter 4 of this volume. They correspond to Figures 4 through 8, respectively.

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[2] Eleanor Gilpatrick and Christina Gullion, Using Task Data in Diagnostic Radiology, Research Report No. 8, Vol. 2, Curriculum Objectives for Radiologic Technology, New York: Health Services Mobility Study, 1977, Chapter 9.

Figures 16 and 17, at the end of this chapter, are annotated task descriptions for Task 182 (Figure 5) and Task 533 (Figure 7), respectively. These are examples of how the task descriptions are cut in half, mounted, and annotated for their skill scale values.

As a practice exercise the new analyst can read the task descriptions in Figures 4 through 8, and use copies of Figure 10 to attempt to scale and annotate the tasks. Figures 11 through 17 can then be used as a check on accuracy, i.e., agreement with HSMS scaling.

## RULES FOR SCALING TASKS FOR SKILLS

Each task description or summary is separately evaluated for each of the HSMS skill scales (Scales 2 through 17). Analysts may work with one skill at a time and scale each task for the skill, or may work with one task at a time and scale the task for each of the skills. In either case the following must be borne in mind:

1. Each of the elements of the task, including all contingencies and instances of the task, are considered as part of the task for scaling. Thus, with normative tasks that include desiderata, the task may include elements not currently being carried out by the performer who was originally interviewed.

2. The analyst must consider the necessary minimum condition which must be met before a task can be rated above zero on each scale, each of the scaling principles of each skill, and the increments along each scale.

3. The task is scaled with the highest scale value required by any element or instance of the task for a given skill, assuming appropriate and acceptable standards for performance of the task (rather than common, current, or superior performance).

## Scaling Steps

1. The scaler reads the task description or summary for the task being considered, paying particular attention to the List of Elements.

2. The scaler reviews the skill scale being considered, especially the nature of the skill, its scaling principles, and its minimum condition for a non-zero scale value.

3. The scaler selects the element(s) or instance(s) of the task that call for the highest level of the skill being considered. These element(s) or instance(s) determine the task's scale value for that skill. The scaler marks off this section of the task on the tasks's annotation sheet.

4. The scaler decides if the non-zero condition is met. If it is not, the task is scaled at zero for the skill on the Skill Scaling Sheet.

5. If the minimum condition is met, the scaler finds the combination of scaling principles among the descriptors that best describes appropriate levels of performance of that skill for the task. The scaler notes the scale value of that descriptor. This is the task's scale value for the skill. It is entered on the annotation sheet and, eventually, circled on the Skill Scaling Sheet.

6. The scaler enters the language(s) called for in the three language skills (Scales 7, 8, and 9) on the Skill Scaling Sheet, unless they scale at zero.

7. The scaler enters the errors called for in the two error consequences scales (16 and 17) on the Skill Scaling Sheet as well as circling the scale values.

## Scaling Guidelines

1. The scale descriptors have content meanings that were assigned numerical values with a special statistical technique. Therefore, <u>the scale values may not be extrapolated</u>. Only the ones shown on the skill scale may be used. The scales are not to be used as purely numerical indexes; the descriptor for a given scale value must apply to the task.

2. All the instances of the task and all its elements must be considered when the scaler decides on the highest level of the skill required for the task. On the other hand, the scaler should be sure to avoid confusing or combining tasks. If activities are not part of the task description they should not be assumed to be part of the task for scaling purposes.[3] If some procedures are always delegated to others during the task, they should not be included for scaling consideration; however, any delegating and giving of orders should be included.

3. Where several elements in a task draw on the same skill, the one drawing on the highest level is the one to use for the scaling decision. If more than one element requires the skill at the same (highest) level, all should be indicated on the annotation sheets.

4. The scaler should not confuse the level of knowledge needed in task performance with the task's level on a skill.

5. The scaler should not permit the scale value for one skill to influence judgment about the scale value for another skill for the same task.

6. The scaler should not permit association of the task with a specific job to influence judgment about the task's scale values.

7. Scalers are expected to use their own judgment of the appropriate scale value to use and not their idea of what the performer's judgment would be.

8. Scalers may compare their scaling of task elements with benchmark guidelines provided in this manual or established in-house so as to ensure consistency and comparability of scaling.

9. Scalers may use their scaling of model task descriptions as guidelines for the scaling of the related task summaries. Scalers must bear in mind those elements in the model that do not appear in a given summary task, and those elements that are unique to the given summary task and then scale accordingly.

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[3] If it appears that a part of the task has actually been omitted, even though it has been reviewed, there is still time to bring this to the attention of the director and have the task description revised. Then the later version is the one that is scaled.

10. In making annotations the scaler must indicate the specific task element(s) or instance(s) of the task. Citing the whole task is not acceptable. When the language of the task does not make clear why the skill is needed or how it is manifested, the scaler should add brief explanatory information.[4]

11. For the error consequences scales (16 and 17), the error entered on the Skill Scaling Sheet is sufficient for annotation for the skill.

12. A scale value is not acceptable unless the scaler can indicate how it is manifested in the task through proper annotation.

## Rules For Special Cases

1. If the performer of a task must transmit information to other employees as an element of a task, such as a conference task, or if the performer must bring information obtained in other tasks to a conference task, the transmission of the information should be scaled for the skills needed to transmit the information, not for the skills involved in the content of what is transmitted.

2. If a clinical teaching task involves demonstrating a task or intervening during an employee's performance of a task, the teaching task must be scaled to reflect the skills and scale values needed for the performance of all the tasks which might be taught in the clinical situation by the performer.

## BENCHMARKS FOR SCALING TASKS FOR SKILLS

Consistency in the use of the scales is of major importance for the subsequent statistical analysis of the data. For this reason it is appropriate and helpful to have staff conferences to establish benchmarks and a common orientation.

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[4] See Figure 16, page 1 of 2 as an example.

Agreement on how to use the scales must be shared by the senior staff who will review the scaling and the director. It should also be agreed in advance who on the staff will make the final scaling decisions in cases of unresolved scaling disagreements.

Chapter 5 of this volume, the curriculum objectives in Research Report No. 8, Volume 2, and Figures 11 through 17 at the end of this chapter offer some of the scaling decisions used by HSMS as benchmarks. The staff can also develop their own benchmarks as follows:

1. Arrange and deal with the tasks in the same groupings used for the task description work. Identify the common language and agree on the scale values for those sections of the tasks.

2. For any given group of tasks, select a model if one has not already been selected. Scale the model task completely, confer on the scale values, and use the task's scale values as a model for others in the group. Then for each of the others, note the differences between the model and the tasks similar to the model and vary the scaling appropriately.

3. Identify tasks that are similar in content but are at obviously different levels; compare their scale values and evaluate whether the scale value assignments reflect the task differences appropriately.

4. For each scale and descriptor, attempt to find task language that illustrates the scale value. Compare scaling with these benchmarks. Avoid confusing the knowledge content of such benchmarks with the skill content. Skills can be found at the same scale value in very different work circumstances.

5. As the work progresses and specific problems arise, have periodic conferences that arrive at conclusions. Record the decisions and use these as additional benchmarks.

PRE-SCALING

Pre-scaling is scaling of tasks before skill scaling interviews with the performer. Pre-scaling permits the analysts to come to preliminary judgments about the skill scale values for each task on each scale. It allows the analysts to establish benchmarks and to prepare questions to use in the interview with the performer to clarify any points which would aid in the scaling.

1. The analysts work independently with their notes, the task descriptions on annotation sheets, the HSMS skill scales, the rules for scaling in Chapter 5 and this chapter, and benchmark scale indicators.

2. It is most efficient to have the analysts scale those tasks for which they have been responsible during task description and task identification. HSMS has found, however, that if the task descriptions are fully developed and detailed, others are capable of skill scaling.

3. The analysts fill out the information called for on the Skill Scaling Sheets, one sheet for each task.[5]

4. The analysts proceed to scale the tasks and annotate the task descriptions following the rules presented here and in Chapter 5.

   a. An analyst may wish to select the scale values and annotate the tasks by concentrating on one scale at a time, or may wish to concentrate on one task at a time and evaluate its scale values for each of the skill scales. It is equally important to keep the boundaries of the tasks in mind and to keep the content of the scales in

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[5] Tasks which are newly identified may overlap across performers or occupations. Such "overlap tasks" can receive only one task description and one set of skill and knowledge scales. If there is enough time, however, it may improve the reliability of the work to allow teams which have independently identified overlap tasks to separately describe and scale such tasks. A single description and a single set of scale values can be arrived at during the review period.

mind; the analyst should choose the method which allows the best concentration on both the task and the skill scale at hand.

b. The zero value descriptor for each scale can be turned into a question which the scaler can use to determine whether a given scale is required above zero for a given task.

c. If the analyst finds that more than one element calls for the scale value selected, annotation is made for all the elements which require that value.

d. The analyst may note that a given element in the task may require more than one skill. This is expected, and is not a problem. The analyst annotates the needed information for as many skills as are represented in an element.

e. Scales 7, 8, and 9 call for insertion of the names of the language(s) called for in the task, including English. These may be known at this time and should be entered on the Skill Scaling Sheets.

f. The analyst notes any questions he or she needs to have answered by the performer to help with assured judgments on the appropriate scale values.

5. The team of analysts compare their scale values, resolve differences of opinion, and/or decide on the questions that must be raised with the performer. They initiate staff conferences to resolve issues of substance or to establish benchmarks.

SCALING INTERVIEWS

The skill scale interviews with the performer are to help the analysts each arrive at an informed, clear, and accurate judgment about which scale values apply to each of the performer's tasks. Even if analysts are certain of a scale value selection before an interview, they can benefit by asking an appropriate question to confirm each scale value selected.

## Scheduling

When there has been a great lapse of time between the task identification and description period and the skill scaling, the performer may have completely forgotten that the analysts need additional information. It is important, therefore, to arrange to call or visit the performer and set up a schedule for the skill scaling period.

## Interview Procedures

The first scaling interview with the performer covers the ground rules for the scaling interviews and then covers Task Frequency if the scale is to be applied.[6] Skill scale interviews proceed one task at a time for each skill rather than one skill scale at a time. This helps the performer to keep the task boundaries in mind.

The following are guidelines for the skill scale interviews:

1. Ground rules for the performer and for the analysts are again established. The work should not begin until all parties agree about what is to occur. The spokesman should once again clarify the purpose of the session and give a rough idea of the kinds of things which will be asked, the length of time involved, and any special arrangement which may have been made.

2. It is most important to be sure that the performer is clear on what the task is, and all the instances it covers. This applies to every aspect of the questioning in the skill scale interviews.

---

6 Scale 1, Frequency, is not used for purposes of job ladder design or curriculum development. Its scale value is determined during interviews with the performer only if the information is requested by the performer's institution.

a. The analysts must be sure that, if a task includes elements not carried out by the performer, the performer is able to consider such elements in the questioning and in his responses.

b. The danger of confusing task boundaries is great when one task involves carrying out decisions arrived at in another task, or involves activities, such as collecting specimens, which are evaluated in a different task and/or considered for diagnosis in still another task. These need to be clearly pinpointed for the performer.

3. The analysts follow all the questions and answers, taking notes and presenting questions of their own. As the topics arise, each analyst is given the opportunity to pose questions at appropriate points in the proceedings.

4. As usual, the spokesman is responsible for terminating the session. He or she thanks the performer for the cooperation given and reconfirms the arrangements for the next skill scale interview, or is told when to expect a request for an appointment for knowledge identification and scaling.

5. Scale editing should take place betwen interview sessions so that the analysts can focus in on their final judgments and on their remaining questions. This is a period when benchmarks can be reviewed or revised, as well.

## TEAM SCALING

The purpose of team skill scaling is to reach the most reliable, accurate, and consistent decisions about the scale values. No matter how reliable the method, a team determination based on consensus will be more valid and reliable than one based on any single analyst's judgment.

The procedures in team scaling involve the following:

1. Each analyst independently prepares a set of Skill Scaling Sheets and annotation sheets, and refers to interview notes, pre-scaling, and benchmark decisions.

2. The analysts on a team compare their results and resolve any differences. Unresolved differences are carried to the staff member assigned to making final determinations.

3. A final set of Skill Scaling Sheets and annotation sheets is prepared and marked as master sheets.

4. A final check for completeness of all the forms should be made. The Skill Scaling Sheets should be checked to see that they are completely filled out, with zeroes circled wherever they are appropriate. The Sheets should be checked further to make sure that any scale values that were transcribed from earlier notes are correctly entered. Languages and errors should be entered where called for. The annotation sheets should be checked to make sure that every scale value above zero for each scale has a referent designated in the task description.

5. Each final Skill Scaling Sheet is stapled to its annotated task description and is then turned over to the staff who will do the review.

REVIEW PROCEDURES

The review of the skill scaling can include a stage in which teams of analysts review each other's scaling. The review may also be carried out by a senior staff member. HSMS uses both review procedures.

The steps in review are as follows:

1. The reviewer reads all the task descriptions to obtain an idea of what is contained in each task. This stage also provides a pre-publication check on typing errors and inconsistencies in the use of language.

2. Each task is checked for completeness of scaling information and annotation as discussed earlier in this chapter.

3. The reviewer groups the tasks as described earlier; similar tasks are grouped with their models; tasks to be compared for consistency of scale gradations are identified and grouped.

4. It is preferable to check scaling one scale at a time across tasks and then to check tasks for consistency of the annotations.

5. The reviewer checks for consistency of scaling.

   a. When an element has been assigned a scale value for a skill, the reviewer checks that it is always assigned the same scale value for the skill whenever it appears in a task (except when a task has elements that are assigned a still higher scale value for the skill).

   b. The reviewer checks that the same scale value has been assigned to comparable activities.

6. The reviewer refers to established benchmarks and develops new ones as they emerge from the scaling. He or she checks that benchmarks have been followed consistently. Where scale gradations are obvious, the reviewer checks that lower skill level activities are scaled appropriately lower than higher skill level activities.

7. When a new benchmark decision is made, the reviewer makes sure that this is consistently applied to all the tasks to which it is relevant, and that all the analysts are aware of the new decisions.

8. When there are inconsistencies, these are discussed with the analysts. The resource respondents, resource persons, or performers can be consulted to obtain additional information. Unresolved problems are settled by the staff member designated to make final decisions.

9. The reviewer makes sure that any final changes in scaling or annotation show up on the Skill Scale Sheets and on the annotation sheets. This is critical for later coding and curriculum work.

When the review has been accomplished, the skill scale data are ready for coding. Coding and data processing are discussed in Volume 3 of this report.

Figure 11. SKILL SCALING SHEET FOR TASK NO. 3

Task Name Conducting radiographic barium study of upper GI tract; non-pediatric patient. Task Code No. 3

Institution ______ Analysts ______

| Scale | 0 | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 | 4 | 4.5 | 5 | 5.5 | 6 | 6.5 | 7 | 7.5 | 8 | 8.5 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 Frequency | 0 | 1 | | 2 | | 3 | | 4 | | | | 6 | | 7 | | 8 | | 9 |
| 2 Locomotion | 0 | | 1.5 | | | | | | | 5 | | | | 7 | | | | 9 |
| 3 Object Manipulation | 0 | | 1.5 | | | | 3.5 | | | 5 | | | | | 7.5 | | | 9 |
| 4 Guiding or Steering | 0 | | 1.5 | | | 3 | | | | | 5.5 | | | 7 | | | | 9 |
| 5 Human Interaction | 0 | 1 | | | | 3 | | | | 5 | | | | 7 | | | | 9 |
| 6 Leadership | 0 | 1 | | | | 3 | | | 4.5 | | | | 6.5 | | | | 8.5 | |
| 7 Language: Oral Use | 0 | | | 2 | | | | 4 | | | | | | | 7.5 | | | 9 |
| Insert name(s) of language(s): English | | | | | | | | | | | | | | | | | | |
| 8 Language: Reading Use | 0 | | | 2 | | | | | | 5 | | | | 7 | | | | 9 |
| Insert name(s) of language(s): English | | | | | | | | | | | | | | | | | | |
| 9 Language: Written use | 0 | | | 2 | | | | | | 5 | | | 6.5 | | | | | 9 |
| Insert name(s) of language(s): English | | | | | | | | | | | | | | | | | | |
| 10 Decision: Methods | 0 | | 1.5 | | | 3 | | | 4.5 | | | | | 7 | | | | 9 |
| 11 Decision: Quality | 0 | | 1.5 | 2 | | | 3.5 | | | | 5.5 | | | 7 | | | | 9 |
| 12 GIS: Figural | 0 | 1 | | | | | 3.5 | | | 5 | | | | 7 | | | | 9 |
| 13 GIS: Symbolic | 0 | | 1.5 | | | | 3.5 | | | 5 | | | | 7 | | | | 9 |
| 14 GIS: Taxonomic | 0 | | | 2 | | | | | | | 5.5 | | | | | | | 9 |
| 15 GIS: Implicative | 0 | 1 | | 2 | | | | 4 | | 5 | | | | | | 8 | | 9 |
| 16 Error: Financial | 0 | 1 | | | | | | 4 | | | | 6 | | | 7.5 | | | 9 |
| Insert error: omitted from this example | | | | | | | | | | | | | | | | | | |
| 17 Error: Human | 0 | 1 | | 2 | | 3 | | | | | 5.5 | | | 7 | | 8 | | 9 |
| Insert error: omitted from this example | | | | | | | | | | | | | | | | | | |

Check here if this is a master sheet . . . (X)

Circle the pre-entered scale value chosen for each scale.

Figure. 12. SKILL SCALING SHEET FOR TASK NO. 182

Task Name Setting up and using suction machine to clear airway or assist with gastric lavage. Task Code No 182.

Institution ______________ Analysts ______________

| Scale | 0 | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 | 4 | 4.5 | 5 | 5.5 | 6 | 6.5 | 7 | 7.5 | 8 | 8.5 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 Frequency | 0 | 1 | | 2 | | 3 | | 4 | | | | 6 | | 7 | | 8 | | 9 |
| 2 Locomotion | 0 | | 1.5 | | | | | | | 5 | | | | 7 | | | | 9 |
| 3 Object Manipulation | 0 | | 1.5 | | | | 3.5 | | | 5 | | | | | 7.5 | | | 9 |
| 4 Guiding or Steering | 0 | | 1.5 | | | 3 | | | | | 5.5 | | | 7 | | | | 9 |
| 5 Human Interaction | 0 | 1 | | | | 3 | | | | 5 | | | | 7 | | | | 9 |
| 6 Leadership | 0 | 1 | | | | 3 | | | 4.5 | | | | 6.5 | | | | 8.5 | |
| 7 Language: Oral Use | 0 | | | 2 | | | | 4 | | | | | | | 7.5 | | | 9 |

Insert name(s) of language(s): English

| Scale | 0 | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 | 4 | 4.5 | 5 | 5.5 | 6 | 6.5 | 7 | 7.5 | 8 | 8.5 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 Language: Reading Use | 0 | | | 2 | | | | | | 5 | | | | 7 | | | | 9 |

Insert name(s) of language(s): English

| Scale | 0 | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 | 4 | 4.5 | 5 | 5.5 | 6 | 6.5 | 7 | 7.5 | 8 | 8.5 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 Language: Written use | 0 | | | 2 | | | | | | 5 | | | 6.5 | | | | | 9 |

Insert name(s) of language(s):

| Scale | 0 | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 | 4 | 4.5 | 5 | 5.5 | 6 | 6.5 | 7 | 7.5 | 8 | 8.5 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 Decision: Methods | 0 | | 1.5 | | | 3 | | | 4.5 | | | | | 7 | | | | 9 |
| 11 Decision: Quality | 0 | | 1.5 | 2 | | | 3.5 | | | | 5.5 | | | 7 | | | | 9 |
| 12 GIS: Figural | 0 | 1 | | | | | 3.5 | | | 5 | | | | 7 | | | | 9 |
| 13 GIS: Symbolic | 0 | | 1.5 | | | | 3.5 | | | 5 | | | | 7 | | | | 9 |
| 14 GIS: Taxonomic | 0 | | | 2 | | | | | | | 5.5 | | | 7 | | | | 9 |
| 15 GIS: Implicative | 0 | 1 | | 2 | | | | 4 | | 5 | | | | | | 8 | | 9 |
| 16 Error: Financial | 0 | 1 | | | | | | 4 | | | | 6 | | | 7.5 | | | 9 |

Insert error:

| Scale | 0 | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 | 4 | 4.5 | 5 | 5.5 | 6 | 6.5 | 7 | 7.5 | 8 | 8.5 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 Error: Human | 0 | 1 | | 2 | | 3 | | | | | 5.5 | | | 7 | | 8 | | 9 |

Insert error: Using poor technique for suctioning.

Check here if this is a master sheet . . . (X).

Circle the pre-entered scale value chosen for each scale.

Figure 13. SKILL SCALING SHEET FOR TASK NO. 363

Task Name Taking plain film radiographs of abdominal contents of non-infant patient. Task Code No 363

Institution ______ Analysts ______

| Scale | 0 | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 | 4 | 4.5 | 5 | 5.5 | 6 | 6.5 | 7 | 7.5 | 8 | 8.5 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 Frequency | 0 | 1 | | 2 | | 3 | | 4 | | | | 6 | | 7 | | 8 | | 9 |
| 2 Locomotion | 0 | | 1.5 | | | | | | | 5 | | | | 7 | | | | 9 |
| 3 Object Manipulation | 0 | | 1.5 | | | | 3.5 | | | 5 | | | | | 7.5 | | | 9 |
| 4 Guiding or Steering | 0 | | 1.5 | | | 3 | | | | | 5.5 | | | 7 | | | | 9 |
| 5 Human Interaction | 0 | 1 | | | | 3 | | | | 5 | | | | 7 | | | | 9 |
| 6 Leadership | 0 | 1 | | | | 3 | | | 4.5 | | | | 6.5 | | | | 8.5 | |
| 7 Language: Oral Use | 0 | | | 2 | | | | 4 | | | | | | | 7.5 | | | 9 |
| Insert name(s) of language(s): English | | | | | | | | | | | | | | | | | | |
| 8 Language: Reading Use | 0 | | | 2 | | | | | | 5 | | | | 7 | | | | 9 |
| Insert name(s) of language(s): English | | | | | | | | | | | | | | | | | | |
| 9 Language: Written use | 0 | | | 2 | | | | | | 5 | | | 6.5 | | | | | 9 |
| Insert name(s) of language(s): English | | | | | | | | | | | | | | | | | | |
| 10 Decision: Methods | 0 | | 1.5 | | | 3 | | | 4.5 | | | | | 7 | | | | 9 |
| 11 Decision: Quality | 0 | | 1.5 | 2 | | | 3.5 | | | | 5.5 | | | 7 | | | | 9 |
| 12 GIS: Figural | 0 | 1 | | | | | 3.5 | | | 5 | | | | 7 | | | | 9 |
| 13 GIS: Symbolic | 0 | | 1.5 | | | | 3.5 | | | 5 | | | | 7 | | | | 9 |
| 14 GIS: Taxonomic | 0 | | | 2 | | | | | | | 5.5 | | | 7 | | | | 9 |
| 15 GIS: Implicative | 0 | 1 | | 2 | | | | 4 | | 5 | | | | | | 8 | | 9 |
| 16 Error: Financial | 0 | 1 | | | | | | 4 | | | | 6 | | | 7.5 | | | 9 |
| Insert error: —— omitted from this example | | | | | | | | | | | | | | | | | | |
| 17 Error: Human | 0 | 1 | | 2 | | 3 | | | | | 5.5 | | | 7 | | 8 | | 9 |
| Insert error: —— omitted from this example | | | | | | | | | | | | | | | | | | |

Check here if this is a master sheet . . . (X)

Circle the pre-entered scale value chosen for each scale.

Figure 14. SKILL SCALING SHEET FOR TASK NO. 533

Task Name Checking automatic exposure termination of diagnostic radiography equipment Task Code No. 533

Institution ______ Analysts ______

Circle Appropriate Scale Value for Each Scale

| Scale | 0 | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 | 4 | 4.5 | 5 | 5.5 | 6 | 6.5 | 7 | 7.5 | 8 | 8.5 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 Frequency | 0 | 1 | | 2 | | 3 | | 4 | | | | 6 | | 7 | | 8 | | 9 |
| 2 Locomotion | 0 | | 1.5 | | | | | | | 5 | | | | 7 | | | | 9 |
| 3 Object Manipulation | 0 | | 1.5 | | | | 3.5 | | | 5 | | | | | 7.5 | | | 9 |
| 4 Guiding or Steering | 0 | | 1.5 | | | 3 | | | | | 5.5 | | | 7 | | | | 9 |
| 5 Human Interaction | 0 | 1 | | | | 3 | | | | 5 | | | | 7 | | | | 9 |
| 6 Leadership | 0 | 1 | | | | 3 | | | 4.5 | | | | 6.5 | | | | 8.5 | |
| 7 Language: Oral Use | 0 | | | 2 | | | | 4 | | | | | | | 7.5 | | | 9 |

Insert name(s) of language(s): English

| Scale | 0 | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 | 4 | 4.5 | 5 | 5.5 | 6 | 6.5 | 7 | 7.5 | 8 | 8.5 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 Language: Reading Use | 0 | | | 2 | | | | | | 5 | | | | 7 | | | | 9 |

Insert name(s) of language(s): English

| Scale | 0 | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 | 4 | 4.5 | 5 | 5.5 | 6 | 6.5 | 7 | 7.5 | 8 | 8.5 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 Language: Written use | 0 | | | 2 | | | | | | 5 | | | 6.5 | | | | | 9 |

Insert name(s) of language(s): English

| Scale | 0 | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 | 4 | 4.5 | 5 | 5.5 | 6 | 6.5 | 7 | 7.5 | 8 | 8.5 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 Decision: Methods | 0 | | 1.5 | | | 3 | | | 4.5 | | | | | 7 | | | | 9 |
| 11 Decision: Quality | 0 | | 1.5 | 2 | | | 3.5 | | | | 5.5 | | | 7 | | | | 9 |
| 12 GIS: Figural | 0 | 1 | | | | | 3.5 | | | 5 | | | | 7 | | | | 9 |
| 13 GIS: Symbolic | 0 | | 1.5 | | | | 3.5 | | | 5 | | | | 7 | | | | 9 |
| 14 GIS: Taxonomic | 0 | | | 2 | | | | | | | 5.5 | | | 7 | | | | 9 |
| 15 GIS: Implicative | 0 | 1 | | 2 | | | | 4 | | 5 | | | | | | 8 | | 9 |
| 16 Error: Financial | 0 | 1 | | | | | | 4 | | | | 6 | | | 7.5 | | | 9 |

Insert error: Damaging equipment during test by faulty handling.

| Scale | 0 | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 | 4 | 4.5 | 5 | 5.5 | 6 | 6.5 | 7 | 7.5 | 8 | 8.5 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 Error: Human | 0 | 1 | | 2 | | 3 | | | | | 5.5 | | | 7 | | 8 | | 9 |

Insert error: Drawing wrong conclusion about test results.

Check here if this is a master sheet . . . (X)

Circle the pre-entered scale value chosen for each scale.

Figure 15. SKILL SCALING SHEET FOR TASK NO. 566

Task Name Carrying out simulation and initial setup for external beam rad. therapy--lymph nodes--mantle, inverted-Y, any pt. Task Code No. 566

Institution ________ Analysts ________

| Scale | 0 | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 | 4 | 4.5 | 5 | 5.5 | 6 | 6.5 | 7 | 7.5 | 8 | 8.5 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 Frequency | 0 | 1 | | 2 | | 3 | | 4 | | | | 6 | | 7 | | 8 | | 9 |
| 2 Locomotion | 0 | | 1.5 | | | | | | | 5 | | | | 7 | | | | 9 |
| 3 Object Manipulation | 0 | | 1.5 | | | | 3.5 | | | 5 | | | | | 7.5 | | | 9 |
| 4 Guiding or Steering | 0 | | 1.5 | | | 3 | | | | | 5.5 | | | 7 | | | | 9 |
| 5 Human Interaction | 0 | 1 | | | | 3 | | | | 5 | | | | 7 | | | | 9 |
| 6 Leadership | 0 | 1 | | | | 3 | | | 4.5 | | | | 6.5 | | | | 8.5 | |
| 7 Language: Oral Use | 0 | | | 2 | | | | 4 | | | | | | | 7.5 | | | 9 |
| Insert name(s) of language(s): English | | | | | | | | | | | | | | | | | | |
| 8 Language: Reading Use | 0 | | | 2 | | | | | | 5 | | | | 7 | | | | 9 |
| Insert name(s) of language(s): English | | | | | | | | | | | | | | | | | | |
| 9 Language: Written use | 0 | | | 2 | | | | | | 5 | | | 6.5 | | | | | 9 |
| Insert name(s) of language(s): English | | | | | | | | | | | | | | | | | | |
| 10 Decision: Methods | 0 | | 1.5 | | | 3 | | | 4.5 | | | | | 7 | | | | 9 |
| 11 Decision: Quality | 0 | | 1.5 | 2 | | | 3.5 | | | | 5.5 | | | 7 | | | | 9 |
| 12 GIS: Figural | 0 | 1 | | | | | 3.5 | | | 5 | | | | 7 | | | | 9 |
| 13 GIS: Symbolic | 0 | | 1.5 | | | | 3.5 | | | 5 | | | | 7 | | | | 9 |
| 14 GIS: Taxonomic | 0 | | | 2 | | | | | | | 5.5 | | | 7 | | | | 9 |
| 15 GIS: Implicative | 0 | 1 | | 2 | | | | 4 | | 5 | | | | | | 8 | | 9 |
| 16 Error: Financial | 0 | 1 | | | | | | 4 | | | | 6 | | | 7.5 | | | 9 |
| Insert error: — omitted from this example | | | | | | | | | | | | | | | | | | |
| 17 Error: Human | 0 | 1 | | 2 | | 3 | | | | | 5.5 | | | 7 | | 8 | | 9 |
| Insert error: — omitted from this example | | | | | | | | | | | | | | | | | | |

Check here if this is a master sheet . . . (X)

Circle the pre-entered scale value chosen for each scale.

Figure 16.

TASK DESCRIPTION FOR TASK 182
ANNOTATED FOR SKILL SCALE VALUES

Code 182 P. 142

1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Patient and suction machine readied for suctioning; tracheal passageway ~~cleared~~ or machine turned on and off as ordered; patient cleansed and/or machine cleansed; matter removed shown to MD.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

MD's orders; patient's chart or check list; suction machine; antiseptic soap; water; tubing and sterile catheter(s) for suction machine; trap and drainage bottles; cup; gauze, saline solution; sheet; clock or watch

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Any patient to be treated with use of suction machine; physician; co-worker

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Setting up and using suction machine to clear airway or to assist with gastric lavage, by obtaining materials and machine, preparing patient, checking machine, turning machine on and off as ordered for gastric lavage, or inserting catheter into ~~tracheal~~ opening and clearing airway; cleaning up afterwards.

FIGURE 16. (continued)
TASK DESCRIPTION SHEET

Task Code No. 182

This is page 1 of 2 for this task.

| List Elements Fully |
|---|
| Performer uses suction machine for purposes such as gastric lavage (when MD inserts catheter) or with patient who has had a tracheostomy performed for the insertion of a tube for breathing. Performer uses suction machine as result of:<br><br>a. Verbal or written request of physician.<br>b. Own decision based on observation of patient's need.<br><br>1. Performer reads physician's orders on chart or check list, listens to verbal orders, or considers own decision.<br><br>2. Obtains necessary materials from storage area or checks that these are with machine. If obtained separately, performer places on table near patient or machine.<br><br>3. Performer wheels suction machine near patient or wheels patient to machine if stationary wall unit. (May check that machine is clean; may decide to clean or have cleaned). If not already done, plugs machine's cord into wall outlet.<br><br>Quality<br>4. Performer may explain to patient what will be done. May drape patient with sheet.<br><br>5. Performer checks machine by turning on suction and checking suction outlet with finger to feel suction. If machine is not functioning, decides to report; obtains another (portable) machine or wheels patient to another machine.<br><br>OK-RP; RR; RR |
| 6. Check here if this is a master sheet. (X) |

Reading use 2.0

guiding or steering with very ill patient: no jostling 3.0

Oral use of language 4.0

Decision making on methods

Task Code No. 182

This is page 2 of 2 for this task.

| List Elements Fully | List Elements Fully |
|---|---|
| 6. Attaches prepackaged tubing and catheter set to machine by connecting tubing to machine and catheter to tubing. | |
| 7. If gastric lavage, performer turns machine on and off at physician's orders after he or she has inserted catheter. Stands by during process. | |
| 8. If patient has had a tracheostomy and needs passage cleared, performer inserts the suctioning catheter with appropriate force to enter the tracheal opening. When inserted to appropriate level, performer turns on suction and attempts to clear mucus from the passageway. Turns off machine when done. | object manipulation 3.5<br>Implicative skills 1.0 |
| Performer may reassure or comfort patient during process; determines whether passage has been cleaned. | Human interaction 5.0<br>Decision making on quality 7.0 |
| If not, performer uses fresh catheter(s) and repeats suctioning until the airway is clear. | |
| 9. Performer may clean the area surrounding the tracheal opening with gauze and saline solution. | Decision making on methods 3.0 |
| 10. After use, performer discards the tubing and catheter(s). May place some of the matter removed from the patient in a cup, pouring it from the drainage bottle or glass, and may show to physician (if requested to do so). | Human Error: poor technique with suctioning: 2.0 |
| 11. Discards cup or matter in bottle; may decide to wash machine and bottles or have subordinate wash (using antiseptic soap and water). Returns machine or has it returned (if portable). | |
| 12. Records what was done and time on patient's chart or check list, or informs physician that task is completed. | |

Figure 17.

TASK DESCRIPTION FOR TASK 533
ANNOTATED FOR SKILL SCALE VALUES

Code 533. p. 1 of 2

1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Phototiming device checked for automatic exposure termination at constant density; test films measured for density; density control accuracy calculated and compared with given acceptable limits; decision made to refuse equipment, repair; test results recorded.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Requirements for diagnostic radiography phototiming equipment; manufacturer's specifications; cassettes; radiopaque markers; diagnostic radiography unit, controls; test descriptions, forms; pen, pencil; test phantoms; densitometer; out-of-order sign; phone

reading use of language

3. Is there a recipient, respondent or co-worker involved in the task? Yes...( X ) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Supervisor; radiologist; repair service personnel or installers

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Checking automatic exposure termination of diagnostic radiography equipment by making test exposures at constant density settings with different kVp's or different phantom thicknesses; using densitometer to measure density of exposed films; calculating accuracy; determining whether automatic timer needs replacement, repair; recording test results; arranging for repair.

TASK DESCRIPTION SHEET

Task Code No. 533



List Elements Fully

Performer checks the automatic exposure termination device of diagnostic x-ray equipment which has been newly installed, or checks current equipment periodically, as a result of:

a. Regular assignment.
b. Request.
c. Decision to do.

1. Performer determines reason for check and type of equipment. May proceed as follows:

   a. Performer notes whether test will be made for three kVp settings at a normal density control setting and mA range, or at a fixed kVp with three phantoms of different densities at the normal density control setting, depending on type of equipment. Checks manufacturer's specifications.

   b. Obtains appropriate phantom(s) and densitometer.

Decision on making quality (taking care throughout task) 7.0

Reading use of Language 5.0

2. Performer sets up for test:

   a. Obtains cassettes loaded with uniform type of test film (from same batch) and screen combinations.

      i) Identifies cassettes as appropriate for test using radiopaque markers.

      ii) Inserts first cassette in bucky tray of x-ray unit or spot film unit, or advances film as ap-

OK-RP;RR;RR

6. Check here if this is a master sheet. (X)

**List Elements Fully**

propriate (such as for automatic changer).

b. Places phantom (or first of three phantoms) on tabletop, and centers to film using appropriate optical system. Sets tube to appropriate target-to-film distance.

Figural 1.0

c. Sets technical factors as appropriate to type of automatic exposure termination system.

quality

i) Sets for automatic exposure mode and normal density setting.

ii) If appropriate sets test mA or first kVp setting.

3. Performer makes first exposure as appropriate and continues with test:

a. Removes cassette.

b. Inserts new cassette in tray and either sets kVp to a lower test position or places a second phantom on table. Makes exposure.

c. Removes cassette. Inserts a new cassette and either sets kVp to a higher test position or places a third phantom on table. Makes exposure.

d. Performer has exposed test films processed under standard conditions.

i) May personally check that standard processing conditions are met.

Decision Making on Methods 3.0

ii) Uses densitometer to measure density on exposed test films.

iii) May use control test film to subtract background density.

methods, quality

iv) Records measurements from densitometer.

4. Performer determines whether the densities of the three films are the same or within an acceptable range of each other. Refers to test standards.

quality

Figure 17. (continued)
TASK DESCRIPTION SHEET (continued)

Task Code No. 533

This is page 2 of 2 for this task.

| List Elements Fully |
|---|
| a. For new equipment, determines whether the unit should be refused or whether service staff should be required to make adjustments or replace phototiming unit. |
| b. For existing equipment, determines whether problem requires shut down of unit until adjustments or repairs are made. |
| c. Performer may discuss results of test with supervisor and/or radiologist in charge before determining what to do. May explain effect of problems and deviations from acceptable standards in terms of patient exposure, diagnostic reliability, legal requirements. |
| d. If performer decides that the test results indicate a major fault, performer informs repair service by calling in-house repair personnel or manufacturer's repair service. Indicates the results of the test and the unit involved. May place out-of-order sign on unit. |
| e. If not already done, performer marks test records with date; may record evaluation of results and what was done. Performer places records in appropriate location for filing. Returns test equipment to storage or has this done. |

Quality

Implicative 1.0

Human interaction 3.0

Oral use of Language 4.0

Implicative skills 1.0

Written use of Language 2.0

ERROR Financial damage to equipment 1.0

ERROR Human wrong conclusion results in retakes for patients 5.5

## CHAPTER 7

### USING THE HSMS KNOWLEDGE CLASSIFICATION SYSTEM AND KNOWLEDGE SCALE

In the HSMS method, knowledge identification and scaling is the assignment to a task of all the categories from the HSMS Knowledge Classification System that are required for performance of the task at a scale value above zero on the knowledge scale. The data are used for grouping tasks and designing job ladders and curricula.

This chapter covers the basic concepts underlying the HSMS Knowledge Classification System and the HSMS "knowledge scale" (Levels of Knowledge). It presents the rules for identifying the knowledge categories required in tasks and for applying the knowledge scale, and indicates how the user can expand the Knowledge Classification System to suit special needs.

This chapter and Chapter 8 do not contain the HSMS Knowledge Classification System and knowledge scale. They are presented in Chapters 2 and 3 of Volume 1 of this report, and must be studied in conjunction with this chapter. Chapter 8 of this volume deals with the knowledge identification and scaling procedures carried out by job analysts and the review procedures carried out by senior staff. The end of Chapter 8 contains examples of HSMS knowledge identification and scaling which parallel the skill scaling examples in Chapter 6. The examples can be used for training. Therefore, in order to rate tasks for required knowledge, the user must work with Chapters 2 and 3 of Volume 1, and Chapters 7 and 8 of this volume.

## CONCEPTS

The word "knowledge" can have many meanings. In the HSMS method it is used to mean detailed information, facts, concepts, and theories that are parts of specific disciplines or subject areas and information on how things function and/or how to use them.

"Knowledge scaling" implies that HSMS treats knowledge as information and theory that is transferable laterally from one job situation to another, and transferable vertically from one job level to another, i.e., that knowledge can be learned in incremental units and can be identified as requirements for task performance at varying levels. The process of knowledge scaling is similar to the scaling of tasks for skills.

## THE HSMS KNOWLEDGE CLASSIFICATION SYSTEM

### Outline Layout

In examining the Knowledge Classification System the reader will see that it is presented as an outline, that each category has an eight digit identification code, that some category names are accompanied by statements in parentheses, and that some category names are underlined and/or have number signs (#) on the left.

The subject categories which make up the HSMS Knowledge Classification System are arranged on their pages in a system of eight progressive levels of indentation (subdivisions) into which the component parts of subjects are divided. This provides a visual relationship of the parts to the whole. The numbers 1 through 8 which appear at the top of each page correspond to the eight degrees of indentation in the outline.

The first level of indentation in the outline represents subject categories at the broadest level of abstraction, such as "Natural Sciences," "Engineering and Technology," "Social Sciences," "Mathematics and Related Disciplines," "Humanities and the Arts," and "Miscellaneous Disciplines."

The next indentation for each of these categories represents major subdivisions of the broad subject category. For example, "Natural Sciences" is composed, at the next level of indentation, of "Biological sciences," "Chemistry," "Physics," "Geosciences," and "Astronomy and astrophysics." The next level of indentation shows a still finer breakdown of each category of the prior level of indentation, and so on.

The process of indentation has been carried out unevenly throughout the System due to time contraints, but it can be carried out up to eight different levels of indentation for any subject area. Asterisks are used to call attention to categories that clearly warrant further subdivision.[1]

Categories are placed and arranged in relevant contexts within the outline; however, each category appears in only one loca-

[1] See the section later in this chapter describing how the user can expand the outline for individual requirements.

tion in the System, even if it is appropriate in more than one part of the outline.

## The Code System

For the purpose of computer applications, each subject category has a unique 8-digit identification code which reflects its place in the outline. The code number appears on the left and identifies a knowledge category as a statistical variable (in the same way that the 16 skill scales each has a unique identification as a statistical variable). The broadest level of the outline has only one non-zero digit, which appears in the far left position. Each progressive indentation continues the prior levels' non-zero digits and adds a non-zero digit in the position corresponding to the category's respective level of indentation. The digit arrangements are represented in the example below:

| | |
|---|---|
| 10000000 | Natural Sciences |
| 11000000 | Biological Sciences |
| 11700000 | Zoology |
| 11730000 | Human Pathology |
| 11733000 | Pathology |
| 11733500 | Disorders of the nervous system and sense organs |
| 11733550 | Disorders of the organs of the special senses |
| 11733555 | Disorders of the ear |

## Broad and Fine Categories

Categories that appear in the System are of four types: some are underlined; some have a number sign (#) to the left; some are neither underlined nor have number signs; and some have both underlining and the number sign. We call categories that are underlined "broad-level categories," and categories with number signs (#) "fine-level categories."

Categories that have both underlining and number signs are subdivisions of still broader underlined categories and have themselves been further "broken out." Categories with neither underlining nor number signs are used in the outline to help the reader through the System; they are "signpost categories." Only those categories which have a number sign (#), and/or are underlined are used for identification purposes.

## Statements in Parentheses

"Parentheses statements" appear with category names to clarify meaning or assist the user. They are as follows:

1. Parentheses statements within a category name help pinpoint the exact content or contain synonyms for the name.

2. Parentheses statements after the category name sometimes explain the meaning of a category in layman's terms or express limiting conditions.

3. Parentheses statements beginning "Includes" or "Also includes" indicate some of the less obvious content covered by the category or the implied subdivisions in a category that has not been further "broken out." However, these statements may not be exhaustive, and the items may not be co-equal in level.

4. Parentheses statements beginning "Note that this category excludes" or "Excludes" indicate specific exclusions of subjects which one might assume to be covered by the category but which are found elsewhere in the System.

5. Parentheses statements beginning "For ____ see ____" specifically exclude subject matter and send the user to other parts of the System.

6. Parentheses statements beginning "See also" suggest additional categories in the System that may apply. These may not always be relevant and are not always exhaustive of other possibilities.

7. Parentheses statements which apply to all the subdivisions of a broad-level category generally appear only at the broad level and are usually not repeated for each of the subdivisions.

Table of Contents, Index and Special Section

The outline and the 8-digit system of arrangement provide the reader with a way to find and deal with relevant portions of the System. In addition, the Table of Contents, the Index and the Special Section help the user find his or her way through the Knowledge Classification System.

Chapter 3 in Volume 1 of this report contains the System with its own Table of Contents. The Table of Contents presents the entire Knowledge Classification System at the 1, 2, and 3-digit levels in outline form, with a page number listed for the beginning of each such category. Thus, the page number of the broad levels which apply to a task can easily be found, and the user can then focus in from that point.

Following the Knowledge Classification System in Volume 1 is an alphabetical Index which gives the 8-digit identification codes for category names and terms which appear in parentheses as part of "Includes" statements. Category names are shown with a comma between the name and the code number; terms found within "Includes" statements are shown with a slash (/) and the code number of the category containing the term. In some cases explanatory phrases are also included.

A Special Section is presented after the Index. It provides explanations to help clarify the meaning and content of selected categories or to pinpoint usages which may be peculiar to the HSMS System. In the Special Section, statements about categories are arranged in numerical order of their 8-digit codes. Within the System, categories represented in the Special Section appear with the letters "SS" to the right of the code number, indicating that the Special Section should be consulted:

## The Categories

In developing the HSMS Knowledge Classification System we attempted breakdowns that would provide the most transferability across work contexts. The selection and arrangement of categories represent choices of how to look at or "slice" broad subject areas, and represent the best judgment of consultants and/or HSMS staff. The divisions and subdivisions are not "correct" or "incorrect," but are alternative ways of seeing material.

The knowledge categories presented in the Knowledge Classification System do not represent all knowledge. The types of categories found in the Knowledge Classification System can be summarized as follows:

1. Each category represents an organized body of knowledge which can be utilized at varying degrees of detail or depth of understanding and can be required at varying levels in a variety of tasks or work situations.

2. Each subject category requires, even at lowest levels of use, a learning effort beyond every day experience or normal maturation. The learning effort may be formal or informal; but it must be conscious.

3. Each category potentially can be identified as a requirement for competent task performance.

The types of category <u>excluded</u> from the Knowledge Classification are summarized as follows:

1. No category is included which cannot be conceived of as ranging from low to high levels of content (i.e., which is not scalable).

2. No category is included which is merely procedural information without links to broader bodies of learning or covers procedures unique to an institution (orientation knowledge). These types of knowledge are either represented at particular scale values in other categories or are not scalable.

3. No category is included which merely covers the individual steps of work tasks.

4. No category is included which cannot be conceived of as applicable in a work situation. Therefore, some of the subjects studied in formal academic curricula may not appear.

The following points must also be understood:

1. The System is arranged so that each category in the System can be found in one and only one place in the outline. As a result, all tasks requiring a given knowledge category will be scaled on that common knowledge category.

2. Aggregative subjects such as City Planning or Community Health Education do not appear in the System. They would be located by the user by finding the individual component categories which combine to make up the discipline. Thus, aggregative disciplines are treated as the sum of their separate disciplines. Similarly, the mathematical components of various sciences appear under "Mathematics and Related Disciplines."

3. The language which appears as names or descriptions of subject categories is an attempt to cover terms used by professionals and non-professionals; these can differ, and the user may not always find language that represents his or her preferences.

4. The word "theory" appears as part of a category name if it is the way the discipline identifies itself. The user should be aware that such use of the word "theory" does not imply that the subject category only exists at high theoretical levels. Lower levels compatible with the knowledge scale are also present.

RULES AND GUIDELINES FOR KNOWLEDGE IDENTIFICATION

In knowledge identification the job analysts make judgments about the knowledge needed for task performance using the Knowledge Classification System as a common frame of reference for naming the required knowledge. The analyst goes through the Knowledge System to find what may be appropriate knowledge categories. In the process, the analyst also reads the statements in parentheses next to category names because many of them apply to all the categories which are subsumed under the category in which they appear.

The Table of Contents at the beginning of the Knowledge System helps the analyst find the broad subject areas that should be considered for a given task; the Index helps the analyst find the broader contexts for subject names which may be suggested by the performer; the Special Section statements within the System and the Index enable the analyst to understand technical terms or idiosyncratic language usage.

## Rules for Knowledge Identification

1. Only categories required for competent task performance should be identified. Optional knowledge which is desirable but not necessary for adequate task performance should not be identified.

2. Only categories which are underlined or have a number sign (#), or both, are identifiable.

3. Knowledge which is acquired during the course of task performance but is not needed beforehand in order to perform the task should not be identified.

4. Knowledge categories should not be confused with any of the skill scales.

5. Languages other than English that are required as an intrinsic part of the task should be identified; such languages are listed under "Linguistics and Languages" in the System.

6. Knowledge categories that are not scalable in the task above zero on the knowledge scale should not be identified.

## Guidelines for Using the System

1. When any broad-level (underlined) category is identified, all its subsumed, fine-level (#) categories should be reviewed for possible inclusion. Those that are required to carry out the task should be identified.

2. When any fine-level (#) category is identified, the broad-level (underlined) category under which it is found should be reviewed for possible inclusion. If the broad-level category is required in its own right (as a broad discipline), or if many of its fine-level categories are already identified, it should be identified.

3. Since the fine-level subdivisions of a category are often more than the sum of co-equal parts of the whole and sometimes represent more than one approach

to or "slice" of the category, each should be considered separately in relation to the task being studied.[2]

4. Analysts should make sure of the context in which inclusions within fine-level categories appear. Sometimes words can be misleading.[3]

5. The user should always check the parentheses statements for the broad-level categories which apply to the fine-level categories identified. Parentheses appear at relatively broad levels in the System when the statements they contain apply to all the categories they cover. When individual fine-level categories are being identified, the user should check back to the broad levels in the System to see if this is the case.

6. Wherever an "SS" mark appears with a category the user should read the appropriate entry in the Special Section.

7. Explanatory parentheses and "Includes" statements help determine whether a category is appropriate. "Excludes" statements in parentheses are a cue to consider whether the categories excluded are also required for the task. "See also" and "For ____ see ____" statements are a cue to consider whether additional categories are also required for the task, and direct the user to examine other categories. However, the cues are never exhaustive and are only guides.; the appropriateness of the cues should be assessed for each task.

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[2] For example, "Normal structure and function," under "Human zoology," covers 13 categories. Some categories name the various systems of the body and cover both physiology and anatomy, but two refer only to anatomy, and two refer to physiological processes. This represents a combination of three different "slices." The analyst must select the individual categories appropriate for a given task.

[3] For example, "Thermal properties" includes "heat transfer, head refraction, radiation, absorption." The term "radiation" in this context does not refer to electromagnetic radiation; it refers to thermal radiation. "Properties of lead," under "Properties of elements" has to do with the chemistry and physics of the element; the properties of lead in the sense of its use as a material appear under "Engineering and technology."

8. When an aggregative discipline is not found under its own name, the analyst must identify each of its separate parts as needed for a given task. The analyst may have to consider which categories together make up the aggregative discipline and then consider each one individually in relation to the task.

9. The Index can be used to check on the inclusion of specific topics or to find possible categories. However, the user should always check each category in its place in the System to perceive the way in which it is used. A given term may appear in more than one discipline with a different meaning in each. Such differences will not be evident unless the user sees the terms in its proper context in the System.

Language Categories

The analyst examines the Skill Scaling Sheet to see if a task is scaled above zero for Language Scales 7, 8, and/or 9. If so, the name(s) of the languages used will be entered. The following rules then apply:

1. If English is entered for Written Use of a Relevant Language (Scale 9), the analyst should consider identifying "Mechanics of writing-English (65620000). Identification of this category depends on whether the category is needed at a non-zero level on the knowledge scale. It should be not be automatically identified.

2. If any language besides English is entered for any of the three language scales, the analyst must determine the following:

   a. If the language (on any of the three scales) is used as an intrinsic part of the task, such as translating or teaching a language, the language is to be identified under "Languages (other than English)" in "Linguistics and language." The scale value will be determined by the nature of the task.

b. If the language is used only by virtue of the locale of the institution, such as speaking Spanish to Spanish-speaking clients, and not as part of the intrinsic nature of the task, the language is not identified. In a case where English is not the primary language, the user should consider creating a category such as "Mechanics of writing ___" for the System.

## EXPANDING THE KNOWLEDGE SYSTEM

The HSMS Knowledge Classification System was designed for use in evaluating tasks in any industry; and it may be usable for other purposes besides task analysis. With this in mind, and knowing that the categories presented are not all "broken out" to the same digit level of detail, HSMS suggests that the user expand the System to suit his or her individual needs.

Once the organizing principles of the System are understood, the user can take those categories which are relevant to an institution's needs and expand them to greater digit-level detail. The digiting system is self-evident. The principles and rules for use were presented earlier in this chapter. With the existing categories serving as points of departure, any broad-level category not already broken out to the 8-digit level can be subdivided by the user. The Index can also be expanded to accomodate the new entries.

To break current categories into finer subdivisions, the following should be borne in mind:

1. The categories to be "broken out" should not repeat content already found elsewhere in the System or names of categories already in the System.

2. Each new category must be able to be scaled for its use in tasks across the full range of the knowledge scale.

3. The new categories broken out under an existing category must not all be required for task performance at fixed combinations of scale values. In such a case there would be no point in having separate subdivisions -- unless they would each scale differently and independently for a given task and from task to task.

4. The terminology used should be identifiable in the situations in which it is planned to apply the System.

5. The subdivisions at a given digit level of detail should properly account for the broader-level category and be co-equal and exhaustive.

THE KNOWLEDGE SCALE

The HSMS method uses a scale for measuring the level at which tasks require knowledge categories. One scale is used for all the categories. The scale is similar in concept to the skill scales. Scale No. 18, "Levels of Knowledge," appears in Chapter 2 of Volume 1 of this report.

As with the skill scales, the knowledge scale has an overall statement of its content and an indication of what scaling principles are to be used to differentiate each of its various numerical levels. Each numerical scale value (which can range from 0.0 to 9.0) is accompanied by a statement (descriptor) which indicates the criteria warranting that descriptor's scale value. The descriptors use generic language, and can be used for any knowledge category.

There are two scaling principles for the knowledge scale: (1) breadth of knowledge, and (2) depth of understanding. Breadth of knowledge refers to the amount of detailed knowledge the performer must know about the category. This covers the varieties of information which are organized within the category, such as facts, terms, definitions, special procedures, and the use of specialized equipment. Depth of understanding, the second principle, refers to knowledge of the conceptual structure of the category named. The nature of the category determines the way depth of understanding is manifested.

For a task to be scaled above zero for a category the knowledge in the category must be consciously applied in the task and must require a learning effort sufficient to be included in a curriculum.[4]

Breadth of Knowledge: Amount of Detailed Knowledge

"Breadth of knowledge," the first principle, is expressed at three levels, rising from "a limited amount of detailed knowledge," to "a moderate amount of detailed knowledge," and then to "a very great amount of detailed knowledge."

The "amount of detailed knowledge" covers the raw materials which are organized into a discipline; i.e., the facts, terms, definitions, special procedures and specialized equipment of the subject which

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[4] "Consciously applied" means that the performer must be able to explain how the knowledge in the category is used in the task. However, this need not mean that the performer must think about the use of the knowledge each time the task is done. He may normally apply the knowledge automatically because of practice, but he must be able to articulate to the analyst how he uses the knowledge in the task.

can be known independently from the degree of knowledge about the structure or theory of the subject area. This first scaling principle is analagous to the quantity of knowledge known in a category.

The breadth of a category refers to everything covered by a category listed in the Knowledge Classification System. What constitutes the maximum amount of detailed knowledge will vary from one category to another depending on the nature of the category.

"A limited amount of detailed knowledge" at scale values 1.5 and 2.5 means that the task requires the performer to apply the meaning, definition, or use of several specific technical terms, facts, or ideas, or apply knowledge of some of the specialized equipment or procedures in a narrow area of the subject category. The "limited amount of detailed knowledge can be drawn from any or all parts of the category and its included topics so long as the term "limited" is interpreted to mean less than "a moderate amount."

"A moderate amount of detailed knowledge" at scale values 3.5, 5.5, and 8.0 means that substantially more than a limited amount must be known and must be applied. This can be in a specific subdivision or across a number of included topics. "A very great amount of detailed knowledge" at scale values 7.0 and 9.0 means that an impressive quantity of facts and information in the category must be applied by the performer in the task or in the sum of the specific instances of the task.

Depth of Understanding

"Depth of understanding," the second principle, is analagous to the quality of knowledge known in the category and refers to the degree of knowledge of the structure or theory of the subject area. This principle is also expressed at three levels. It rises from "general awareness" to "considerable degree of understanding," and then to "a very deep understanding."

"General awareness" at scale points 2.5 and 3.5 means that the task requires the performer to apply a grasp of what is covered by the knowledge category, its general uses, and the kinds of things it deals with. This means knowing something about a category's overall contents, approaches, and/or history.

"Considerable degree of understanding," at scale points 5.5 and 7.0 covers comprehension of the principles at work in the subject category or the ways in which the subject is applied. The task requires that the performer apply principles for using the material that the category covers, know when to use its various parts, be able to comprehend concepts related to how the subject area is structured, and apply any basic principles or theories (if these are present in the category).

"A very deep understanding" at scale points 8.0 and 9.0 is meant to convey the highest degree of comprehension of the intellectual structure of the subject category and its applications. This refers to theory in many academic categories, but in areas such as first aid or materials, very deep understanding must be understood within the context of the particular category's individual intellectual structure. The task must require the performer to apply an advanced level of comprehension of the category and all that it deals with, to utilize expert knowledge of how the category's ideas are interrelated, and to apply information about the major developments in the field.

Scale Values

At 1.5 on the scale only the lowest level of the first principle, breadth of knowledge, is present. The second principle, depth of understanding, is not yet involved. Since "general awareness" cannot occur without some "limited amount of detailed knowledge," it is not found separately on the scale and appears at 2.5 on the scale combined with "a limited amount of detailed knowledge."

At 3.5 on the scale "general awareness" is combined with an increase of detailed knowledge to "a moderate amount." This scale value is applicable when a task requires the performer to know many facts or procedures but not to use them in a conceptual framework.

"A considerable degree of understanding" does not coexist with "a limited amount of detailed knowledge." It takes more details than "a limited amount" to understand a subject to "a considerable degree." The difference between 5.5 and 7.0 on the scale is in the amount of detailed knowledge involved. Both cover "a considerable degree of understanding," but these two points are not in a simple linear relationship on the scale. One may know much about the structure or theory of a subject area without necessarily knowing "a very great amount of detailed knowledge." To convey a higher level of comprehension than 5.5 with "a moderate amount of knowledge," the scaler must go from 5.5 to 8.0. At 7.0 there is only an increase in the amount of details known.

Similarly, scale points 8.0 and 9.0 both involve "a very deep understanding," but 9.0 does not represent deeper understanding than 8.0. Scale value 9.0 represents more detailed knowledge than does 8.0. When a task requires "a very great amount of detailed knowledge," the scale level to convey a deeper understanding than at 7.0 is scale value 9.0, and not 8.0.

In using the knowledge scale one should avoid being biased by the nature of the category. Some categories are clearly theoretical in nature. It is easy to choose 8.0 or 9.0 when depth of theoretical understanding is involved. However, 8.0 or 9.0 can also be involved in "Bandages, dressings, tourniquets and splints," which has its own intellectual structure and set of concepts.

Knowledge scaling implicitly takes account of prior educational requirements, whether formally or informally attained. It should be borne in mind that, in order to learn and therefore apply theory, the performer must have been exposed to its content; practical activity by itself does not transmit theoretical formulations. Therefore, the user should realize that scale values above 3.5 imply that prior preparation for the task involves exposure to concepts and/or theory. Unless the task requires the performer to use the conceptual ~~or~~ theoretical formulations of the category, scale values below 5.5 are appropriate.

To scale above 3.5, the task must require a conscious grasp of concepts or theory. For example, planning a lecture may require that a performer think about some types of content presentation (42300000); but unless the task requires the application of (knowing) the theory of content presentation, the task would not scale above "general awareness."

# CHAPTER 8

## KNOWLEDGE IDENTIFICATION AND SCALING PROCEDURES

The HSMS method specifies procedures for identifying the knowledge categories required for task performance and scaling them for the level at which they are needed. As with skill scaling, there are also procedures for annotating the task descriptions as a check on the knowledge identification and scaling and in preparation for curriculum design.

This chapter is a procedural manual for knowledge identification and scaling similar to Chapter 6 for skill scaling. It is addressed to job analysts and to senior staff who review the knowledge identification and scaling and/or carry out curriculum design. The chapter covers preparation for knowledge identification and scaling, annotation of task descriptions, establishment of benchmarks, identification procedures, interviews, final preparation of data, and review of knowledge identification, scaling, and annotations.

Knowledge identification (ID) and scaling takes place after skill scaling. The analysts use the second set of "annotation sheets" prepared earlier (see Chapter 6) which contain the approved final versions of the task descriptions. The analysts work with the HSMS Knowledge Classification System (which appears in Chapter 3 of Volume 1 of this report), the Levels of Knowledge Scale (which appears in Chapter 2 of Volume 1), the Skill Scale Sheets for the tasks (for reference to languages), this chapter and the preceding chapter, and any relevant notes.

## PREPARATION

### The Knowledge Identification Sheet

Figure 18 is a blank copy of an HSMS Knowledge Identification Sheet. The analysts use this form to record the knowledge categories and scale values for each task. A separate Sheet is filled out for each task to be scaled, and additional pages are used as needed.

At the top is space for the abbreviated task name, the Task Code No., the name of the institution, the names of the analysts on the team, and the Sheet's page number, "page _ of _ for this task." When a sheet is considered to be in final form and ready for review, it is checked on the last line, making it a "master sheet" for the given task.

The HSMS Knowledge Identification Sheet is divided into three columns. The widest column, on the far left, provides space for the abbreviated knowledge category name. This is usually the words listed just before any parentheses statement as the category appears in the Knowledge System. Next to this is a column for the 8-digit code for the category. This need not be filled in until the Sheet is in final form. At that time it must be filled in accurately because the categories enter the computer solely by their 8-digit designations. The column on the far right is for the scale value assigned to the category for the given task.

Figure 18. HSMS KNOWLEDGE IDENTIFICATION SHEET

| | | | |
|---|---|---|---|
| Task Name ______ | | Task Code No. ______ | |
| Institution ______ | | Analysts ______ page __ of __ for this task. | |

For every category chosen: remember to examine whether, if you have chosen a broad-level category, any of the related finer-level break-outs apply; whether, if you have chosen a fine-level break-out, the related broad level category applies.

| Abbreviated Knowledge Classification System Name | Knowledge System 8-digit ID | Scale Value |
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## Special Training

Unlike the case of skill scaling, when early training and practice in the use of the scales is sufficient to prepare the job analysts, one-time training in use of the Knowledge Classification System and scale is not sufficient. Correct use of the Knowledge Classification System depends a great deal on the analyst's awareness of what is covered by categories and on his familiarity with what is likely to be involved in the tasks to be evaluated. The Knowledge System and the world of work are so vast, that training must be done afresh for each new functional area studied.

Analysts who have some familiarity with a functional area and the context and details of individual task descriptions are more apt to recognize the need for some categories and the obvious inappropriateness of others. For example, an analyst who knows that venereal disease is considered to be an epidemic problem would be aware that knowledge of "Epidemiology" might be involved in some examination tasks. Analysts who are familiar with the issues in diagnostic radiology and understand categories such as "Radiobiology" and "Interaction with radiation" would be skeptical about identification of a category such as "Genetics" for radiologic technologist tasks.

Without prior study of the Knowledge System, analysts can misinterpret the meaning of categories and can improperly identify or miss categories. For example, when "Manipulation" is found under "Surgery" it does not mean moving parts of the body. It refers to the movement of a joint beyond its active limit of motion. "Surgery" includes categories required by patient care aides, technicians, and registered nurses, as well as by surgeons. For example, "Introductory procedures," found under "Surgery," includes injections and irrigations as well as more specialized procedures.

After reviewing all the categories in the System, an analyst develops a "feel" for which areas might apply and the sections where appropriate categories may be found.

Before embarking on knowledge identification for any given functional-area, each analyst should:

1. Review the relevant literature for the area, especially glossary-type information dealing with the language, technology, and concepts of the field.

2. Review the task descriptions and notes to consider the likely knowledge involved.

3. Review the Knowledge Classification System itself:

   a. Look for those categories that may be needed and make note of them.

   b. Look up the meaning of category names that are unclear. Consult reference books, glossaries, encyclopedias, and/or specialists in the field (such as the resource respondents).

   c. Become familiar with parentheses statements and Special Section explanations for possible categories. Consult relevant sources to make sure of the context of possible categories.

## Practice Training

After becoming familiar with the content of this and the prior chapter, analysts should practice with approved task descriptions and knowledge ID data. The task language associated with knowledge categories and the scale values which have been applied and approved serve as benchmarks. As with skill scaling, the HSMS curriculum objectives in Chapter 9 of Research Report No. 9 are a rich source of practice materials.[1] The curriculum objectives present excerpts from HSMS task descriptions in which the applications of knowledge categories are manifested at the scale values indicated.

Figures 19 through 22, presented at the end of this chapter, provide examples of knowledge ID and scaling. The figures are offered as benchmarks and as training aids. These filled-in Knowledge Identification Sheets show the categories and scale values assigned to four of the task examples presented in Chapter 4 of this volume. They correspond to Figures 5 through 8, respectively.

Figures 23 and 24 are examples of how the task descriptions are cut in half, mounted, and annotated for their knowledge categories and scale values. The figures are presented at the end of this chapter.

To use the material as a practice exercise, the new analyst would read the task descriptions in Figures 5 through 8 and would attempt to identify the categories, scale them, and annotate the tasks. The data could be recorded on copies of Figure 18. Figures 19 through 24 could then be used to check accuracy, i.e., to see if there is agreement with HSMS knowledge identification and scaling.

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[1] Op. cit.

RULES FOR IDENTIFYING AND SCALING TASKS FOR KNOWLEDGE

Knowledge Identification Rules

Each task description or summary is separately evaluated for the categories required in competent task performance. The following should be borne in mind by the analyst and the reviewer:

1. Each of the elements of the task, including all contingencies and instances of the task, are part of the task for purposes of knowledge ID and scaling. Thus, with normative tasks that include desiderata, the task may include elements not currently being carried out by the performer who was originally interviewed. The analyst must identify all the knowledge required in the task for all its instances, contingencies, and elements. If a category is ever needed, it must be identified.

2. For a category to be identified it must have a referent in the language of the task description which indicates how the knowledge is used in the task. The referent may be a contingency or emergency that appears rarely, or may relate to the special things used, or the particular recipients, respondents, or co-workers of the task.

3. For a category to be identified it must be required for competent performance (rather than be an option for superior performance or be knowledge acquired in the course of carrying out the task, or be knowledge learned in the classroom that is not applied in the task).

4. For a category to be identified it must be required at a level above the zero-condition on the Levels of Knowledge Scale.

5. For a category to be identified it must appear in the Knowledge Classification System as an underlined broad-level category or as a number-signed (#) fine-level category.

6. Whenever a category is selected the user must consider its related broad-level category or all its fine-level subdivisions. This rule does not mean

that the user must identify the broad- or fine-level categories involved; it only means that they must be considered.

## Knowledge Identification Guidelines

1. When deciding on the knowledge categories required for the task, the user should be sure to avoid confusing or combining tasks:

   a. Activities not included in the task description should not be assumed to be in the task.

   b. Procedures that are always delegated to others during the task should not be included for knowledge ID considerations.

   c. Steps leading up to the task or following the task that are actually parts of other tasks should be excluded from consideration for knowledge identification.

2. The user should consider whether additional categories have been suggested by the ones already tentatively identified.

3. The user should not automatically assume that categories mentioned in "excludes," "see also," and "for ____ see" statements are relevant.

4. The user should consider whether the context of a category is appropriate for a given task.

5. The user should not confuse the knowledge needed in task performance with the task's skill requirements.

6. The user should not be influenced by the job in which the task is found, other tasks of the performer, or the performer's level of education when judging the categories needed for a task.

   a. Tasks in higher-level jobs do not necessarily all require academic subject matter.

   b. Tasks in lower-level jobs do not necessarily exclude the need for academic subject matter.

7. To ensure consistency and comparability of knowledge identification, users may refer to benchmark guidelines provided in this manual or established in-house to compare task requirements.

8. Users may utilize knowledge identification data for model tasks as guidelines for use with related task summaries. They must consider the elements in the model that do not appear in a given summary task and elements unique to the given summary task.

9. Categories are not properly identified unless the user indicates how each is manifested in the task by proper task annotation.

10. In making annotations, the user must indicate the specific task element(s) or instance(s) of the task. Citing the whole task is not acceptable. When the language of the task does not make sufficiently clear how a category is applied in the task, the user should add brief explanatory information.

11. If several elements in a task draw on the same knowledge category, all should be indicated on the annotation sheets, especially if they refer to different areas of the subject matter covered by the category.

Knowledge Scaling Rules

Knowledge scaling is the assignment of a scale value to each knowledge category that has been identified for a task. The same scale is used for all knowledge categories. The scale value is chosen to reflect the highest level on the knowledge scale at which the category is required for competent performance of the task. The following should be borne in mind:

1. All the annotated portions of the task description that relate to a given knowledge category are considered for scaling purposes.

2. The analyst must consider each of the two scaling principles for knowledge; the increments along the scale, and the necessary minimum condition before a category can be rated above zero on the scale.

3. In determining the depth or "degree of understanding" for scaling, the analyst scales for the <u>highest</u> level required by any element or instance of the task. When annotated portions of the task de-

scription refer to contingencies or several instances of the task; the contingencies or instances that require the greatest degree of understanding are considered for purposes of scaling.

4. In determining the "amount of detailed knowledge" for scaling, the analyst scales for the sum of the detailed knowledge needed in all the elements and instances of the task that require the category.

5. The task is scaled for knowledge assuming competent performance of the task (rather than common, current, or superior performance).

Knowledge Scaling Guidelines

1. The scale descriptors have content meanings that were assigned numerical values with a special statistical technique. Therefore, <u>the scale values may not be extrapolated</u>. Only the ones shown on the scale may be used. The scale values are not to be used as pure quantity symbols; the content of the descriptor for a given scale value must apply to the category's use in the task.

2. The scale value for a category needed for competent performance in the task should be judged independently from the value of the same category in another task done in the same job title, or with the value of other categories in the same task.

   a. Categories which are subdivisions of a broad category might not be required for the task at equal scale values. Each category must be scaled in terms of its own use in the task.

   b. In a given task, a broad-level (underlined) category can scale higher than any of its fine-level (#) subdivisions if the amount of detailed knowledge called for in the category as a whole must be greater than the depth of understanding of any of its individual parts.

   c. In a given task, a broad-level (underlined) category can scale lower than any of its fine-level (#) subdivisions if the amount of detailed knowledge called for in the category as a whole is relatively low, while the amount of detailed knowledge called for in any of the subdivisions is relatively higher.

3. The scale value for a category is not determined by how central or essential the category is in the performance of the task, or how central the element for which it is needed is within the task as a whole.

4. The scale value for a category is not determined by the level of education required for the job, or attained by individual performers of the task, or a performer's personal level of comprehension of the category, or his articulateness.

5. The scale value for a category is not determined by the scale values required for the skills involved in applying the category in the task.

6. The scale value for a category is not determined by the extent of the performer's awareness of his use of the knowledge in the task. That is, the performer may have made the knowledge so much a part of his functioning that it is automatically applied. The scale value is determined by the use of the knowledge, not by the self-conscious use of the knowledge.

7. Scalers are expected to use their own judgment of the appropriate scale value to use and not their idea of what the performer's judgment would be.

8. To ensure consistency and comparability of scaling, scalers may refer to benchmark guidelines provided in this manual or established in-house to compare the scaling for categories.

9. Scalers may utilize the knowledge scaling for model tasks as guidelines for the knowledge scaling of task summaries. They must differentiate among categories identified for the model that are appropriate for the summary task, those not required for the summary task, and those categories that are unique to the given summary task.

10. In making annotations the scaler must indicate the specific task element(s) or instance(s) to which the scale value applies. If several elements draw on the category at the scale value, all should be given the value on the annotation sheets.

## SPECIAL PROBLEMS AND BENCHMARKS

The following are benchmarks developed and followed by HSMS to handle special issues which arose during knowledge identification and scaling.

### Diagnosis and Evaluation

In tasks which involve evaluation of a patient's condition, either through examination or in reading and interpreting diagnostic information, the analyst is faced with the choice of identifying knowledge categories that relate solely to the area of the body and pathology directly involved, or seeing the patient holistically, and identifying other systems, parts of the body, and pathologies that might be interrelated. Performers themselves disagree about what is appropriate. HSMS endorses the holistic approach, and, therefore, scales all possible relevant subject categories. Some are included at relatively low scale values in comparison with the scale values assigned to the obvious specialty category. In all cases each category must be justified by an indication of how it is used in the task.

### Transmitting Information and Acquired Knowledge

When a given task requires the performer to acquire and transmit information to subordinates or co-workers, such as presenting a report, the information acquired is not a requirement for task performance; it is a byproduct of that task or a prior task. The task that involves transmission of such information should be scaled for the transmission, and not for the specific content of what is transmitted.

When the nature of the task requires the performer to constantly acquire new knowledge or information, such acquired knowledge is not a requirement in terms of the HSMS phrase: "skills and knowledge required in the task." The latter are skills and knowledges which the performer must have in order to be given the task to do, rather than knowledge gained in the act of carrying out the task. For example, in recommending equipment for use in a diagnostic radiology department, the performer must periodically become familiar with the equipment available for particular kinds of radiographic examinations. In this and the earlier example, the knowledge needed to carry out the task would include the knowledge needed to carry out the broad primary activities in the subject area, and not the specific knowledge transmitted or acquired.

Alternative Procedures From Other Specialties

In tasks such as radiologists' "consultation tasks," the performer considers requested and alternative diagnostic procedures, makes recommendations, and issues a requisition. Recommendations can include procedures outside the performer's specialty, such as in ultrasound and nuclear medicine. Such knowledge areas outside the specialty should be identified when applicable, even if the specific alternatives are not identified in the task description. These categories would be scaled for the degree of knowledge needed to consider the alternative procedures in these areas. This rule also applies to reading and interpreting diagnostic information when the performer must evaluate information from procedures done in other specialty departments.

## Teaching Tasks

HSMS generally separates teaching tasks according to the subject matter involved. Different tasks reflect whether the teaching is done in lecture form, in a case study format, or in the form of clinical instruction or supervision. The following knowledge scaling guidelines are used by HSMS:

1. If a clinical teaching task involves demonstrating tasks and/or intervening during students' clinical performance of tasks, the teaching task must reflect the knowledge categories and scale values needed for the performance of all the tasks which might be taught in the clinical situation by the performer. Therefore, knowledge scaling for such tasks should be carried out after all the tasks to be taught have been scaled for knowledge. There would be at least as many knowledge categories as the sum of all those involved, and scale values at least as high. The analyst then adds any knowledge required for the teaching aspects of the task.

2. Broad-level categories are more likely to be required at higher levels for teaching than for carrying out the tasks being taught.

3. When the content of a teaching task is broadly stated, such as patient care, general radiology, etc., the following is recommended:

   a. Identify the tasks of the subordinates that are to be covered by the performer's teaching task unless the teaching is purely theoretical. (In the latter case the knowledge categories will be fairly easy to identify.)

   b. Identify the fine-level categories that the performer would have to teach the subordinates. The performer's task may not require all the categories in the subordinates' tasks, but each should be considered.

   c. Identify the broad-level categories that the performer would have to know in order to teach the fine-level categories identified.

d. Identify all ~~the~~ categories that the performer would have to know in order to meet the teaching objectives of the institution, provided there is a referent in the task description language.

e. Identify all ~~the~~ categories that the performer would have to know in order to plan the lessons, make the presentation, and test, grade, and evaluate students, <u>if these latter elements are in the task</u>.

f. Scale each category identified for items (b) and (c), above, at least as high as the level required in the subordinates' tasks. The level should reflect a comprehension of the subject that is high enough for teaching. This probably means greater depth, but may also involve greater breadth of knowledge. Higher values may not be needed for all categories. The analyst should evaluate each separately.

## Meetings

Tasks that involve attendance and participation at a staff meeting or conference should be scaled for the knowledge required for the performer to contribute to the particular kind of meeting involved. If the task relates to the performer's work at the institution, the knowledge identified should include the categories needed to cover the other tasks of the performer whose contents are likely to be discussed. HSMS usually identifies broad-level categories and those fine-level categories that would be topics for discussion or would be drawn on in arriving at conclusions or policy, depending on the nature of the task or specialty.

## Answering Patients' Questions

When the performer is expected to handle patients' questions about home care, the task must be scaled to reflect the knowledge and scale values of the performer's job level. For example, a technician answers questions that draw on technician-level training, but is expected to contact someone more qualified to handle questions and problems that require more advanced knowledge. HSMS identifies broad-level categories required in the technician's other relevant tasks and those fine-level categories which are needed to answer questions ~~that might~~ be asked frequently and which require detailed ~~answers~~.

## HSMS Benchmark Knowledge Identifications and Scale Values

1. "Pharmacology" and drug categories are required only when something must be understood about drugs. This is not the case when the performer takes inventories. Preparing injection doses requires 1.5 for "Pharmacology" (12300000). Explaining side effects and/or allergy tests requires 1.5 for "Drug toxicity" (12331000) and for "Drug idiosyncrasy ~~and allergy~~ pharmacogenetics" (12332000).

2. ~~Being able to~~ consider dangers, such as the safety of x-ray equipment in the presence of various types of anesthetics, requires 1.5 for the category involved, in this case "Anesthesiology" (11736000).

3. If the performer must deal with patients who have or who may have terminal illnesses, the HSMS desiderata call for "Death and dying behavioral development" (41666700); the scale value can vary.

4. "Algebra" (51200000) is required at 1.5 for making extrapolations, using ratio equations, or simple formulas.

5. "Descriptive statistics" (52220000) is required at 1.5 for using log and semi-log paper or calculating averages.

6. "Mechanics of writing English" is required at 1.5 if grammar, punctuation and spelling must be used correctly; at 2.5, sentence construction and syntax must be used correctly as well; at 3.5, correct paragraph construction and/or structuring reports and letters are added requirements.

PRELIMINARY PROCEDURES

Preliminary knowledge identification, scaling, and task annotation are essential parts of the knowledge identification and scaling period. Without an initial attempt by the analysts to consider the content of tasks and to apply the Knowledge System and scale to the given set of tasks, analysts would flounder in the subsequent knowledge identification interviews. Preliminary knowledge ID and scaling allows the analysts to establish benchmarks and to prepare questions to use in interviews with the performer.

Establishing Benchmarks

Knowledge identification must be applied consistently as well as correctly. For this reason it is appropriate and helpful to have staff conferences to establish benchmarks and a common point of view on knowledge identification and scaling (similar to those for skill scaling). There should be a shared approach on the part of each team of analysts, the senior staff who will review the work, and the director. There should also be agreement on which staff member is to make the final decisions in cases of unresolved knowledge identification and scaling disagreements.

This chapter, the curriculum objectives in Research Report No. 8, Volume 2, and Figures 19 through 24 at the end of this chapter offer some of the benchmark decisions made and used by HSMS. The user's staff can also develop their own benchmarks as follows:

1. Arrange and deal with the tasks in the same groupings used for the task description work. Identify

common language and agree on the knowledge categories and scale values for these sections of the tasks.

2. For any given group of tasks, select a model if one has not yet been selected. Identify knowledge and scale the model task completely; confer on the selections and use the task as a model for others in the group. Then note the differences between the model and the tasks similar to the model.

3. Develop a list of knowledge categories that are the central "core" categories for similar tasks, such as radiologic technologist examination tasks or radiation therapy technologist treatment tasks. Identify differences among groups, such as tasks in which the performer has responsibility to decide what to do, is in close contact with the patient, has to be aware of the patient's condition, or has to consider the use of contrast media. Assign scale values to categories under the varying conditions and use these as benchmarks. Treat differences in the type of recipient, respondent, or coworker similarly; for example, differences for "infant" and "non-infant" patients using "Growth and development" in procedure tasks.

4. Identify tasks that require a given knowledge category at obviously different levels; establish scale values for these and use the criteria as benchmarks.

5. Attempt to find task language that illustrates each category and scale value descriptor and use these as benchmarks.

6. As the work progresses and specific problems arise, have periodic conferences that arrive at conclusions. Record the decisions and use these as additional benchmarks.

Preliminary Knowledge Identification, Scaling and Annotations

1. It is most efficient to have the analysts work with tasks for which they have been responsible during task description and skill scaling.

2. The analysts work independently with their notes, the task descriptions on annotation sheets, the HSMS Knowledge Classification System, the knowledge scale, completed Skill Scaling Sheets, the rules in Chapter 7 and in this chapter, and benchmarks.

3. The analysts fill out the information called for at the top of the Knowledge Identification Sheets for each task. Several sheets may be needed for some high-level tasks. Even if a task requires no knowledge category, it is represented by a Knowledge Identification Sheet marked "No knowledge." Having such a sheet avoids the possibility that the loss of a Sheet with categories will not be noted and will be misconstrued to mean that no knowledge is required for the given task.

4. The analysts identify knowledge categories, scale the categories, and annotate the task descriptions following the rules presented in Chapter 7 and in this chapter. In addition:

   a. The analysts annotate all the task elements that call for a knowledge category; all those that require the category at the scale value selected for the task show the scale value.

   b. A given element in a task may require more than one category. This is expected, and is not a problem. The analysts annotate the element for as many knowledge categories as are represented.

5. The team of analysts compare their knowledge identifications and scale values, resolve differences of opinion, and/or decide on the questions that must be raised with the performer. They initiate staff conferences to resolve issues of substance and to establish benchmarks.

6. The analysts prepare questions for the performer which can help them to assess the appropriateness of all the categories tentatively identified and scaled and any not already covered.

   a. If the analysts are unclear about the knowledge requirements for a task and cannot come up with a tentative list of identifications, they plan initial questions to focus on which of the broadest-level categories are at all relevant; they then zero in from there.

   b. In scaling, at least one question per category is planned. Each of the descriptors on the scale can be used to create questions. The analysts can work up and down the scale until one descriptor fits.

## GENERAL PROCEDURES

### Knowledge Identification Steps

This section applies to preliminary knowledge identification, editing, team conferences, and final preparation of data. In all cases analysts work with one task at a time, and identify all the categories needed for the task. As a check, once all the tasks have been dealt with, analysts can work with one category at a time across tasks to make sure that the category has been included for all tasks in which it is required.

1. The analyst reads the task description or summary for the task to be considered.

2. The analyst makes a list of all the categories that might be required for the task, applying the rules for knowledge identification and the guidelines.

3. The analyst considers languages and "Mechanics of writing English," as described in Chapter 7.

4. The analyst considers all the elements or instances of the task that call for the given knowledge category, since the sum of these determines the "breadth of knowledge" involved for scaling purposes. The analyst then marks these sections off on the task's annotation sheets.

5. The analyst enters the knowledge category names and code numbers on the Knowledge Identification Sheet, preferably in numerical order. (Knowledge category names are entered prior to knowledge scaling.)

6. Even if a task requires no knowledge categories, the analyst fills out a Knowledge Identification Sheet indicating "No knowledge" on the first line.

Knowledge Scaling Steps

This section applies to preliminary scaling, editing, team conferences, and final preparation of data. In all cases analysts may choose to scale one knowledge category at a time, but it is preferable to scale knowledge for one task at a time and then, as a check, review the scaling by categories.

1. The scaler refers to the knowledge category names entered on the Knowledge Identification Sheet(s) for the task, one at a time.

   a. The scaler must keep in mind the content of the given knowledge category, since the scale value depends on judgments regarding the task's requirements in terms of the depth and breadth of the content covered by the category.

   b. The scaler takes account of the category name, the content of the fine-level categories subsumed under the given category (or what would be intended were the subdivisions to be made), the category's explanatory parentheses, "includes" statements, notes in the Index and the Special Section, and statements attached to broad-level categories under which it is listed. The scaler excludes subject matter specifically mentioned in "excludes," "for ___ see ___," and "see also" statements, or in similar statements attached to the broader-level categories under which the category is listed. These suggest both the scope and the limits of the category content.

   c. The scaler determines what "depth of understanding" refers to in the particular category and what would be rated as "very deep understanding," "a considerable degree," and "general awareness" within the framework of the category's content.

   d. The scaler determines what "detailed knowledge" is covered by the category.

2. The scaler reads the annotated task description or summary for the task to be considered and finds all the elements that require a given knowledge category,

and applies the knowledge scaling rules and guidelines as described.

a. The scaler compares the amount of detailed knowledge covered by all the annotated task elements with the category's total coverage.

b. The scaler compares the greatest depth of understanding required by any of the annotated task's elements with the deepest possible understanding of the category's content.

c. If the non-zero condition is not met, the category is removed from the Knowledge Identification Sheet.

d. The scaler decides which combination of levels of the two scaling principles applies, finds the highest descriptor on the knowledge scale which most aptly represents this combination as it is required in the task, and assigns that value. The scale value is entered on the Knowledge Identification Sheet on the line containing the category name.

3. The scaler selects the element(s) that represent the scale value assigned to the task and enters this scale value next to all these elements on the annotation sheets. Thus, the total breadth of detailed knowledge required for each category now has a series of annotated referents, with only those reflecting the deepest level of understanding assigned the scale value.

KNOWLEDGE INTERVIEWS, EDITING AND REVIEW

Knowledge Interviews

Preliminary knowledge identification and scaling is not a substitute for knowledge interviews with the performer. Preliminary identification can only produce tentative identifications and a set of questions for the performer. In the interviews with the performer, categories not yet considered may be uncovered, and tentative categories are confirmed or discarded.

The first knowledge interview reestablishes ground rules with the performer and clarifies what is required. Analysts proceed with one group of tasks at a time, and, within groups, one task at a time. Initially, the interviews deal with knowledge identification, but it is helpful to obtain scaling information at the same time, while the performer is focused on the content of a task and the meaning of a category. Analysts should use their own experience and their sense of the characteristics of given performers to determine efficient ordering of the interviews.

After ground rules for the performer and the analysts are reestablished, the analysts must be sure that the following points are understood by the performer:

1. The analysts want to know what subject matter must be learned and used by the performer in order to carry out tasks.

2. The analysts want to focus on the subject matter needed for individual task activities rather than for the job as a whole, or for the purpose of taking an examination, such as for licensure.

3. The analysts want to know how the performer describes the subject matter he or she must know, and will also be asking about technical terms; the analysts will be asking for help in comparing or relating the performer's terms with the terms that the analyst must work with in the Knowledge Classification System.

The analysts must be sure that the performer is clear about the activities and all the instances covered by the task that is being discussed. This aspect of the work is the same as that for skill scaling.

Once the task is in focus, the spokesman leads with a question which allows the performer to express himself fully about what he or she needs to know to perform the task. The initial question should not be as broad as "What do you need to know?" since this wording can evoke a list of task steps. The initial question might be framed as follows:

1. If you were asked to name the topics or subjects that you have to draw on to do the work we just described, what would you name?

2. What subjects would someone have to learn and use in order to do this work? Could you list the subjects?

3. Forgetting what you already know or knew that might be more than you need for the work activity we just described, what would you put on a list of topics a person must know and use in order to do this particular work activity?

4. An example can be used, such as:

   If I were a tax accountant, and I had an activity in which I had to decide on a client's deductions, I might have to know something about tax law and something about accounting. Of course, I would also have to get information from the client, but I wouldn't need to have learned that before I could do the task. Tell us what you had to learn before you could do the work we are talking about.

It is hoped that the performer will recount a list of kinds of knowledge. Some of the list will be usable and appropriate, and other parts will be steps of the task, procedural detail, overly broad categories, orientation-type knowledge, or the names of courses of study. These should be copied down, however, because some can be used as points of departure for leading the performer into providing more usable and detailed information. The list is not complete until the answer to the question "Anything else?" draws no further replies.

The performer's initial answers can be used as a point of departure:

1. Some of the performer's answers may be the names of Knowledge System broad-level categories. When this is the case, the performer should be asked: "You say you had to study ____. Would you say everything in the field, or special parts of it?" If the answer is "Everything in the field," the performer should be asked to give an idea of what the field covers. If the answer is "Parts of it," the performer should be asked to specify which ones.

2. If the performer mentions whole tasks or procedures, the analysts should try to break the task up and ask which subject(s) cover each step.

The spokesman should mention individual variations of the task, of elements of the task, and ask the performer to identify the knowledge needed for each. This may uncover knowledge that might otherwise be overlooked.

If the analysts determine from the performer's responses that no Knowledge System categories are needed (i.e., the task requires only skills and procedural information), the analysts should move on to the next task.

If the performer's responses indicate very different types of categories than those to be found in the System, the analysts must make sure that they have complete notes for later use in translating the responses into Knowledge System categories.

At some point in the questioning, the analysts must ask the performer to explain how the knowledge is used in the task. This is a primary check on whether the knowledge is appropriately identified in terms of the conditions set by the HSMS method, and/or is required at a scalable level. If the performer's language is different from that used in the System, such questioning helps to suggest Knowledge System categories. In addition, with complex tasks, the analyst can ask:

> I'm not clear about how that is really needed in this particular activity. I can see it for ___ (activity); can you explain how you use the knowledge in this case, or what you use it for?

To check on whether knowledge is orientation knowledge or is needed at too low a level to be on the scale, the analyst might ask whether, having done the task, the performer could apply the knowledge mentioned to something else. For example, when "Asepsis" is mentioned:

> Would what you know about keeping these things sterile be usable for doing something else?

The analysts should attempt to have the questions focus on one issue at a time. Questioning about the categories which were tentatively identified during preliminary knowledge identification should be held off until the performer has had a chance to express his or her own ideas on the knowledge categories needed.

The points below cover the early questioning and questions about categories tentatively identified:

1. The performer should be questioned further if there is any doubt about whether knowledge mentioned is optional rather than actually required for the task to be performed. The analyst might indicate that he realizes that the performer has the knowledge, but would like to know if anyone doing the task must use that knowledge. Alternative questions might be, "Must anyone doing this (task) know that (subject)?" "Do you have to know that; or is it just that you happen to know that?"

It might be helpful to ask if the same task carried out in a lower-level job title requires the same knowledge.

2. A performer may actually use knowledge of some detailed information in a subject category without being aware of the category context. Remember that at 1.5 on the scale there is no general awareness of the intellectual structure of the subject. The analyst must be aware when terms, equipment, and procedures are part of the detailed information in a category area. For example, if the analyst thinks that "Asepsis" is involved, he or she can ask, "You have to make sure not to let those materials be contaminated by touching other things. What would it mean if that happened?" If the answer is something like, "They wouldn't be sterile," the analyst could ask, "Do you have to know about conditions of things being sterile? Is that something you had to learn about?"

3. Performers will vary in articulateness and in educational experience, formal or otherwise. It is appropriate to ask a performer what he means by a subject designation and to ask him if something he has named refers to what the analyst thinks it is, such as a category in the System.

4. Performers may take for granted knowledge which comes automatically to them or knowledge which they acquired in informal ways. Asking about the way the performer learned to do the task may help to evoke overlooked knowledge. In cases where the performer mentions the syllabus of a course, this may not be appropriate for identification. The analyst should redirect the performer with questions such as, "Yes, but do you need all that for this specific work activity? Which parts in particular? How do you use that in this (task)?"

5. Probe questions should be used to distinguish between required skills and required knowledge of subject matter.

6. The performer's language may touch on categories covered in parentheses statements in one of the System's category names. For example, "I must know spelling," means that "Mechanics of writing English" is involved; "I must know how to advise families on money management," may mean that "Consumer economics" is involved. Since the analyst may not always be able to make the association during the interview, he should be sure that he has adequate notes for use in post-interview editing.

After the team has fully questioned the performer about his initial responses, the spokesman and the other analysts should turn to their lists of prepared questions related to tentatively identified Knowledge System categories.

The analysts can and should focus on and even quote the annotated portions of the task descriptions which have been tentatively associated with categories. This helps bring into consideration aspects of the task that might not be carried out by the performer but which must be scaled. The performer should be asked, "If you were to do this, what subjects would you have to know and use?"

When the analysts question the performer about tentatively identified knowledge categories, they must make sure that the performer is aware of what the categories cover. The following approaches may be used:

1. The analyst may be utilizing language found in the System itself while doing the questioning. He can sometimes ask the performer directly, "Do you need to know any ____?" naming an actual category, and should probe to see how the category is used. This serves as a check on whether the performer has the correct idea of what the category name means and whether it is really required for the task.

2. If the performer does not know what the System category name means, the analyst should explain as well as he can what is meant by the name, using language appropriate to the performer's background.

3. The analyst can name a broad category under which a troublesome name is included if the broad category has a self-evident name, such as "Physics." The analyst might say, "We have divided Physics into several parts. They are: [reads the co-equal categories at the next finer level]. Do you sense how we have divided it?" [If yes], "Do you use or need any of these for this task?" [If one of these includes the troublesome category], "We divide [category] into: [reads the categories subsumed under the troublesome one]. Do you see the basis for this breakdown of parts?" [If yes], "Which of these do you use or need?"

4. If the performer cannot understand or agree with the System category subdivisions, the analyst should ask him for his breakdown, write this down, and ask him which of his own categories are needed in the task. The performer should be encouraged to explain what he means by his categories.

5. Performers who are articulate, interested in the Knowledge Classification System, and able to handle it conceptually, can be shown the Knowledge System, told how it is arranged, and be asked about particular areas. The performer then sees the categories in context. This approach should not be used if the performer is likely to be overwhelmed by the experience or so ego-involved that he or she turns the focus of the interview towards a revision of the Knowledge Classification System.

In scaling the categories, the analysts focus on the content of the category, the amount of detailed knowledge, and the depth of understanding required.

1. The spokesman begins the questioning about any given category by naming it and explaining its meaning or checking with the performer on his comprehension of what the category covers. In some cases it will be necessary to pinpoint the particular aspect of the category being referred to. The spokesman makes

sure that the meaning of the category is clear to the performer before going on.

2. It is important to question the performer about the depth and breadth of the category that is needed when the use of the knowledge has become automatic for the performer. It is appropriate to ask the performer to explain how the knowledge category is put to use in the task.

3. Even if the analyst is fairly certain of a scale point selection before the interview, he should attempt to question to verify his or her judgment and be open to changing his decision as a result of the questioning.

Interviewing continues until all the tasks have been scaled for all the knowledge categories identified, as follows:

1. Interviews after the initial knowledge scaling interview should open with remaining questions about categories in tasks already covered so that data sheets can be completed and set aside.

2. Editing takes place between interview sessions so that the analysts can prepare remaining questions and make final decisions.

3. Interviews continue until all the categories have been examined for each task and the analysts have no further questions on the scale values.

Editing

The notes taken in any given interview result in a series of knowledge category identifications, a listing of "performer language" categories that must be translated into Knowledge System categories, and scaling information. During the editing period after each knowledge interview the analysts refine their list of identified categories for tasks, make judgments on scale values, and prepare questions.

The following should be borne in mind when finding Knowledge System counterparts for performer language:

1. If a phrase actually describes a skill, no counterpart category is needed.

2. If a phrase is covered by the content of a broad-level category, the category is identified only if the phrase would permit scaling the category above zero on the knowledge scale. If not, the fine-level categories should be considered.

3. If the analyst is convinced that a category represents optional knowledge, it should not be converted to a Knowledge System category.

4. The analyst should check to be sure that a Knowledge System category properly translates the meaning of the performer's language.

5. When the knowledge category chosen contains parentheses elaborations, these should be followed through to find additional categories, as described earlier.

6. The analyst notes which knowledge categories are still tentative and ~~which performer~~ language is still untranslated, and frames appropriate questions.

The analysts then attempt to scale all categories that have been confirmed in the interview and prepare questions to confirm scaling or clarify ambiguities.

Team Decisions On Knowledge

The purpose of team knowledge identification and scaling is to reach the most valid, reliable, accurate, and consistent decisions about the knowledge required for tasks. The procedures are similar to those for skill scaling:

1. Each analyst independently prepares a set of Knowledge Identification Sheets and annotation sheets,

using interview notes, benchmark decisions, and interim copies of the Knowledge ID Sheets.

2. The team deals with one group of related tasks at a time, one task at a time. It is most convenient to deal with category names in the order of their 8-digit identification codes. In that way related categories can be discussed in relation to one another, and later checking is simplified.

3. One of the analysts is assigned to fill out the master copy of the Knowledge Identification Sheets for tasks as they are covered. The Sheets are appropriately paged and checked as "master sheets." They include the abbreviated name of each category in the left-hand column, each category's 8-digit identification code, the scale values, and task identification information at the top.

4. The analysts on a team compare their results and resolve any differences. Unresolved differences are carried to the staff member assigned to making final determinations.

5. The master Knowledge Identification Sheets for each task are reviewed to see that inappropriate categories have been eliminated, that names and code numbers are correct and match, that each category is scaled with values that appear on the knowledge scale, and that the annotation sheets reflect each category and scale value.

6. The master Knowledge Identification Sheets are stapled to the task's annotation sheets. These are then turned over to the staff who will do the review.

## Review Procedures

The review of the knowledge identification and scaling can include a stage in which teams of analysts review each other's work. The review may also be carried out by one or more senior staff members. HSMS uses both review procedures. The steps in knowledge data review are as follows:

1. Each task is checked for completeness of knowledge information and annotation as described earlier. This includes a check on each of the following:

   a. There is a Knowledge Identification Sheet for each task, even if no knowledge has been identified for some tasks.

   b. All the Knowledge Identification Sheets for a task are present and numbered correctly.

   c. Only permissible underlined or number-signed (#) categories have been identified.

   d. The category names are correct; the 8-digit code numbers are correct and match the category names.

   e. Each category has a scale value above zero, and the scale value appears on the knowledge scale.

   f. The annotations for categories and scale values are complete.

2. The reviewer groups the tasks as discussed earlier; similar tasks are grouped with their models; tasks to be compared for consistency of scale gradations are identified and grouped.

3. The reviewer checks knowledge identification and scaling one category at a time across tasks, and then checks tasks for consistency of annotations and scaling.

4. The reviewer refers to established benchmarks, develops new ones as they emerge from the review, and checks that these have been followed consistently.

5. The reviewer checks that the categories and scale values have been applied consistently, and that the same categories and values have been assigned to comparable activities. Where category scale gradations are obvious, the reviewer checks that lower-level activities are scaled appropriately lower than higher-level activities.

6. The reviewer checks that, when an element has been assigned a category and scale value, it is always assigned that category and value whenever it appears in a task.

7. Where there are inconsistencies, these are discussed with the analysts. The resource respondents, resource persons, or performers can be consulted to obtain additional information. Unresolved problems are settled by the staff member designated to make final decisions.

8. When a new benchmark decision is made, the reviewer makes sure that it is consistently applied to all the tasks to which it is relevant and that all the analysts are informed.

9. The reviewer makes sure that any final changes in categories identified, scaling, or annotations show up on the Knowledge Identification Sheets and on the annotation sheets. This is critical for later coding and curriculum work.

When the review has been accomplished, the knowledge data are ready for coding. Coding and data processing are discussed in Volume 3 of this report.

Figure 19. HSMS KNOWLEDGE IDENTIFICATION SHEET FOR TASK NO. 182.

Task Name Setting up and using suction machine to clear airway or assist with gastric lavage Task Code No. 182
Analysts
Institution page 1 of 1 for this task.

For every category chosen: remember to examine whether, if you have chosen a broad-level category, any of the related finer-level break-outs apply; whether, if you have chosen a fine-level break-out, the related broad level category applies.

| Abbreviated Knowledge Classification System Name | Knowledge System 8-digit ID | Scale Value |
|---|---|---|
| Introductory procedures | 11735400 | 1.5 |
| Mechanics of writing English | 65620000 | 1.5 |
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Figure 20. HSMS KNOWLEDGE IDENTIFICATION SHEET FOR TASK NO. 363

Task Name Taking plain film radiographs of abdominal contents of non-infant patient. Task Code No. 363
Analysts
Institution page 1 of 2 for this task.

For every category chosen: remember to examine whether, if you have chosen a broad-level category, any of the related finer-level break-outs apply; whether, if you have chosen a fine-level break-out, the related broad level category applies.

| Abbreviated Knowledge Classification System Name | Knowledge System 8-digit ID | Scale Value |
|---|---|---|
| Normal structure and function | 11731000 | 2.5 |
| Regional anatomy | 11731100 | 3.5 |
| Topographic anatomy | 11731200 | 3.5 |
| Digestive system | 11731600 | 1.5 |
| Urinary system | 11731700 | 1.5 |
| Musculoskeletal system | 11731800 | 2.5 |
| Bones and joints | 11731820 | 2.5 |
| Neoplasms | 11733200 | 1.5 |
| Disorders of the circulatory system | 11733600 | 1.5 |
| Disorders of the digestive system | 11733700 | 1.5 |
| Disorders of the respiratory system | 11733800 | 1.5 |
| Disorders of the urinary system | 11733900 | 1.5 |
| Disorders of the musculoskeletal system | 11734200 | 1.5 |
| Shock and trauma | 11734800 | 2.5 |
| First aid and care | 11737000 | 2.5 |
| Handling and transportation of the sick or wounded | 11737300 | 5.5 |
| Sprains, strains, fractures and their healing | 11737400 | 1.5 |
| Wounds and their healing | 11737700 | 1.5 |
| Asepsis | 11738000 | 2.5 |
| Radiobiology | 12210000 | 3.5 |
| Diagnostic radiography | 12223000 | 5.5 |

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Figure 20. HSMS KNOWLEDGE IDENTIFICATION SHEET (continued)

Task Name Taking plain film radiographs of abdominal contents of non-infant patient Task Code No. 363
Analysts
Institution page 2 of 2 for this task.

For every category chosen: remember to examine whether, if you have chosen a broad-level category, any of the related finer-level break-outs apply; whether, if you have chosen a fine-level break-out, the related broad level category applies.

| Abbreviated Knowledge Classification System Name | Knowledge System 8-digit ID | Scale Value |
|---|---|---|
| Drugs acting on the central nervous system | 12342830 | 1.5 |
| Interaction with radiation | 15222500 | 1.5 |
| Death and dying behavioral development | 41666700 | 1.5 |
| Mechanics of writing English | 65620000 | 2.5 |
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Figure 21. HSMS KNOWLEDGE IDENTIFICATION SHEET FOR ~~TASK~~ NO. 533.

Task Name Checking automatic exposure termination of diagnostic radiography equipment Task Code No.: 533

Analysts ____________

Institution ____________ page 1 of 1 for this task.

For every category chosen: remember to examine whether, if you have chosen a broad-level category, any of the related finer-level break-outs apply, and whether, if you have chosen a fine-level break-out, the related broad level category applies.

| Abbreviated Knowledge Classification System Name | Knowledge System 8-digit ID | Scale Value |
|---|---|---|
| Radio biology | 12210000 | 2.5 |
| Diagnostic radiography | 12223000 | 3.5 |
| Interaction with radiation | 15222500 | 1.5 |
| Mechanics of writing English | 65620000 | 1.5 |
| | | |

Check here if this is a master sheet (X)

Figure 22. HSMS KNOWLEDGE IDENTIFICATION SHEET FOR TASK NO. 566

Task Name: Carrying out simulation and initial set-up for external beam radiation therapy-lymph nodes-mantle, inverted Y; any patient. Task Code No. 566
Analysts: 
Institution: page 1 of 2 for this task.

For every category chosen: remember to examine whether, if you have chosen a broad-level category, any of the related finer-level break-outs apply; and/or if you have chosen a fine-level break-out, the related broad level category applies.

| Abbreviated Knowledge Classification System Name | Knowledge System 8-digit ID | Scale Value |
|---|---|---|
| Normal structure and function | 11731000 | 2.5 |
| Regional anatomy | 11731100 | 5.5 |
| Topographic anatomy | 11731200 | 5.5 |
| Circulatory system | 11731400 | 2.5 |
| Musculoskeletal system | 11731800 | 2.5 |
| Bones and joints | 11731820 | 2.5 |
| Neoplasms | 11733200 | 3.5 |
| Disorders of the circulatory system | 11733600 | 1.5 |
| Shock and trauma | 11734800 | 2.5 |
| Surgery | 11735000 | 1.5 |
| Operative procedures | 11735100 | 1.5 |
| Introductory procedures | 11735400 | 1.5 |
| First aid and care | 11737000 | 3.5 |
| Bandages, dressings, tourniquets and splints | 11737100 | 1.5 |
| Hemorrhage and bleeding and their arrest | 11737200 | 1.5 |
| Handling and transportation of the sick or wounded | 11737300 | 5.5 |
| Asepsis | 11738000 | 2.5 |
| Radiobiology | 12210000 | 5.5 |
| Radiotherapy | 12220000 | 5.5 |
| Radionuclide therapy | 12222000 | 4.5 |
| Diagnostic radiography | 12223000 | 3.5 |

Check here if this is a master sheet. ( )

Figure 22. HSMS KNOWLEDGE IDENTIFICATION SHEET (continued)

Task Name Carrying out simulation and initial set up for external beam radiation therapy - lymph nodes - mantle - inverted Y patient. Task Code No. 566

Analysts ____________

Institution ____________ page 2 of 2 for this task.

For every category chosen: remember to examine whether, if you have chosen a broad-level category, any of the related finer-level break-outs apply; whether, if you have chosen a fine-level break-out, the related broad level category applies.

| Abbreviated Knowledge Classification System Name | Knowledge System 8-digit ID | Scale Value |
|---|---|---|
| Pharmacology | 12300000 | 1.5 |
| Cancer and virus chemotherapy | 12341300 | 1.5 |
| Interaction with radiation | 15222500 | 2.5 |
| Death and dying behavioral development | 41666700 | 1.5 |
| Mechanics of writing English | 65620000 | 2.5 |

Check here if this is a master sheet (X)

Figure 23. TASK DESCRIPTION FOR TASK 182
ANNOTATED FOR KNOWLEDGE AND SCALE VALUES

Task Code No. 182

This is page 1 of 2 for this task.

1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Patient and suction machine readied for suctioning; tracheal passageway cleared or machine turned on and off as ordered; patient cleansed and/or machine cleansed; matter removed shown to MD.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

MD's orders; patient's chart or check list; suction machine; antiseptic soap, water; tubing and sterile catheter(s) for suction machine; trap and drainage bottles; cup; gauze, saline solution; sheet; clock or watch

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If yes to Q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant conditions; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Any patient to be treated with use of suction machine; physician; co-worker

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Setting up and using suction machine to clear airway or to assist with gastric lavage, by obtaining materials and machine, preparing patient, checking machine, turning machine on and off as ordered for gastric lavage, or inserting catheter into tracheal opening and clearing airway; cleaning up afterwards.

Figure 23. TASK DESCRIPTION SHEET (continued)

Task Code No. 182



| List Elements Fully |
|---|
| Performer uses suction machine for purposes such as gastric lavage (when MD inserts catheter) or with patient who has had a tracheostomy performed for the insertion of a tube for breathing. Performer uses suction machine as result of:<br><br>a. Verbal or written request of physician.<br>b. Own decision based on observation of patient's need.<br><br>1. Performer reads physician's orders on chart or check list, listens to verbal orders, or considers own decision.<br><br>2. Obtains necessary materials from storage area or checks that these are with machine. If obtained separately, performer places on table near patient or machine.<br><br>3. Performer wheels suction machine near patient or wheels patient to machine if stationary wall unit. (May check that machine is clean; may decide to clean or have cleaned). If not already done, plugs machine's cord into wall outlet.<br><br>4. Performer may explain to patient what will be done. May drape patient with sheet.<br><br>5. Performer checks machine by turning on suction and checking suction outlet with finger to feel suction. If machine is not functioning, decides to report; obtains another (portable) machine or wheels patient to another machine.<br>OK-RP; RR; RR |
| 6. Check here if this is a master sheet. (X) |

Figure 23. TASK DESCRIPTION SHEET (continued)

Task Code No. 182

This is page 2 of 2 for this task.

| List Elements Fully | List Elements Fully |
|---|---|
| 6. Attaches prepackaged tubing and catheter set to machine by connecting tubing to machine and catheter to tubing. | |
| 7. If gastric lavage, performer turns machine on and off at physician's orders after he or she has inserted catheter. Stands by during process. | |
| 8. If patient has had a tracheostomy and needs passage cleared, performer inserts the suctioning catheter with appropriate force to enter the tracheal opening. When inserted to appropriate level, performer turns on suction and attempts to clear mucus from the passageway. Turns off machine when done: | Introductory procedures 1.5 |
| Performer may reassure or comfort patient during process; determines whether passage has been cleaned. | |
| If not, performer uses fresh catheter(s) and repeats suctioning until the airway is clear. | |
| 9. Performer may clean the area surrounding the tracheal opening with gauze and saline solution. | |
| 10. After use, performer discards the tubing and catheter(s). May place some of the matter removed from the patient in a cup, pouring it from the drainage bottle or glass, and may show to physician (if requested to do so). | |
| 11. Discards cup or matter in bottle; may decide to wash machine and bottles or have subordinate wash (using antiseptic soap and water). Returns machine or has it returned (if portable). | |
| 12. Records what was done and time on patient's chart or check list, or informs physician that task is completed. | Mechanics of writing English 1.5 |

Figure 24. TASK DESCRIPTION SHEET FOR TASK 533
ANNOTATED FOR KNOWLEDGE AND SCALE VALUES

Task Code No. 533

1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

Phototiming device checked for automatic exposure termination at constant density; test films measured for density; density control accuracy calculated and compared with given acceptable limits; decision made to refuse equipment, repair; test results recorded.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

Requirements for diagnostic radiography phototiming equipment; manufacturer's specifications; cassettes; radiopaque markers; diagnostic radiography unit, controls; test descriptions, forms; pen, pencil; test phantoms; densitometer; ~~out-of-order sign~~; phone

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

Supervisor; radiologist; repair service personnel or installers

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

Checking automatic exposure termination of diagnostic radiography equipment by making test exposures at constant density settings with different kVp's or different phantom thicknesses; using densitometer to measure density of exposed films; calculating accuracy; determining whether automatic timer needs replacement, repair; recording test results; arranging for repair.

Figure 24. TASK DESCRIPTION SHEET (continued)

Task Code No. 533

This is page 1 of 2 for this task.

**List Elements Fully**

Performer checks the automatic exposure termination device of diagnostic x-ray equipment which has been newly installed, or checks current equipment periodically, as a result of:

a. Regular assignment.
b. Request.
c. Decision to do.

1. Performer determines reason for check and type of equipment. May proceed as follows:

   a. Performer notes whether test will be made for three kVp settings at a normal density control setting and mA range, or at a fixed kVp with three phantoms of different densities at the normal density control setting, depending on type of equipment. Checks manufacturer's specifications.

   b. Obtains appropriate phantom(s) and densitometer.

2. Performer sets up for test.

   a. Obtains cassettes loaded with uniform type of test film (from same batch) and screen combinations.

      i) Identifies cassettes as appropriate for test using radiopaque markers.

      ii) Inserts first cassette in bucky tray of x-ray unit or spot film unit, or advances film as ap-

Interaction with radiations

Diagnostic radiography 2.5

OK-RP; RR; RR

6. Check here if this is a master sheet. (X)

Figure 24. TASK DESCRIPTION SHEET (continued)

Task Code No. 533

This is page 2 of 2 for this task.

List Elements Fully

propriate (such as for automatic changer).

b. Places phantom (or first of three phantoms) on tabletop, and centers to film using appropriate optical system. Sets tube to appropriate target-to-film distance.

c. Sets technical factors as appropriate to type of automatic exposure termination system.

i) Sets for automatic exposure mode and normal density setting.

ii) If appropriate sets test mA or first kVp setting.

Diagnostic radiography 3.5

3. Performer makes first exposure as appropriate and continues with test:

a. Removes cassette.

b. Inserts new cassette in tray and either sets kVp to a lower test position or places a second phantom on table. Makes exposure.

c. Removes cassette. Inserts a new cassette and either sets kVp to a higher test position or places a third phantom on table. Makes exposure.

d. Performer has exposed test films processed under standard conditions.

i) May personally check that standard processing conditions are met.

ii) Uses densitometer to measure density on exposed test films.

iii) May use control test film to subtract background density.

iv) Records measurements from densitometer.

Diagnostic radiography 3.5

Interaction with radiation 1.5

4. Performer determines whether the densities of the three films are the same or within an acceptable range of each other. Refers to test standards.

diagnostic radiography 2.5

Figure 24. TASK DESCRIPTION SHEET (continued)

Task Code No. 539

This is page 2 of 2 for this task.

| List Elements Fully |
|---|
| a. For new equipment, determines whether the unit should be refused or whether service staff should be required to make adjustments or replace phototiming unit.<br>b. For existing equipment, determines whether problem requires shut down of unit until adjustments or repairs are made.<br>c. Performer may discuss results of test with supervisor and/or radiologist in charge before determining what to do. May explain effect of problems and deviations from acceptable standards in terms of patient exposure, diagnostic reliability, legal requirements.<br>d. If performer decides that the test results indicate a major fault, performer informs repair service by calling in-house repair personnel or manufacturer's repair service. Indicates the results of the test and the unit involved. May place out-of-order sign on unit.<br>e. If not already done, performer marks test records with date; may record evaluation of results and what was done. Performer places records in appropriate location for filing. Returns test equipment to storage or has this done. |

Radiobiology 1.5

Radiobiology 2.5

Interaction with radiation 1.5

mechanics of English writing 1.5

CHAPTER 9

# JOB ANALYSIS FIELD TECHNIQUES *

The purpose of the interviews and observations with the "performer" is to collect accurate and relevant information about the work activities he or she carries out. Therefore, the ability to relate to performers and other analysts is at the heart of an analyst's functioning. Since the analyst depends on the performer for much information, the quality of the work is partly determined by the extent to which an open, frank, and honest interchange can take place, free of defensiveness, evasiveness, or reticence. To achieve this, the analyst needs to clearly understand the procedures involved and also needs skills to encourage cooperation and to help the performer provide the information required. This chapter deals with such human interaction skills. It is addressed directly to the analyst, and includes a code of behavior, interview techniques, and comments on role-playing and field practice.

## A CODE OF BEHAVIOR FOR JOB ANALYSTS

Before beginning work as a job analyst, it is wise to consider that you will be carrying out data collection work in a setting which demands certain modes of behavior from you and which sets limits on the way in which you may carry out your work.

In gathering task analysis data, you arrive as a potential intruder into a normal work situation. Regardless of how welcome the data collection results will be, persons in the institution are being

* This chapter was co-authored by Irene Seifer.

asked to adapt their work schedules in order to provide for your work needs. As a job analyst, you may find yourself in a situation in which qualified workers are in short supply and/or staffing is under tight financial restrictions. Supervisors may be harried; workers may be frustrated by years of service with little recognition, or by sheer overwork. There may be other emotional overtones or undertones depending on the institution's emphasis on communications among staff, status, lines of authority, and the use of power. Therefore, the burden lies with you to be as cooperative and undisruptive as possible.

It is important to realize that you are a guest in the work situation. Whether you are also an employee of the institution is irrelevant; the fact that you are looking at the work which others do makes you a guest in their environment. You have to decide in advance to be a considerate guest, one who will be invited back, because you are going to have to come back in order to carry out your work.

Consider the institution in the following ways:

1. Never violate the rules of the institution. Supervisory relationships and chains of command must never be overlooked.

2. Avoid being conspicuous. If certain types of dress are called for, such as lab coats, or if certain standards of grooming are required, you must adhere to them. If voices are to be muted in the places you conduct your work, you must be as quiet as possible. In crowded situations you should avoid obstructing traffic.

Interviews and observations are possible only if the performer and his supervisor allow them; without cooperation there can be no information and no task analysis. Without the goodwill of the performer and his supervisor, you cannot hope to gather valid data.

Consider the performer in the following ways:

1. Refrain from making judgments or comments on the behavior of staff at the institution and respect other people's views or behavior, no matter how different from your own.

2. Address all persons with the appropriate title of Dr., Mrs., Mr., or Miss and the surname unless they request otherwise.

3. Never call on persons in authority to force a person to cooperate. If someone refuses to participate and he cannot be convinced otherwise, report to your director so that the problem can be solved. The person involved must never suffer for his refusal to cooperate, and must never be in fear that he or she will suffer if he does not cooperate.

4. Do not loiter after an interview or spend time talking with the supervisor of someone you have interviewed. This may engender fear that you are reporting on the interview, and can harm your effectiveness.

5. Do not allow yourself to become involved in discussions about the internal problems or grievances at the institution.

6. Treat the task analysis data, the interviews in which they are collected, and the confidences of the persons interviewed as confidential. Every person interviewed has a right to know who will see the data, in what form, and whether he or she will be identified by name.

How confident you are about your role as an analyst can affect the performer's participation. The more you feel that you know what you are doing and why, the less likely you will be to concentrate on yourself. You then will be able to function with poise and flexibility and will be able to give the performer warm, accepting attention. The performer is then free from the uncomfortable feeling one gets in the presence of someone who is stumbling at his job and is able to respond more openly. Your own attitude and respect for the quality of the work you are doing is the most important factor in your functioning.

Consider the quality of the work in the following ways:

1. Place as your first responsibility the quality of the data you collect. If, at any time, you have reason to believe you have made a mistake in the work, bring this to the attention of the person in charge of your work. It may avoid serious consequences and you will not be penalized.

2. Follow the step-by-step procedures faithfully.

3. Never allow time pressures to keep you from doing the kind of work you can be proud of.

4. Never assume that proper explanations of your work will be carried down through chains of command. If you are to explain aspects of the task analysis work, never ask or rely on anyone else to do this. Unless you convey the information, it can be distorted.

5. Never challenge the performance of another analyst in the presence of someone from the institution.

6. Keep all your notes, data forms, manuals, and related materials confidential and in a secure place, away from the view of unauthorized personnel.

## THE RELATIONSHIP WITH THE PERFORMER

In the interview process an interaction takes place between the person being interviewed (the performer) and the interviewers (the analysts). The objective of the interviews is to obtain information about the work. In such a situation the quality of the interaction is crucial to the outcome. It must be based on trust, mutual respect, and cooperation; it need not be intimate or intense. What is needed to establish factual, objective information is a two-way interchange in a positive, warm and honest work relationship.

The Analyst

When you first meet the performer, he or she may relate to very little of the task analysis work, may misunderstand what it involves, or may fail to see any benefits from such work. Your success in eliciting maximum participation from the performer does not depend on the performer's enthusiasm about your work. It begins with your interest in the performer's work and your willingness to treat it with respect.

During task analysis you will be working with performers at all job levels, from the entry level to the highest professional levels. You will be meeting and dealing with persons of varying ages, races, and national origins. Unless you have an intrinsic respect for the dignity of each performer, unless you are prepared to deal with each performer as an individual, you will not succeed, because you will be unable to develop the mutuality needed for accurate data collection.

Problems in dealing with the performer sometimes stem from the analyst's own set of biases and misconceptions. The analyst may predetermine and prejudge the content of a performer's tasks based on his or her concept of who the performer is or what he does.

Some analysts prefer to function with performers in occupations they admire or whom they perceive to have high status. They not only tend to transmit this feeling, they are liable to abandon critical evaluation of the performer's responses and may fail to adequately probe for information.

Such analysts may also display lack of courtesy or indifference to performers whom they regard as low-status persons. This attitude can never be hidden, and invariably results in a closed performer and biased data. The analyst is liable to miss a performer's intangible task elements, such as decision making, when these are not packaged in a familiar container--the one of his own prejudices.

The most liberal of individuals is capable of snobbishness of one form or another. Age, education, or "generation" can be as much a basis for subjective bias as ethnicity, sex, or race. Being able to relate only to entry-level employees and treating managerial employees and middle class performers as in an "enemy class" rather than as individuals can also result in lack of true cooperation and inadequate data collection.

Instead of relating through biases, you can choose to participate with each performer as an individual as each functions in the "real world."

Initial Contact

Contact with the performer is first achieved with the help of the supervisor and/or the employee representative during scheduling. The performer may have been selected during a prior discussion in the department, may be a volunteer, or may have been selected by the supervisor. Regardless of how the performer was chosen, your initial face-to-face contact is critical. At this point you establish the tone and set the course for the task analysis work with this performer.

The Performer

An understanding of what encourages the participation of the performer and how to develop these positive influences will help you to enlist maximum participation from the performer. Each participant comes to the interaction with a history of prior experiences, expectations, perceptions, and ideas of what the interview will be and should be. These attitudes and experiences can affect participation:

1. A performer may be positively inclined to participate by virtue of being a social being who can take pleasure and satisfaction from helping himself and others.

   You should be prepared to honestly answer questions such as, "What will be done with the results?" "What good can come of this?" However, you must be careful not to promise to deliver more benefits than the management of the institution is prepared to offer.

2. A performer can be motivated to participate by the sheer intellectual pleasure of being asked to articulate his or her work in conceptual or classifiable terms, and may also find the rigor or scientific nature of the approach attractive. The intellectual stimulation, the opportunity to be questioned, to think about and to respond to new or different topics related to work can be highly rewarding. If the work is approached as an intellectual challenge to you both, such a performer will respond to the questioning as to a challenge. However, you must be careful not to waste time in theoretical discussions.

3. The interview situation can offer emotional rewards to a performer who has had little personal recognition in his or her work, or has the need to express the nature of his work and how he carries it out. A good listener occurs only rarely. An effective analyst asks good questions and also listens well.

The task analysis situation offers this sort of satisfaction, particularly since there is the possibility that the information will be put to serious and productive uses. However, you must be careful not to allow the interviews to become "gripe sessions."

4. A performer may welcome a break from routine or may enjoy the opportunity to be given the prolonged attention which the method provides. Such a person will reflect carefully, and will respond to questions with precision and a willingness to provide as much information as you require.

5. A performer can resent being called away from an already heavy work load. Such a person will tend to provide hurried, sometimes superficial answers, may prove to be resistant, if not actually misleading, and will, if you are not able to change his attitude, meet only the minimum needs of an interview.

The performer's work patterns and routines can be the basis of some reluctance to participate fully. Every performer has certain routines, activities, and preoccupations that could conflict with his participation. You should be aware of these in advance in order to keep such conflict to a minimum.

6. A performer's prior experience with surveys, interviews, or job analysis may underlie an initial hostility towards you. If you sense reticence, it is advisable to find out what the performer thinks the method is about. The performer may have been studied by efficiency experts, time-and-motion personnel, or industrial engineers. Such approaches, unlike this one, are concerned with the speed and efficiency of the performer. He may have been evaluated in such terms and may be defensive about another such encounter. You should make sure that the performer understands that the HSMS method involves none of this.

Other forms of task analysis or similar research may have antagonized the performer. If he gave much time and attention to a prior interviewer and received no thanks or follow-up on the results, he may be resentful. You should make it a point to explain those aspects of the method which you think will best allay such resentment.

7. The performer may, because of other past experiences, resent you as a "stranger," a "management person," or an "ivory-tower type;" he may also be extremely defensive and fearful of being criticized or of having been singled out. The performer should be reassured that he was not selected on the basis of any personal characteristics, but because his work is representative of his job title. Help him understand that it is the work and not the individual that is being studied.

You can determine which positive or negative influences on the performer's participation are most likely to be involved by being sensitive to signs of these attitudes in the performer's first responses. Sensitivity to the performer's needs comes out of respect for his integrity as an individual. It cannot come from a desire to manipulate him. If you gain this awareness, you can give more attention to the relevant aspects of your interaction and thereby increase participation.

People vary greatly in the nature and the extent of the explanation they require before deciding about their participation. You should think about the way you will present your explanation of the task analysis work, so that it can be meaningful and relevant to the performers in terms of their past experiences and interests:

1. You will need to explain what organization or staff is doing the data collection, what the institutional relationship to the performer is, and what the results are expected to provide. You could give some idea of how the data collected in each phase are put together and the type of results that can be achieved. You can show examples. In explaining anticipated uses, never promise anything to which the institution has not committed itself.

2. If the performer has never had an interview experience you should be prepared to spend time explaining what will happen. Use language that will be easily understood. The performer may wonder about

you as an analyst, about whether you will be threatening or congenial. He should be reassured that the situation will be made as relaxed as possible.

3. The performer's participation will be obtained more easily if he has a voice in setting the interview periods and their duration. He should be made aware of what time is needed, and what arrangements, if any, have been made to free him for the interview.

4. Some performers may wish to know something of how the method was developed and what the method actually is, in terms of its definitions and theory. You can talk about what you know, based on your own training, obtain answers from the person in charge of the task analysis work, or provide HSMS literature. However, it is advisable to refrain from discussing the method in great detail, because some professionals will, with only a limited understanding of the method, proceed to assess it or recommend changes. This may lead to conflict between you and/or result in wasted time.

## Dealing With Resistance and Refusals

In the initial period the flow of communication may seem blocked or disjointed. The performer should be encouraged to ask questions or describe in his or her own words something which you have explained. You may then discover that the performer misunderstands some of the procedures and/or what you are doing as an analyst. He or she may have a distorted view of what type of information the analyst is seeking, the uses to which the data will be put, or the reason he was chosen. You may also find that shyness or anxiety has been operating to block communications. An early exchange of perceptions can help to remove the block.

Occasionally, despite your most careful efforts to obtain participation, you may encounter strong resistance on the part of the performer. At some point he may refuse to participate. In such cases it is a good idea to review the situation. Reappraise the various reasons which could be involved and the past encounters with the performer; check the way he was first told about the task analysis work. Ask the performer direct questions about his perceptions. Misunderstandings may have developed which are now making him feel threatened. You may not see the data collection and the method as threatening, but you cannot assume that the performer shares your view.

Sometimes the performer will have been pressured not to talk about out-of-title work. Since specific task identification information will be used internally, you can encourage frankness. You may have to reassure the supervisor that the results will not be used to damage him or his staff and have him reassure the performer.

The supervisor may be the one to have misunderstood the nature of the work. He may feel that he is being evaluated indirectly, and he may have pressured the performer as a result. You may have to carefully probe to see whether this has occured, and then correct the problem at its source.

You may find that you, as an individual, or your team partner(s) have clashed with the performer and "rubbed him the wrong way." Assess your behavior and the way you have presented the work. Have you antagonized the performer by forcing your own attitudes on him? You will need to appraise this situation without feeling personally threatened yourself. The only way to do that is to recognize that you are dealing with an individual with his own set of perceptions. The point is to assess the situation objectively and to overcome the obstacles. You may discover that you can change the situation. It only takes (1) your willingness to openly and honestly find out what is wrong, (2) your willingness to place no blame but to patiently explain a misunderstanding, and (3) your willingness not to be defensive.

If, after all attempts to save the situation have been made, the performer still refuses to go on, the following should be noted:

1. Never use the authority of a person in a supervisory relationship to the performer to force the performer to participate. This will turn the performer into an unreliable respondent and will make the task analysis appear to be a partisan management function.
2. Arrange for the alternate or someone else to be involved without drawing blame or negative attention to the performer. Thank the performer for any cooperation already obtained.
3. Repeat all prior scheduling and initial interview steps with the new performer. Take nothing for granted.

INTERVIEW PROCEEDINGS

In interviewing, your objective is to obtain all the information you need to identify and describe all the performer's tasks, and/or to identify and scale the skills and knowledges needed to carry out the tasks. If you are to arrive at quality information which is accurate, clear, and complete, you must continue to maintain the performer's level of participation.

Information given freely is likely to be of a higher quality than information given with indifference or reluctance. Therefore, the performer must be at ease and well-motivated in the interview situation. He must not feel threatened or pressured. He must feel that you are treating him with respect and are not judging him.

In order to obtain the kind of information you need in a useful and expeditious manner, follow the procedures outlined in this report carefully and faithfully. The procedures are designed to avoid confusion and duplication of effort and to provide for a smoothly run interview.

Preliminaries

When the performer arrives for the first interview he or she should be introduced to the other team members by the analyst who did the scheduling. This person should probably be the spokesman for that session. Within the constraints set by the institution, the performer can be invited to have some coffee or tea.

At the start, the spokesman should go over the purpose of the interview and refer to the arrangements with respect to time. The performer should be given information on how to contact the analysts whenever necessary. Specific questions about the procedures can be dealt with now, but further discussions about the method and its uses should be dealt with at a later time.

Initial interviews should be geared to provide you with a full list of the performer's work activiites and assignments. You will be asking fairly broad, open-ended questions at first. If the performer continues to provide relevant, clear information, he need only be encouraged to continue.

A question such as, "Would you tell me the things you do on your job? I need a list of everything you do," can be used after the performer is introduced to the interview situation. As the performer speaks, you should make note of points that need expansion, clarification, or greater detail. Note apparent contradictions. These can be followed up by questions of narrower scope to fill out detail, expand on areas only touched on, or to explain contradictions. When areas are fairly complete, summaries can be presented to the performer for confirmation.

Do not spend too much time on details at first. Your primary focus should be to note the possible groupings of activities which may all be instances of the same task, the various methods that are used or which are chosen among, or the types of individuals who are involved in the work activities.

General Procedures

During the interviews openness, courtesy, and respect for the performer determine the proceedings. These should also be extended by the analysts to each other. When questions are being directed to the performer by one analyst, you and any others present should listen politely and attentively without interrupting. The performer could easily become confused or lose patience if different people throw questions at him simultaneously or ask him a new question before he finishes answering the old question.

Precious time can be saved if you listen to the other analysts' questions and note the performer's responses. Some of your own questions may be answered. During a response to a question you may hear something which will serve as a clue to information that you had not previously considered. Record your own questions as they come to mind. Don't rely on memory; the information accumulates rapidly. Raise your questions in the proper co[illegible]hat is being discussed. Give the performer your full attention. Listen carefully without staring at him in a manner which will make him nervous.

If you are the questioning analyst, speak naturally, in a normal manner, and not in memorized speeches. Know what you intend to ask and what steps you must cover. This will help you to be self-assured and will inspire confidence that you are a serious researcher. If you are self-confident you are more likely to be relaxed, and this will help to relax the performer.

You may sometimes feel sure enough about some information to draw your own conclusions about task boundaries or later scaling. However, you would be wise to corroborate such assumptions with one or two questions. It is better to ask extra questions than to have wrong information or inadequate notes.

Be careful not to make the performer feel totally responsible for educating you about the work being discussed. This can happen if, in pleading a modest unfamiliarity with the work, you also plead total ignorance. If you give the performer the impression that you do not understand <u>anything</u> that he has said, you risk losing h[illegible]participation, since he may feel that he is too inarticulate to help you, or that you are too inexperienced for him to take the time to provide you with details. It is always wise to tell the performer at the outset that you are not an expert in his particular field, that you have prepared yourself to understand, but that you need his assistance.

Note Taking

In both interviews and observations the analysts take notes. This should not ordinarily cause alarm on the part of the performer. However, to ensure against this, avoid taking notes in a secretive manner, and be sure that the performer knows beforehand that you are not judging his or her performance, that speed is not of interest to you, and that you need factual information on the nature of the work. However, do not attempt to formulate rules for note taking that are so rigid they defeat your own needs. If you are to do a good job at task identification and scaling, you need clear, informative notes.

Notes must be legible. No matter how complete the contents might be, if they cannot be read, they are worthless. If you have a tendency to scribble or write in a very abbreviated manner, take extra care to make your notes more legible and more complete during the editing period. Do not wait too long after leaving the performer to do this. Job analysts have been known to be unable to read their own notes only a day after the interview. They should be readable by another analyst if necessary. It is a good idea to date your notes, since the information you collect may be revised over time.

If the performer uses technical language with which you are not familiar and/or whose spelling you are unsure of, write the words the way they sound and later enlist the performer's help with the spelling. Use a technical dictionary to check.

## Terminating the Interview

The performer will be involved in a large number of interview sessions spread out over a long period of time. In each phase of task analysis there is the initial session which sets the form for the others, the related interviews, and the final interview for a phase, such as task identification or skill scaling. At the very end, there is the termination interview.

All interviews should be terminated as follows:

> When you have determined that you have all the information required for a session, or that the time allotted for the interview has expired, you should terminate the session in as friendly a manner as possible and thank the performer.
>
> In ending you should never use any statement which would imply that you, rather than the performer, have time constraints, and he is therefore dismissed. Never say things such as, "I'm sorry, we have to stop now. Someone else is due in five minutes." This will make the performer feel that he is being pushed out the door and that his participation is not appreciated or respected.
>
> If the performer seems extremely reluctant to leave, and it is imperative that he or she do so, you can easily terminate the interview by rising to shake hands. You then thank the performer for giving his or her time.
>
> Before the performer leaves, check the date and time of the next appointment. If there are any conflicts these can be immediately ascertained and rescheduling can be done.

In terminating the initial interview:

Allow some time so that the performer's questions can be solicited and answered. Further participation may depend on his being able to air any anxieties or doubts that he may have after undergoing the first interview experience. However, he should not be allowed to ramble on indefinitely since he usually will be expected back at his work site. Questions should be answered truthfully and as briefly as possible. If more detailed information is requested than can be provided in this period of time, you can offer to bring information to the next interview or to send literature. Once promised, you must keep your word.

Before the performer leaves, review the sequence of interviews and check the next appointment. Be sure that the performer knows how to reach you.

In terminating the final interview for a phase:

Cover the fact that a period of time may elapse before the performer and/or his supervisor are contacted again for scheduling purposes. Indicate when you expect this to happen. Obtain information about the performer's plans for vacation, leave of absence, or any other reason why he may not be reachable when the next phase begins.

By the time of the termination interview, you and the performer have gotten to know each other and you should not suppress your warm feelings. You have reason to express your appreciation to the performer for having given so much of himself over so long a period of time. Remember the following:

The performer should be left with good feelings about the task analysis and his participation in it.

Allow some time for the performer to ask any questions which he may have thought of during the course of the task analysis, or which may occur to him now after being involved in the entire process.

Use this situation as an opportunity to get some feedback on your own performance and effectiveness as a job analyst. Be sure you both can handle this and will not become tense or defensive.

If requested to do so by the performer, you can arrange to send him any literature you have related to the method. Do not promise to send him any data or research results. This is the province of the management.

Soon after the termination interview, letters of thanks should be sent to the performer and/or his supervisor expressing appreciation for the time, effort, and helpfulness of the performer for participating, and to the supervisor for making this possible.

## INTERVIEW TECHNIQUES

This section deals with some of the techniques of interviewing. It attempts to make explicit behaviors which you do not consciously think about or which you nearly always take for granted. The techniques are presented to help you be a successful and relaxed data collector who is able to relate to the variety of people who will be involved with you as performers. The techniques can only "work," however, if you and the performer are already somewhat trustful of one another and have established mutual respect.

### Asking Questions

The interviews with the performer call for oral questions. "Open-ended" questions which require more than a few words in response and permit non-directed answers are useful when the questioner is unfamiliar with the material to be discussed. The analyst can then focus in on specific subject matter. Questions which require only a few words in response are generally more useful for pinpointing specific information and to fill out incomplete details.

The performer may be uncomfortable with open-ended questions because they place the burden of the response on him or her. This can be difficult for an inarticulate performer. If the performer seems nervous, anxious, confused, or reticent in response to such questions, try to proceed with more narrowly framed questions which require only a few words of response. If this helps, you will then have to arrive at your information through a more directed line of approach.

In contrast, an articulate performer may become annoyed by questions which do not allow him to express himself fully. He may wish to go beyond the few words your question calls for, and may wish to introduce new information or his own reasoning.

The use of such open-ended questions as, "Would you tell me what you do then?" implies that you respect the judgment of the performer and are relying on him to select the information that is relevant to your needs. You can then use directed questions which pick up from what the performer has said. Using narrowly focused questions almost exclusively may cut off a full recounting of information and you are in danger of losing data and the performer's interest.

Once you have some idea of the subject being discussed, you may firm up specific details which you need by using questions that require "yes" and "no" answers. Be careful in using such a question when you think that the performer may not understand the full content of the question. Some performers will automatically agree with something they cannot comprehend in order to avoid embarrassment or to speed the interterview. "Yes" or "no" questions are useful for focusing a performer's attention on a line of reasoning or to corroborate clearly stated points. The main point is to be aware of the performer's response and to be ready to change the interview style to meet the performer's needs.

General Guides For Questions

1. Ask questions that require elaboration rather than "yes" or "no" answers, unless you already have all the details you need.

2. Avoid stating the answer to a question for the performer and asking him to agree, except as a means to focus on the particular information you are seeking.

3. Questions with the words "what," "how," "why," "when," or "who" evoke fuller responses than "do you?" questions.

4. Bear in mind that performers may take for granted essential steps, such as deciding what is wrong, making choices, or carrying out routine procedures. Questions should evoke information about such activities. This may require a sequence of questions linked with "and then what do you do?" phrases.

5. Ask the performer to explain words, terms, or concepts you do not understand, but do not turn the session into a personal lesson.

6. Questions which are phrased without any reference to prior questions and answers tend to give a new focus to questioning. This is useful provided that your purpose is to lead in a new direction.

   The continued use of questions which do not refer to prior questions or answers may make the interview seem highly fragmented and discontinuous. The performer may feel frustrated by the disjointed sense he gets. Avoid this feeling of discontinuity or overcome it by referring from time to time to the performer's responses. This will assure him that you are following him.

7. Be wary of being so preoccupied with formulating your next question that you lose the opportunity of building your next question on the performer's response. By linking your question to what the performer has said you build a common frame of reference between you and open the way to fuller answers.

8. Your attention to the performer's responses can help you note inconsistencies which you can have clarified, or can suggest new directions for your questioning. By writing down the performer's reference to information you wish to pursue later, you have a departure point to reach that information at a later time in the interview. A phrase reminding the performer that he has said something of value which you remembered all this time and now wish to pursue can be helpful.

If, during an interview, the performer shows resistance to a line of questioning and you do not know whether the resistance is due to lack of information or to a feeling of anxiety, move on to another question. Later, when the performer feels more confident and at ease, you can return to the earlier topic and, through a question making reference to the earlier answer, attempt to obtain the information. You can also directly ask what the problem is.

One method of clarifying a response is to present the performer with your own summary of what he said and obtain his confirmation or correction. Your summary accomplishes several objectives. It can assemble, consolidate, and synthesize a number of pieces of information which the performer has provided in separate responses. Therefore, it can give fuller meaning to the response material. It can clarify ambiguities. It can also cut short a performer who tends to be rambling and repetitive without hurting his feelings.

Remember, however, that it is always easier for a performer to agree with your summary than to disagree, since he will then have to explain why he disagrees. The performer may feel reluctant to disagree or may not want to get involved in explanations. The danger is particularly serious if you have the tendency to record your own summary statements regardless of what the performer has said. Preface your formulation of what you feel is an accurate summary by saying that you are not sure whether you have fully understood what has been said. Break up a long summary by asking for feedback for individual sections of the summary.

When you note inconsistencies within a response, or between two discrete responses, or between a response and another source of information, bring this to the performer's attention tactfully and attempt to resolve it. If your question is worded carefully and you are relaxed, the performer will not become defensive. Avoid directly quoting sources other than the performer, especially the supervisor's list of assigned duties or a job description. It is better to repeat an earlier question and compare the new answer with an earlier response.

Intentional repetition of questions can be helpful. If you feel that some early questions were answered evasively, superficially, or were not understood, and if you think that the performer is likely to respond better now, you can repeat earlier questions. It is always wise to assume that the performer remembers the earlier question. Indicate that you are aware that you are repeating yourself, but that you wish to make sure that you understand something properly.

The use of words such as "good," "aha," "yes, I understand," and nodding the head convey to the performer without interrupting him that you approve of what he is saying, that you are interested, that he is on the right track, and that you wish him to continue in this direction. These can be helpful if used purposefully. If you are not aware that you are using such feedback mechanisms, you may find that you are encouraging the performer in a direction which you do not intend. If the performer really has nothing more to say in a particular direction, you may get a rambling or unrelated response.

Continuity and Flow

A common fear for an inexperienced interviewer is that he will not be able to maintain a continuous flow of questions and answers. In his anxiety to keep the process moving, he may perceive any pause or silence as a danger signal to be dealt with immediately by asking another quesiton. Be reassured that silence can serve a useful purpose.

The silence of the performer is often his time for gathering his thoughts together and may precede a relatively lengthy response. If you break the silence by another question you may inhibit the further response that would otherwise by f[illegible]ncoming. Some performers may interpret <u>your</u> silence as your desire to have them continue to speak on the same topic. Other performers may be as uncomfortable with your silence as you are with theirs. The point is to be aware of what role silence is playing between you and the performer and deal with it.

When the performer is rambling, is talking about topics unrelated to your needs, or is repeating material you already have in your grasp, you face the need to interrupt. The danger, of course, is that the performer may be offended. If possible, avoid questions that induce the sort of responses that need interruptions. Do not be afraid to interrupt when it is called for, but do not attempt to interrupt until your relationship with the performer is sufficiently established that you do not close off the performer's participation. Interruptions can appear to be criticisms.

Interruptions should be done courteously, starting during the flow of the performer's words with a nod of your head and a phrase such as, "Excuse me, but ___," or "Please let me interrupt you for a minute." At this point you would do well to refer to what the performer has been saying, to reinforce the fact that you have been listening. Then say that, while this is interesting, what you are asking about is something else. If the performer has been repeating himself, refer to the fact that he answered your question well before, and now you have something related to this to ask.

Naturally, in any set of interviews geared to cover all of a performer's work activities, you will need to make many transitions from one topic to another. You will also need transitions to move from a difficult area which is uncomfortable to the performer to a more reassuring topic. Transitions are easier if you explain to the performer that you are satisfied about one topic and are now ready to take on another. This gives him a sense of accomplishment and closure, and encourages him to continue with you to the next topic.

Be sure that you do not shift from a topic prematurely. You can lose valuable information and irritate the performer. He can lose interest and reduce his participation if he thinks that you are cutting him off.

When the performer is the one to shift to another topic you will need to ascertain whether it is because he has exhausted the prior topic, finds it threatening, or is merely unfocused. You can then either go along with the new topic, or steer the conversation back.

Pace or Tempo

When job analysts are above average in their verbal skills, they tend to develop a rapid tempo in discussions. However, your normal pace may be very different from that which is familiar or congenial to the performer. The performer is the person to whom you must adapt the tempo of the interview. A slow tempo is not necessarily a sign of limited verbal ability; those who deliberate carefully before they speak can provide full, rich answers to your questions. However, persons who have difficulty in speaking quickly may be sensitive about their pace. You may have to resort to narrowly framed questions and use open-ended questions sparingly.

The difficult adjustment is to unfamiliar pacing, language and tempo, rather than to fast or slow *per se*. If the performer's speech patterns, language, and pacing are unfamiliar to you, yours may be unfamiliar to the performer. Work this adjustment out with the performer.

The problem with the performer whose pace is too fast for you is that you will have difficulty taking notes. You can ask the performer to slow down. Another solution is to divide the interview with your analyst partner. One of you questions, while the other takes notes. Do not be afraid to stop the performer from time to time to get something down in exact wording. If not done too often, the performer will be more flattered than annoyed, and may give you more precise wording.

Problems With Performers

Do not confuse a performer's verbal ability with precision. You will have to assess whether you are being "snowed" or not about work practices and knowledge requirements. You will have to find out what a performer actually does, not what he thinks he can do. A question such as, "You don't really ____, do you?" may not be helpful, because it asks the performer to downgrade himself. Instead, you might say, "Sometimes people are able to do more than the job asks of them. Do you have to ____, or do you do that because you know how?"

Conversely, a performer may be overly modest about his work and ignore mental acts which he takes for granted. You should find out whether a performer must come to conclusions or make decisions in his mind and is overlooking these processes because he does not have to report them.

Overly talkative performers can present a problem, especially if the performer uses the interview as a means of socializing, showing off, complaining, or exercising control. The analyst's silence may encourage non-directed talk rather than reduce it. You may have to make your questions more narrow, or may have to interrupt and redirect the performer. Your chief concern here is to act without showing annoyance, or you will lose the performer's participation. When the overly-talkative performer pauses for breath you can ask a summary question and move to a new topic. Being "quick on the draw" with your question is essential. Although frequent abrupt changes of topic and breaks with prior content are not generally recommended, they are probably useful in this case.

If all else fails, enlist the performer's help in getting through all the material you have to cover. He may then find a constructive outlet for his energy. Before you consider changing performers because of over-talkativeness, discuss this with the person supervising the task analysis work.

The <u>reticent, untalkative performer</u> may be shy, threatened, fearful, or may feel inadequate to the interview situation. When you first notice reticence, try to find the reasons; you may be able to help by giving additional or clarifying information. Your admission of your own newness to the experience may be reassuring to a shy performer.

Narrowly focused questions that can be easily answered by the performer will help give him self-confidence. You can attempt to build a sequence of such questions to gain the same information you might have gotten through an open-ended question. As you progress, giving approval cues to the performer and warm attention may help make the performer more free in his answers, and you can then shift to more open-ended questions. Questions referring to the performer's prior briefer answers can carry you from one mode to the other.

Communication

The content of the interview is expressed in oral use of language. However, the communication between you and the performer about the content also includes non-verbal cues. You will be able to communicate better with the performer if you pay attention to both verbal and non-verbal communication:

1. The same apparently familiar terms can mean different things depending on social background, field of expertise; and level of education. Be alert for misunderstandings about the meanings of words.

2. The performer may be reluctant to tell you that he doesn't understand something you said. Be alert for visual signs that the performer has not understood you.

3. The performer may react emotionally to words you consider neutral, and you may have similar reactions. Be alert to signs that you or the performer may have taken words "the wrong way" in terms of the connotations involved. This is especially important if you talk about right and wrong ways of doing tasks, or the errors which can be made while performing tasks. Keep such discussions impersonal and in the third person, if possible.

4. When the performer uses specialized terms or abbreviations which you do not understand, you may convey the impression that you know nothing about his field. This can reduce his willingness to participate on a detailed level. If you have read the literature collected for this area of work you can convey that you know something about the field, but need help with special terms, jargon, or abbre-

viations. Never avoid a question about terms which you do not understand. It will inhibit your ability to continue with writing task descriptions and scaling.

5. In communicating with the performer about his field, use the professional's terms only if your are truly familiar with them. You will block participation if you are obviously showing off, especially if you are using terms incorrectly.

6. In communicating with the performer about the task analysis work, avoid terminology specific to the HSMS method, such as "output," "recipient," "task boundaries," etc. It is needless to train the performer in the method, and alien terms can create bars to communication.

7. Complex concepts and ideas in questions may be difficult to respond to, especially if the performer has a limited educational or verbal background. Try to relate the abstract concept to concrete examples in his own work area. Do not become impatient. Pay attention to the answers to get clues about where the difficulty lies in the performer's grasp of the concept.

8. Be aware of your use and the performer's use of non-verbal communication of understanding, agreement, approval, or the reverse of these. Notice nods of the head, gestures, and facial expressions. Determine whether your own use of non-verbal cues projects what you intend.

## TRAINING

When you have gone through the nine chapters of this manual, your training is only half done. You must now practice the method in two ways: the first is role-playing with others; the second is practice in the field.

Role-playing provides an opportunity to find out how the actual procedures feel to the participants in the interviews. In this way, analysts can gain insight about how to conduct the work. Since role-playing is done with co-workers, there is an opportunity for feedback and change. Analysts can discuss their work with each other, and exchange comments and reactions.

In role-playing you should take turns playing the performer and the analyst. When your turn comes to be the performer, remember that you cannot imagine the circumstances of a job you know little about. Play the role of yourself in a job you once held. You can also pretend to be your own supervisor. When it is your turn to play the role of analyst, the other person should play himself in <u>his</u> prior job.

Actual <u>field work</u> with practice experiences in a real insti-tution is an essential part of job analyst preparation. There should be sufficient time for you to go through all the steps of task identi-fication, description, skill scaling, knowledge identification, and knowledge scaling in a team, under the supervision of someone experi-enced and trained in the use of the method, so that the field work can be evaluated, corrected, and improved. If you practice in a team you can discuss the problems and find solutions as a team. You will learn to work effectively.

We wish you well.