



Customer Satisfaction through Quality Index

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Definition: Quality

What is Quality?

The term 'quality' is often used in a vague, blurred way. It means different things to different people. So the definition of quality varies from person to person. Some may define quality as reasonably bug-free, delivered on time and within budget, meets requirements and/or expectations, and is maintainable.

Exhibit 1: Different view of Quality from different person



The definition given by the ISO/IEC 8402 standard is-

"The totality of features and characteristics of a product or a service that bear on its ability to satisfy stated or implied needs".

Definition: Quality Index

What is Quality Index?

We can't measure quality of a product that is performing well today, but can go down tomorrow because of changes in customer needs. Thus we define Quality Index (QI), which is a measure of quality.

Need for Quality Index

- Customer satisfaction is one of the most critical things when it comes to quality of the application. Based on the QI, one can measure customer satisfaction.
- Easy for management to digest one number and drill down, if required.
- The QI trend provides continuous feedback, which is required for control. It is easy to monitor when the process is going *out-of-control*.

Quality Characteristics of Product

Exhibit 2: Quality characteristics of product



Quality can be seen as the sum of multiple separate quality attributes i.e. quality characteristics of product.

Let's look at each characteristic and their sub-characteristics on which they are judged in following table

Exhibit 3: Quality Characteristics of Product

| Characteristic | Sub-Characteristic | Definition |
|---------------------|--------------------|---|
| Completeness | | Required information is present. |
| | Suitability | Replaces existing process and performs a specified task. |
| | Accuracy | Performs specified task accurately. |
| | Data Integrity | In case of multiple systems, data across all the systems is the same. |
| | Interoperability | Ability to interact with specified systems. |
| Conciseness | | No excessive information is present. |
| Consistency | | Product contains uniform notation, symbols and terminology within itself. |

| | | |
|------------------------|-------------------|--|
| Portability | | Ability to operate in different environments with required effort to install. |
| | Adaptability | Ability to adapt to different environments. |
| | Install ability | Effort required for installing the product in a specified environment. |
| Maintainability | | Ability of the product to extend with new requirements. |
| | Analyzability | Ability to identify causes of failures or parts to be modified. |
| | Changeability | Effort required for modification, defect removal or environmental change. |
| | Stability | Ability to withstand unexpected modifications. |
| Testability | | Ability to be tested against acceptable criteria and performance evaluation. |
| Usability | | Effort required for using the product. |
| | Understandability | Effort required for recognizing the logical concept and its applicability. |
| | Learn ability | Effort required for learning its application |
| | Operability | Effort required for operation and operation control. |
| Reliability | | Ability to perform satisfactorily using it's functions |
| | Fault tolerance | Level of performance in case of failure |
| | Recoverability | Ability to recover the data in case of product failure |
| Efficiency | | Ability to perform its function with required latency (response time) and resources. |
| | Latency time | Response and processing time in performing its function. |
| | Resource used | Amount of resources used and the duration of such use in performing its function. |
| Security | | Ability to protect data against unauthorized access and to withstand malicious interference with its operations. |

Evaluating Quality Index

There are two approaches for evaluating QI:

- Metric based Approach
- Question-Answer (QA) based Approach

Question-Answer (QA) based Approach

This approach is easy and works well for evaluating QI. Based on the requirement and the view point of the customer, we can measure QI and drill down, if required.

Process

Each Characteristic and their Sub-Characteristics are converted into meaningful questions and sent to the stakeholders. Stakeholders should rate each one on a scale of 1 to 3 as follows: -

- Bad = 1
- Fair /Acceptable = 2
- Good = 3

We can use the rating table for this purpose.

Rating table

The following rating table can be used for calculating QI , which contains questions as a measurement, on the basis of which the rating can be decided:-

Exhibit 4: Rating Table

| Name | | | |
|--------------------|--|--------|-------|
| Testing Platform | | | |
| Date | | | |
| Quality Index (QI) | | | |
| Characteristic | Sub-Characteristic - Measurement | Rating | |
| | | S (i) | C (j) |
| Completeness | | | |
| | Suitability - How efficiently can the product replace the existing process? | | |
| | Accuracy - Is the product resulting in accurate data? | | |
| | Data Integrity - In case of multiple systems, is the data across all systems same? | | |

Exhibit 4: Rating Table

| | | | |
|------------------------|--|--|--|
| | Interoperability-- How easy to exchange and use information with other systems? | | |
| Conciseness | What is the amount of information the product can offer? | | |
| Consistency | Does the product contain uniform notation, symbols and terminology within itself? | | |
| Portability | | | |
| | Adaptability – How simple is it to adapt to a new environment? | | |
| | Install ability- How easy is it to install and configure the product? | | |
| Maintainability | | | |
| | Analyzability - How easily can the causes of failures be identified or the parts be modified? | | |
| | Changeability - How easily can the product be modified, made defect-free or adapt itself to environmental change? | | |
| | Stability - How does the system react to unexpected modifications? | | |
| Testability | Is the product tested against acceptable criteria and performance evaluation? | | |
| Usability | | | |
| | Understandability - Is product easy to understand? | | |
| | Learn ability- How easy is it for a novice to learn the product? | | |
| | Operability - How easily can the product be operated? | | |
| Reliability | Fault tolerance - How does the product perform when it encounters an error (crashes, exits gently, throws error, etc)? | | |
| | Recoverability - how does the product recover data in case of failure? | | |
| Efficiency | Latency time – What is the turnaround time of the product response to a user request? | | |
| | Resource used-Is product using the resource without wastage? | | |
| Security | Is the information secure? | | |

Calculation:

Once rating is completed, calculate rating of each Characteristics using following formulae:-

$$C (j) = \frac{\sum_{i = N (j)} S (i)}{N (j)}$$

Where,

C (j) = Rating of Quality Characteristics,

S (i) = Rating of Quality Sub- Characteristics on which C (j) is judged,

N (j) = number of Sub- Characteristics. For Characteristics not having Sub - Characteristics N (j) will be 1,

i, j = 1, 2, 3...n

After C (j) is computed we calculate QI of product using formulae:

$$QI = - \frac{\sum_{j = n} C (j)}{n} * 100$$

Where,

QI = Quality Index

n = number of Quality Characteristics

Based on the QI calculated we can decide Quality level of product using following table: -

Exhibit 5: Quality Level of Product

| | |
|------------------|------------------|
| | |
| 1.0 – 1.5 | Bad |
| 1.5 – 2.5 | Fair /Acceptable |
| 2.5 – 3.0 | Good |

Remember

- QI, as a number per se, is probably not meaningful. It's the trend that is relevant.
- QI number can't be compared across companies in the industry, as there are a lot of variables, which won't cancel each other!
- QI cannot be compared across different teams within the same company

Conclusion

Quality is a subjective term. Each type of 'customer' will have their own slant on 'quality' - the accounting department might define quality in terms of profits while an

end-user might define quality as user-friendly and bug-free. Quality Index is a measure of quality.

The objective of calculating QI is to achieve customer satisfaction and also result in improved productivity, reduced errors, reduced training and improved acceptance.

Finally I would like to conclude with following statement by Kitchenham (1989):

“Quality is hard to define, impossible to measure, easy to recognize”

Reference

- Center of software engineering:
<http://www.cse.dcu.ie/essiscope/>
- Software QA and Testing Resource Center: <http://www.softwareqatest.com/>

About the Author

A Capgemini India Test Engineer with over two years of proven test execution and test analysis experience using Mercury (now HP) tools in the Financial Services sector. Highly organized, versatile and results-oriented team player, with an energetic and articulate approach to testing. Ability to acquire new skills within short time scales, adapt to rapidly changing work practices and build and maintain excellent working relationships with colleagues.

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