Quality Professionals' Roles, Tasks and Competences

A SQMA report

In this report, documents and reports from American Society for Quality (ASQ)[1], the European Organization for Quality (EOQ)[2] and Swedish Association for Quality (SFK)[3] are analyzed to show how quality professionals' roles, competences and tasks are defined by these organizations. In section 1, simple findings from each of the organizations are presented. In section 2, roles, tasks and competences defined by different organizations are compared.

1. Quality Professionals in ASQ, EOQ and SFK

ASQ defines 27 quality professional roles and they do not categorize for these roles. Roles, average salaries and their tasks are presented in Appendix I. ASQ provides certification for 19 roles. Certification documents were used while analyzing the competence requirements from each role. However a few of these roles were very content related including biomedical auditor and pharmaceutical gmp professional. So competence requirements are explained for only 12 roles (Appendix II). In order to obtain a certification, quality professionals are required to have work experience. The longest work experience is expected from a quality manager with ten years, followed by reliability engineers, quality engineers and supplier quality professionals with eight years. While a calibration technician is required to have five years' work experience, a quality technician needs four years of work experience. Quality improvement associates, quality inspector and quality process analysts need only two years of work experience. Among the six sigma staff, master black belts are required to have five years' work experience as six sigma black belt and must complete ten six sigma black belt projects. Six sigma black belts are required to have three years of work experience and must complete two projects. Six sigma green belts are only demanded to have three years of work experience.

In most cases, if candidates have completed a degree with accreditation accepted by ASQ, they will be allowed to reduce some years from the number of years' experience required from them. For example if they have a diploma from a technical or trade school, they can reduce one year or if they have a master's or doctorate degrees, then they are allowed to reduce five years.

In one of the extensive lists of EOQ, 49 roles are mentioned, however there is no description about the tasks and competences of all these roles. Compared to ASQ, in this extended list, EOQ introduces juniors for each roles such as quality management representative junior. EOQ uses different alternatives to categorize roles. One of the alternatives include categories of integrated quality, specific sectors and other functions. Member countries of EOQ can use different systems for categorizing the roles, for instance QualityAustria uses categories of integrated management system, quality management, environmental management, occupational health and safety management, automotive, food safety and risk management for the quality professional roles they provide certifications.

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[1] www.asq.org

[2] www.eoq.org

[3] Kartläggning av kvalitetsprofessionen; uppdrag roller kompetenser, alla verksamhetsområden (FH 2015)

In their own webpage, EOQ documents describe requirements from quality management personnel and personnel from other fields including environment, safety, risk and energy. These roles have a lot in common. For example a quality management representative, an environmental management representative and an energy management representative have common tasks and competences. While analyzing the tasks and competences required from quality professionals, only six relevant roles were included and role including energy manager, environmental manager and risk manager were excluded (Appendix III and Appendix IV). EOQ requires four years of work experience from quality managers, quality auditors and quality lead auditors, while only two years of work experience is required from quality management representatives.

SFK defines 20 roles and categorizes them based on task oriented subjects. These subjects are supplier quality; six sigma; leadership and organization; audit; evaluation; everyone's participation and commitment; learning organization; impact and change management; business intelligence; quality management system; development of new products/processes; measurement and verification of products; process orientation; customer interaction; strategy, set goals, monitor, analyze and report; development of improvement concept and quality methods and tools. Their work is under development, therefore, although some roles and tasks are mentioned, competence requirements from some roles are not defined yet.

Definition of roles and categories developed by three organizations tend to depend on the stakeholders they intend to inform. ASQ and EOQ categories are directed towards informing individuals for their career path, focusing on roles while SFK intends to inform managers about which activities, resources and roles are required for each business area. To summarize, quality professionals defined by three organizations are categorized based on their contribution to quality management (Table 1).

2. Comparison of roles, tasks and competences

2.1. Comparison of roles

All three organizations acknowledge quality professionals roles, either on their homepage or through documents (e.g. certification). ASQ define 24 roles and explains clearly the tasks associated with each of these roles, however ASQ do not categorize these roles. EOQ present a longer list of roles which includes "juniors" for each role, but EOQ describe roles and tasks for only 19 of these roles. Compared to other two organizations, EOQ provide sector related categorization. Partners of EOQ use different categories as in the example of QualityAustria. The Swedish version, SFK describe tasks and competences required from each of the 20 roles they introduce. SFK do not start by introducing the roles but instead has the focus on tasks and then introducing roles which are supposed to carry out these tasks, sometimes two or three roles work together for a task to be accomplished. This might explain why there is no direct quality manager role in SFK. They use 5 main categories and several subcategories to categorize tasks.

When three organizations are compared by analyzing exact terminologies used for defining roles, ASQ and EOQ have only one role in common: quality managers. Although being partners, EOQ and SFK have no roles that are common, while SFK and ASQ have 8 roles in common: analysts, auditors, inspectors, specialists, coordinators, managers, consultants and educators. EOQ have little that are in common with other two organizations because EOQ use sector specific categorization and identifies roles based on which sector they belong to. Similarities between ASQ and SFK also include that both organizations introduce "six sigma"

related roles which EOQ do not have. A major difference between EOQ and other organizations is, lack of practical roles such as technicians, calibration technicians, analysts and inspectors, while almost for each sector, a manager, a management representative, an auditor and a lead auditor are defined by EOQ.

Table 1. Quality professionals defined by ASQ, EOQ and SFK

	Six sigma	Layer 1 (core)	Layer 2 (support)	Layer 3 (outside)
ASQ	Master black belt, black belt, green belt, yellow belt, white belt	Quality engineer, quality manager	Analyst. auditor, inspector, specialist, technician, calibration technician, process/manufacturing/ project engineer, reliability/safety engineer, software quality engineer, statistician, supplier quality engineer/professional, coordinator, director, champion, manager, supervisor, vice president/executive	Associates, consultant, educator/instructor
EOQ	-	Quality manager, quality management representative	Quality auditor, quality lead auditor	-
SFK	-	Process owner, project leader	Analyst, auditor, specialist, coach, idea seller, inspirer, communicator, organizer, informer, document inspector, leader, coordinator, operation representative, controller, internal consultant	Educator

2.2. Comparison of tasks

Tasks that are mentioned by three organizations are six sigma related tasks, practical tasks (including data management, auditing), management tasks and educational tasks.

Both ASQ and SFK define six sigma related tasks. In ASQ, these tasks are carried out by six roles including champions, master black belts, black belts and green belts. In SFK, six sigma related tasks are given under the main category of "constant improvement" and they are carried out by idea sellers, process owners, coordinators, coaches and project leaders. Idea sellers in SFK act very similar to a champion in ASQ. Tasks of black belt from ASQ are divided between a project manager and a coach in SFK. The only common six sigma related

task between ASQ and SFK is “to lead and implement improvement projects”. ASQ define tasks for each role in a more abstract way, especially for yellow and white belts. On the other hand, SFK make more detailed explanations of tasks such as coordinator deciding criteria for selection of projects and idea seller convincing colleagues of usefulness of six sigma.

Analysis and reporting of data is a common activity in ASQ and EOQ. In ASQ, several roles share data collection and analysis tasks. Green belts assist with data collection and analysis; analysts initiate and coordinate quality related data; technicians analyze quality costs and other quality data; quality engineers designs and evaluates quality assurance process sampling systems, procedures and statistical techniques; statisticians report and interprete statistical data to management; coordinators collect, organize, monitor and distribute information related to quality and process improvement functions and; managers and supervisors present direct reports. In EOQ, data related tasks are carried out by quality managers or sector related managers such as a quality manager analyses quality related data while an energy manager is expected to analyze energy related data and a social responsibility manager is expected to collect and analyze data and evaluate economical, ecological and social figures. Management representatives assist by presenting and reporting results to different target groups. In SFK, data is not mentioned but analysts carry out tasks including defining new processes, analyzing and improving processes, estimating and compiling poor quality costs, compiling and analyzing process information and compiling metrics for management review while a specialist and coach develop metrics and principles of visualization and monitoring.

Auditing is another common task. In ASQ, different roles carry out different auditing tasks: auditors inspect and examine a quality system to ensure compliance to requirements and performs and reports on internal and external quality system audits; inspectors audit and report to ensure conformance with the organization’s quality standards and technicians perform audits. In EOQ, auditing tasks are carried out by auditors and lead auditors with minor support from managers. An auditor creates, implements, assesses and improves audit programs and initiates, plans, performs and revise management system, process and compliance audits. In addition to these tasks, a lead auditor evaluates complex quality management systems and act as audit team leader. Sector specific managers in EOQ (quality manager, environmental manager etc.) are expected to create, implement, assess and improve audit programs. In SFK, auditing tasks are delivered by different roles, similar to ASQ, a process owner develops a customized audit program, an auditor plans, performs and follows up the audit and audits suppliers, and a manager performs product auditing according to routines.

Compared to EOQ and SFK, ASQ list more practical tasks, particularly for two roles, technicians and calibration technicians. Technicians analyze and solve quality problems, prepare inspection plans and instructions, select sampling plan applications, prepare procedures and train inspectors. Since technicians work under a quality engineer, a quality engineer is expected to design inspection and testing mechanisms and equipment. Calibration technicians test, calibrate, maintain and repair analytical and electronic measuring, recording and indicating instruments and equipment. EOQ and SFK do not list such tasks.

ASQ and SFK introduce similar tasks which can be categorized as process, safety and supplier oriented tasks. In ASQ, these tasks are carried out by engineers such as a safety engineer or a supplier quality engineer. A process (or manufacturing/project) engineer in ASQ

evaluates manufacturing processes or performance improvement projects and also develops processes to ensure quality, cost and efficiency. In EOQ, management representatives are expected to carry out process management tasks. In SFK, process oriented tasks are carried out by a manager, coach, specialist and an analyst and these tasks include defining and mapping main processes, support processes and management processes, defining new processes, creating standard for process mapping, analyzing and improving processes and developing principles for process standardization. Safety tasks in ASQ are to use principles of performance evaluation and prediction to improve the safety, to plan reliability test and to develop and administer reliability information systems which are carried out by a safety (reliability) engineer. In EOQ, these tasks are listed under risk management category and risk managers are expected to carry out tasks including applying methods to mitigate the human factor and understanding factors creating human safety. In SFK, safety and reliability tasks are listed under the audit section, coordinators are expected to check product safety, risk assessment before, during and after production and, check product liability, make damage investigations and is responsible of insurance issues. ASQ suggest that a supplier quality engineer should be responsible of all quality improvement issues related to vendors and suppliers and carries out two supplier related tasks: assessing potential new suppliers and working with suppliers to develop the supply chain. SFK list supplier quality related tasks as participating in the development of strategy for the selection of suppliers and monitoring quality, performing supplier assessment, making risk analysis of supplier process, developing quality preparation at suppliers, managing suppliers' customer complaints, designing requirements for quality related parameters and following up suppliers' quality outcomes. In SFK, these tasks are carried out by a manager, an operation representative, a process owner and a coordinator.

A common role defined in three organizations is motivating employees and promoting management system. In ASQ, a quality manager is responsible to lead and champion process improvement initiatives, to motivate and evaluate staff and to facilitate and lead team efforts to establish customer and supplier relations; while a vice president (or executive) is expected to develop an environment of continual improvement and act as a champion for quality. A director's responsibility is to facilitate change. In EOQ, a management representative acts as a contact person and a motivator for employees and supports the decision maker, and a manager promote company's management system and supports top management in demonstrating leadership and commitment to the quality management system. SFK list relevant roles as idea sellers, inspirers, coaches, communicators and managers. Relevant tasks are convincing management of the importance of systematic quality work, supporting managers to create involvement among its employees and having knowledge about motivation and incentives and how commitment is created and measured, and establishing a culture for quality improvement.

Deciding the quality related strategy is one of the areas where tasks are provided. ASQ define such tasks as supporting strategic planning and deployment initiatives, overseeing all aspects of organization's quality and business improvement efforts, establishing strategic plans, policies and procedures, administrating organization's quality, process and business improvement efforts and, establishing directions for the development and administration of organization's quality improvement efforts. In ASQ, these tasks are shared between a quality manager, a director, a manager, a supervisor and a vice president. No such tasks are mentioned in EOQ's documents. In SFK, these tasks are to control and manage systematic

quality processes, to promote a culture of a systematic approach to quality in order to achieve the business quality, to identify needs of quality excellence for each group within the organization, to relate quality work to overall strategy, to structure improvement work, to compose improvement program with relevant methods and tools, to customize methodologies for the improvement for their own context, to assess and introduce new methodologies for improvement within the organization, and to design, introduce and drive management system. These tasks are carried out mainly by specialists, process owners and internal consultants.

Besides strategy related tasks, there are other ones related to policies, limitations, standards, guidelines and specifications. Analyzing production and service limitations and standards, recommending revision of specifications and formulating quality assurance policies and procedures are example of such tasks from ASQ which are carried out by quality engineers. In EOQ, these tasks are to implement and maintain quality management system, decide on the application of quality management method and manage quality management projects, to recognize legal and other normative requirements and coordinate their assessment in the company and to integrate requirements from different management system standards. SFK suggest more detailed tasks including being able to apply and train others to learn to apply main quality tools and methods, seven basic improvement tools and seven management tools which are expected to be delivered by an internal consultant.

A common role defined by all three agencies is educational roles. In ASQ, training and coaching of employees is a part of directors' tasks; instructing and training others on quality related topics, tools and techniques are carried out by educators and quality engineers may also conduct training on quality assurance. In EOQ, a quality manager is expected act as internal trainer for topics of relevance to company quality management and other management systems. In SFK, the role of educator is introduced however an educator has other tasks than teaching. Instead, a coach teaches and/or facilitates the work to translate market insights to new products, services and offers.

Customer related tasks are the last category. A manager in ASQ might be responsible for dealing with customers and supplier on quality related issues. In EOQ, acting as a contact person for external interested parties, recognizing customer-specific requirements, continuously analyzing customer interests, representing them in the company and implementing are a part of quality management representatives' and quality managers' tasks. There are no such tasks in SFK.

2.3. Comparison of competences

All three organizations use different taxonomies to describe the level of competence required. In ASQ, six levels are used: remember, understand, apply, analyze, evaluate and create. In EOQ, four level are used and each level is represented with a vowel: recognize (A), understand (B), apply (C) and analyze results and evaluate them (D). In SFK, there are three levels, represented with 3 vowels: B, C and D. In order to facilitate comparison between required competence levels suggested by these three organizations, their competence levels were presented with a standard system in Appendix II, IV and VI. Competence levels in this standard system is defined as: recognize (A), understand (B), apply (C), analyze and evaluate (D) and create (E).

There are common competences defined by all three organizations and project management related competences are one of them. In ASQ, manager of quality is expected to use project

management methodology and ensure that each project is aligned with strategic objectives; while a quality engineer is expected to define, describe and use project management tools. Master black belts are the ones with most competences required about project management and they are explained very detailed including appraising interrelated projects, positioning multiple projects, prioritizing projects, overseeing critical projects, supporting methodology to monitor projects, monitoring and, developing techniques to inform stakeholders about progress. In most of these competences, master black belts are required to create and develop techniques. In EOQ, only quality management representatives are expected to be able to apply project management methods while in SFK, project management skills are required from several roles including specialists, coaches, project leaders, document inspectors and educators.

Strategy related competences are acknowledged often by ASQ and SFK. In ASQ, manager of quality must have a wide range of competences related to strategic plan development and deployment which include competences like strategic planning models and business environment analysis. Quality improvement associates are expected to identify how a team's effort support organization's key strategies. Supplier quality professionals are responsible of supplier strategy and must have competences of communicating strategy internally and communicating expectations to suppliers externally. A master black belt must have strategy related competences to ensure enterprise-wide planning and deployment. These competences are describing strategic planning tools, describing how to develop strategic deployment goals, but also in relation to six sigma and strategy. Six sigma black belts are expected to be able to define the importance of strategic planning for six sigma projects. In EOQ, quality managers must have competence of developing future scenarios regarding the quality management system based on the vision, mission and strategy of the organisation, a quality auditor is expected to be able to assess the implementation of the planned measures to reach the objectives based on business strategy/objectives during the audit. In SFK, an idea seller should be able to act as a strategist, while a specialist, educator and coach should understand the business objectives and requirements.

Team management competences is another category mentioned by all three organizations. In ASQ, these competences include basic team building steps, identifying different teams, team development, team support, evaluation of team performance. Quality managers, quality engineers, quality improvement associates, quality inspectors, quality process analysts, quality technicians, supplier quality professionals, master black belts and six sigma black belts are expected to have team management competences. Among these roles, quality inspectors should only be able to recognize some relevant competences while master black belts are expected to create and develop. The number of competences are most for quality improvement associates and six sigma black belts. In EOQ, a quality manager should be able to apply some of the relevant competences while quality lead auditors are expected to be able to analyze and evaluate such as forming an audit team. In SFK, these competences are only related to support with appropriate tools and systems, expected by specialists and coaches.

Competences related to training of employees are important. In ASQ, these competences include being able to train staff, developing trainings plans, using various training tools and training design and delivery. Calibration technicians, manager of quality, quality engineers, quality process analysts, supplier quality professionals, master black belts and six sigma black belts are expected to have these competences. Number of competences are less for quality

process analysts while manager of quality and master black belts are expected to have many competences for training. In EOQ, these competences include providing trainings, using different techniques and assessing trainings. Requirements are easy for quality management representatives to fulfill who only need to recognize these competences while quality managers are expected to be able to apply, analyze and evaluate for most competences. In SFK, two competences are mentioned, pedagogy and competence matrices. Specialists are expected to be able to apply pedagogical competences while process owners should be able to analyze and evaluate competence matrices.

Change management competences are required from some roles. In ASQ, one of these competences is using various change management strategies. Manager of quality, master black belts and six sigma black belts are expected to have change management related competences. EOQ's relevant competences include generating acceptance of changes, identifying needs for change and knowing principles of change management. Both quality managers and quality management representatives are expected to have these competences. SFK defines such competences as argumentation method and change management. Inspirers and communicators are expected hold these competences at applying level.

Competences required from quality professionals include knowledge of different standards. In ASQ, quality managers should be able to define and describe ISO 9001 standards and this is only required at understanding level. A quality engineer should be able to describe key points of ISO 9000. In EOQ, a quality management representative is expected to understand, interprete ISO 9001 standards and distinguish it from other standards and they are also required to know other standards, ISO 9000, ISO 9004, EN 15224. Quality management representatives are also expected to have an overview of other standards: ISO 10000, ISO 14001, ISO 45001, ISO 31000 (only at recognize level). A quality manager is expected to be able to apply standards of ISO 9004. Quality managers and quality auditors are expected to carry out some tasks according ISO 19011 standards. Quality lead auditors should be able to consider requirements of ISO 17021 and ISO 19011. In SFK, several roles including specialists, idea sellers, organizers, coaches and educators are expected to be experts in ISO 9001 and other related standards. Specialists, communicators, idea sellers and project leaders are expected to understand ISO 9004 standards and auditors are expected to analyze and evaluate according to ISO 19011 standards.

All three organizations defined competences related to customer relations. In ASQ, these competences include defining customer segments, analyzing customer comments and expectations, analyzing customer feedback and customer relation tools, analyzing strategies for developing customer relations and, defining metrics of customer satisfaction. Calibration technicians, quality managers, reliability engineers, quality engineers, quality improvement associates, quality inspectors, quality process analysts, quality technicians, quality professionals, master black belts, six sigma black belts and six sigma green belts should hold these competences. In EOQ, understanding the principle of customer focus, assessing contractual arrangements with customers, integrating customer demands into processes are only a few of competences related to customer relations. The roles that are supposed to have these competences are quality managers and quality management representatives. SFK define similar competences as understanding customer and regulatory requirements, systematic customer complaint handling and quality drafting methodology. Specialists, idea sellers,

organizers, coaches, educators, communicators, project leaders and process owners are expected to have these competences.

Communication and information related competences are required from the majority of the roles. In ASQ, these competences include defining and applying various modes of communication, developing and implementing specific communication methods, maintaining active communication with suppliers and using electronic communications to support long-distance collaboration. Quality managers, quality engineers, quality technicians, master black belts, six sigma black belts and six sigma green belts are expected to have these competences. In EOQ, there are similar competences and these are: to understand the necessity and plan actions for communication and be able to use techniques for information collection and preparation. Quality management representatives, quality auditors and quality lead auditors should have communication and information related competences. In SFK, only one abstract competence is defined for this category, requiring several roles being able to apply and evaluate communication. These roles are project leaders, document inspectors, educators and informers, internal audit coordinators, coaches, specialists, communicators and idea sellers.

Only ASQ and SFK require six sigma related competences. In ASQ, competences include being able to select, interpret and apply tools such as root cause analysis, PDCA, six sigma DMAIC and identify key six sigma concepts and tools. Quality managers and quality engineers are expected to have these competences at analyze and evaluate levels, while reliability engineers are required only at apply level. Quality improvement associates and quality process analysts should have these competences at understanding level and quality technicians should recognize six sigma related concepts. The competence requirements start from understanding level and gets stricter for roles of six sigma green belts, six sigma black belts and master black belts. In SFK, idea sellers, process owners, coordinators, coaches and project leaders should have several six sigma related competences including being able to apply six sigma related concepts, however the required level of competence is being able to apply.

Knowing statistics is a common competence required by the organizations. In ASQ, statistics related competences are presented in detail and they include calculating basic statistics: measures of central tendency (mean, median, mode), and measures of dispersion (range, standard deviation, and variance), defining basic measurement terms, analyzing data to distinguish between common and special cause variation and applying non-parametric data analysis methods. Quality managers, reliability engineers, quality engineers, quality process analysts and quality technicians are expected to have these competences. The number of competences increase for quality technicians and six sigma black belts as well as six sigma green belts. In EOQ, quality managers are expected to be able to select, produce and interpret graphical presentation methods for statistical data (diagrams, charts). In SFK, three roles, specialists, coaches and analysts are expected to have statistical knowledge.

Quality professionals are also required to know different types of methods, techniques and tools which are specific for every quality professions. Methods include, measurement methods, improvement methods, housekeeping methods for calibration, risk control and mitigation methods, TQM, reliability techniques and methods for improvement, feedback methods, assessment methods, knowledge management methods, methods for identifying customer requirements and assessing customer satisfaction, leadership techniques project

management methods and audit methods. In ASQ, most of these methods are explained in detail. For example quality improvement methods include flowcharts/process maps, check sheets, Pareto diagrams, cause and effect diagrams, scatter diagrams, control charts, and histograms. In EOQ, details are provided for different methods and techniques as well. In SFK, a more abstract terminology is used as “seven basic improvement tools, seven management tools and industry spread quality methods and tools”. In overall, depending on their profession, quality professionals are expected to at least apply these methods, techniques and tools.

Unlike ASQ, EOQ acknowledge one EU related competence while SFK define two EU related competences. These competences are about understanding EU standards and law. In EOQ, quality management representatives and in SFK, coordinators are required to have these competences.

Appendix I: Quality professionals' roles and tasks defined by ASQ

Six sigma related

Champion ($95,286)
- Ensures resources are available for quality training and projects
- Gets involved in project tollgate reviews

Master Black Belt ($127,875)
- Trains and coaches Black Belts and Green Belts
- Develops key metrics and strategic direction

Black Belt ($97,402)
- Implements process improvement projects
- Leads problem-solving projects
- Trains and coaches project teams
- Demonstrates team leadership, understands team dynamics and assign team member roles and responsibilities

Green Belt ($94,703) (works under Black belt)
- Assists with data collection and analysis under the supervision of a Black Belt

Yellow Belt
- Participates as a project team member

White Belt
- Can work on local problem-solving teams, not part of a Six Sigma project team

Practice related

Analysts ($80.377) (also Quality process analyst) (works under quality engineers or supervisors)
- Initiates and/or coordinates quality related data from production and service activities and reports these data using statistical techniques
- Analyses and solves quality problems

Auditors ($76,019)
- Inspects and examines a quality system to ensure compliance to requirements
- Performs and reports on internal or external quality system audits

Inspectors ($47,649) (also Quality inspector) (works under quality engineers, supervisors or technicians)
- Audits and reports on materials, processes and products using variable or attribute measuring instruments and techniques to ensure conformance with the organization's quality standards

Specialists ($78,572)
- Performs specific functions within a quality initiative (statistical analysis or testing, management representative)

Technicians ($48,015) (also Quality technician) (works under quality engineers or supervisors)
- Performs basic quality tasks to track, analyse and report on materials, processes and products, ensures they meet organizational standards
- Analyses and solves quality problems
- Prepares inspection plans and instructions, selects sampling plan applications, prepares procedures, trains inspectors
- Performs audits
- Analyses quality costs and other quality data, applies fundamental statistical methods for process control

Calibration technician ($54,584)
- Tests, calibrates, maintains and repairs electrical, mechanical, electromechanical, analytical and electronic measuring, recording and indicating instruments and equipment

Process/manufacturing/project engineer ($85,360)

- Performs engineering work to evaluate manufacturing processes or performance improvement projects for optimization
- Can also develop processes to ensure quality, cost and efficiency

Reliability/safety engineer ($109,789)

- Uses principles of performance evaluation and prediction to improve the safety, reliability and maintainability of products and systems
- Plans reliability tests and conduct analyses of field failures
- Develops and administers reliability information systems for failure analysis and performance improvement

Software quality engineer ($98,309)

- Applies quality principles to the development and use of software and software based systems
- Designs and implements software development and maintenance processes as well as test methods for software inspection, verification and validation

Statistician ($118,860)

- Specializes in the use of statistical techniques for process control and other quality-related methods
- Reports and interprets statistical data to management
- May design research and testing methods

Supplier quality engineer/professional ($98,318)

- Responsible for all quality improvement issues related to vendors and suppliers
- Assesses potential new suppliers, works with suppliers to develop and improve an entire supply chain
- May be involved in purchasing

Management related

Quality engineers ($83,302)

- Designs, installs and evaluates quality-assurance process-sampling systems, procedures and statistical techniques
- Designs inspection and testing mechanisms and equipment
- Analyses production and service limitations and standards
- Recommends revision of specifications
- Formulates quality assurance policies and procedures
- Interfaces with all other engineering functions
- May conduct training on quality assurance

Quality managers (also Manager of quality/organizational excellence)

- Oversees the administration of quality, process and/or business improvement efforts
- Leads and champions process-improvement initiatives
- Facilitates and leads team efforts to establish and monitor customer/supplier relations
- Supports strategic planning and deployment initiatives
- Helps to develop measurement systems to determine organizational improvement
- Should be able to motivate and evaluate staff manage projects and human resources
- Analyse financial situations, determine and evaluate risk
- Employ knowledge management tools and techniques in resolving organizational challenges

Coordinator ($61,266)

- Collects, organizes, monitors and distributes information related to quality and process improvement functions, including compliance to and documentation of quality management standards
- Generates reports and distributes

Director ($130,791)

- Oversees all aspects of an organization's quality or business improvement efforts including developing and administrating the program
- Training and coaching employees
- Facilitating change

- Establishes strategic plans, policies and procedures

Manager ($94,703)

- Ensures the administration of an organization's quality, process or business improvement efforts
- Has direct reports
- Might be responsible for dealing with customers and suppliers on quality or performance issues

Supervisor ($73,915)

- Administers the organization's quality improvement efforts
- Has direct reports that implement some aspect of the policies and procedures of the quality functions

Vice president/executive ($165,299)

- Establishes the directions for the development and administration of the organization's quality improvement efforts
- Consults with other executes
- Develops an environment of continual improvement
- Acts as a champion for quality

Outside organisation

Associates (Also quality improvement associate) ($64,791)

- Gets involved in quality improvement activities or projects but not full-time, no primary responsibility for traditional quality management, assurance or control

Consultant ($108,204)

- Provides advice, facilitation and training on the development, administration and technical aspects of an organization's quality improvement efforts

Educator/instructor ($96,360)

- Instructs or trains other on quality related topics, tools and techniques

Appendix II: Competences required from certified quality professionals' by ASQ

Body of Knowledge	Learning Taxonomy
Calibration Technician	
General Metrology	
Describe and define the seven base units: meter, kilogram, second, ampere, kelvin, candela, and mole	B
Define and calculate various derived units, including degree, ohm, pascal, newton, joule, coulomb, hertz, etc	C
Define various multipliers, including, kilo, deci, centi, milli, and calculate converted values, such as mega to kilo, micro to milli, etc	C
Identify fundamental constants c (velocity or speed of light in a vacuum), g (gravitational constant), and R (universal gas constant), their standard symbols, and their common applications	A
Describe and apply IM&TE in measuring temperature, humidity, pressure, torque, force, mass, voltage/current/resistance, time/frequency, and linear displacement	D
Identify various aspects of traceability, including traceability through commercial and national laboratories and international metrology organizations	B
Define and distinguish between various types of standards, including primary, reference, working, intrinsic, derived, consensus, and transfer, and identify when to use them in various situations	C
Determine when and how calibration standards can be substituted based on measurement requirements, equipment availability, equipment specifications, etc	D
Measurement Systems	
Describe and use various measurement methods, including direct, indirect, ratio, transfer, differential, and substitution by unit under test (UUT)	D
Define and distinguish between various measurement characteristics, including variability, sensitivity, repeatability, reproducibility, bias, linearity, stability, etc	B
Identify and analyze various aspects of measurement data, including format, readability, resolution, suitability for use, confidentiality, etc	D
Define and use common specification descriptions, including percent of full scale (FS), percent of range, percent of reading, and number of counts	D
Identify and correct for error sources that can affect measurement results, including drift, bias, operator error, environment, etc	D
Define and describe basic MAP concepts, including interlaboratory comparisons and testing schemes, proficiency tests, gage R&R studies, etc	B
Identify and define common elements of calibration procedures, such as required equipment, revisions, equipment listing, environmental considerations and restraints, etc	B
Use methods such as spanning, nulling, zeroing, linearization, etc	D
Identify various sources of industry-accepted metrology and calibration practices, including published resources, manufacturer recommendations, ANSI standards, etc	B
Define and distinguish between government regulations, traceability and other legally mandated metrology requirements, national or international guidance, etc	C
Define and describe various environmental parameters for humidity, dust levels, electrostatic discharge (ESD), temperature, vibration, etc	D
Describe the basic flow of IM&TE through the calibration process	B
Identify IM&TE logistical information, such as equipment identification, ownership, service history, process tracking systems, etc	B

Identify roles and responsibilities of calibration staff members, including laboratory manager, technical manager, scheduler, quality manager, technician, etc	B
Describe IM&TE scheduling considerations, including planned calibration intervals, product or equipment recalls, steps in the notification process, overdue lists, staff workloads, etc	D
Identify issues related to validating manual and automated calibration systems, and identify unique validation considerations for software or firmware that is part of IM&TE or calibration processes	B
Define and describe document control in terms of maintaining the integrity and confidentiality of various calibration records, including audit results, staff training, uncertainty budgets, customer data, etc	C
Describe and distinguish between various types of formal results reporting, including calibration labels, test reports, nonconforming calibration reports, calibration certificates, etc	C
Measurement Uncertainty and Applied Math	
Define basic terms, such as guardbanding, test uncertainty ratio (TUR), test accuracy ratio (TAR), bias, error, percent of tolerance, etc	A
Identify various type A and type B uncertainty components, including environment, human factors, methods and equipment, item under test, reference standards, materials, etc	C
Identify and use various methods to determine and report measurement uncertainty, including combined and expanded uncertainty, weighted factors, explanatory graphics, coverage factors, confidence levels, effective degrees of freedom, uncertainty calculation elements including mean, standard deviation, root sum square (RSS), variance, etc	D
Quality Systems and Standards	
Define and distinguish between various components of a quality system, including management and customer focus, employee training and development, continuous process improvement, etc	C
Identify various methods used to develop, improve, and review quality systems, including mission and goals, planning and deployment, cross-functional teams, etc	B
Select and apply the seven basic quality tools: flowcharts/process maps, check sheets, Pareto diagrams, cause and effect diagrams, scatter diagrams, control charts, and histograms	D
Define basic audit types	B
Determine conformance status and apply various methods of identifying and segregating nonconforming IM&TE materials	D
Define and use various tools	C
Identify appropriate behaviors that are aligned with the ASQ Code of Ethics, for various situations	C
Identify potential hazards in the work environment, including improper ventilation, mercury vapors, soldering fumes, suboptimal workplace lighting, etc	B
Identify and interpret various elements of the HazCom standard (also known as the OSHA Right-to-Know Law) including material safety data sheet (MSDS) terms, material labeling requirements, etc	B
Describe housekeeping methods in the calibration environment including, maintenance, 5S's, IM&TE and cleaning)	A
Accreditation and registration boards such as NVLAP, A2LA, IAS, LAB, RABQSA, IRCA, etc	B
Manager of Quality/Organizational Excellence	
Leadership	
Define and describe organizational designs (i	C
Describe typical roles, responsibilities, and competencies of people in leadership positions and how those attributes influence an organization's direction and purpose	D

Describe typical roles, responsibilities, and competencies of people in management positions and how those attributes contribute to an organization's success	D
Use various change management strategies to overcome organizational roadblocks and achieve desired change levels, and review outcomes for effectiveness	D
Develop and implement techniques that motivate employees and sustain their enthusiasm	E
Describe and distinguish between job enrichment and job enlargement, job design and job tasks	C
Identify different types of teams and their purpose, including process improvement, self-managed, temporary or ad hoc (special project), and work groups or workcells	B
Define and describe the classic stages of team development: forming, storming, norming, performing	C
Apply basic team-building steps such as using ice-breaker activities to enhance team introductions and membership, developing a common vision and agreement on team objectives, identifying and assigning specific roles on the team	C
Define and describe typical roles related to team support and effectiveness such as facilitator, leader, process owner, champion, project manager, and contributor	D
Evaluate team performance in relation to established metrics to meet goals and objectives	D
Identify and apply behaviors and actions that comply with this code	C
Strategic Plan Development and Deployment	
Define, describe, and use basic elements of strategic planning models, including how mission, vision, and values as guiding principles relate to the plan	C
Analyze an organization's strengths, weaknesses, opportunities, and threats, and develop and prioritize actions to take in response to that analysis	D
Define and describe various forces that drive strategic plans, including existing competition, the entry of new competitors, rivalry among competitors, the threat of substitutes, bargaining power of buyers and suppliers, current economic conditions, and how well the organization is positioned for growth and changing customer expectations	C
Identify and differentiate various internal and external stakeholders, as well as their perspectives, needs, and objectives to ensure that the organization's strategic objectives are aligned with those of the stakeholders	D
Describe how changes in technology can have long- and short-term influences on strategic planning	B
Identify and describe the effects that influence an organization's internal capabilities: human resources, facilities capacity, and operational capabilities	D
Define and describe how these factors can influence strategic plans	B
Identify basic characteristics of tactics: specific, measurable, attainable, relevant, time-specific, and linked to strategic objectives	D
Evaluate current resources to ensure they are available and deployed in support of strategic initiatives	D
Develop these measures and ensure that they are aligned with strategic goals, and use the measures to evaluate the organization against the strategic plan	D
Support strategic plan deployment by applying continuous improvement and other quality initiatives to drive performance outcomes throughout the organization	E
Define and apply basic management principles such as planning, leading, delegating, controlling, organizing, and allocating resources	C
Define and describe management theories such as scientific, organizational, behavioral, learning, systems thinking, and situational complexity	C

Describe the interdependence of an organization's areas (human resources, engineering, sales, marketing, finance, research and development, purchasing, information technology, logistics, production, and service) and how those dependencies and relationships influence processes and outputs	B
Apply HR elements in support of ongoing professional development: setting goals and objectives, conducting performance evaluations, developing recognition programs, ensuring that succession plans are in place where appropriate	C
Read, interpret, and use various finance tools including income statements, balance sheets, and product/service cost structures	D
Describe and use risk control and mitigation methods: avoidance, reduction, prevention, segregation, and transfer	C
Use KM techniques in identifying core competencies that create a culture and system for collecting and sharing implicit and explicit knowledge among workers, customers, competitors, and suppliers	C
Define and apply various modes of communication used within organizations, such as, verbal, non-verbal, written and visual	C
Develop skills in empathy, tact, friendliness, and objectivity	C
Identify key challenges of communicating across different time zones, cultures, languages, terminology, and business practices, and identify ways of overcoming them	B
Identify how technology has affected communications, including improved information availability, its negative influence on interpersonal communications, and the new etiquette for e-communications	C
Use project management methodology and ensure that each project is aligned with strategic objectives	C
Use tools such as risk assessment, benefit-cost analysis, critical path method (CPM), Gantt chart, PERT, and work breakdown structure (WBS) to plan projects and estimate related costs	C
Use tools such as cost variance analysis, milestones	D
Use written procedures and project summaries to document projects	C
Develop and monitor the quality mission and policy and ensure that it is aligned with the organization's broader mission	E
Develop and deploy the quality plan and ensure that it is documented and accessible throughout the organization	E
Evaluate the effectiveness of the quality system using various tools: balanced scorecard, internal audits, feedback from internal and external stakeholders, skip-level meetings, warranty data analytics, product traceability and recall reports, and management reviews	D
Define and describe common elements and criteria of performance excellence models such as the Malcolm Baldrige National Quality Award (MBNQA), Excellence Canada, and the European Excellence Award (EFQM)	B
Define and describe how the ISO 9001 standards can be used to support quality management systems	B
Describe and differentiate methods such as total quality management (TQM), continuous improvement, and benchmarking	C
Describe and apply basic methodologies and theories proposed by quality leaders such as Shewhart, Deming, Juran, Crosby, Feigenbaum, and Ishikawa	C
Select, interpret, and evaluate output from these tools: Pareto charts, cause and effect diagrams, flowcharts, control charts, check sheets, scatter diagrams, and histograms	D
Select, interpret, and evaluate output from these tools: affinity diagrams, tree diagrams, process decision program charts (PDPCs), matrix diagrams, prioritization matrices, interrelationship digraphs, and activity network diagrams	D
Select, interpret and apply tools such as root cause analysis, PDCA, six sigma DMAIC (define, measure, analyze, improve, control), and failure mode and effects analysis (FMEA)	D
Use various techniques and exercises for creative decision-making and problem-solving, including brainstorming, mind mapping, lateral thinking, critical thinking, the 5 whys, and design for six sigma (DFSS)	C
Define and distinguish between prevention, appraisal, internal, and external failure cost categories and evaluate the impact that changes in one category will have on the others	D

Describe how process goals are established, monitored, and measured and evaluate their impact on product or service quality	D
Use various tools to analyze a process and evaluate its effectiveness on the basis of procedures, work instructions, and other documents	D
Identify and use lean tools such as cycle-time reduction, 5S, just-in-time (JIT), kanban, value stream mapping, single-minute exchange of die (SMED), poke- yoke, kaizen, and overall equipment effectiveness (OEE)	C
Define key concepts of TOC: systems as chains, local vs	B
Use techniques such as the goal-question-metric (GQM) model and others to identify when, what, and how to measure projects and processes	C
Define and describe basic sampling techniques such as random and stratified	B
Calculate basic statistics: measures of central tendency (mean, median, mode), and measures of dispersion (range, standard deviation, and variance)	D
Define basic measurement terms: accuracy, precision, bias, and linearity	B
Interpret graphs and charts to identify cyclical, seasonal, and environmental data trends	D
Analyze data to distinguish between common and special cause variation	D
Recognize process capability (Cp and Cpk,) and performance indices (Pp and Ppk)	B
Define and describe basic reliability measures: mean time between failures (MTBF) and mean time to repair (MTTR)	B
Identify subjective measures such as verbatim comments from customers, observation records, and focus group output	D
Define and describe the impact an organization's treatment of internal customers will have on external customers	D
Define external customers and describe their impact on products and services	D
Define and describe the process of customer segmentation and its impact on aligning service and delivery to meet customer needs	D
Use quality function deployment (QFD) to analyze customer needs in relation to products and services offered	D
Develop systems to capture positive and negative customer perceptions and experiences, using tools such as voice of the customer, listening posts, focus groups, complaints and warranty data, surveys, and interviews	E
Develop and deploy strategies that support customer service principles: courtesy, politeness, smiles, cheerfulness, attention to detail, active listening, empathy, rapid response, and easy access for information and service	C
Establish and monitor priorities to avoid or resolve conflicting customer requirements and demands	D
Supply Chain Management	
Define, develop, and use criteria for selecting suppliers, including internal rating programs and external certification standards	E
Develop and implement specific communication methods with suppliers, including regularly scheduled meetings and routine and emergency reporting procedures	E
Define, develop, and monitor supplier performance in terms of quality, cost, delivery, and service levels, and establish associated metrics for defect rates, product reliability, functional performance, timeliness, responsiveness, and availability of technical support	E
Define and conduct supplier audits, evaluate corrective and preventive action plans, provide feedback, and monitor process improvements	E
Define and implement supplier certification programs that include process reviews and performance evaluations	E
Describe the impact that purchased products and services can have on final product assembly or total service package, including ship-to-stock, and just-in- time (JIT)	B
Training and Development	
Develop and implement training plans that are aligned with the organization's strategic plan and general business needs, including leadership training and alignment of personal development plans	E
Use various tools and techniques such as surveys, performance reviews, regulatory guidances, and gap analysis to identify training needs	E

Use various tools, resources, and methodologies to develop training materials and curriculum that address adult learning principles and the learning needs of an increasingly diverse workforce	C
Assess training effectiveness and make improvements based on feedback from training sessions, end-of-course test results, on-the-job behavior or performance changes, and departmental or area performance improvements	E
Reliability Engineer	
Reliability Management	
Describe how reliability engineering techniques and methods improve programs, processes, products, systems, and services	B
Define and describe the relationships among safety, reliability, and quality	B
Describe how reliability techniques can be applied in other functional areas of the organization, such as marketing, engineering, customer /product support, safety and product liability, etc	C
Integrate reliability engineering techniques with other development activities, concurrent engineering, corporate improvement initiatives such as lean and six sigma methodologies, and emerging technologies	C
Describe the importance of these concepts in determining reliability acceptance criteria	B
Define and describe warranty terms and conditions, including warranty period, conditions of use, failure criteria, etc	B
Use various feedback methods	C
Define and describe supplier reliability assessments that can be monitored in support of the overall reliability program	B
Explain basic reliability terms	B
Explain how planning, testing, tracking, and using customer needs and requirements are used to develop a reliability program, and identify various drivers of reliability requirements, including market expectations and standards, as well as safety, liability, and regulatory concerns	B
Describe the relationship between reliability and various types of risk, including technical, scheduling, safety, financial, etc	B
Describe the impact various lifecycle stages (concept/design, introduction, growth, maturity, decline) have on reliability, and the cost issues (product maintenance, life expectation, software defect phase containment, etc	B
Use validation, verification, and other review techniques to assess the reliability of a product's design at various lifecycle stages	D
Describe how these processes are used to create requirements and prioritize design and development activities	B
Identify appropriate ethical behaviors for a reliability engineer in various situations	D
Describe the roles and responsibilities of a reliability engineer in relation to product safety and liability	B
Identify safety-related issues by analyzing customer feedback, design data, field data, and other information	D
Probability And Statistics For Reliability	
Define and use terms such as population, parameter, statistic, sample, the central limit theorem, etc	C
Use basic probability concepts	C
Compare and contrast various distributions (binomial, Poisson, exponential, Weibull, normal, log-normal, etc	D
Define and describe homogeneous and non-homogeneous Poisson process models (HPP and NHPP)	B
Apply non-parametric statistical methods, including median, Kaplan-Meier, Mann- Whitney, etc	C
Use various theories, tables, and formulas to determine appropriate sample sizes for statistical and reliability testing	C
Define and describe SPC and process capability studies (Cp, Cpk, etc	B
Obtain point estimates of model parameters using probability plots, maximum likelihood methods, etc	D
Compute confidence intervals, tolerance intervals, etc	D
Apply hypothesis testing for parameters such as means, variance, proportions, and distribution parameters	D
Reliability In Design And Development	

Identify environmental and use factors	C
Apply stress-strength analysis method of computing probability of failure, and interpret the results	D
Define and distinguish between failure mode and effects analysis and failure mode, effects, and criticality analysis and apply these techniques in products, processes, and designs	D
Describe this type of failure (also known as common cause mode failure) and how it affects design for reliability	B
Apply these techniques to develop models that can be used to evaluate undesirable (FTA) and desirable (STA) events	D
Describe how tolerance and worst-case analyses	B
Plan and conduct standard design of experiments (DOE)	D
Define and describe fault tolerance and the reliability methods used to maintain system functionality	B
Use various approaches, including redundancy, derating, trade studies, etc	C
Describe the relationship between human factors and reliability engineering	B
Apply DFX techniques such as design for assembly, testability, maintainability environment (recycling and disposal), etc	C
Use these techniques to specify subsystem and component reliability requirements	D
Apply techniques for materials selection, parts standardization and reduction, parallel modeling, software reuse, including commercial off-the-shelf (COTS) software, etc	C
Use methods such as S-N diagram, stress-life relationship, etc	D
Explain the implications of parts obsolescence and requirements for parts or system requalification	C
Develop metrics for reliability, maintainability, and serviceability	E
Reliability Modeling and Predictions	
Describe sources of reliability data (prototype, development, test, field, warranty, published, etc	C
Generate and analyze various types of block diagrams and models, including series, parallel, partial redundancy, time-dependent, etc	E
Identify various failure mechanisms	C
Describe the advantages and limitations of the Monte Carlo and Markov models	C
Describe dynamic reliability as it relates to failure criteria that change over time or under different conditions	B
Use parts failure rate data to estimate system- and subsystem-level reliability	C
Reliability Testing	
Create and apply the appropriate test strategies	E
Evaluate the environment in terms of system location and operational conditions to determine the most appropriate reliability test	D
Describe the purpose, advantages, and limitations of each of the following types of tests, and use common models to develop test plans, evaluate risks, and interpret test results	D
Describe the purpose, advantages, and limitations of each of the following types of tests, and use common models to develop product test plans, evaluate risks, and interpret test results	D
Maintainability and Availability	
Develop plans for maintainability and availability that support reliability goals and objectives	E
Identify the advantages and limitations of various maintenance strategies	C
Describe various types of availability	C
Define and use PM tasks, optimum PM intervals, and other elements of this analysis, and identify situations in which PM analysis is not appropriate	C
Describe the elements of corrective maintenance analysis	C

Describe the types and uses of these tools	B
Use various testability requirements and methods	C
Describe the relationship between spare parts requirements and reliability, maintainability, and availability requirements	D
Data Collection and Use	
Identify and distinguish between various types of data	D
Identify appropriate methods and evaluate the results from surveys, automated tests, automated monitoring and reporting tools, etc	D
Describe key characteristics of a database	D
Examine collected data for accuracy and usefulness	E
Select and use various root cause and failure analysis tools to determine the causes of degradation or failure, and identify appropriate preventive or corrective actions to take in specific situations	D
Use various data analysis tools to evaluate the effectiveness of preventive and corrective actions in improving reliability	D
Describe methods such as mechanical, materials, and physical analysis, scanning electron microscopy (SEM), etc	B
Identify the elements necessary for a FRACAS to be effective, and demonstrate the importance of a closed-loop process that includes root cause investigation and follow up	C
Quality Engineer	
Management and Leadership	
Describe continuous improvement tools, including lean, six sigma, theory of constraints, statistical process control (SPC), and total quality management, and understand how modern quality has evolved from quality control through statistical process control (SPC) to total quality management and leadership principles (including Deming's 14 points)	B
Identify and define top management's responsibility for the QMS, including establishing policies and objectives, setting organization-wide goals, and supporting quality initiatives	C
Define the concept of benchmarking and why it may be used	A
Define, describe and use stakeholder identification and analysis	C
Define, describe and use performance measurement tools	C
Define, describe and use project management tools, including PERT charts, Gantt charts, critical path method (CPM), and resource allocation	C
Identify and describe the basic elements of a QIS, including who will contribute data, the kind of data to be managed, who will have access to the data, the level of flexibility for future information needs, and data analysis	B
Determine appropriate behavior in situations requiring ethical decisions	D
Analyze various principles and techniques for developing and organizing teams and leading quality initiatives	D
Describe the facilitator's roles and responsibilities on a team	B
Apply various tools used with teams, including brainstorming, nominal group technique, conflict resolution, and force-field analysis	C
Identify specific communication methods that are used for delivering information and messages in a variety of situations across all levels of the organization	D
Define, apply, and analyze the results of customer relation tools such as quality function deployment (QFD) and customer satisfaction surveys	D
Apply various supplier management techniques, including supplier qualification, certification, and evaluation	C
Analyze supplier ratings and performance improvement results	D
Understand business continuity, resiliency, and contingency planning	B
Identify barriers to quality improvement, analyze their causes and impact, and implement methods for improvement	D

The Quality System	
Interpret the basic elements of a quality system, including planning, control, and improvement, from product and process design through quality cost systems and audit programs	D
Analyze the design and alignment of interrelated processes to the strategic plan and core processes	D
Identify and describe quality system documentation components, including quality policies and procedures to support the system	B
Evaluate configuration management, maintenance, and document control to manage work instructions and quality records	D
Apply national and international standards and other requirements and guidelines, including the Malcolm Baldrige National Quality Award (MBNQA), and describe key points of the ISO 9000 series of standards	C
Describe and distinguish between various types of quality audits such as product, process, management (system), registration (certification), compliance (regulatory), first, second, and third party	C
Identify and define roles and responsibilities for audit participants such as audit team (leader and members), client, and auditee	B
Describe and apply the stages of a quality audit, from audit planning through conducting the audit	C
Apply the steps of audit reporting and follow up, including the need to verify corrective action	C
Identify and apply COQ concepts, including cost categorization, data collection, reporting, and interpreting results	D
Identify and apply key elements of a training program, including conducting a needs analysis, developing curricula and materials, and determining the program's effectiveness	C
Product, Process, and Service Design	
Define, interpret, and classify quality characteristics for new and existing products, processes, and services	D
Translate design inputs such as customer needs, regulatory requirements, and risk assessment into robust design using techniques such as failure mode and effects analysis (FMEA), quality function deployment (QFD), Design for X (DFX), and Design for Six Sigma (DFSS)	D
Identify and apply common elements of the design review process, including roles and responsibilities of participants	C
Interpret specification requirements in relation to product and process characteristics and technical drawings, including characteristics such as views, title blocks, dimensioning and tolerancing, and GD&T symbols	D
Interpret the results of evaluations and tests used to verify and validate the design of products, processes and services, such as installation qualification (IQ), operational qualification (OQ), and process qualification (PQ)	D
Describe and apply the tools and techniques used to maintain and improve process and product reliability	C
Review and analyze indices such as MTTF, MTBF, MTTR, availability, and failure rate	D
Identify, define, and distinguish between the basic elements of reliability models such as exponential, Weibull, and bathtub curve	C
Define, construct, and interpret the results of failure mode and effects analysis (FMEA), failure mode, effects, and criticality analysis (FMECA), and fault tree analysis (FTA)	D
Product and Process Control	
Implement product and process control methods such as control plan development, critical control point identification, and work instruction development and validation	D
Define and distinguish between these concepts, and describe methods for applying them in various situations	D
Describe material segregation and its importance, and evaluate appropriate methods for applying it in various situations	D
Classify product and process defects and non-conformities	D
Describe the purpose and function of an MRB and evaluate nonconforming product or material to make a disposition decision in various situations	D
Interpret the concepts of producer and consumer risk and related terms, including operating characteristic (OC) curves, acceptable quality limit (AQL), lot tolerance percent defective (LTPD), average outgoing quality (AOQ), and average outgoing quality limit (AOQL)	D

Dodge-Romig sampling tables and when they should be used	D
Identify and apply techniques for establishing and maintaining sample integrity	C
Select and describe appropriate uses of inspection tools such as gage blocks, calipers, micrometers, and optical comparators	D
Identify when destructive and nondestructive measurement test methods should be used and apply the methods appropriately	C
Apply metrology techniques such as calibration, traceability to calibration standards, measurement error and its sources, and control and maintenance of measurement standards and devices	D
Calculate, analyze, and interpret repeatability and reproducibility (Gage R&R) studies, measurement correlation, capability, bias, linearity, precision, stability and accuracy, as well as related MSA quantitative and graphical methods	D
Continuous Improvement	
Select, construct, apply, and interpret the following quality control tools: Flowcharts, Pareto charts, Cause and effect diagrams, Control charts, Check sheets, Scatter diagrams, Histograms	D
Identify, describe, and apply elements of the corrective action process, including problem identification, failure analysis, root cause analysis, problem correction, recurrence control, and verification of effectiveness	D
Identify, describe and apply various preventive action tools such as error- proofing/poka-yoke, robust design and analyze their effectiveness	D
Define, classify, and compare discrete (attributes) and continuous (variables) data	C
Define and describe nominal, ordinal, interval, and ratio scales	B
Describe various methods for collecting data, including tally or check sheets, data coding, automatic gaging, and identify the strengths and weaknesses of the methods	C
Apply techniques that ensure data accuracy and integrity, and identify factors that can influence data accuracy such as source/resource issues, flexibility, versatility, inconsistency, inappropriate interpretation of data values, and redundancy	C
Describe, calculate, and interpret measures of central tendency and dispersion (central limit theorem), and construct and interpret frequency distributions, including simple, categorical, grouped, ungrouped, and cumulative	D
Construct, apply, and interpret diagrams and charts such as stem-and-leaf plots, and box-and-whisker plots	D
Construct, apply, and interpret diagrams such as normal and non-normal probability plots	D
Define and apply quantitative terms, including population, parameter, sample, statistic, random sampling, and expected value	D
Distinguish between numeric and analytical studies	D
Describe concepts such as independence, mutually exclusive, multiplication rules, complementary probability, and joint occurrence of events	B
Define and distinguish between these distributions such as normal, uniform, bivariate normal, exponential, lognormal, Weibull, chi square, Student's t and F	D
Define and distinguish between these distributions such as binomial, Poisson, hypergeometric, and multinomial	D
Define, describe, and assess the efficiency and bias of estimators	D
Define, interpret, and apply hypothesis tests for means, variances, and proportions	D
Define and use paired-comparison (parametric) hypothesis tests, and interpret the results	C
Define chi square and other goodness-of-fit tests, and understand the results	B
Define and use ANOVAs and interpret the results	D
Define and use contingency tables to evaluate statistical significance	C
Calculate the regression equation for simple regressions and least squares estimates	D
Calculate the correlation coefficient and its confidence interval, and construct and interpret a hypothesis test for correlation statistics	D

Define, describe, and use time-series analysis, including moving average to identify trends and seasonal or cyclical variation	C
Identify and explain the objectives and benefits of SPC	B
Describe, identify, and distinguish between these types of causes	D
Identify and select characteristics for monitoring by control chart	D
Define and apply the principles of rational subgrouping	C
Identify, select, construct, and use various control charts, including X −R, X −s, individuals and moving range (ImR or XmR), moving average and moving range (MamR), p, np, c, and u	D
Read and interpret control charts and use rules for determining statistical control	D
Define and describe these charts and how they differ from other control charts	B
Identify and define short-run SPC rules	B
Define, describe, calculate, and use process capability studies, including identifying characteristics, specifications and tolerances, developing sampling plans for such studies, and establishing statistical control	D
Distinguish between natural process limits and specification limits, and calculate percent defective, defects per million opportunities (DPMO), and parts per million (PPM)	D
Define, select, and calculate Cp, Cpk, Cpm, and Cr, and evaluate process capability	D
Define, select, and calculate Pp and Ppk, and evaluate process performance	D
Define terms such as dependent and independent variables, factors, levels, response, treatment, error, and replication	B
Identify the basic elements of designed experiments, including determining the experiment objective, selecting factors, responses, and measurement methods, and choosing the appropriate design	D
Define and apply the principles of power and sample size, balance, replication, order, efficiency, randomization, blocking, interaction, and confounding	C
Construct one-factor experiments such as completely randomized, randomized block, and Latin square designs, and use computational and graphical methods to analyze the significance of results	D
Construct full-factorial designs and use computational and graphical methods to analyze the significance of results	D
Construct two-level fractional factorial designs and apply computational and graphical methods to analyze the significance of results	D
Understand identification, planning, prioritization, and oversight of risk	B
Identify and apply evaluation metrics	C
Apply and interpret risk mitigation plan	D
Apply categorization methods and evaluation tools to assess risk	D
Identify and document risks, gaps and controls	D
Apply auditing techniques and testing of controls	D
Quality Improvement Associate	
Quality Concepts	
Define quality and use this term correctly in various circumstances	C
Define a quality plan, describe its purpose for the organization as a whole, and identify the various functional areas and people that have responsibility for contributing to its development	B
Define and distinguish between employee involvement and employee empowerment, and describe the benefits of both concepts	B
Define and distinguish between a system and a process and describe the interrelationships between them	D
Define and distinguish between common and special cause variation in relation to quality measures	B
Describe how using quality techniques to improve processes, products and services can benefit all parts of an organization	B

Describe and distinguish between the following theories and philosophies	B
Team Basics	
Describe why teams are an effective way to identify and solve problems, and describe when, where, why, and how teams can be used more effectively than other groups of workers	C
Define and distinguish between various types of teams: process or continuous improvement teams, workgroups or workcells, self-managed teams, temporary or ad hoc project teams, and cross-functional teams	C
Identify how a team's efforts can support an organization's key strategies and effect positive change throughout the organization	B
Describe the roles and responsibilities of various team stakeholders	B
Apply the elements of launching and sustaining a successful team, including establishing a clear purpose and goals, developing ground rules and schedules, gaining support from management and commitment from the team members	C
Describe how to select team members based on their knowledge and skill sets and team logistics, such as a sufficient number of members in relation to the size or scope of the project, appropriate representation from affected departments or areas, and diversity	C
Describe the classic stages of team evolution: forming, storming, norming, and performing	B
Describe the value of team conflict and recognize how to resolve it	D
Describe and use different decision-making models such as voting (majority rule, multi- voting) and consensus, and use follow up techniques to clarify the issue to be decided, to confirm agreement on the decision, and to come to closure on the decision made	C
Continuous Improvement Techniques	
Define and use continuous improvement tools and techniques	B
Identify key six sigma concepts and tools, including the different roles and responsibilities of green belts and black belts, typical project types that are appropriate for six sigma techniques, and the DMAIC phases: design, measure, analyze, improve, and control	B
Identify lean tools that are used to reduce waste, including set-up and cycle-time reduction, pull systems (kanban), kaizen, just-in-time (JIT), 5S, and value stream mapping	B
Define benchmarking and describe how it can be used to develop and support best practices	B
Describe and distinguish between these two types of improvements, the steps required for each, and the type of situation in which either type would be expected	B
Quality improvement tools	
Select, interpret, and apply the seven basic quality tools	C
Customer-Supplier Relations	
Distinguish between internal and external customers and suppliers	B
Describe different types of customer feedback mechanisms (formal surveys, informal feedback, official complaints) and describe the importance of using data from these and other sources to drive continuous improvement	B
Identify supplier performance measures, including quality, price, delivery, and level of service	B
Quality Inspector	
Technical Mathematics	
Solve basic shop math problems using addition, subtraction, multiplication, division of fractions and decimals, squares and square roots	C
Solve or simplify first-degree and single-variable equations	C
Calculate general parameters such as area, circumference, perimeter, and volume for basic geometric shapes	C
Compute angles and lengths using trigonometric functions such as sine, cosine, tangent, and the Pythagorean Theorem	C
Convert units within and between English and metric measurement systems (SI) such as inch to micro-inch, liter to quart, meter to millimeter, etc	C

Use various numbering methods such as scientific notation, decimals, and fractions, and convert values between these systems	C
Metrology	
Identify and use variable gauges, including micrometers, calipers, dial indicator, CMM, linear scales, etc	C
Identify and use attribute gauges, including thread plug, progressive ring, flush pin, radius gauge, etc	C
Identify and use transfer gauges, including small-hole gauges, spring calipers, etc	C
Describe and distinguish between dial, digital, and vernier scales	A
Identify and describe the following basic tools and components	A
Select gauges according to the feature or characteristic to be measured, the applicable tolerance and the accuracy, and the resolution and capability of the test instrument	C
Identify and apply various methods of cleaning, handling, and storing gauges	C
Identify and apply methods for establishing the correlation between measurement instruments such as gauge-to-gauge or manual-to-automated process	C
Select and use height gauges, V-blocks, indicators, etc	C
Identify and use protractors, sine bars, angle blocks, etc	C
Describe and apply weights, balances and scales	C
Describe and apply profilometers, fingernail comparators, etc	C
Describe and apply mechanical comparators, roundness testers, precision spindles, profile tracers, etc	C
Describe and apply optical comparators, optical flats, microscopes, etc	C
Define and describe the use of digital cameras, in-line optical sensors, and other digital systems for product inspection	A
Describe the advantages and disadvantages of the CMM and the basic operation of the x, y, and z axes	B
Describe the principles and purpose of a calibration system, including the importance of establishing calibration intervals	C
Describe the hierarchy of standards, from working standards through international standards	A
Describe the requirements for documenting traceability to standards	A
Describe the effects that environmental conditions, such as temperature, humidity, vibration and cleanliness of the gauge, etc	C
Describe the effects that out-of-calibration instruments can have on product acceptance and the actions to take in response to this situation	C
Define and describe the following elements of MSA	A
Inspection and Test	
Define and interpret various sections of technical drawings: title block, tolerances, change or revision blocks, including notes, scale, and size details, etc	C
Define and interpret drawing views and details for product specifications or other controlling documents	D
Calculate position and bonus tolerances from various drawings	D
Determine part alignment and setup using the datum structure	D
Define and interpret the following terms related to sampling	C
Define and distinguish between inspection types such as incoming material, first- article (first-piece), in-process, final, etc	C
Identify potential inspection errors such as bias, fatigue, flinching, distraction, etc	C
Identify methods to trace products and materials such as age control, shelf life, and first-in first-out (FIFO)	C
Describe various methods of identifying nonconforming material such as tagging, labeling, and segregating	C
Define and describe levels of severity (critical, major, minor, etc	C
Describe disposition methods including rework, reprocess, scrap, customer waiver, etc	C

Define and use the following methods in various situations	C
Identify and describe basic tools	A
Quality Assurance	
Calculate mean, median, and mode	C
Calculate range, standard deviation, and variance	C
Calculate percentage and ratio measures for various data sets	C
Define, interpret, and use scatter diagrams, tally sheets, bar charts, etc	C
Describe various characteristics of a normal distribution: symmetry, bell curve, central tendency, etc	B
Explain the difference between these causes of variation	D
Define, describe, and distinguish between these limits as used in SPC	C
Identify characteristics and uses of p, np, c, and u charts	C
Define and distinguish between Cp, Cpk, Pp, and Ppk studies and identify their application to various types of data	B
Define basic quality improvement concepts such as defect detection and prevention, the cost of poor quality, total quality management (TQM), the importance of customer satisfaction, etc	B
Define and distinguish between products and processes	B
Define and describe various types of audits, including internal, external, system, product, process, etc	B
Define and describe various stages of the audit process (planning, performance, and closure), including audit scope and purpose, resources needed, audit schedule, opening meeting, interviewing, data gathering, document and record review, analysis of results, closing meeting, audit documentation and recordkeeping, verification of corrective actions, etc	B
Define and describe the purpose of checklists, log sheets, sampling plans, record and document reviews and forward-and backward-tracing	B
Define and describe the use of graphs, charts, diagrams, and other aids for written and oral presentations including interview techniques and listening skills	B
Describe how CARs from audits can support quality improvement	B
Define and use the following quality tools and techniques	C
Describe and use the following tools and techniques in various situations	C
Define and use various resources related to personal and environmental safety: material safety data sheet (MSDS), personal protective equipment (PPE), etc	C
Identify and use national and international standards	C
Review, analyze, and interpret technical reports that are used to diagnose problems and communicate solutions	D
Describe how employees can be empowered and the value they add to project teams or quality improvement teams	A
Quality Process Analyst	
Quality Concepts and Tools	
Define a quality plan, describe its purpose for the organization as a whole, and know who has responsibility for contributing to its development	B
Define and distinguish between national or international standards, customer requirements, and product or process specifications	B
Define and describe the four basic cost of quality categories: prevention, appraisal, internal failure, external failure	B
Identify and describe common elements of various document control systems, including configuration management, and describe the relationship between quality manuals, procedures, and work instructions	B
Define and distinguish between basic audit types, including internal and external audits, product, process, and systems audits, and first-, second-, and third-party audits	B

Identify various elements of the audit process, including audit purpose and scope, the standard to audit against, audit planning (preparation) and performance, opening and closing meetings, final audit report, and verification of corrective actions	B
Identify and describe the roles and responsibilities of key audit participants: lead auditor, audit team member, client, and auditee	B
Select, construct, apply and interpret the seven basic quality tools: cause and effect diagrams, flowcharts, check sheets, pareto charts, scatter diagrams, control charts, and histograms	D
Distinguish between various types of teams: process improvement teams, workgroups/workcells, self-managed teams, temporary/ad hoc project teams, and cross- functional teams	D
Identify various elements in team-building such as inviting team members to share information about themselves during the initial meeting, using ice-breaker activities to enhance team membership, and developing a common vision and agreement on team objectives	C
Describe the roles and responsibilities of various team stakeholders: sponsor, champion, facilitator, team leader, team member	B
Identify common group challenges, including members with hidden agendas, intentional distractions, and other disruptive behaviors	B
Describe various elements of training, including linking the training to organizational goals, identifying training needs, adapting information to meet adult learning styles, and using coaching and peer training methods	B
Identify and apply behaviors that are aligned with the ASQ Code of Ethics	C
Problem Solving and Improvement	
Define and explain elements of Plan-Do-Check-Act (PDCA), kaizen, and incremental and breakthrough improvement	C
Identify key six sigma concepts and tools, including green belt and black belt roles and responsibilities, project types and processes used, and six sigma DMAIC phases, design, measure, analyze, improve, and sustaining control	B
Identify and apply lean tools and processes, including set-up reduction (SUR), pull (including just-in-time (JIT) and kanban), 5S, continuous flow manufacturing (CFM), value stream, poka-yoke, and total preventive/predictive maintenance (TPM) to reduce waste in areas of cost, inventory, labor, and distance	C
Define and describe this technique and how it can be used to support best practices	B
Select and apply affinity diagrams, tree diagrams, process decision program charts, matrix diagrams, interrelationship digraphs, prioritization matrices, and activity network diagrams	C
Select and interpret scheduling and monitoring tools such as Gantt charts, program evaluation and review technique (PERT), and critical path method (CPM)	D
Identify and describe Taguchi concepts: signal-to-noise ratio, controllable and uncontrollable factors, and robustness	B
Data Analysis	
Define, calculate, and interpret measures of central tendency (mean, median, mode) and measures of dispersion (standard deviation, range, variance)	C
Define and explain frequency distributions (normal, binomial, Poisson, and Weibull) and the characteristics of skewed and bimodal distributions	B
Describe and use probability concepts: independent and mutually exclusive events, combinations, permutations, additive and multiplicative rules, conditional probability	C
Define basic reliability concepts: mean time to failure (MTTF), mean time between failures (MTBF), mean time between maintenance actions (MTBMA), mean time to repair (MTTR)	A
Define and use nominal, ordinal, interval, and ratio measurement scales	C
Identify, define, and classify in terms of continuous (variables) and discrete (attributes) data	C
Identify and define sampling characteristics such as lot size, sample size, acceptance number, and operating characteristic (OC) curve	B

Define and distinguish between various sampling methods such as random, sequential, stratified, fixed sampling, and attributes and variables sampling	B
Define and describe the principles of rational subgroups	B
Define and distinguish between accuracy, precision, repeatability and reproducibility (gauge R&R) studies, bias, and linearity	B
Identify and distinguish between control limits and specification limits	B
Identify, interpret, and select control charts (p, np, c, and u) for data that must be plotted in discrete units (dollars, hours, go/no-go and yes-no choices) and that measure only the presence or absence of a characteristic	D
be plotted on a continuous and infinite scale (distance, pressure, temperature)	C
Describe the conditions that must be met in order to measure capability	D
Interpret various control chart patterns (runs, hugging, trends) to determine process control, and use SPC rules to distinguish between common cause and special cause variation	D
Identify the advantages and limitations of presenting data graphically instead of numerically	B
Describe how these models are used for estimation and prediction	C
Calculate confidence intervals using t tests and the z statistic, and determine whether the result is significant	D
Define basic DOE terms: blocking, randomization, treatment, error, response, and factors	A
Define key elements of ANOVAs and how the results can be used	B
Customer-Supplier Relations	
Define and distinguish between internal and external customers and suppliers	C
Describe the different types of tools used to gather customer feedback: surveys, complaint forms, warranty analysis	B
Describe how validation and qualification methods, including beta testing, first-article, in- process, and final inspection, are used to approve new or updated products, processes, and services	B
Define and describe key supplier performance measures, including quality, price, delivery, and level of service, and commonly used metrics: defect rates, functional performance, timeliness, responsiveness, and technical support	B
Describe the importance of identifying material by lot, batch, source, and conformance status	C
Corrective and Preventive Action (CAPA) ( )	
Identify and use key elements of the corrective action process: identify the problem, contain the problem, determine the causes of the problem, propose solutions to eliminate them or prevent their recurrence, verify that the solutions are implemented, and confirm their effectiveness	C
Identify and use key elements of a preventive action process: track data trends and patterns, use failure mode and effects analysis (FMEA), review product and process monitoring reports, and study the process to identify potential failures, defects, or deficiencies; improve the process by developing error- or mistake-proofing methods and procedural changes, and verify that the changes are made and confirm their effectiveness	C
Quality Technician	
Quality Concepts and Tools	
Define internal and external customers, identify their expectations, and determine their satisfaction levels	B
Identify basic quality principles related to products (such as features, fitness-for-use, freedom from defects, etc	B
Define and distinguish between national or international standards, customer requirements, and product or process specifications	B
Describe and distinguish between the four classic cost of quality categories (prevention, appraisal, internal failure, external failure) and classify activities appropriately	C

Identify key six sigma concepts and tools, including green belt and black belt roles and responsibilities, project types and processes used, and define terms such as quality function deployment (QFD), design, measure, analyze, improve, control (DMAIC), etc	A
Identify key lean concepts and tools such as, 5S, value-stream mapping, flow, pull, etc	A
Define and use various continuous improvement techniques including the Plan Do Check Act (PDCA) cycle, brainstorming, benchmarking, etc	B
Select, construct, apply and interpret the seven basic quality tools: cause and effect diagrams, flowcharts, check sheets, pareto charts, scatter diagrams, control charts, and histograms	D
Define, describe, and apply various meeting management techniques, including selecting team members, creating and following an agenda, facilitation techniques, recording and distributing minutes, establishing ground rules and protocols, etc	C
Apply basic team building methods and concepts such as, group dynamics, decision-making tools	C
Define and describe the impact that globalization has on team-related issues, including developing virtual teams and participating on them, using electronic communications to support long-distance collaboration, etc	B
Statistical Techniques	
Identify and differentiate between statistical terms such as population, sample, parameter, statistic, statistical process control (SPC), etc	B
Define and compute normal, Poisson, and binomial frequency distributions	C
Define, compute, and interpret mean, median, and mode	D
Define, compute, and interpret standard deviation, range, and variance	D
Determine, calculate, and apply confidence levels in various situations	C
Determine, calculate, and apply confidence limits in various situations	C
Calculate probability using the basic concepts of combinations, permutations, and area under the normal curve	C
Identify and describe the different uses of control limits and specification limits	B
Identify, select, construct, and interpret variables charts such as X – R , X – s , etc	D
Identify, select, construct, and interpret attributes charts such as p, np, c, u, etc	D
Define the prerequisites for capability, and calculate and interpret Cp, Cpk, and capability ratio (CR) in various situations	D
Interpret various control chart patterns (runs, hugging, trends, etc	D
Identify the advantages and limitations of using this method to analyze data visually instead of numerically	B
Metrology and Calibration	
Describe, select, and use the following types of M&TE, and evaluate their measurement results to determine conformance to specifications	D
Describe various methodologies for identifying and controlling M&TE to meet traceability requirements, and apply appropriate techniques for maintaining such equipment to obtain optimum performance	C
Describe and apply requirements for validation and control of customer-supplied equipment	C
Establish calibration schedules on the basis of M&TE usage history and gauge repeatability and reproducibility (R&R) data	D
Identify the causes of calibration error and its effect on processes and products	B
Inspection and Test	
Interpret drawings and apply requirements in various test and inspection activities	D
Define and use GD&T terms covered in the ASME Y14	D
Define, distinguish between, and classify defect characteristics in terms of critical, major, minor, etc	C
Define and distinguish between direct, differential, and transfer measurements	B
Determine which measurement instrument to use in various situations, based on considerations such as the characteristic to be measured, test uncertainty ratio (TUR), test accuracy ratio (TAR), etc	D

Define and distinguish between measurement terms such as correlation, bias, linearity, precision-to- tolerance, percent agreement, etc	D
Use truncation and rounding rules on both positive and negative numbers	C
Convert between metric and English units	C
Define and distinguish between inspection point functions (receiving, in-process, final, source, first- article, etc	C
Define various types of inspection error, including parallax, fatigue, flinching, distraction, etc	B
Describe the requirements for documenting and preserving the identity of a product and its origins	B
Define and distinguish between these two types of certificates	B
Identify various NDT techniques (X-ray, eddy current, ultrasonic, liquid penetrant, electromagnetic, magnetic particle, etc	B
Identify various destructive tests (tensile, fatigue, flammability, etc	B
Identify characteristics of testing techniques such as those used for electrical measurement (DC, AC, resistance, capacitance, etc	A
Identify and define sampling characteristics such as operating characteristic (OC) curve, lot size, sample size, acceptance number, switching rules, etc	C
Define and distinguish between fixed sampling, 100% inspection, attributes and variables sampling, etc	C
Determine sample size	C
Determine whether products or material meet conformance requirements, and use various methods to label and segregate nonconforming materials	C
Describe various elements of this process, including the function of the material review board (MRB), the steps in determining fitness-for-use and product disposition, etc	B
Quality Audits	
Define basic audit types: internal, external, systems, product, and distinguish between first-, second-, and third-party audits	B
Describe and apply various elements of the audit process: audit purpose and scope, audit reference standard, audit plan (preparation), audit performance, opening and closing meetings, final report and verification of corrective action	C
Define and apply various auditing tools: checklists and working papers, data gathering and objective evidence, forward- and backward-tracing, audit sampling plans and procedural guidelines	C
Identify and use appropriate interviewing techniques and listening skills in various audit situations, and develop and use graphs, charts, diagrams, and other aids in support of written and oral presentations	C
Corrective and Preventive Action (CAPA)	
Identify and apply elements of the corrective action process: identify the problem, contain the problem (interim action), assign responsibility (personnel) to determine the causes of the problem and propose solutions to eliminate it or prevent its recurrence (permanent action), verify that the solutions are implemented, and confirm their effectiveness (validation)	C
Identify and apply elements of a preventive action process: use various data analysis techniques	C
Supplier Quality Professional	
Supplier Strategy	
Assist in the development and communication of the supply chain vision/mission statement	C
Develop the process for supplier selection and qualification including the identification of sub- tier suppliers, using tools such as SIPOC, and decision analysis	E
Develop the supplier performance monitoring system including; expected levels of performance, process reviews, performance evaluations, improvement plans, and exit strategies	E
Define a supplier classification system	E
Identify and analyze strategies for developing customer-supplier partnerships and alliances	D

Identify and apply relevant inputs to prioritize cost reduction opportunities	D
Interpret and analyze the optimization of a supply base to improve spending and leverage investments into supplier quality, or risk reduction	D
Provide input on make/buy decisions by using internal and external capability analysis	D
Review and provide input for developing terms and conditions that govern supplier relationships to ensure quality considerations are addressed	C
Communicate strategy internally, and communicate expectations to suppliers externally	C
Risk Management	
Develop a risk-based approach to manage the supply base, including business continuity and contingency planning	E
Develop and implement a risk mitigation plan to minimize, monitor, and/or control risks	D
Identify and evaluate strategies and techniques such as supply chain mapping, avoidance, detection and mitigation used to prevent the introduction of counterfeit parts materials and services	D
Identify, assess and prioritize risks to supplier quality using tools such as, decision analysis (DA), failure mode effects analysis (FMEA), fault tree analysis (FTA), and process auditing	D
Develop and deploy controls such as inspection or test plan	E
Verify the effectiveness of the control plan and improve if necessary, using continuous improvement methods such as plan-do-check-act (PDCA), lean and product auditing tools	E
Supplier Selection and Part Qualification	
Identify and apply common elements of the design review process, including roles and responsibilities of the participants	C
Identify and apply internal requirements	D
Evaluate existing supplier's capabilities, capacities, past quality, delivery, price, lead times, and responsiveness against identified requirements	D
Assess potential new suppliers against identified requirements using tools such as, self- assessments, audits and financial analysis	D
Evaluate and select supplier based on analysis of assessment reports and existing supplier evaluations, using decision analysis tools and selection matrices	D
Interpret and evaluate technical specification requirements and characteristics such as, views, title blocks, dimensioning and tolerancing and GD&T symbols as they relate to product and process	D
Collaborate with suppliers to define, interpret, and classify quality characteristics for the part/process/service	D
Develop a part/process/service qualification plan with supplier and internal team, that includes calibration requirements, sample size, first article inspection, measurement system analysis (MSA), process flow diagram (PFD), failure mode and effects analysis (FMEA), control plans, critical to quality (CTQ), inspection planning, capability studies, material and performance testing, appearance approval and internal process validation	D
Understand the production part approval process (PPAP) requirements and ensure suppliers understand the processes required to produce parts with consistent quality during an actual production run at production rates	B
Collaborate with internal team to interpret the results of the executed qualification plan for the part/process/service	D
Supplier Performance Monitoring and Improvement	
Define, implement, and monitor supplier performance metrics such as, quality, delivery, cost and responsiveness	D
Analyze supplier performance data	D
Apply lean principles and applications such as 5S, Kaizen, value stream mapping, single minute exchange of dies (SMED), kanban, muda, standardized work, takt time and error proofing to reduce waste and increase performance	D
Assess and evaluate nonconforming materials to determine whether a material review board (MRB) requires disposition	D

Evaluate the root cause analysis of a problem using tools such as, cause and effect diagrams (CE), Pareto analysis, 5 Why's, fault tree analysis, design of experiments (DOE), brainstorming, check sheets, measurement system analysis (MSA), production records and review of process flow	D
Evaluate and implement corrective/ preventive action, and review its effectiveness and robustness with supplier	D
Supplier Quality Management	
Describe and distinguish between the stages of a quality audit, from audit planning through conducting the audit	C
Apply process audit reporting and follow up, including verification of the effectiveness of corrective action	C
Maintain active communication with suppliers to assess risk and take appropriate action	D
Identify and analyze present and future training needs and gaps, using quality methods and tools, such as Kaizen, and benchmarking	D
Understand and apply various types of project reviews, such as phase-end, management, and retrospectives or post-project reviews to assess project performance and status, to review issues and risks, and discover and capture lessons learned from the project	C
Identify and describe the various types of teams and the classic stages of team development: forming, storming, norming, performing, and adjourning	C
Define and describe various team roles and responsibilities for leader, facilitator, coach, and individual member	B
Describe various techniques to evaluate training, including evaluation planning, feedback surveys, pre-training and post-training testing	B
Understand and evaluate compliance with regulations	D
Relationship Management	
Understand and apply processes for orientation of suppliers such as, providing overview of company, vision, mission, guiding principles, overall requirements, expectations, and criticality of product, service, and delivery requirements	C
Identify and apply communication techniques (oral, written, and presentation) specifically for internal stakeholders and suppliers to resolve issues	D
Use appropriate technical and managerial reporting techniques, including the seven classic quality tools (Pareto charts, cause and effect diagrams, flowcharts, control charts, check sheets, scatter diagrams, and histograms) for effective presentation and reporting	D
Understand and apply techniques for coaching suppliers through regular communications, influencing without authority, negotiation techniques and establish clear roles and responsibilities of internal stakeholders and suppliers	D
Business Governance, Ethics and Compliance	
Determine appropriate behavior in situations requiring ethical decisions, including identifying conflicts of interest, recognizing and resolving ethical issues	C
Understand issues of compliance and their applicable policies, laws and regulations	C
Apply organizational policies for executing appropriate agreements such as, non-disclosure, quality, and change notification agreements	C
Apply procedures for protecting the intellectual property of an organization and its suppliers	C
Understand and interpret policies for reporting observations and deviations that could be perceived as illegal activity	C
Master Black Belt	
Enterprise-wide Planning and Deployment	
Describe strategic planning tools and methods (hoshin kanri, SWOT, PEST, etc	C
Describe how to develop strategic deployment goals	C
Describe how to align projects to the organizational strategic plan	C
Describe how projects are aligned with business objectives	C
Describe the following key deployment elements	C
Demonstrate an advanced understanding of the following methodologies, including their associated tools and techniques	C

Facilitate working sessions to identify new project opportunities that can be prioritized	C
Determine the elements of a well-defined project (i	C
Describe how to engage stakeholders	C
Describe techniques for intervening across levels to prevent potential project failures	C
Use these tools to develop concept alternatives	C
Use risk management and analysis tools to analyze organizational elements, to appraise portfolios and critical projects, and to identify potential problem areas	D
Create, manage, and prioritize a pipeline of potential projects for consideration	E
Create a selection process that provides a portfolio of active six sigma opportunities that are clearly aligned and prioritized to meet/exceed strategic goals	E
Apply systems thinking to anticipate the effect that components of a system can have on other subsystems and adjacent systems	D
Describe the implications these factors can have on six sigma implementation, including potential barriers	B
Describe techniques for changing an organizational culture, such as rewards and recognition, team competitiveness, communications of program successes, and appropriate cascading of goals throughout the organization	C
Describe how to gain commitment from the organization's leadership for the six sigma effort	B
Develop the inherent organizational structure needed for successful deployment	C
Describe elements of effective communications with management regarding organizational benefits, failures, and lessons learned	C
Describe the MBB role in change management and apply various techniques to overcome barriers to successful organizational deployment	C
Define and use financial measures, including revenue growth, market share, margin, cost of quality (COQ), net present value (NPV), return on investment (ROI), cost-benefit analysis, activity-based cost analysis, and breakeven time performance, etc	D
Describe various business performance measures, including balanced scorecard, key performance indicators (KPIs), and the financial impact of customer loyalty; and describe how they are used for project selection, deployment, and management	D
Develop a project cash flow stream	D
Understand the requirements for financial controls dictated by SOX	B
Cross-functional Competencies	
Assess the appropriate collection of Voice of the Customer and Voice of the Process data, both internal and external, and develop a customer-focused strategy for capturing and assessing customer feedback on a regular basis	D
Use knowledge of human and organizational dynamics to enhance project success and align cultural objectives with organizational objectives	C
Use appropriate intervention, communications, and influence styles, and adapt those styles to specific situations (i	C
Address and resolve potential situations that could cause the program or a project to under- perform	C
Describe the roles and responsibilities of executive leaders in the deployment of six sigma in terms of providing resources, managing change, communicating ideas, etc	D
Create action plans to support optimal functioning of master black belts, black belts, green belts, champions, and other participants in the deployment effort	E
Project Management	
Appraise interrelated projects for scope overlap and refinement and identify opportunities for leveraging concomitant projects	D
Formulate the positioning of multiple projects in terms of providing strategic advice to top management and affected mid-level managers	E
Prioritize projects in terms of their criticality to the organization	C
Oversee critical projects and evaluate them in terms of their scope, goals, time, cost, quality, human resources requirements, communications needs, and risks	D

Support and review the development of an overall measurement methodology to record the progress and ongoing status of projects and their overall impact on the organization	D
Apply appropriate monitoring and control methodologies to ensure that consistent methods are used in tracking tasks and milestones	C
Develop and maintain communication techniques that will keep critical stakeholders and communities apprised of project status, results, and accountability	E
Generate accurate project supply/demand projections, associated resource requirements analysis, and mitigate any issues	E
Facilitate corrective actions and responses to customers about the corrective action and its impact	C
Develop governance documents, tracking tools, and other methodologies that will support project success	E
Design a system for measuring project and portfolio performance	E
Assess and explain budget implications, forecasting, measurement, monitoring, risk analysis, and prioritization for portfolio level projects	D
Define the concepts of hard and soft dollars and use cost of poor quality tools, activity-based costing, and other methods to assess and prioritize portfolios	C
Training Design and Delivery	
Assess the current level of knowledge and skills in each target group in relation to the skills and abilities that are needed	D
multi-level competency training is appropriate	E
Evaluate and select training materials and resources that adhere to adult learning theories	D
Ensure that the training harmonizes and leverages other tools and approaches being used and that it is aligned with the organization's strategic objectives and culture	D
Monitor and measure training to ensure that it is delivered effectively and efficiently by qualified individuals	C
Develop an evaluation plan to assess and verify the acquisition of required knowledge and skills	E
Mentoring Responsibilities	
Collaborate with executives and champions on reviewing projects, including timing, questions to ask, and setting expectations for project timing and completion	E
Collaborate with executives and champions on sizing projects and selecting individuals and assignments for various projects	D
Coach executives and champions on the need for constancy of purpose and message, and the importance of using clear communication techniques and consistent messages	D
Use constructive techniques to provide feedback to champions and executives	D
Develop a career progression ladder for black belts and green belts	D
Create guidelines and expectations for project reviews, and perform them in a timely manner	E
Practice and teach meeting control, analyze team performance at various stages of team development, and support appropriate interventions for overcoming team challenges, including floundering, reviewing and diagnosing failing projects, etc	E
Develop information that will help non-belt project participants to advance their understanding of six sigma and develop the necessary skills and knowledge to become green belts or black belts	E
Advanced Measurement Methods and Tools	
Use this technique to evaluate measurement systems and calculated values	D
Use various tools and methods	D
Use various tools and methods	D
Calculate capability using Weibull and other methods for non-normal data	C
Identify autocorrelated data, including time-series modeling	B
Apply and interpret multiple regression analysis, including using variance inflation factors (VIFs) to identify collinearity issues	C

Apply and interpret logistic regression analysis, including binary, ordinal, and nominal data considerations	C
Apply and interpret fits of models that are non-linear	C
Apply and interpret GLMs using assumptions and assumptions testing	C
Select, calculate, and interpret components of variation and nested design studies	D
Apply simulation tools such as Monte Carlo, dynamic process simulation, queuing theory, etc	C
Understand how linear programming principles, such as critical path analysis, can be used in modeling diverse types of problems	B
Use reliability modeling and tools to enhance reliability of a product or process and reliability growth modeling	C
Use appropriate qualitative analysis tools (affinity diagrams, force field analysis, etc	D
Apply and interpret factor relationship diagrams	C
Recognize other designs for handling more complex blocking structures, including balanced incomplete block design (BIBD)	B
Recognize when to apply approaches such as response surface methodology (RSM), mixture experiments, evolutionary operations (EVOP), split-plot designs, Taguchi, D-optimal designs, etc	B
Recognize when to use APC instead of or in conjunction with SPC	B
Six Sigma Black Belt	
Organization-wide Planning and Deployment	
Define and describe the value, foundations, philosophy, history, and goals of these approaches, and describe the integration and complementary relationship between them	B
Describe when to use six sigma instead of other problem-solving approaches, and describe the importance of aligning six sigma objectives with organizational goals	C
Describe the interactive relationships among business systems, processes, and internal and external stakeholders , and the impact those relationships have on business systems	B
Define the importance of strategic planning for six sigma projects and lean initiatives	C
Describe the roles and responsibilities of executive leadership, champions, sponsors, process owners, master black belts, black belts, and green belts in driving six sigma and lean initiatives	B
Describe how an organization's structure and culture can impact six sigma projects	C
Organizational Process Management and Measures	
Describe the impact six sigma projects can have on customers, suppliers, and other stakeholders	B
Define and distinguish between various types of benchmarking, e	C
Define and describe balanced scorecard, key performance indicators (KPIs), customer loyalty metrics, and leading and lagging indicators	D
Define and use revenue growth, market share, margin, net present value (NPV), return on investment (ROI), and cost-benefit analysis (CBA)	C
Team Management	
Define and describe various teams, including virtual, cross-functional, and self-directed	C
Define and describe various team roles and responsibilities for leader, facilitator, coach, and individual member	B
Describe various factors that influence the selection of team members, including the ability to influence, openness to change, required skills sets, subject matter expertise, and availability	C
Identify and describe the elements necessary for successful teams	C
Describe and apply techniques to motivate team members	C
Identify and describe the classic stages of team development: forming, storming, norming, performing, and adjourning	C
Describe and explain the elements of an effective communication plan	C

Describe and select appropriate leadership approaches	C
Identify and use various conflict resolution techniques	D
Select and use various meeting management techniques, including using agendas, starting on time, requiring pre-work by attendees, and ensuring that the right people and resources are available	C
Define, select, and use various tools	C
Identify the steps involved to implement an effective training curriculum: identify skills gaps, develop learning objectives, prepare a training plan, and develop training materials	B
Describe various techniques used to deliver effective training, including adult learning theory, soft skills, and modes of learning	B
Describe various techniques to evaluate training, including evaluation planning, feedback surveys, pre-training and post-training testing	B
Define	
Identify and segment customers and show how a project will impact both internal and external customers	C
Identify and select appropriate data collection methods	D
Define, select, and apply appropriate tools to determine customer needs and requirements, including critical-to-X (CTX when 'X' can be quality, cost, safety, etc	D
Describe business case justification used to support projects	B
Develop a project problem statement and evaluate it in relation to baseline performance and improvement goals	D
Develop and review project boundaries to ensure that the project has value to the customer	D
Identify SMART (specific, measureable, actionable, relevant and time bound) goals and objectives on the basis of the project's problem statement and scope	D
Identify and evaluate performance measurements	D
Explain the importance of having periodic project charter reviews with stakeholders	B
Identify and use the following PM tools to track projects and document their progress	D
Identify and use the following analytical tools throughout the DMAIC cycle	C
Measure	
Identify and use process flow metrics	D
Select, use and evaluate various tools	D
Define, classify, and distinguish between qualitative and quantitative data, and continuous and discrete data	D
Define and use nominal, ordinal, interval, and ratio measurement scales	C
Define and describe sampling concepts, including representative selection, homogeneity, bias, accuracy, and precision	D
Develop and implement data collection plans that include data capture and processing tools	D
Use gauge repeatability and reproducibility (R&R) studies and other MSA tools	D
Identify how measurement systems can be applied to marketing, sales, engineering, research and development (R&D), supply chain management, and customer satisfaction data	B
Define and describe elements of metrology, including calibration systems, traceability to reference standards, and the control and integrity of measurement devices and standards	B
Define and distinguish between population parameters and sample statistics	C
Explain the central limit theorem and its significance in the application of inferential statistics for confidence intervals, hypothesis tests, and control charts	B
Calculate and interpret measures of dispersion and central tendency	D
Construct and interpret diagrams and charts	D

Distinguish between descriptive and inferential statistical studies	D
Describe and apply probability concepts	C
Describe, interpret, and use various distributions	D
Define, select, and calculate Cp and Cpk	D
Define, select, and calculate Pp, Ppk, Cpm, and process sigma	D
Describe and apply elements of designing and conducting process capability studies relative to characteristics, specifications, sampling plans, stability and normality	D
Calculate the process capability and process sigma level for attributes data	C
Identify non-normal data and determine when it is appropriate to use Box-Cox or other transformation techniques	C
Distinguish between natural process limits and specification limits	D
Describe and use appropriate assumptions and conventions when only short-term data or only long-term data are available	D
Analyze	
Calculate and interpret the correlation coefficient and its confidence interval, and describe the difference between correlation and causation	D
Calculate and interpret regression analysis, and apply and interpret hypothesis tests for regression statistics	D
Use and interpret multivariate tools	D
Define and interpret the significance level, power, type I, and type II errors of statistical tests	D
Define, compare, and interpret statistical and practical significance	D
Calculate sample size for common hypothesis tests: equality of means and equality of proportions	C
Define and distinguish between confidence and prediction intervals	D
Use and interpret the results of hypothesis tests for means, variances, and proportions	D
Select, calculate, and interpret the results of ANOVAs	D
Define, select, and interpret the results of these tests	D
Select, develop, and use contingency tables to determine statistical significance	D
Understand the importance of the Kruskal-Wallis and Mann-Whitney tests and when they should be used	B
Describe the purpose and elements of FMEA, including risk priority number (RPN), and evaluate FMEA results for processes, products, and services	D
Analyze scenarios to identify performance gaps, and compare current and future states using predefined metrics	D
Define and describe the purpose of root cause analysis, recognize the issues involved in identifying a root cause, and use various tools	D
Identify and interpret the seven classic wastes (overproduction, inventory, defects, over- processing, waiting, motion, transportation) and resource under-utilization	D
Improve	
Define basic DOE terms	B
Define and apply DOE principles	C
Plan and evaluate DOEs by determining the objective, selecting appropriate factors, responses, and measurement methods, and choosing the appropriate design	D
Design and conduct completely randomized, randomized block, and Latin square designs, and evaluate their results	D
Design, analyze, and interpret these types of experiments, and describe how confounding can affect their use	D
Design, conduct, and analyze these types of experiments	D
Select and apply tools and techniques for eliminating or preventing waste	D

Use various tools and techniques for reducing cycle time	D
Define and distinguish between kaizen and kaizen blitz and describe when to use each method	C
Identify and describe how other process improvement methodologies are used	B
Develop plans for implementing proposed improvements, including conducting pilot tests or simulations, and evaluate results to select the optimum solution	D
Control	
Explain the objectives of SPC, including monitoring and controlling process performance, tracking trends, runs, and reducing variation within a process	B
Identify and select critical process characteristics for control chart monitoring	C
Define and apply the principle of rational subgrouping	C
Select and use control charts in various situations: X – R , X – s , individual and moving range (ImR), p, np, c, u, short-run SPC, and moving average	C
Interpret control charts and distinguish between common and special causes using rules for determining statistical control	D
Define the elements of TPM and describe how it can be used to consistently control the improved process	B
Define the elements of visual controls	B
Review and evaluate measurement system capability as process capability improves, and ensure that measurement capability is sufficient for its intended use	D
Develop a control plan to maintain the improved process performance, enable continuous improvement, and transfer responsibility from the project team to the process owner	C
Document the lessons learned from all phases of a project and identify how improvements can be replicated and applied to other processes in the organization	C
Develop or modify documents including standard operating procedures (SOPs), work instructions, and control plans to ensure that the improvements are sustained over time	C
Develop and implement training plans to ensure consistent execution of revised process methods and standards to maintain process improvements	C
Identify and apply tools	C
Design For Six Sigma (DFSS) Framework and Methodologies	
Identify and describe DMADV (define, measure, analyze, design, and validate) and DMADOV (define, measure, analyze, design, optimize, and validate)	B
Describe design constraints, including design for cost, design for manufacturability (producibility), design for test, and design for maintainability	B
Describe the elements of robust product design, tolerance design, and statistical tolerancing	B
Six Sigma Green Belt	
Overview: Six Sigma and the Organization	
Recognize why organizations use six sigma, how they apply its philosophy and goals, and the evolution of six sigma from quality leaders such as Juran, Deming, Shewhart, Ishikawa, and others	B
Identify the linkages and supports that need to be established between a selected six sigma project and the organization's goals, and describe how process inputs, outputs, and feedback at all levels can influence the organization as a whole	B
Recognize key business drivers (profit, market share, customer satisfaction, efficiency, product differentiation) for all types of organizations	B
Define and describe lean concepts such as theory of constraints, value chain, flow, and perfection	C

Use value-stream mapping to identify value-added processes and steps or processes that produce waste, including excess inventory, unused space, test inspection, rework, transportation, and storage	B
Distinguish between DMADV (define, measure, analyze, design, verify) and IDOV (identify, design, optimize, verify), and recognize how they align with DMAIC	B
Use FMEA to evaluate a process or product and determine what might cause it to fail and the effects that failure could have	D
Define Phase	
Describe the project selection process and what factors should be considered in deciding whether to use the six sigma DMAIC methodology or another problem-solving process	B
Define and describe process components and boundaries	D
Understand various types of benchmarking, including competitive, collaborative and best practices	B
Identify process input and output variables and evaluate their relationships using the supplier, inputs, process, output, customer (SIPOC) model	D
Identify the process owners and other stakeholders in a project	C
Identify the internal and external customers of a project, and what effect the project will have on them	C
Collect feedback from customers using surveys, focus groups, interviews, and various forms of observation	C
Use quality function deployment (QFD) to translate customer requirements statements into product features, performance measures, or opportunities for improvement	C
Define and describe elements of a project charter and develop a problem statement that includes baseline data or current status to be improved and the project's goals	C
Help define the scope of the project using process maps, Pareto charts, and other quality tools	C
Help develop primary metrics (reduce defect levels by x-amount) and consequential metrics (the negative effects that making the planned improvement might cause)	C
Use Gantt charts, critical path method (CPM), and program evaluation and review technique (PERT) charts to plan projects and monitor their progress	C
Describe the types of data and input needed to document a project	C
Describe the elements of a project risk analysis, including feasibility, potential impact, and risk priority number (RPN)	B
Review with team members and sponsors the project objectives achieved in relation to the charter and ensure that documentation is completed and stored appropriately	C
Define, select, and apply these tools: 1) affinity diagrams, 2) interrelationship digraphs, 3) tree diagrams, 4) prioritization matrices, 5) matrix diagrams, 6) process decision program charts (PDPC), and 7) activity network diagrams	C
Calculate process performance metrics such as defects per unit (DPU), rolled throughput yield (RTY), cost of poor quality (COPQ), defects per million opportunities (DPMO), sigma levels, and process capability indices	D
Define and describe communication techniques used in organizations: top-down, bottom-up, and horizontal	C
Define and describe the stages of team evolution, including forming, storming, norming, performing, adjourning, and recognition	B
Describe and define the roles and responsibilities of participants on six sigma and other teams, including black belt, master black belt, green belt, champion, executive, coach, facilitator, team member, sponsor, and process owner	C
Define and apply team tools such as brainstorming, nominal group technique, and multi-voting	C
Identify and use appropriate communication methods (both within the team and from the team to various stakeholders) to report progress, conduct reviews, and support the overall success of the project	C
Measure Phase	

Develop process maps and review written procedures, work instructions, and flowcharts to identify any gaps or areas of the process that are misaligned	E
Identify and use basic probability concepts: independent events, mutually exclusive events, multiplication rules, permutations, and combinations	C
Define the central limit theorem and describe its significance in relation to confidence intervals, hypothesis testing, and control charts	B
Define and describe various distributions as they apply to statistical process control and probability: normal, binomial, Poisson, chi square, Student's t, and F	B
Identify and classify continuous (variables) and discrete (attributes) data	D
Define and apply various sampling methods (random and stratified) and data collection methods (check sheets and data coding)	C
Define, calculate, and interpret measures of dispersion and central tendency	D
Construct and interpret diagrams and charts that are designed to communicate numerical analysis efficiently, including scatter diagrams, normal probability plots, histograms, stem-and-leaf plots, box-and-whisker plots	E
Calculate, analyze, and interpret measurement system capability using gauge repeatability and reproducibility (GR&R) studies, measurement correlation, bias, linearity, percent agreement, and precision/tolerance (P/T)	D
Define and distinguish between natural process limits and specification limits, and calculate process performance metrics	D
Define, describe, and conduct process capability studies, including identifying characteristics, specifications, and tolerances, and verifying stability and normality	D
Describe the relationship between these types of indices	D
Describe the assumptions and conventions that are appropriate to use when only short-term data are used	D
Analyze Phase	
Select appropriate sampling plans to create multi-vari study charts and interpret the results for positional, cyclical, and temporal variation	E
Describe the difference between correlation and causation	D
Distinguish between statistical and practical significance	C
Conduct hypothesis tests to compare means, variances, and proportions (paired-comparison t-test, F-test, analysis of variance (ANOVA), chi square) and interpret the results	D
Improve Phase	
Define and describe terms such as independent and dependent variables, factors and levels, responses, treatments, errors, repetition, blocks, randomization, effects, and replication	B
Interpret main effects analysis and interaction plots	C
Use cause and effect diagrams, relational matrices, and other problem-solving tools to identify the true cause of a problem	D
Select and apply tools and techniques for eliminating or preventing waste, including pull systems, kanban, 5S, standard work, and poka-yoke	C
Use various techniques to reduce cycle time (continuous flow, setup reduction)	D
Define and distinguish between these two methods and apply them in various situations	C
Describe the theory and objectives of SPC, including measuring and monitoring process performance for both continuous and discrete data	D
Define and describe how rational subgrouping is used	B
Identify, select, construct, and use control charts : X – R , X – s , individual and moving range (ImR or XmR), median, p, np, c, and u	C
Assist in developing and implementing a control plan to document and monitor the process and maintain the improvements	C
Define the elements of TPM and describe how it can be used to control the improved process	B
Define the elements of a visual factory and describe how it can be used to control the improved process	B

Appendix III: Quality professionals' roles and tasks defined by EOQ

Quality management

Quality management representative

- Implement and maintain QM system, decide on the application of QM methods and manage QM projects
- Recognize legal and other normative requirements and coordinate their assessment and implementation in the company
- Adress risks and opportunities
- Process management
- Manage and moderate groups
- Present and report results to different target groups
- Be a contact person and motivator for employees in the organisation
- Support the decision maker/responsible management function
- Be the contact person for external interested parties
- Recognize customer-specific requirements

Quality manager

- Apply QM methods, analyse quality-related data, assess facts, consolidate and present
- Continuously analyse customer interest, represent them in the company and implement them
- Understand the context of the organisation
- Support top management in demonstrating leadership and commitment to the QM system, develop QM system, manage QM changes, address risks and opportunities
- Integrate/combine requirements from different management system standards and other internal and external requirements
- Be an internal QM service consultant
- Be able to act as internal trainer for topics of relevance to company QM and other management systems
- Promote the company's management system
- Create, implement, assess and improve audit programs

Quality auditor

- Create, implement, assess and improve audit programs
- Initiate, plan, perform and revise Management System, process and compliance audits
- Assess QM systems

Quality lead auditor

- Create, implement, assess and improve audit programs for third party certification
- Initiate, plan, perform and revise Management System, process and compliance audits
- Evaluate complex QM systems
- Act as audit team leader

Quality management in healthcare

Quality management representative in healthcare

- Implement and maintain QM system, decide on the application of QM methods and manage QM projects
- Recognize legal and other normative requirements and coordinate their assessment and implementation in the organisation
- Specific regulations in Healthcare
- Process management
- Manage and moderate groups
- Present and report results to different target groups
- Be a contact person and motivator for employees in the organisation
- Perform the role of Management representative or support the representative with tasks including advising and reporting to top management
- Recognize the importance of knowledge management for the organisation
- Be the contact person for external interested parties
- Recognize customer-specific requirements

Quality manager in healthcare

- Analyse quality-related data, assess facts, consolidate and present
- Continuously analyse customer interest, represent them in the company and implement them
- Develop QM system
- Integrate/combine requirements from different management system standards and other internal and external requirements
- Be an internal QM service consultant
- Be able to act as internal trainer for topics of relevance to company QM and other management systems
- Promote the company's management system
- Create, implement, assess and improve audit programs

Appendix IV: Competences required from quality professionals' by EOQ

Knowledge and skills	Role	Learning taxonomy
Understand the basics of organizational governance and management Understand the main structural forms of organisation, decision- making processes as well as their impact on the management system and in particular the quality management aspects. Understand the fundamental elements of a management system	Quality management representative	B
	Quality management representative in Healthcare	B
Understand the principle of customer focus, including customer requirements, needs and expectations Understand the term „quality" in the context of health and social services as the fulfillment of standards and requirements. To be able to distinguish and explain "quality management" and "quality management system". To be able to differentiate the quality dimensions structure quality, process quality and result quality.	Quality management representative in Healthcare	B
Be able to explain and apply the PDCA principle	Quality management representative	C
	Quality management representative in Healthcare	C
ISO 9000: Understand the quality terminology as defined by ISO 9000 Understand the quality management principles of ISO 9000	Quality management representative	B
	Quality management representative in Healthcare	B
ISO 9000: Understand the objectives and scope of the standard.	Quality management representative	B
	Quality management representative in Healthcare	C
ISO 9001: Understand the objectives, scope and structure of the standard. Be able to interpret requirements and realize them in a manner appropriate for a specific organization	Quality management representative	C
ISO 9004: Understand the objectives, scope and structure of the standard. Understand the distinction from ISO 9001 Be able to explain the approach	Quality management representative in Healthcare	B
	Quality manager	B
EN 15224: Understand the objectives, scope and structure of the standard. Be able to work out and interpret requirements as well as to realize them in a manner appropriate for and specific to an organisation	Quality management representative in Healthcare	C
Be able to understand the differences between EN 15224 and ISO 9001 and to be able to work out the specific requirements	Quality management representative in Healthcare	B
Have an overview of the existence of other standards on quality management (notably ISO 9004 and ISO 10000 series)	Quality management representative	A

Have an overview of management system rules and standards that are relevant to an integrated management system (e.g. ISO 14001, ISO 45001, ISO 31000, etc.)	Quality management representative in Healthcare	A
Be able to analyze the requirements of relevant rules and standards (in particular: be able to work out generic content or shared elements in all management system standards relevant to the organisation as well as requirements that are specific to a set of rules or standards).	Quality management representative in Healthcare	D
Understand and be able to explain the importance of standards and harmonized EU standards	Quality management representative in Healthcare	C
Understand the common elements of different management system standards and implement them into the processes of an organisation	Quality management representative	C
Be able to identify relevant standards, laws and regulations and to interpret their significance for the organization, particularly as regards the quality of products and services	Quality management representative	C
Be able to assess contractual arrangements with customers and suppliers Be able to integrate requirements from rules and standards into processes	Quality management representative in Healthcare	C
Have an overview over methods for identifying risks and opportunities and methods to analyze end evaluate risks.	Quality management representative	B
Know about commonly used models in Healthcare and social services.	Quality management representative in Healthcare	B
Be able to establish, implement, maintain and improve a quality management system based on processes, and be able to coordinate and support process owners	Quality management representative	C
Be able to identify requirements of customers and relevant interested parties and to incorporate them into company processes Be able to determine the processes needed and their interactions and be able to model processes and present process flows Be able to identify and manage process interactions in an organisation Be able to determine risks and opportunities for processes and plan and implement appropriate actions	Quality management representative in Healthcare	C
Be able to define and measure process performance Understand and be able to apply/use process performance indicators (systems) To be able to integrate requirements of regulations and standards in the processes.	Quality management representative in Healthcare	C
Understand moderation techniques Recognize group-dynamic processes	Quality management representative	B
	Quality management representative in Healthcare	B
Be able to conduct QM-related discussions	Quality management representative	C
	Quality management representative in Healthcare	D
Be able to use creativity techniques like Brainstorming, Card Technique, Force Field Analysis Be able to conduct Quality-circles	Quality management representative in Healthcare	C

Be able to present results adequately for specific target groups	Quality management representative	C
	Quality management representative in Healthcare	C
Be able to use techniques for information collection and preparation	Quality management representative in Healthcare	C
Be able to generate acceptance of the management system and changes	Quality management representative	C
	Quality management representative in Healthcare	C
Motivate: Have an overview of motivation theories (e. g. Maslow, Herzberg and others)	Quality management representative	A
	Quality management representative in Healthcare	C
		A
Be able to recognize and discuss the business impact of quality- related decisions Be able to recognize and discuss the impact of quality-related decisions to persons performing work under the control of the organisation Understand the necessity and plan actions for communication and awareness w.r.t. the quality management system	Quality management representative	B
	Quality management representative in Healthcare	D
Be able to analyze and consolidate facts and figures as well as to process them in a decision-making relevant manner Be able to develop and prepare reports suitable for the specific target group	Quality management representative	C
	Quality management representative in Healthcare	D
Be able to develop and prepare risk-related reports suitable for the target group	Quality management representative in Healthcare	C
Understand knowledge management as the basis of decisions	Quality management representative in Healthcare	B
Know methods of knowledge management: e.g. Blogs, Wikis, Communities of Practice, Lessons Learned, competence-management, portals, knowledge-cards	Quality management representative in Healthcare	A
Be able to deal with feedback, including complaints, from interested parties appropriately (e.g. good communicator) Be able to represent the company's interests on quality related topics	Quality management representative	C
	Quality management representative in Healthcare	C
Understand methods for identifying customer requirements	Quality management representative	B

	Quality management representative in Healthcare	B
Be able to integrate customer demands into processes and take appropriate actions to assure the satisfaction of customer demands.	Quality management representative in Healthcare	D
Be able to select appropriate methods and tools for: Information gathering (e.g. Check-list, data-collection sheet, monitoring and measurement, etc.) Creativity (e.g. brainstorming, force field analysis, etc.) Information analysis (e.g. Diagrams, Histogram, Flow chart, Pareto diagram etc.)	Quality management representative	B
	Quality management representative in Healthcare	C
Problem analysis (e.g. Cause-Effect Diagram, FMEA, 8D Report, etc.) Continuous improvement (e.g. Kaizen, Poka Yoke, 5s Method)	Quality management representative	B
	Quality management representative in Healthcare	B
Be able to apply project management methods (e.g. for the implementation and maintenance of management systems, for improvement projects, audit planning)	Quality Management Representative	C
	Quality management representative in Healthcare	C
Be able to apply the principles of data analysis (Selection of data, extraction of data, data handling, presentation of data(distributions, trends, histograms)	Quality manager	C
	Quality manager in Healthcare	B
Be able to select, produce and interpret graphical presentation methods for statistical data (diagrams, charts)	Quality manager	C
	Quality manager in Healthcare	C
Be able to define criteria and methods for an effective operation and control of processes (including measurement and performance indicators) Evaluate process performance and opportunities for improvement of processes	Quality manager	C
Understand distribution characteristics: Indicators for central tendency and dispersion: Arithmetic middle, median and mode. Variance and standard deviation.	Quality manager	B
	Quality manager in Healthcare	B
Understand the principles of correlation and regression. Understand the principles of Design of Experiments Understand the principles of reliability theory: Mean Time Between Failure, failure rate. Understand measurement capability and typical measurement errors; capability of measuring equipment. Understand statistical tolerance; statistical addition of several tolerances (dimensional chain of tolerances vs. individual tolerances)	Quality manager in Healthcare	B
Understand: sampling inspection, Lot inspection: AQL, Re, Ac, process capability	Quality manager	B
	Quality manager in Healthcare	B
	Quality manager	C

Be able to identify and apply methods for surveying and analyzing customer satisfaction, to rate their adequacy and propose relevant actions	Quality manager in Healthcare	C
Understand the influence of the organizational context / of interested parties in relation to the organizational development	Quality manager	B
	Quality manager in Healthcare	B
Understand the importance of leadership for an effective quality management system Be able to communicate the benefits of an effective quality management system for the overall success of an organisation Understand effective methods to carry out management reviews	Quality manager	C
Be able to apply methods for identifying risks and opportunities. Being able to analyze and evaluate risks in order to determine actions to address risks and opportunities	Quality manager	C
Be able to align the management system to the future requirements of the markets and interested parties	Quality manager	C
	Quality manager in Healthcare	C
Be able to apply guidelines from ISO 9004 appropriately in a manner specific to the organisation	Quality manager	C
	Quality manager in Healthcare	D
Understand and take into account the structure of Excellence Models in a manner specific to the organisation	Quality manager	C
	Quality manager in Healthcare	C
Know the methods for carrying out assessments. Know the principles of finance, controlling and governance	Quality manager	A
	Quality manager in Healthcare	B
Apply methods and possibilities for merging management subsystems Based on a fundamental understanding of models and systems be able to create one management system or to structurally enhance /merge a complex management system with different disciplines	Quality manager	D
	Quality manager in Healthcare	D
Be able to explain complex issues appropriately to different target groups Be able to organize persons in teams, projects and programs Apply moderation techniques in group meetings Recognize group-dynamic processes and resolve conflicts and be able to moderate them Coordinate and lead quality management activities within the organisation	Quality manager	C
	Quality manager in Healthcare	C
Prepare, conduct/moderate and follow up on events, and also be able to evaluate them	Quality manager in Healthcare	C
Be able to provide trainings, promote and advice topics to different target groups Know techniques for analyzing training needs. Organize and evaluate trainings.	Quality manager	C
	Quality manager in Healthcare	C
	Quality manager	D

Be able to develop future scenarios regarding the quality management system based on the vision, mission and strategy of the organisation Be able to identify the need for improvement, change or innovation in a quality management system Be able to apply leadership principles, methods and techniques Be able to raise employee awareness of individual issues	Quality manager in Healthcare	D
Be able to create, implement, review and improve audit programs (according ISO 19011), in particular:	Quality manager	C
Be able to define an audit program appropriately in terms of objectives, scope and resources Be able to recognize and minimize risks, obstacles and difficulties related to the audit program	Quality manager in Healthcare	C
Be able to carry out an audit program in terms of informing the parties about the program; specifying the objective, scope and criteria of individual audits; organizing the execution of individual audits (audit teams, time, resources); guiding and recording audit programs, individual audits and audit staff. Be able to select and use appropriate audit methods and tools regarding audit scope and objective (e.g. being able to select suitable audit types depending on the set objective, scope and criteria (system, process, product and compliance audit)) Know the process of competence determination and evaluation of the persons involved in the audit including auditors Know the competence requirements for auditors (personal behavior, knowledge and skills) and be able to apply them when forming the audit team. Be able to monitor an audit program Be able to review and improve an audit program	Quality auditor	D
Know the principles of change management. Have an overview of change processes in organizations – product, process, organizational and regulatory related.	Quality manager	B
To understand the significance of an audit to boost operative performance	Quality auditor	B
Be able to explain the benefit of an audit to other persons	Quality auditor	C
Understand audit principles, procedures, methods and techniques and to apply them in auditing practice Be able to conduct single and combined system audits	Quality auditor	D
Be able to perform process audits	Quality auditor	D
Know how compliance audits are carried out (together with experts if necessary)	Quality auditor	B

Be able to initiate, prepare, conduct audit activities with focus on the objectives and boundary conditions of the organisation (according to Chap. 6 ISO 19011:2011), in particular: To understand the roles and tasks of an auditor in all phases of the audit Be able to understand and classify the task and responsibilities of the audited persons Be able to initiate an audit from the first contact to determining the feasibility Be able to prepare an audit in terms of creating the audit plan, assigning the tasks in the audit team and preparing working documents. This includes e.g.: - Be able to select and use appropriate audit methods and tools with regard to the scope and objective of the audit - Be able to recognize and minimize risks, obstacles and difficulties related to audit day scheduling - Be able to recognize and minimize risks during audit planning Be able to perform the audit activities of document verification, opening meeting, communication during the audit, roles and responsibilities of advisers and observers, collection, verification, evaluation of information, audit statements, audit conclusions and closing meeting according to the objectives. This includes among others: - Be able to steer the formation and deployment of the individual team members according to the audit objectives - Be able to use goal-oriented interviewing techniques in all phases of the audit - Be able to create interview minutes and audit reports appropriately and with a view to the target group - To recognize audit risk, obstacles and difficulties during the implementation, to avoid conflicts and be able to cope with them appropriately if the situation arises Be able to close the audit and conduct audit follow-up measures	Quality auditor	D
Know and be able to interpret relevant regulations and standards regarding the management system being audited Be able to analyze and evaluate characteristics and features of processes Be able to evaluate process results in terms of objective achievement and conformity Be able to assess the implementation of the planned measures to reach the objectives based on business strategy/objectives during the audit	Quality auditor	D
In addition to Quality Auditor: Taking into account requirements and guidance (Annex F – Considerations for the audit programme, scope or plan) of ISO 17021	Quality lead auditor	D
In addition to Quality Auditor: Be able to perform compliance audits, product audits and third party audits - taking into account requirements (chapter 9) and guidance (Annex E Third party audit and certification process) of ISO 17021 in connection with ISO TS 17021-3 chapter 5.2-5.4.	Quality lead auditor	D
Know relevant legal and other requirements and the basics of contract and liability law(s) Know legal terminology and structures of legal systems (national and international)	Quality lead auditor	B
Be able to evaluate conformity regarding relevant laws, regulations, standards (assisted by experts)	Quality lead auditor	C

Be able to assess the effectiveness of quality management systems Take into account information from other relevant disciplines (finance, human resources, organizational development, environment, OHS et al.) for evaluation of the quality management system and discuss results and development possibilities with the top management of the auditee.	Quality lead auditor	D
Knowledge and skills according ISO 19011 ‚Generic knowledge and skills for audit team leaders' Be able to lead the audit team and represent it in communications Be able to organize and lead the audit team members Be able to manage the audit process	Quality lead auditor	D
To understand and evaluate an organizational business plan To understand how to determine appropriate business improvement tools	Quality lead auditor	B

Appendix V: Quality professionals' roles and tasks defined by SFK

The business and its context
Business intelligence
Specialist • Help to analyze the management process outcomes to get the selection of areas to be monitored for business intelligence

- Participate in the analysis of business intelligence results
- In interaction, design systems/structure to spread knowledge about the outcome of business intelligence. So that this spreads to managers and employees in the organization

Coach
- Teach and/or facilitate the work to translate as market insights to new products/services/offers.

Leadership and culture

Leadership and organization

Specialist
- Control and management of systematic quality processes that promote business activity
- Develop and support processes that promote a culture of a systematic approach to quality in order to achieve the business quality

Idea seller
- Convince management of the importance of systematic quality work

Manager
- Lead quality group

Everyone's participation and commitment

Specialist/coach
- Support managers and executives to create involvement among its employees
- Knowledge of motivation and incentives, and how the commitment is created and measured

Learning organization

Specialist
- Develop and support a culture of continuous improvement in order to strengthen the company's quality and its competitiveness

Process owner
- Identify the needs of "quality excellence" for each group within the organization

Impact and change management

Inspirer, Coach and Communicator
- Establish a culture for quality improvement

Needs oriented Quality Assurance

Quality management system

Specialist, Idea seller, Organiser
- Design management system

Project leader, Document Inspector, Educator and informer, Internal Audit Coordinator
- Introduce management system

Coach, Educator
- Drive management system

Specialist, Communicator, Idea seller, Project leader
- Improve management system

Audit

Process owner
- Development of a customized audit program

Auditor
- Planning, performing and follow up of the audit

Measurement and verification of products

Controller
- Independent verification of product properties

Leader
- Product auditing according to fixing routines
- Measuring system analysis

Coordinator between the relevant departments; design, production, audit, complaint, and contact person for market surveillance
- Product safety; risk assessment before/during/after production

Coordinator between the internal/external partners
- Product liability; damage investigations and insurance issues

Strategic management

Process orientation

Leader
- Define the main processes, support processes and management processes

Leader/Coach/Specialist
- Map existing processes

Analyst/Specialist
- Define new processes

Specialist
- Create standard for process maps (symbols)
- Create structure for the visualization of processes (part of the management system)

Leader/Analyst
- Analyze and improve processes

Leaders/Specialist
- Develop principles for the standardization of processes

Supplier quality

Leader
- Participate in the development of strategy for the selection of suppliers, and monitor quality aspects of processes and products

Operation representative
- Participate in the selection of suppliers, along with purchase
- Perform supplier assessment

Process owner
- Make risk analysis of supplier process
- Develop quality preparation at suppliers
- Manage suppliers' customer complaints
- Design requirements for quality related parameters
- Follow up suppliers' quality outcomes

Coordinator
- Be a contact person for quality related questions

Auditor
- Audit suppliers

Controller
- Evaluate goods and services from suppliers

Strategy, set goals, follow up, analyse and report

Specialist
- Relate quality work to the overall strategy

Specialist/Educator/Coach
- Convince the management about the importance of quality work

Specialist/Coach
- Develop metrics and principles of visualization and monitoring (including scorecard)

Specialist/Educator
- Prepare for the measurement of poor quality costs: define quality defects (for business) and train staff

Leader/Specialist/Analyst
- Estimate and compile poor quality costs

Specialist/Analyst
- Compile and analyze process information (statistical process control)

Analyst
- Compile and make available metrics in the business
- Compile metrics for management review (e.g. reports)

Constant improvement

Development of improvement concept

Coach/Project leader
- Lead and implement improvement projects

Process owner
- Structure improvement work with a base in any improvement cycle
- Compose improvement program with relevant methods and tools that lead to the achievement of set targets

Idea seller
- Convince management of the importance to invest in improvement

Specialist
- Customize and develop methodologies for the improvement for their own context

Internal consultant
- Assess and, if necessary, introduce new methodologies for improvement within the organization

Quality methods and tools

Internal consultant/Project leader
- Be able to apply and coach applications of the seven basic improvement tools
- Be able to apply and coach applications of the seven management tools

Internal consultant • Knowledge of main quality tools and methods in their own fields
Six sigma
Idea seller • Convince colleagues in the management team about how six sigma can improve operations Process owner • Coordinate Six Sigma activities Coordinator • Criteria for selection of projects Coach • Project Sponsor Project leader • Perform basic Six Sigma projects
Evaluation
• Auditor • Planning, performing and follow up of the audit

Appendix VI: Competences required from quality professionals' by SFK

Competences	Roles	Competence level
The business and its context		
Business intelligence		
Support with appropriate tools	Specialist	C
Project management, sales skills		C, D
Project management	Coach	C
Leadership and culture		
Leadership and organization		
Sustainable business, product and process development	Specialist	C
Business development		C
Strategist	Idea seller	C
Internal consultant		D
Everyone's participation and commitment		
Support with appropriate tools and system	Specialist/Coach	B, C, D

Learning organization		
Pedagogy	Specialist	C
Competence matrices	Process owner	D
Impact and change management		
Argumentation method	Inspirer	C
Change management	Inspirer	C
Quality adapted to its operations	Coach	D
Argumentation method	Communicator	C
Needs oriented Quality Assurance		
Quality management system		
Expert ISO 9001 and other related standards	Specialist, Idea seller, Organiser, Coach, Educator, Communicator, Project leader	D
Customer and regulatory requirements		B
System Support		B
Project Management	Project leader, Document Inspector, Educator and informer, Internal Audit Coordinator, Coach, Educator, Specialist, Communicator, Idea seller	D
Document Management		D
Communication		D
Internal audit		C
Deviation management		D
Process management		D
Models for "business excellence"	Coach, Educator	C
Analytical skills		B
Models for "business excellence"	Specialist, Communicator, Idea seller, Project leader	D
Analytical skills		D
Own assessment according to ISO 9004		B
Audit		
System audit, process audit, level auditing "layered audit"	Process owner	D
ISO 19011 guidelines for auditing management systems and related standard/model to be audited	Auditor	D
Measurement and verification of products		
Knowledge of methodology for selection	Leader	B, C, D
Audit methodology		
Influencing factors		
Measurement method		
Evaluate the results		
Knowledge of methods		
Knowledge of risk analysis	Coordinator between the relevant departments; design, production, audit, complaint, and contact person for market surveillance	B, C, D
Knowledge of law about product safety in the EU		

Some knowledge of the law in product liability in the EU	Coordinator between the internal/external partners	B
Strategic management		
Process orientation		
Method knowledge, knowledge of the business	Leader	C, D
Method Knowledge	Leader/Coach/Specialist	C
Knowledge of the business	Analyst/Specialist	D
Method Knowledge	Specialist	C
Knowledge of the business	Specialist	D
Method Knowledge, knowledge of the business	Leader/Analyst	D
Knowledge of the business and staffs' competence	Leaders/Specialist	D
Supplier quality		
Categorization of suppliers; alternative criteria for each category	Leader	D
Alternative assessment criteria for each category		
Qualification of suppliers	Operation representative	C
Alternative assessment criteria for each category		
Risk analysis	Process owner	C
Quality Drafting methodology		D
Systematic customer complaint handling		D
Product knowledge		C
Controller, authenticator		C
Audit, Evaluation	Auditor	D
Controller, authenticator	Controller	C
Strategy, set goals, follow up, analyze and report		
Understand the business objectives and requirements	Specialist	B, C
Understand the business objectives and requirements, rhetoric	Specialist/Educator/Coach	B, C
Method knowledge, statistical knowledge, knowledge of the business	Specialist/Coach	B, C, D
Teaching skills, rhetoric, methodological knowledge	Specialist/Educator	B, C
Method knowledge, statistical knowledge	Specialist/Analyst	C
Constant improvement		
Development of improvement concept		
Improvement methodology, project management	Coach/Project leader	C
Improvement methodology	Process owner	C
Conceptual knowledge of the improvement	Idea seller	C
Improvement methodology	Specialist	D
Knowledge of new methods (network) and their own context	Internal consultant	C
Quality methods and tools		
Seven basic improvement tools	Internal consultant/Project leader	C
Seven management tools		C

Industry spread quality methods and tools	Internal consultant	C
Six sigma		
Conceptual knowledge of Six Sigma	Idea seller	C
Argumentation method		C
Conceptual knowledge of Six Sigma	Process owner	C
Conceptual knowledge of Six Sigma	Coordinator	C
Project management	Coach	C
DMAIC process	Project leader	C