



Certification Examination Development

The Certified Software Development Professional examination was developed in collaboration with Chauncey Group International (CGI), a subsidiary of the Educational Testing Service (ETS) of Princeton, NJ.

The IEEE Computer Society's Certified Software Development Professional examination meets testing-industry standards of fairness, validity, and reliability. These standards are defined as follows:

- An examination is fair when its contents neither favor nor discriminate against any individual or group due to ethnic background, geographic locale, practice setting, or other demographic criteria.
- Examinations are valid when they accurately reflect the knowledge and skills required for competent practice; and they are reliable when they yield consistent results over time.

The rigorous examination development process was completed over a three year period and included the steps listed below.

Job Analysis

The Job Analysis process provided an industry accepted, systematic procedure for identifying/validating the performance domain of a job and the knowledge and skills that are necessary to perform the job. The information derived by the job analysis provided the basis from which the examination specifications are developed. The major steps of the job analysis were:

A. Planning Meeting: A meeting was held to discuss the tasks and knowledge areas to be analyzed.

B. Field Interviews: A small number of telephone interviews with selected practitioners were conducted to assist in the development of the draft task/knowledge list. The test developer (CGI) prepared the draft task list to be used as the basis for the first Job Analysis Task Force Committee Meeting.

C. Job Analysis Task Force Committee Meeting: A job analysis committee consisting of 10-12 participants was formed and our CGI test developer conducted the first committee meeting to review and revise the draft listing of task and knowledge statements. The committee also determined the rating scales, wording, format and demographic data to be collected.

D. Development of Survey: A draft survey was distributed to the committee at the conclusion of the meeting. Committee members were asked to review the survey and return it with their comments.

The draft survey was also distributed to a small number of beta survey participants, and any changes determined appropriate by the beta group were made prior to final distribution.

E. Return and Statistical Analysis of Survey: The surveys were distributed to the required participants. Data analysis of the survey returns were completed by the test developer. When

sufficient numbers of surveys (minimum of 300-400) were received and analyzed, a report was prepared for evaluation and discussion by the Job Analysis Committee.

Examination Specifications

The Examination Specifications were developed from information derived from the job analysis. The specifications became the blueprint for defining the final content of the examination. Examination questions were then developed in accordance to these specifications. The major steps of an examination specification development were:

A. Examination Specifications Meeting: A meeting of 10-12 subject matter experts was held to develop examination content weights. The meeting included the presentation of the job analysis results and the development of test specifications that was used to guide examination development activities.

B. Examination Specifications and Final Report: A report of findings of the test specifications as well as a final report documenting the activities and results of the job analysis was provided by our test developer at CGI.

Examination Item Development

The next step in the development of an exam was to write, edit and approve examination questions, or items. The approved items are put in to an item bank from which an exam form is developed. The major steps of examination item development were:

A. Item Writing: Items for the exam were written at a three-day meeting by 20-30 participants. The participants were practitioners, supervisors and/or experts in the field who know the content and are thoroughly familiar with the standards. The item writers reflected the diversity that exists within the occupation with respect to gender, geographic regions and major racial/ethnic subgroups.

The test developer presented the group with the guidelines for good item writing. Participants learned about the variety of items available and how to craft good items. The items written at the workshop were reviewed by the test developer and by small groups of workshop participants. Items were clarified and improved as needed.

B. Item Review: Following the Item Writing Workshop, all items were first reviewed and edited by the test developer for style, format, logic and grammar and then classified and banked.

The items were next reviewed by participants of the Item Review Workshop. The two-day workshop required 12-15 participants, approximately half from the Item Writing Workshop and half new participants. The items were sent to the participants for review in advance of the workshop. At the workshop, each item was carefully evaluated to ensure that it is clear and concise, and measures the content as specified on the test outline.

Examination Form Development

The approved items were then assembled into an exam form in accordance with the examination specifications. The major steps of examination form development were:

A. Assembly of the Examination: Our test developer from CGI selected items from those approved at the item review workshop and assembled the examination forms according to the test specifications. The developer ensured that the content of the forms contains the appropriate number of items in each of the designated content areas to be covered by the examination.

B. Review of Exam Forms by Test Developer: The exam forms were reviewed several times to ensure that they met standards for quality and fairness. The exam items were examined for clarity, style appropriateness for the test population, and accuracy. The individual forms were reviewed to ensure that items within each form do not cue or overlap one another. A sensitivity review was

done to eliminate stereotypic references to any groups, racial, ethnic or gender group favoritism, or language that might be offensive to candidates. Finally, the forms were reviewed to assure that the items selected meet the test plan, answer key balance and agreement of all keys, clarity of directions and other quality control requirements.

C. Final Review of the Examination Forms: At this two-day meeting 12-15 participants reviewed the exam forms. Items identified as potential problems were revised and replacement items were substituted for any item deemed inappropriate.

After the meeting, the forms were reviewed a final time by the test developer and then prepared for computer delivery.

Validation

Validity indicates the extent to which an examination measures what it sets out to measure. The validation of the program in general and the test forms in particular was conducted by trying out the test in computer-based test centers and by establishing a passing score. The major steps of a test program and test form validation were:

A. Beta Testing: The approved test forms were made available by the test delivery company. Over 200 individuals took the beta version of the exam. The beta testers were mixture of gender, race and nationality. Special attention should be paid to insure that most of the pilot testers are in the targeted range for education and experience.

B. Preliminary Item Analysis: A preliminary item analysis was conducted by the test developer. The PIA ensured that the correct key is being used and detected whether items are performing in a way that adversely affected the statistical characteristics of the test or in a way that was unintended (i.e., high scoring candidates get the item wrong while low scoring candidates get the item right).

C. Cut Score Meeting: Approximately 12 to 15 individuals who were not been involved in the test development process met with the test developer to set a scaled passing score. The test developer linked the passing score of one test form with the other(s) through a statistical process. The Cut Score was determined using the Angoff method.

Approval

Es submitted for review and endorsement by the Professional Practices Committee (PPC). Upon endorsement by the PPC, a proposal was submitted for approval by the IEEE Board of Directors.