

Social Security Job Demands Project
Methodology to Identify and Validate Critical Job Factors
Deliverable 9

****** See Page 40 ******

**“Usability / Practicability Previous comparisons have put the PAQ
on top of the list
regarding its usability and practicability. “**

Submitted by

Disability Research Institute at
The University of Illinois at Champaign-Urbana

Northwestern University
Rehabilitation Institute of Chicago

November 3, 2002

The research reported herein was performed pursuant to a grant from the U.S. Social Security Administration (SSA) and funded as part of the Disability Research Institute (DRI). The opinions and conclusions expressed are solely those of the authors and should not be construed as representing the opinions or policy of SSA or any agency of the Federal Government.

Table of Contents

Table of Contents	1
Executive Summary	7
Chapter 1	11
Introduction.....	11
Overview of SSA Transition from DOT to O*Net	11
SSA’s Concerns Regarding O*NET	12
Data Aggregation Issues	12
Job Demands and Measures.....	13
Data Collection Issues.....	13
Activities to Address Concerns about O*NET and Obsolescence of DOT.....	14
Defining the Conceptual Model and Domains of Interest for Identifying Optimal Job Demands	15
Disability Determination within SSA	15
The SSA Five-Step Sequential Evaluation Process.....	16
1. Is the individual engaging in substantial gainful activity?.....	16
2. Does the individual have an impairment or combination of impairments that significantly limits his or her physical or mental ability to do basic work activities?.....	16
3. Does the individual’s impairment(s) meet or equal a listed impairment in Appendix 1 to Subpart P of the Regulations Part 404 (Listing of Impairments)?.....	16
4. Does the individual’s impairments prevent the claimant from performing his or her past relevant work?.....	17
5. Does the individual’s impairment(s) prevent him or her from performing other work?	18
The Current Project.....	20
Methodology	22
Deliverables	23
Overview of the Proposed Procedures for Identifying Optimal Job Demands.....	24
Chapter 2	28
Review of Job Analysis Methodologies	28
Level 3 Review of Job Materials	29
Direct Observation	30
Performance	30
Interview	30
Subject Matter Experts (SME) panels.....	31
Critical incidents	31
Functional Job Analysis (FJA).....	32
Task inventories	32
Standardized job analysis systems/questionnaires	32
Review of Job Analysis Systems/Questionnaires	33
Common Metric Questionnaire (CMQ)	33
Fleishman Job Analysis Survey (F-JAS)	34
Occupational Analysis Inventory (OAI)	36
Occupational Information Network (O*NET)	38
Position Analysis Questionnaire (PAQ).....	39

A Critique of Existing Job Analysis Systems	40
Chapter 3	43
A Methodology to Identify Optimal Job Demand Variables.....	43
Survey Development.....	43
Survey Participants	44
Survey Administration and Analysis	45
Automated Concept Mapping	45
Step 1: Data Collection from a Large Group.....	46
Step 2: Identification of Core Concepts from the Large Group Data.....	47
Step 3: Sorting and Prioritizing the Job Demand Variables.....	47
Step 4: Identification of Dimensions of Job Demands.....	47
Step 5: Clustering of Job Demand Variables.....	48
Chapter 4	50
Procedures for Validating Job Demand Variables.....	50
Need for Verification/Initial Validation	51
Replication/Cross-Validation:.....	51
SME Evaluation:.....	52
Convergent/Content Validation:	52
Procedure A. Replication/Cross-Validation.....	53
Procedure B: Evaluation by Subject Matter Experts	53
Procedure C: Convergent/Content Validation (Comparison with Existing Lists).....	54
Summary and Recommendations.....	55
Table 4-1. Comparative Analysis of Recommended Validation Procedures	55
Chapter 5	57
Procedures for Developing a Job Demands Questionnaire.....	57
Questionnaire Development.....	58
Selecting Rating Scale Response Categories	58
Figure 5.1. Anchors for frequency and importance	59
Selecting the appropriate range of response categories	59
Additional considerations	60
Table 5.1. Rating Scales: Job Analysts versus Incumbents	60
Types of Ratings	61
Frequency.....	62
Figure 5.3. Frequency Ratings: Physical strength (behaviorally-specific).....	62
Figure 5.4. Frequency Ratings: Psychosocial job demands (global).....	62
Figure 5.5. Frequency Ratings: Oral Communication (behaviorally-specific).....	63
Importance	63
Figure 5.7. Importance Ratings: Physical strength (behaviorally-specific).....	64
Figure 5.8. Importance Ratings: Psychosocial demands (global).....	64
Figure 5.9. Importance Ratings: Information exchange (behaviorally-specific).....	65
Proficiency	65
Figure 5.10. Proficiency Ratings: Physical Job Demands (global)	65

Ability to lift and move less than 10 pounds	66
Figure 5.11. Proficiency Ratings: Psychosocial Job Demands (global)	66
Choosing the appropriate response format	66
Missing Data	66
Observable Job Demand Items	67
Additional issues for items development	68
Cognitive Interviewing	68
Pilot Test of the Questionnaire	69
Number of Jobs for the Field Test.....	69
Number of Participants per Job.....	70
Training of Questionnaire Participants	70
Chapter 6	70
Construct Validation: Dimensionality Assessment and Calibration of Job Demand Variables	70
Selecting Optimal Job Demands for a Minimum Data Set	71
Analysis of Ratings of Job Demands	72
Traditional Item Analysis	72
Factor Analysis	73
Item response theory – The Role of One Parameter and Two Parameter Models.....	74
2-Parameter Models	75
Unidimensionality and Fit.....	77
Application to the Validation of Job Demands.....	77
Chapter 7	80
Summary	80
Conclusions of the Job Demands Project.....	80
References.....	84
Appendix A:	93
Research Approaches to Validation of SSA’S Job Demands Job Demands Validation Criteria	93
Introduction.....	93
Current Approaches to the Evaluation of Job Demands	93
a..... Fleishman’s Job Analysis Survey	94
b..... O*NET: Occupational Information Network	94
c..... Functional Job Analysis	95
d..... Position Analysis Questionnaire	96
e..... Common-Metric Questionnaire – CMQ	97
Reliability.....	97
Internal Consistency.....	98
Measurement Validity.....	99

a.....	Content-Related/Translational Approaches to Measurement Validity	99
Face validity.....		100
Content validity.....		101
b.....	Construct-Related Validity	103
Hierarchical Order and Fit.....		103
Convergent and Discriminant (Divergent) Validity.....		106
Factor Analysis.....		107
c.....	Criterion-Related Validity	109
Concurrent validity.....		109
Predictive validity.....		109
Issues in Applying Validation Criteria.....		110
References.....		112
Table 1: Summary of Selected Job Analysis Systems.....		117
Definitions.....		119
Appendix B:.....		121
Report on Job Analysis Databases, Systems and Software.....		121
Introduction.....		121
Background.....		122
Programs or Systems Offered by Public and Private Companies.....		123
Job-Matching Programs.....		123
General Methodology Used By Job-Matching Programs.....		124
Identification of Job-Matching Programs.....		126
Utilization of Job-Matching Programs for Determining Disability.....		134
Job Analysis Programs.....		136
International Systems.....		137
Summary and Conclusions.....		140
Table 1.....		141
Summary of Job-Matching Systems and Programs.....		141
Bibliography.....		143
Systems & Software.....		143
Job Analysis & Classification Methodologies.....		173
Job Matching Methodology.....		185
Vocational Evaluation.....		193
Changing Nature of the Work Environment.....		204
Appendix C:.....		213
Annotated Bibliography.....		213
Introduction.....		213
1. The Changing Nature of the Work Environment.....		214
Defining Human Performance.....		216

Vocational Evaluation.....	216
Evaluation of Human Performance	221
Describing Job Demands	222
Job Analysis	223
Job Classification Systems.....	231
Methods of Identifying and Validating Job Demands	232
Identifying Job Demands.....	232
Validating Job Demands	234
Current Applications	237
Impact of the Social/Political Context on the Assessment of Disability	237
Appendix D:	242
Content Review of Job Demands Contained Within Current Job Analysis Systems	242
Table 1. Functional Job Analysis.....	242
Table 2. Common Metric Questionnaire (CMQ).....	243
Table 3. Fleishman – Job Analysis Survey.....	244
Table 4. Occupational Analysis Inventory.....	246
Table 5. Occupational Information Network (O*NET).....	248
Table 6. Position Analysis Questionnaire.....	249
Appendix E.....	251
Table 1. Examples of Common Job Demands Classified by Domain.....	251
Table 2. Example of Critical Physical Factors.....	252
References.....	253

EXECUTIVE SUMMARY

This monograph serves as a final report and ninth deliverable to the Social Security Administration (the Agency or SSA) on one of the major Disability Research Institute (DRI) projects. The DRI was asked to develop a methodology to develop the optimal job demand variables that the Agency needs to compare the residual functional capacity (RFC) of claimants for disability benefits with the occupational demands of work. The Disability Research Institute was asked to recommend one or more approaches and identify the attendant issues that SSA should consider in its investigation of job demand variables that would be the most useful indicators of the ability to work. The desired results of the methodology were (a) a small enough number of variables to be manageable in the Agency's disability determination process; (b) a large enough number of variables to cover the areas of functioning which SSA currently uses in its process; (c) variables that are valid indicators representing the essential functions for work including physical and mental requirements; (d) utility by occupational analysts; (e) appropriately calibrated thresholds and scales for disability evaluation purposes; (f) measures that provide a means for comparing individuals' residual functional capacity in regard to that variable and the minimum level required by any given job; and (g) easy linkage of the variables to physical and mental impairments, and impairments to claimant functioning.

In its effort to develop these methods, the DRI was asked to describe variables that capture areas of functional deficit relevant to both the occupational requirements in today's labor market and the current population of persons with disabilities, both as they exist in the United States and with a review of how they might relate to international standards of practice. The DRI was asked to address issues of validity and reliability for the variables that are identified.

DRI staff accomplished several tasks to complete this project:

1. A literature review and analysis related to the goal of the project.
2. An investigation of public and private entities that collect data on job requirements or demands in addition to using or producing systems or software for delivering the data.
3. A description of Automated Concept Mapping (ACM) in order to develop methodologies for identifying optimal variables that SSA can use to compare residual functional capacities of disabled claimants with the occupational demands of work.
4. An investigation of how SSA should approach validating job demand variables and setting valid and reliable scales and thresholds appropriate for assessing the ability to work.
5. A review of the relevance of methodologies utilized for the DRI's Medical Listings Validation Project, particularly methodologies that are used to identify physical, mental, or social abilities for validating the predictive ability of a listing to indicate an inability to work. (During the course of this project, it became evident that the methodologies needed for job demand identification are distinct from those needed to validate Medical Listings.)

Job demand variables can be represented as the human attribute requirements demanded in a job or job family. These attribute requirements can be organized into five domains: physical, psychomotor, sensory, cognitive, and psychosocial (Fleishman, 1975, 1982, 1992).

Optimal job demand variables are reflected by the human attributes that are considered relevant to job performance across a wide range of jobs. In an effort to design a job analysis methodology that is both easily and effectively applied for the purpose of disability determinations, optimal job demand variables should be parsimoniously structured and clearly defined to represent key attribute requirements that exist across a range of job families. Job demand variables that are relevant to a small microcosm of jobs should not be included, since these would likely result in a more complex structure of variables while adding little utility in application.

An evaluation was conducted for five of the most widely researched and frequently utilized job analysis systems/questionnaires, including the Common Metric Questionnaire, Fleishman-Job Analysis Survey, Occupational Analysis Inventory, The Occupational Information Network (O*NET), and the Position Analysis Questionnaire. Each methodology and approach was evaluated in terms of the extent to which it has demonstrated reliability, validity, and usability in identifying job demand variables, with particular reference to applications relevant to establishing job families and enabling disability determination. On this basis, recommendations were made with regard to methodologies that show the greatest promise for effective use by SSA in building a structure and database for job demand variables that effectively facilitate making valid disability determinations. .

Because existing methodologies are generally limited with regard to cognitive and psychosocial domains, an innovative new approach (ACM) is considered as a way to gather data about what the vocational community believes are important job demands within these domains. However, we recommend a multi-faceted approach that builds on the best of existing approaches to job analysis, but which takes advantage of recent technological developments.

The methodology recommended consists of 7 components:

1. Review existing job demand approaches to create a list of job demand variables that is not redundant.
2. Create and administer a web-based survey to the widest possible audience of vocational experts that will (a) provide review and feedback on existing job demand variables and (b) generate a list of additional job demand variables significant for working in today's economy.
3. Analyze this survey data, utilizing current text analysis technology to create a comprehensive list of job demand variables.
4. Create a job analysis questionnaire that turns the job demands generated in step 3, into observable, measurable items.
5. Administer the questionnaire to incumbents, supervisors, and job analysts, having them rate all job demands for using frequency, importance, and level of proficiency scales.

6. Analyze this data, capitalizing on the strengths of both traditional item analysis and state-of-the-art psychometric analyses, selecting those job demands that are most critical to the widest range of jobs, that is, optimal job demands.
7. Use modern psychometric technology to set thresholds using the proficiency rating scale for the optimal job demands selected in step 6.

We propose a methodology for generating these optimal job demand variables that consists of four major phases: (1) Survey Development, (2) Identification of Survey Participants, (3) Survey Administration, and (4) Survey Analysis.

1. **Survey Development:** Development of a web-based survey of current practitioners and other stakeholders in the field of work disability. This survey will ask participants to respond to questions about existing job demand variables from the literature, and to provide information about job demand variables, particularly related to cognitive and psychosocial variables, that are important to work as it currently exists in the economy. While some of this data collected will be quantitative (rating scale format), the majority of the information will be qualitative (free-text format).
2. **Identification of Survey Participants:** It is recommended that the widest possible range of interested persons and stakeholders be included in this survey.
3. **Survey Administration:** We provide details and discussion on issues pertinent to developing a web-based survey, including the appropriate format of free-text responses and ensuring security and privacy of respondents.
4. **Survey Analysis:** It is recommended that survey data initially be analyzed using computer-based, free-text analysis. This analysis is described in some detail. The goal is to initially reduce the vast amounts of information obtained from recipients, into consistent groupings of ideas. From these initial groupings, subject matter experts (SMEs) will create a single list of non-redundant job demands variables. A description is made about how these variables are rated for importance and relevance by two separate groups of raters. Each set of ratings is then subjected to multi-dimensional scaling and cluster analysis. The results of this analytic procedure for each group are compared by SMEs and inconsistencies resolved.

Next, the procedures needed for assessing the accuracy and completeness of the list of optimal job demand variables is described. This assessment is an essential component of the validation of the job demand variables previously identified. Validity provides a check on how well a questionnaire or a list of optimal job demand variables fulfills its function. While the quality of the methods and procedures used in developing such a list of job demand variables is a necessary prerequisite to establishing the validity and comprehensiveness of such a list, this in itself may not be sufficient to assure the validity of the end product.

Finally, the process of validating job demands is described. Emphasis is placed on the need for content and construct validation. Because one of the aims of this project is to propose how to develop a minimum data set, it is critical that the job demands selected are the best representatives of the constructs and represent what is most commonly seen in jobs currently in

the economy. This means the demands cover an appropriate range of the content of the previously identified clusters. As long as the individual elements that comprise those clusters can be identified with specific measures, SSA can understand from the ratings of the deconstructed items what the measure for the entire cluster means in terms of a claimant's RFC. For example, SSA's current use of the *Dictionary of Occupational Titles* (DOT) strength categories is possible because each category (cluster) is defined by actual measures that relate to human functions (i.e., lift by weight, sit by amount of time, etc.) for the items within the cluster and these items cover the range of difficulty of those demands seen in the work place.

Procedures are described for development of a questionnaire for rating jobs and job families based on the job demand variables identified and validated earlier in the process. Development of a psychometrically sound mechanism for generating a description or profile for each job or job family using relevant job demand variables is described. Such a description or profile should be capable of furnishing reliable information on what the relevant job demand variables are for each job or job family and the minimum level of proficiency required on these variables for successful job performance by an incumbent. This would require:

1. Development of a questionnaire with Likert-type items (or other appropriate type of format) covering all job demand variables,
2. Use of the questionnaire and its different scales to rate a representative sample of jobs or job families and,
3. Establishment of minimum proficiency levels (or thresholds) for jobs or job families.

In summary, this methodology will help SSA develop an instrument that enables job analysts to accurately measure the critical job factors considered relevant for making determinations of disability. Once the job analysis method has been developed, the next steps will be to determine what jobs should be analyzed,

- who will collect this data,
- what type of database will result,
- how this database will be integrated into the disability determination process, and
- whether the job analysis method is reliable, accurate, and valid.

Chapter 1

Introduction

Vocational factors are critical in determining disability at all levels of the Social Security Administration's (SSA) adjudication process. Of the initial and reconsidered determinations finding a claimant disabled, approximately 40% are based on vocational factors. Steps four and five of SSA's five-step process for determining disability requires a contemporary understanding of work, as it exists in the national economy. The Social Security Administration uses the *Dictionary of Occupational Titles* (DOT), a Department of Labor (DOL, 1991) document, as its primary source of vocational information. The Department of Labor's decision to abandon the DOT and to create a successor system called the *Occupational Information Network* (O*NET) creates a dilemma for SSA. O*NET does not adequately describe job demands to meet SSA's current program requirements and, therefore, the needs of SSA's Disability Determination adjudicators and vocational specialists, and Administrative Law Judges and Vocational Experts in the Office of Hearings and Appeals.

This chapter provides (a) an overview of activities SSA planned to create a transition from the DOT to O*NET, or that is, updated occupational data that are usable for disability adjudication, (b) a conceptual model for identifying optimal job demands, and (c) summarizes the work plan used by the Disability Research Institute (DRI) to develop the subsequent chapters in this monograph. The initial section is drawn from materials developed by Sylvia Karman in SSA's Office of Disability to help guide project team members as they began their work in 2001.

Overview of SSA Transition from DOT to O*Net

SSA uses the DOT and its companion volume, *Selected Characteristics of Occupations*, as a primary source in the medical-vocational portion of its sequential evaluation for disability determinations. The DOL has begun to replace the DOT with the O*NET. O*NET represents a significant conceptual departure from the DOT. Because SSA's medical-vocational rules are based on DOT constructs, a transition from DOT to O*NET would spell profound changes in how SSA evaluates disability cases at Steps 4 and 5 of the sequential evaluation process. However, since the DOT is no longer being updated and will eventually become obsolete, SSA must develop an alternative strategy. This chapter describes the concerns SSA faces in making a transition away from the DOT and how the Office of Disability (OD) is working to address them. Since work began on this project, SSA has revised its concept to mean a transition from DOT to updated occupational data that are usable for disability adjudication. While SSA is working with DOL, they do not know as of yet whether the resulting occupational data will merely crosswalk to O*NET (while still under Standard Occupational Classification – SOC) or reside within SOC-O*NET structure. SSA intends for the new data to be gathered using the prescribed rubric of the SOC used by the Bureau of Labor Statistics and the Census Bureau for labor market data. However, because SSA requires information about jobs to be grouped in a way that differs substantially from the way work is organized in O*NET occupational units, it may not be possible to classify many of those jobs under existing O*NET occupational units.

SSA's Concerns Regarding O*NET

From November 1999 through November 2000, SSA staff evaluated the O*NET for evidentiary purposes in SSA's disability determination process. SSA contracted with the American Institutes for Research (AIR) to assess how well O*NET would fit in SSA's medical-vocational evaluation process. AIR conducted data analyses and forums involving SSA adjudicators and policy experts as well as private experts involving occupational data, vocational assessment, psychiatric and physical medicine, and disability law. The evaluation results identified three areas of concern: (1) data aggregation, (2) measures of work/worker, and (3) data collection.

Data Aggregation Issues

The DOT contains over 12,000 job titles; some of these no longer exist in the national economy while other jobs have evolved that the DOT does not include. The way in which the occupations are grouped or aggregated within O*NET significantly reduces the number of job titles and results in a loss of specificity that SSA requires in its disability decision process. The O*NET taxonomy clusters nearly 9,500 DOT job titles into approximately 900 groupings, called occupational units (OUs). Many of the OUs contain a large, heterogeneous mix of jobs with a wide range of required job demands (e.g., strength requirements and skill level). For example, the range of job requirements in one O*NET OU might span several levels of effort: sedentary, light, medium, heavy and very heavy for strength levels. An adjudicator could not determine if the OU reflects work that requires a specific strength level.

Examples of key data aggregation issues involving the use of O*NET include:

- Task lists and occupational requirements for OU do not adequately reflect task lists and requirements for a number of jobs that were folded into that OU.
- Users are unable to discern what constitutes entry-level work from examining, for example, the journeyman-level work within OU. The aggregation of O*NET OUs conceals the true differences among jobs, differences that are central to SSA's ability to assess disability claimants' vocational profiles in terms of the mental or physical limitations resulting from impairments.
- Averaging of tasks combined with the averaging of ratings results in flattened scores. Therefore, in O*NET many occupations seem to require lower or higher ability levels than they might require in actuality. This prevents adjudicators from making accurate comparisons to claimants' residual functional capacity (RFC) to perform past relevant work (PRW) or any other work in the national economy.

These findings imply that an adjudicator who attempts to cite an O*NET OU as possible work that a disability claimant could perform cannot tell if the OU reflects work that is actually performed at the strength and skill level appropriate for the claimant's residual functional capacity and vocational profile.

Job Demands and Measures

Approximately 50 of the more than 200 O*NET descriptors of occupational demands, such as “Standing” and “Sitting” appear to be relevant to the medical-vocational process. In fact, some of these variables, like “Selective Attention” and “Conflict Situations” refer to cognitive and psychosocial demands of work that may be very useful in assessing the medical-vocational profile for claimants with mental impairments. Many of the descriptors in O*NET reflect global, theoretical constructs that are not measured (or reported) in terms of observable manifestations of the construct. Unfortunately, the manner in which the descriptors were developed and measured prevents SSA from readily adopting them for disability determinations. As such, many of the descriptors and their ratings cannot be related to human function, as is necessary in disability adjudication. Therefore, SSA is concerned about the extent to which the descriptors validly and accurately reflect the type and level of functioning required in an occupation. Furthermore, adjudicators cannot use the descriptors reliably to assess a claimant’s ability to perform work.

Examples of job demand and measurement concerns include:

- Many of the descriptors are difficult to observe in the work place and difficult to relate to the claimant or prospective worker. For example, it is unclear how someone might be able to rate the minimum amount of “Static Strength” or “Problem Sensitivity” required to perform a given job. Also, it is unclear as to how an adjudicator would assess the level of “Static Strength” or “Problem Sensitivity” that claimants could perform given their residual functional capacity, and then relate the scores for these descriptors on a given occupation to medical evidence regarding human function.
- Because the measures for O*NET descriptors involve the use of numerical scales rather than interval scales, the user cannot know what the descriptor scores mean in terms of the functional level required to perform the occupation. Scales are also applied unevenly. For example, some descriptors involve scales for which the highest possible score may be a 5; however, the scale spans 1 through 7.
- Uneven scaling may also be related to problems with the anchors. Anchors for the scales, of which many are vague or irrelevant to actual work experience, compromise the reliability of the descriptor ratings. They also compromise the validity of the survey questions used to rate the descriptors because it is uncertain if the survey questions are capturing what they are intended to measure.

Data Collection Issues

A primary concern for SSA regarding the O*NET data collection plans is that the resulting data must provide users with information about the existence and prevalence of representative work at all levels of requirements (i.e., including unskilled and entry-levels, as well as higher levels).

In July 2000, the O*NET development staff asked SSA to review a draft of DOL's request for clearance by the Office of Management and Budget of the O*NET Data Collection Plan.

The nature of the comments made by SSA staff to the O*NET Survey Design team in August 2000 is reflected below:

- There is a need for data regarding unskilled and lower-level work for SSA's use based on the law and regulations.
- SSA would need access to the full range of incumbent and analyst ratings, as well as the mean values of their scores.
- SSA is concerned about the reliability of occupational data provided by job incumbents.
- There is concern regarding the representativeness of samples for large OUs and lower level work.
- There is a need for measures of work requirement levels, regardless of importance rating.

Activities to Address Concerns about O*NET and Obsolescence of DOT

The prospect of the losing the DOT, combined with the problems identified regarding the use of O*NET, has significant legal and programmatic impact for SSA. To negotiate the changes required by the imminent obsolescence of the DOT, SSA is planning several activities to resolve the concerns about O*NET while simultaneously investigating options for updating its medical-vocational policies as well. Because of the complexity of the O*NET concerns and relevant medical-vocational policy issues, SSA staff have focused their efforts in three separate but coordinated tracks of activity. The second track includes the efforts resulting in this final report:

1. Aggregation and data collection issues
 - Involves working with DOL and private professional vocational rehabilitation association members.
2. Demands and measures of work issues
 - Involves working with the Office of Policy and Office of Research and Evaluation (OP/ORES) and the Disability Research Institute (DRI) on the Job Demands project.
 - Involves continued collaboration with experts in the fields of vocational and physical rehabilitation, as well as psychiatric and physical medicine.
3. Medical-vocational policy issues
 - Involves contracted studies of non-medical factors.

Defining the Conceptual Model and Domains of Interest for Identifying Optimal Job Demands

DRI researchers were guided by comments from Richard Balkus (SSA's Office of Disability and Income Assistance Policy) during the course of our activities. Extracted below are comments he provided to help define a conceptual model relevant to the definition of job demands.

Disability Determination within SSA

Validating the list of job demand variables (i.e., assessing the relevance or completeness of these variables) requires determining how the variables fit within the current rules and procedures established for disability determination.

The following brief review of the definition of disability under the Social Security programs and the five-step sequential evaluation process highlights the complex relationship with the use of job demand variables at the different steps in the process. The review further defines the domains of interest for identifying optimal job demands.

The Social Security program uses a stringent test for determining disability. Specifically, section 223(d)(1)(A) of the Social Security Act states:

Disability means the "inability to engage in any substantial gainful activity by reason of any medically determinable physical or mental impairment which can be expected to result in death or which has lasted or can be expected to last for a continuous period of not less than 12 months.

Disability based on blindness is defined in Section 216(i)(1) of the Act and requires that the claimant's corrected vision not be better than 20/200 or that his or her visual field be limited to 20 degrees or less with the best correction.

Under the Act and regulations, a medically determinable physical or mental impairment is defined as an impairment that results from anatomical, physiological or psychological abnormalities, which can be demonstrated by medically acceptable clinical and laboratory diagnostic techniques. The impairment must be established by medical evidence consisting of signs, symptoms, and laboratory findings and cannot be established only by the individual's statement of symptoms.

Section 223(d)(2)(A) further prescribes that an individual will be found disabled only if his or her impairment(s) "are of such severity that he is not only unable to do his previous work but cannot, considering his age, education, and work experience, engage in any other kind of substantial gainful work which exist in the national economy, regardless of whether such work exists in the immediate area in which he lives, or whether a specific vacancy exists for him, or whether he would be hired if he applied for work."

The SSA Five-Step Sequential Evaluation Process

The following five-step sequential evaluation process for evaluating disability claims as stated in the regulations follows the statutory definition.

1. Is the individual engaging in substantial gainful activity?

If the individual is working and his or her work is substantial gainful activity (SGA) as defined in the law and regulations, then the individual is not disabled for Social Security purposes. The amount of monthly earnings considered as SGA depends on the nature of a person's disability. The Act specifies a higher SGA amount for statutorily blind individuals, and the regulations specify a lower amount for non-blind individuals. Both SGA amounts increase with increases in the national wage index. That amount for 2002 is \$780 a month for non-blind individuals. The dollar amount for 2002 for blind persons is \$1,300. Monthly earnings above these amounts usually constitute substantial gainful activity and would direct a finding of not disabled.

2. Does the individual have an impairment or combination of impairments that significantly limits his or her physical or mental ability to do basic work activities?

For an impairment(s) to be found not severe and a direct finding of not disabled at this step, "there must be a slight abnormality (or combination of slight abnormalities) that has no more than a minimal effect on the ability to do basic work activities" (See SSR 96-3p).

The regulations define basic work activities as the abilities and aptitudes to do most jobs. Abilities include walking, standing, sitting, lifting, seeing, hearing, and speaking. Aptitudes include use of judgment and understanding, carrying out, and remembering simple instructions, responding appropriately to supervision, co-workers and usual work situations, and dealing with changes in a routine work setting.

This step, therefore, has relevance to the identification of optimal job demand variables. Within this context, one would expect that basic work activities would be at least a subset of the optimal job demands generated from the methodology being proposed. Such basic work activities (By definition, basic work activities are essential to the performance of most jobs.) should be included in any list of optimal job demand variables, as these can constitute core job demands as well. As core job demands, they become relevant again in evaluating disability at steps four and five of the sequential evaluation process.

3. Does the individual's impairment(s) meet or equal a listed impairment in Appendix 1 to Subpart P of the Regulations Part 404 (Listing of Impairments)?

The Listing of Impairments describes impairments for each body system that are considered severe enough to prevent the person from engaging in any gainful activity. Part A contains medical criteria that apply to evaluating claims for persons 18 and older and Part B contains additional criteria for evaluating claims for persons under age 18. A finding that the claimant's impairment meets the listing requires that the medical records include the medical

criteria for the impairment specified in the listing. A finding of medical equivalence requires that the medical findings for the claimant's impairment(s) are at least equal in the severity and duration of the listed findings. The absence of a listing-level impairment does not direct a finding of not disabled, but requires that the adjudicator to continue evaluating the claim under the fourth step.

The criteria for meeting the listing for certain physical impairments, includes functional limitations that are also relevant job demands. For example, the preamble to the revisions in the musculoskeletal listings notes the importance of evaluating the person's ability to ambulate and perform fine and gross movements effectively on a sustained basis in determining whether the impairment is of listing severity. These revisions parallel changes to other listings, representing more emphasis on evaluating the impact of the impairment on an individual's ability to function and perform any gainful activity.

The current criteria for evaluating mental disorders, found in paragraphs B and C, also indicate the connections between job demand variables and the different steps in the process. In each of the areas of functional limitations, activities or abilities are cited that are relevant to the world of work and, some, by definition, are job demand variables. For example, "concentration, persistence and pace is one of the four areas and refers to the ability to sustain focused attention sufficiently long to permit the timely completion of tasks commonly found in work." The following statement from the introduction to the mental impairment listings clearly recognizes the connection between such functional criteria for the mental impairment listings and the person's RFC, which is determined if a person does not meet or equal a listing. "RFC complements the criteria in paragraphs B and C of the listings for mental disorders by requiring consideration of an expanded list of work-related capacities which may be impaired by a mental disorder when the impairment is severe but does not meet or equal a listed mental impairment."

4. Does the individual's impairments prevent the claimant from performing his or her past relevant work?

This step requires that the adjudicator first determine the claimant's RFC or what he or she can still do despite any physical and mental limitations caused by a medically determined impairment(s) and related symptoms. The RFC is then compared to the physical and mental demands of work that the claimant performed in the last 15 years. If the claimant has the RFC to perform such work, he or she is then found not disabled.

The RFC reflects an assessment of a person's abilities to do the demands of work activities. The regulations cite as examples of physical demands "sitting, standing, walking, lifting, carrying, pushing, pulling, or other physical functions (including manipulative or postural functions, such as reaching, handling, stooping or crouching)." The mental demands of work include "understanding, remembering, and carrying out instructions, and in responding appropriately to supervision, co-workers, and work pressures in a work setting." The regulations also recognize that certain impairments may cause environmental restrictions, which would affect other work-related abilities.

5. Does the individual's impairment(s) prevent him or her from performing other work?

At this final step in the evaluation process, the adjudicator considers the claimant's RFC and his or her age, education, and past work experience to see if he or she can do other work. If the claimant cannot, he or she is judged disabled.

Appendix 2 to Subpart P of Part 404 contains specific numbered table rules (referred to as the "Grid") for use at the fifth step. The rules are laid out in three tables, each of which addresses a particular exertional level. Each table establishes the presence of an occupational base that includes a full range of the unskilled occupations. The base is broadened to include skilled and semi-skilled occupations when the individual has transferable skills. The rules take administrative notice of the approximate numbers of unskilled jobs that exist throughout the national economy. To use a particular rule, the individual must have only an exertional or strength limitation(s) and the vocational factors must match the criteria of a particular rule. Each rule directs a finding of disabled or not disabled. If the claimant has non-exertional limitations (e.g., fine manipulation or postural limitations or mental limitations) or cannot perform the full range of work at a particular exertional level, the rules are used as a framework in the decision-making process.

Each exertional level represents a number of physical job demands. For example,

sedentary work involves lifting no more than 10 pounds at a time or occasionally lifting or carrying articles like docket files, ledgers and small tools. Although a sedentary job is defined as one that involves sitting, a certain amount of walking and standing is often necessary in carrying out job duties. Jobs are sedentary if walking and standing are required occasionally and other sedentary criteria are met.

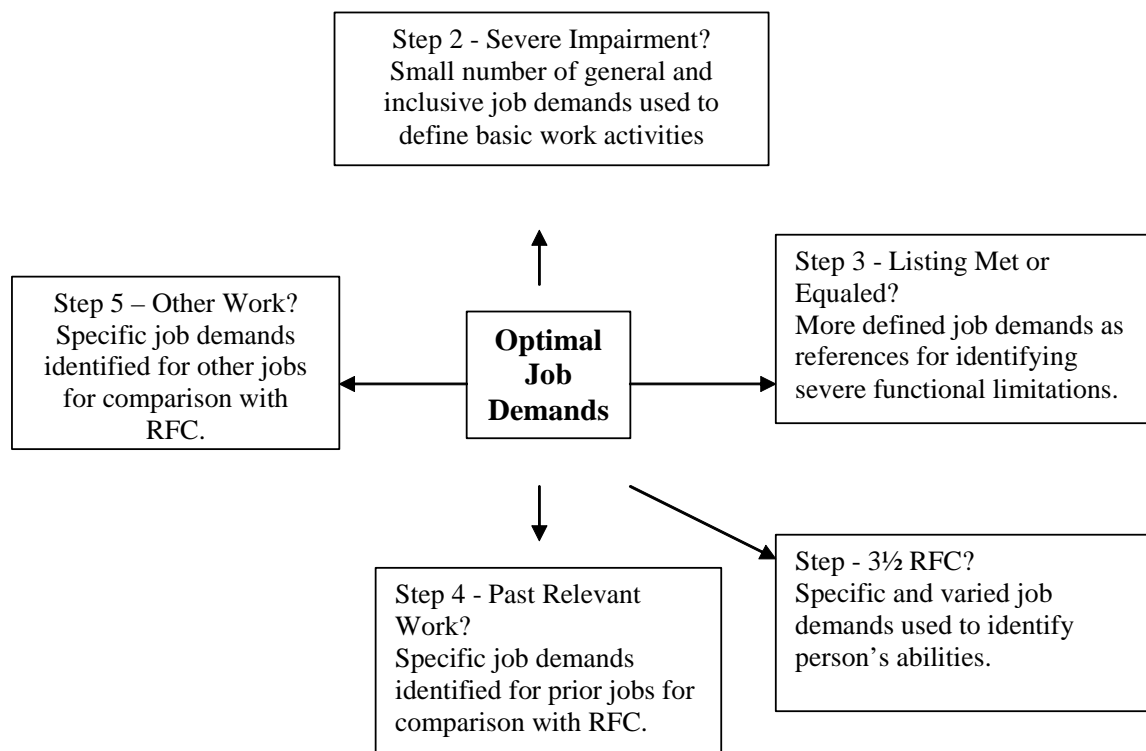
The requirements for each skill level also represent a set of job demands. For example,

semi-skilled work is work that needs some skills but does not require doing the more complex work duties. Semi-skilled jobs may require alertness and close attention to watching machine processes; or inspecting, testing or otherwise looking for irregularities; or tending or guarding equipment, property, materials, or persons against loss, damage or injury; or other types of activities which are similarly less complex than skilled work by more complex than unskilled work. A job may be classified as semi-skilled where coordination and dexterity are necessary, as when hands or feet must be moved quickly to do repetitive tasks.

The above summary of the sequential evaluation process indicates that the reference points for assessing physical and mental abilities are job demands. The basic work activities or core job demands at the second step in the process are further defined and supplemented in the third, fourth, and fifth steps of the process. The second step is a "screen out" process using general and very basic work activities to find claimants with relatively minor impairments who are not disabled. The third step defines the functional limitations required to meet listing-level severity. This step is a "screen in" process, which identifies persons with very severe work-related

limitations that would preclude the likelihood of performing any work. The functional limitations defined in terms of job demands, such as ability to ambulate and perform fine and gross movements, are relevant to the performance of most gainful activity. The fourth and fifth steps move from a screening mode to a more individualized assessment and, therefore, require a more precise measurement of the person’s ability and job demands. Step four requires a specific assessment of the person’s abilities, which also are job demands or can be translated as job demands, and a description of the specific job demands of the person’s past work. Step 5 builds on this individualized assessment by considering the person’s age and education and identifying other jobs with demands consistent with the person’s RFC. At these last two steps, core job demands such as lifting are further defined for specific exertional levels. Threshold requirements result in some job demands defined with greater specificity and with measurements identified as separate job demands. Figure 1.1 summarizes the type of job demand variables at the relevant steps in the process.

Figure 1.1: Job demands in the sequential evaluation process



The use of job demand variables at the different steps in the process defines the domains of interest and points to two criteria for assessing content validity.

First, the variables must represent the essential functions of work. This is important for each of the four steps that include job demand variables. Secondly, the variables should reflect

the demands of a wide range of jobs so that a limitation resulting from a physical or mental impairment would result in the inability to perform a number of jobs or occupations. This is particularly important for the fourth and fifth steps of the process.

Scales for the variables that are appropriately calibrated for evaluation at the different steps of the process can be established.

The disability environment provides clues for identifying two additional criteria for assessing content validity. A major factor is the projected increase in disability claims and the need for the most efficient process possible within expected budget constraints. Another is the ongoing concern about disparities in disability outcomes at and between the different levels of adjudication.

The number of variables is small enough to be manageable in terms of the job analysis required to gather data and in terms of their use in the disability process, as well as large enough to cover the areas of functioning that SSA currently uses in the process.

Disability adjudicators at all levels can readily apply the variables, and the findings using job demand variables improve consistency in decision-making. Disability adjudicators should be able to link the job demand variables to physical and mental impairments (as documented by medical records) and recognize the variables when assessing these impairments and their effects on functioning.

In view of the policies, rules, and needs of SSA with respect to the disability adjudication process, and for the purposes of this research investigation, the domain of interest is defined as follows:

Optimal job demand variables should reflect the demands of a wide range of jobs so that a limitation resulting from a physical or mental impairment that precludes the ability to meet a particular job demand would result in the inability to perform a number of jobs or occupations.

To summarize, the rules and procedures associated with the SSA disability adjudication process must provide the basis for all procedures associated with the identification and validation of job demand variables. As such, all participants in this process (e.g., survey respondents, subject matter expert panel members) should receive standardized instructions that direct their input to the identification or validation of job demand variables. These instructions must establish an accurate and consistent working knowledge of the rules so that the final list of optimal job demand variables is consistent with and supportive of the needs and policies SSA with respect to the disability adjudication process.

The Current Project

The goal of this “Job Demands” Project commissioned by SSA is to develop a methodology to launch an investigation regarding the optimal job demand variables that SSA needs to compare the RFC capacity of claimants for disability benefits with the occupational demands of work. The DRI was asked to recommend one or more approaches and identify the attendant issues that SSA should consider in its investigation of job demand variables that would

be the most useful indicators of the ability to work. A “useful” methodology is one that SSA could use to identify, validate, and calibrate exertional and non-exertional factors that are the most salient and useful indicators of claimants’ ability to meet job demands. The methodology should produce the following results:

1. The number of variables is small enough to be manageable in terms of the job analysis required to gather data and in terms of their use in SSA’s disability process, as well as large enough to cover the areas of functioning which SSA currently uses in its process.
2. The variables are valid indicators representing the essential functions for work. The variables should reflect the demands of a wide range of jobs so that a limitation resulting from a physical or mental impairment that precludes performance of a particular job demand would result in the inability to perform a number of jobs or occupations.
3. Occupational analysts can observe and measure the variables.
4. Thresholds and scales for the variables that are appropriately calibrated so disability evaluation can be established. Such measures should provide a means for comparing individuals’ residual functional capacity in regard to that variable and the minimum level required by any given job.
5. Disability adjudicators can readily apply the variables. Disability adjudicators should be able to link the variables to physical and mental impairments and recognize the variables when assessing these impairments and their effects on functioning.

In its effort to develop one or more methodologies, the DRI was asked to identify examples of variables that meet the above criteria. The goal was to describe variables that capture areas of functional performance relevant to both the occupational requirements in today’s labor market and the current population of persons with disabilities, both as they exist in the United States and with a review of how they might relate to international standards of practice. The DRI was asked to address issues of validity and reliability for the variables that are identified. Completion of this project will allow pilot testing of the proposed methodology in subsequent years.

In accomplishing the project’s goal, the DRI was asked by SSA to evaluate benchmarks used by selected private and public entities that develop or work with occupational databases to determine if there exist methodologies for identifying optimal variables. Salient questions included: How do these entities identify the salient physical and mental requirements for jobs? What measures do they use and how do they address issues of validity and reliability? In conjunction with this investigation, the DRI was charged with considering the usefulness of the occupational databases and related systems and software used by these entities and SSA as the Agency moves forward in considering an approach and product for transitioning from the DOT.

The following issues describe how this Job Demands Project fits within the current strategy to move forward in developing an approach for transitioning from the DOT as the primary source of vocational information.

- Steps 4 and 5 of the sequential evaluation process require more specificity than what DOT's proposed replacement, O*NET, provides. More specifically, the medical-vocational process requires a classification of work in the US economy that is representative of the full range of levels of work in terms of skill level (e.g., entry level through journeyman, supervisory, professional) and in terms of levels of exertional and non-exertional abilities. This means that the jobs must be grouped in a manner that permits enough specificity for users to be able to distinguish between and among the various levels of skill and ability within each occupation.
- SSA's recent evaluation of O*NET for use in the disability determination process reveals three main areas of concern. For two of the areas, SSA is addressing its concerns through collaborative interagency projects with the Department of Labor. These areas involve (1) the aggregation (or grouping) of the former DOT job titles into large occupational units which do not provide the level of specificity described above; and (2) the manner in which occupational data are being collected.
- This Job Demands Project was designed to develop a methodology that helps SSA address the third area of concern: the need for valid job demand variables that can be calibrated for use in evaluating disability.
- The impending obsolescence of the DOT also creates an opportunity for SSA to reevaluate its use of non-medical factors (i.e., age, education, and work experience) in determining whether an individual is unable to work. Another objective of this effort is to explore ways in which SSA could be less reliant on occupational data for addressing these factors.

Methodology

The DRI undertook the following activities to complete this project:

1. DRI completed a literature review and analysis related to the goals of the project, including a prior literature review and an analysis relevant to the project's goal.
2. As part of its literature review and analysis, the DRI investigated public and private entities that collect data on job requirements or demands in addition to using or producing systems or software for delivering the data. We sought to address the following questions:
 - What methodologies do these entities use in identifying the physical and mental requirements for work?
 - What types of scales or ratings exist for measuring these variables?
 - How do these entities approach the issues of validity and reliability?
 - What methods do they use in collecting, updating, and providing the data?
3. The DRI was asked to describe the use of Automated Concept Mapping (ACM) in order to develop methodologies for identifying optimal variables that SSA can use in comparing of disabled claimants with the occupational demands of work. As described in Chapter 3, this procedure allows the expertise of a large sample of

- professionals to be accessed and analyzed in order to identify a hierarchy of minimal core job demands.
4. The DRI investigated how SSA should approach validating job demand variables and setting valid and reliable scales and thresholds appropriate for assessing the ability to work. The validity investigation focused on content and criterion aspects of validity.
 5. The DRI considered the relevance of methodologies utilized for its Medical Listings Validation Project, particularly methodologies that are used to identify physical, mental or social abilities for validating the predictive ability of a listing to indicate an inability to work.¹

Deliverables

The following deliverables evolved into Chapters in this Final Report, originally known as Deliverable 9:

1. A list of articles from the literature search.
2. A report that provides a summary and critical review of pertinent literature on validation criteria including those for validating job demands. (Appendix A)
3. An annotated bibliography of the literature search completed as Deliverable 1. (Appendix C)
4. A preliminary report that describes the methods by which ACM could be used to identify job demands concept maps. (Part of Chapter 3)
5. A summary report on databases and the systems and software that utilize job demand data in evaluating disability or return to work potential. (Appendix B)
6. A report that describes the methodology (or methodologies) developed for identifying the optimal job demand variables. (Chapter 2)
7. A description of the procedures for validating the job demand variables. (Chapter 3)
8. A report of the methods for developing scales, thresholds and rating procedures to assess job demand variables. (Chapter 4)
9. The final report that includes a review and discussion of potential issues, including approaches for SSA to consider in transitioning from the DOT. (This document)

¹ During the course of work on this project, DRI staff realized that, while the Medical Listing Validation Project and this Job Demands Project have complementary objectives, the methodologies for identifying job demands are necessarily distinct from those required to validate the Medical Listings.

Overview of the Proposed Procedures for Identifying Optimal Job Demands

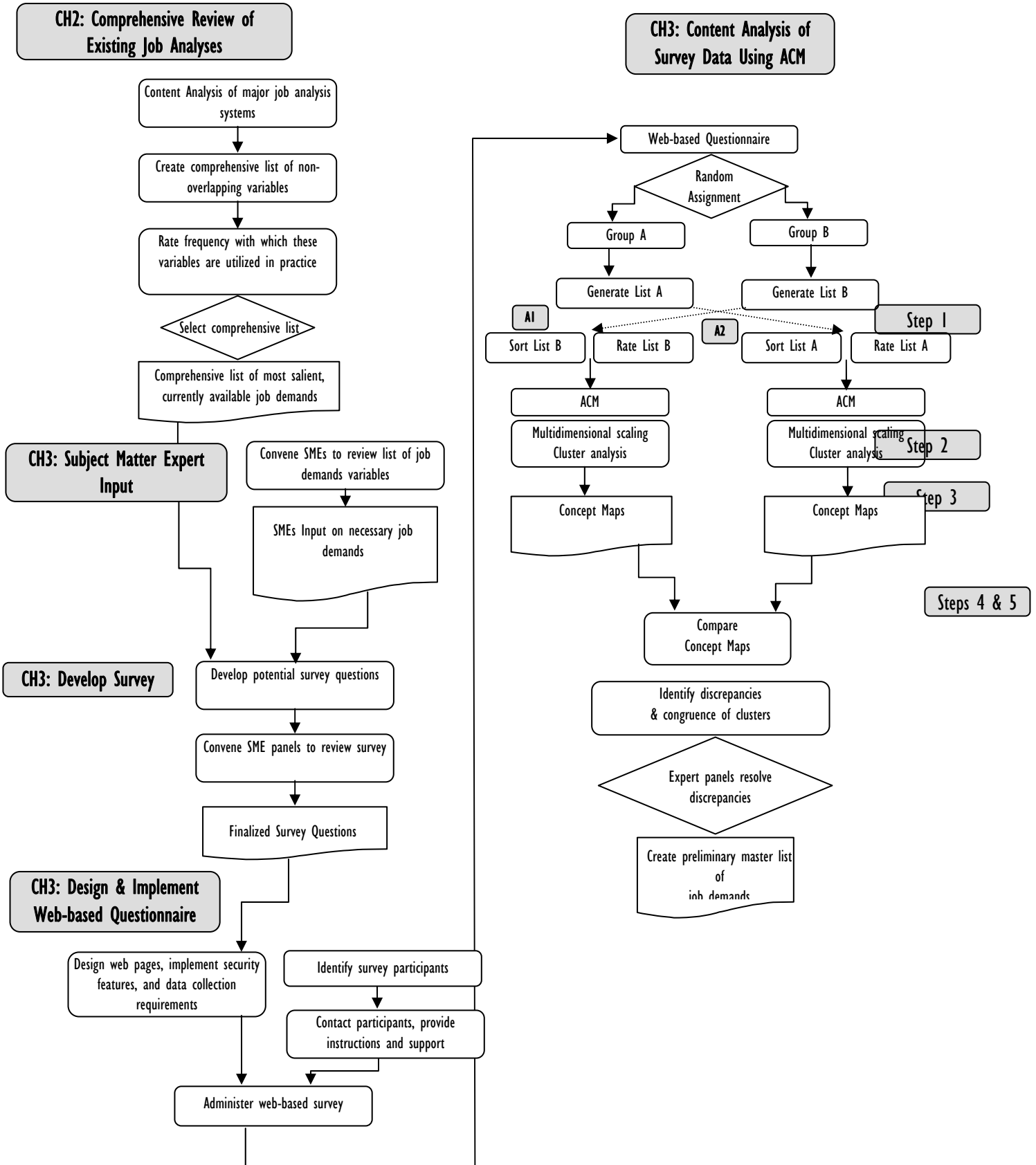
The process of validating job demands involves a number of major steps. These include:

1. Creating a list of job demand variables currently in use
 - a. A comprehensive review of existing job analyses (Chapter 2)
 - b. Subject matter expert input about necessary job demands (Chapter 3)
2. Creating a more comprehensive list that includes the most valuable existing job demand variables and identifies new variables not represented by current job analyses
 - a. Development of a web-based questionnaire to survey relevant parties about optimal job demands (Chapter 3)
 - b. Design and implementation of the web-based survey (Chapter 3)
 - c. Content analysis of the survey data using automated concept mapping (including multi-dimensional scaling and cluster analysis) (Chapter 3)
 - d. Refine the list of job demands and comparing it to existing job demands (Chapter 4)
3. Describing jobs in the economy with this new, comprehensive list of job demand variables
 - a. Develop a job demands questionnaire (Chapter 5)
 - b. Implement a pilot test of the job demands questionnaire (Chapter 5)
 - c. Analyze data from the job demands questionnaire; develop the final item sets (Chapter 6).

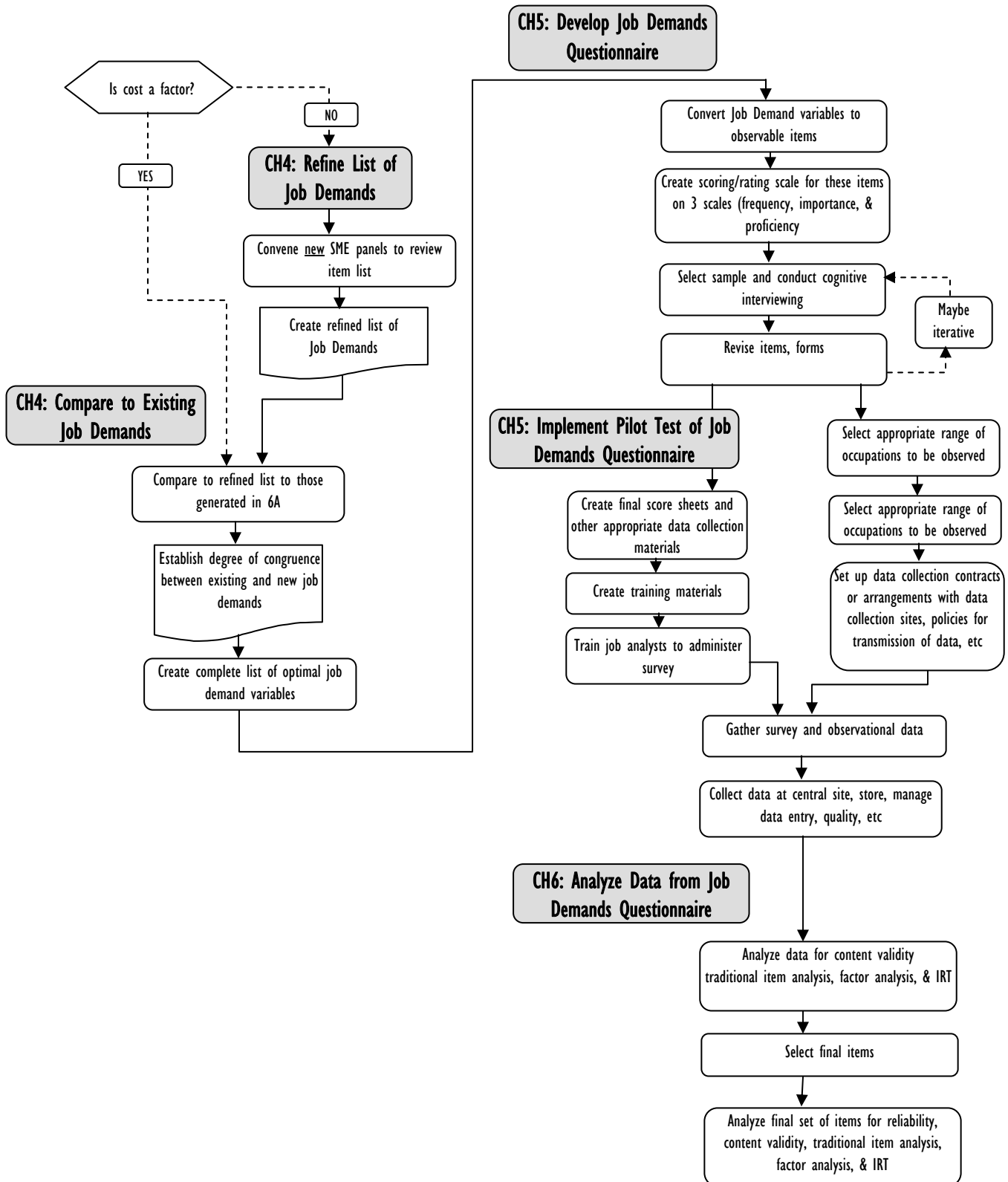
The following flowchart (Figure 1.2) illustrates a proposed methodology for identifying job demands. In addition to outlining the flow of the steps presented above, it also details the significant sub-tasks that must be completed as part of those steps. The flowchart indicates in which chapter the steps and sub-tasks are discussed.

Figure 1.2

Flowchart: Job Analysis Review and Questionnaire Design



Flowchart: Questionnaire Design, Data collection and Validation



Advisory Board and Consultants

Several staff members from the University of Illinois (Chrisann Schiro Geist, Richard Roessler, Tanya Gallagher, Tiffany Neuman, Emer Broadbent, Michael Welge, Duane Sears Smith), Northwestern University and the Rehabilitation Institute of Chicago (Allen Heinemann, Trudy Mallinson, Christine Chen, Hagay Amir, Patricia Taylor, Robert Trieweiler, Maureen Stress, Nicole Thorne), University of Wisconsin – Stout (Karl Botterbusch), and Illinois Institute of Technology (Nambury Raju, Bruce Fisher).

The DRI worked through the Office of Research, Evaluation, and Statistics, collaboratively with the Office of Disability (Sylvia Karman) and the Office of Disability and Income Assistance Policy (Richard Balkus) during the course of this Project.

Chapter 2

Review of Job Analysis Methodologies

The primary objective of this chapter is to review job analysis methodologies in order to identify optimal job demand variables. This review of the current literature identifies the best of existing approaches to job analysis as they relate to the disability determination process and to also identify where new methodologies might be needed. To this end, we have conducted a critical review and evaluation of existing major job analysis approaches and methodologies. Each methodology and approach has been evaluated in terms of one or all of the following criteria: a) demonstrated reliability, b) demonstrated validity, c) potential usability, and d) practicality in its application to identify optimal job demand variables. For explanatory purposes, we present a discrete evaluation of each method. In practice, several methods are usually used in conjunction with one other to ensure a comprehensive definition of job content and context.

Job demand variables can be represented as the human attribute requirements demanded (i.e., essential to job performance) in a job or job family. Based on a review of the job analysis literature, these attribute requirements can be organized into five domains: physical, psychomotor, sensory, cognitive, and psychosocial (Fleishman, 1975, 1982, 1992).

Optimal job demand variables are reflected by those human attributes that are considered relevant (i.e., important) to job performance across a wide range of jobs in the world of work. In an effort to design a job analysis methodology that is both easily and effectively applied for the purpose of disability determinations, optimal job demand variables should be parsimoniously structured and clearly defined to represent key attribute requirements that exist across a range of job families. Job demand variables that are relevant to a small microcosm of jobs would not be included, since these would likely result in a more complex structure of variables, while adding little utility in application.

Our evaluation of methodologies for the identification of optimal job demand variables has considered all commonly used job analysis methodologies, including:

- Review of job materials,
- Direct observation,
- Job performance,
- Interviews,
- SME panels,
- Critical incidents,
- Functional job analysis,
- Task inventories,
- Standardized job analysis systems/questionnaires.

Specifically, our evaluation included an analysis of five of the most widely researched and frequently utilized job analysis systems/questionnaires, which included: The Common Metric

Questionnaire, Fleishman-Job Analysis Survey, Occupational Analysis Inventory, O*NET, and Position Analysis Questionnaire.

Each methodology and approach was evaluated in terms of the extent to which it has demonstrated reliability, validity, and usability (practicality) in identifying job demand variables, with particular reference to applications relevant to the needs of SSA (e.g., establishing job families, enabling disability determination). On this basis, recommendations are made with regard to methodologies that show the most promise for use by SSA in building a structure and database for job demand variables that will be effective in making valid disability determinations under the SSDI and SSI programs.

To the extent that all existing methodologies have some limitations for this application, a new approach (ACM) is considered as a complement to other recommended approaches. Thus, we recommend a multi-faceted approach, which takes advantage of recent advances in technology (e.g., Internet) and data analytic techniques.

Level 3 Review of Job Materials

A variety of source materials are frequently used to define job demands. These materials include:

Job descriptions:

Organizations' job descriptions frequently describe job demands as a basis for defining selection requirements for individual positions/jobs in an organization. However, in terms of adopting job descriptions as source data for identifying optimal job demands, their narrative format and lack of consistency in data language present problems. Further, the purpose for which job descriptions have been developed varies. As a result, job descriptions are often incomplete and inadequate for some uses (Jones, Hulbert, & Haase, 1953). Their utility as a basis for identifying optimal job demand variables is highly questionable.

Dictionary of Occupational Titles (DOT) descriptions:

DOT descriptions were derived from functional job analysis interviews (U.S. Department of Labor (DOL), 1991) conducted by occupational analysts in U.S. Employment Services offices. The DOT provides a standardized format, which describes over 13,000 jobs in terms of ratings on dimensions of people, data and things. In addition, ratings are provided on approximately 60 job demand variables (e.g., aptitudes, interests, temperaments, physical demands, and working conditions). Estimates of test-retest reliability of these ratings are generally above .70 (Cain & Green, 1983), and internal consistency estimates of reliability of ratings generally exceed .80 (Geyer, Hice, Hawk, Boese, and Brannon, 1989). Still, there are a number of potentially serious problems with the use of DOT descriptions/ratings as a basis for identifying optimal job demand variables. Most of the demand variables have not been updated since the mid-1970's and most of the data refer to work requirements in the mid-1960's (National Research Council, 1980). Changing work demands

resulting from growth in information processing occupations and team-based work are not likely to be represented accurately. Finally, the time and expense involved in updating the DOT has prompted the DOL to develop a replacement and, as a result, DOT data will become increasingly outdated. On this basis, sole reliance on DOT data may not be an acceptable methodology for identification of optimal job demands variables.

Training manuals and related materials:

A review of training manuals and related job materials can provide an effective source of input to job analysis through which inferences can be made regarding job demands. However, the unstandardized nature of these materials makes it difficult to employ as a key job analysis methodology for identifying optimal job demand variables.

Direct Observation

Direct observation of incumbents' job performance is appropriate for jobs that require primarily manual, standardized and short-cycle tasks. In such situations, and where job analysts are trained to use a standardized format for documenting observations (e.g., functional job analysis; Fine, 1989), reasonably high reliabilities can be expected. However, it is an inappropriate methodology for jobs that require substantial mental activity (Cascio, 1991; Fisher, 2002). While direct observation may be a useful building block for additional job analysis methodologies, it is seldom sufficient, and it cannot be recommended as the sole methodology for identifying optimal job demand variables.

Performance

Job performance is an appropriate job analysis methodology under circumstances where job analysts can readily learn to perform the job. Similar to direct observation, this methodology is usually appropriate for jobs that require primarily manual, standardized and short-cycle tasks, and inappropriate for jobs requiring substantial mental activity. Again for manual tasks, where job analysts are trained to use a standardized format for documenting observations (e.g., functional job analysis; Fine, 1989), reasonably high reliabilities can be expected. Still, because of its limited applicability across the universe of jobs, job performance cannot be recommended as an independent methodology for identifying optimal job demand variables.

Interview

The job analysis interview with job incumbents and/or supervisors is probably the most widely used job analysis methodology. As a check of information obtained, it is important to interview more than one incumbent, as well as the immediate supervisor who knows the job. With the use of a structured interview guide, the interview can provide valid and reliable data regarding job demands (McCormick, 1979). Further, it is considered more broadly applicable

than the observation and performance methods. The interview has been used as a source of data for the development of many other methodologies, including critical incidents, task inventories and standardized questionnaires. As a stand-alone methodology, it is acceptable for limited applications. However, the time-intensive nature of the process and the need for trained interviewers suggest that it is not an appropriate as a sole methodology for a large scale process designed to identify optimal job demand variables across numerous job families.

Subject Matter Experts (SME) panels

Panels of SMEs, typically composed of six to eight individuals, are often utilized as a job analysis methodology. In these situations, it is important that the SMEs are representative of various types of expertise. For within organization applications, both incumbents and supervisors are included. For cross-organization applications, incumbents and supervisors may be joined by trained job analysts from diverse fields (industrial/organizational psychology, rehabilitation psychology). It is also important that SME panels represent diversity in terms of race, gender, age, and disability. SME panels can provide an effective vehicle for identifying job demands, and this is accomplished through questionnaires and/or panel interviews. SMEs are encouraged to discuss issues and disagreements openly and to work toward consensus. Regardless of the approach to data collection, SME input should be captured through carefully developed instrumentation and psychometric analysis (Hughes & Prien, 1989). Inter-rater reliability is an appropriate method for evaluating data quality. For the purpose of identifying optimal job demand variables, SME panels show some promise, particularly if panels are established to review specific job families of which they have great knowledge. Within this context, SME panels could be effectively utilized as a source of data review and integration following broader data collection efforts.

Critical incidents

The critical incident approach involves collecting behavioral examples (typically from job incumbents and supervisors) that describe particularly good or poor performance. The emphasis on observable behaviors yields particularly good job analysis data, which can be translated into job demand variables. It is considered a highly useful technique when used in conjunction with other methodologies (Page & Van De Voort, 1989). There are, however, serious limitations in its potential use for identifying optimal job demand variables across a broad range of jobs. First, it is a very costly technique, since hundreds of critical incidents must be gathered to represent a single job family. Further, the emphasis on critical incidents, which are designed to represent exceptionally good and poor performance, overlooks behaviors associated with “average” performance and may, on this basis, fail to identify many routine job demands. In view of these factors, the critical incidents methodology would not be appropriate for a broad scale project to identify optimal job demands across a range of job families.

Functional Job Analysis (FJA)

FJA defines the exact tasks of a specific job or occupation. FJA is based on the premise that every job requires a worker to function in relation to Things, Data and People (factors) in varying degrees. (Appendix A presents additional detail regarding the way in which FJA analyzes the structure of work.) A level is determined for each of the three areas for each worker function. A measure of emphasis was developed by assigning percentages to weight each factor. The level at which a worker functions in relationship with Things, Data and People together with the weights form a functional profile. FJA has been shown to result in reliable and valid ratings of functional job analysis scales (Bernotavicz & Huff, 1988, Levine, Maye, Ulm, & Gordon, 1997; Schmitt, & Fine, 1983). This notwithstanding, FJA is a costly, time-intensive methodology that may not be the most efficient approach for large-scale analysis of multiple job family.

Task inventories

Structured surveys of job tasks enable a quantifiable analysis of job content. These task inventories are typically developed for individual jobs or job families as a list of tasks or job activities, which have been identified through interviews and/or observations. Respondents (e.g., incumbents, supervisors, job analysts) typically rate each task in terms of time spent (or frequency) and importance. Test-retest reliabilities for these data have been reported at or above .70 (Christal, 1974). While this methodology is highly effective for many personnel applications, it is a very expensive and time-consuming process to develop a task inventory. In addition, this methodology is not an effective method for discerning worker/behavioral requirements of jobs. In view of these limitations, the task inventory method is not recommended for use in a large-scale analysis of job demands across a range of job families.

Standardized job analysis systems/questionnaires

Standardized job analysis systems/questionnaires have been a preferred approach to large-scale job analysis for many years. As a result, there is a plethora of standardized job analysis questionnaires available for use by qualified job analysts. There is also a wealth of data regarding job demand variables, which can be distilled from these questionnaires. Data across a variety of standardized questionnaires indicate good reliability and validity. A comprehensive review of all standardized job analysis instruments is not practical. However, a review of the most widely used and well-researched questionnaires may yield great insight into the most reliable, valid and useful methods for defining job demands for a range of job families. On this basis, the next section presents an evaluation of five standardized questionnaires, which are among the most frequently cited instruments used in research and practice in the United States, including Common Metric Questionnaire (CMQ), Fleishman's Job Analysis Survey (F-JAS), Occupational Analysis Inventory (OAI), O*NET (Occupational Network Information), Positional Analysis Questionnaire (PAQ).

Review of Job Analysis Systems/Questionnaires

This section provides a critical review of five popular job analysis systems. In addition, to a review of development procedures, content domains, orientation, reliability, validity, and usability/practicality, Appendices A - E present a comprehensive summary of the structure for job demand variables utilized by each of these methods. These data may provide an effective foundation for identification of optimal job demand variables.

Common Metric Questionnaire (CMQ)

Development

The CMQ was developed to address some of the limitations its author identified with existing job analysis questionnaires. To do this, the author conducted an analysis of what was effective in other methods and settled on the PAQ and Job Element Inventory (JEI, Cornelius & Hackel, 1978) as generally effective instruments. These two instruments were factor analyzed to extract both general-purpose work dimensions, as well as managerial work dimensions. The resulting dimension categories were combined to form the 3 main categories (i.e., interpersonal dimensions; decision making/information processing activities; and physical, mechanical, and contextual aspects of work). Items were then written for each of the dimensions (Harvey, n.d.).

Content Domains

The CMQ includes 80 general work and managerial activities that were derived from the PAQ and JEI. These 80 general work and managerial activities map into three main categories. These categories are interpersonal dimensions; decision making/information processing; and physical, mechanical, and contextual aspects of work.

Reliability Evidence

The analysis included 904 occupational titles and evaluated the reliability of the 80 CMQ scales. The internal consistencies of the scales were generally acceptable. The median internal consistency for CMQ scales that included at least 6 items was .86.

Validity Evidence

Criterion related validity was demonstrated through a stepwise regression methodology to evaluate the relationship between items on the CMQ dimensions and pay as well as exempt status. Results yielded a multiple R of .86 for pay and .74 for exempt status. It should be noted that the stepwise regression methodology looked only at the best predictors from the pool of 80 items and as a result all items were not included in either of the final regression equations.

Content and construct validity were not directly assessed, though the CMQ dimensions were based on dimensions directly extracted from the existing PAQ and JEI measures. As a result we can infer content and construct validity based on the evidence for the PAQ and JEI.

Demonstrated Application The CMQ is useful in describing both exempt and non-exempt positions as well as predicting compensation. The measure also has the potential to provide the necessary information to create a comprehensive occupational database.

Usability Information The purpose in developing the CMQ was to create a tool that was more behaviorally based than other job analysis questionnaires and more easily understood by raters. The CMQ can be completed in 2 hours or less by untrained job incumbents or supervisors. Additionally, the items were written at an 8th grade reading level.

Fleishman Job Analysis Survey (F-JAS)

Development Most of the 52 ability constructs included in the Fleishman Job Analysis Survey (F-JAS) come from several comprehensive literature reviews, which present repeated linkage of a specific ability to job task performance. Hence, the F-JAS is based on a well-researched criterion/ performance foundation. The lists of abilities were analyzed and reevaluated by subject matter experts and industrial psychologists for various jobs. These revisions were made in an iterative fashion, until the refinement appeared to result in operationally viable definitions and descriptions of each category yielded high inter-rater agreement (Fleishman & Mumford, 1991).

Content Domains The F-JAS is a job analysis tool based on 52 items, which assess physical, sensory, psychomotor, cognitive, and social/interactive abilities, as well as job skills and knowledge.

Orientation/Focus The F-JAS consists of behavioral anchored rating scales that assess job related abilities. The social/interactive dimension and the job skill/knowledge dimension are more recent developments. These add a focus on the interpersonal and job-specific skills and knowledge to the Fleishman's job analysis method.

Reliability Evidence Studies on the F-JAS are quite comprehensive (Fleishman & Mumford, 1991, Fleishman 1992). Inter-rater reliability

coefficients across ability ratings have generally been good. Some studies reported them to range from the mid .80s to mid .90s. Other studies list supervisor-incumbent coefficients of .80 to .90, supervisor-job analyst coefficients in the .mid 60s to mid .70s, and incumbent- job analysis coefficients in the mid .60s.

Validity Evidence

Research investigating the validity of the F-JAS has concentrated on establishing internal validity evidence as well as construct validity evidence. Research has shown that the ability taxonomy can account for 70% to 85% of the tasks that are required for a specific job. When introducing the job knowledge and skill dimension an additional 10-15% of the tasks can be correctly classified. Research generally concludes that the content of the ability taxonomy carries good validity (Fleishman & Mumford, 1991). Hence, tasks can be assigned to ability categories in an interpretable and meaningful fashion. Further, by investigating ability constructs to one-another and across different task requirements, evidence of convergent and discriminate validity has been reported.

Evidence of external validity has also been established. It has been found that ability ratings can be generalized across work site locations, establishing cross-validity evidence. Ability ratings have also been linked to empirically derived task performance ratings, giving evidence for criterion related validity. Ability scale ratings have predicted performance ratings with a multiple correlation of .35 up to .80 (concurrent and predictive design). Overall, it appears that there is good evidence for the content, construct, and criterion related validity of the F-JAS ability dimensions.

Demonstrated Application

The F-JAS appears to find its application in the creation of job families, the selection of incumbents, and performance appraisals. One of its strengths is the possibility to use the ability rating scale for the determination of job-related ability requirements. This aspect of the F-JAS makes it a good candidate for the development of disability scores related to various jobs.

Usability / Practicability

The F-JAS is a relatively brief questionnaire, which is easily understood and administered. As mentioned earlier, it appears that one of the F-JAS major advantages is the possibility to calculate job and task specific ability scores. Such ability score could potentially be linked to the definition of disability levels across jobs.

Occupational Analysis Inventory (OAI)

Development

The Occupational Analysis Inventory (OAI) was developed for use as a taxonomic tool, through deriving a broad set of human work dimensions (factors) based on a questionnaire, and establishing some degree of construct validity for the resultant dimensions. 602 OAI work elements (items) were subjected to several factor analyses based on the ratings of 1,414 jobs on the elements and ratings of the elements on their requirements for 102 defined human attributes. The resultant factors were significantly related to the tested abilities of relevant jobholders. It was concluded that job-rating factors should be fairly reflective of the various types of work activities and conditions extant in the world of work and unique in their coverage of information relevant to occupational, education, and career decision making (Cunningham, Boese, Neeb, & Pass, 1983).

Content Domains

The OAI was designed to yield more specific job information than other multi-job questionnaires such as the PAQ while still capturing work requirements for virtually all occupations. The major categories of items are five-fold: (1) Information Received, (2) Mental Activities, (3) Work Behavior, (4) Work Goals, and (5) Work Context. OAI respondents rate each job element on one of four rating scales: part-of-job, extent, applicability, or a special scale designed for the element. The OAI has been used to gather information on 1,400 jobs selected to represent five major occupational categories (Parry-Hill, 1975).

Orientation/Focus

The OAI is an instrument containing work elements describing work activities and conditions on which jobs and occupations are rated (Parry-Hill, 1975). OAI describes occupations in terms of work activities and conditions, and attribute-requirement estimates characterizing occupation in terms of various human requirements (Cunningham, 1972).

Reliability Evidence

The most utilized methodology for evaluating reliability of the OAI is inter-rater reliability (Parry-Hill, 1975; Cunningham et al, 1983). Empirical work has been completed to evaluate the reliability and validity of the OAI (Cunningham et al., 1983). A study of the reliability of OAI ratings was conducted using 12 job analysts and 21 trained psychology graduate students who rated 215 jobs using written task descriptions from the U.S. Employment Service. Correlations were computed between two independent raters for each OAI work element. The mean correlation was .53 and the median was .56. Another source states that reliabilities

obtained with the OAI have been moderate, somewhat lower than those achieved with the PAQ (Source: <http://www.hr-guide.com/data/G012.htm>). However, when shortening of the OAI was attempted (going from 622 to 229 items) the inter-rater reliabilities from four raters over 150 jobs were substantial (Parry-Hill, 1975).

Validity Evidence

Several studies aimed at evaluating the construct validity of the OAI have been conducted, including the comparisons of clusters of occupations obtained with the OAI on several tests and inventories (68 of the 92 measures showed statistically significant discrimination between the clusters), the prediction of mean occupational scores on the General Aptitude Test Battery using OAI factor scores, (median cross-validated multiple correlations were .60 for mental and .24 for motor abilities), bivariate correlations between OAI attribute-requirement estimates and mean scores of job incumbents (statistically significant correlations at the .05 level were found for 38 of 55 analyses), and analyses of variance to relate OAI need-requirement estimates to job satisfaction scores (12 of 15 analyses provided supporting evidence) (Cunningham, 1972; Cunningham, et al, 1983). In addition, OAI ratings were performed on written job descriptions of a 1,414 representative job sample (Boese & Cunningham, 1975). Eight separate sections of OAI elements were factor analyzed, and the resultant first-order factors were, in turn, subjected to an overall (higher-order) factor analysis. These analyses produced 132 first-order and 28 general higher-order work dimensions, which are readily interpretable and meaningful. Analyses of factorial stability derived from two subsamples of 707 jobs each indicated some degree of stability in the derived work dimensions. It was concluded that the OAI dimensions should be broadly representative of the kinds of activities and conditions existent in the world of work.

Demonstrated Applications The OAI is designed to be especially relevant to occupational education and guidance. In addition, many studies have evaluated the OAI in terms of hierarchical job families or clusters (Boese & Cunningham, 1975; Pass & Cunningham, 1975). A hierarchical cluster analysis produced 21 macro clusters, which subsumed 88 micro clusters. Subsequent modifications of the structure expanded the major clusters to 25 and reduced the micro clusters to 47. Statistical analyses of the macro clusters showed moderate to substantial within-cluster homogeneity, intercluster discriminability, and cluster stability (Pass & Cunningham, 1977).

Usability/Practicality

The OAI shows generally excellent measurement characteristics, when it is applied in the recommended manner--using college educated, trained analysts (Boese & Cunningham, 1975; Cunningham, 1972). Most of the reported empirical work has been conducted using "paper jobs," that is, written job descriptions from the U.S. Employment Service. It is not clear that it would work as well if used in the field by job incumbents, supervisors, or other occupational experts, many of whom would not be college-trained or be available for special training on the OAI.

The analysis of work represented by the OAI and the General Work Inventory (GWI, Cunningham & Ballentine, 1982) demonstrates well the utility of a descriptive system designed to be applied to the general population of occupations, but still retaining enough specificity to provide meaningful differentiations between occupations, to link to assessments of persons, and to form useful occupational structures based on the information obtained from the system. (Source: http://books.nap.edu/html/occup_analysis/app_B.html).

Occupational Information Network (O*NET)

Development

The O*NET was developed as a replacement of the DOT which was designed as a structured approach to describing occupations. This approach builds on, but is distinct from the F-JAS and is therefore included here as a separate system. The O*NET expanded on the features of the DOT by including multiple windows (i.e., different ways of describing a particular occupation and the world of work in general), a common language, and taxonomies and hierarchies of occupational descriptors. These basic principles as well as existing literature on job analysis guided the development of the O*NET content model (Peterson et al., 2001).

Content Domains

The content model of the O*NET includes six domains: worker characteristics, worker requirements, experience requirements, occupational requirements, occupation-specific requirements, and occupational characteristics.

Reliability Evidence

Peterson, Borman, Hanson, and Kubisiak (1999) looked primarily at inter-rater agreement coefficients as a measure of reliability. Reliability coefficients for 10 raters ranged from .45 to .86 with the majority of coefficients at or above .70 and estimated reliability coefficients for 30 raters ranged from .83 to .95.

Validity Evidence

Construct validity was assessed using 2,487 respondents within 29 different occupations with each occupation ranging in number of respondents from 19-264 individuals. The analysis looked at the extent to which similar domains from the O*NET correlated with similar and dissimilar constructs. The resulting relationships supported the construct validity of the instrument (i.e., that similar domains and work behaviors correlated positively and dissimilar domains and work behaviors exhibited low or negative correlations).

Demonstrated Applications

The O*NET was developed as a means to identify, define, and classify occupations and provide a searchable database that individuals can use to understand occupations and make determinations as to the person-occupation fit based on a variety of domains.

Usability Information

While the measure itself is rather lengthy and actually contains several questionnaires, it seems to be very user friendly. The website offers a simple way to find occupations of interest based on individual differences such as work values or interests. This can be done by anyone with a basic knowledge of Internet navigation.

Position Analysis Questionnaire (PAQ)

Development

As a foundation for development of the PAQ, interviews with job incumbents and observations of performance in a wide variety of jobs were conducted. On this basis, the PAQ's predecessors (e.g., Checklist of Work Activities, Palmer & McCormick, 1961; Work Activity Profile, McCormick, Gordon, Cunningham, & Peters, 1962; and previous forms of the PAC McCormick, Jeanneret, & Mecham; 1971) were developed. More information regarding its development can be found in McCormick (1979) and McCormick and Jeanneret (1988).

Content Domains

The PAQ is a 195-item structured interview that has received extensive research. Its content framework is defined by six major content domains including: Information Input, Mental Processes, Work Outputs, Relationship with Other Persons, and Job Context. These content domains can be subdivided into 45 job dimensions.

Orientation/Focus

In order to assess a comprehensive amount of job components, the PAQ focuses primarily on job behaviors. Based on six different types of rating scales the interviewer is able to assess a behavior's

extent of use, importance to the job, amount of time, possibility of occurrence, applicability, and item specificity. Task specific information can be gathered based on pre-interview preparation. Results of the PAQ interview can be linked to job-specific KSA based on extensive research on general aptitude measures such as the General Aptitude Test Battery (GATB) and others.

Reliability Evidence

Evidence for its reliability has been well established (Taylor & Colbert, 1978; Frieling, Kannheiser, & Lindberg, 1974). Inter-rater reliabilities are rather good. The mean inter-rater reliability for different analysts is .68 (range: .35 to .95). The mean inter-rater reliability for the same analyst is .78 (range: .45 to .95). Reliability coefficients for the job dimension scores range from .60 (low quartile) up to .99 (high quartile).

Validity Evidence

Extensive research on the PAQ has indicated evidence for its validity (PAQ Technical manual, 1989). Several exploratory and confirmatory factor analyses have validated the conceptual structure of the 195 items and 45 job dimensions. Through the use of general aptitude tests, the PAQ's job component validity (synthetic criterion) has been well established. The PAQ's job dimensions and individual items have been related to several constructs of the GARB, reflecting job component validity.

Demonstrated Application

Research has confirmed its utility for areas such as job family development, selection, performance appraisal, job evaluation, compensation, and the prediction of exempt status.

Usability / Practicability

Previous comparisons have put the PAQ on top of the list regarding its usability and practicability (Levin, Ash, Hall, & Sistrunk, 1983; McCormick & Jeanneret, 1988). Some disadvantages, however, include a high reading level and its attendant need for rater/interview specialists. Such specialists need to be well trained and compensated. Preparing and conducting the interview takes about 3-4 hours on the interviewer side and 3-4 hours on the interviewee side. Extensive preparation before and after the interview appears to be important for the job analysis process. Some findings suggest that it is best suited for blue-collar rather than professional, managerial, and technical jobs.

A Critique of Existing Job Analysis Systems

Fleishman's research on JAS started with the development of a taxonomy of abilities underlying the world of work (Fleishman, 1975, 1982; Fleishman & Quaintance, 1984). The initial taxonomy consisted of 52 cognitive, physical, psychomotor, and sensory abilities. It was later expanded to include social-interactive abilities, job skills, and knowledge (Fleishman,

1992). This taxonomy has a strong research base and is very highly regarded by the professional community. In fact, McCormick et al. (1972) and Cunningham et al. (1983) used earlier versions of Fleishman's taxonomy as a basis for developing lists of attributes for the PAQ and OAI job analysis systems, respectively. Despite its strong psychometric foundation, the JAS taxonomy of abilities is somewhat old and may require significant updating to reflect jobs in the current economy, especially the dot com industry. Furthermore, JAS has not been applied to a large number of jobs in the US economy to generate an occupational database (National Research Council, 1999). (It should be noted that, while the number of jobs assessed with Fleishman's taxonomy is limited, there is information on the minimal levels of abilities required for successful performance on the jobs analyzed with the JAS. Thus, there is work here that may be leveraged later in the process of establishing thresholds for the job demand variables as related to the disability adjudication process.) There are, however, a number of factors that limit the applicability of the F-JAS for the disability determination process including: the global theoretical nature of Fleishman's descriptors and a lack of a sufficient occupational database.

As job analysis systems, PAQ and OAI have much in common in terms of their philosophy, development, item content, and score reports, except that OAI has more items and has a lower reading level than PAQ. Both systems report job level information on aptitudes, with 67 aptitudes for PAQ and 103 aptitudes for OAI. While some of these aptitudes are comparable in meaning to Fleishman's abilities, they are not empirically derived as Fleishman's abilities were. The aptitudes in PAQ and OAI were based on prior research by other investigators (e.g., Fleishman, 1975; French, Ekstrom, & Price, 1963) and on the information contained in the DOT. Several Division 14 (Society for Industrial and Organizational Psychology) members of the American Psychological Association (APA) and some psychology graduate students rated the relevance of each aptitude to each of the items in the PAQ. Only psychology graduate students were involved in rating the relevance of the aptitudes in the OAI. The fact that the aptitude ratings did not directly relate to specific jobs makes it very difficult to justify the use of these lists of aptitudes as constituting the job demand variables for use by SSA. These aptitudes along with Fleishman's ability taxonomy, however, may serve as prompts in the proposed methodology and/or as a basis for validating an independently derived list of job demand variables within the context of this project.

Harvey's CMQ is a job analysis system similar to the OAI in terms of its orientation and behavioral specificity. The psychometric assessment of CMQ was based on data generated from over 4500 positions involving more than 900 occupational titles. Job incumbents provided much of the data. Factor analysis of these data resulted in 80 dimensions. The dimension scores have proven to be highly predictive of mean aptitude scores reported in the DOT. Unlike PAQ and OAI, CMQ currently does not have any provision for aptitude ratings. This severely restricts the use of CMQ as the basis for generating job demand variables in making valid disability determinations. However, some of the experimental methods used for assessing the psychometric quality, as well as the establishment of a common metric, of CMQ may prove valuable in the proposed methodology.

The most recent of the job analysis systems reviewed in this chapter is O*NET. It was developed as replacement for the DOT. O*NET was developed as a means to identify, define, and classify occupations and provide a searchable database for exploring occupational potential. A major contribution of O*NET is the development of cross-job descriptors that offer a common

language to describe different jobs. This was achieved at the price of specificity, typically required in many applications of job analysis data (Peterson et al., 2001). An important consequence of this development is that the 12,000 job titles in the DOT are now classified into about 900 O*NET occupational units. While O*NET allows for gathering job specific information, it must be done at the occupational unit level. This transition from individual jobs to occupational units makes it very difficult for SSA to obtain detailed, specific information about jobs, especially those that have low physical/mental/skill requirements (Karman, 2002). Industrial/Organizational (I/O) and Rehabilitation Professionals have raised questions about the psychometric quality (the use of holistic rating scales for rating abilities and other constructs, the size and representativeness of jobs used for gathering psychometric data, and levels of inter-rater reliabilities) of O*NET (Harvey & Wilson, 1998). The reported reliability and other psychometric data were based on only 29 (out of 80 sampled) occupations (Peterson et al., 2001), raising questions about the stability and generalizability of these results. Suffice it to say, these limitations (especially the lack of specificity at the job level) have led to the current project for identifying optimal job demand variables for use in disability determinations.

The five instruments (F-JAS, PAQ, OAI, CMQ and O*NET) discussed thus far are job analysis systems. In addition, McCroskey's Vocational Quotient System (MVQS) is a computer program designed to provide job-person matching, transferable skills analysis, values, needs, vocational interest and personality reinforcer type indicator, and earning capacity estimation (McCroskey, 2001). Additional information about MVQS is provided in Appendix B. While MVQS is not a job analysis system in the traditional sense, some may look upon this as a mechanism for generating job demand variables. For example, the transferable skills component of MVQS provides ratings of jobs on a scale from 0% to 97% in terms of transferable skills. This implies that MVQS has information on the needed skills or abilities for each job and the extent to which these skills/abilities are transferable across jobs. The information that MVQS uses in making these transferable skill projections are the data from DOT, which are considered outdated, and the data on O*NET, occupational units, which are known to be unreliable. In addition, the transferable skill ratings are analytically derived, lacking empirical verification of these projections. While a recent study has offered support for the transferable skill projections (Grimley, Williams, Hahn, & Dennis, 2000), there is still a need for more empirical verification of the MVQS predictions, prior to seriously considering it (MVQS) as a mechanism for generating job demand variables.

In summary, there are several reasons for conducting a separate study for generating job demand variables for SSA's use in disability determinations. Some of the important reasons are: (a) Existing job analysis systems do not sufficiently address the needs of SSA in assessing the RFC of claimants for the purpose of determining disability, (b) with the exception of O*NET, the available job analysis inventories (and their derived job demand variables) may not adequately reflect the fast changing world of work, especially the dot-com industry; while O*NET is a new system, its serious deficiencies in meeting the needs of SSA are well known (Harvey & Wilson, 1998; Karman, 2002), and (c) recent advances in measurement technology (Muraki & Bock, 1996; Hambleton, Swaminathan, & Rogers, 1991; Lord, 1980; Wright & Master, 1982; Wright & Stone, 1979,) allow for a more precise assessment and simultaneous calibration of jobs and job demand variables on a common metric. This proposed study/methodology is described in the next chapter.