

Software Engineering
College of Arts, Media and Technology ,CMU.

SE422 Software Quality Assurance

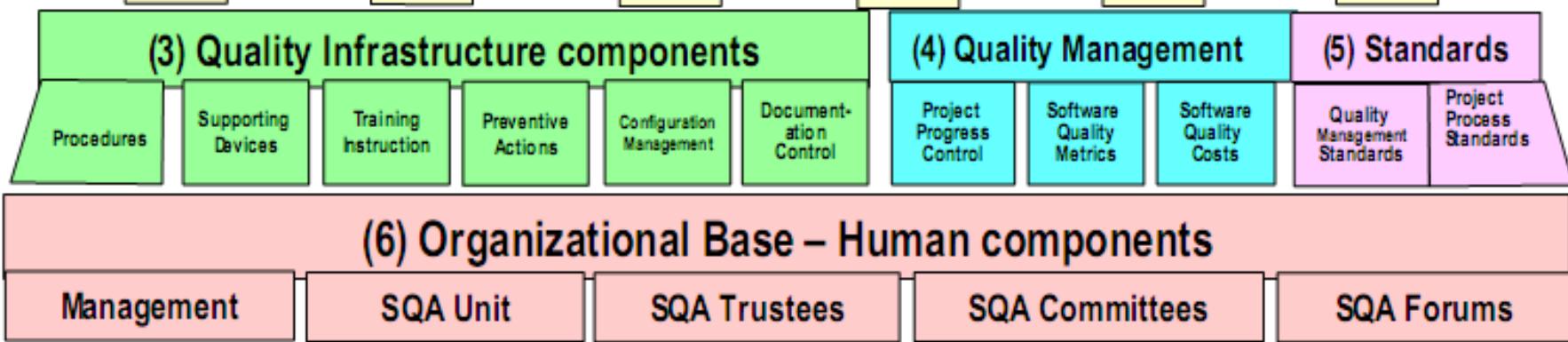
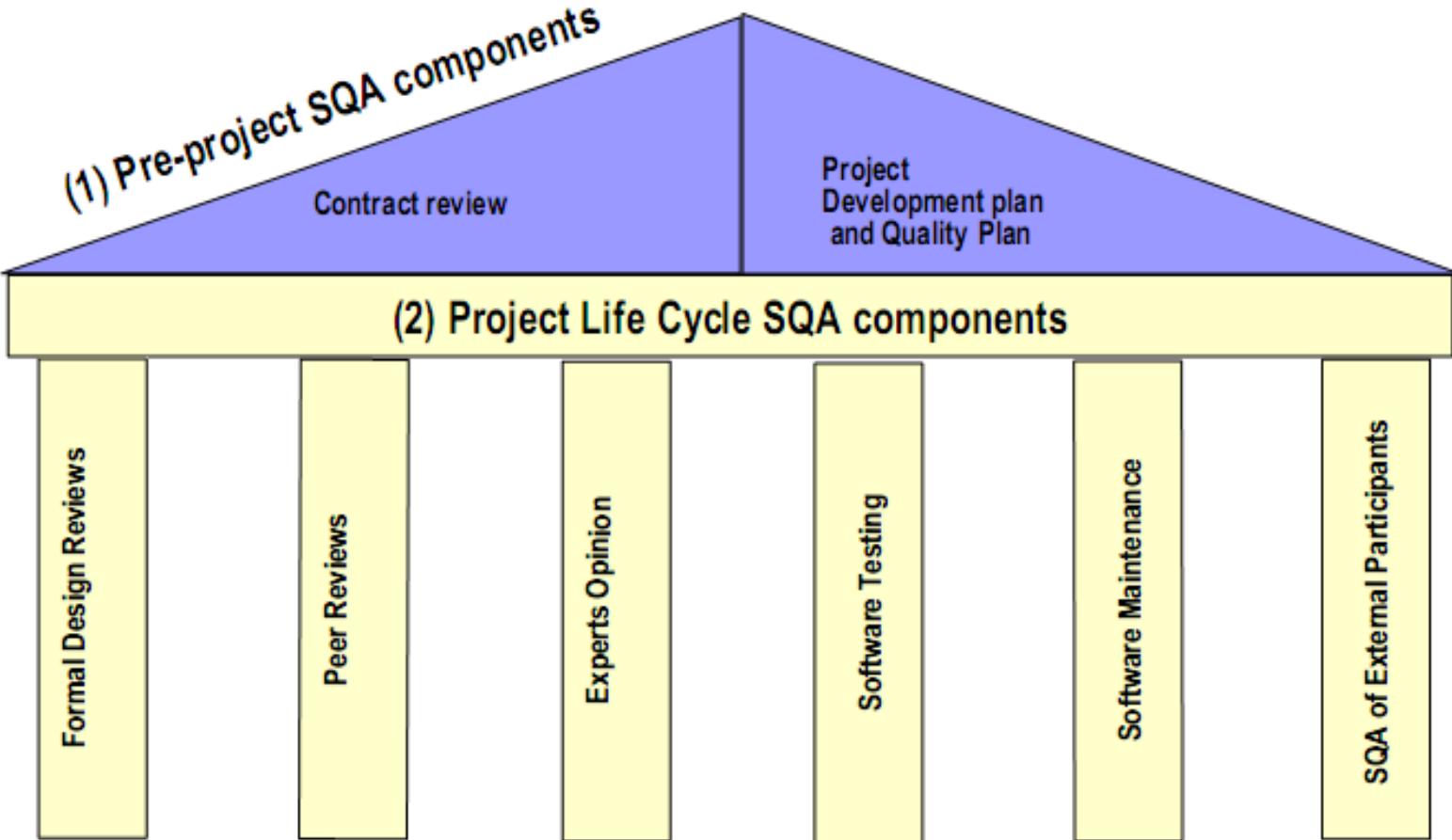
CH-4 Components of the SQA system

Topics

- The SQA system
- Pre-project component
- Software project life cycle components
- Infrastructure components for error prevention and improvement
- Management SQA components
- SQA standards, system certification, and assessment components
- Organizing for SQA
- Considerations guiding construction of an organization's SQA system

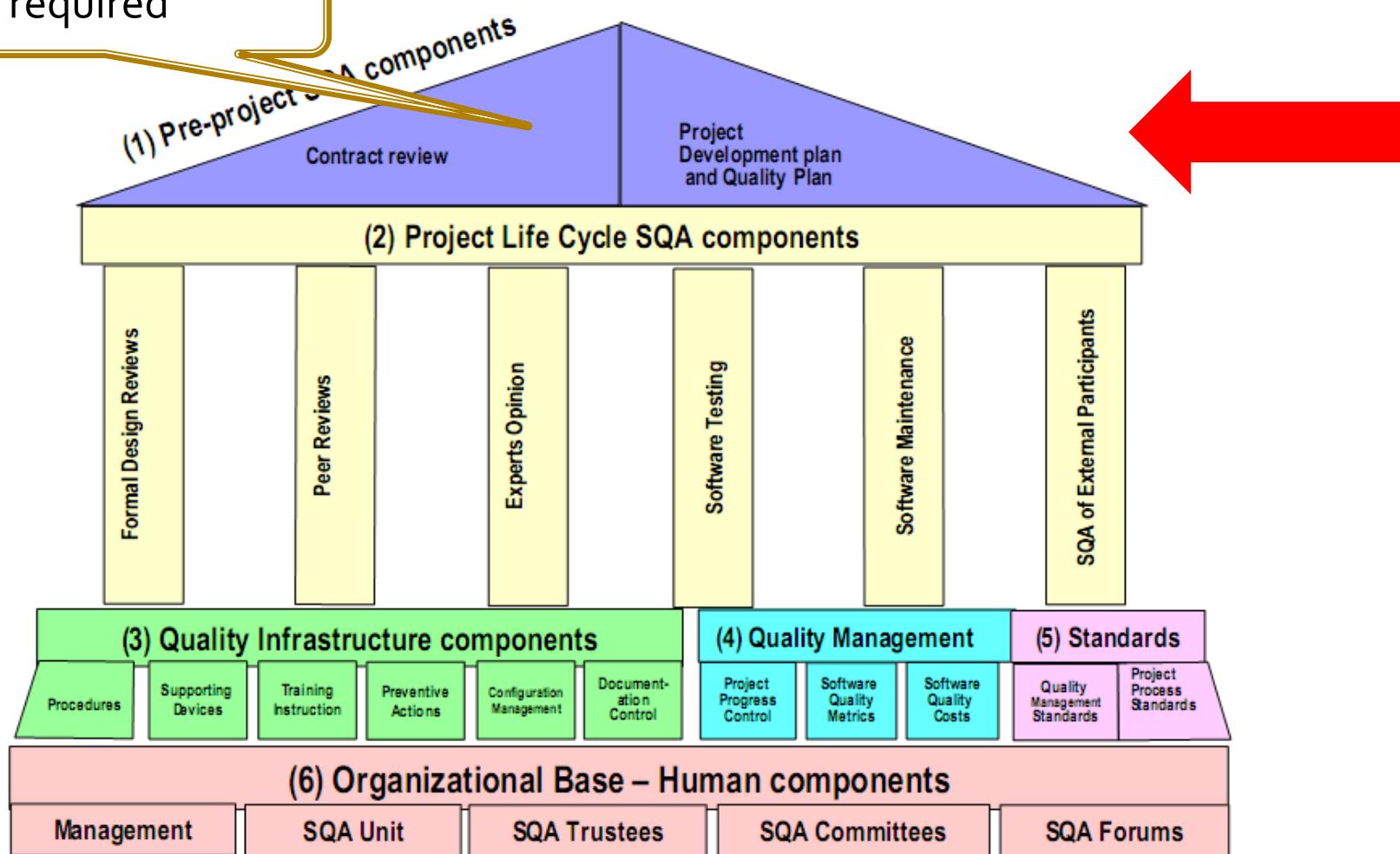
The SQA system-an SQA architecture

- Software is...
 - High complexity.
 - Invisible product.
 - Hard to search and fix defect(bug).
- SQA system components can be classified into six classes:



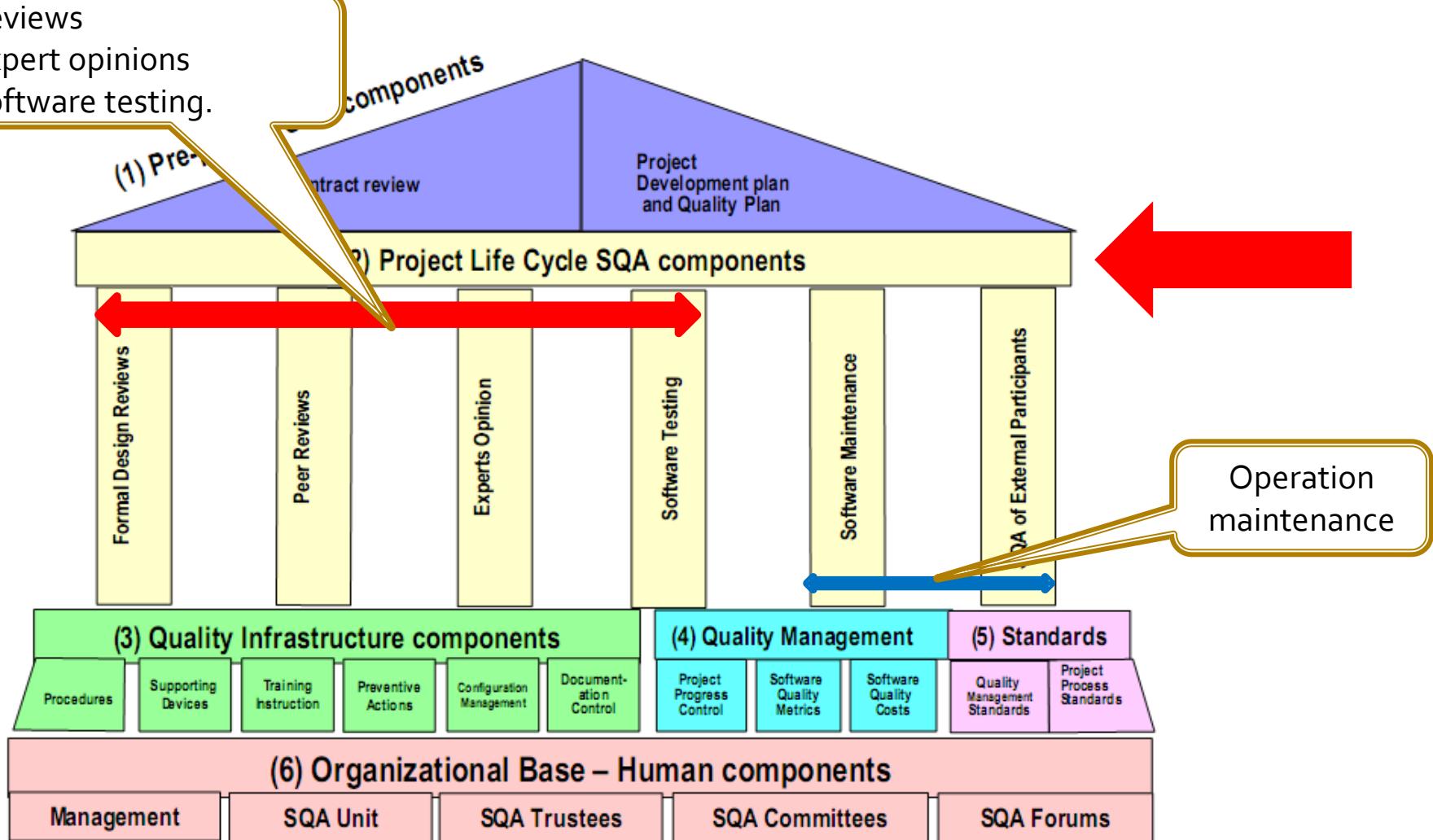
1.Pre-Project components

resources required

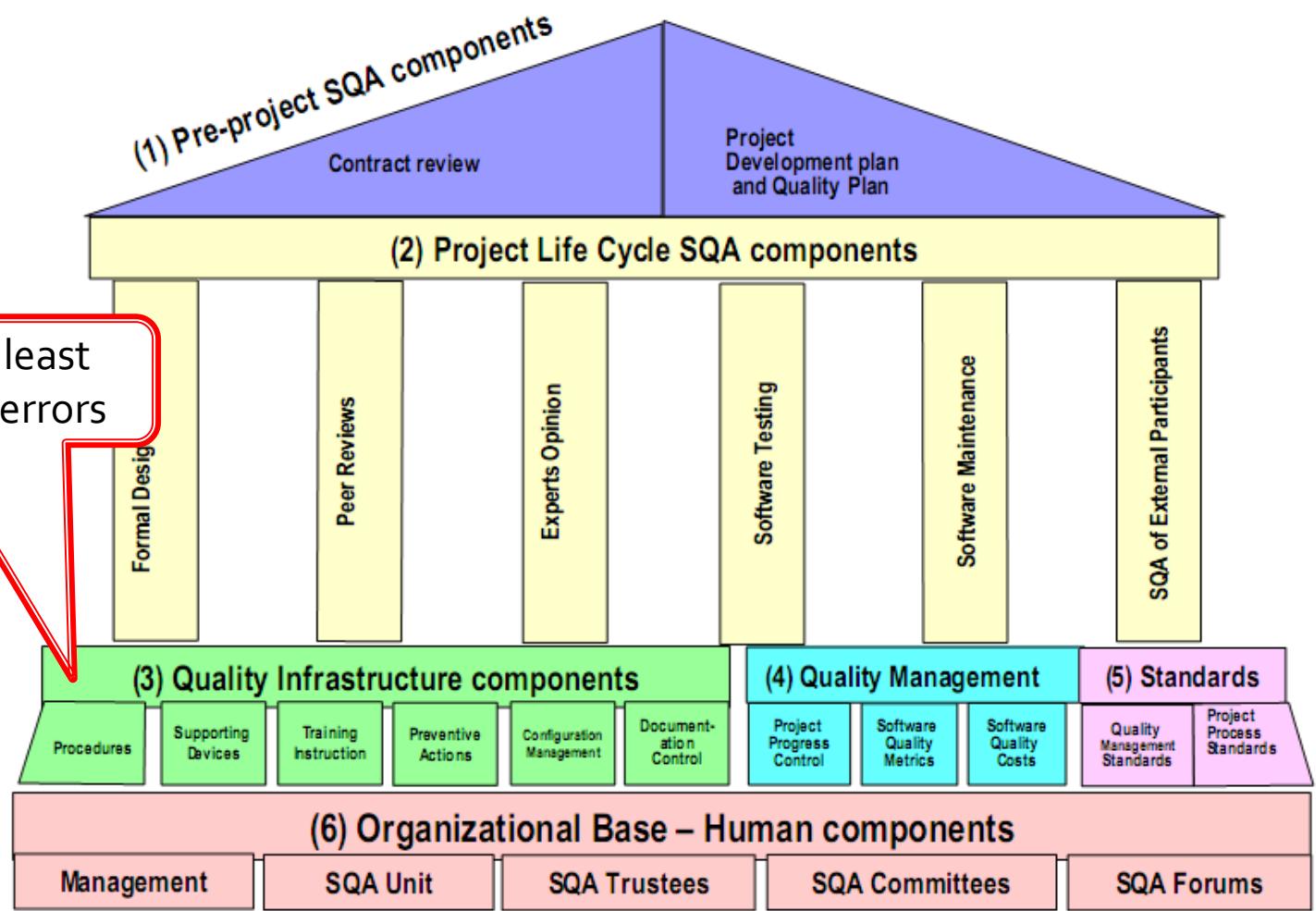


2. Components of project life cycle activities assessment.

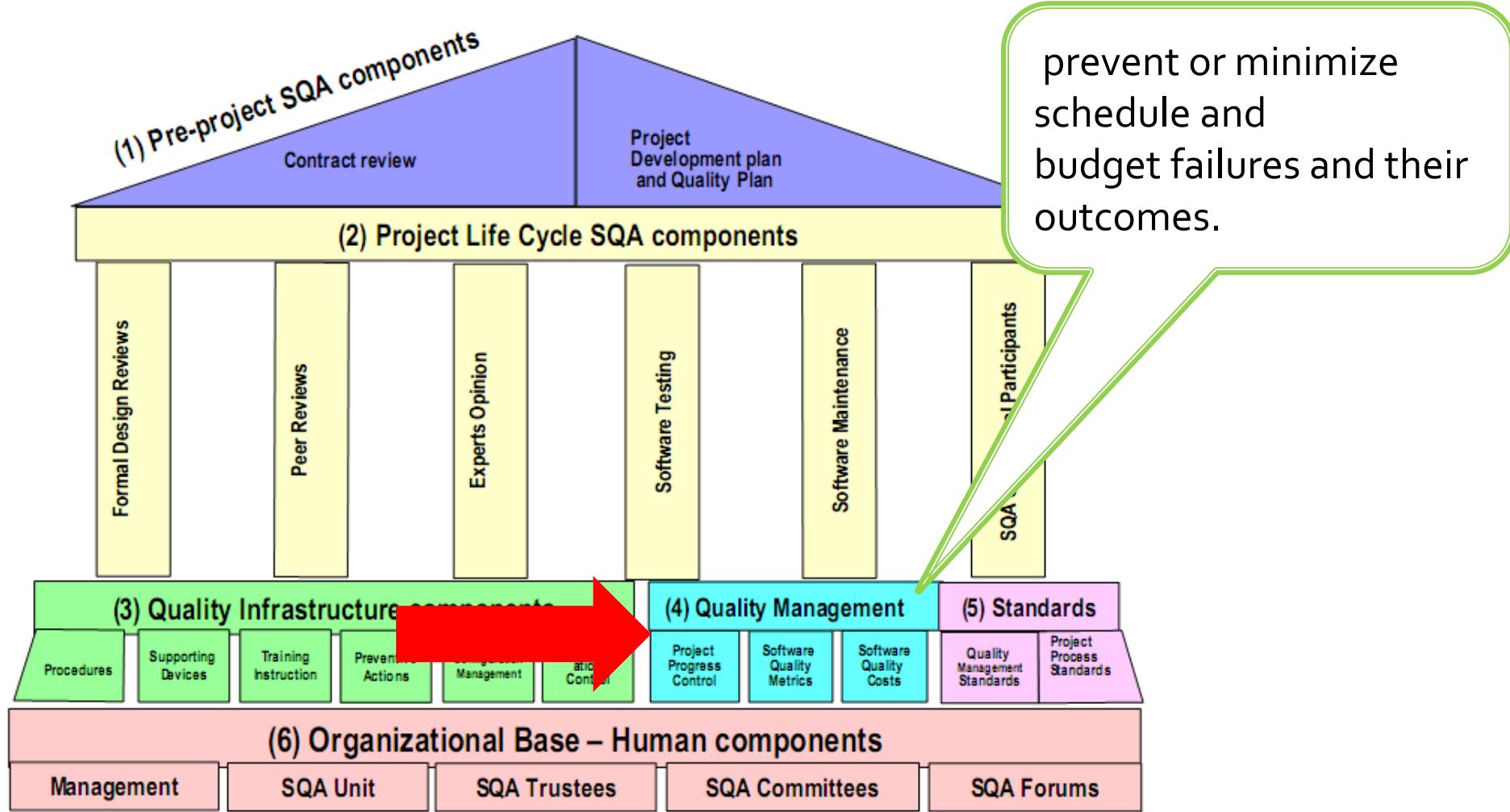
- Reviews
- Expert opinions
- Software testing.



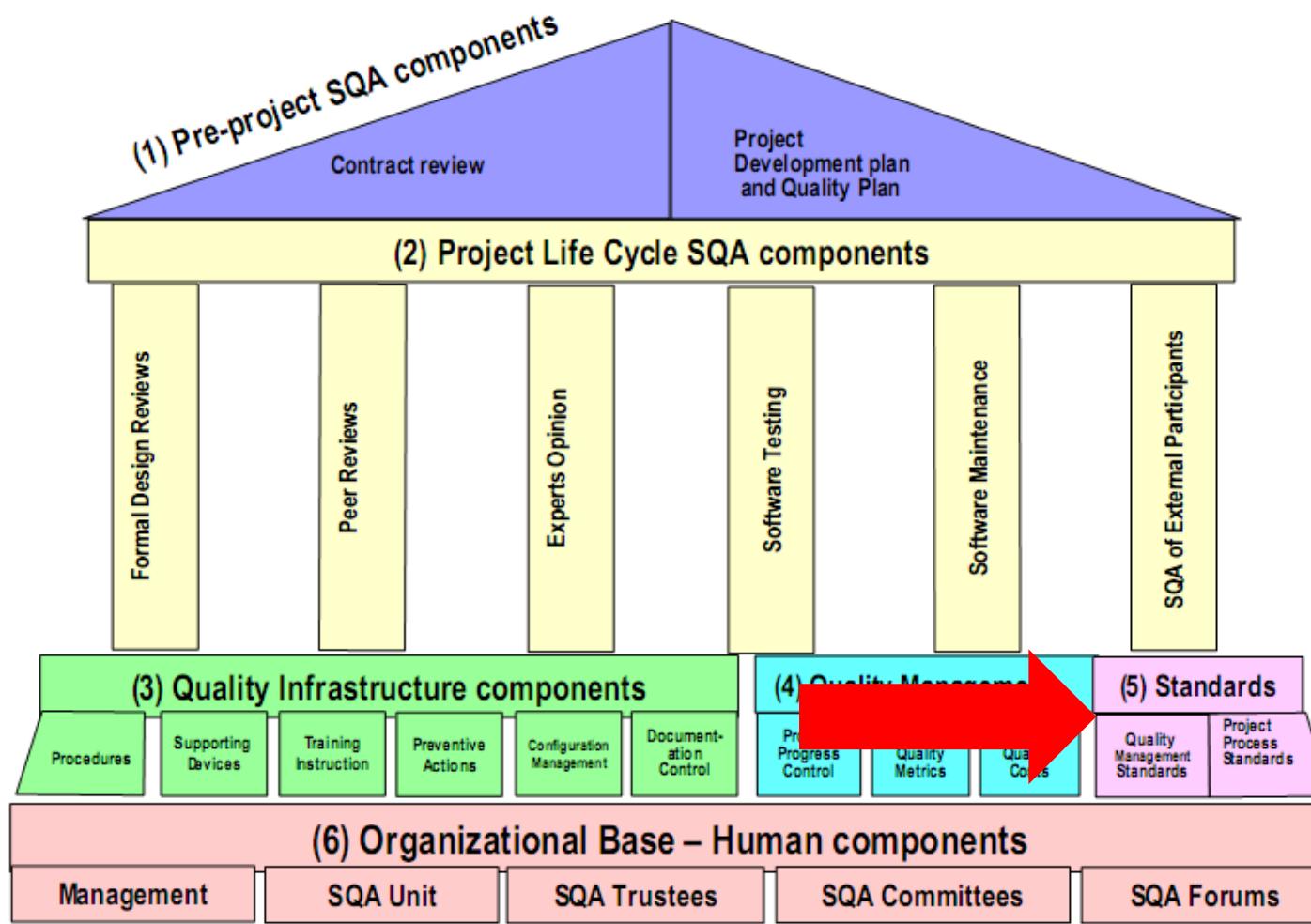
3. Components of infrastructure error prevention and improvement.



4. Components of software quality management.



5. Components of standardization, certification, and SQA system assessment

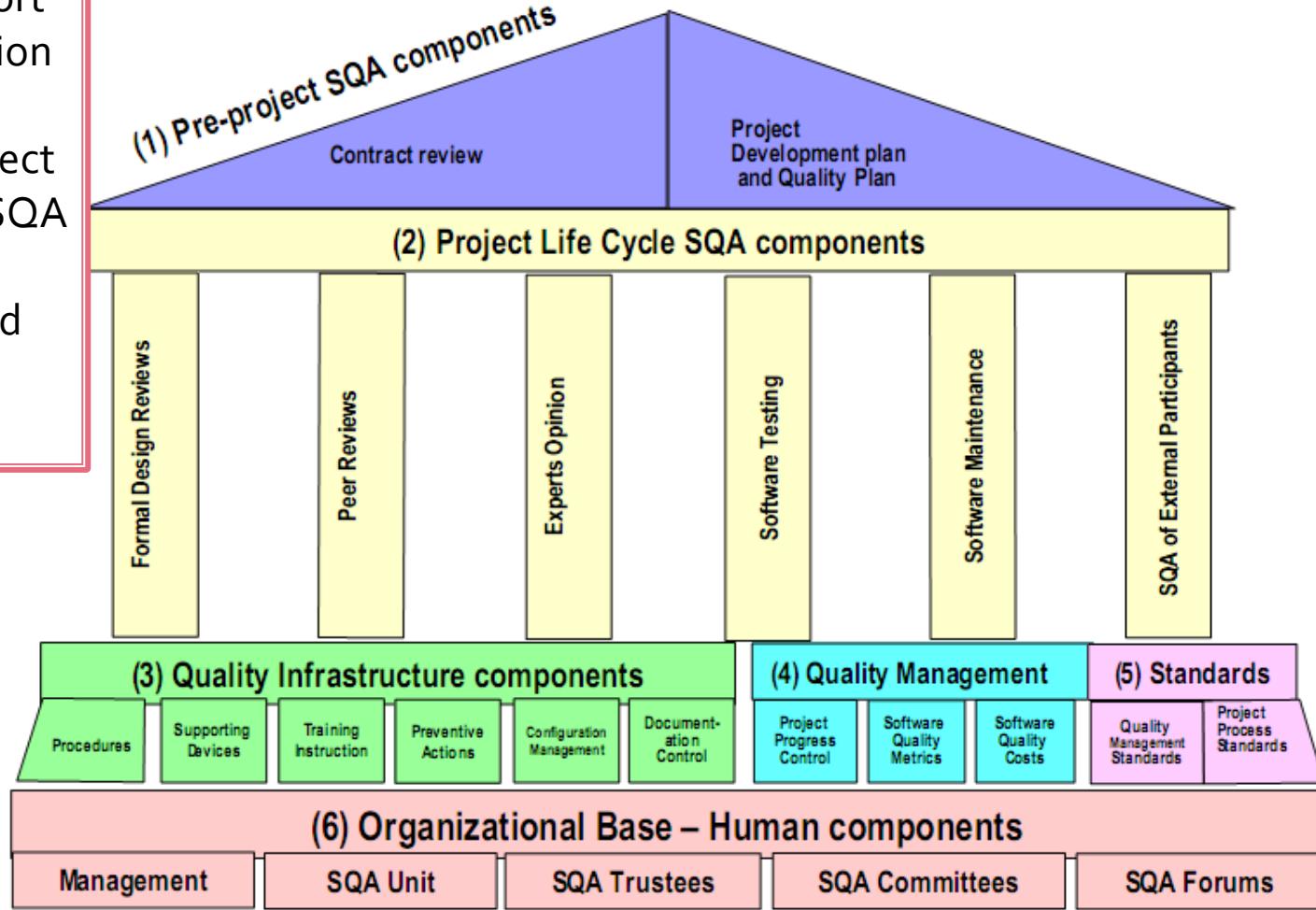


The main objectives of (5.)

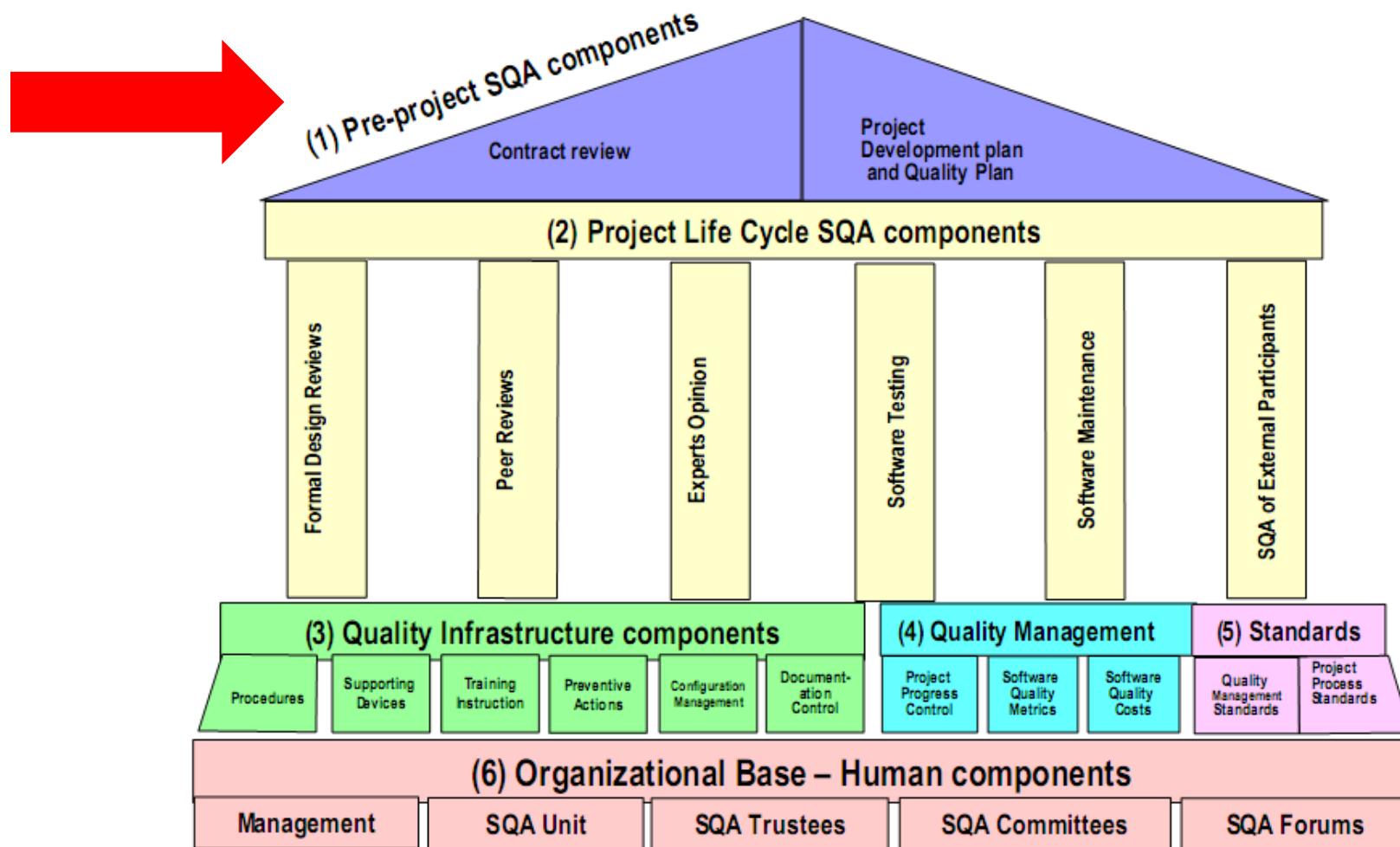
- utilization of international *professional knowledge*.
- *improvement* of coordination of the organizational quality systems with other organizations.
- *assessment* of the achievements of quality systems according to a common scale.

Organizing for SQA – the human components.

initiate and support the implementation of SQA components, detect deviations from SQA procedures and methodology, and suggest improvements.



The SQA system



Pre-project components

-Contract review

- Contract- the development unit is committed to an agreed-upon **functional specification, budget** and **schedule**.
- examination of...
 - the **project proposal draft**.
 - the **contract drafts**.



Contract review activities(1/2)

- Clarification of the customer's requirements
- Review of the project's schedule and resource requirement estimates
- Evaluation of the professional staff's capacity to carry out the proposed project

Contract review activities(2/2)

- Evaluation of the customer's capacity to fulfill his obligations
- Evaluation of development risks.

Pre-project components

-Development and quality plans

a plan is prepared of the project ("*development plan*") and its integrated quality assurance activities ("*quality plan*"). These plans include additional details and needed revisions based on prior plans that provided the basis for the current proposal and contract.

It is quite common for several months to pass between the tender submission and the signing of the contract.

The main issues treated in the *project development plan* are:

- Schedules
- Required manpower and hardware resources
- Risk evaluations
- Organizational issues: team members, subcontractors and partnerships
- Project methodology, development tools, etc.
- Software reuse plans.

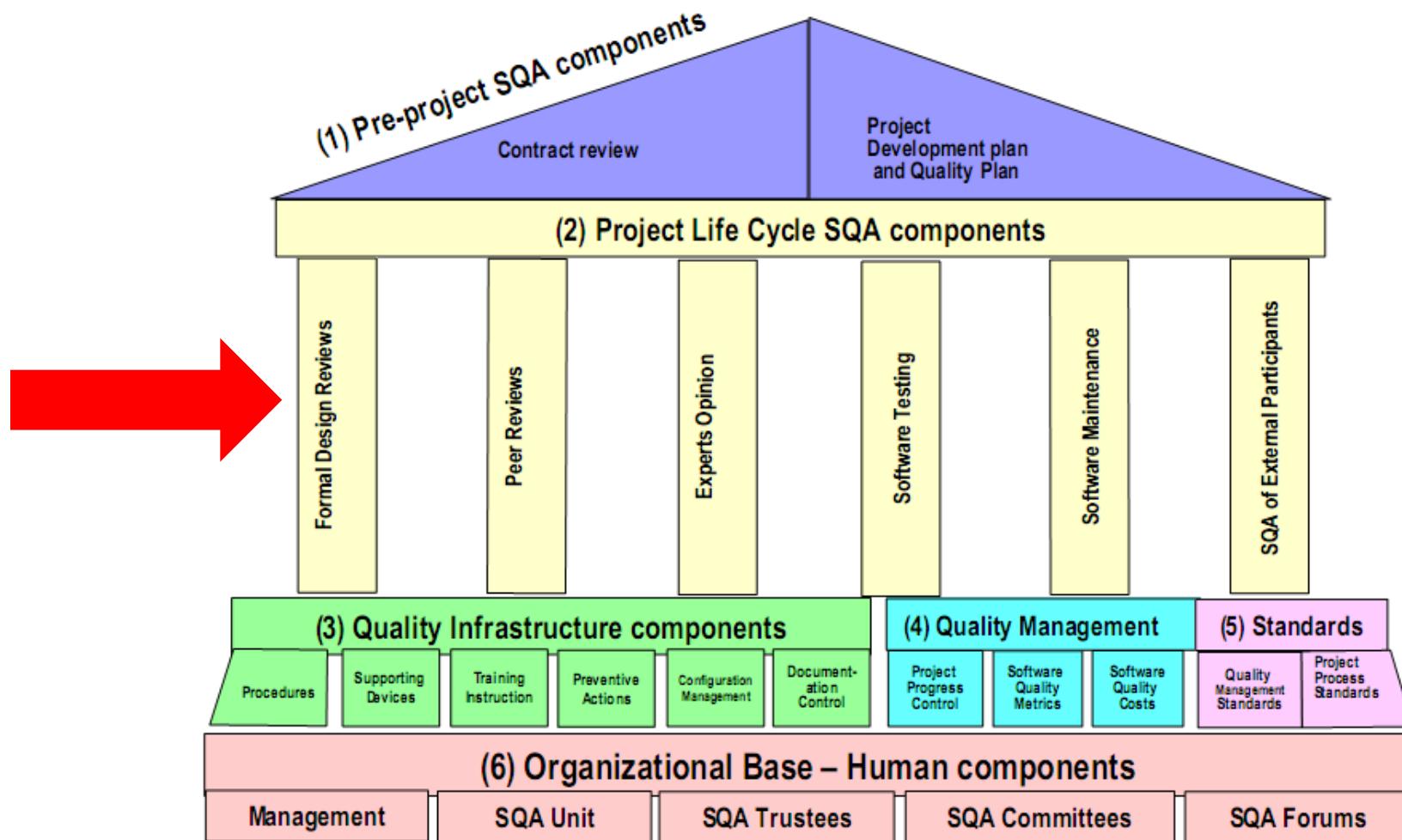
The main issues treated in the *project's quality plan* are:

- Quality goals, expressed in the appropriate measurable terms
- Criteria for starting and ending each project stage
- Lists of reviews, tests, and other scheduled verification and validation activities.

Reading Assignment

- Read the examples of Project Plan and Quality Plan in SQA. site.

The SQA system



Software project life cycle components

- Reviews
- Expert opinions
- Software testing
- Software maintenance
- Assurance of the quality of the subcontractors' work and the customer supplied parts.

Reviews

- The design phase of the development process produces a variety of documents.
The printed products include design reports, software test documents, software installation plans and software manuals, among others.

Reviews can be categorized as

- formal design reviews (DRs)
- peer reviews.



Formal design reviews (DRs)

- The committees are composed of senior professionals, including the project leader and, usually, the department manager, the chief software engineer, and heads of other related departments.
- The DR report itself includes a list of required corrections (termed “action items”).

Formal design reviews (DRs)

- When a design review committee sits in order to decide upon the continuation of the work completed so far, one of the following options is usually open for consideration:
 - Immediate approval of the DR document and continuation to the next development phase.
 - Approval to proceed to the next development phase after all the action items have been completed and inspected by the committee's representative.
 - An additional DR is required and scheduled to take place after all the action items have been completed and inspected by the committee's representative.

Peer reviews

- Peer reviews (inspections and walkthroughs) are directed at reviewing short documents, chapters or parts of a report, a coded printout of a software module.
- usually, the reviewers are all peers, not superiors, who provide professional assistance to colleagues.



Peer reviews

- The main objective of inspections and walkthroughs is to detect as many design and programming faults as possible.
- The output is a list of detected faults and, for inspections, also a defect summary and statistics to be used as a database for reviewing and improving development methods.

Expert opinions

- Expert opinions support quality assessment efforts by introducing additional external capabilities into the organization's in-house development process. Turning to outside experts may be particularly useful in the following situations:

Expert opinions (more in page 62)

- Insufficient in-house professional capabilities in a given area.
- In small organizations in many cases it is difficult to find enough suitable candidates to participate in the design review teams.
- In cases of major disagreement among the organization's

Software testing

- Software tests are formal SQA components that are targeted toward review of the actual running of the software. The tests are based on a prepared list of test cases that represent a variety of expected scenarios.
- The test report will include a detailed list of the faults detected and recommendations.

Software maintenance components

- Software maintenance services vary in range and are provided for extensive periods, often several years. These services fall into the following categories:
 - **Corrective maintenance** – User's support services and correction of soft-ware code and documentation failures

Software maintenance components

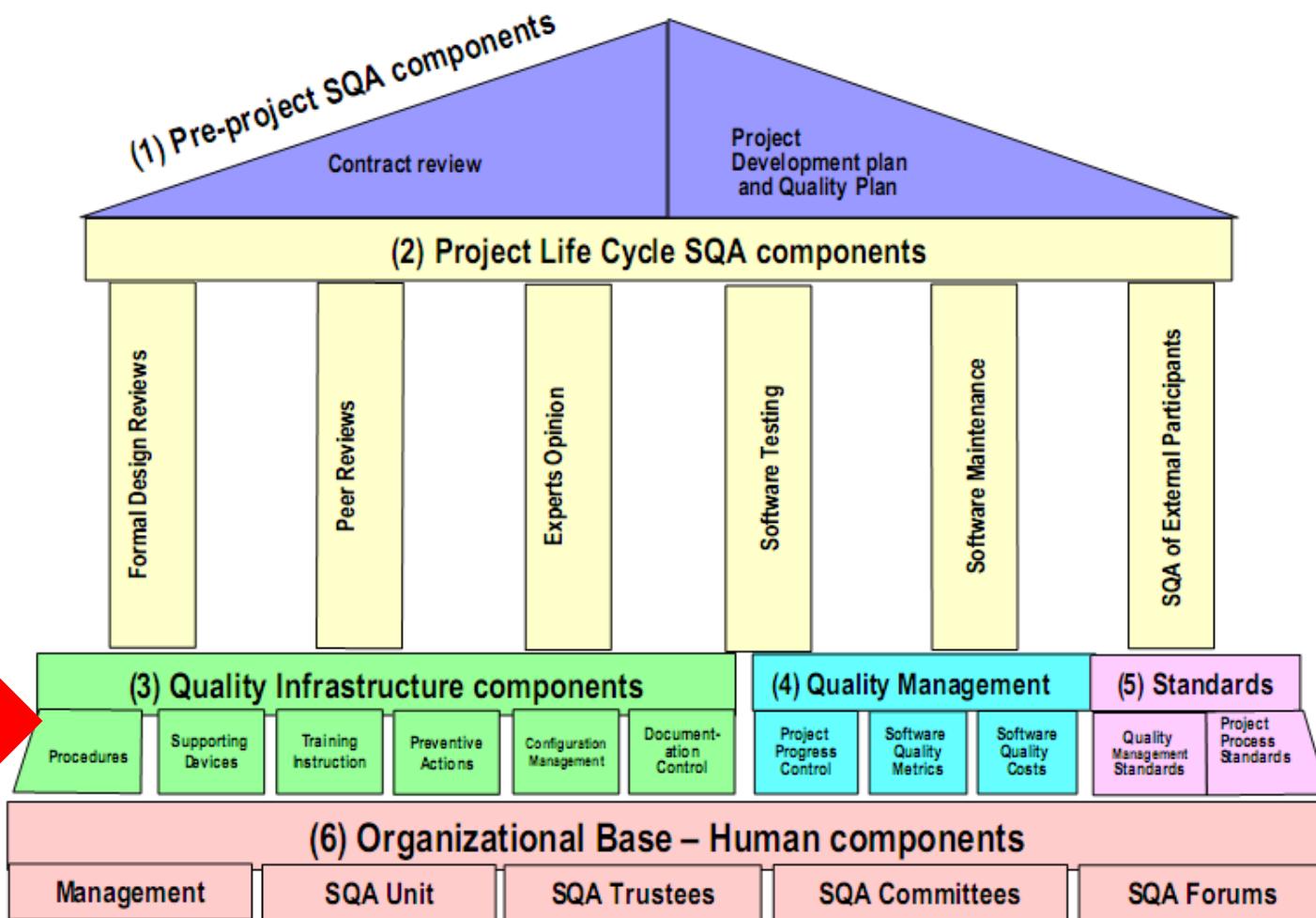
- **Adaptive maintenance** – Adaptation of current software to new circumstances and customers without changing the basic software product.

- **Functionality improvement maintenance** – The functional and performance related improvement of existing software, carried out with respect to limited issues.

Assurance of the quality of the external participant's work

- Subcontractors and customers frequently join the directly contracted developers (the “supplier”) in carrying out software development projects. The larger and more complex the project, the greater the likelihood that external participants will be required, and the larger the proportion of work trans-mitted to them

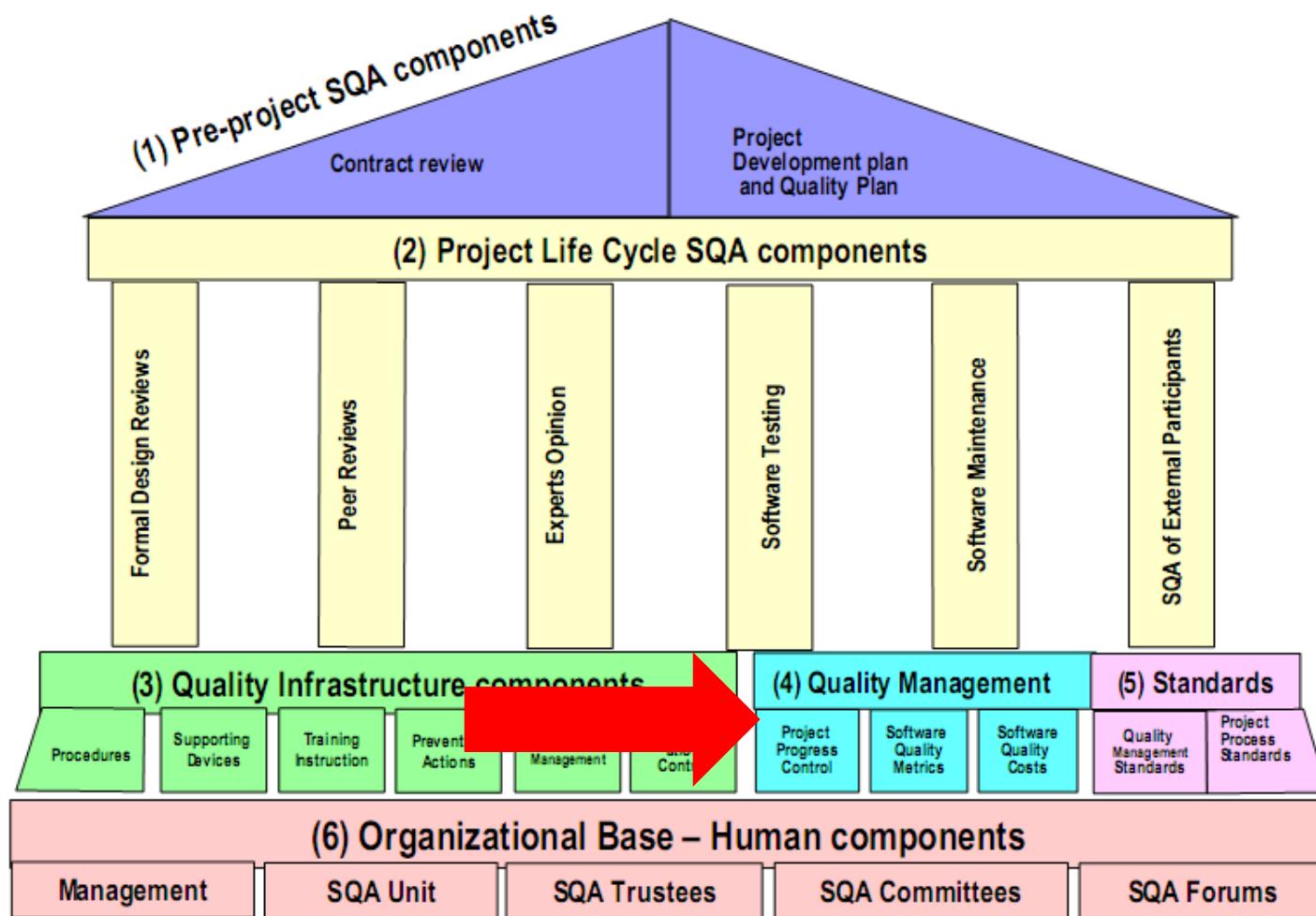
The SQA system



Infrastructure components for error prevention and improvement

- Procedures and work instructions
- Templates and checklists
- Staff training, retraining, and certification
- Preventive and corrective actions
- Configuration management
- Documentation control.

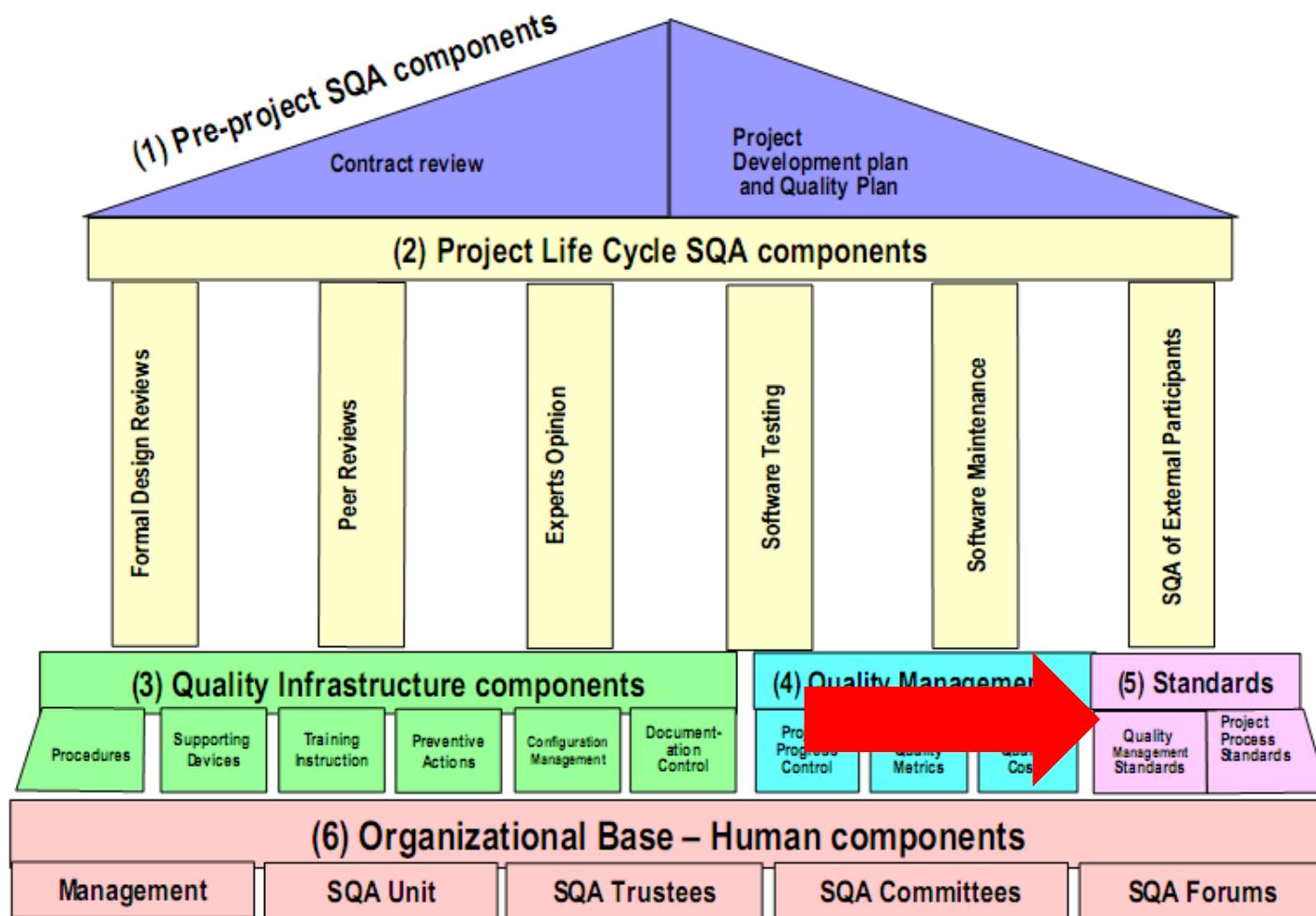
Management SQA components



Management SQA components

- Project progress control (including maintenance contract control)
- Software quality metrics
- Software quality costs.

SQA standards, system certification, and assessment components

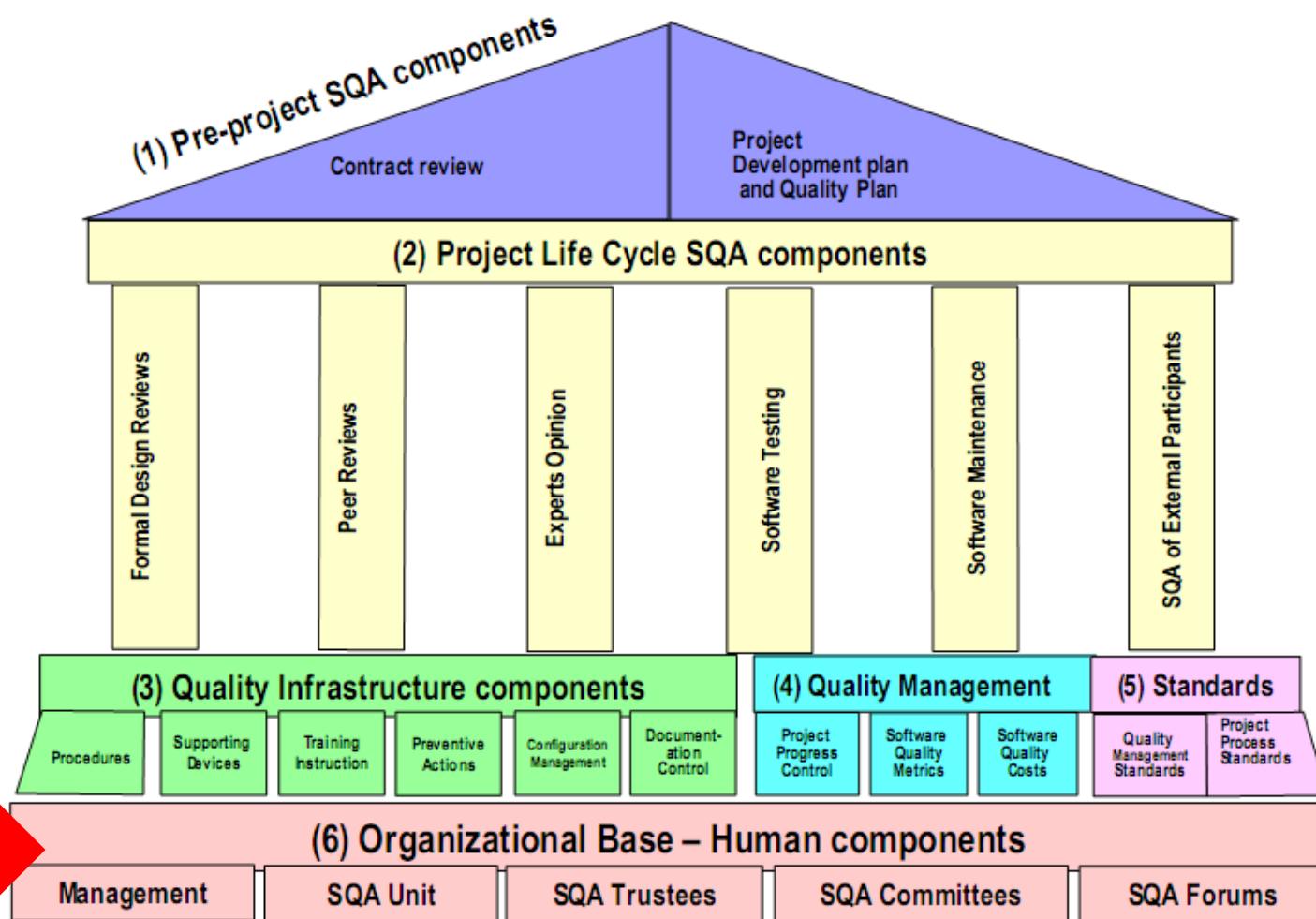


SQA standards, system certification, and assessment components

- Quality management standards
 - SEI CMM assessment standard
 - ISO 9001 and ISO 9000-3 standards.
- Project process standards
 - IEEE 1012 standard
 - ISO/IEC 12207 standard.
 - ISO/IEC 29110 standard

Organizing for SQA

– the human components



Organizing for SQA

– the human components

- Management's role in SQA
 - The responsibilities of top management
- The SQA unit
 - This unit and software testers are the only parts of the SQA organizational base that devote themselves full-time to SQA matters.

Organizing for SQA

– the human components

- SQA trustees, committees and forums
 - SQA trustees are members of development and maintenance teams who have a special interest in software quality and are prepared to devote part of their time to these issues.

Job Position	Job Description	Exp. 0-5 yrs.		Exp. >5 yrs.	
		Min (\$)	Max (\$)	Min (\$)	Max (\$)
QA Engineer / Software Tester	Create test cases and perform testing to ensure software standardization.	17,000	40,000	35,000	80,000
SAP Consultant	Provide functional or technical advice on the implementation of SAP. Must have business process and IT knowledge.	35,000	80,000	60,000	180,000
Software / Solutions Architecture	Set strategies and working plans for developing IT systems or software that conform with business strategies, business needs and company IT architecture.	20,000	60,000	45,000	65,000
Software Engineer	Develop software and applications starting from analysis, designing, coding, testing and training users.	18,000	65,000	35,000	80,000
Software Quality Assurance Manager	Monitor and test software, following quality standards to ensure software standardization.	N/A	N/A	120,000	180,000
System Administrator	Administrat and monitor servers and data center to maintain system reliability.	20,000	50,000	75,000	100,000
System Analyst / Business Analyst	Perform system feasibility studies, analysis and design to meet users requirements. Work closely with programmers and software engineers.	20,000	50,000	40,000	80,000
System Consultant Manager	Responsible for Post-Sale based on customer requirements.	N/A	N/A	60,000	120,000
System Engineer	Analyze, design, and provide configuration of server systems to clients.	20,000	55,000	30,000	85,000
Technical Consultant	Understand technical aspects of all products administration. Design, develop and maintain and	20,000	65,000	45,000	90,000

Considerations guiding construction of an organization's SQA system

- Decisions regarding the organization's software quality management system fall into two main categories:
 1. The SQA organizational base
 2. The SQA components to be implemented within the organization and the extent of their use.

Organizational considerations:

- The type of software development clientele.
- The type of software maintenance clientele.
- The range of products.
- The size of the organization.
- The degree and nature of cooperation with other organizations carrying out related projects.
- Optimization objectives.

Project and maintenance service considerations:

- The level of software complexity and difficulty.
- The degree of staff experience with project technology.
- The extent of software reuse in new projects.

Professional staff considerations:

- Professional qualifications.
- Level of acquaintance with team members.

Referrence

- Chapter 4: Daniel Galin. SOFTWARE QUALITY ASSURANCE From theory to implementation. Pearson Education Limited, 2004.