



Setting the Standard for Automation™

ISA Certified Automation Professional® (CAP®)



Standards
Certification
Education & Training
Publishing
Conferences & Exhibits

Rev. 7/2009

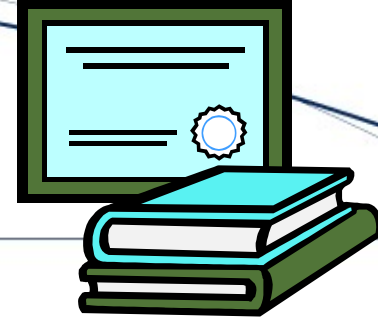
Overview of this Presentation



- CAP Overview and Discussion of Benefits
- Comparison of CAP to Other Certifications
- How to Become a CAP
- Overview of the CAP Exam
- What Can You Do About CAP?

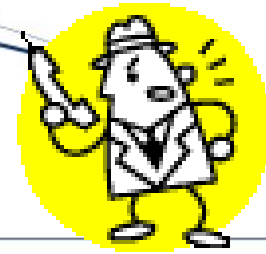
CAP Overview and Discussion of Benefits

Major New Certification by ISA



- “High Stakes” certification used for hiring, advancement, and contracting decisions
- Setting the standard for automation knowledge
- Worldwide credibility
- Not just one more credential, THE credential for professional level automation knowledge

Market Studies Show Strong Interest in Automation Certification



- 77% of the respondents believed certification would enhance recognition and respect for individuals working in this field
- 67% of the respondents reported that certification in this field would be valuable to their organization.
- 64% of the employer respondents agreed that salary/remuneration/benefits should increase for certified industrial automation professionals.
- 77% of respondents indicated that they would encourage eligible employees to seek certification in this field if it is offered by ISA.

Employer respondents cited the following benefits for CAP:

- *-Increased quality*
- *-Safety*
- *-Standardization*
- *-Professional recognition*
- *-Additional means of evaluating potential job candidates*
- *-Help to weed out amateurs posing as automation specialists*

Who Is ISA?



- A leading, global, nonprofit organization
- Setting the standard for automation
- 30,000 worldwide members

- Develops standards
- Certifies industry professionals
- Provides education and training
- Publishes books and technical articles
- Hosts a number of conferences including the largest conference and exhibition for automation professionals in North America.

Like certifications in many other fields, **CAP adoption driven by:**

- Individual automation professionals
who want to distinguish their automation knowledge
- Companies with professional automation employees
who want to advance the education of their employees
- Companies providing automation services
who want to distinguish themselves in the market
- Users of automation services
who want to improve the quality of services they purchase

...rather than by any legal requirement

CAP Benefits Individual Automation Professionals



- Enhances professional credibility
 - Travel from job to job and provide immediate proof of ability.
 - Younger professionals increase their recognition and credibility
 - Mid-range professionals validate and document their range of knowledge
 - Those nearing retirement enhance their future marketability
- Enhances self image
- Improves career opportunities -
 promotion, pay increases, job portability
- Encourages life long learning and professional development

CAP Benefits Employers of Automation Professionals



- Develops a better trained workforce
 - Provides documented evidence that employees are qualified to do their job. Such documentation is a requirement of the ISO 9001 standard.
- Incentive for employees to remain current
- Promotes safe practices
- Qualification tool for hiring and advancement decisions
- Enhances company image with internal or external customers

CAP Benefits Companies Providing Automation Services



- Provider companies can distinguish themselves in the market by advertising that their employees are certified
- Many users of automation technician services require CCST certification,
 - and providers who can supply CCSTs have an advantage – the same thing will happen with CAP
- Qualified automation professionals doing the work results in fewer call-backs, less rework, and higher profits

CAP Benefits Companies Contracting for Automation Services



- When outside companies do your automation design how do you know that...
 - The people doing the work on your projects are competent?
 - Your safety critical systems are designed in the best way and to the latest standards?
 - Your plant will get the greatest advantage from the latest standards on batch recipe management, data integration, fieldbus, wireless, and other areas?
- If the people doing your work have a CAP credential...
 - They have demonstrated competence
 - Their knowledge of automation is well above average
 - They are much more likely to know the latest standards
 - Continuing education requirements keep knowledge up-to-date

More Competent Automation Professionals Develop Automation Systems that...

- Are less expensive
- Operate more efficiently
- Are easier for operators to work with
- Are easier to maintain
- Have fewer mistakes in design that have to be corrected
- Startup hours or even days faster
- Have fewer unplanned shutdowns
- Utilize the latest, most cost effective standards appropriately
- Avoid safety incidents
- Avoid environmental incidents

Who are Automation Professionals?



- Automation Professionals are:
 - responsible for the direction, definition, design, development/ application, deployment, documentation, and support of systems, software, and equipment used in control systems, manufacturing information systems, systems integration, and operational consulting
- Work for
 - End-users
 - Engineering contractors
 - Specialty automation and manufacturing information providers including System Integrations and application services divisions of supplier companies
 - Hardware and Software product companies as application engineers, sales personnel and product developers

- **Education - Experience**

- Four-year technical degree (engineering, engineering technology, computer science, math, science, etc.) + five years experience
- Two-year technical degree + eight years experience including two years in responsible charge
- Without a degree, ten years of experience including two years in position of responsible charge

- **Exam**

- Pass a comprehensive exam

- **Continuing automation education**

- 45 hours every three years (average of 15 hours per year)

- Covers the Automation Body of Knowledge
- Difficult and comprehensive – if it wasn't a tough exam the certification wouldn't mean much...
 - **but passable by many automation professionals**, particularly after studying less familiar topics
 - Experience helps
 - Pass rate is about 2/3
- Multiple choice questions
- Testing locations worldwide
- Testing available every business day and Saturdays at some locations

Who should become CAP certified?



- People working in automation at the professional level employed by:
 - End users
 - System integrators
 - Engineering contractors
 - Vendors
- Technical supervisors
- Technical sales personnel
- Automation educators
- ISA leaders in particular should become certified (CAP or CCST) if their work background is appropriate -- section officers, district officers, division officers, and society officers

What some current CAPs are saying:



- “The CAP has given me a way to prove to my employer that I have knowledge of automation”
- “Since I don’t have a degree, becoming a CAP is the only way I can show my next employer that I am competent in automation”
- “I’m nearing retirement and the CAP will help me be more attractive for part-time work”
- “In our company, people advance faster with the right credential. CAP is that credential in the automation area”
- “My company is using CAP to demonstrate to our customers that we have competent personnel”

Comparison of CAP to Other Credentials

Three Types of Credentials



- **Certificate**

- Evidence of taken course or series of courses on one subject
- Example: ISA Leadership Development Certificate Program
- Usually only requires participation

- **License**

- legal right to practice in broad area
- Examples: medical doctor, professional engineer
- Requires education, comprehensive exam and possibly continuing education

- **Certification**

- generally narrower area than license
- Examples: Certified Ophthalmologist, Project Management Professional, Certified Automation Professional
- Requires education, experience, exam and continuing education

Hundreds of Certifications are in Use Today

- Many certifications have a legal requirement – particularly in the health field
- Hundreds of certifications are voluntary
- Professional Engineer Registration in the U.S.
 - Control System Engineering
- Certified Control System Technician

Examples of Voluntary Certifications



- Project Management Professional (PMP) – over 200,000 active, 38% outside North America
- Certified Safety Professional – 20% salary differential vs. those not certified doing similar work - 18,000 awarded, 10% are also P.E.s
- Certified Industrial Hygienist – virtually all practitioners in this area are certified
- Certified Manufacturing Engineer (CMfgE) – 12,000 are certified by Society of Manufacturing Engineers
- Certified Quality Engineer (CQE)
- Certified HR Professional

Each of these certifications...



- Have been shown to increase job opportunities for those holding the certification
- Some are essentially required to work in the respective field in some industries or companies
- Enhances competitiveness of companies offering services

What about the United States Professional Engineer (P.E.) License?

- P.E. is legal license granted by states in the U.S.
- The P.E. exam can be taken in many technical areas –
so does not certify competence in any specific area
- Most states require an approved engineering degree
(generally engineering technology and computer science do not qualify)
- U. S. only
- 15% of ISA members report that they have a P.E.
- Very little automation work requires the P.E.

CSE option in the P.E. is more specific to automation

- Control System Engineering (CSE) exam demonstrates competence in process control --
so has similarities with certifications

BUT...

- CSE focuses only on process control area of automation
- CSE is not usually identified in the P.E. designation so is not a good indicator of automation knowledge
- CSE will apparently never reach critical mass
 - Only about 1% of automation professionals in the U.S. have passed in 14 years
 - Less than 1% of ISA members report that they have passed the CSE

In automation, P.E.s and CAPs do the same type of work, but...

- CAP demonstrates competence across the entire automation field
- CAP includes the large number of automation professionals with degrees in areas other than engineering
- CAP is worldwide and has worldwide credibility
- The number of CAPs will reach critical mass in a few years
CAP will be the de facto standard for demonstrating automation competence
- CAP is not a legal “license” to practice automation

Comparison to the Certified Control System Technician® (CCST®)



- The job description of a CCST includes:
 - Calibration
 - Loop Checking
 - Troubleshooting
 - Start-Up
 - Maintenance/Repair
 - Project Organization
 - Administration
- These are significantly different tasks from the project, system design, and operation improvement tasks in the CAP's job description
- CCST is focused on process automation which is where most control system technicians work

How to Become a CAP

Submit the Application

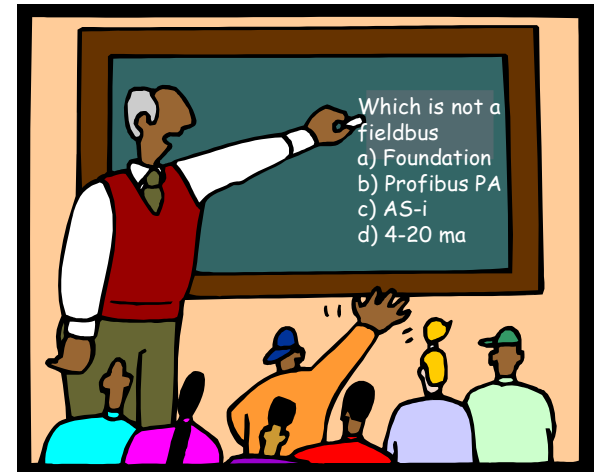


- Review the application deadlines for the three testing windows. www.isa.org/cap
- You can only take the CAP exam during a testing window.
- Submit your application either online or mail by one of the application deadlines.
- After you submit your application, you are eligible to take the test during a nine month period, or two testing windows.

Become Familiar with the Exam



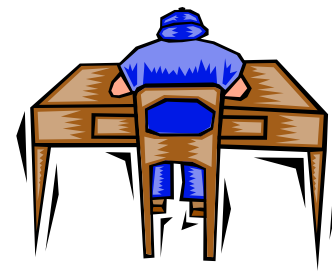
- This presentation
- CAP Study Guide, 2nd Edition - 75 sample questions available at www.isa.org/cap



Do General Study in All Topics

with one of the following approaches:

- A Guide to the Automation Body of Knowledge
 - 500 page, readable book
 - comprehensive overview of all 37 topics in the scope of the exam
 - available at www.isa.org/autobok
- CAP Three-Day Review Course
 - thorough basic preparation for the exam
 - For dates and locations of classes see www.isa.org/cap
 - additional classes can be scheduled for companies or co-sponsored with ISA Sections.
 - this review course is also available on the internet
- CAP Learning System
 - self-study modules in print and sample questions on the internet
 - instructor-assisted with Ask the Instructor and Discussion Board features
 - available at www.isa.org/caplearn



Further Study Weaker Areas:



- **Books** - For a list of recommended books see www.isa.org/cap
- **Web seminars** – ISA offers 40 archived web seminars free to members
- **Short Courses** – ISA offers over 60 courses of 1-3 day duration that cover the entire Automation Body of Knowledge

Schedule the exam



- ISA will:
 - notify you when they approve your application
 - assign an eligibility ID number
 - send that to you and to the Thompson Prometric testing service
- Then go to www.prometric.com/ISA
 - enter your eligibility ID number
 - select the location you prefer - for a list of locations see www.prometric.com/ISA
 - select a time that fits your schedule – anytime there is a space available at the testing center
- Take the exam within next two testing windows after the application deadline



Take the exam



- Multiple choice questions with four possible answers
- 175 questions, four hours
- Computerized exam
 - Allows marking questions for easy review later
 - Easy return to questions skipped
 - Pop-up Windows basic calculator on computer
 - Instantaneous reporting of result when finished
- Nothing in, nothing out but scratch paper supplied
- Make sure you answer all questions --
but time is usually ample

If you Passed, Great!



- Let your management know you are a CAP
- Discuss the value of CAP with your supervisor
- Suggest your company build CAP into its strategic plan for employee development
- Let your internal and/or external customers know you are a CAP and help them understand what it means
- Add CAP to your business card, your signature, and wherever you use your name professionally

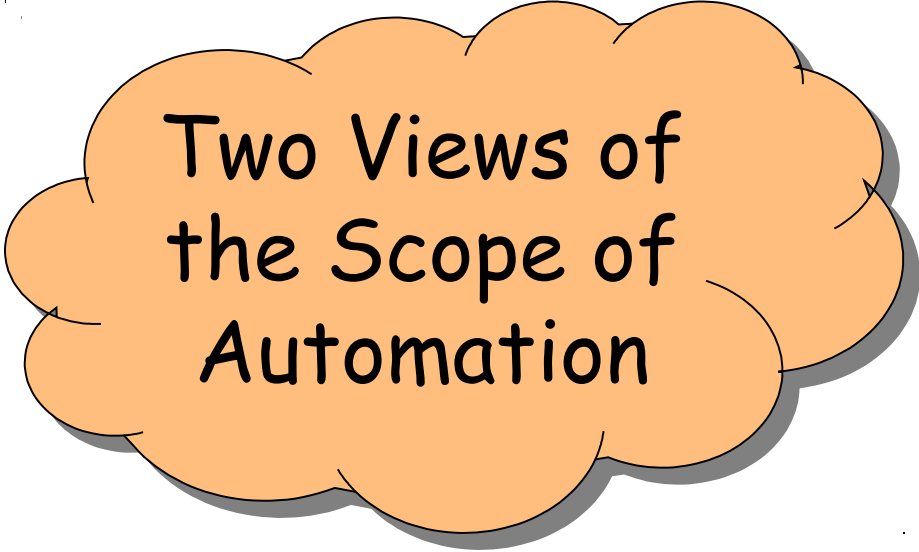
If You Didn't Pass This Time...



- Analyze your results
- Study areas where you could improve
- Take the exam again



Overview of the CAP Exam

An orange, cloud-like graphic with a black outline and a drop shadow, containing the text "Two Views of the Scope of Automation".

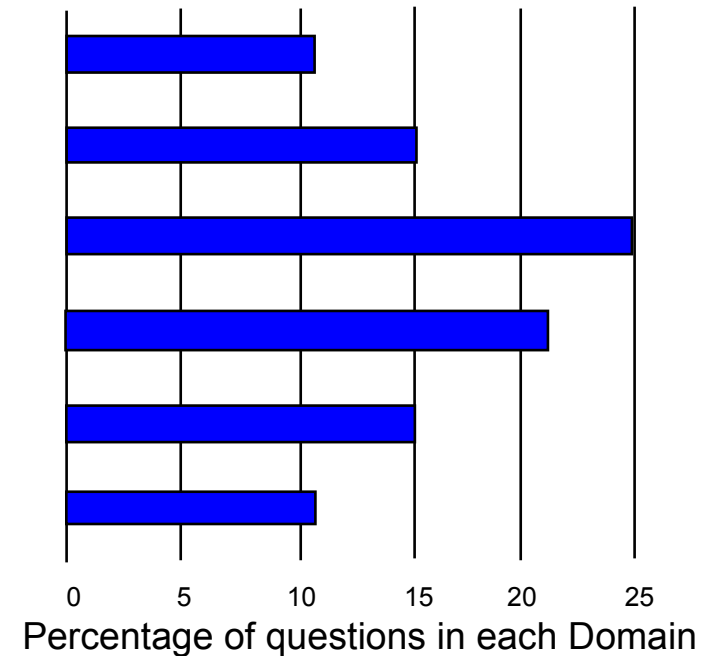
Two Views of
the Scope of
Automation

What you do -- Job Description of an Automation Professional



Job Description of an automation professional defined by these six **“Domains”** (subdivided into 52 “Tasks”)

- I. Feasibility Study
- II. Definition
- III. System Design
- IV. Development
- V. Deployment
- VI. Operation and Maintenance



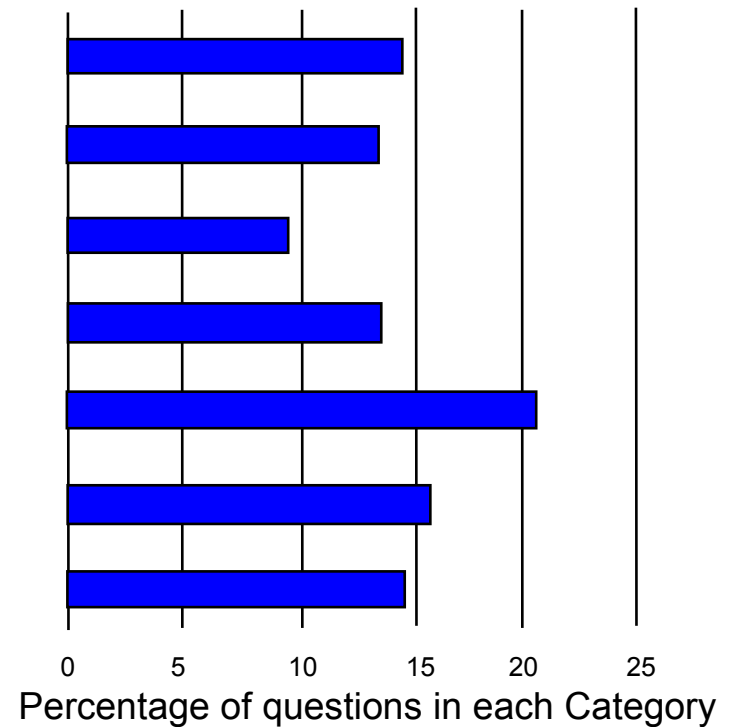
*A full listing of this job description is available at:
www.isa.org/cap under Knowledge and Skills*

What you know - Automation Body of Knowledge



The technical scope of professional work is defined in these seven **“Categories”** (subdivided into 37 “Topics”).

- I. Basic Continuous Control
- II. Discrete and Manufacturing Control
- III. Advanced Control
- IV. Reliability, Safety, and Electrical
- V. Integration and Software
- VI. Deployment & Maintenance
- VII. Work Structure (projects, teams)



*A full description is in the book,
[A Guide to the Automation Body of Knowledge](#)
and the table of contents can be viewed on the ISA website.*

**The
7 Knowledge Categories
subdivided into 37 Topics**
(i.e. the Automation Body of Knowledge)

**should be the focus of
your study for the exam.**

Knowledge Category I – BASIC CONTINUOUS CONTROL



1. Process Instrumentation
2. Analytical Instrumentation
3. Continuous Control
4. Control Valves
5. Analog Communication
6. Control System Documentation
7. DCS Control Equipment

Category I - sample question



When tuning a three mode controller by trial-and-error, which mode is usually adjusted first

- a) integral
- b) gain
- c) derivative
- d) offset

Knowledge Category II – BASIC DISCRETE AND MANUFACTURING CONTROL

8. Discrete Sensors and General Manufacturing Measurements
9. Discrete Control Concepts and PLC Equipment
10. Motor and Drive Control
11. Motion Control

Category II – sample question



IEC 1131 graphical programming languages for PLCs include:

- a) Structured text
- b) The ADA programming language
- c) Function Block Diagrams
- d) Fuzzy Logic

Category III – ADVANCED CONTROL



- 12. Process Modeling
- 13. Advanced Process Control
- 14. Control of Batch Processes
- 15. Environmental
- 16. Environmental Monitoring
- 17. Building Automation

Category III – sample question



What is the best type of control to use if the process changes from time to time and if there are a number of variables to be controlled?

- a) Fuzzy Logic
- b) Model Predictive Control
- c) Model Reference Control
- d) Advanced Regulatory Control

Category III – sample question



What is the relationship between a control recipe and a master recipe and a batch?

- a) Control recipes are a copy of the master recipe and describe the formulation for a series of batches in a run
- b) A control recipe is derived from the master recipe and is unique to a batch
- c) The control recipe is a more general version of the master recipe and covers an entire plant
- d) The control recipe is used by the research department as a control over a series of batches.

Knowledge Category IV – RELIABILITY, SAFETY & ELECTRICAL

- 18. Alarm Management
- 19. Reliability
- 20. Process Safety
- 21. Electrical Installations
- 22. Electrical Safety

Category IV – sample question



Which of the following logic systems is the safest and the one most likely to respond to a true demand?

- a) 1 out of 1
- b) 1 out of 2
- c) 2 out of 2
- d) 2 out of 3

Knowledge Category V – INTEGRATION AND SOFTWARE

- 23. Digital Communications
- 24. Industrial Networks
- 25. Manufacturing Execution Systems and Business Integration
- 26. Systems and Network Security
- 27. Operator Interface
- 28. Data Management
- 29. Software
- 30. Custom Software

Category V – sample question



A network device that provides isolation from different networks, without changing any of the data is called:

- a) Hub
- b) Router
- c) Switch
- d) Gateway

Category V – sample question



Which of these types of communication methods usually results in less field wiring when connecting process transmitters to a control room

- a) AS-i bus
- b) Profibus PA
- c) HART
- d) 4-20 ma

Knowledge Category VI – DEPLOYMENT & OPERATION

31. Operator Training
32. Checkout, System Testing, and Startup
33. Troubleshooting
34. Maintenance, Long Term Support and System Management

Category VI – Sample question



When training operators on a new control system, which training method would be best:

- a) Self-study of printed material
- b) Lecture by the supervisor
- c) Demonstration by the system design professional
- d) Practice using the controller on a simulated system

Knowledge Category VII – WORK STRUCTURE



- 35. Automation Benefits and Project Justification
- 36. Project Management
- 37. Interpersonal Skills

Category VII – Sample question



A project has completed 40% of the work but has spent 60% of the budgeted funds. What is the cost performance index?

- a) 0.50
- b) 0.67
- c) 0.60
- d) 0.20

What Can You Do About CAP?

As an Individual what can you do about CAP?

- Become certified yourself
- Encourage others to become certified
- Talk with your management about CAP
 - Encourage your company to select a representative to become certified
 - Suggest your company build CAP into its strategic plan for employee development

As a Company Employing Automation Professionals what can you do about CAP?



- Identify an initial person in your organization to apply
 - Also possibly take the three day review course
- Build CAP into your strategic training plans
- Encourage professionals in your organization to become certified
 - Develop a policy of payment/part payment for application and/or preparatory training for CAP
 - Consider a one time bonus for becoming a CAP
 - Give preference in salary and advance to those who have taken the initiative to become CAPs

As a Company Using Outside Automation Services what can you do about CAP?



- Explain the advantages of CAP to your services suppliers
- In requests for bids ask for information on which personnel have a CAP
- Tell your suppliers that you will begin to give preference...
 - To system integrators, supplier application groups, and engineering contractors whose lead personnel have a CAP
 - To individual contractors that that have a CAP

As an Automation Services Company what can you do about CAP?



- Identify an initial person in your organization to apply
 - Also possibly take the three day review course
- Build CAP into your strategic training plans
- Encourage professionals in your organization to become certified
 - Develop a policy of payment/part payment for application and/or preparatory training for CAP
 - Consider a one time bonus for becoming a CAP
 - Give preference in salary and advancement to CAPs
- Advertise that you have CAP certified people
- Tell your customers why CAPs on their projects will be better qualified than your competitors' people

As an Automation Hardware or Software Supplier what can you do about CAP?



- Talk with your customers about CAP
 - Let them know that you support the CAP program because customers with a CAP will be better able to correctly apply your products
 - Encourage them to become certified
- Use CAP to satisfy pre-requisites for training you provide to customers as appropriate

Summary



- CAP is becoming the standard for demonstrating automation competence
- CAP will be used for hiring and advancement decisions
- CAP will be used by automation services providers to differentiate themselves in the market
- Users will require CAPs to do their outsourced work

For More Information



- Download the CAP Handbook and get other information at www.isa.org/CAP
- E-mail questions to: cap@isa.org