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Quality and Quality Management in Architecture Work

On this page, the following topics are discussed:

- Quality and Quality Management in General: Brief introduction to quality and quality management on a general level
- Quality and Quality Management in EA and SA Context: Introduction to quality and quality management in architecture work

Quality and Quality Management in General

First, we need to define what quality means. Juran & Godfrey (2000) presents the following two meanings for the word 'quality':

- "Quality means those features of a product which meet customer needs and thereby provide customer satisfaction."
- "Quality means freedom from deficiencies - freedom from errors that require doing work over again (rework) or that result in field failures, customer dissatisfaction, customer claims, and so on."

Lecklin (2002) and Dale (2003) describe quality (of a product, service, etc.) for example with the help of the following characteristics:

- conformance to agreed and fully understood requirements,
- fitness for purpose or use, and
- customer satisfaction: the product or service satisfies customer expectations and understands their needs and future requirements in a cost-effective way.

Why we should care about quality in the first place? Dale (2003) presents various points why quality is perceived to be important. Examples of these are as follows:

- quality is a primary buying argument for the ultimate customer,
- quality is a major means of reducing cost,
- quality is a major means for improving flexibility and responsiveness, and
- quality is a major means for reducing throughput time.

How should quality be managed, then? Juran (Juran and Godfrey 2000) introduces his **Trilogy of Quality Management**, which defines that managing for quality makes extensive use of three managerial processes:

1. quality planning,
2. quality control, and
3. quality improvement.

Quality planning can be defined as a

> "structured process for developing products (both goods and services) that ensures that customer needs are met by the final result. The tools and

methods of quality planning are incorporated along with the technological tools for the particular product being developed and delivered." (Juran and Godfrey 2000)

Quality planning has to deal with the quality gaps depicted in the figure below by providing processes, methods, tools and techniques for closing each of the component gaps and thereby ensuring that the final quality gap is at a minimum.
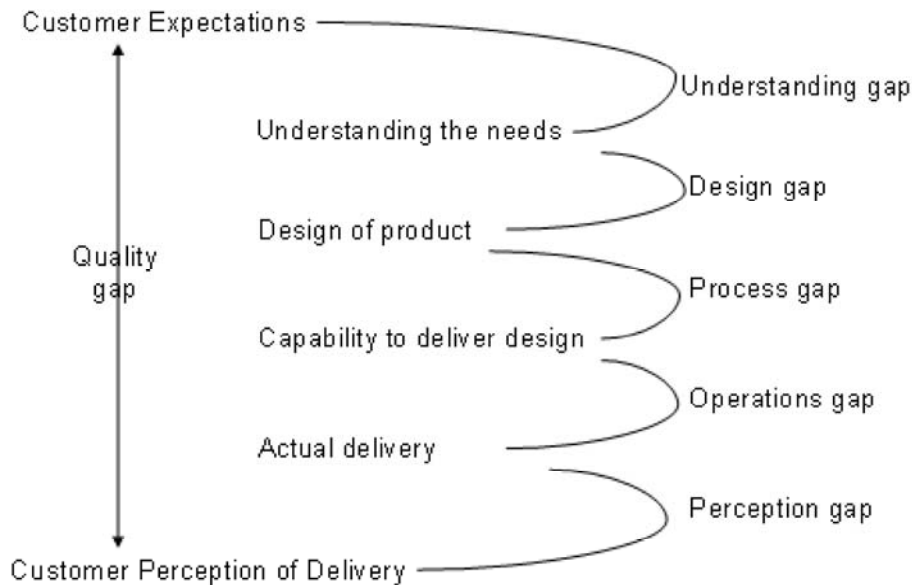

Figure: The quality planning deals with the quality gaps (Juran and Godfrey 2000).

The quality control process is

"a universal managerial process for conducting operations so as to provide stability - to prevent adverse change and to maintain the status quo." (Juran and Godfrey 2000)

To maintain stability, the quality control process evaluates actual performance, compares actual performance to goals, and takes action on the difference. According Juran quality control's relation to quality assurance can be described as follows:

"Each evaluates performance, each compares performance to goals, each acts on the difference. However, quality control has as its primary purpose to maintain control (or stability), performance is evaluated during operations. **Quality assurance's** main purpose is to verify that control is being maintained, performance is evaluated after operations."

Quality improvement process is clarified with the definition of the term improvement. It can be seen as an

"organized creation of beneficial change; the attainment of unprecedented levels of performance." (Juran and Godfrey 2000)

Furthermore, improvement usually takes place project by project and step by step.

Another quality management appoach is **the Total Quality Management (TQM)**. It is a

"management philosophy embracing all activities through which the needs and expectations of the customer and the community, and the objectives of the organization are satisfied in the most efficient and cost effective way by maximizing the potential of all employees in a continuing drive for improvement" (Dale 1994),

or

"the vast collection of philosophies, concepts, methods, and tools now being used throughout the world to manage quality." (Juran and Godfrey 2000)

Dale (1994, 21) describes the TQM to evolve through four stages:

- **Inspection**: Activities such as measuring, examining, testing, gauging one or more characteristics of a product or service and comparing these with specified requirements to determine conformity.
- **Quality control**: The operational techniques and activities that are used to fulfill requirements for quality.
- **Quality assurance**: All those planned and systematic actions necessary to provide adequate confidence that a product or service will satisfy given requirements for quality.
- **Total quality management** is the fourth and the highest level and it involves the application of quality management principles to all aspects of the business, including customers and suppliers.

As a conclusion, we want to point out that quality management is not a separate part of the organization, it is more or less integrated into the management system of an organization to enable systematic deployment of the management's strategies and declarations of will throughout the organization (Lecklin 2002). Quality management also includes and deals with the organizational parts, responsibilities, procedures, processes and resources needed to improve quality (Lillrank 1998).

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Quality and Quality Management in Enterprise and Software Architecture Context

Product and process quality management practices as well as process maturity and capability assessment practices are widely adopted and introduced in ICT industry. These practices include, among others,

- quality standards (e.g. ISO 9000 standards),
- frameworks for assessment the process maturity of an organization or a project (e.g. CMMI, Software Productivity Research (SPR)),
- and quality award programs (e.g. Malcolm Baldrige, European Quality Award).

EA and SA management processes and their quality management are relatively new parts of organisations' processes. Software architecture management (SAM) consists of the activities of capturing the architectural requirements of software-intensive systems and understanding them. Moreover, the process also includes design, analysis/evaluation, implementation, maintenance, improvement, and certification of the architecture as well as its documentation (IEEE, 2000; Bass et al., 1998).

The quality management activities of SA management can be divided into

- **Activities that relate to the quality management of SAM process:** These activities concentrate on the quality of SAM-process (process quality aspect).
- **Activities that relate to the quality management of SA:** These activities concentrate on the achievement of software architecture of good quality (product quality aspect).

Similary, **the quality management of EA** was addressed. An EA, to be successful, needs to be understood, accepted and used in everyday business functions, including also the various activities conducted by the top-management. The success needs also to be measured in order to ensure that desired results are achieved. While there is no widely accepted definition of a high-quality EA, we have suggested (see the papers Potential Critical Success Factors for Enterprise Architecture and Towards a Generic Evaluation Model for Enterprise Architecture) that **EA has high quality** if it

- conforms to the agreed and fully understood business requirements,
- fits for the purpose, which is to gain business value through EA, and
- satisfies the different stakeholders' (e.g. the top management, IT management, architects, developers) expectations in a cost-effective way and understands their current needs as well as the future requirements.

Briefly, different stakeholders profit from the high-quality architecture work and its results. Especially, EA should provide the management a clear view of the top priority projects the organization needs to carry out in the first place. Furthermore, the different views of EA quality presented above implicitly imply that the quality of EA is more than merely the quality of the implemented EA, indicating that it is successfully used. The quality of EA may also refer to the quality of EA documentation, the quality of the EA development process, the quality of EA governance (process), and so forth.

Quality management (QM) of EA is about defining and conducting all those activities that are needed to reach an EA of high quality and, thus, it relates to the same perspectives than the quality of EA. There is a need to manage e.g. the quality of EA governance process, EA development process, EA artifacts or specification, and the implemented EA that is used. We suggest that, as presented in the figure below, **QM activities for EA** are integrated into

- the EA governance process and
- the EA development life cycle.

Quality management of the EA artifacts is included in the QM activities that are integrated into the EA development life cycle.
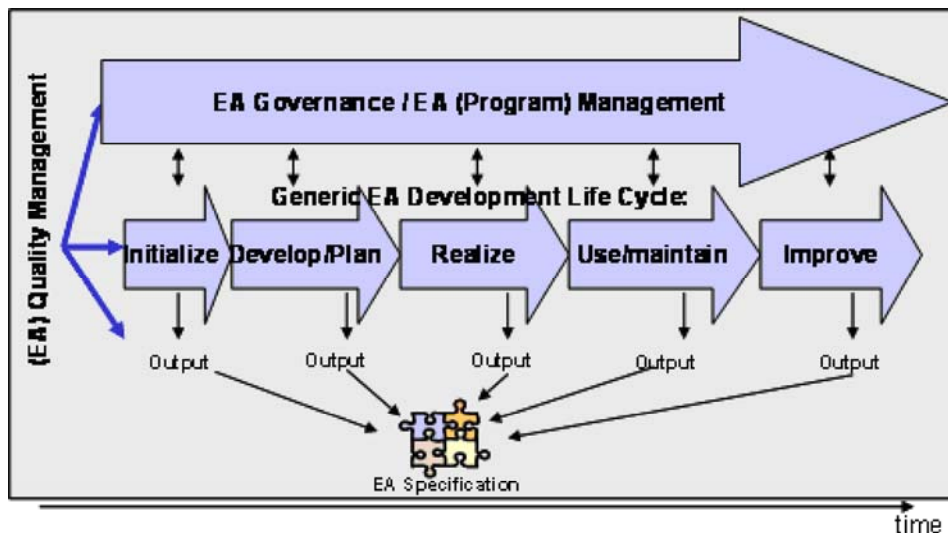
Figure: EA quality management is integrated into the EA governance process and the EA development life cycle.

As a conclusion, we state that architecture management, both on EA and SA level, is spread out to many processes in organisations and there is a need

- to move from architectures driven by investment planning and system development towards architectures driven by architecture management
- of architecture management practices and process models that aim at high-quality architectures
- to advance the maturity of architecture management processes
- for agility in architecture management and development
- for metrics and metric programs for architectural maturity and quality.

More detailed information on quality management of SA can be found in

- the paper Quality Management Activities for Software Architecture and Software Architecture Process or
- the report Quality Management Activities in Software Architecture Process.

Similarly, more detailed information on the quality management of EA can be found in the report Quality Management Activities for Enterprise Architecture.