

Phase IV Paper

Identifying SSA's OIS Standards: Scientific

Introduction

The Social Security Administration (SSA) is developing a new occupational information system (OIS) to serve SSA's unique disability adjudication needs. We have developed a Research and Development (R&D) Plan identifying a range of activities that we must undertake to create a useful and supportable OIS. As the agency must base its OIS development on sound empirical grounds, a key preliminary step involves identification of the general scientific standards that will guide our development activities.¹

The purpose of this paper is to identify those overarching standards, guidelines, or requirements that will guide our OIS R&D activities to ensure that we meet applicable Federal requirements pertaining to scientific integrity. Our work addressed the following questions:

1. What scientific standards do the Federal regulations or guidelines require that are applicable to our development of an OIS for the agency's disability programs?
2. Beyond Federal standards, do the following sources identify additional scientific standards that are applicable globally to technically relevant activities involved in the development of an OIS for our use?
 - professional organizations or associations
 - relevant scientific literature
 - internal and external experts

We present the final results of our examination of these questions in a compilation of relevant, overarching scientific standards incorporated in this document.

Background

For many years, SSA has relied on the Dictionary of Occupational Titles (DOT) as a source of occupational information in its disability adjudication process. However, the Department of Labor (which authored the DOT) has not significantly updated the DOT in more than 20 years. As a result, it contains occupational information that is outdated and incomplete for our purposes. We have determined that revising the DOT or using its successor, the Occupational Information Network (O*NET), or other existing OISs are not adequate solutions to our need for

¹ Upon our completion of the R&D phase of OIS development, we will examine the applicability of other scientific standards that may be relevant for carrying out post-R&D work that will facilitate the application of OIS data in SSA's programs.

current and reliable occupational information. Therefore, in 2008 we initiated an effort to develop our own OIS tailored specifically for use in disability adjudication.

To obtain expert advice on the development of its OIS, we established the Occupational Information Development Advisory Panel (the Panel) to obtain recommendations regarding “the research design of the OIS, including the development and testing of an OIS content model and taxonomy, work analysis instrumentation, sampling, and data collection and analysis.” We also established an internal OIS Workgroup consisting of representatives of various agency components to provide advice and assistance on the project.

The development of a new OIS is a highly complex endeavor that involves a wide range of R&D activities, including design and development of an extensive data collection and analysis process. All of these activities present major technical and operational challenges. To help ensure that we are able to address these challenges successfully, we must apply appropriate scientific standards. The importance of such standards is tied to the need for the agency to have an OIS that is legally supportable.² For example, although legal supportability entails multiple elements, one such element involves the need for SSA to demonstrate that its OIS decisions were not arbitrary and capricious. To the extent that we base our development of the OIS on clear scientific standards, we will be able to demonstrate that our decisions were neither arbitrary nor capricious. We are also basing our emphasis on scientific standards on the recognition of the technical or methodological limitations identified in other national OISs. For example, assessments performed by the National Academy of Sciences (NAS) and other researchers several decades ago pointed to substantial weaknesses in some of the methods used to develop the DOT.³ Similarly, our own reviews of the O*NET as well as assessments made by the Panel have identified the limitations of that OIS with regard to the agency’s technical and programmatic needs.

Methodology

To identify relevant scientific standards, we:

- consulted with internal and external experts and stakeholders to identify scientific standards, guidelines, or best practices in their respective fields that could provide a scientific framework for OIS R&D.
- conducted a wide-ranging literature review pertaining to scientific standards, encompassing academic literature (particularly in the I/O field), government

² We have developed a set of OIS standards related to legal supportability. See Phase IV paper “Identifying SSA’s OIS Standards: Legal”.

³ National Research Council, Committee on Occupational Classification and Analysis, *Work, Jobs, and Occupations: A Critical Review of the “Dictionary of Occupational Titles”*, National Academy Press, Washington, D.C., 1980; Cain, Pamela S., & Treiman, Donald S. (1981). *The Dictionary of Occupational Titles as a Source of Occupational Data*, *American Sociological Review*, Vol. 46, No. 3, pp. 253-278

publications, and documents developed or collected for other SSA OIS project activities, including Panel reports, papers written by an internal I/O expert, and documents describing standards applied by other OISs.

Consultation with experts and stakeholders

We consulted with experts and agency stakeholders at various stages of this activity including our preliminary planning, design, data gathering and analysis, and report preparation phases (i.e., Phases I, II, III, and IV of the OIS Business Process). The external experts included the following members of the Panel who have extensive research and social scientific backgrounds:

- Mary Barros-Bailey, Ph.D., Bilingual Rehabilitation Counselor, Vocational Expert, Life Care Planner, Intermountain Vocational Services, Inc.
- Shanan Gwaltney Gibson, Ph.D., Assistant Professor of Management, East Carolina University
- H. Allan Hunt, Ph.D., W.E. Upjohn Institute for Employment Research
- Abigail Panter, Ph.D., L.L. Thurstone Psychometric Laboratory, Department of Psychology, University of North Carolina
- Juan Sanchez, Ph.D., Department of Management and International Business, College of Business Administration, Florida International University
- David Schretlen, Ph.D., Department of Psychiatry and Behavioral Sciences, The Johns Hopkins University School of Medicine

We also obtained comments on a draft list of scientific standards from an expert who works under contract with the agency (for other agency projects unrelated to the OIS):

- Michael Wiseman, Ph.D., Research Professor of Public Policy, Public Administration, and Economics, George Washington Institute of Public Policy, The George Washington University

We consulted with members of our OIS Workgroup, which includes representatives from the following SSA components:

- Office of Retirement and Disability Policy/Office of Disability Programs
- Office of Disability Adjudication and Review/Office of the Chief Administrative Law Judge

- Office of Disability Adjudication and Review/Office of Appellate Operations
- Office of Operations/Office of Disability Determinations
- Office of Quality Performance
- Office of the General Counsel

In our consultations with experts and stakeholders, we sought advice on:

- particular scientific standards, requirements, guidelines, and best practices that they believed were globally applicable to SSA's R&D process
- sources of information that may be worthwhile for SSA to review in our effort to identify globally applicable scientific standards, requirements, guidelines, and best practices
- our proposed approach and methods for identifying scientific standards
- the relation of scientific standards we identify as part of this activity to the standards and methods we will ultimately develop and apply when carrying out specific OIS R&D activities

Literature review

Through our review, we sought to identify standards that have been:

- issued by Federal agencies
- established by major scientific institutions or organizations, such as the National Academies
- established by national professional bodies
- representing common, accepted practice within a field (as presented in major instructional texts or prominent articles)
- identified or applied by organizations or agencies during the development of other occupational information systems
- recommended to the agency for its development of a new OIS (e.g., identified in Panel reports or in internal working papers)

The literature review for our investigation of scientific standards consisted of the following steps: construction of search terms, an online literature search, a review of literature found,

and documentation and summarization of findings. We consulted with internal and external experts to help identify relevant search terms and specific sources. We also reviewed existing documents developed for the OIS project for additional search terms and sources. We then conducted the online literature search for OIS project activities and other search terms by four categories: (1) laws/regulations, (2) standards, (3) guidelines, and (4) best practices. Search engines and/or specialized databases used included Google (General and Scholar) and EBSCO Host (Academic Search Premier and Business Source Premier). We employed a “snowball” search strategy; i.e., when we identified possible source documents, we examined them for mention of additional relevant sources, and we then conducted a further search. The search terms used, either individually or in combination, included the following:

- occupational information system
- occupational information system standard
- occupational information system guideline
- occupational information system best practice
- scientific standards
- scientific guidelines
- scientific requirements
- Federal government scientific standards
- Federal government scientific guidelines
- Federal government scientific requirements
- Federal government research standards
- Federal government research guidelines
- Federal government research requirements
- job analysis
- taxonomy development
- content model development
- test development

- instrument development
- data management
- sampling
- sampling design
- data collection
- surveys
- reliability
- interrater reliability
- evaluation
- program evaluation
- factor analysis
- rating scale development
- usability standards

We also examined the results obtained from another extensive literature review conducted for the OIS project.⁴ This review examined more than 40 documents on the subject of work analysis including academic journal articles, book chapters, dissertations, and SSA OIS working papers. Excluding the internal working papers, the various articles, book chapters, and dissertations were primarily obtained using academic databases and search engines (e.g., academic source complete, EBSCO, and PsycInfo). Within these databases, keyword searches were performed using the following terms:

- content Model
- model Development
- test Development
- content Validation

⁴ We conducted this literature review to support development of an OIS work taxonomy, but it was wide-ranging in terms of its coverage of key documents pertaining to OIS development and work analysis.

- psychometrics
- work analysis
- job analysis
- taxonomy development

We obtained the articles identified from peer-reviewed journals including:

- Personnel Psychology
- Journal of Applied Psychology
- Academy of Management
- Applied Measurement in Education
- International Journal of Selection

Synthesis of Consultative and Literature Review Information

We summarized the results of our literature reviews and then reviewed these results in light of the input we received from experts and stakeholders. Based on this review and further deliberation with agency OIS team members and Panel members, we refined our criteria for selection of OIS scientific standards and then identified relevant standards based on those criteria. We provided a draft list of OIS scientific standards to the experts and Workgroup members for their review and conducted a final review of the draft standards based on the comments we received. The results presented below represent the end product of that effort.

Results

We present the principal results of our effort to identify relevant scientific standards in the list below. However, in examining the list of standards and identifying their possible application to the agency's OIS development, we uncovered several key issues regarding the purpose and nature of standards for the development of an OIS for the agency's use. We explain our findings below.

Overarching vs. Specific Standards

Use of the term "standards" with regard to their application in scientific (and, in particular, social scientific) efforts is highly variable and not well defined. In scholarly and other publications, the term is often used interchangeably with other terms such as "requirements"

or “guidelines.” In this paper, we define scientific “standards” as requirements, criteria, or guidelines that are authoritative due to either:

- the actual legal authority that an entity (e.g., a Federal agency such as the Office of Management and Budget) may have to issue, and enforce compliance with, such standards.
- the widespread use or recognition of a given set of guidelines as legitimate in relevant communities of practice.

While we recognize that application of the term “standards” necessarily entails judgment, we believe that the rationale we provide for adopting the standards we have identified (below) explains our reasoning.

We also make a key distinction between standards that are general and overarching in their scope and application versus those that are more specific in that they are applied selectively to a single or limited set of OIS scientific activities. For purposes of identifying our OIS scientific standards, we focused on the former for two reasons. First, we are still in the early stages of OIS development. Therefore, these standards will provide both broad, overarching criteria and a coherent, comprehensive framework for our design and execution of R&D activities. Second, we cannot make decisions regarding more specific requirements and methods for particular OIS activities in advance of carrying out the in-depth examination and analyses needed for those activities. Thus, this paper does not attempt to identify and prescribe more detailed scientific requirements or standards nor to formulate specific methodological decisions (e.g., selection of a particular methodological approach the agency should apply to an R&D activity). But the overarching scientific standards identified in this paper will serve to provide the broader framework within which we will make those more specific decisions.

Sources of Scientific Standards

We can derive scientific standards from two primary sources. One major source may be governmental authorities that mandate or encourage adherence to a particular set of standards as a means of ensuring accountability or compliance with legal and policy requirements. Such standards typically take the form of guidelines identifying criteria, steps, and processes that Federal agencies must consider and apply when conducting scientific activities. In fact, various entities of the Federal government have established requirements and guidelines to help ensure that agencies carry out scientific activities (e.g., data collection and analysis) in a rigorous and transparent manner. The Office of Management and Budget (OMB)—which is the Federal executive branch office that has responsibility for issuing government-wide policies pertaining to key areas of government financial and program management—is the primary issuer of these standards. However, other Federal agencies whose role involves establishment of cross-cutting standards, such as the Office of Science and Technology (OST), or agencies that exercise research, oversight, or advisory responsibilities, such as the Government

Accountability Office (GAO), may also issue standards. And agencies such as SSA may also issue their own standards to ensure compliance with established requirements.

Academic communities and the professional organizations that often represent academic disciplines or practitioners who must apply concepts and practices identified through scholarly work are another source of scientific standards. For example, the field of Industrial/Organizational (I/O) Psychology has generated a wide range of scholarship and methods that pertain to the development of occupational information and the analysis of work. Researchers may identify standards through a review of the resulting academic literature (e.g., professional journals) or of publications (e.g., handbooks or textbooks) that synthesize such literature.

The OIS standards we present in this paper represent those issued by Federal executive branch agencies and do not include standards derived from academic and professional sources or from other Federal agencies where the standards address specific methods or procedures⁵. There are three reasons for this result. First, as a Federal agency, we are required to comply with Federal (executive branch) standards.⁶ Second, our review of relevant literature and discussion with experts indicate that no “gold” standards—and no single, comprehensive source of potential standards—exist for the type of research and development activities (i.e., in the field of I/O psychology as applied to occupational information and job analysis) that we must engage in to develop a new OIS. Instead, the literature presents a number of competing perspectives on scientific approaches and methods that we may consider using to develop, collect, analyze, and organize occupational information.⁷ Finally, as discussed in the prior subsection, the standards issued by the Federal government are much more in line with the types of overarching standards that we want to establish as a broad framework for OIS R&D work. In

⁵ An example of guidelines intended for more specific application include the U.S. Government Accountability Office (1991). *Designing evaluations* (PEMD 10.1.4). Washington, D.C.: author. Retrieved from http://www.gao.gov/special.pubs/10_1_4.pdf

⁶ Although, as noted earlier, the GAO is also a Federal agency that issues scientific standards, it is not an executive branch agency. Therefore, we have not included their guidelines among our scientific standards. However, executive branch guidelines may refer to GAO standards either explicitly or implicitly, and the application of executive branch standards may entail consideration of the types of standards issued by GAO.

⁷ Of course, a significant body of literature pertaining to these issues does exist as well as publications that attempt to compile or synthesize current practices or findings in the I/O field. For example, the American Psychological Association’s *Handbook of Industrial and Organizational Psychology* presents a wide range of information regarding both the theory and practice of I/O psychology (including a chapter on work analysis). As SSA carries out its R&D activities, we will conduct the necessary reviews and consultations to identify relevant sources of information regarding specific scientific approaches that will allow us to meet the overarching Federal scientific standards.

contrast, academic sources tend to focus on more particular, limited applications of specific methods and are not applicable globally for OIS development.⁸ Of course, in the process of implementing the applicable Federal guidelines, we must consider and apply methods and approaches that conform with generally accepted professional or social science standards.⁹

OIS Scientific Standards

Our OIS R&D scientific standards consist of the following:

1. Information Quality Act (IQA) and associated OMB guidelines

Purpose:

The IQA (sometimes referred to as the “Data Quality Act”) refers to an amendment of the Paperwork Reduction Act (PRA) that was included in the Treasury and General Government Appropriations Act for Fiscal Year 2001 (P.L. 106-554). That amendment required OMB to *"provide policy and procedural guidance to Federal agencies for ensuring and maximizing the quality, objectivity, utility, and integrity of information (including statistical information) disseminated by Federal agencies."* OMB issued final IQA guidelines for federal agencies that became effective in January 2002.¹⁰

Content:

Among the basic principles, standards, and requirements identified by OMB in its guidelines are the following:

- Agencies are required to adopt a basic standard of quality (including objectivity, utility, and integrity) as a performance goal and incorporate information quality criteria into their information dissemination practices. Agencies must develop a process for reviewing the quality of information before it is disseminated.
- Standards of quality should vary based on the type of information disseminated. “Some government information may need to meet higher or more specific information quality standards than those that would apply to other types of government information. The more important the information, the higher the quality standards to which it should be

⁸ We recognize that there are many academic publications that provide broad, general guidance on a wide range of analytic and methodological approaches (e.g., textbooks on program evaluation methods). However, our intent was to avoid pointing to such sources as standards because the information presented in these sources can be considered as basic knowledge required of anyone who may be deemed qualified to conduct scientific work. In contrast, we consider the information presented in Federal scientific guidelines to be a distillation of such knowledge that is tailored to the needs of Federal agencies.

⁹ Federal scientific standards are not established in opposition to those recognized or applied in academic and professional communities. Instead, the Federal standards reflect, and sometimes explicitly refer to, academic and professional standards.

¹⁰ http://www.whitehouse.gov/omb/FEDREG_final_information_quality_guidelines/

held ...” However, OMB recognized that “information quality comes at a cost” and therefore advised agencies to weigh the costs and benefits of higher information quality.

- Data and analytic results need to be subjected to formal, independent, external, agency-sponsored peer review of acceptable objectivity. The peer review process must meet standards for transparency and competency issued by OMB.
- Agencies must ensure “transparency about data and methods to facilitate the reproducibility of such information by qualified third parties.” OMB explained that this requirement would help facilitate assessment by others of the extent to which an agency’s results are dependent on its “specific analytic choices.”
- Agencies are required to establish a process by which external parties can seek to have information corrected to the extent that the information does not comply with the OMB guidelines.

2. SSA Information Quality Act (IQA) guidelines

Purpose:

In compliance with the OMB requirements, the agency issued its own “Information Quality Guidelines” along with procedures for affected persons seeking correction of information disseminated by the agency.¹¹ These guidelines necessarily adhere closely to the IQA definitions and requirements identified by OMB, although SSA does attempt to frame IQA-related issues in terms of its particular activities and requirements.

Content:

In its IQA guidelines, the agency identified requirements and processes that it would apply to ensure compliance with the act:

- Regarding information utility, the agency states that it “will keep informed of information needs through active and ongoing contact with the user community and provide vehicles for user input...” This will include “convening and attending conferences, conducting user surveys, working with advisory committees, and sponsoring outreach activities.” The agency also notes that its “information dissemination process will make information products widely available and broadly accessible.”
- Regarding information objectivity, the agency states that:
 - “Analytic reports will be prepared by subject specialists who use sound statistical and analytic methods and are knowledgeable about the data sources and models being used.”
 - “Analytical techniques will be reviewed to ensure that they are appropriate for the data and the analysis to which they are applied and they will be documented.”

¹¹ <http://www.ssa.gov/515/>

SSA adds that, "Reports and studies that are considered to be more technically complex and are likely to have a greater impact are also reviewed by external technical committees to provide additional perspective and expertise."

- "Surveys sponsored by SSA will be conducted using methodologies that are consistent with generally accepted professional standards for all aspects of survey design and implementation."
- Regarding information transparency and reproducibility, the agency says that it will make the information it disseminates "as transparent as possible so that they can, in principle, be reproducible by qualified individuals." The agency also notes that "products that are deemed to have a greater impact on public policies are subject to more extensive internal review and, where appropriate, review by external technical panels prior to release."

3. OMB Quality Bulletin for Peer Review

Purpose:

Issued under the IQA, this bulletin¹² establishes government-wide guidance aimed at enhancing the practice of peer review of government science documents. Peer review is an important procedure used by the scientific community to ensure the quality of published information. Peer review can increase the quality and credibility of the scientific information generated across the Federal government. The bulletin establishes that important scientific information will be peer reviewed by qualified specialists before the Federal government disseminates it. The use of a transparent process, coupled with the selection of qualified and independent peer reviewers, should improve the quality of government science while promoting public confidence in the integrity of the government's scientific products.

Content:

The bulletin includes guidance to Federal agencies on what information is subject to peer review, the selection of appropriate peer reviewers, opportunities for public participation, and related issues. The bulletin also defines a peer review planning process that will permit the public and scientific societies to contribute to agency dialogue about which scientific reports merit especially rigorous peer review. OMB recognizes that different types of peer review are appropriate for different types of information. Therefore, OMB grants agencies broad discretion to weigh the benefits and costs of using a particular peer review mechanism for a specific information product. OMB leaves the selection of an appropriate peer review mechanism for scientific information to agency discretion.

This bulletin also applies stricter minimum requirements for the peer review of highly influential scientific assessments, which are a subset of influential scientific information. A scientific assessment is an evaluation of a body of scientific or technical knowledge that typically synthesizes multiple factual inputs, data, assumptions, models, and/or applies best

¹² http://www.whitehouse.gov/omb/memoranda_fy2005_m05-03

professional judgment to bridge uncertainties in the available information. To ensure that the bulletin is not too costly or rigid, these requirements for more intensive peer review apply only to the more important scientific assessments disseminated by the Federal government.

Even for these highly influential scientific assessments, the bulletin leaves significant discretion to the agency formulating the peer review plan. In general, an agency conducting a peer review of a highly influential scientific assessment must ensure that the peer review process is transparent by making available to the public the written charge to the peer reviewers, the peer reviewers' names, the peer reviewers' report, and the agency's response to the peer reviewers' report. The agency selecting peer reviewers must ensure that the reviewers possess the necessary expertise. In addition, the agency must address reviewers' potential conflicts of interest (including those stemming from ties to regulated businesses and other stakeholders) and independence from the agency. This bulletin requires agencies to adopt or adapt the committee selection policies employed by the National Academy of Sciences¹³ when selecting peer reviewers who are not government employees. Those that are government employees are subject to Federal ethics requirements.

4. OMB Standards and Guidelines for Statistical Surveys

Purpose:

In conformance with the framework established by the IQA, this document¹⁴ provides 20 standards that apply to Federal censuses and surveys whose statistical purposes include the description, estimation, or analysis of the characteristics of groups, segments, activities, or geographic areas in any biological, demographic, economic, environmental, natural resource, physical, social, or other sphere of interest.¹⁵ The standards also cover the development, implementation, or maintenance of methods, technical, or administrative procedures, or information resources that support such purposes. In addition, these standards apply to censuses and surveys that agencies use in research studies or program evaluations if the purpose of the survey meets any of the statistical purposes noted above. To the extent they are applicable, these standards also cover the compilation of statistics based on information collected from individuals or firms (such as tax returns or the financial and operating reports required by regulatory commissions), applications/registrations, or other administrative records.

¹³ National Academy of Sciences, "Policy and Procedures on Committee Composition and Balance and Conflicts of Interest for Committees Used in the Development of Reports," May 2003: Available at: <http://www.nationalacademies.org/coi/index.html>.

¹⁴ http://www.whitehouse.gov/sites/default/files/omb/inforeg/statpolicy/standards_stat_surveys.pdf

¹⁵ For our OIS, we will consider using a variety of data collection methods including questionnaires, interviews, and on-site observation by trained job analysts. While the title of these OMB guidelines refers to "surveys," the issues addressed in the guidelines are relevant for each of these methods of data collection.

Content:

OMB divides these standards and guidelines into seven sections as follows:

SECTION 1 – DEVELOPMENT OF CONCEPTS, METHODS, AND DESIGN

Survey Planning: Agencies initiating a new survey or major revision of an existing survey must develop a written plan that sets forth a justification, including: goals and objectives; potential users; the decisions the survey is designed to inform; key survey estimates; the precision required of the estimates (e.g., the size of differences that need to be detected); the tabulations and analytic results that will inform decisions and other uses; related and previous surveys; steps taken to prevent unnecessary duplication with other sources of information; when and how frequently users need the data; and the level of detail needed in tabulations, confidential microdata, and public-use data files.

Survey Design: Agencies must develop a survey design, including defining the target population, designing the sampling plan, specifying the data collection instrument and methods, developing a realistic timetable and cost estimate, and selecting samples using generally accepted statistical methods (e.g., probabilistic methods that can provide estimates of sampling error). Any use of nonprobability sampling methods (e.g., cut-off or model-based samples) must be justified statistically and be able to measure estimation error. The size and design of the sample must reflect the level of detail needed in tabulations and other data products, and the precision required of key estimates. Agencies must maintain documentation of each of these activities and resulting decisions in the project files.

Survey Response Rates: Agencies must design the survey to achieve the highest practical rates of response--commensurate with the importance of survey uses, respondent burden, and data collection costs--to ensure that survey results are representative of the target population and can therefore be used with confidence to inform decisions. Agencies must conduct nonresponse bias analyses when unit or item response rates or other factors suggest the potential for bias to occur.

Pretesting Survey Systems: Agencies must ensure that all components of a survey function as intended when implemented in the full-scale survey and that measurement error is controlled by conducting a pretest of the survey components or by having successfully fielded the survey components on a previous occasion.

SECTION 2 – COLLECTION OF DATA

Developing Sampling Frames: Agencies must ensure that the frames for the planned sample survey or census are appropriate for the study design and that they evaluate the frames against the target population for quality.

Required Notifications to Potential Survey Respondents: Agencies must ensure that for each information collection instrument they clearly state the reasons they plan to collect the information; the way they plan to use such information to further the proper performance of the functions of the agency; whether responses to the collection of information are voluntary or mandatory (citing authority); the nature and extent of confidentiality to be provided, if any

(citing authority); an estimate of the average respondent burden together with a request that the public direct to the agency any comments concerning the accuracy of this burden estimate and any suggestions for reducing this burden; the OMB control number; and a statement that an agency may not conduct and a person is not required to respond to an information collection request unless it displays a currently valid OMB control number.

Data Collection Methodology: Agencies must design and administer their data collection instruments and methods in a manner that achieves the best balance between maximizing data quality and controlling measurement error while minimizing respondent burden and cost.

SECTION 3 – PROCESSING AND EDITING OF DATA

Data Editing: Agencies must edit data appropriately, based on available information, to mitigate or correct detectable errors.

Nonresponse Analysis and Response Rate Calculation: Agencies must appropriately measure, adjust for, report, and analyze unit and item nonresponse to assess their effects on data quality and to inform users. Agencies must compute response rates using standard formulas to measure the proportion of the eligible sample represented by the responding units in each study, as an indicator of potential nonresponse bias.

Coding: Agencies must add codes to collected data to identify aspects of data quality from the collection (e.g., missing data) in order to allow users to appropriately analyze the data. Codes added to convert information collected as text into a form that permits immediate analysis must use standardized codes, when available, to enhance comparability.

Data Protection: Agencies must implement safeguards throughout the production process to ensure that they avoid disclosing survey data.

Evaluation: Agencies must evaluate the quality of the data and make the evaluation public (through technical notes and documentation included in reports of results or through a separate report) to allow users to interpret results of analyses, and to help designers of recurring surveys focus improvement efforts.

SECTION 4 – PRODUCTION OF ESTIMATES AND PROJECTIONS

Developing Estimates and Projections: Agencies must use accepted theory and methods when deriving direct survey-based estimates, as well as model-based estimates and projections that use survey data. Agencies must calculate and disseminate error estimates to support assessment of the appropriateness of the uses of the estimates or projections. Agencies must plan and implement evaluations to assess the quality of the estimates and projections.

SECTION 5 – DATA ANALYSIS

Analysis and Report Planning: Agencies must develop a plan for analyzing survey data prior to the start of a specific analysis to ensure that they use statistical tests appropriately and that they have adequate resources to complete the analysis.

Inference and Comparisons: Agencies must base statements of comparisons and other statistical conclusions derived from survey data on acceptable statistical practice.

SECTION 6 – REVIEW PROCEDURES

Review of Information Products: Agencies are responsible for the quality of information that they disseminate and must institute appropriate content/subject matter, statistical, and methodological review procedures to comply with OMB and agency Information Quality Guidelines.

SECTION 7 – DISSEMINATION OF INFORMATION PRODUCTS

Releasing Information: Agencies must release information intended for the general public according to a dissemination plan that provides for equivalent, timely access to all users and provides information to the public about the agencies' dissemination policies and procedures including those related to any planned or unanticipated data revisions.

Data Protection and Disclosure Avoidance for Dissemination: When releasing information products, agencies must ensure strict compliance with any confidentiality pledge to the respondents and all applicable Federal legislation and regulations.

Survey Documentation: Agencies must produce survey documentation that includes those materials necessary to understand how to properly analyze data from each survey, as well as the information necessary to replicate and evaluate each survey's results. Survey documentation must be readily accessible to users, unless it is necessary to restrict access to protect confidentiality.

Documentation and Release of Public-Use Microdata: Agencies that release microdata to the public must include documentation clearly describing how the information is constructed and provide the metadata necessary for users to access and manipulate the data. Public-use microdata documentation and metadata must be readily accessible to users.

5. OMB Questions and Answers When Designing Surveys for Information Collections

Purpose:

OMB issued this guidance to assist agencies and their contractors in preparing Information Collection Requests (ICRs), commonly known as PRA submissions or "OMB clearance packages," for surveys used for general-purpose statistics or as part of program evaluations or research studies.¹⁶ The Paperwork Reduction Act of 1995 requires that Federal agency information collections employ effective and efficient survey and statistical methodologies appropriate to the purpose for which the information is to be collected. It further directs OMB to develop and oversee the implementation of Government-wide policies, principles, standards, and guidelines concerning statistical collection procedures and methods.

This guidance document provides details about the OMB review process, assistance in strengthening supporting statements for information collection requests, and advice for

¹⁶ http://www.whitehouse.gov/sites/default/files/omb/infocreg/pmc_survey_guidance_2006.pdf

improving information collection designs. OMB wrote the guidance for a wide audience to improve the quality of Federal surveys and statistical information.

Content:

This document uses a question and answer format to help illuminate the specific standards and requirements of the PRA. It addresses issues that frequently arise in OMB reviews, including:

- Scope of information collection (e.g., purpose, frequency, and estimated time and cost of data collection).
- Data collection methods (e.g., surveys, case studies, focus groups)
- Data collection modes (e.g., face-to-face or telephone interviewing; mail or computer questionnaire)
- Sampling considerations (e.g., census vs. sample survey; sampling frames; sample size)
- Questionnaire design (e.g., developing questionnaire items; pretesting instrument)
- Statistical standards (e.g., statistical definitions and classifications)
- Respondent participation and data confidentiality (e.g., agency requirements to notify and ensure protection)
- Response rates and participation incentives (e.g., acceptable response rates; nonresponse bias; justification for incentives to improve participation)
- Analysis and reporting (e.g., formulation of analysis plans identifying specific methods used to produce results; review of methods applied)

6. *OMB Guidance on Facilitating Scientific Research by Streamlining the Paperwork Reduction Act Process*

Purpose:

Among the primary purposes of the PRA is to “ensure the greatest possible public benefit from and maximize the utility of information created, collected, maintained, used, shared and disseminated by or for the Federal Government” and to “improve the quality and use of Federal information to strengthen decision-making, accountability, and openness in Government and society.” Federal agencies play a critical role in collecting and managing information to promote openness, increase program efficiency and effectiveness, reduce burdens on the public, and improve the integrity, quality, and utility of information to all users within and outside the government.

Pursuant to the Open Government Directive, OMB issued a memorandum¹⁷ on Dec. 9, 2010 that addresses the question of whether and how the PRA applies in the context of scientific research. OMB notes that scientific research is essential to achieving a broad range of national goals, and government-sponsored science plays an important role in developing solutions to our most pressing problems. This document explains how to streamline and simplify the PRA

¹⁷ <http://www.whitehouse.gov/sites/default/files/omb/memoranda/2011/m11-07.pdf>

process in the context of such research and reflects OMB's efforts to work collaboratively with agencies to promote open government.

Content:

This memorandum consists of three parts. First, it explains that the PRA does not apply to certain kinds of scientific research such as collections that are neither "sponsored" nor "conducted" by the agency. Second, it describes several possible options for streamlining the PRA process that may be available to agencies engaging in scientific research, including generic clearances that cover multiple, similar data collection efforts and emergency reviews for circumstances where a delay in data collection is likely to cause harm or result in violation of a mandated deadline. Finally, it offers suggestions for strategies that agencies can use to expedite the PRA process as a whole, such as early collaboration with OMB and minimizing duplicative documentation.

7. Office of Science and Technology Policy Memorandum on Scientific Integrity

Purpose:

On March 9, 2010, the President issued a memorandum articulating six principles central to the preservation and promotion of scientific integrity and assigning responsibility to the Director of the Office of Science and Technology Policy (OSTP) for ensuring the highest level of integrity in all aspects of the executive branch's involvement with scientific and technological processes. Subsequently, the OSTP Director issued a memorandum¹⁸ providing further guidance to agencies to implement these principles.

Content:

The OSTP memo lays out the following principles for scientific integrity in the federal government:

Establish the foundations of scientific integrity in government --

- Ensure a culture of scientific integrity which entails honest investigation, open discussion, a firm commitment to evidence, and a shielding of scientific data from inappropriate political influence.
- Strengthen the actual and perceived credibility of government research by ensuring the selection of qualified candidates for scientific positions and ensuring independent peer review by qualified experts, among other steps.
- Facilitate the free flow of scientific information by establishing open communication among scientists and between experts and the public, and facilitating public access to scientific and technological information.

¹⁸ <http://www.whitehouse.gov/sites/default/files/microsites/ostp/scientific-integrity-memo-12172010.pdf>

- Establish principles for conveying scientific information to the public through clear statements of underlying assumptions, uncertainties, and probabilities associated with optimistic and pessimistic projections.

Establish requirements for public communications that foster openness with the public --

- Ensure that federal scientists can explain the scientific aspects of their work in an objective, non-partisan way.
- Facilitate federal scientists' opportunities to speak with the public and the media.

Develop policies for convening Federal Advisory Committees (FAC) to provide scientific advice –

- Ensure that recruitment of FAC members is as transparent as possible.
- Make FAC member biographical information widely available to illustrate the person's professional qualifications.
- Select FAC members based on expertise, knowledge, and contributions to the relevant subject area while seeking some balance in the points of view represented.
- Ensure that FAC products are not subject to agency revision.

Facilitate professional development of government scientists and engineers –

- Encourage publication and presentation of their research findings.
- Allow their full participation in scholarly and professional societies, organizations, or functions.
- Allow their receipt of honors and awards for research and discoveries.

Next Steps

The articulation of scientific standards (coupled with the identification of legal and usability standards) establishes firm ground for OIS R&D activities. To facilitate the application of scientific standards to our R&D activities, our next steps include:

1. Disseminating these standards to all OVRD staff, Workgroup members, and Panel members so that the project components are aware of the scientific standards SSA will apply throughout the design and implementation of OIS R&D activities.
2. Developing and disseminating supplementary guidelines or protocols to OVRD staff to help ensure understanding of and compliance with these standards as we develop research designs and evaluate results.
3. Identifying the applicable standards in our internal business process documents (i.e., our Phase papers).
4. Identifying these standards—and the requirement to comply with them—in our contractual and other arrangements with external individuals or organizations with whom we contract or collaborate in the development of the OIS.

Our application of these standards to the R&D activities will strengthen the scientific basis for our work in several ways. First, these standards reinforce the OIS business process that we have established because they highlight the need for the types of planning and review steps that are incorporated in our process (e.g., development of design documents; consultation with experts). Second, the standards provide a common framework and readily available set of initial references for all staff and other personnel (Panel members) who are responsible for conducting or reviewing OIS R&D activities. Third, as we implement the “Next Steps” laid out above, the standards will provide a concrete basis for articulating the particular requirements and criteria that we will establish for our R&D activities. For example, as we seek effective peer review for various activities, we can find an explicit set of guidelines and criteria in these standards to provide a firm basis for such efforts. And as we address complex activities such as sampling and data collection, we have an established set of standards to draw on, which can be incorporated into our preliminary and detailed design papers (i.e., Phase I and Phase II) and, where applicable, can be directly cited in contractual documents as basic standards to which we will hold contractors accountable (e.g., criteria regarding response rates, nonresponse analysis, pre-testing, and use of nonprobability samples). In addition, the standards provide a number of references to more detailed guidelines that will help us to establish a solid, comprehensive set of scientific requirements for particular activities.

Appendix 1

Sources Reviewed

In the literature reviews we conducted to identify relevant scientific standards, we examined the following sources:

American Educational Research Association, American Psychological Association, & National Council on Measurement in Education. (1999). *Standards for Educational and Psychological Testing*. Washington, DC: American Educational Research Association.

Ash, R.A., & Levine, E.L. (1980). A framework for evaluating job analysis methods. *Personnel Psychology*, 57(6), 53-59.

ASTM International. (2009). *Standard Practice for Certificate Programs*. West Conshohocken, PA.: author.

Bartram, D. (2005). The Great Eight Competencies: A criterion-centric approach to validation. *Journal of Applied Psychology*, 90(6), 1185-1203.

Benson, J. & Clark, F. (1982). A guide for instrument development and validation. *American Journal of Occupational Therapy*, 36(12), 789-800.

Bevan, N. (2006). International standards for HCI. In C. Ghaoui (Ed), *Encyclopedia of Human Computer Interaction* (pp.362-372). Hershey, PA: Idea Group Reference.

Burke, R.A. (1996). Standard setting: The next generation (where few psychometricians have gone before!). *Applied Measurement in Education*, 9(3), 215-235.

Butler, S.K., & Harvey, R.J. (1988). A comparison of holistic versus decomposed rating of position analysis questionnaire work dimensions. *Personnel Psychology*, 41(4), 761-771.

Campbell, C.H., Ford, P., Pulakos, E.D., Borman, W.C., Felker, D.B., De Vera, M.V., et al. (1990). Development of multiple job performance measures in a representative sample of jobs. *Personnel Psychology*, 43(2), 277-300.

Cascio, W.F., & Aguinis, H. (2008). Research in industrial and organizational psychology from 1963 to 2007: Changes, choices, and trends. *Journal of Applied Psychology*, 93(5), 1062-1081.

Chang, L. (1997). Dependability of anchoring labels of Likert-type scales. *Educational and Psychological Measurement*, 57(5), 800-807.

Christal, M., Gernand, R., Sapp, M., & Korb, R. (1999). Best practices for data collectors and data providers: Report of the working group on better coordination of postsecondary education data collection and exchange (National Center for Education Statistics Report No. 1999-191).

Washington, D.C.: U.S. Department of Education. Retrieved from

<http://pareonline.net/pdf/v10n7.pdf>

Costello, A.B., & Osborne, J.W. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment, Research & Evaluation*, 10(7), 1-9. Retrieved from <http://pareonline.net/pdf/v10n7.pdf>

Cunningham, J.W., Boese, R.R., Neeb, R.W., & Pass, J.J. (1983). Systematically derived work dimensions: Factor analyses of the occupation analysis inventory. *Journal of Applied Psychology*, 68(2), 232-252.

Dierdorff, E.C., & Morgeson, F.P. (2009). Effects of descriptor specificity and observability on incumbent work analysis ratings. *Personnel Psychology*, 62, 601-628.

Dierdorff, E.C., & Wilson, M.A. (2003). A meta-analysis of job analysis reliability. *Journal of Applied Psychology*, 88, 635-646.

DeVellis, R.F. (2012). *Scale development: Theory and applications* (2nd ed.). Thousand Oaks, CA: Sage.

Downing, S.M., & Haladyna, T.M. (1997). Test item development: Validity evidence from quality assurance procedures. *Applied Measurement in Education*, 10(1), 61-82.

Dutra, J. & Busch, J. (2003). Enabling knowledge discovery: Taxonomy development for NASA (NASA technical white paper 03-0382). Washington, D,C,: U.S. National Aeronautics and Space Administration. Retrieved from <http://trs-new.jpl.nasa.gov/dspace/bitsream/2014/6569/1/03-0382.pdf>

Drasgow, F., & Miller, H.E. (1982). Psychometric and sustentative issues in scale construction and validation. *Journal of Applied Psychology*, 67(3), 268-279.

Edwards, J.R., Scully, J.A., & Brtek, M.D. (1999). The measurement of work: Hierarchical representation of the multimethods job design questionnaire. *Personnel Psychology*, 52(2), 305-334.

European Communities (2008). Survey sampling reference guidelines: Introduction to sample design estimation techniques (Cat. No. KS-RA-08-003-EN-N). Luxembourg, Belgium: Office for

Official Publications of the European Communities. Retrieved from
http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-RA-08-003/EN/KS-RA-08-EN.PDF

Fleishman, E.A. (1967). Development of a behavior taxonomy for describing human tasks: A correlational-experimental approach. *Journal of Applied Psychology*, 51(1), 1-10.

Fleishman, E.A. (1988). Some new frontiers in personnel selection research. *Personnel Psychology*, 41(4), 679-701.

Geisinger, K.F. (1994). Psychometric issues in testing students with disabilities. *Applied Measurement in Education*, 7(2), 121-140.

Ghaoui, C. (Ed.). (2006). *Encyclopedia of Human Computer Interaction*. Hershey, PA: Idea Group Reference.

Gibson, S.G., Harvey, R.J., & Quintela, Y. (2004). Holistic versus decomposed ratings of general dimensions of work activity. Chicago: SIOP.

Goldberg, G.L. & Roswell, B.S. (2001). Are multiple measures meaningful?: Lessons from a statewide performance assessment. *Applied Measurement in Education*, 14(2), 125-150.

Griffeth, R.W., Steel, R.P., Allen, D.G., & Bryan, N. (2005). The development of a multidimensional measure of job market cognitions: The employment opportunity index (EOI). *Journal of Applied Psychology*, 90(2), 335-349.

Hambleton, R.K., & Murphy, E. (1991). A psychometric perspective on authentic measurement. *Applied Measurement in Education*, 5(1), 1-16.

Hart, D.E., & Carraher, S.M. (1995). The development of an instrument to measure attitudes toward benefits. *Education and Psychological Measurement*, 55(3), 480-484.

Harvey, R.J. (1991) "Job analysis." *Handbook of Industrial and Organizational Psychology*, 2, 71-164. (M.D. Dunnette, & L.M. Hough, Eds.) Palo Alto, California: Consulting Psychologists Press, Inc.

Harvey, R.J. (1986). Quantitative approaches to job classification: A review and critique. *Personnel Psychology*, 39(2), 267-289.

Henderson, N.D. (2010). Predicting long-term firefighter performance from cognitive and physical ability measures. *Personnel Psychology*, 63(4), 999-1039.

- Hughes, G.L., & Prien, E.P. (1989). Evaluation of task and job skill linkage judgments used to develop test specifications. *Personnel Psychology*, 42(2), 283-292.
- Hurley, A.E., Scandura, T.A., Shriesheim, C.A., Brannick, M.T., Seers, A., Vandenberg, R.J., & Williams, L.J. (1997). Exploratory and confirmatory factor analysis: Guidelines, issues, and alternatives. *Journal of Organizational Behavior*, 18(6), 667-683.
- Institute for Credentialing Excellence (2010). Defining features of quality certification and assessment based certificate programs. Washington, D.C.: author. Retrieved from [http://www.credentialingexcellence.org/portals/0/3-9-10%20features%20document%20ICE%20update .pdf](http://www.credentialingexcellence.org/portals/0/3-9-10%20features%20document%20ICE%20update.pdf)
- Institute of Medicine (2002). *The Dynamics of Disability: Measuring and Monitoring Disability for Social Security Programs*. Washington, D.C.: National Academies Press
- Institute of Medicine & National Research Council (1998). *The Social Security Administration's Disability Decision Process: A Framework for Research*. Washington, D.C.: National Academies Press
- Institute of Medicine & National Research Council (2007). *The Future of Disability in America*. Washington, D.C.: National Academies Press
- Jeanneret, R.P. (1969). A study of job dimensions of "worker-oriented" job variables and of their attribute profiles. Ann Arbor, Michigan: University Microfilms, INC.
- Jeanneret, P.R., & Strong, M.H. (2003). Linking O*NET job analysis information to job requirement predictors: An O*NET application. *Personnel Psychology*, 56(2), 465-492.
- Jereb, E., Rajkovic, U., & Rajkovic, V. (2005). A hierarchical multi-attribute system approach to personnel selection. *International Journal of Selection and Assessment*, 13(3), 198-205.
- Kane, M. (1996). The precision of measurements. *Applied Measurement in Education*, 9(4), 355-379.
- King, E.B., & Ahmad, A.S. (2010). An experimental field study of interpersonal discrimination toward job applicants. *Personnel Psychology*, 63(4), 881-906.
- Komaki, J.L., Zlotnik, S. & Jensen, M. (1986). Development of an operant-based taxonomy and observational index of supervisory behavior. *Journal of Applied Psychology*, 71(2), 260-269.
- Krieg, Jr., E.F. (1999). Biases induced by coarse measurement scales. *Education and Psychological Measurement*, 59(5), 749-766.

LaPolice, C.C., Carter, G.W. & Johnson, J.W. (2008). Linking O*NET descriptors to occupational literacy requirements using job component validation. *Personnel Psychology*, 61(2), 405-441.

Levine, E.L., Ash, R.A., Hall, H. & Sistrunk, F. (1983). Evaluation of job analysis methods by experienced job analysts. *Academy of Management Journal*, 2, 339-348.

Levine, E.L., Sistrunk, F., McNutt, K.J., & Gael, S. (1988). Exemplary job analysis systems in selected organizations: A description of process and outcomes. *Journal of Business and Psychology*, 3(1), 3-21.

Lievens, F., Buyse, T. & Sackett, P.R. (2005). Retest effects in operational selection settings: Development and test of a framework. *Personnel Psychology*, 58(4), 981-1007.

Lord, R.G., & Maher, K.J. (1991). Cognitive theory in industrial and organizational psychology. *Handbook of Industrial and Organizational Psychology*, 2, 1-62. (M.D. Dunnette, & L.M. Hough, Eds.) Palo Alto, California: Consulting Psychologists Press, Inc.

Manpower Demonstration Research Corporation, Fred Doolittle, Steve Bell, Howard Bloom, George Cave, James Kemple, Larry Orr, Linda Traeger, John Wallace (1993). *A Summary of the Design and Implementation of the National JTPA Study*

Manpower Demonstration Research Corporation (2008). *How Best to Determine Whether Social and Education Programs Work – or Don't Work*

Marcoulides, G.A. (1997). Optimizing measurement designs with budget constraints: The variable cost case. *Educational and Psychological Measurement*, 57(5), 808-812.

Morgeson, F.P., & Campion, M.A. (2000). Accuracy in job analysis: Toward an inference-based model. *Journal of Organizational Behavior*, 21, 819-827.

Muchinsky, P.M. (2004). When the psychometrics of test development meets organizational realities: A conceptual framework for organizational change, examples, and recommendations. *Personnel Psychology*, 57(1), 175-209.

Murphy, K.R., & De Shon, R. (2000). Progress in psychometrics: Can industrial and organizational psychology catch up? *Personnel Psychology*, 53(4), 913-924.

National Research Council (1999). *The Changing Nature of Work: Implications for Occupational Analysis*. Washington, D.C.: National Academies Press

National Research Council (2001). *Evaluating Welfare Reform in an Era of Transition*. Washington, D.C.: National Academies Press

National Research Council (2008). *Rebuilding the Research Capacity at HUD*. Washington, D.C.: National Academies Press

National Research Council (2010). *A Database for a Changing Economy: Review of the Occupational Information Network (O*NET)*. Washington, D.C.: National Academies Press

National Research Council and Federal Judicial Center (2011). *Reference Manual on Scientific Evidence (Third Edition)*. Washington, D.C.: National Academies Press

Office of Management and Budget (2002). *Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility, and Integrity of Information Disseminated by Federal Agencies*

Office of Management and Budget (2004). *Final Information Quality Bulletin for Peer Review*

Office of Management and Budget (2004). *Policies for Federal Agency Public Websites (M-05-04)*. Retrieved from

<http://www.whitehouse.gov/sites/default/files/omb/memoranda/fy2005/m05-04.pdf>

Office of Management and Budget (2006). *Standards and Guidelines for Statistical Surveys*

Office of Management and Budget (2006). *Questions and Answers When Designing Surveys For Information Collections*

Office of Management and Budget (2009). *Increased Emphasis on Program Evaluation*

Office of Management and Budget (2010). *Evaluating Programs for Efficacy and Cost-Efficiency*

Office of Management and Budget (2010). *Facilitating Scientific Research by Streamlining the Paperwork Reduction Act Process*

Office of Personnel Management (1999). *Demonstration Projects Evaluation Handbook*

Office of Personnel Management (n.d.). *Demonstration Projects: Beyond Current Flexibilities*

Office of Science and Technology Policy (2010). *Scientific Integrity*

Prien, K.O., Prien, E.O., & Wooten, W. (2003). Interrater reliability in job analysis: Differences in strategy and perspective. *Public Personnel Management*, 32(1), 125-141.

Pulakos, E.D., Arad, S., Donovan, M.A., & Plamondon, K.E. (2000). Adaptability in the workplace: Development of a taxonomy of adaptive performance. *Journal of Applied Psychology*, 85(4), 612-624.

- Roch, S.G., & O'Sullivan, B.J. (2003). Frame of reference rater training issues: recall, time and behavior observation training. *International Journal of Training and Development*, 7(2), 93-107.
- Sanchez, J.I. (2000). Adapting work analysis to a fast-paced and electronic business world. *International Journal of Selection and Assessment*, 8(4), 207-215.
- Scherbaum, C.A. (2005). Synthetic validity: Past, present, and future. *Personnel Psychology*, 58(2), 481-515.
- Shippmann, J.S., Ash, R.A., Batjtsta, M., Carr, L., Eyde, L.D., Hesketh, B., et al. (2000). The practice of competency modeling. *Personnel Psychology*, 53(3), 703-740.
- Society for Industrial and Organizational Psychology, Inc. (2003). *Principles for the validation and use of personnel selection procedures* (4th ed.). Bowling Green, OH: author. Retrieved from <http://www.siop.org/Principles/principles.pdf>
- Steel, P.D., Huffcutt, A.I., & Kammeyer-Mueller, J. (2006). From the work one knows the worker: A systematic review of the challenges, solutions, and steps to creating synthetic validity. *International Journal of Selection and Assessment*, 14(1), 16-36.
- Stemler, S.E., & Tsai, J. (2008). Best practices in interrater reliability: Three common approaches. In J.W. Osborne (Ed.), *Best practices in quantitative methods* (pp.29-49). Thousand Oaks, CA: Sage.
- The Institute for Employment Studies (2004). *Socio-Economic Research in the Information Society: A User's Guide from the RESPECT Project*
- Thomas, A., Palmer, J.K., Coker-Juneau, C.J., & Williams, D.J. (2003). Factor structure and construct validity of the interaction with disabled persons scale. *Education and Psychological Measurement*, 63(3), 465-483.
- Trevisan, M.S., Sax, G., & Michael, W.B. (1994). Estimating the optimum numbers of options per item using an incremental option paradigm. *Educational and Psychological Measurement*, 54(1), 86-91.
- U.S. Bureau of Justice Assistance, Office of Justice Programs, Center for Program Evaluation (n.d.). *Guide to Program Evaluation*. Retrieved from <http://www.ojp.usdoj.gov/BJA/evaluation/guide/index.htm>
- U.S. Census Bureau (2009). *Design and Methodology: American Community Survey*. Washington, D.C.: U.S. Government Printing Office. Retrieved from

http://www.census.gov/acs/www/Downloads/survey_methodology/acs_design_methodology.pdf

U.S. Department of Education/Institute for Education Sciences (2003). *Identifying and Implementing Educational Practices Supported by Rigorous Evidence: A User Friendly Guide*

U.S. Department of Education/Institute of Education Sciences (2003). *NAEP Validity Studies: An Agenda for NAEP Validity Research* (Working Paper No. 2003-07)

U.S. Equal Employment Commission, U.S. Civil Service Commission, U.S. Department of Labor, and the U.S. Department of Justice (1978). *Uniform Guidelines on Employee Selection Procedures*. Washington, D.C.: U.S. Equal Employment Opportunity Commission. Retrieved from <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div5&view=text&node=29:4.1.4.1.8&idno=29>

U.S. Department of Health and Human Services (2006). *Research-based web design and usability guidelines*. Washington, D.C.: U.S. Government Printing Office. Retrieved from http://www.usability.gov/guidelines/guidelines_book.pdf

U.S. Department of Health and Human Services (2007). *ORI Introduction to the Responsible Conduct of Research*. Washington, D.C.: U.S. Government Printing Office.

U.S. General Accounting Office (1990). *Assessing Internal Controls in Performance Audits* (GAO/OP-4.1.4). Washington, D.C.: author.

U.S. General Accounting Office (1990). *Case Study Evaluations* (PEMD-Transfer Paper 10.1.9). Washington, D.C.: author.

U.S. General Accounting Office (1991). *Designing Evaluations* (PEMD 10.1.4). Washington, D.C.: author. Retrieved from http://www.gao.gov/special.pubs/10_1_4.pdf

U.S. General Accounting Office (1991). *Using Structured Interviewing Techniques* (PEMD 10.1.5). Washington, D.C.: author. Retrieved from <http://www.gao.gov/special.pubs/pe1015.pdf>

U.S. General Accounting Office (1992). *Quantitative Data Analysis: An Introduction* (PEMD 10.1.11). Washington, D.C.: author. Retrieved from <http://www.gao.gov/special.pubs/pe10111.pdf>

U.S. General Accounting Office (1992). *Using Statistical Sampling* (PEMD-10.1.6). Washington, D.C.: author.

- U.S. General Accounting Office (1992). *The Evaluation Synthesis* (PEMD-10.1.2). Washington, D.C.: author.
- U.S. General Accounting Office (1993). *Developing and Using Questionnaires* (PEMD 10.1.7). Washington, D.C.: author. Retrieved from <http://archive.gao.gov/t2pbat4/150366.pdf>
- U.S. General Accounting Office (1999). *Standards for Internal Control in the Federal Government* (GAO/AIMD-00.21.3.1). Washington, D.C.: author.
- U.S. General Accounting Office (1999). *Federal Research: Peer Review Practices at Federal Science Agencies Vary* (GAO/RCED-99-99). Washington, D.C.: author.
- U.S. General Accounting Office (2000). *Program Evaluation: Studies Helped Agencies Measure or Explain Program Performance* (GGD-00-204). Washington, D.C.: author. Retrieved from <http://www.gao.gov/new.items/gg00204.pdf>
- U.S. General Accounting Office (2003). *Program Evaluation: An Evaluative Culture and Collaborative Partnerships Help Build Agency Capacity* (GAO-03-454). Washington, D.C.: author.
- U.S. Government Accountability Office (2010). *Employment and Training Administration: Increased Authority and Accountability Could Improve Research Program* (GAO-10-243). Washington, D.C.: author.
- U.S. National Aeronautics and Space Administration (n.d.). *NASA.gov Portal Standards and Guidelines*. Retrieved from <http://www.hq.nasa.gov/pao/portal/usability/guidelines/index.htm>
- U.S. Social Security Administration (n.d.). *Social Security Administration Information Quality Guidelines*
- Van der berg, P.T., & Feij, J.A. (2003). Complex relationships among personality traits, jobs characteristics, and work behaviors. *International Journal of Selection and Assessment*, 11(4), 326-339.
- Viswesvaran, C., & Ones, D.S. (1995). Theory testing: Combining psychometric meta-analysis and structural equations modeling. *Personnel Psychology*, 48(4), 865-885.
- Woehr, D.J., & Huffcutt, A.I., (1994). Rater training for performance appraisal: A quantitative review, *Journal of Occupational & Organizational Psychology*, 67(3), 189-205.