



# Quality Indicators in Whole Quality

## What Should Be Examined to Understand Quality Factors

### Foundational Article 9 — Third Edition

#### Whole-Quality Institute

##### 1. Why Quality Indicators Matter

The authoritative definition of Quality Indicator is established in the Whole Quality Root Vocabulary Standard (WQI VOC1).

This article explains why Quality Indicators occupy a central methodological position within Whole Quality.

FTA8 established that Quality Factors represent the principal dimensions of Function Realization.

Understanding those dimensions, however, is not sufficient for responsible Quality Determination.

A further methodological question must be answered:

**«What should be examined in order to understand the state of each Quality Factor?»**

The answers become the Quality Indicators.

Quality Indicators do not replace Quality Factors.

They identify particular aspects of those Quality Factors that should be examined.

##### 1.1 Observation Is Necessary

A Quality Factor cannot ordinarily be determined through its name alone.

For example, identifying Cardiovascular Health as a Quality Factor does not by itself explain its current state.

The methodology must establish what aspects of Cardiovascular Health should be examined.

Those aspects become the Quality Indicators.

Accordingly, Whole Quality distinguishes between:

- understanding a Quality Factor; and
- observing the Quality Factor through its Quality Indicators.

This distinction is fundamental.

## 1.2 Recurring Example — Human Body Health

Assume again that the defined Quality Object is:

**«Human Body Health»**

One Quality Factor may be:

**«Cardiovascular Health»**

Whole Quality now asks:

**«What aspects should be examined to understand the state of this Quality Factor?»**

Examples may include:

- heart health;
- blood-vessel health;
- circulation of blood throughout the body;
- regulation of blood pressure;
- tissue perfusion;
- cardiovascular response to physical activity;
- cardiovascular recovery following physical demand.

These are Quality Indicators.

Each represents one aspect of the broader Quality Factor.

Together they provide a more complete understanding of Cardiovascular Health.

## 1.3 One Quality Factor Commonly Requires Multiple Quality Indicators

One aspect is seldom sufficient to represent a broad Quality Factor.

This is not merely a matter of practical convenience.

It is a consequence of the natural multidimensionality of Function Realization.

Because a Quality Factor represents a principal dimension of Function Realization, that dimension commonly is examined through several complementary Quality Indicators.

Each Quality Indicator reveals one aspect.

Together they provide a balanced methodological representation of the Quality Factor.

## 1.4 Quality Indicators Are Not Observation Methods

Whole Quality carefully distinguishes the Quality Indicator from the method used to examine it.

For example:

- Quality Indicator: circulation of blood throughout the body.

- Observation method: clinical examination, physiological testing, imaging, laboratory investigation, or another appropriate examination method.

The Indicator identifies what should be examined.

The observation method establishes how that examination is performed.

These concepts should not be confused.

## 1.5 Preparing for Quality Outcome Criteria

Observation alone does not establish the Quality State.

After a Quality Indicator has been examined, a further methodological question remains:

**«Against what expected state or result should this observation be interpreted?»**

The answer is provided through Quality Outcome Criteria.

Quality Indicators therefore form the methodological bridge between understanding Function Realization through Quality Factors and interpreting observations through Quality Outcome Criteria.

Throughout this progression, one methodological principle remains unchanged:

**«Quality Indicators identify what should be examined. They do not establish the expected condition, determine the Quality State, or independently support a Quality Claim.»**

## 2. Deriving Quality Indicators from Function Realization

Whole Quality does not begin by selecting Quality Indicators from available measurements, existing checklists, commonly used metrics, or familiar professional practice.

Instead, it begins by understanding the defined Quality Object and the way in which that Quality Object realizes its Intended Function.

Quality Indicators are therefore derived, not merely selected.

They are derived through the methodological progression established in the preceding Foundational Articles.

### 2.1 The Derivation Pathway

The derivation pathway may be summarized as follows:

Defined Quality Object

↓

Quality Object Description

↓



Boundaries



Interfaces



Intended Function



Multiple Intended Results



Function Realization



Quality Factors



Quality Indicators

Each methodological step contributes meaning to the next.

The defined Quality Object establishes what is being determined.

Its description establishes its relevant characteristics, composition, relationships, and conditions.

Boundaries establish the scope of the determination.

Interfaces establish the relevant interactions.

The Intended Function and Intended Results explain what the Quality Object is expected to realize.

Function Realization explains how those results are realized.

Quality Factors organize the principal dimensions of Function Realization.

Quality Indicators identify the aspects through which those dimensions become visible.

## 2.2 Recurring Example — Human Body Health

Assume again that the defined Quality Object is:

**«Human Body Health»**

One Quality Factor is:

**«Cardiovascular Health»**

Whole Quality does not begin by asking:

**«Which cardiovascular measurements are already available?»**

Instead, it asks:

**«What aspects of Cardiovascular Health are needed to understand how this Quality Factor contributes to the Function Realization of Human Body Health?»**

The resulting Quality Indicators may include:

- heart health;
- blood-vessel health;
- circulation of blood throughout the body;
- regulation of blood pressure;
- tissue perfusion;
- cardiovascular response to activity;
- cardiovascular recovery after physical demand.

These Indicators are not selected because they are familiar or convenient.

They are derived because they reveal aspects of the declared Quality Factor.

## 2.3 Traceability

Every proposed Quality Indicator should remain traceable to the methodology.

It should be possible to identify:

- the defined Quality Object to which it applies;
- the Quality Factor that it helps help examine;
- the Intended Function and Intended Results that the Quality Factor supports;
- the Boundaries and Interfaces within which it is applicable.

A measurement does not become a Quality Indicator merely because it can be measured.

An observation does not become a Quality Indicator merely because it can be recorded.

A checklist item does not become a Quality Indicator merely because it has been used previously.

A characteristic becomes a Quality Indicator only when it has a defined methodological role in examining a relevant Quality Factor for the defined Quality Object.

## 2.4 Progressive Methodological Resolution

FTA4 introduced the principle of a Methodological Resolution adequate for the intended Quality Determination.

That principle continues here.

At a Methodological Resolution adequate for the intended Quality Determination, broader Quality Factors are examined through progressively more specific Quality Indicators.

The Quality Object does not change.

The Intended Function does not change.

The methodology does not change.

Whole Quality simply reveals additional aspects of the same Function Realization.

## 2.5 Preparing for Quality Outcome Criteria

Deriving Quality Indicators answers one methodological question:

**«What should be examined?»**

It does not yet answer the next question:

**«What state or result should that observation demonstrate?»**

That question belongs to Quality Outcome Criteria.

Accordingly, Quality Indicators prepare the observations that will later be interpreted through one or more Quality Outcome Criteria during responsible Quality Determination.

## 3. Applicable Basis and Conditions of Function Realization

Understanding a Quality Factor is not, by itself, sufficient to derive appropriate Quality Indicators. The Applicable Basis and the relevant conditions of Function Realization help establish what applies to the defined Quality Object and what must be examined.

Before Whole Quality determines what should be examined, it must first understand what is required for the Intended Function to be realized successfully.

These conditions are expressed through Applicable Basis and conditions of Function Realization.

Applicable Basis and conditions of Function Realization provide the methodological bridge between:

- the Intended Function;
- the Intended Results;
- the realization of those Intended Results;
- the Quality Factors representing the principal dimensions of Function Realization;
- and the Quality Indicators through which those dimensions become observable.

### 3.1 Applicable Basis and conditions of Function Realization Express What Must Be Present

A applicable condition of Function Realization identifies something that must be present, maintained, achieved, protected, supported, controlled, coordinated, or preserved for successful Function Realization.

Depending on the defined Quality Object, a applicable condition of Function Realization may concern:

- a condition;
- a capability;
- a relationship;
- a resource;
- a control;
- a protection;
- a support mechanism;
- a behavior;
- a process;
- or another necessary aspect of Function Realization.

These conditions are not observations. They describe aspects on which Function Realization may depend.

They identify what Function Realization depends upon.

### 3.2 Recurring Example — Human Body Health

Assume again that the defined Quality Object is:

**«Human Body Health»**

One Quality Factor is:

**«Cardiovascular Health»**

Before selecting Quality Indicators, Whole Quality asks:

**«What must be present for Cardiovascular Health to contribute successfully to the Intended Function of Human Body Health?»**

Applicable Basis and conditions of Function Realization may include:

- effective pumping of blood by the heart;
- unobstructed circulation through the vascular system;
- adequate delivery of oxygen and nutrients to body tissues;
- maintenance of appropriate blood pressure;
- coordinated regulation by neurological and endocrine systems;
- appropriate adaptation to changing physiological demands.

These are not yet Quality Indicators.

They describe the conditions that Function Realization requires.

Quality Indicators are then derived to examine these relevant conditions.

### 3.3 Applicable Basis and conditions of Function Realization Improve Traceability

Applicable Basis and conditions of Function Realization strengthen the traceability of the methodology.

For every proposed Quality Indicator, it should be possible to identify:

- the applicable condition of Function Realization that the Indicator helps examine;
- the Quality Factor represented by that Requirement;
- the Intended Result supported by that Requirement;
- the Intended Function to which the Intended Result contributes;
- the defined Quality Object whose Quality State is being determined.

This traceability helps ensure that each Quality Indicator has a defined methodological purpose.

### 3.4 Applicable Basis and conditions of Function Realization Do Not Replace Quality Indicators

Applicable Basis and conditions of Function Realization explain what must exist for successful Function Realization.

Quality Indicators identify what should be examined to understand whether those requirements are being realized.

The two concepts therefore perform different methodological roles.

The Applicable Basis and relevant conditions establish what applies. Quality Indicators identify what should be examined.

Indicators make those conditions observable.

### 3.5 Preparing for Quality Outcome Criteria

Once the Quality Indicators have been derived, the methodology has established:

- the defined Quality Object;
- the Intended Function;
- the Intended Results;
- the Applicable Basis and conditions of Function Realization;
- the Quality Factors;
- the Quality Indicators.

The next methodological question becomes:

**«What state or result should each Quality Indicator demonstrate for the relevant applicable condition of Function Realization to be considered realized within the declared Context?»**

That question leads directly to Quality Outcome Criteria, which establish the expected states or results against which the observations associated with each Quality Indicator are interpreted.

## 4. Failure-Mode Families as a Methodological Completeness Check

Whole Quality derives Quality Indicators from the defined Quality Object and the logic of Function Realization.

However, deriving Indicators is not sufficient by itself.

The methodology should also examine whether the proposed Indicator set provides adequate visibility over the principal ways in which Function Realization may become weakened, degraded, interrupted, distorted, uncertain, or lost.

Whole Quality addresses this question through Failure-Mode Families.

Failure-Mode Families do not independently create Quality Factors or Quality Indicators.

They provide a methodological completeness check.

#### 4.1 Why Completeness Matters

A proposed Indicator set may appear comprehensive while still failing to reveal important departures from Function Realization.

For example, the methodology may adequately observe successful operation while overlooking:

- gradual degradation;
- instability;
- interruption;
- deterioration;
- incorrect conditions;
- uncertainty;
- boundary-related failures;
- interface-related failures;
- unintended interactions.

A Quality Determination based upon such an incomplete Indicator set may therefore provide an incomplete understanding of the defined Quality Object.

#### 4.2 Recurring Example — Human Body Health

Assume again that the defined Quality Object is:

##### **«Human Body Health»**

One Quality Factor is:

##### **«Cardiovascular Health»**

Suppose that the proposed Quality Indicators include:

- heart health;
- circulation of blood throughout the body;
- blood-pressure regulation.

These Indicators may reveal many important aspects of Cardiovascular Health.

However, Whole Quality should also ask:

##### **«Can this Indicator set reveal meaningful departure from successful Function Realization?»**

For example, can it reveal:

- progressive deterioration?
- instability?

- interruption?
- inadequate adaptation during physical activity?
- impaired recovery?
- uncertainty due to insufficient information?

If important forms of departure remain invisible, additional Indicators may be required.

#### 4.3 Failure-Mode Families Do Not Determine the Indicators

Failure-Mode Families should not be treated as another list of Quality Indicators.

They serve a different methodological purpose.

Quality Indicators are derived from Function Realization.

Failure-Mode Families then help evaluate whether those Indicators provide sufficient visibility across the principal ways in which Function Realization may depart from its expected realization.

Thus:

- Function Realization determines what should become observable.
- Failure-Mode Families help determine whether the observation architecture is sufficiently complete.

#### 4.4 Completeness Supports Responsible Quality Determination

The objective of this review is not to maximize the number of Indicators.

The objective is to achieve sufficient methodological visibility.

An unnecessarily large Indicator set may become difficult to apply.

An incomplete Indicator set may overlook important aspects of Function Realization.

Whole Quality therefore seeks an appropriate methodological balance.

Completeness is achieved not by quantity alone, but by ensuring that the selected Indicators provide sufficient visibility over both successful Function Realization and its meaningful departures.

#### 4.5 Preparing for Interpretation

At this stage, the methodology has established:

- the defined Quality Object;
- the Intended Function;
- the Intended Results;
- the Applicable Basis and conditions of Function Realization;
- the Quality Factors;
- the Quality Indicators;
- the methodological completeness of the proposed Indicator set.

The next methodological question is no longer:

## «What should be examined?»

It becomes:

## «Against what expected state or result should each observed Quality Indicator be interpreted?»

That question is answered through Quality Outcome Criteria, which provide the interpretive basis for responsible Quality Determination.

### 5. A Quality Indicator Should Reveal Both Function Realization and Meaningful Departure

The purpose of a Quality Indicator is not merely to confirm that Function Realization appears satisfactory.

Its methodological purpose is broader.

A properly derived Quality Indicator should help make visible both:

- successful Function Realization; and
- meaningful departure from Function Realization.

This principle supports responsible Quality Determination.

If a Quality Indicator can reveal only satisfactory realization, it provides only partial methodological visibility.

#### 5.1 Observation Should Remain Methodologically Neutral

A Quality Indicator should identify what should be examined.

It should not embed the expected judgment within its own wording.

For example:

Quality Indicator

- circulation of blood throughout the body.

not

- adequate circulation of blood throughout the body.

Similarly:

Quality Indicator

- communication accessibility.

not

- effective communication accessibility.

The expected condition belongs to the Quality Outcome Criterion, not to the Quality Indicator itself.

Maintaining this distinction preserves the separate methodological roles of:

- the Quality Indicator;
- the Quality Outcome Criterion;
- the observed information;
- the subsequent interpretation.

## 5.2 Recurring Example — Human Body Health

Assume again that the defined Quality Object is:

### «Human Body Health»

One Quality Factor is:

### «Cardiovascular Health»

One Quality Indicator may be:

### «Circulation of blood throughout the body»

The methodological purpose of this Indicator is not merely to confirm satisfactory circulation.

It should also support recognition of:

- reduced circulation;
- unstable circulation;
- interrupted circulation;
- progressively deteriorating circulation;
- uncertain circulation where available information is insufficient;
- restoration of circulation during recovery.

Thus the same Quality Indicator supports observation across different states of Function Realization.

## 5.3 Observation Is Different from Interpretation

Observation identifies what has been found.

Interpretation determines what those observations mean.

Whole Quality therefore separates:

- the Quality Indicator;
- the observation;
- the Quality Outcome Criterion;
- the interpretation.

The observation may remain the same.

Different Contexts, Boundaries, or applicable Quality Outcome Criteria may legitimately lead to different interpretations.

Maintaining this separation improves methodological transparency and traceability.

#### 5.4 Visibility Across Time

Some aspects of Function Realization cannot be understood through a single observation.

Where appropriate, a Quality Indicator may require observation:

- at different points in physical time;
- throughout different Lifecycle stages;
- before and after an intervention;
- during changing operating conditions;
- during deterioration;
- during recovery.

This does not change the Quality Indicator.

It changes the observational basis needed to understand its state within the declared Context.

#### 5.5 Preparing for Quality Outcome Criteria

By this stage, Whole Quality has established:

- what should be examined;
- why it should be examined;
- how the proposed Indicator architecture supports sufficient methodological visibility.

The remaining methodological question is:

**«What state or result is expected for each Quality Indicator within the declared Context?»**

That question is answered through Quality Outcome Criteria.

Quality Outcome Criteria do not identify what should be examined.

They establish the expected state or result against which the observations associated with each Quality Indicator are interpreted during responsible Quality Determination.

#### 6. Forms of Quality Indicators

Whole Quality establishes one common methodological role for Quality Indicators.

It does not require every Quality Indicator to have the same form.

The appropriate form depends upon the defined Quality Object, the relevant Quality Factor, the nature of Function Realization, the established Boundaries and Interfaces, and the purpose of the Quality Determination.

The methodological role remains stable.

The form of observation may differ.

## 6.1 Quality Indicators May Take Different Forms

Depending upon the defined Quality Object, a Quality Indicator may concern:

- a condition;
- a characteristic;
- a capability;
- a relationship;
- a behavior;
- a process;
- an interaction;
- a result;
- a pattern;
- a trend;
- a frequency;
- a duration;
- a change over physical time;
- a documented state;
- another aspect of the relevant Quality Factor.

These different forms do not change the methodological role of the Quality Indicator.

Each identifies what should be examined.

## 6.2 Recurring Example — Human Body Health

Assume again that the defined Quality Object is:

### «Human Body Health»

Different Quality Indicators may take different forms.

For example:

- Heart health may be observed through structural and functional characteristics.
- Circulation of blood throughout the body may be observed as a physiological condition.
- Cardiovascular response to physical activity may be observed as a functional capability.
- Recovery of cardiovascular function after exertion may be observed as a change over physical time.
- Coordination between cardiovascular and respiratory function may be observed as an interaction between body systems.

Although their forms differ, each remains a Quality Indicator because each identifies an aspect of the same Quality Factor.

## 6.3 Quantitative and Qualitative Quality Indicators

Some Quality Indicators are primarily quantitative.

Others are primarily qualitative.

Many require both forms.

Whole Quality does not assign methodological superiority to either approach.

The appropriate form depends upon what must become observable for responsible Quality Determination.

Accordingly, quantitative and qualitative observations are complementary rather than competing.

#### 6.4 Direct and Indirect Quality Indicators

Some Quality Indicators examine the relevant aspect of Function Realization directly.

Others examine related aspects that help reveal the state of the relevant Quality Factor.

Both may contribute to responsible Quality Determination.

However, indirect Indicators should always remain methodologically traceable to the Quality Factor they help help examine.

#### 6.5 Stability of the Quality Indicator

The Quality Indicator itself normally remains conceptually stable.

What changes are:

- the observations;
- the observed values or conditions;
- the Context;
- the applicable Quality Outcome Criteria;
- the resulting interpretation.

This distinction is important.

Whole Quality seeks stable methodological concepts while recognizing that observations may legitimately differ across Quality Objects, Contexts, physical time, Lifecycle stages, operating conditions, and populations.

#### 6.6 Preparing for Context

The same Quality Indicator may appear in different application domains.

Its methodological role remains unchanged.

Its practical meaning depends upon the Context in which it is interpreted.

This principle prepares the next stage of the methodology.

Quality Indicators identify what should be examined.

The applicable Quality Outcome Criteria establish the expected state or result for that Quality Indicator within the declared Context.

Thus, the methodology preserves one stable architecture while allowing appropriate variation in practical application across infrastructure, manufacturing, health, support services, environmental systems, management systems, and other Quality Objects.

## 7. Quality Indicators Across Application Domains

Whole Quality establishes one common methodological role for Quality Indicators across application domains.

Each Quality Indicator identifies an aspect of a Quality Factor through which Function Realization becomes visible.

The specific Indicators differ because the defined Quality Objects, Intended Functions, Boundaries, Interfaces, and Applicable Basis and conditions of Function Realization differ.

Universality belongs to the methodology. Specificity belongs to the defined Quality Object.

### 7.1 Representative Applications

For infrastructure Quality Objects, Indicators may concern structural condition, containment, operational capability, monitoring performance, protection systems, maintenance condition, environmental compatibility, and emergency preparedness.

For support-service Quality Objects, Indicators may concern communication, continuity, participation, dignity and autonomy, safeguarding, responsiveness, coordination, and accessibility.

For Human Body Health, Indicators may concern heart health, circulation, respiratory function, neurological function, mobility, endurance, pain during activity, and recovery after physical demand.

In each application, the Indicator identifies what should be examined. It does not establish whether the observed state satisfies the applicable Quality Outcome Criteria.

### 7.2 Stable Role, Context-Specific Meaning

A Quality Indicator may remain conceptually stable while its observations, values, conditions, and significance differ across Contexts, physical time, Lifecycle stages, operating conditions, persons, populations, and locations.

The applicable Quality Outcome Criteria establish the expected states or results through which the Indicator is interpreted within the declared Context.

## 8. Preparing for Quality Outcome Criteria

FTA9 establishes what should be examined through Quality Indicators. It does not establish the expected state or result.

A Quality Indicator may be interpreted through one or more applicable Quality Outcome Criteria because the aspect represented by the Indicator may require complementary expected states or results.

For example, the Quality Indicator Heart Health may require interpretation through complementary criteria concerning pumping function, rhythm, conduction, valve function, myocardial perfusion, structural condition, response to physiological demand, and recovery.

The need for multiple criteria exists before Context-specific refinement. Context then determines which criteria apply, how they are formulated, and how they are interpreted within the declared circumstances.

FTA10 develops this interpretive stage in detail, including the organization of Quality Outcome Criteria, their Context-specific refinement, their supporting Reference Layers, and their role in preparing responsible Quality Determination.

**«Quality Indicators make Quality Factors observable. Multiple Quality Outcome Criteria make each Quality Indicator responsibly interpretable.»**

## 9. Methodological Sources and Related Work

Whole Quality treats the Quality Indicator as the aspect of a Quality Factor that identifies what should be examined. This is distinct from the method used to observe, measure, test, or otherwise obtain Evidence.

Established measurement and systems-engineering literature provides related methodological context. ISO/IEC/IEEE 15939 distinguishes information needs, measures, measurement methods, and analysis, while failure-analysis practice such as IEC 60812 provides a structured basis for considering ways in which realization may degrade or fail [1][2]. These sources do not define the WQI Root Concepts.

The WQI contribution in this article is the cross-domain placement of Quality Indicators between Quality Factors and Quality Outcome Criteria, together with traceability to Function Realization and the use of Failure-Mode Families as a methodological completeness check. WQI\_VOC1 remains authoritative for the controlled definitions.

### References

- [1] ISO/IEC/IEEE 15939:2017, Systems and software engineering — Measurement process.
- [2] IEC 60812:2018, Failure modes and effects analysis (FMEA and FMECA).

## Conclusion

Quality Indicators occupy a distinct methodological position within Whole Quality.

They are derived from the defined Quality Object and the logic of Function Realization. They identify what should be examined, support visibility of both realization and meaningful departure, and remain traceable to the relevant Quality Factor, Applicable Basis and conditions of Function Realization, Intended Results, Boundaries, and Interfaces.

Quality Indicators are not observation methods, observed values, Quality Outcome Criteria, Evidence, findings, Quality States, or Quality Claims. Each of these elements performs a separate methodological role.

FTA9 therefore prepares the transition from methodological understanding to observation and from observation to interpretation.

The stabilized methodological relationships are:

An Intended Function may be realized through multiple Intended Results.

A Quality Factor may be examined through multiple Quality Indicators.

A Quality Indicator may be interpreted through one or more applicable Quality Outcome Criteria because the aspect represented by the Indicator may require complementary expected states or results.

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