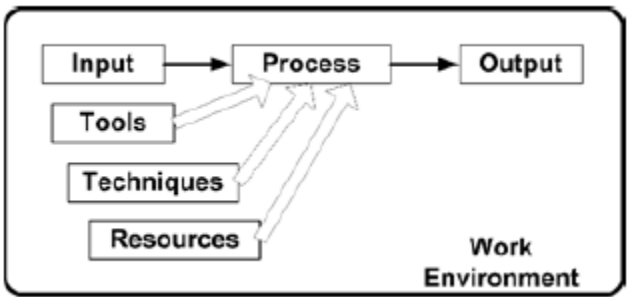
Defining, Planning, Controlling, Assuring, and Delivering Quality

Quality: A Process Flow Perspective

The idea of seeing a business as a bunch of flows through pipes is not a new one. Chemical engineering developed a method called *flow diagramming* for chemical plants, and that led to *data flow diagramming* for business by the 1950s. We also talk about work flow, information flow, and cash flow. When things are flowing, it's good for business.

We can think of each task as having three core elements, and four ancillary elements. The major elements are:

- *Inputs*, which are the ingredients, raw materials, or components that go into a process and become part of the output.
- *Process*, the activity of transforming inputs to make outputs—the work.
- *Outputs*, the end results of a task, such as a component or a finished product.



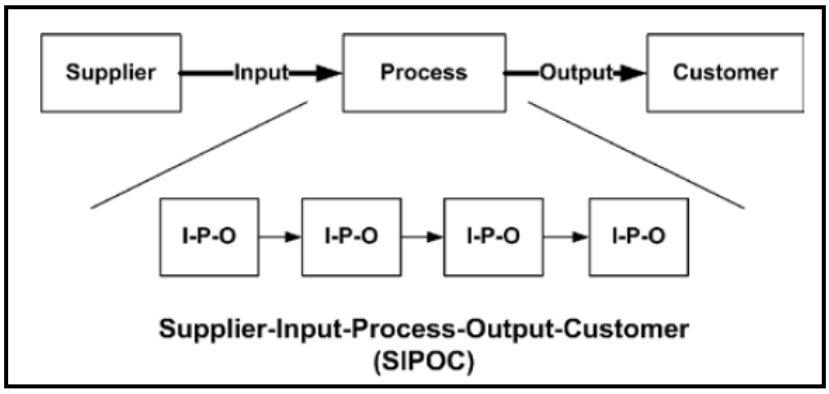
The input-process-output model

The additional, minor elements are:

- *Tools or equipment*, which are used for the task, but not used up.
- *Resources*, including disposable items (such as cleaning supplies), and our effort, which are used up in the process but do not get included in the product.
- *Techniques*, the instructions for the work process.
- *The work environment*, the space and conditions within which the work is being done.

Of course, each product may be built using many tasks—perhaps thousands or even millions. Tasks are linked because the output of one task is the input of another, until we can link the suppliers through all the tasks to the customer. This is called the Supplier-Input-Process-Output-Customer model, SIPOC.

Of course, a single product or company has many such chains that link all suppliers through many processes to all customers.



We can map the five stages of our quality management framework to the SIPOC model as follows:

- *Quality definition* comes before the definition of processes.
- *Quality planning* includes defining what processes are required to deliver the product to meet or exceed specifications, putting them in order by linking outputs of one process to inputs of the next, and then defining all seven aspects of each process with requirements and tolerances on all key variables, so that we can consistently produce all outputs of all processes to specification.
- *Quality control* in the broad sense including all forms of checking ensures that outputs and processes meet requirements, that defective output is reworked or scrapped, and that all seven aspects of processes are adjusted and restored to work within tolerances.
- *Quality assurance* includes activities to evaluate and improve processes, re-engineer work to eliminate unnecessary processes or steps, ensure effective communication and mutual understanding throughout the SIPOC chain, and auditing and review to ensure all processes are maintained to standard and improved.
- *Delivering quality* means carrying the SIPOC chain all the way through to the customer's receipt of the product or service, to the customer's perception that he or she has indeed received value and quality in the product, service, and contact with the company.

Defining Quality

Here are some excellent practices for obtaining good requirements:

- *Define your goal clearly at the start.* Are you seeking to define a new product? Are you seeking to learn about what your customers do and don't like about your current product? Are you seeking to compare customer opinions of your product or service and your competitors'? Are you seeking to determine what specific changes to your product or service the customers most want?
- *Make it interactive.* We learn more by letting customers try out or taste or play with a sample or prototype than we do by asking questions. We want the customers focused on the product, not on us. If a prototype or sample isn't possible, then we should use pictures, charts, and diagrams.
- *Record everything*. If possible, videotape or audiotape the sessions. If not, have two note takers so you lose as little as possible.
- *Use industry best practices*, such as focus groups and structure requirements elicitation methods.

- *Learn and use good survey design.* Good surveys are harder to make than you would think.
- *Study your results*. Don't just gather a lot of data and ignore it. Put it all together and learn what you need to know.
- *Check and test your results*. If you have a limited set of customers, or customer representatives, have them check and improve what you come up with from the sessions before it goes final. Otherwise, use multiple methods, such as a survey, a focus group, and a limited pilot product launch before you go into full production.

Some Characteristics of a Good Requirements Specification Adapted from IEEE standard 830-1993 and *Creating a Software Engineering Culture* by Karl E. Wiegers

Characteristic	**Description**
Complete	Nothing is missing, all attributes relevant to customer satisfaction are included, defined, and given tolerances.
Consistent	The specification contains no internal contradictions.
Correct	The specification accurately reflects customers' and stakeholders' wants and needs.
Feasible	Delivering to the specification is possible with technology that is available, can be obtained, or can be developed. Delivering to the specification is possible within time, cost, and other constraints.
Modifiable	The specification is designed so that future changes can be made in a defined, practical, traceable way.
Necessary	Each requirement adds value for the customer.
Prioritized	Requirements are ranked as to how essential it is to include each in the book. A group at the top may be listed as required, and then optional ones listed below that, in priority order.
Testable	Each requirement must be defined in a way that will allow for one or more tests of either process or product that will ensure conformance and detect error.
Traceable	Each element is uniquely identified so that its origin and purpose can be traced to ensure that it is necessary, appropriate, and accurate. This usually means assigning a number or code to each requirement that doesn't change, and then adding codes to indicate changes to a requirement and giving each new requirement its own code or number.
Unambiguous	Each requirement has only one possible interpretation.

Planning for Quality

Quality planning includes all of the work we do to organize and layout a plan for all stages of our quality work. Some of it begins even before we define product quality through requirements elicitation. After we have the requirements specification, we do a lot more quality planning. We define all of the reviews, inspections, and tests. We define our approach to QA, QC, rework and scrapping, process improvement, and delivering customer delight.

STATISTICAL QUALITY CONTROL

The only difference between statistical quality control and inspection is that, in inspection, we examine every single product. When we have thousands or millions of products made to the same specification, we can save time and money by applying Shewhart's statistical techniques and doing statistical quality control. If we can show that a sample of the product falls within a narrower tolerance, called the control limits, and certain other requirements are also met, then we can be confident that the whole batch fits within the customer's wider tolerance, called the specification limits.

Quality Assurance

Quality assurance (QA) developed in North America while TQM was developing in Japan. QA focused on solving quality problems, rather than living with rework and scrapping. The major difference between QA and TQM is that QA was usually performed at an engineering or management level with little executive support. Also, QA tended to gather information by auditing after the fact, which meant that it didn't bring in rapid benefits the way that methods that focus on the earliest parts of the process can. QA focused on production—the ratio of 10 in the 1:10:100 rules—more than on planning and requirements definition, where there is more to be gained.

Delivering Quality: Customer Delight

Key areas of improvement in customer delight include:

- *Training of salespeople, customer service representatives, and repair service people in customer service,* including listening skills, empathy, and follow through.
- *Empowerment of customer service representatives* within the company so that they can do what is needed to delight the customer.
- *Training in PDCA* so that customer service personnel can develop procedures and improve continuously.
- *Team customer service* to increase effectiveness and efficiency while reducing errors.
- *Automated information systems* for customer service, such as customer relations management (CRM) software systems.
- *Automated customer service* that embodies the highest quality customer service into artificial intelligence such as web interfaces and call management systems
- *Intelligent communications and training systems* that provide customer service representatives with the latest solutions and create cost-effective methods for communication with customers, such as support via Internet chat dialog.