The Certified Enterprise Integrator (CEI) Examination

Dr. Tracy S. Tillman, CMfgE, CEI
Eastern Michigan University

Introduction

This paper will describe the Computer and Automated Systems Association's (CASA) new Certified Enterprise Integrator (CEI) examination and certification program, which is administered by the Manufacturing Engineering Certification Institute (MECI) of the Society of Manufacturing Engineers (SME). Topics to be addressed include the:

(a) nature and development of the CEI program and examination,
(b) application procedure,
(c) body of knowledge and structure of the examination,
(d) examination preparation strategies,
(e) examination administration, and
(f) CEI designation and certification maintenance.

Nature and Development of the CEI Program and Examination

The development of the CEI program and examination is the result of years of diligent work by number of experts in the fields related to manufacturing enterprise integration. Following appropriate psychometric procedures, these content experts identified the body of knowledge and requisite competencies that individuals should have to become recognized as a CEI. The following steps, as recommended by Tillman (1996), were followed to develop the CEI certification program and examination:

1. A separate certification organization (MECI) was established with administrative independence from the "parent" organization (SME).
2. Grandfathering of candidates was not allowed.
3. A procedure for handling misconduct by certified individuals was developed.
4. A market/needs analysis for the new program and examination was conducted before development began.
5. A psychometric consultant familiar with certification procedures was used.
6. A role delineation of the professional functions of an enterprise integrator was developed using the new CASA (1993) wheel model of enterprise integration.
7. The body of knowledge and specific competency areas were developed and verified by experts and individuals practicing in the field. Many of these individuals were participants in CASA's technical forum.

8. A examination outline and table of specification was developed, based on content, cognitive level, and item difficulty.

9. An item bank of about 500 objective, multiple-choice questions were written by technical forum attendees and other technical experts under the guidance of the psychometric consultant.

10. The items were reviewed and validated by committee, and a passing point value for each item was set using the Angoff (1971) method.

11. Items were selected from the item bank by stratified random selection to construct the first draft of the examination. An examination passing point was set based on the Angoff rating of the items selected from the item bank.

12. The examination was pretested on subjects similar to the population to be tested.

13. A statistical analysis of test and item performance was performed. Items that performed poorly were deleted or improved.

14. A final draft of the examination was developed and national administration began in mid-1996.

15. New items will be selected from the item bank for each examination administration, and new items will continue to be written and added to the item bank.

Application Procedure

A candidate for the CEI certification is one who can lead the implementation of complex business changes using information technology to enhance products, processes, and services. The candidate must have eight years of combined education and enterprise integration-related experience, of which at least four years must be experience. The candidate must complete an application form and describe his/her academic training and work experience related to enterprise integration. The payment of $350 US for SME members or $450 US for non-members for examination fees must be included with the application.

Body of Knowledge and Structure of the Examination

The model for the CEI body of knowledge, the CASA (1993) enterprise wheel, is shown in Figure 1.
THE NEW MANUFACTURING ENTERPRISE WHEEL

Figure 1. The CASA/SME Manufacturing Enterprise Wheel.
The examination consists of three modules, based on the CASA (1993) wheel model of enterprise integration: (I) Business Processes/Manufacturing Environment Infrastructure; (II) Shared Knowledge Systems, and (III) Customer Focus/People, Teamwork, Organization/Resources and Responsibilities. Each module makes up about 1/3 of the total examination. The definition of each part of the three modules is given below:

Module I

**Business processes.** This element includes key processes from product definition through manufacturing and customer support. There are three main categories of processes: product/process definition, manufacturing, and customer support.

**Manufacturing environment infrastructure.** Customers, competitors, suppliers, workforce, investment, transportation, communication, schools, research, government support and regulations.

Module II

**Shared knowledge systems.** This element includes both manual and computer tools to aid research, analysis, innovation, documentation, decision-making, and control of every process in the enterprise.

Module III

**Customer focus.** The role of an enterprise mission and vision to align work toward meeting customer expectations. Marketing, design, manufacturing, and support must be aligned to meet customer needs.

**People and teamwork.** Included here are the means of organizing, hiring, training, motivating, measuring, and communicating to ensure teamwork and cooperation.

**Resources and responsibilities.** Resources (inputs) include capital, people, materials, management, information, technology, and suppliers. Responsibilities (outputs) include employee, investor, and community relations, as well as regulatory, ethical, and environmental obligations.

The expected skills, knowledge, and abilities of a certified enterprise integrator, based on the body of knowledge, are as follows:

1. Determine customer needs and solutions.
2. Effectively interface with the user/customer.
3. Form, train, and develop teams, people, and organizations.
4. Gather data, and formulate concepts and alternatives.
5. Determine system requirements and engineer solutions.
6. Determine hardware, software, network, and database architecture.
7. Establish and evaluate quality standards.
8. Develop system tests.
9. Measure user and customer satisfaction.
10. Determine support requirements.
11. Plan, organize, direct, and control project implementation.
13. Integrate people, processes, and technology.
14. Leverage leadership/management theories and practices.

Examination Preparation

It is recommended that the candidate obtain the CEI examination study guide (1996) for help in preparing for the examination. The study guide includes sections on the CASA/SME Enterprise wheel, the body of knowledge, and selected and recommended readings for study. The CEI examination is an open book test. A candidate should avoid bringing too many references. It is best for the candidate to look at the body of knowledge, study guide information, and example questions in order to identify their weak areas. They should select the books most needed and use post-it notes to indicate the location and type of information in the reference books that they may need to use during the test.

When taking the test, candidates should first record answers for those items they can do quickly, without using any references. They should go through the entire test and skip hard items. They should then go through the test a second time and answer those items for which they can quickly find helpful reference information, again skipping harder items. They should then go through the test a third time and answer the harder questions that take more time, but still skip the hardest items that would take a great deal of time to answer. Finally, by the end of the exam period they should answer any remaining unanswered items as best they can, and make sure all items are answered.

Examination Administration

The examination consists of about 270 items (about 90 items in each module). The items are in multiple-choice format. If given as a paper and pencil exam, the answers are recorded onto a scantron-type sheet. If given as a computer-based test (available anytime at Sylvan computer centers) the answers are selected using the computer keyboard.

The candidate is must complete all three examination modules within a five hour examination period. If a candidate fails, they only need to retake any module(s) that they failed, but must wait for a 6 month period before retesting.

CEI Designation and Certification Maintenance

A passing candidate may professionally use the designation "CEI" with their name. To maintain their certification, the CEI must abide by SME's Certification Code of Ethics, and recertify every two years by either retaking and passing the examination or by providing evidence of sufficient professional development activities, such as education, in-plant training, attendance at conferences, clinics, technical meetings, etc.
Conclusion

This is not an easy examination to pass. The requisite competencies of an enterprise integrator are both broad and technically specific. However, CASA, its Technical Forum members, and SME invested a great deal of time, effort, and funding to develop what they think is an important certification program, examination, and credential. More and more, companies need qualified and competent individuals to help them integrate their technologies with the people and structure within their own organization, as well as with their customers and suppliers.

The presenter, Tracy Tillman, was active in the development of the CEI examination. He continues to participate in SME certification activities and will encourage attendees at the presentation session to ask specific questions regarding this new manufacturing certification program and examination.

References


Biographical Information

TRACY TILLMAN is an associate professor in the undergraduate and graduate manufacturing and quality programs at Eastern Michigan University. He has been involved in research and development of certification examinations and programs for the Society of Manufacturing Engineers for 10 years. Is is currently working on a book on tool design with Mark Curtis of Ferris State University.