# Kryterion Psychometric Services...Our Approach

While we take the utmost care to ensure that the examination being developed meets both psychometric and accreditation standards, we also work very closely with you to help achieve your business goals based on their budget, time, and other resource constraints. With enough time and money, anything is possible, but we realize that you do not have unlimited resources. We help you make the best decisions for your programs based on our expertise and practical experience for what actually works and what will make the most sense given a client's specific situation.

Our process also complies with legal and technical requirements for credentialing examinations as well as ANSI and NCCA assessment standards for accreditation. Many of these requirements are described in three primary documents:

- **The Standards for Educational and Psychological Testing (2014)** jointly published by the American Educational Research Association (AERA), the American Psychological Association (APA), and the National Council on Measurement in Education (NCME),

- **Standards for the Accreditation of Certification Programs** from the National Commission for Certifying Agencies (NCCA), and

- **ISO/IEC 17024: General Requirements for Bodies Operating Certification Systems of Persons** and **IAF Guidance to ISO/IEC 17024** from the American National Standards Institute (ANSI).

Further Kryterion has a strong set of core values that set us apart from other psychometric and test delivery vendors:

- ➢ **We own it** – Kryterion psychometrics staff treats your program as if it were our own. We will ensure each step along the way creates the best possible end product.

- ➢ **We are one team** – Kryterion psychometrics staff will work with you to creatively meet your program's specific needs as part of your team. Rigid structures and requirements from a vendor seldom lead to the best result.

- ➢ **We listen and learn from each other** – Kryterion psychometrics staff will explain the underlying reasons for each approach we recommend and undertake. If alternate approaches have been suggested to you in the past, we will gladly learn and attempt to incorporate new approaches when possible.

- ➤ **We face challenges with optimism** – Kryterion psychometrics knows setbacks can occur, but we never treat them as roadblocks. We're confident we can find a solution to every problem.

- ➤ **We continuously improve** – Kryterion psychometrics makes every effort to stay up to date on the latest testing industry trends and topics. We enthusiastically learn new things so we can best meet the individual needs of each and every client.

- ➤ **We build trust** – Kryterion psychometrics will never recommend or push solutions we feel do not add value to your assessment program. We want to build the best possible solution that meets your needs and budget.

- ➤ **We help our customers succeed** – Kryterion psychometrics doesn't just want to help build a test. We want to build a test that will provide the results you need to positively impact the lives of your candidates and help you work toward fulfilling your mission.

## Psychometric Services for Examination Development & Maintenance

In general, the process of examination development can be visualized in *Figure 1* below. Kryterion recommends and can assist with each step in this process.



*Figure 1. Examination Development – Initial Process*

Once the initial development process is complete, the cycle of examination maintenance begins as shown in Figure 2. Starting with any noted revisions from the initial iteration of the exam, maintenance entails continually monitoring the validity and measurement performance of your examination content to ensure the work completed in the initial development process is retained. How often ongoing item and exam development occurs will depend on many factors (e.g., number of administrations, number of test forms, how often exams are available to be scheduled). Once a maintenance schedule is determined, it typically occurs routinely for the next 5-7 years, or until the job, role, or occupation changes substantially enough to warrant a new job analysis be completed, at which point the examination program moves back to the development process in Figure 1.
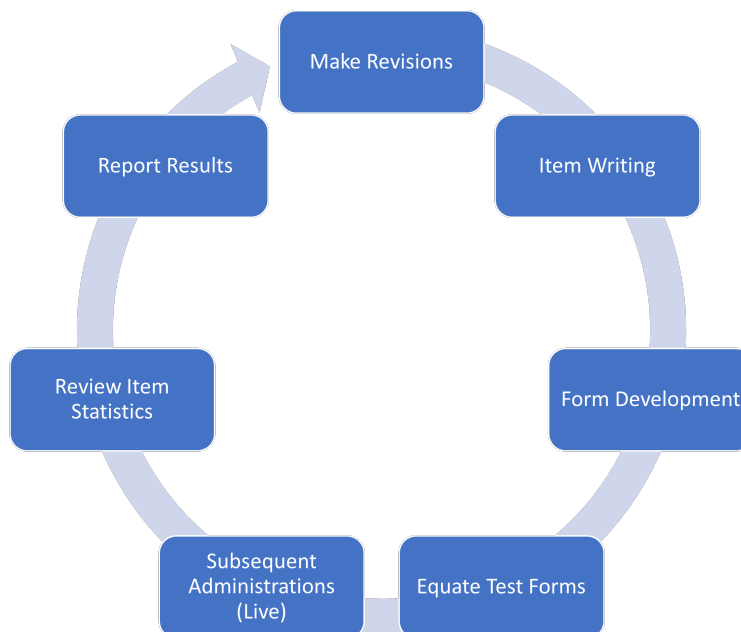


*Figure 2. Examination Development – Maintenance Cycle*

A description of the development activities that you may find pertinent and beneficial to your examination program(s) are:

## 1. Program Design

Perhaps you have or want to establish an examination program with multiple interrelated credentials. How can you segment all of the related content into credentials or pathways that validly reflect the processes of actual work and meet your candidates' needs? How do you structure and validate your assessments to ensure they make sense within the desired structure of your credentialing program?

Kryterion can assist you in working through what begins as a highly ambiguous and uncertain process. We enable you to make informed judgments to best structure programs to meet your

business goals as well as candidates' professional aspirations. Through a program design workshop, we can assist you and your stakeholders in identifying:

- The specific market needs you are intending to fill
- The related bodies of knowledge that would fill those gaps
- How to segment that body of knowledge into assessable pieces
- Defining the type of assessment that best meets the defined needs
- How to structure those assessments into an examination program
- Define next steps for credentialing examination development

## 2. Test Definition

The saying "if you don't know where you're going, chances are you won't get there" applies to designing a certification program as well as a specific examination. The test definition phase provides the foundation for the test development process and is probably the most crucial, and yet, most overlooked step in the process. Completing the Test Definition Document ensures that your stakeholders and Kryterion have a shared understanding of the purpose of the examination, the target audience, minimal level of competence required to pass the examination, the intended interpretation of test scores, and the overall structure of the examination BEFORE development begins. The Test Definition process helps ensure that the examination development activities are completed in the most efficient and effective manner. Otherwise, the test development process can become a "moving target" that results in lost time and money and often a poor-quality product (e.g., changing the focus of your exam once item writing has already begun).

## 3. Job Analysis Study

A job analysis (aka practice analysis, role delineation) is a systematic process for collecting information regarding a job role in terms of the job functions (i.e., responsibilities/duties) and tasks performed, as well as the knowledge and/or skills (i.e., competencies) required to perform those tasks. The results of the job analysis describe the breadth and depth of knowledge and skills that must be covered by the certification examination for it to be deemed valid, reliable, and legally defensible. We also use the results of the job analysis as the basis for the test blueprint and examination development activities. Everything measured in the examination needs to be linked to an important knowledge or skill from the job analysis.

There are a variety of approaches to job analysis, and the one that best meets your needs should be selected. Kryterion Psychometricians are experienced in conducting job analyses through different approaches and will work with you to determine the methodology that will:

1) provide your credentialing program(s) with valid foundational examination construction documentation, and

2) utilize your resources and subject matter expert time as efficiently as possible.

Generally, job analysis methods fall into two big categories:

## Survey-Based Methodologies

This methodology typically involves the following steps:

- Review available literature to prepare for the job analysis focus group sessions
- Conduct web conference focus group sessions to develop the content for the job analysis survey
- Create an online job analysis survey
- Pilot test and finalize the job analysis survey
- Administer the job analysis survey and collect data
- Analyze data from job analysis survey
- Conduct another web conference focus group to review data results and perform linkage exercise

Kryterion will review relevant literature (e.g., job analysis studies for similar job roles, training materials, and job descriptions) to prepare draft materials for the job analysis focus group sessions and become familiar with the job tasks. Kryterion will then facilitate a series of web conference focus group sessions with 8 to 12 SMEs who are representative of the target audience for the examination (in terms of geography, experience, education, work setting, and any other factor that might significantly impact practices within the job role) as well as the major stakeholder groups. Please note that meetings can be conducted either onsite or remotely; however, total time required for proper development remains the same.

The output of the focus group will be a survey instrument that can be distributed by Kryterion or by you to gather work-related data pertinent to your credentialing program(s). When enough data are collected, Kryterion will analyze the data and facilitate a web conference to review the survey data results and facilitate discussions to yield a validated test blueprint (aka test specifications, content outline).

## Committee-Based Methodologies

If you suspect that an initial pool of practitioners will be too small to produce reliable survey results and/or wish to expedite development of the test blueprint, Kryterion proposes a committee-based job task analysis approach. However, if the project time

constraints are the <u>sole</u> concern, a survey-based job task analysis method is still recommended to best meet industry best practices and accreditation standards.

Kryterion will facilitate an onsite focus group session with 8 to 12 SMEs who are thoroughly knowledgeable of the target audience for the exam (in terms of geography, experience, education, practice setting, type of practice and any other factor that might significantly impact practice within the job role) as well as the major stakeholder groups for the certification. The purpose of the focus group is to identify the primary tasks, subtasks, and supporting knowledge and skills expected of a certified individual.

This information will be used to develop a list of proposed test objectives for the certification examination. The list of test objectives should reflect what an individual should be able to demonstrate as evidence that they possess the knowledge and skills needed to perform the job role in a competent manner.

After the SMEs feel comfortable that the list of test objectives is comprehensive and accurate in relation to the level and scope of the certification, the SMEs will rate the test objectives on importance and frequency. This information will be used as the basis of the test blueprint. The test blueprint discussion will include the structure and format of the exam, including:

1) percentage and number of exam items allocated to each topic area

2) objectives and types of items to be included

3) adjustments to verbiage to describe objectives or content areas

## 4. Item Writing Training

Once your program(s) have the necessary foundational documentation for examination construction created from a job analysis, the item development process can begin. Item writing training can be done as an onsite workshop or virtual training. During the training, Kryterion teaches your SMEs the proven principles of effective and efficient item writing, provides information to help SMEs write items at an appropriate level of difficulty for your examination, and provides instruction to SMEs on how to enter items into Webassessor.

### Onsite Item Writing Workshop

Kryterion will facilitate a two- or three-day onsite item writing workshop to train SMEs on item writing guidelines and best practices and guide the initial process of item development. This training includes teaching SMEs how to enter items into Webassessor and providing information to assist SMEs in writing items at the appropriate level of difficulty for the

examination. At the completion of the item writing workshop, Kryterion will assess any remaining item writing needs, if applicable, and assist you in assigning SMEs to complete these items independently. Any additional or remaining writing and review can be accomplished remotely in Webassessor and through web conferences.

## Item Writing Virtual Training

The item writing training can alternatively be conducted via a one- to two-hour web conference. After each SME writes a few items (e.g., 2-3 items), Kryterion recommends holding another web conference to provide feedback to the SMEs to ensure an understanding of the item writing principles and improve the quality of the additional items that will be written. During this web conference, the SMEs will receive feedback from a Kryterion psychometrician on compliance to item writing guidelines as well as feedback from the other item writers on appropriateness of difficulty level, etc.

In both the onsite item writing workshop and virtual training methods, after each SME writes a few items (e.g., 2-3 items), Kryterion will guide SMEs to conduct an initial review of the items. In addition to reviewing the items for technical accuracy, SMEs brainstorm ways to improve each item (e.g., making a scenario more realistic, coming up with common misconceptions for incorrect answers). After this initial group review, SMEs write a few more items, and those items are reviewed in an iterative manner.

Following this "write and review" methodology has a number of advantages, including:

‣ Quickly improving the item writing skills of the SMEs by reviewing items written by others and by receiving timely feedback on their own items.
‣ Substantially decreasing writers' fatigue by keeping item writing and review sessions short and sequential.
‣ Overcoming writer's block and leveraging the creativity and knowledge of the other SMEs to improve the items rather than spending a lot of time trying to write the "perfect item".

## 5. Psychometric and Grammar Edit

Kryterion will perform a psychometric, sensitivity, and English grammar edit on newly written items, revised items, or existing imported item banks in Webassessor. The psychometric edit will verify that each of the items conform to recognized psychometric item writing guidelines. The sensitivity edit is a brief review to ensure that the items do not appear to favor any particular nationality, race, religion, or gender. This is a subtle issue; even if an item does not carry obvious bias, it may require minor language changes to align with contemporary developments. The English grammar edit will check for grammar, punctuation, usage, readability, clarity, and consistency of usage. After the editing is completed, SMEs or other stakeholders can be granted access to review the items to

ensure that the substantive nature of the item was not inadvertently altered during the editing process.

## 6. SME Technical Review

Kryterion will facilitate a review of any items not approved during an in-person item writing workshop via web conferences. The SME technical review is part of the quality-control process that significantly increases the chances that an item will perform well enough to be put on an operational examination. During the SME technical review, the SMEs review the items as a group for:

- Congruence with the knowledge/skills in test blueprint
- Technical accuracy
- Scoring accuracy
- Clarity
- Importance to practice
- Plausibility of incorrect options (i.e., distractors)

## 7. Item Bank Reclassification

If you have an existing item bank and have updated your examination test blueprint, Kryterion can assist you and your SMEs in classifying all existing items in your item bank to the new test blueprint structure. During the process, SMEs can evaluate the existing items for quality similar to the technical review process above. Items that do not sufficiently conform to item writing best practices, or that have become outdated can be marked for retirement. Items that are retained can then be reclassified to the new test blueprint structure, and a new active item bank can be created.

Once the new active item bank is created, Kryterion can assist in identifying any gaps or areas in the item bank that require additional items to be written in order to maintain a healthy item pool for your program.

## 8. Test Form(s) Construction

Kryterion will create beta test form(s) and/or operational test form(s) that comply with your test blueprint. When creating operational test forms, Kryterion will use available item statistics to create test form(s) that have a similar level of difficulty to alternate or previous test forms. The number of test forms required will depend on various factors that impact examination security (e.g., number of test takers, retesting policies, risk of test takers sharing information, geographic locations in which examination is administered).

All test items should be beta tested to confirm they are performing acceptably before they are used

in scoring candidates. The process of and options for beta testing are described below.

## Beta Testing

The purpose of beta testing is to collect enough response data on each item to statistically analyze its performance and determine whether it should be retained, discarded, or revised and beta tested again. During beta testing, the items are administered in a secure environment to approximately 100 test takers that are representative of the target audience (minimum of 60 test takers). Beta testing impacts form construction and can be done in one of two ways:

A. **Beta test administration:** In this method, more items than are required by the test blueprint are included on the beta test form. Consequently, there are enough items that perform appropriately both statistically and in compliance with the test blueprint that can be used to score the beta test takers. Beta test takers are not provided with a score upon completing their examination and must wait a few weeks for examination results. Beta test taker results cannot be generated until a sufficient sample size has been attained on the beta test, the items are statistically evaluated, the items to be scored (and appear on the final test form) are identified, and a passing/cut score has been determined. This is a good method when a lot of items need to be beta tested in a relatively short period of time.

B. **Beta test items on live test form:** In this method, beta test (i.e., unscored) items are included on the existing live test form. Test takers do not know which items are unscored. Test takers received their examination scores according to the normal process. If there are more items that require beta testing than can be added to the existing live test form, you must monitor the progress and replace the beta test items after 100 test takers (minimum of 60 test takers) have responded to the items.

## 9. Psychometric Analyses

Kryterion will perform an item analysis on one examination (with up to two forms) which have been previously administered to enough candidates, which will provide valuable information on item difficulty (i.e., the proportion of test takers that answered the item correctly), item discrimination (i.e., how well an item discriminates between high- and low-test performers), and option analysis (i.e., the proportion of test takers choosing each option), to name just a few of the statistical indices that are included.

Kryterion can perform a summary analysis of an examination or a more detailed diagnostic analysis that includes detailed item option statistics summaries.

## Summary Examination & Item Analyses

For the summary analysis, a report will be prepared and presented for your review. The report will identify items that exhibit unusual statistical performance. You and your SMEs will make the final determination to retain, delete, or rework items from the item bank.

## Diagnostic Item Analyses

For the diagnostic analysis, a report will be prepared and presented for your review. The report will identify items that exhibit unusual statistical performance down to the option level. A Kryterion psychometrician will conduct a web conference with you and your SMEs to explain the item analysis report and provide consultation on the final item selection. You and your SMEs will make the final determination to retain, delete, or rework items from the item bank. Please note that if SMEs rework items to such a degree that the beta statistic no longer describes them, those items should not be used for scoring purposes without additional data collection and analysis.

## Data Forensics

In addition to regular monitoring of item and test performance statistics for routine maintenance, Kryterion can assist with a variety of data forensic analyses that may point to specific concerns surrounding exposure of examination content, or non-standard performance of items/test forms between different testing populations.

### Test Form Performance Comparisons

Kryterion can assist with ongoing monitoring of test form pass rates and average scores to ensure ongoing equity of examination results regardless of which form a candidate may be administered. Differences in test form performance may indicate overexposure of a subset of items, or an entire test form.

### Item Speededness

Kryterion can assist in evaluating the potential of item exposure and candidate pre-knowledge of the items by analyzing the speededness at which items are answered (if response time data are gathered). These analyses can point to potential overexposure of individual items, and potentially identify subsets of candidates with pre-knowledge of the examination content.

### Item Drift

Kryterion can assist with the monitoring of overall item exposure by monitoring item performance statistics longitudinally. Kryterion will monitor normal item performance as compared to the most recent item performance statistics to observe the amount difficulty and discrimination indices "drift" from the initial item performance statistics. In this way,

individual items can be identified for rest or retirement based on the severity of drift and length of use.

Any of the listed analyses can be performed on a regular schedule in conjunction with routine item analyses, or only as needed when specific concerns arise to warrant further investigation.

## 10. Passing/Cut Score Study

### Modified Angoff Standard Setting Study

Kryterion will perform a modified Angoff standard setting procedure to provide a recommended passing/cut score range for the new test form(s). The modified Angoff study will be conducted via a series of web conferences. The first web conference will take approximately one (1) hour. In this meeting, SMEs will learn about the modified Angoff process and how to perform their role in it. Between the first and second web conference, each SME will independently review each item in the pool without the key and predict for each item what percentage of minimally qualified test takers would correctly answer the item. Kryterion will compile the predictions from all SMEs and review the results with the SMEs in a second web conference. The second web conference will take between three (3) and six (6) hours, depending on the number of items being rated. SMEs will have an opportunity to discuss the rationale behind skewed ratings for those items that have a large difference between the highest and lowest predictions.

Kryterion will compile and analyze the final predictions and provide a recommended cut score range.

### Equating Study

In the event your examination already has an established passing standard, Kryterion will statistically equate the passing/cut score between a new or revised test form (created as part of routine examination maintenance) and a previous/reference test form. Depending on the availability of item information, equating may take one of two different forms.

**IRT Equating Method:** When candidate volume is sufficiently large (ideally at least 200 candidates), Kryterion will use a Rasch Item Response Theory (IRT) equating methodology.

**CTT Equating Methods:** When candidate volume is not sufficient to reliably produce IRT performance statistics, Kryterion will use a CTT equating methodology to equate the passing/cut score for a new test form.

Please note that the ability to perform an equating study depends on the availability of candidate response data, test form key, and passing/cut score for the base or reference form.

Kryterion will provide a recommended cut score based on the equating study.

## 11. Rescoring Examination Administrations

If at any point you find the need to rescore your examinations (e.g., following a Beta administration, upon finding validity concerns with one or more items), Kryterion can assist in making those changes via a hand rescore outside of the Webassessor system and/or updating scores and results in the Webassessor platform. Kryterion will also help identify the potential impacts associated with making scoring alterations on your examinations and mitigate any potential risks to examination defensibility they may cause.

## 12. Consulting Services

If you have more specific needs not listed in our available services, or you have need of psychometric assistance but no idea where to begin, Kryterion can assist in identifying areas of improvement for your program.

## Program Audits

If you feel that your program could use some improvements but are unsure where you would see the most benefit or even what might be missing at all, we can help.

**Test Development Audits**
We will review all of your technical documentation related to the development of your current examination and recommend further action or activities that will help strengthen the validity of your examination program. If you currently lack technical documentation for the development of your examination, we will review the steps taken to develop the program with you, identify any gaps that might warrant correction, and recommend actions that can be taken to strengthen your program.

**Test Administration & Security Audits**
We will review your policy documentation related to test delivery of your assessment(s) and summary administration data analyses to identify potential threats to your examination security and validity. We can additionally identify any potential fairness concerns in your administration procedures and, in particular, any that might be cause to consult your legal counsel for legal ramifications.

## Accreditation Consulting

Pursuing accreditation through a third party for your examination program (e.g., NCCA, ANSI/ANAB, ABSNC) can be a daunting task. If you need assistance determining what documentation is required for a smooth application process, or need help translating requests from accreditation reviewers, Kryterion's experienced Psychometricians can help. We will provide assistance during your application process in whatever capacity you desire, whether that be to facilitate understanding of the standards prior to an initial application or with complying with requests from accreditation reviewers in cases of identified nonconformities to the standards. We can help remove any ambiguity from the process and get you on the path to full accreditation.