The Making of a Certified Quality Manager (CQM)

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1. Introduction

The purpose of this paper is to explain how a person earns the title of Certified Quality Manager (CQM). One might ask why is this important? Asking such a question is essentially the same as asking "why is quality important." The person who holds the position of quality manager in a company has, at least in name, primary functional responsibility for the quality of that company's products and services. To the extent that he or she has the requisite knowledge and competence to carry out that responsibility, so will that company deliver just that much higher quality products and services. And it is the American Society for Quality's (ASQ) quality manager certification program that, arguably more than anything else, promotes and contributes to the manager gaining that knowledge and competence. To become a CQM one must meet the high standards of ASQ in three areas: (1) having the requisite amount of work experience/education, (2) providing evidence of professionalism, and (2) proving one truly has a comprehensive understanding of and can apply the concepts and principles of quality management. By far, the most difficult of these three for the average candidate is the latter which is accomplished by passing the Certified Quality Manager Examination. This is a challenging exam with a pass rate of between 40% and 45% (Okes, 2001). For this reason, this paper will be mostly about this exam. This paper is organized as follows:

1. Introduction
2. Background
3. The benefits of certification

4. How the exam is developed
5. How the exam is administered
6. Examples of exam questions
7. Exam taking tips
8. Preparing for the exam
9. Recertification
10. Conclusion

2. Background

This section will cover the following:

- ASQ and the Quality Management Division (QMD)
- The Certified Quality Manager (CQM) Exam
- The Body of Knowledge (BOK) (in general)
- The multiple-choice Body of Knowledge
- The constructed response Body of Knowledge
- Why quality management certification was deemed necessary

The American Society for Quality (ASQ) and the Quality Management Division (QMD). ASQ's Quality Management Division (QMD), working closely with ASQ, is responsible for the Quality Manager certification program. ASQ is probably *the* major quality organization in the world. Here is a description from its home page (http://www.asq.org):

> The American Society for Quality (ASQ) has been the leading quality improvement organization in the United States for more than 50 years. Its members have initiated *most of the quality methods used throughout the world*, including statistical process control, quality cost measurement and control, total quality management, failure analysis, and zero defects [emphasis added].
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> ASQ has more than 117,000 individual and 1,100 corporate sustaining

members worldwide. Individual members belong to one of 247 local Sections located throughout the United States, Canada, Mexico, Puerto Rico, and an International Chapter. ASQ also has 22 industry and topic-specific Divisions.

One of those divisions is the Quality Management Division (QMD) (http://asq-qmd.org):

> The Quality Management Division (QMD) is the largest ASQ division with over 20,000 members. These members include many of the Society's quality executives, managers, supervisors, team and project leaders, and quality professionals aspiring to those positions. The division's mission is to provide its members with the latest information on basic and leading edge quality management principles, systems, tools, and techniques and to represent the members to society and the profession.

As of May 2002, the ASQ home page listed eleven types of certification sponsored by ASQ. These range from Quality Technician to Quality Manager. One of the latest is Quality Auditor—Biomedical. As mentioned QMD is responsible for the Quality Manager certification. This is accomplished primarily by having applicants take the CQM Exam and evaluating the results.

The Certified Quality Manager (CQM) Exam. The CQM Exam consists of two parts: 150 multiple-choice questions and three constructed response (essay answer) questions. Two of the three constructed response questions must be answered. For more details on these questions see section 6 of this paper. The examinee has three hours and 15 minutes to answer the multiple-choice questions and 45 minutes to answer the two constructed response questions selected.

The Body of Knowledge (BOK) (in general). Going hand-in-glove with the CQM Exam is the Body of Knowledge (BOK). The CQM Exam and associated BOK began in 1995 (Okes & Westcott, 2001). All CQM Exam questions are based on this BOK. Since it is ASQ's policy to update the BOK every five years,

the latest (second) version was published in 2000. Okes & Westcott (2001) described this new BOK as follows:

> It contains new content reflecting changes in business technologies and emphasis, and at the same time maintains the core of what quality management is all about. The new structure of the BOK is also *more process oriented and better aligned with widely known models for organization excellence*[1] [emphasis added]. (p. xxi)

This new BOK is set forth in Appendixes A and C. Appendix A is the BOK for the multiple-choice questions on the exam and Appendix C is the BOK for the constructed response questions.

The multiple-choice Body of Knowledge. The multiple-choice BOK is organized into seven areas. Figure 1 is a summary down the second level of the multiple-choice BOK (which, except for areas V and VII, has three levels). You will notice that the Appendix A BOK contains a brief summary of what each subarea covers. For example, this is the first subarea under the Leadership area:

I. Leadership (30 questions)
A. Organizational Leadership
1. *Organizational development*
Basic organizational design: matrix, flat, parallel, Big Q/little q; upper management, middle management, quality council; union influence (Application)

1) In particular the Malcolm Baldrige National Quality Award. This award was established in 1987 to promote quality in the United States. If an organization qualifies, five awards are made annually in the areas of business (manufacturing, service, small business), education, and health care. Rigid criteria must be met in these seven areas: leadership, strategic planning, customer and market focus, information and analysis, human resource focus, process management, and business results. These criteria are becoming popular for organizational improvement even if the award itself is not being sought. For more information see the National Institute of Standards and Technology (NIST) web page http://www.quality.nist.gov.

First Level Area	Second Level Area
I. Leadership (30 questions)	A. Organizational Leadership
	B. Team Processes
II. Strategy Development and Deployment (30 questions)	A. Environmental Analysis
	B. Strategic Planning and Assessment
	C. Deployment
III. Quality Management Tools (20 questions)	A. Problem-Solving Tools
	B. Process Management Approaches
	C. Measurement: Assessment and Metrics
IV. Customer-Focused Organizations (20 questions)	A. Customer Identification and Segmentation
	B. Customer Relationship Management and Commitment
V. Supplier Performance (10 questions)	A. Supplier Selection Strategies and Criteria
	B. Techniques for Communicating Requirements to Suppliers
	C. Techniques for Assessment and Feedback of Supplier Performance
	D. Supplier Improvement Strategies
	E. Supplier Certification Programs
	F. Partnerships and Alliances with Suppliers
	G. Logistics and Supply Chain Management
VI. Management (30 questions)	A. Principles of Management
	B. Communications
	C. Projects
	D. The Quality System
	E. Quality Models
VII. Training and Development (10 questions)	A. Alignment with Strategic Planning and Business Needs
	B. Training Needs Analysis
	C. Training Materials and Curriculum Development
	D. Methods of Training Delivery
	E. Techniques for Evaluating Training Effectiveness

Figure 1. A summary of the BOK for the multiple-choice questions on the CQM Exam.

This information is used as guidelines for writing exam questions but is not meant to be all-inclusive as far was what will be on the exam. It is rather "intended to clarify how the topics relate to a Quality Manager's role" (CQM Brochure, p. 8). At the end of each summary the "maximum level of cognition" at which the topic will be tested is given; in this example, at the "application" level. These levels are those of Benjamin S. Bloom's famous taxonomy of educational objectives[2] and range from simple recall at the "knowledge" level to evaluating ideas, solutions, etc. at the "evaluation" level. These levels are listed and briefly described in Appendix B.

The constructed response Body of Knowledge. Quoting again from ASQ's CQM Brochure (p. 12) concerning the constructed response BOK, the answers to the constructed response questions will be graded on "knowledge of quality management, as it relates to the content areas listed below and in the following skills and abilities: communication; critical-thinking, including the ability to analyze and synthesize information; personnel management; and, general management." These are the "content areas listed below":

- Contribute to the Strategic Planning and Deployment Process
- Develop and Maintain a Customer Focus (Internal and External Customers)
- Manage the Quality Organization/Department
- Assess Performance Information
- Develop Systems for Managing Supplier Performance

Appendix C, the constructed response BOK, provides more details regarding the makeup of each of these content areas.

Why quality management certification was deemed necessary. Hutchins (1997)

2) This taxonomy was first published in 1956. Here is a description of the book from the U.S. Library of Congress' home page: *Taxonomy of educational objectives; the classification of educational goals*, by a committee of college and university examiners. Benjamin S. Bloom, editor [and others. 1st ed.] New York, Longmans, Green, 1956-v. illus. 22 cm.

quotes Tom Pyzdek, a well known quality professional, with regard to why Quality Manager certification was becoming necessary:

> In recent years it became increasingly obvious that there existed a glaring certification omission from the ranks of certified quality professionals: the quality managers. The quality manager supervised the work of an array of certified professionals without needing to be certified himself or herself. This situation could and did lead to problems, especially when the quality manager was less than fully qualified for his or her position.
>
> When the demand for qualified professional quality managers exceeded the supply, the field was overrun with hacks and incompetents. The result was resentment on the part of the other certified quality professionals and a general lack of respect for the ability of the quality department to contribute to the success of the organization. (under CQM: What is it?)

I might add that ASQ itself has a vested interest in quality manager certification if it wants to continue being considered a preeminent quality organization. After all, since ASQ's Quality Management Division is its largest, in a very real sense, the "quality" of its quality manager members is a reflection on the "quality" of ASQ itself. That there was a real need for such a program is evident from the fact that according to the QMD's home page (http://www.asq-qmd.org), "Over 5,000 quality managers have become certified over the past five years, and most of them are QMD members."

3. The Benefits of Certification

We have just discussed the benefits of certification in terms of the quality profession. At this point let's take a closer look at why an *individual* might want to seek certification. To begin with we might ask what, in ASQ's view, does certification mean. From a strictly technical point of view it means that the individual has been recognized by his/her peers as having "demonstrated a proficiency in

and comprehension of a particular quality area [in this case quality management] at a specific point in time." A more practical explanation of the meaning of certification is: "It demonstrates that the certified individual has the knowledge to ensure the quality of products and services" (both quotes from the CQM Brochure, p. 1). As can be seen from a perusal of the BOKs (Appendixes A and C) the "knowledge" expected of the certified Quality Manager is, indeed, great. Given this requirement and the effort that must go into gaining the knowledge, what can the person expect in return? Some of the benefits are:

- A higher salary
- Advancement
- Making yourself more marketable
- Peer recognition
- Increasing and validating your knowledge
- Increased self-esteem.

A higher salary. Every year ASC does a salary survey which includes a comparison between those who are certified and those who aren't. The latest survey results (December, 2001) show the average annual salary for a quality manager without certification is $66,058.00 as opposed to $71,163.00 for those certified; a difference of $5,105.00, or 7.7% (Phillips-Donaldson, 2001, p. 38). An interesting letter appeared in the February 2002 issue of same magazine that published the salary survey results (*Quality Progress*). The letter writer said that to unequivocally say that ASQ certification leads to higher salaries is making an "unjustified leap from correlation to cause and effect" (Hansen, 2002) since other factors might well be influencing the difference. Technically this is a good point and it behooves ASQ to better qualify its statements. However, since all seven ASQ certifications surveyed show similar positive results and, apparently have in the past, it seems safe to assume that certification is a major contributing factor if not *the* major contributing factor. It should be pointed out, however, that it is

not just the "certificate" that counts but the gumption that is required to get that certification, and surely this plays a big part in how companies reward their people. An analogy might be why a person with a Ph.D. is often recognized as much for his or her stick-to-it-iveness in gaining the credential as the knowledge gained by it.

Advancement. It seems only common sense that an employer will take into consideration certification when making promotion decisions. In fact, the CQM Brochure lists 122 companies (many top Fortune 500) that have formally endorsed ASQ certification (including, of course, that for the Quality Manager). And, according to ASQ, this represents only a sample of the "numerous organizations" that utilize ASQ's certification in their personnel practices.

Making yourself more marketable. As Hutchins (1997) states it: "All other things being equal, between you and other job applicants, that something extra may make the difference between getting the job or not..." It is similar to having ISO 9001 certification[3]: if your company has it and another possible suppler doesn't, it is more likely the customer will chose you.

Peer recognition. In fact, as mentioned above, and according the ASQ's CQM Brochure (p. 1), certification is "peer recognition that an individual has demonstrated a proficiency in and comprehension of a particular quality area [in this case quality management] at a specific point in time." Once you have become certified as a CQM, you are then part of a special "family" whose members not only rate special recognition but are expected to contribute in special ways to ASQ and the Quality Management Division (QMD). For example, only CQMs can participate in all the activities that go into developing the CQM Exam; however, once certified and time permits, CQMs are *expected* to help with this and other ASQ work.

3) ISO 9001 certification is acknowledgement by a recognized authoritative third-party that your organization has a good quality management system.

Increasing and validating your knowledge. Unless the person is exceptionally knowledgeable—for example, someone consulting in the quality management field—almost everyone who takes the CQM Exam must learn a great deal. Just look at the major topics in the BOKs:

For the multiple choice questions:

- Leadership
- Strategy Development and Deployment
- Quality Management Tools
- Customer-Focused Organizations
- Supplier Performance
- Management
- Training and Development

For the constructed response questions:

- Contribute to the Strategic Planning and Deployment Process
- Develop and Maintain a Customer Focus (Internal and External Customers)
- Manage the Quality Organization/Department
- Assess Performance Information
- Develop Systems for Managing Supplier Performance

As Okes (2000) so aptly puts it, becoming a CQM "...is not an easy process. But then, anything worthwhile usually isn't." He goes on to say: "Being recognized as knowledgeable in the entire BOK is approximately equivalent to holding a master's degree in quality management."

Perhaps just as important as increasing ones knowledge, is validating what you know. I have not taken the CQM Exam but I have been exposed to the broad range of knowledge tested by taking the QMD CQM Section Refresher Course (February, 2002). Although I have been interested in and studied total quality

management (TQM) over the last 13 years[4], I was humbled realizing how much I still didn't know. On the other hand, I was also pleased with what I did know. Studying for (and taking) the CQM Exam will quickly tell you both things.

Increased self-esteem. Although listed last, this is perhaps the most important benefit. Simply knowing you are among a rather elite group as far as understanding not only the importance of good quality but effective means to achieve it, cannot help but be a source of pride. And, armed with this knowledge and confidence, the CQM is more likely to take the initiative—*and* be asked for help by others—when management problems[5] arise. And, as the CQM begins to show he or she does have what it takes to either solve management problems or, at least, help others do this, his or her reputation will increase along with even greater feelings of self-esteem. That is, we have a good "vicious circle" that works to the benefit of both the CQM and his or her organization.

4. How the Exam is Developed[6]

In this section I will cover the following:

- Those involved in developing the exam

4) I began learning about TQM in 1989 when I started working for Douglas Aircraft Company (DAC) in Long Beach, California as a "procedures analyst." At the time, DAC was just launching a major quality initiative called Total Quality Management System (TQMS). The "rise and fall" of this program is documented in Austenfeld (1994). DAC was part of McDonnell Douglas Corporation which has now merged into the Boeing Company.

5) The distinction between simply "good management" practices and "quality management" is becoming more and more blurred. For example, the Malcolm Baldrige National Quality Award, already mentioned, could well be renamed the Malcolm Baldrige National "Good Management" Award given its scope. Also the recent revision (December, 2000) to ISO 9000, the standard for a good quality management system, is now much more "management" oriented.

6) Unless otherwise noted, the sources for the information in this section are: Westfall (2002, 2001) and Moran & La Londe (2000).

- How the BOK is created/updated
- How the raw exam items are prepared
- How the raw exam items become "approved" exam items
- How the examination is prepared

Those involved in developing the exam. There are three groups involved (Westfall, 2002): (1) the ASQ Certification Office (at the ASQ headquarters in Milwaukee, Wisconsin), (2) the ASQ Certification Board, and (3) the sponsoring division (in this case QMD). The Certification Office provides all the administrative support such as maintaining data banks, assembling tests from the data bank, facilitating workshops, calculating statistics on results, etc.

The Certification Board consists of a Chair for each exam (eleven at present) and the Board Chair. These are all volunteers. The Board is responsible for setting policy and procedures and for final approval of the items that will be covered by the BOK.

The QMD is responsible for managing the CQM Exam. Until recently (July 1, 2002) this was accomplished with a committee consisting of CQM Exam ASQ Certification Board Chair, the QMD Exam Chair, and the QMD Liaison to the Certification Board. As of July 1, the ASQ Board and QMD Exam Chairs have been combined into a single position reporting to both the QMD and the ASQ Certification Board. The Liaison position remains as before and is responsible for assembling the teams of CQMs to participate in the various workshops that develop the BOK and exam items.

How the BOK is created/updated. When it is decided to create a new certification examination the first step is to create the BOK since this will be the basis for the examination. It is also ASQ policy to update BOKs every five years (unless otherwise specified). The first step in this creation/update process is the do a job analysis. This is accomplished by an Advisory Committee of twelve certified individuals (or well-qualified subject matter experts for a brand new exam).

This committee develops a job analysis survey instrument which is first piloted to five certified individuals to check for clarity and the time required to complete it. Then it is sent to approximately 2,000 certified individuals. The purpose of this survey is to identify the tasks and knowledge that would normally be required of a highly qualified quality manager. According to Moran & La Londe (2000), "a task or knowledge must score at or above the mid-point, in other words earn a score of at least 2.5 on a scale of 1 to 5" to be included in a list of recommended subject matter items. This list of recommended items is then sent to QMD and the ASQ Certification Board for review and final approval. Then a team of twelve CQMs meet for two days to take this set of subject matter items and turn it into a finalized BOK. It is here that items are grouped logically and the number of questions to be taken from each area is determined. The team also determines "the depth... ...to which a Quality Manager should be able to perform or use the knowledge" (Westfall, 2001).

How the raw exam items are prepared. Now that the BOK has been created (or updated) exam items must be developed. Actually, this activity will occur every two or three years depending on the number of available items in the data bank. (Initially these will be "raw" items until they are fully vetted.) To accomplish this task, a team of 30 CQMs is assembled for a two or three day question writing workshop. After receiving training on exam development based on nationally recognized standards, the team is divided into subteams; some responsible for preparing multiple-choice questions and some responsible for constructed response questions. "Each item must be grammatically correct and meet structural requirements that have been established to ensure fairness of both the individual items and the overall exam" (Westfall, 2001). Furthermore, each item must be associated with the applicable area of the BOK and a specific supporting reference (including text, author, and page). For the constructed response questions, a scoring criteria that meets specific requirements must be included.

How the raw exam items become "approved" exam items. Now the "raw" items must be reviewed for such things as clarity, grammar, relevance and proper categorization. This is done every year or two by another team of certified individuals meeting for two days. Moran & La Londe (2000) explain the purpose of this review:

> This additional, intensive process of review, revision and rework is designed to ensure that all language ambiguities have been eliminated and that questions have been phrased and presented as clearly as possible without teaching or unintentionally clueing the correct answer through word matching or other cues. The items are also reviewed to ensure that they aren't biased in favor of any one industry. (under Writing the Questions)

Each item is either approved, revised, discarded, or left for later review. Approved items are now ready for exam use.

How the examination is prepared. Before each examination, a draft is prepared from approved items in the data bank. As mentioned, the exam consists of 150 multiple-choice questions and three constructed response questions. The number multiple-choice questions from each area of the BOK will be as specified in the BOK; i.e., 30 from the Leadership area, 30 from the Strategy area, etc. (see Appendix A). This draft exam is sent to twelve certified individuals who take the exam using the same time constraints as if they were actual candidates. The completed exams, along witih comments on both individual items and the exam as whole, are sent to ASQ for collation. These collated results are then used for a final team review and any questionable items, again, may be either accepted, revised, or returned to the data bank for further review. After a final examination is prepared it is sent to at least two members of the review team to perform a final review. As will be mentioned in the next section, any additional comments from examinees/proctors will be used to make further refinements.

As can be seen, exam development, from the initial job-analysis to consider-

ation of examinee/proctor comments, is an extremely conscientious and, as Westfall (2001) says, "meticulous process." Here is how she sums it all up:

> The exam development process is designed to provide a fair, unbiased, clear exam that evaluates the candidates' knowledge and ability to perform as a Quality Manager. This is achieved by including the input of many Quality Management Professionals from a diverse range of backgrounds, and through careful, repeated review of the items to ensure that they meet relevance, clarity and validity standards. The exam and exam development process is continuously improved based on the inputs of the participants of the process.

5. How the exam is administered[7)]

The administration of the CQM Exam will be discussed in terms of:

- The application process
- The examination dates and venues
- Exam rules
- Scoring
- Feedback to applicant

The application process. The application must be postmarked or faxed by the application deadline which is approximately two months before the examination date. For example, the application deadline for the examination scheduled for October 19, 2002 is August 23, 2002. The application is a two-page form meant to ensure that the applicant is indeed an eligible exam candidate. Besides the routine administrative requirements, such as applicant identification, fee payment, and designation of preferred exam date/site, the application covers the following: education, experience, professionalism, and compliance with rules.

7) Unless otherwise noted, the information in this section comes from the Certified Quality Manager (CQM) Brochure (Revised July, 2001).

For *education*, the applicant must indicate the degree or diploma and institution. International applicants must provide documentation to substantiate that their degree is equivalent to a similar U.S. degree. Although the nominal minimum work experience requirement is 10 years, part of this can be waived according to the following[8]:

- Technical/trade school diploma 1 year
- Associate degree 2 years
- Bachelor's degree 4 years
- Master's/doctoral degree 5 years

As just stated, the minimum work *experience* requirement is 10 years, up to five years of which can be waived. This experience/education must be in "one or more areas of the CQM BOK." Furthermore, the work experience must have been in a "decision-making" position; decision-making defined as "the authority to define, execute, or control projects/processes and to be responsible for the outcome." The position does not necessarily have to be a management/supervisory one. The bottom-line is that the applicant must have *at least* five years of decision-making experience in one or more areas of the BOK. To substantiate this experience, the applicant must provide information on applicable past jobs: job title, from/to dates, employer's name and address, and name of supervisor.

Proof of *professionalism* is accomplished in one of three ways:

- Being a member of ASQ or another society recognized by ASQ[9].
- Being a registered professional engineer.
- Having two people who are members of ASQ or a recognized society, and who have personal knowledge, attest to the applicant's "professional ac-

8) The accreditation of these schools must be acceptable to ASQ.

9) A "recognized" society is an international affiliate or another society that is a member of either the American Association of Engineering Societies or the Accreditation Board for Engineering and Technology.

tivities as a practitioner of the Quality Sciences" and of the applicant's ability to meet the requirements of ASQ membership and the ASQ Code of Ethics. (The ASQ Code of Ethics is reproduced at Appendix D.)

Of course supporting documentation must be provided for whatever way is used.

The final application item is *compliance with rules*. The applicant is required to sign the following statement:

> I have read, and I understand, the rules of certification contained in this brochure[10], and I agree to comply with them and with the ASQ Code of Ethics [see Appendix D]. I agree not to discuss or release in any form the examination contents. I affirm that all the information contained in this application is correct.

This part of the application also asks the applicant to "please read the ASQ Code of Ethics" and states that this code is "mandatory for all certified individuals, whether or not they are members of ASQ."

Once completed, the application and all supporting documentation are mailed to ASQ (Milwaukee, Wisconsin) along with the applicable fee (at the time of this paper):

- ASQ members $235.00
- Nonmembers $340.00
- Exam retake $185.00

Note that certification is not limited to ASQ members. However, nonmembers are encouraged to join and a membership application is attached to the CQM Exam application. As for exam retakes, there is no limit on the number of times you can do this; however, each retake must be within two years of the last attempt. If more than two years have passed a new application must be submitted

10) I would understand this to mean all the requirements to become certified such as having the requisite work experience/education and professionalism. The "brochure" is ASQ's CQM Brochure (Item B0070).

with the full fee.

The examination dates and venues. The examination is scheduled on a regular basis on the first Saturday of March and the third Saturday of October each year. However it is also administered at major ASQ events such as the Quality Management Division's annual conference and ASQ's annual Quality Congress.

If the candidate lives within the United States, Canada, or Mexico, he or she is asked to enter their ASQ section number on the application. The CQM Brochure lists a total of 231 sections within the United Sates[11], 15 in Canada, and two in Mexico. Candidates outside the U.S., Canada, and Mexico are asked to designate a major city and country where they would prefer to take the exam. The candidate will either be assigned to the preferred site or one as near as possible to the preferred site. To assist ASQ with international candidates, the CQM Brochure lists 45 "international certification examination contacts" in some 34 countries from Argentina to Zimbabwe. For example, the Japan contact is the International QA Institute, Meguro-ku, Tokyo. In the event it is not possible to assign either a section or international contact to host the exam, other arrangements will be made for proctoring the exam.

Exam rules. As already mentioned, the exam consists of a three-hour and 15-minute multiple-choice part and a 45-minute constructed response (essay) part. For the constructed response part, the examinee is given three questions and must answer two. The multiple-choice part is open book[12] with the exception that

11) This includes a section in Washington, D.C. and one in Puerto Rico. With the exceptions of Montana, North Dakota, South Dakota, West Virginia, and Wyoming, every state has at least one ASQ section.

12) However, at a refresher course I took (QMD CQM Section Refresher Course, February, 2002) the general view was that it is better to plan on *not* using much reference material given the limited time available. Furthermore, by this time the examinee's understanding the BOK should be so thorough that there is little need to "look up" the answer.

absolutely no questions and answers can be brought to the exam—this includes any questions one may have used to practice for the exam, be they from a refresher course or any other preparation program. The constructed response part of the exam is closed book.

Some other restrictions:

- No laptops, palmtop computers, cell phones, headphones, or pagers allowed.
- No sharing of reference materials or calculators.
- Acceptable calculators are "silent, hand-held, battery-operated" and *without* an alphabetic keyboard. Furthermore, if it has a programmable memory, that memory must be cleared before the exam.

Scoring. The scoring of the exam can be broken down into five discrete actions: (1) determining the cut-score (for the first exam after a new or revised BOK), (2) adjusting the cut-score (if necessary) for subsequent exams, (3), the actual scoring of the exam, and (4) post-scoring activities.

Determining the cut-score. Whenever a BOK is created or revised, a cut-score must be determined for that particular BOK[13]. This is because the cut-score must coincide as much as possible with the "difficulty" inherent in the BOK which, in turn, reflects the exam's difficulty (since the exam is based on the BOK). The cut-score is defined as the score a candidate must obtain to be considered *minimally* qualified. To determine this cut-score, a panel of 12 to 15 subject matter experts (also known as judges) do a "cut-score study." This study is conducted over a period of two days. The first step in this study is to develop expected performance standards for the exam. This is done by creating, through consensus, a

13) For those more "technically inclined," the process for developing the cut-score for the CQM Exam is called the "Modified Angoff Method." This method allows for adjustment of each exam according to its difficulty thus making the exams more reliable and fair.

set of characteristics the judges believe a minimally qualified (or "borderline") candidate should be expected exhibit with respect to the BOK. Then, based on these characteristics, each multiple-choice question on the exam is rated in terms of the number of borderline candidates the judges believe will get the answer correct. This example is given in the CQM Brochure:

> For example, the judges may agree that borderline candidates will know a particular topic in the BOK very well when asked a definition question, and therefore they may estimate that 85% to 90% will get it right. But the same candidates will be much more challenged in that topic when required to apply a specific formula to get the correct answer (resulting in estimates of 35% to 45% correct). (p. 3)

Once the judges have rated each question in terms of expected borderline candidate performance, this data is entered into a spreadsheet. Where there is a difference of more than 25 points, a discussion is held as to why the high-scoring judges thought the candidate would do so well and why the low-scoring judges thought the opposite. Then all of the judges are invited to change their scores based on what they have heard. This is how the panel arrives at a "consensus." (Sheila Connolly, a psychometrician with ASQ's Certification Office—from information quoted in Westfall, 2002).

Once all the multiple-choice questions have been rated, the ratings are averaged and combined with data the panel develops with respect to the constructed response questions into a recommended raw cut-score for the exam. This recommend cut-score along with the performance standards the panel developed are submitted to ASQ's Certification Board. At this point, the Certification Board reviews not only this information but other data it generates based on this submitted information to give it as much data as possible when making a final cut-score decision (Connolly–from information quoted in Westfall, 2002). Once the raw cut-score is approved, it is converted to a scaled score of 550 and this then

is the score necessary for passing the exam[14].

Adjusting the cut-score. For subsequent exams based on the same BOK, it is necessary to answer this question: should the cut-score should be adjusted? The reason for this is to ensure that the scoring of each exam is fair since it is possible that one set of questions (examination) could be more difficult than another. This is done by embedding in the next exam, a subset of questions used in the first exam. These questions span all areas of the BOK and levels of difficulty. These questions, called "equaters," are then used to determine why the average overall scores on the two exams differ. Drawing on the example given in the CQM Brochure (p. 3), suppose the overall average for the first exam was 111 and for the second exam it was 108. At first glance one would conclude that the second exam was more difficult. However, this mean-score difference could be due to a difference in the candidates; that is, we must now ask was there a difference in the overall knowledge/abilities of the candidates taking each exam? To ascertain this, a comparison of how the two groups performed on the equaters is made. If the two groups did equally well on these questions, then we can conclude that, generally speaking, the two groups are equal and the second exam was, in fact, harder. If this is the case, the cut-score is adjusted accordingly so the number of questions the candidate must answer to pass the second exam will be less. The scaled score is also adjusted to keep the "passing" score at the standard of 550.

Scoring the exam. Next is scoring the exam and, based on the cut-score, determining who has passed. Since the CQM Exam has constructed response (essay) questions, special measures are used to ensure these are graded as objectively as possible. And rightly so as this possible lack of objectivity is one of the big concerns of those taking the exam. In fact, it is listed in the CQM Brochure (p. 4) as one of the "top 10 myths of certification." Here is how this myth is laid to rest:

14) The 550 score is the passing score for all ASQ certification examinations.

Myth: The grading of the constructed response portion of the certified quality manager exam is very subjective.

FACT: The constructed response portion of the exam is designed to test the candidate's ability to respond to realworld situations. The responses are scored by certified quality managers who have been trained in the evaluation techniques used for the scoring process. In addition, all the scorers judge the papers against a standard of performance that is specific to each essay question. That standard is neither arbitrary nor subjective, but is developed on the basis of sound quality practices, as described and prescribed in major textbooks in the field of quality. The essay questions are pretested on a group of certified quality managers, so the development of the question includes a reality check to make sure that the committee's expectation of performance matches actual responses.

Post-scoring activities. These involve a final check of the questions. Once scoring is accomplished a statistical analysis is conducted of the test questions. The results of this analysis plus comments from examinees/proctors are used to weed out any questions that, despite all previous efforts, are still not good (confusing, more than one answer, etc.). These questions are sent back for further review.

Feedback to the applicant. The final administrative action is notifying candidates of the results. For the CQM Exam, the results are mailed out about three and a half weeks after the examination. If you have passed you are sent a letter of congratulations from the ASQ Certification Board along with wallet-size card and certificate. Your name will published in ASQ's newsletter, *Quality Advocate* (formerly *On Q*), and your ASQ section will be notified.

If you did not pass the exam, you will receive a letter from ASQ showing how many of the questions in each of the multiple-choice BOK areas you got correct.

The average number in each area that successful candidates got correct is also shown for comparison purposes. You are also shown how your two constructed response answers were scored (high, medium, or low). The purpose of this information is to provide the candidate feedback to more effectively prepare for retaking the exam. The letter also provides a brief form to apply for the retake. Appendix E is a reproduction of an actual letter (with the names changed).

6. Examples of Exam Questions

As already explained, the examination consists of 150 multiple-choice questions and three constructed response (essay) questions, two of which must be answered. The multiple-choice questions are written across the range of Bloom's six levels of cognition (see Appendix B). Figure 2 shows how these levels are distributed among the seven areas of the multiple-choice BOK (Appendix A). Recall that these levels represent the *highest* level of complexity to which a particular subarea will be tested.

For example the one (and only, by the way, for the entire BOK) "knowledge level" subarea under the Leadership area is constraint management:

I. Leadership (30 questions)

A. Organizational Leadership

6. *Constraint management*

Identifying and removing constraints and bottlenecks through the use of affinity diagrams, force field analysis, and other management tools (Knowledge)

This means any questions about constraint management will not be at a level higher than the knowledge level of Bloom's taxonomy and so forth. Figure 2 also shows the relative level of difficulty one might associate with each area as a rough indication of where one should spend most of his or her time in preparing for the exam. This indicator was derived by first getting an "average Bloom

Bloom Level ("difficulty")	Multiple-Choice BOK Area							
	Leadership	Strategy	QM Tools	Customer	Supplier	Management	Training	Total
Konwledge (1)	1	0	0	0	0	0	0	1
Comprehension (2)	0	1	3	1	1	3	3	12
Application (3)	4	4	3	3	5	10	1	30
Analysis (4)	2	3	5	4	1	3	1	19
Synthesis (5)	5	3	0	0	0	0	0	8
Evaluation (6)	5	3	6	0	0	3	0	17
total # of subareas	17	14	17	8	7	19	5	87
"average Bloom level"	4.47	4.21	4.18	3.38	3.00	3.47	2.60	
# of questions on exam	30	30	20	20	10	30	10	150
relative difficulty level	0.89	0.84	0.56	0.45	0.20	0.69	0.17	
rank	1	2	4	5	6	3	7	

Figure 2. How Bloom's cognitive levels are distributed among the seven areas of the multiple-choice BOK and the relative difficulty of each area.

level." To get this each level was assigned a "difficulty" number: 1 for knowledge, 2 for comprehension, etc. Then, for each area, the difficulty number was multiplied by the number of subareas tested to that level and these products were averaged to get the "average Bloom level" (e.g., 4.47 for the Leadership area). Finally, to account for the difference in the number of questions the examinee is required to answer in each area, the area's average Bloom level was multiplied by the percentage of the total questions for that area (e.g., 0.20 for the Leadership area). This gives the "relative difficulty level" for each area. As can be seen from the rankings, the two areas that will probably be most difficult are Leadership and Strategy and, as a rough guide, this is where the candidate might want to spend the most preparation time. (I am indebted to Duke Okes at the Febru-

ary, 2002 Refresher Course for these ideas.)

The multiple-choice questions. As mentioned the questions can range across all the Bloom levels. Here is an example of a simple recall type of question[15]:

> What does Juran's Trilogy® consist of?
>
> a. Quality planning, quality control, quality deployment
> b. Quality planning, quality control, quality improvement
> c. Quality improvement, quality control, quality deployment
> d. Quality control, quality costs, quality development
>
> Answer: b

As Figure 2 suggests, most of the questions require more than simply recalling some fact. This makes sense since the ultimate purpose of the exam is to not to see who has the best memory but who can think like a quality manager. Here is another typical question written at the *application* level:

> Given a need to achieve greater consistency and uniformity in its processes, an organization will find which of the following most applicable?
>
> a. ntroducing flexibility
> b. Striving for market domination
> c. Instituting policies and procedures
> d. Reducing training costs
>
> Answer: c

Many of the multiple-choice questions present the candidate with a situation which requires the use of his/her analysis, synthesis, and/or evaluation skills.

15) The example questions in this section are from material used during the QMD CQM Section Refresher Course (25–27 February, 2002), New Orleans, Louisiana.

Here is an example:

> A continuous improvement project team has been set up to reduce order receipt to order shipment time. As team sponsor, you receive a copy of the minutes of the second team meeting. You note that the team has brainstormed a list of possible reasons for late shipments and now plans to collect data to help identify which of the causes occurs most often. What should you do?
>
> a. Contact the team leader and congratulate him/her on the team's quick progress.
> b. Contact the team facilitator and recommend that the team use a cause-and-effect diagram to organize the list to ensure that they fully understand the system.
> c. Attend the next meeting and show the team the customer complaint log, which includes late shipment information.
> d. Contact the team leader and ask why the team is focused on late shipments.
>
> Answer: d

As can be seen from this small sample of typical multiple-choice questions, unless the candidate has both a fairly deep and fairly broad knowledge of all areas of quality management (namely the BOK), then there is not much likelihood of passing the exam. See Appendix F for more examples of multiple-choice questions.

The constructed response questions. Even more challenging are the constructed response questions. Here is an example of a typical question:

> A major regional travel services company with three locations and sales of $200M is in a tight business situation. Profits are getting slim, private shareholders are demanding action, and the budgeting cycle is coming up. The CEO know it's either cut costs or she'll be out of a job, so she's made the decision to cut costs across the board. The CEO gives each manager (including you, the corporate quality manager) a target of 10% reduction in your department budget. What will you do?

As can be seen from the suggested answer (following), 45 minutes is not a lot of time to put together two "high scoring" answers to the constructed response questions. Note that this particular answer employs the Plan, Do, Check, Act (PDCA)

model. Here is a suggested answer:

Issues to consider include:

- Immediacy/concern of the issue relative to the CEO.
- Organization as a system rather than departments and potential for suboptimization.
- Differences between the interdependencies of the three locations.
- Potential impact on motivation of employees.
- Partnerships with others in the supply chain.

Recommended actions include the following:

Plan

Test the CEO's receptivity to alternatives other than the 10% across-the-board cuts if the alternative is supported by opportunities. Talk with the managers at each facility to see if they can come up with some ideas/suggestions that are more systemically oriented and have more leverage. Consider whether the cuts should be allocated differently based on location and/or service line; also consider approaching suppliers to look for joint opportunities to cut costs. Develop a rough outline of potential cuts for the quality function:

- Analyze the key functions or departments supported in each location.
- For each function, list the key activities supported by budgeted quality personnel.
- Estimate the dollar value of the support provided and the present budget required by the support.
- Compute the net value added for each line item and assign a priority to each line item based on the amount of value added, in dollar terms, that the line item contributes to the organization and risks related to reducing or eliminating the activity.
- Adjust the budget for lower value/risk to achieve the 10% overall reduction.

Then:

- Look for items that could be cut more than 10%, with the difference invested in improvements that pay back in a short time.
- Look for projects that could be delayed.
- Communicate the urgency to the remainder of the quality organization and get them involved in idea generation.

Do

- Discuss the potential cuts with quality personnel and other managers at each location:
  - Are the estimates, risks, and reductions reasonable?
  - Can support be combined with another location or locations to achieve a reduction?
  - What other options are feasible?

- Adjust the budget figures based on their input to achieve a 10% cut.
- Prepare to present results to the CEO. (Prepare three scenarios.)

Check

- Meet with the CEO to discuss the approach taken, high-priority items, and risks.
- Conclude with a decision as to which option is to be implemented. (The decision could be delayed until other department budgets are submitted.)

Act

- Implement the final plan approved by the CEO.
- However reductions are made, have a process for monitoring each effort and its results (both financial and otherwise).

The PDCA model is actually the PDCA Cycle[16] and is a simple but powerful way to approach almost any problem: first make a plan to solve the problem (e.g., creating a product customers will buy), second, implement your plan, at least on a trial basis (e.g., by setting up a pilot program), third, check on how the plan is working out (e.g., through customer feedback), and fourth, based on this feedback, act to improve the plan and its execution (e.g., the product features) and repeat the cycle. The above answer is a good example of how the PDCA model can be used to structure a constructed response answer. The idea of using a model to structure the constructed response answer will be discussed further in the next section. Appendix G is an example of another constructed response question showing the scoring criteria used and sample "high," "medium," and "low" scoring answers.

7. Exam Taking Tips

The ASQ CQM Brochure lists some "test-taking tips" on page 5. These apply primarily to the multiple-choice questions. For example: (1) answer the questions

16) Also known as the Plan, Do, Study, Act (PDSA) Cycle, the Shewhart Cycle, or the Deming cycle. W. Edwards Deming, probably one of the most influential people in the quality movement, is largely responsible for popularizing this cycle which was originally conceived of by Walter Shewart. Shewart was a statistician with Bell Laboratories in America. Deming died in 1993 (at the age of 93); Shewhart died in 1967.

you know for sure first and come back to the others, (2) read each question carefully rather than quickly assuming you know what's being asked, and (3) keep in mind that one of the answers might be a correct statement in itself but *not* the answer. Another good tip is to look for "key words" in the question such as "not," "most," "least," and "except." For example, a question could well have more than one answer that is technically correct but only one that satisfies the "most" or "least" requirement. Most of these tips are universally applicable to any multiple-choice test and are usually already known by the examinee.

However, it is with the constructed response questions that the examinee will probably have the most difficulty since these require developing an answer from scratch. Since these count about 17% of the total score, here are some suggestions for answering these questions[17]:

- What are the key issues?
- Will a model help?
- What assumptions are you making?
- Don't answer in terms of *your* organization.
- Don't worry about format.

What are the key issues? This is one of the first things a scorer will be looking for: were you able to identify the key issues involved in the situation and then systematically address them. For example, look at the answer to the example constructed response question in section 6 above. It starts by identify five issues and then develops a set of recommended actions that address those issues. One way to both help validate a possible issue and tie it to some recommended action is a simple three-column model shown in Figure 3. In answering the "why" question you will be forced to think about the theory that is involved. In this example, we want to be sure we fully understand the CEO's concerns and find out if there is

17) Again, these tips came from the February 2002 QMD CQM Section Refresher course. See Footnote 15.

Possible Issue	Why Is It an Issue?	Recommended Action
1. Immediacy/concern of issue to CEO.	Need to see just how strong the CEO feels about this 10% cut. (Will help insure we are having good communications and help reveal any hidden agendas that might exist.)	Test CEO's receptivity to alternatives other than the 10% across-the-board cuts.
2. Etc.		
3. Etc.		

Figure 3. A simple model for identifying and validating key issues (idea source: QMD CQM Section Refresher Course, 25–27 February, 2002).

anything else about the issue that we should know; i.e., we could be said to be drawing on theories about the importance of good communications.

The constructed response example in Appendix G, about the midsized airline, has the broad issues already spelled out in the question: roles, obstacles, and overcoming strategies. However, a good answer will then take each of these broad issues and identify the most important associated sub-issues.

Will a model help? Again, look at the example in section 6. This answer, as already discussed, was structured using the PDCA model. Of course, the PDCA model may not always be an appropriate way to structure the answer but, because of its highly universal applicability, it should always be considered. Another model recommended by the QMD CQM Refresher Course instructors is that used for the Malcolm Baldrige National Quality Award (see Figure 4). This model is part of the Baldrige *Criteria for Performance Excellence (Business)* (2002, p. 5) and is the framework for "connecting and integrating" the criteria's seven categories. As can seen, this model depicts the organization as a system of six elements, all working together to produce business results. Using this model the examinee would be sure he or she had not overlooked any major aspect of the organization when formulating an answer.

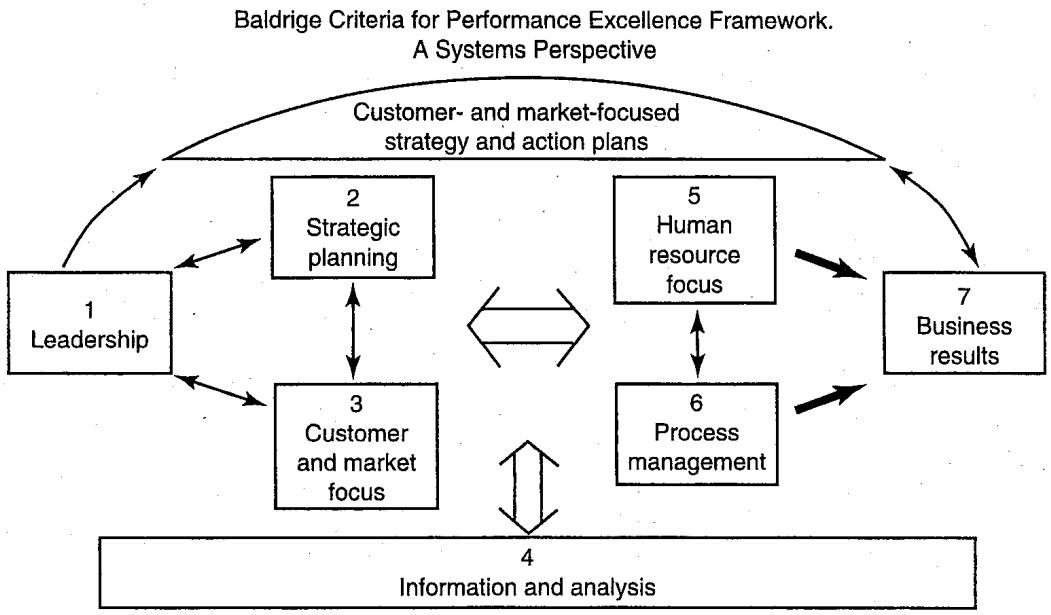

Figure 4. The Baldrige Criteria for Performance Excellence Framework (source: Okes, D. & Westcott, R, T. (Eds.), 2001).

Another, and similar, way to structure the answer would be to take into consideration the seven areas of the multiple-choice BOK (Appendix A). In fact, one of refresher course instructors recommended that this BOK be memorized down to the second level to provide a ready checklist when taking the exam.

Of course, there could be other ways to structure the answer such as a simple problem solving approach of "what is the problem?, facts bearing the problem, etc." The important thing is to have some sort of structure so the question is being answered in a logical and systematic way.

What assumptions are you making? One common mistake candidates make is to make assumptions about the problem without making these assumptions explicit. This could easily result in the scorer not being able to understand how the candidate arrived at some part of the answer. The obvious lesson here is to clearly state any assumptions made.

Don't answer in terms of your *organization.* Another common mistake is for the candidate to think only in terms of his or her organization. The problem here is that what works in the candidate's organization may not work elsewhere. It is

better to think in terms of a generalized organization. To help overcome such a tendency, one of the refresher course instructors recommended candidates develop and answer a constructed response question about some organization completely different from theirs.

Don't worry about format. When answering the constructed response questions, almost anything goes as far as format. Complete sentences are not necessary and any sort of chart, graph, or other visual aid may be included as part of the answer. The only requirement is that everything is legible and, of course, should be organized in a way that will aid the scorer in understanding the answer.

These then, are some of the more important tips for taking the constructed response part of the exam. Perhaps a final, if not obvious, caution would be to budget the time since only 45 minutes are allocated to answer both questions. Now, let's look at some aids to exam preparation.

8. Preparing for the exam

There is really no substitute for just plain "grunt-it-out" study for the CQM Exam. As with anything important, for almost everyone, preparing for the exam will be hard work. Here is what ASQ has to say about preparing:

> We should say at the outset that preparing to take an exam is a personal matter and highly dependent on an individual's personal learning methods. For some, a careful reading of the texts in the reference bibliography will be most helpful, while others may find value in purchasing study guides, taking a local ASQ section refresher course, or forming a study group with other quality professionals. All certification candidates are responsible for their own study and preparation for the examination. No specific set of courses or curriculum of study is required as part of the certification process. Likewise, ASQ makes no representation that completion of any specific course or program of study will significantly enhance a person's

chance of passing a certification examination. (CQM Brochure, 2001, p. 5)

Some of the aids to help one prepare for the exam include:

- Reference material
- ASQ public courses
- The ASQ Section Refresher Course
- The ASQ Computer-Based Course
- The examination itself

Reference material. There is no dearth of reference material. Appendix H lists several references according to each area of the multiple-choice BOK. Undoubtedly one of the best references is *The Certified Quality Manager Handbook* (2nd ed.) (Okes & Westcott, 2001) since it is written completely in line with the multiple-choice BOK. Furthermore, this book is replete with additional references should the candidate wish to delve deeper into any particular subject.

I would strongly recommend at least two other references: the *Certified Quality Manager (CQM) Brochure* (latest edition, July 2001) and the Malcolm Baldrige *Criteria for Performance Excellence (Business)* (latest version). The CQM Brochure, which has been quoted extensively in this paper, provides almost anything a prospective candidate for the CQM Exam would want to know. It is truly an excellent source of information on the exam. The Baldrige criteria has already been mentioned as a possible model for structuring answers to the constructed response questions (section 7). But besides this, it is jam-packed with good ideas for what constitutes a world-class organization. Since having such an organization is, ideally, the goal of every quality manager, a thorough perusal of the criteria should help the candidate's thinking during the exam.[18)]

ASQ public Courses. ASQ offers a wide variety of courses open to the public

18) A search of the Web will reveal other good study references such as *The Handbook for Quality Management* (ISBN 0-930011-70-8) by Thomas Pyzdek.

at various locations throughout the U.S. According to ASQ's home page (www.asq.org), the following are the courses offered in 2002 that were recommended for those interested in becoming CQMs:

- Introduction to Quality Management (five days)
- The Project Management Process (three days)
- Using Quality Tools and a Problem-Solving Process for Sustained Improvement (two days)
- Customer-Supplier Partnerships—An Introduction (two days)
- Measuring and Managing Customer Satisfaction and Loyalty (two days)

The cost of these courses runs from approximately $1,000 to $1,500. These courses can also be used to earn recertification units (RUs) (see section 9).

The ASQ Section Refresher Course. By far the best course to take as far as getting a general overview of the entire BOK is the ASQ Section Refresher Course. Perhaps even more important, the course provides a good insight into the exam process and many useful ideas for improving the candidate's chances for success. In essence, this three-day course quickly takes you through *The Certified Quality Manager Handbook* (2nd ed.) and provides many opportunities to practice both multiple-choice and constructed response questions[19]. When I took this course in February 2002 the cost was $675 and included the handbook.

The ASQ Computer-Based Course. This self-directed program in a combination of computer-based and print material. It has seven modules, one for each area of the multiple-choice BOK. There are tests for each module and enough questions in the question bank to allow users to make up multiple tests. Also, many practical application situations are provided for practice in writing constructed response answers. The program also offers a pretest and post-test. With

19) I considered myself fortunate to have had the opportunity to take this course when it was presented by the co-authors of the handbook: Duke Oakes and Rus Westcott, just before the February, 2002 QMD conference in New Orleans.

validation by ASQ, a score of 80% or more on the post-test can earn the user RU points good for recertification (see section 9). The cost of this course is $495 for ASQ members and $595 for nonmembers.

The examination itself. As mentioned before, the pass rate on the exam is around 45%. One reason for this is that many aspiring CQMs take the exam just for the experience; to see how much they know and to identify their weak areas. Indeed, taking the exam is an excellent way to not only identify weak areas but to gain a feel for the exam that can be gotten no other way.

9. Recertification

Quoting from the relevant portion of ASQ's home page:

> To maintain the integrity of your certification, ASQ requires that you recertify every three years—either by RU [recertification unit] credits or by testing. The purpose of recertifying is to ensure that as an ASQ-certified quality professional you maintain the same level of knowledge originally demonstrated when you passed the written examination. If you do not recertify, your certification will lapse and ASQ will no longer recognize you as "certified."

Most people prefer to certify by recertification units (RUs) since ASQ offers many, many ways to earn these. Recertification requires 18 RUs. Here are some of the ways RUs can be earned:

- Professional development (conferences, seminars, workshops, forums, etc.)
- Employment (either full- or part-time)
- Participation in courses as either a student or instructor (course must "clearly apply to at least one area of the BOK")
- Meetings (must be "technically or professionally based" and "clinics and workshops must be held directly before or after the meetings")
- Committees (committee must "contribute to the advancement of the qual-

ity professions")

ASQ provides a downloadable recertification journal for listing RU credits. This journal and supporting documentation must be submitted no later than six months after the certification expiration date. Otherwise, an exam must be taken to recertify. ASQ allows one year from certification expiration for recertification by exam. If you pass the exam, you are issued a new certification card and certificate with the same certification number as before. If you don't pass, you are de-certified and must start all over as a new applicant.

10. Conclusion

The purpose of this paper has been to introduce the reader to the requirements for becoming a Certified Quality Manager (CQM). Although a CQM candidate must have the requisite amount and type of work experience/education and show proof of professionalism, it is the CQM Exam that is the most difficult hurdle to get over. For this reason, this paper has been mostly about that exam: what it consists of; how it is developed, administered, and scored; examples of questions/answers; and suggestions for taking and preparing for it. The paper also discussed several reasons for becoming certified and how one goes about becoming recertified when the three-year certification period expires.

Although seemingly a relatively small thing on the world-stage, I firmly believe ASQ's certification programs and especially the CQM program, are important far beyond their appearances. The continuing problems organizations have with quality, such as the Ford/Firestone tire problem (fiasco?), is proof enough that America, indeed the world, can use more people who truly understand the importance of quality and how to improve it[20]. The fact that so many companies have already embraced the ASQ CQM certification as a means of

20) And, I might add, people who abide by ASQ's high ethical standards (see Appendix D).

identifying superior employees is a positive sign that the program is paying off; not only for individuals but for the organizations that care about such things, and for our society at large.

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Appendix A (page 1 of 10)

The Body of Knowledge for the Multiple-Choice Questions on the Certified Quality Manager Examination

(source: ASQ's CQM Brochure [July 2001, Item B0070], pp. 8–11)

I. Leadership (30 questions)

A. Organizational Leadership

1. *Organizational development*
   Basic organizational design: matrix, flat, parallel, Big Q/little q; upper management, middle management, quality council; union influence (Application)
2. *Organizational culture*
   Characteristics that determine or identify organizational culture, e.g., union vs. non-union; proactive vs. reactive; expected standards of behavior (Analysis)
3. *ASQ Code of Ethics*
   Behaviors and actions presented in scenarios that require response in accordance with the code (Application)
4. *Techniques for facilitating or managing organizational change*
   Various change agent methodologies (Evaluation)
5. *Organizational roadblocks*
   The inherent structures of an organization (e.g., its cultures and constructs) that present basic barriers to improvement and methodologies for overcoming them (Application)
6. *Constraint management*
   Identifying and removing constraints and bottlenecks through the use of affinity diagrams, force field analysis, and other management tools (Knowledge)
7. *Negotiation techniques*
   Tools that help conflicting parties (departments, groups, leaders, staff) recognize common goals and how to work together to achieve them (Analysis)
8. *Motivation techniques*
   Quality approaches that support and sustain employee enthusiasm (Evaluation)
9. *Conflict resolution techniques*
   Consensus techniques, brainstorming, effort/impact, multivoting, interest-based bargaining, etc. (Evaluation)
10. *Employee empowerment*
    Effective techniques for teams and individuals, job enrichment vs. job enlargement, etc. (Application)

Appendix A (page 2 of 10)

The Body of Knowledge for the Multiple-Choice Questions on the Certified Quality Manager Examination (continued)

B. Team Processes

1. *Types of teams*
   Process improvement teams, work groups, self-managed teams, temporary/ad hoc teams, etc. (Synthesis)
2. *Team formation and evolution*
   The stages of team development: forming, storming, norming, performing (Synthesis)
3. *Team-building techniques*
   Basic steps in team building: goals, introductions, agendas (both stated and hidden), handling distractions, disruptions, behaviors, etc. (Synthesis)
4. *Team facilitation techniques*
   Coaching and guidance and the facilitator's limits and responsibilities (Synthesis)
5. *Team leadership techniques*
   Sponsor and champion roles, team involvement, etc. (Synthesis)
6. *Team performance evaluation*
   Goals, objectives, and metrics that support team success (Evaluation)
7. *Team reward and recognition*
   When, why, and how to reward teams; common pitfalls and ways to avoid them (Evaluation)

II. Strategy Development and Deployment (30 questions)

A. Environmental Analysis

1. *Legal and regulatory factors*
   Broad variability across industries requires coverage of basic or generic concepts only (Comprehension)
2. *Market forces, industry trends, competitive analysis*
   Competitive forces that drive strategy development: entry of new competitors, threat of substitutes, bargaining power of buyers and suppliers, rivalry among existing competitors (Synthesis)
3. *Stakeholder groups*
   Employees, suppliers, customers, local community, shareholders; how to align stakeholder needs with the objectives of the organization (Application)
4. *Technology trends and internal capabilities*

Appendix A (page 3 of 10)

The Body of Knowledge for the Multiple-Choice Questions on the Certified Quality Manager Examination (continued)

The effect of external technology trends and internal capabilities on strategy formation (Analysis)

5. *S.W.O.T. (strengths, weaknesses, opportunities, and threats) analysis*
   How to identify and prioritize; how to deploy appropriate action in response (Evaluation)
6. *Customer/employee surveys and feedback*
   Not how to create a survey but how to use the resulting information strategically; how to translate data to action (Evaluation)
7. *Internal capability analysis*
   How to measure resources, skills, and process capabilities; need vs. have, etc. (Synthesis)

B. Strategic planning and assessment

1. *Strategic planning techniques and models*
   Definitions of strategy and strategic planning; identification/formulation of strategic themes; use of Baldrige criteria and ISO 9000 as models (Application)
2. *Competitive comparisons and benchmarks*
   Identifying and using valid comparisons and basic benchmarking methodologies (Synthesis)
3. *Formulating quality policies*
   Recognizing the ripple effect that changes in quality policy have on the organization as a whole, on individual areas or departments, and on customers, suppliers, employees, etc. (Analysis)

C. Deployment

1. *Assure integration between strategic and other plans*
   Horizontal and vertical deployment between plans by mid-level and functional management; resolving conflicts between new strategic outlook and existing programs, etc. (Application)
2. *Deploy strategic goals and objectives into operational plans and improvement projects*
   Translating goals into action plans and ensuring that they support the organization's mission, strategies, and objectives (Application)
3. *Resource allocation planning activities*
   Monitoring resources in terms of priorities and adjusting as necessary (Analysis)

Appendix A (page 4 of 10)

The Body of Knowledge for the Multiple-Choice Questions on the Certified Quality Manager Examination (continued)

4. *Metrics and goals that drive organizational performance*
   Recognizing the pervasive, cascading effect that strategy has throughout the organization; using balanced scorecards, house of quality, and other organization-wide measures and tools (Evaluation)

III. Quality Management Tools (20 questions)

A. Problem-solving tools

1. *The seven quality control tools*
   Use, interpret, correct, and explain: Pareto charts, cause and effect diagrams flowcharts, control charts, check sheets, scatter diagrams, and histograms (Evaluation)
2. *The seven management and planning tools*
   Use, interpret, correct, and explain: affinity diagrams, tree diagrams, process decision program charts (PDPCs), matrix diagrams, interrelationship digraphs, prioritization matrices, and activity network diagrams (Evaluation)
3. *Root cause analysis, Plan-Do-Check-Act (PDCA) and other, like models*
   Use, interpret, and explain various elements of these approaches (Evaluation)
4. *Tools for innovation and creativity*
   Various creative-thinking techniques and exercises for decision-making and problem-solving (Application)
5. *Cost of quality*
   Prevention, appraisal, failure: internal & external cost categories; how each category is affected by various quality, continuous, or process improvement approaches (Application)

B. Process management approaches

1. *Process goals*
   How process goals are established, monitored, and measured (Application)
2. *Cycle time reduction*
   How cycle-time reduction can be used to identify defects and non-value-added activities using Kaizen-type methods to reduce waste of space, inventory, labor, and distance (Analysis)
3. *Process analysis and documentation*
   Process mapping, written procedures, work instructions, flowcharting, etc. (Analysis)

Appendix A (page 5 of 10)

The Body of Knowledge for the Multiple-Choice Questions on the Certified Quality Manager Examination (continued)

4. *Theory of constraints*
   Finite resources, increased expectations, do-more-with-less, etc. (Comprehension)
5. *Theory of variation*
   Common and special causes of variation, including six sigma approach (Comprehension)

C. Measurement: Assessment and Metrics

1. *Statistical analysis*
   Apply basic statistical techniques (e.g., measures of central tendency, range, variance, types of distribution, check sheet output) to data sets, charts, and other statistical summaries in order to make decisions and monitor projects and processes (Analysis)
2. *Trend analysis*
   Identify and interpret trends in tabular data sets, graphs, charts, etc., and distinguish different kinds of trends (e.g., cyclical, seasonal, shift, environmental) (Analysis)
3. *Process capability*
   Read charts and interpret data to determine whether a process is in statistical control and capable as measured by Cp and Cpk indices (Analysis)
4. *Reliability and validity*
   Classical measurement theory as it relates to reliability and validity, including content-, construct-, and criterion-related strategies for supporting inferences made about data, especially in relation to the development and use of survey instruments and results (Comprehension)
5. *Qualitative assessment*
   Subjective measures (e.g., verbatim comments from customers, observation data, focus group output) and how they differ from objective measures; when measurements should be made in categories rather than in terms of numeric averages (Evaluation)
6. *Analysis and use of survey results*
   Evaluate survey results and ensure that they are applied appropriately (Evaluation)
7. *Benchmarking: internal and external*
   Philosophy, tools, and techniques (Evaluation)

Appendix A (page 6 of 10)

The Body of Knowledge for the Multiple-Choice Questions on the Certified Quality Manager Examination (continued)

IV. Customer-Focused Organizations (20 questions)

A. Customer identification and segmentation

1. *Internal customers*
   Who they are, how to work with them effectively to improve process and services, and how an organization's treatment of its internal customers influences its processes for external customers (Analysis)
2. *External customers*
   How to distinguish different customer types (distributor, consumer, end-user) and recognize their various influences on products and services (Analysis)

B. Customer relationship management and commitment

1. *Determining and assuring customer satisfaction*
   How to capture, differentiate, and use complaints and output from focus groups, surveys, and interviews; how to use customer value analysis, guarantee and warranty information, corrective actions, etc. to measure and improve satisfaction (Analysis)
2. *Customer service principles*
   The proven values of rapid response, courtesy, politeness, smiles, attention to detail, etc. (Application)
3. *Multiple-customer management*
   Recognizing or establishing priorities, resolving conflicting requirements and demands, managing capacity and resources caused by multiple customers (Application)
4. *Customer retention/loyalty*
   How to measure the value of existing customers and the financial impact of losing customers (Comprehension)
5. *Anticipate customer expectations, priorities, needs*
   Dissatisfiers, satisfiers, exciters/delighters; projecting future needs (Application)
6. *Deploy the voice of the customer through QFD*
   How to develop, deploy, and manage the house of quality matrix and other, like models (Analysis)

V. Supplier Performance (10 questions)

A. *Supplier selection strategies and criteria*
   Internally developed rating programs, external certification standards or models, and

Appendix A (page 7 of 10)

The Body of Knowledge for the Multiple-Choice Questions on the Certified Quality Manager Examination (continued)

their affect on an organization's overall strategy (Application)

B. *Techniques for communicating requirements to suppliers*
Planned, regular meetings; reporting procedures (routine and emergency); stated expectations and potential consequences (awareness of criticality) (Application)

C. *Techniques for assessment and feedback of supplier performance*
Key measures of supplier performance (e.g., quality, price, and delivery/level of service) and metrics (e.g., defect rates, functional performance, timeliness, responsiveness, availability of technical support) (Application)

D. *Supplier improvement strategies*
Audits (e.g., surveillance) and corrective and preventive action plans (Analysis)

E. *Supplier certification programs*
Steps in the certification process, ongoing review, and measures of performance (Application)

F. *Partnerships and alliances with suppliers*
Steps to developing partnerships and alliances (Application)

G. *Logistics and supply chain management*
How purchased products and services impact final product assembly or total service package, including ship-to-stock, just-in-time, etc. (Comprehension)

VI. Management (30 questions)

A. Principles of Management

1. *Principles of management*
Planning, leading, controlling, organizing, staffing, monitoring, etc. (Application)

2. *Total quality management (TQM)*
The basic philosophies of Deming, Juran, Crosby, Feigenbaum, and other contributors to the philosophy of quality approaches in an organization-wide system of management (Application)

3. *Management styles*
Theories X, Y, and Z; Myers-Briggs type indicator; how to identify different learning styles and respond appropriately (Application)

4. *Organizational structures*
How management styles and models are influenced by an organization's size, industry type, competition, etc. (Evaluation)

Appendix A (page 8 of 10)

The Body of Knowledge for the Multiple-Choice Questions on the Certified Quality Manager Examination (continued)

5. *Business systems and interdependence of functions*
   Internal functional responsibilities such as human resources, engineering, sales and marketing, finance, R&D, purchasing, accounting, etc.; cross-functional collaboration, systems management theories (e.g., how optimizing a process may result in sub-optimizing a system) (Application)
6. *Staffing*
   Selection processes, performance evaluations, professional development, goals, objectives, quality responsibilities, and job/position descriptions (Application)

B. Communications

1. *Communication techniques*
   Vertical and horizontal methods of communication; written, verbal, non-verbal; communication effectiveness: strategies, media choices, appropriate vehicles for different situations, open- and closed-questioning techniques, listening strategies, etc. (Application)
2. *Information systems*
   How to use information systems (technology) to support a sound performance measurement system; how to use data to monitor organizational goals and objectives (Analysis)
3. *Knowledge management*
   How to capture and share learning, including storing, organizing, and accessing information to enhance an organization's operating performance; the data-information-knowledge development cycle; availability of information and knowledge; how to develop and support a learning organization; how to develop and manage core competencies (Comprehension)

C. Projects

1. *Project justification and prioritization techniques*
   Calculate and explain a benefit-cost analysis (e.g., return on investment (ROI), return on assets (ROA), benefit-cost-ratios) using simple math, round numbers; fundamental knowledge of decision analysis and portfolio analysis as applied to project decisions (Analysis)
2. *Project planning and estimation*
   PERT charts, Gantt charts, critical path method (CPM), work breakdown structure (WBS) and estimation techniques (Application)

Appendix A (page 9 of 10)

The Body of Knowledge for the Multiple-Choice Questions on the Certified Quality Manager Examination (continued)

3. *Monitor and measure project activity*
   Measurement techniques that ensure successful completion against the plan; risk management activities, stage/gate processes, milestones, etc. (Evaluation)
4. *Project documentation and related procedures*
   Repeatable processes and other PDCA-type activities (Application)

D. The Quality System

1. *The quality function mission*
   Various dimensions of quality; the position and role the quality function has in a quality-driven organization; how the quality function aligns with the organization's broader mission (Application)
2. *Quality plan deployment in the organization*
   How the quality plan meshes with other processes in the organization (Application)
3. *Review the effectiveness of the quality system*
   Managerial review tools and metrics: e.g., management by walking around (MBWA), internal audits, skip-level meetings, employee and customer feedback systems (Evaluation)

E. Quality Models

1. *Malcolm Baldrige National Quality Award (MBNQA) Criteria for Performance Excellence*
   How companies use the principles of the MBNQA criteria for performance excellence as a management model (Analysis)
2. *ISO 9000*
   How companies use ISO 9000 as a systems management model (Comprehension)
3. *Major industry and other international standards*
   QS (automotive), TL (Telecommunications), JCAHO (Joint Commission on Accreditation of Health Care Organization), NCQA (National Committee for Quality Assurance), etc.; how these standards must be considered in the development of an organization's quality system, plans, and programs (Comprehension)

VII. Training and Development (10 questions)

A. *Alignment with strategic planning and business needs*
   Identifying and linking training plans with the needs of the organization; limits and requirements of training plans (Application)

Appendix A (page 10 of 10)

The Body of Knowledge for the Multiple-Choice Questions on the Certified Quality Manager Examination (continued)

B. *Training needs analysis*
What tools are used to develop needs analyses and when to use them (Comprehension)

C. *Training materials and curriculum development*
Appropriate resources and methodologies; knowledge of adult learning principles (Comprehension)

D. *Methods of training delivery*
Lectures, workbooks, on-the-job training, videos, computer-based instruction and effectiveness of each method in different settings (Comprehension)

E. *Techniques for evaluating training effectiveness*
Kirkpatrick's 4 levels of evaluating training effectiveness and other like measures (Analysis)

Appendix B

The Six Levels of Cognition (based on Bloom's Taxonomy [1956])

(source: ASQ's CQM Brochure [July 2001, Item B0070], p. 12)

Note: Each subarea within the Body of Knowledge (BOK) for the multiple-choice questions (Appendix A) has one of the following cognitive levels associated with it. This is to indicate the highest cognitive level at which the subarea will be tested. The levels are listed from least to most complex.

1. Knowledge Level

(Also commonly referred to as recognition, recall, or rote knowledge.) Being able to remember or recognize terminology, definitions, facts, ideas, materials, patterns, sequences, methodologies, principles, etc.

2. Comprehension Level

Being able to read and understand descriptions, communications, reports, tables, diagrams, directions, regulations, etc.

3. Application Level

Being able to apply ideas, procedures, methods, formulas, principles, theories, etc. in job-related situations

4. Analysis

Being able to break down information into its constituent parts and recognize the parts' relationship to one another and how they are organized; identify sublevel factors or salient data from a complex scenario

5. Synthesis

Being able to put parts or elements together in such a way as to show a pattern or structure not clearly there before; identify which data or information from a complex set is appropriate to examine further or from which supported conclusions can be drawn

6. Evaluation

Able to make judgments regarding the value of proposed ideas, solutions, methodologies, etc., by using appropriate criteria or standards to estimate accuracy, effectiveness, economic benefits, etc.

Appendix C (page 1 of 2)

The Body of Knowledge for the Constructed Response Questions on the Certified Quality Manager Examination

(source: ASQ's CQM Brochure [July 2001, Item B0070], pp. 12–13)

A. Contribute to the Strategic Planning and Deployment Process

Represent the quality system in the strategic planning process; facilitate and train leaders in planning strategies; assure that the voice of the customer is heard; provide structure and methodology for the strategic planning process

1. Participate in formulating the organization's overall strategic plan
2. Develop quality strategies to help the organization achieve its strategic goals
3. Develop and maintain an organizational focus on the importance of performance excellence
4. Formulate quality-related policies and procedures that support the strategic plan
5. Collaborate with other departments on the development of methods for strategic plan deployment throughout the organization
6. Develop and implement performance improvement plans that support organization's goals, including developing short- and long-term plans and their impact on various stakeholders
7. Identify and obtain the resources necessary for implementing performance improvement plans within the context of organizational constraints
8. Collaborate on the development and delivery of training programs for improved performance

B. Develop and Maintain a Customer Focus (Internal and External Customers)

1. Use customer expectations as a basis for product and service design and delivery
2. Establish and use communication channels (listening posts, feedback mechanisms, etc.) with customers as a resource for quality system requirements
3. Evaluate customer feedback for continuous improvement opportunities
4. Involve customers in the design and implementation of product, service, and process improvements

C. Manage the Quality Organization/Department

1. Define the mission of the quality organization/department, including linking it to the larger organization's mission
2. Establish the goals and objectives of the quality organization/department

Appendix C (page 2 of 2)

The Body of Knowledge for the Constructed Response Questions on the Certified Quality Manager Examination (continued)

3. Manage the budget and resource requirements of the quality organization/department
4. Develop the quality staff, including selection, evaluation, and professional growth

D. Assess Performance Information

1. Develop and implement plans to evaluate the effectiveness of the quality system
2. Assess the effectiveness and efficiency of organizational performance
3. Design and implement feedback loops to provide performance information to the organization for continuous improvement
4. Use results of assessments to continuously improve systems and processes

E. Develop Systems for Managing Supplier Performance

1. Develop and implement an overall supplier management program, including supplier assessments and monitoring follow-up actions
2. Use supplier performance information to continuously improve effectiveness of the value chain, including audits, performance data, JIT, dock-to-stock, etc.
3. Partner with suppliers, including information-sharing, involving suppliers in design, providing training, collaborating, etc.

Appendix D (page 1 of 2)

ASQ Code of Ethics

(source: ASQ's CQM Brochure [July 2001, Item B0070], p. 7)

To uphold and advance the honor and dignity of the profession, and in keeping with high standards of ethical conduct I acknowledge that I:

Fundamental Principles

I. Will be honest and impartial, and will serve with devotion my employer, my clients, and the public.

II. Will strive to increase the competence and prestige of the profession.

III. Will use my knowledge and skill for the advancement of human welfare, and in promoting the safety and reliability of products for public use.

IV. Will earnestly endeavor to aid the work of the Society.

Relations With the Public

1.1 Will do whatever I can to promote the reliability and safety of all products that come within my jurisdiction.

1.2 Will endeavor to extend public knowledge of the work of the Society and its members that relates to the public welfare.

1.3 Will be dignified and modest in explaining my work and merit.

1.4 Will preface any public statements that I may issue by clearly indicating on whose behalf they are made.

Relations With Employers and Clients

2.1 Will act in professional matters as a faithful agent or trustee for each employer or client.

2.2 Will inform each client or employer of any business connections, interests, or affiliations which might influence my judgment or impair the equitable character of my services.

2.3 Will indicate to my employer or client the adverse consequences to be expected if my professional judgment is overruled.

2.4 Will not disclose information concerning the business affairs or technical processes of any present or former employer or client without his consent.

2.5 Will not accept compensation from more than one party for the same service without the consent of all parties. If employed, I will engage in supplementary employment of consulting practice only with the consent of my employer.

Appendix D (page 2 of 2)

ASQ Code of Ethics (continued)

Relations With Peers

3.1 Will take care that credit for the work of others is given to those whom it is due.

3.2 Will endeavor to aid the professional development and advancement of those in my employ or under my supervision.

3.3 Will not compete unfairly with others; will extend my friendship and confidence to all associates and those with whom I have business relations.

Appendix E (page 1 of 2)

Example of a Letter Informing a Candidate of Not Passing the CQM Exam

(this is a reproduction of an actual letter with the names changed; actual letters are on ASQ letterhead)

March 27, 2001

EXAM DATE	DEADLINE
OCT 20 01	AUG 24 01
MAR 2 02	JAN 11 02

00123456
John K. Doe
Quality Manager
ABC Mining Corporation
132 W. Ore Ave.
Goldbrick, SD 45682-2109

Dear Mr. Doe,

An analysis of the ASQ Certified Quality Manager exam that you recently wrote indicates that you did not achieve the required passing score of 550.

Your Score: 500

A diagnosis of your performance is listed below. PLEASE SEE THE ENCLOSED LETTER FOR CLARIFICATION.

MULTIPLE CHOICE PORTION

BOK AREAS	Total Questions	Number You Had Correct	Average*
I.	30	25	24
II.	30	19	24
III.	20	12	15
IV.	20	15	15
V.	10	8	8
VI.	30	21	25
VII.	10	9	9

*Average computed on total number of responses from only those who passed.

CONSTRUCTED RESPONSE PORTION

The constructed response questions are graded on content not format.
Responses are assigned a score by each of two independent members of the Quality Management Division.

Appendix E (page 2 of 2)

Example of a Letter Informing a Candidate of Not Passing the CQM Exam (continued)

Problem A (Upgrade Quality Control System)	L
Problem B (Job Enrichment Techniques)	M
Problem C (Supplier Certification Plan)	–

Please complete the information below and enclose the $185.00 retake fee.

Jane X. Smith
Manager, Certification

Please schedule me to retake the Manager's exam to be held on _____
in Section #_____.

_____Enclosed is a check for $185.00
_____My Mastercard/VISA/American Express card number is:
_____Expiration Date_____
00123456
John K. Doe

Appendix F (page 1 of 3)

Some Examples of Multiple-Choice Questions

(source: ASQ's CQM Brochure [July 2001, Item B0070], p. 13)

1. Which of the following is NOT an appropriate use of the Baldrige Award criteria?

a. Self-assessment model
b. Quality system registration
c. Quality award application
d. Quality system model

2. To ensure success in implementing quality initiatives, the most important factor is

a. an empowered work force.
b. a training program that explains and promotes the quality initiative.
c. upper management support.
d. a reward and recognition program.

3. Rank order, from first to last, the steps listed below in the development of an employment requirements plan for a department or organization.

1. Make an organization chart.
2. Determine the amount of time and skills required to complete the activities.
3. List all activities required to produce the end product.
4. Determine end products or output of the organization.
5. Determine the number of people and skills needed.

a. 1,3,2,4,5
b. 1,5,3,2,4
c. 3,4,2,5,1
d. 4,3,2,5,1

4. One of the most effective means of implementing quality initiatives is for executive management to

a. establish quality goals tied to organizational performance.
b. conduct meetings on quality and demonstrate support for initiatives.
c. make public announcements explaining the company's quality goals.
d. hire a quality consultant to develop a total quality plan and lead its implementation.

5. The value of an exceptional guarantee is that it

a. builds long-term customer relationships while minimizing defects.
b. is possible for all customers to attain.
c. ensures that top priority customers will pay the least amount of money.
d. allows a Cpk process to be in control.

Appendix F (page 2 of 3)

Some Examples of Multiple-Choice Questions (continued)

6. Which of the following approaches to quality improvement planning connects quality and profits?

a. Identifying, analyzing, and controlling all cost-of-quality costs for the business
b. Concentrating efforts on improving nonfinancial measures of quality
c. Developing a strategic quality plan that has financial and nonfinancial goals and that integrates business and financial planning processes
d. Focusing on reforms in management-employee relationships, worker training, new measurement schemes, and increased employee awareness of customer attitudes

7. Which of the following is the most effective way for a quality manager to lead the work activities of a quality department?

a. Hold regular meetings to review performance against established goals and objectives.
b. Review weekly written reports of activities submitted by staff.
c. Conduct periodic meetings to flow down information about ongoing operations.
d. Discuss the activities with the supervisors within the department.

8. A senior-level director is considering a $10,000 investment to increase the quality rating of a piece of equipment from 85% to 95% and asks the quality manager for an opinion. The manager knows the equipment will require increased setup time that, in turn, will cause the overall availability of the equipment to decrease from 87% to 74%. In this situation, the quality manager should respond in which of the following ways?

a. Endorse the investment to improve quality.
b. Discuss with the director the effectiveness measure that would result from the investment.
c. Consider the future value of the cost of this improvement in quality.
d. Determine the costs of the downtime required to install the system before proceeding to implement the request.

9. Scatter diagrams are best described as

a. histograms.
b. correlation analysis.
c. Pareto analysis.
d. Ishikawa diagrams.

Appendix F (page 3 of 3)

Some Examples of Multiple-Choice Questions (continued)

10. A process improvement team has studied the flow of product through the company's production system. To increase output, the most effective action would be to

a. shorten the critical path.
b. eliminate bottlenecks.
c. reduce quality check points.
d. change the sampling plan.

Answers:

1. b	6. c
2. c	7. a
3. d	8. b
4. a	9. b
5. a	10. b

Appendix G (page 1 of 3)

Example of a Constructed Response Question

(source: ASQ's CQM Brochure [July 2001, Item B0070], pp. 14–15

[slight modifications have been made for format purposes])

The Question:

A cross-functional team for a midsized airline has examined the key findings of a customer satisfaction survey, which was conducted by a trade association for airlines. The survey results indicate that customers are dissatisfied in three areas: 1) the high cost of airline tickets; 2) excessive wait time (including telephone reservations, check-in lines, flight delays); and 3) lost or misdirected baggage. The team also gathered data from internal customer service records, analyzed the data in relation to the trade association survey results, and developed a proposed process improvement initiative focusing on the baggage routing errors. The quality manager has taken the team's proposal to the executive committee (EC) for approval to implement.

The EC reviews the proposal, along with a summary report of the trade association survey, and tells the quality manager that they want to see all three key findings addressed in a companywide process improvement initiative. The EC will support this larger initiative by assigning staff as needed from various affected departments to any teams the quality manager thinks should be formed, but the quality manager will be responsible for leading and coordinating the effort.

Describe how the quality manager should respond to the EC, including the roles the EC and the quality manager will have, as well as potential obstacles to the initiative and appropriate strategies for overcoming those obstacles.

Scoring Criteria:

Effective responses would include:

1. Describing the executive committee's role(s) such as:
   - Keeping the project visible to the organization
   - Participating in planning, team membership, etc.
   - Linking the project to corporate strategies, mission, vision, etc.
   - Supporting communication
   - Providing resources, rewards, recognition
2. Describing the quality manager's role(s) such as:
   - Project leadership
   - Liaison between teams and EC
   - Facilitating team development
   - Enabling and cheerleading teams
   - Helping identify team performance measures
3. Presenting typical obstacles

Appendix G (page 2 of 3)

Example of a Constructed Response Question (continued)

4. Presenting strategies for overcoming those obstacles

High Score: Candidate responds to all four points requested (EC's role, manager's role, obstacles and overcoming them)

Medium Score: Candidate describes the EC's role and two of the other three points requested

Low Score: Candidate responds to any two of the four points requested

Sample Answer 1 (High Scoring)

The quality manager should respond to the EC with the following information:

- The role of the EC is to provide support to the teams involved in the companywide process improvement initiative. At this point, the EC has agreed to the proposal presented and is willing to reassign staff. However, the EC must provide the necessary time and money to effectively implement the initiatives.
- Some of the obstacles that may take place are: an initiative is too costly; an initiative does not really meet the needs of the customer; poor mix of membership on a cross-functional team; incorrect measurement of implementation progress; and lack of management support.
- The methods to overcome such obstacles are: to do a cost-benefit analysis prior to implementation; seek customer feedback on proposed initiatives; make sure cross-functional teams have good representation; choose correct tools to measure the initiative (one tool may be a poor choice for all initiatives proposed); encourage management support throughout the whole process. At times management may need to approve additional staffing, give or gain permission for some things to be done.
- The quality manager's role is to be a leader and help coordinate the implementation of the initiatives by facilitating teams; reporting to the EC periodically and to keep up with the measurement of the process.

Sample Answer 2 (Medium Scoring)

Top management must have a vision statement declaring that teamwork, continuous improvement, and customer-first thinking is the way to go. Stand behind this 200%.

- The quality manager must form cross-functional teams including people from all areas, possibly more than one team will be needed to address different aspects of problems. (Pareto problems.) Cause-and-effect diagrams and flowcharts need to be drawn and reviewed, procedures need to be reviewed, to understand the metrics of the process flow.
- Companywide audit needs to be preformed to uncover underlying problems.
- Rewrite procedures; provide training to all affected areas; conduct audits to assure conformity; train and retrain; measure training.
- Benchmark other organizations.

Appendix G (page 3 of 3)

Example of a Constructed Response Question (continued)

- Include all departments in training of customer needs and desires.
- In cross-functional teams it is important to use empowerment techniques to motivate employees and gain their dedication to quality.

Sample Answer 3 (Low Scoring)

Step 1: Gather data. Review the results of the trade association survey. Review the results of the internal customer service survey. Review the executive committee's request.

Step 2: Plan a course of action. Select three distinct cross-functional teams to address each of the three critical elements. Assign team leaders. Instruct them to review their element and provide you with a plan of action for improvement. Satisfy yourself that each plan will work and that timelines for completion have been set.

Step 3: Get it done: Submit your plan, showing the actions each team will take and the actions you will take to verify effectiveness. This should include reviewing clear measurables as defined for the success of each team, as well as ensuring that the timeline is met.

Step 4: Solicit feedback from the EC. Review and revise plan to address any EC concerns. Feedback must confirm that the EC is not only fully supportive of the initiative, but is, in fact, driving it.

Step 5: Implement the plan.

Step 6: Follow-up to verify effectiveness.

Appendix H (page 1 of 3)

Reference Material for the CQM Exam

(source: ASQ's CQM Brochure [July 2001, Item B0070], p. 16; note: some references may have been revised)

These books cover significant parts of the Body of Knowledge. The ASQ Certification Board does not endorse any one particular reference source.

Books with item numbers in **BOLD** can be purchased from ASQ.

I. Leadership

Covey, Stephen R., *Principle-Centered Leadership*, New York: Summit Books, 1991. ISBN 0671749102

Deming, W. Edwards, *Out of the Crisis*, Cambridge, MA: MIT Press, 1986. ISBN 0911379010

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