Boundaries in Whole Quality

Scale, Object Nature, Interfaces, and Quality Claims

Foundational Article 7

Whole-Quality Institute

Quality cannot be determined responsibly if the boundary of the claim is unclear.

A quality claim may sound strong. It may say that a service is good, an infrastructure system is safe, a product conforms, a person's condition is stable, or a management system is effective. But without a boundary, the claim remains vague.

What object is being discussed?
What part of the object is included?
What part is excluded?
What time period is covered?
What lifecycle stage is covered?
What evidence supports the claim?
What uncertainty remains outside the claim?

Whole-Quality uses boundaries because quality is always quality of something, within some defined scope.

A boundary is the stated separation between two sides of a quality interpretation. It shows what is inside the quality object, quality determination, or quality claim, and what is outside it.

Boundaries are not secondary details. They are part of the method that makes quality visible.

Without boundaries, quality claims can become overstated, fragmented, confusing, or unsupported by evidence.

1. Why Boundaries Matter

Whole-Quality begins with the Quality Object.

But the Quality Object cannot be understood clearly unless its boundaries are defined.

A boundary helps answer:

What is being evaluated?
Where does the object begin and end?
What functions are included?
What conditions are included?
What interfaces matter?
What evidence applies?
What evidence does not apply?
What can be claimed?
What cannot be claimed?

This is important because real objects are often complex.

An infrastructure system may include pipes, stations, valves, pressure-control systems, monitoring systems, protective zones, environmental conditions, operators, documents, and emergency interfaces.

A support service may include the person, support worker, provider, family, funder, plan, documentation, daily setting, communication, safety conditions, and actual lived experience.

A human health quality object may include body systems, mental state, function, symptoms, environment, medical care, medications, support, recovery, work capacity, and social participation.

A management system may include processes, responsibilities, information flows, leadership, supplier control, corrective action, risk control, documentation, and evidence of performance.

In each case, quality cannot be determined by looking at an undefined whole. The boundary must be clear enough to make the quality claim meaningful.

Boundaries make quality claims honest.

They do not make Whole Quality smaller. They make Whole Quality responsible.

2. Boundary Is Not the Same as Object

The Quality Object is the object whose quality is being determined.

The boundary defines the scope and separation used to interpret that object's quality state.

These are related, but not identical.

For example, the Quality Object may be a natural gas pipeline transportation system. But the boundary of a specific quality claim may cover only one pipeline segment, one station, one repair project, one lifecycle stage, one pressure regime, one operating period, or one public-safety interface.

The Quality Object may be a support service. But the boundary of the claim may cover one service stream, one person's experience, one setting, one provider arrangement, one support activity, one documentation period, or one employment-support stage.

The Quality Object may be human health. But the boundary of the claim may cover whole-person health, one body system, post-injury medical condition, social functioning after disability, rehabilitation progress, or work-capacity limitations.

The boundary shows how much of the Quality Object is actually being interpreted.

A broad Quality Object may support many narrower Quality Claims.

A narrow Quality Claim should not pretend to describe the whole object unless the evidence and boundary support that broader claim.

3. Boundaries at Different Scales

Boundaries exist at different scales.

A boundary may define a very large object, such as an energy infrastructure system, a healthcare system, a national support-service system, or an organization.

A boundary may also define a smaller object, such as a pipeline section, a compressor station, a weld, a valve, a repair activity, a support interaction, a care episode, a body system, a cell, or a DNA region.

Whole-Quality does not treat scale as a reason to abandon the method.

The same method applies:

Quality Object → Boundaries → Interfaces → Intended Functions and Results → Failure-Mode Families → Quality Factors → Indicators → Quality Outcome Criteria → Evidence → Quality Claim

But the meaning of the boundary changes with scale.

At a large scale, the boundary may define a system-of-systems.

At a smaller scale, the boundary may define a component, activity, condition, interaction, or time-limited state.

At a micro scale, the boundary may define internal biological, chemical, genetic, or cellular behavior that is only partly visible.

This is why boundary definition is one of the most important steps in Whole-Quality work.

If the scale is wrong, the quality claim may be wrong.

If the boundary is too narrow, the claim may miss important interfaces.

If the boundary is too broad, the evidence may not be sufficient.

If the boundary is unclear, the claim may sound meaningful but remain unsupported.

4. Types of Boundaries in WQI

Boundaries may have different natures.

They may be physical, functional, organizational, lifecycle-based, regulatory, operational, technical, environmental, social, informational, evidence-based, responsibility-based, biological, relational, or claim-scope boundaries.

A physical boundary may define the material limit of an object, such as a pipe wall, casing, building envelope, body surface, organ structure, or equipment component.

A functional boundary may define the function included in the quality claim, such as transportation, pressure control, support, communication, mobility, cognition, or repair.

An organizational boundary may define which organization, department, provider, contractor, or responsible party is included.

A lifecycle boundary may define whether the claim applies to design, construction, commissioning, operation, maintenance, repair, modification, transition, or decommissioning.

A regulatory boundary may define the legal or compliance scope that applies to an object or activity.

An operational boundary may define operating conditions, pressure limits, service conditions, staffing arrangements, or use conditions.

A technical boundary may define design assumptions, technical systems, control systems, materials, or engineering limits.

An environmental boundary may define interaction with soil, water, climate, weather, geotechnical conditions, indoor environment, public space, or ecological conditions.

A social boundary may define relations among people, roles, services, families, communities, institutions, or support systems.

An informational boundary may define what data, records, documents, observations, or communications are included.

An evidence boundary may define what evidence supports the claim and what evidence is missing, outdated, uncertain, or outside scope.

A responsibility boundary may define who is responsible for action, decision, control, verification, support, maintenance, or response.

A biological boundary may define organs, systems, cells, tissues, membranes, genetic regions, immune barriers, metabolic pathways, or biological interfaces.

A relational boundary may define the interaction space between people, such as support worker and supported person, clinician and patient, family member and person receiving care, worker and employer, or person and community.

A claim-scope boundary defines the limits of what is being claimed.

These boundary types may overlap.

For example, a pipeline pressure boundary is physical, technical, functional, operational, safety-related, and evidence-dependent.

A support-service boundary may be functional, organizational, social, ethical, documentation-based, funding-related, and lived-experience-based.

A human health boundary may be biological, functional, social, emotional, clinical, environmental, and evidence-limited at the same time.

Whole-Quality uses boundary language because quality objects are not only physical. They may also be living, social, organizational, relational, informational, or mixed.

5. External and Internal Boundaries

Boundaries may be external or internal.

External boundaries separate the Quality Object from something outside it.

Internal boundaries exist inside the Quality Object, where subsystems, functions, processes, responsibilities, lifecycle stages, or biological systems interact.

For infrastructure, external boundaries may include the relation between an asset and soil, climate, public space, surrounding communities, connected systems, regulators, contractors, or emergency responders.

Internal boundaries may include welds, valves, coatings, control systems, monitoring systems, station interfaces, lifecycle handoffs, documentation systems, and operational decision processes.

For support services, external boundaries may include the relation between the service and the person, family, employer, funder, regulator, community, housing setting, or healthcare provider.

Internal boundaries may include handoffs among staff, documentation and actual support, service planning and service delivery, supervision and direct work, funding authorization and real support need, or safety control and autonomy.

For human health, external boundaries may include the person's interaction with care settings, family, work, food, housing, medication access, environmental exposure, support services, and social conditions.

Internal boundaries may include body systems, organs, tissues, cells, nervous networks, immune response, endocrine regulation, mental state and physical function, pain and mobility, cognition and emotion, or medication and body systems.

For human beings, internal boundaries are not limited to organs or body systems. They also include cognitive, emotional, functional, dignity-related, autonomy-related, and lived-experience states. These internal states interact with one another and form internal interfaces inside the person.

In support services, these internal interfaces may also interact with the internal states of another person, creating a human-to-human interface that must be understood as part of service quality.

Internal boundaries are especially important because whole quality can fail between parts even when the parts appear acceptable separately.

A component may conform, but the system may fail.

A service task may be completed, but the person's dignity or participation may not be supported.

A medical test may be normal, but the person's functional condition may remain unstable.

A process may be documented, but the management system may fail at the handoff.

This is why Whole-Quality asks not only what parts exist, but how boundaries and interfaces affect function realization.

6. Boundary and Interface Are Different

A boundary separates.

An interface interacts.

This distinction is central to WQI.

A boundary identifies the separation between two sides of a quality interpretation.

An interface is the quality-relevant interaction at, across, or within that boundary.

For example, the pipe wall may be a boundary. The interaction between the pipe wall, internal gas, external soil, coating, corrosion protection, pressure, and environment is an interface condition.

A service plan may create a boundary between authorized service and non-authorized service. The interaction between the plan, the person's real life, the support worker, documentation, and changing needs is an interface condition.

The skin may be a biological boundary. The interaction between skin, immune response, microbes, injury, temperature, touch, pain, and environment is an interface condition.

A department may be an organizational boundary. The handoff of information, responsibility, timing, and decision-making between departments is an interface condition.

In a support relationship, the boundary may separate one person's role, autonomy, privacy, responsibility, and need from another person's role, duty, judgment, emotion,

and action. The interface is the actual human interaction where support, misunderstanding, dignity, control, protection, trust, or harm may occur.

Quality often fails not because the boundary exists, but because the interface is poorly understood, poorly controlled, or poorly evidenced.

A boundary without interface analysis can make quality look simpler than it is.

An interface without boundary definition can make quality analysis vague.

Whole-Quality needs both.

7. Designed, Inferred, Discovered, and Verified Boundaries

The nature of a boundary depends on the nature of the object.

In human-created objects, many boundaries are designed.

In biological objects, many boundaries are discovered.

In complex natural or subsurface systems, some boundaries are inferred before they are directly verified.

This distinction is important.

A designed boundary is created intentionally through human decision, design, construction, manufacturing, documentation, regulation, or operating control.

An inferred boundary is interpreted from indirect evidence, such as models, assumptions, measurements, simulations, seismic data, historical records, or incomplete observations.

A discovered boundary is found through observation, testing, investigation, science, clinical evidence, drilling, inspection, monitoring, or lived experience.

A verified boundary is supported by evidence showing that the boundary exists, functions, and remains effective within the relevant conditions of the claim.

In infrastructure, people design, manufacture, construct, document, inspect, and regulate many boundaries. A pipeline, station, valve, pressure boundary, protective zone, right-of-way, operating limit, and lifecycle handoff may be intentionally created by human decisions.

But even in infrastructure, not all boundaries are equally visible or verified.

Some boundaries are designed on paper before they are realized in physical conditions.

Some boundaries are inferred from indirect evidence before they are confirmed.

Some boundaries must be verified during construction, commissioning, inspection, operation, testing, or monitoring.

Some boundaries are hidden, especially in subsurface infrastructure.

For example, in a subsurface well, casing and cementing may be designed as barriers and boundaries. But the actual realized boundary exists in a hidden geological environment. It may require evidence of cement placement, bonding, isolation, pressure behavior, compatibility, and lifecycle performance. The designed boundary is not automatically the verified boundary.

The same caution applies to geological interpretation. A subsurface boundary inferred from seismic interpretation, modeling, or indirect measurement may be useful, but it is not the same as a boundary discovered or verified through drilling, testing, or long-term performance evidence.

In biological objects, boundaries are usually not designed by humans.

They are discovered through observation, science, imaging, testing, clinical evidence, biological knowledge, and lived experience.

A cell membrane, immune barrier, organ boundary, neural pathway, hormonal feedback loop, genetic function, or body-system interface may exist before we understand it. The boundary is real, but our knowledge of it may be partial.

This creates a major WQI distinction:

Human-created objects often have assigned or designed boundaries.

Subsurface and complex natural systems often include inferred, discovered, and partially verified boundaries.

Biologically based objects often have discovered or inferred boundaries.

All types require evidence.

Designed boundaries require evidence that they were realized and remain effective.

Inferred boundaries require evidence limits to be stated clearly.

Discovered boundaries require evidence that they are understood well enough to support the quality claim.

Verified boundaries require evidence that the boundary exists and performs within the conditions being claimed.

8. Boundaries and Function Realization

Boundaries are not only lines around objects.

They are part of function realization.

A function can only be understood if we know the boundary within which it is expected to occur.

A pipeline transports gas within pressure, material, route, environmental, operational, public-safety, and connected-system boundaries.

An underground gas storage facility stores, withdraws, and transfers gas within reservoir or cavern boundaries, well-integrity boundaries, pressure boundaries, injection and withdrawal limits, cushion-gas conditions, monitoring boundaries, and connected-system interfaces.

A support service supports a person within boundaries of role, responsibility, consent, funding, setting, safety, autonomy, documentation, and actual need.

A human body system realizes function within biological boundaries, internal interfaces, environmental conditions, and life-stage conditions.

A management system realizes function within organizational boundaries, process boundaries, responsibility boundaries, information boundaries, and evidence boundaries.

If the boundary is wrong, the function-realization analysis becomes wrong.

For example, if a support service claim includes only task completion but excludes the person’s actual experience, the boundary is too narrow for a claim about support quality.

If an infrastructure claim includes only component conformity but excludes system interfaces and operating conditions, the boundary is too narrow for a claim about system quality.

If a subsurface infrastructure claim treats inferred geological boundaries as fully verified boundaries, the claim may be stronger than the evidence permits.

If a human health claim includes only one test result but excludes symptoms, function, medication effects, social conditions, or recovery context, the boundary may be too narrow for a whole-person quality claim.

A correct boundary does not need to include everything. But it must match the claim being made.

The boundary must be wide enough to support the function being claimed, and narrow enough to be supported by evidence.

9. Boundaries and Failure-Mode Families

Failure modes often reveal boundary problems.

A failure may occur because a boundary was missing, unclear, unstable, hidden, crossed, ignored, inferred incorrectly, or not controlled.

In infrastructure, failures may arise when the boundary between asset and environment is poorly understood, when right-of-way or protective zones are not controlled, when construction assumptions do not match actual field conditions, when monitoring boundaries do not cover relevant risks, or when handoffs between lifecycle stages lose essential information.

In subsurface infrastructure, failures may arise when geological boundaries, pressure boundaries, reservoir boundaries, caprock boundaries, cement boundaries, casing boundaries, or wellbore interfaces are assumed, designed, or inferred but not adequately verified under actual conditions.

In support services, failures may arise when responsibility boundaries are unclear, when the service boundary does not match the person's needs, when the boundary between support and control is crossed, when documentation does not reflect real support, or when funding boundaries distort the intended function of the service.

In human health, failures may arise when clinical boundaries separate body systems too rigidly, when mental and physical conditions are treated as unrelated, when work function is separated from medical condition, when medication effects are not connected to functional state, or when social conditions are excluded from health interpretation.

In management systems, failures may arise when departments, processes, documents, records, corrective actions, and responsibilities are defined separately but their interfaces are not controlled.

For this reason, WQI uses failure-mode families to test whether the boundary structure is sufficient.

If a recurring failure occurs at an unrecognized boundary, the boundary must become visible.

If a recurring failure occurs across an interface, the interface must become visible.

If evidence cannot support a claim because the boundary is unclear or only inferred, the claim must be narrowed, qualified, or left uncertain.

10. Boundaries and Evidence

Evidence is always boundary-limited.

No evidence supports every possible claim.

An inspection may support a claim about one component, but not the whole system.

A pressure test may support a claim about one tested condition, but not every future operating condition.

A seismic interpretation may support a geological model, but not necessarily a fully verified subsurface boundary.

A medical test may support a claim about one biological condition, but not the person's whole health state.

A service record may support a claim that an activity occurred, but not necessarily that the person's dignity, safety, autonomy, or participation was supported.

A certification audit may support a claim about a management system within the audit scope, but not every activity, site, person, supplier, outcome, or future condition.

Evidence must therefore be interpreted within its boundary.

Whole-Quality asks:

What evidence exists?
What object does it relate to?

What boundary does it cover?
What time period does it cover?
What condition does it describe?
What interface does it make visible?
Is the boundary designed, inferred, discovered, realized, or verified?
What uncertainty remains?
What claim can it support?
What claim can it not support?

This is one of the most important protections against overstated quality claims.

A narrow evidence base may be valid, but only for a narrow claim.

A broad claim requires broad, sufficient, and relevant evidence.

Where evidence is limited, the Quality State may need to be described as uncertain, partially evidenced, insufficiently evidenced, or valid only within a declared boundary.

11. Boundaries and Quality Claims

Every Quality Claim has a boundary.

Sometimes the boundary is clearly stated. Sometimes it is only implied. Sometimes it is hidden.

WQI requires the boundary to be visible.

A Quality Claim should clearly identify:

the Quality Object;
the scope of the object included;
the lifecycle stage or time period;
the relevant functions and results;
the boundaries and interfaces considered;
the Quality Factors and Indicators applied;
the Quality Outcome Criteria used;
the evidence supporting the claim;
the evidence limitations;
the uncertainty that remains;
and the party making the claim.

A claim without a boundary may be misleading even when some evidence exists.

For example:

“This pipeline is safe” is too broad unless the boundary, evidence, conditions, and claim scope are clear.

“This underground storage facility is reliable” is too broad unless the reservoir or cavern boundary, well integrity, pressure behavior, injection and withdrawal conditions, monitoring evidence, and uncertainty are clear.

“This support service is person-centered” is too broad unless the actual service experience, person’s needs, dignity, autonomy, participation, safety, and evidence are included.

“This person is medically stable” may be too broad unless the medical condition, time period, symptoms, function, risks, treatment context, and evidence are clear.

“This management system is effective” is too broad unless the processes, sites, functions, responsibilities, results, and evidence scope are clear.

Whole-Quality does not prohibit broad claims. But broad claims require broad support.

If the evidence supports only a narrower claim, the claim should be narrowed.

This is not weakness. It is quality honesty.

12. Boundary Visibility Differs by Object Nature

Different objects have different boundary visibility.

In many human-created objects, boundaries are more visible because they are designed, documented, owned, regulated, or physically inspectable.

But even human-created objects may contain hidden or uncertain boundaries. Subsurface infrastructure, software systems, long supply chains, complex organizations, and social services may all include boundaries that are difficult to see.

In subsurface systems, boundaries may be especially difficult to verify because the object is hidden, pressure-dependent, geologically complex, and only partly observable. Geological layers, faults, fractures, caprock behavior, reservoir limits, cement placement, casing integrity, fluid migration pathways, and pressure communication may be inferred from indirect evidence, but actual conditions may differ from interpretation.

In biological objects, boundary visibility is often more limited. Many important boundaries are internal, microscopic, dynamic, adaptive, or only indirectly observable.

In human beings, boundaries are even more complex because the person is biological, conscious, social, emotional, moral, relational, and meaning-making.

A human being has external boundaries, such as body surface, personal space, privacy, legal identity, dignity, consent, communication, social role, and relationship with the surrounding environment.

A human being also has internal boundaries. These include biological systems, cognitive states, emotional states, memory, pain, fatigue, trauma, autonomy, values, motivation, functional capacity, self-understanding, and lived experience.

These internal states are not isolated. They interact with one another. Pain may affect mood. Fatigue may affect cognition. Fear may affect communication. Medication may affect function. Social stress may affect physical condition. A person's internal quality state is therefore shaped by internal boundaries and internal interfaces.

For this reason, a single human being may be analyzed as one Quality Object because the person has an integrated biological, conscious, social, and functional unity. But that unity is not simple. It contains many internal states, internal boundaries, and internal interfaces.

In support services, care, healthcare, education, employment support, and family assistance, the boundary structure becomes even more complex. The internal states of one human being interact with the internal states of another human being.

For example, a supported person may experience fatigue, pain, confusion, fear, dependence, hope, resistance, need for dignity, or need for autonomy. A support worker or caregiver may bring skill, attention, fatigue, stress, assumptions, emotional state, role understanding, documentation duties, and organizational pressure.

Quality is affected not only by what each person does separately. Quality is also affected by what happens at the interface between them.

Two human beings together do not automatically become one Quality Object. They may become one quality object only when there is a shared function, defined relationship, role structure, responsibility boundary, or social-functional system.

A caregiver–recipient relationship, support worker–supported person relationship, clinician–patient relationship, family-care relationship, or employment-support relationship may therefore be analyzed as a dyadic quality object when the relationship has an intended function and a defined quality-relevant boundary.

This dyadic quality object has external boundaries with the wider service system, family, organization, funder, regulator, workplace, community, and environment. It also has internal relational interfaces between the two people.

These human-to-human interfaces may support function realization, but they may also distort it. Support may become control. Protection may reduce autonomy. Documentation may replace real understanding. Assistance may violate dignity. Professional distance may become neglect. Emotional closeness may cross role boundaries. Funding limits may distort real need.

Therefore, in human service quality, boundary analysis must include three connected levels:

the internal boundaries of each person;
the relational interface between the people;
and the external boundaries of the dyad with the wider service system.

Without this analysis, a service may appear complete on paper while failing in the real human interface where quality is actually experienced.

The nature of the object determines which boundaries matter.

Whole-Quality uses one method, but it does not flatten all objects into the same boundary structure.

13. Boundary Change Across Time

Boundaries are not always fixed.

Some boundaries change over time.

Infrastructure boundaries may change through aging, corrosion, repair, modification, environmental movement, land-use change, operating conditions, repurposing, or loss of documentation.

Subsurface boundaries may change or appear to change through pressure cycling, depletion, injection, withdrawal, compaction, thermal effects, fluid migration, well aging, cement degradation, caprock stress, or improved evidence.

Support-service boundaries may change when a person’s needs change, when family circumstances change, when funding changes, when employment changes, when health changes, or when the support setting changes.

Human health boundaries may change through growth, aging, injury, illness, recovery, treatment, disability, adaptation, stress, or environmental exposure.

Management-system boundaries may change through organizational restructuring, outsourcing, new technology, new suppliers, new products, new regulations, or new risks.

A boundary that was valid at one time may become incomplete later.

For this reason, Quality Claims are temporal.

A Quality Claim should be connected to a point in time, a period of time, or a lifecycle stage.

Boundary review is necessary when the object, environment, function, risk, evidence, or intended result changes.

14. Boundary Errors

Many quality problems begin with boundary errors.

A boundary may be too narrow. Important functions, interfaces, risks, people, evidence, or consequences are excluded.

A boundary may be too broad. The claim covers more than the evidence supports.

A boundary may be unclear. People do not know what is included, excluded, or controlled.

A boundary may be artificial. It follows administrative convenience rather than the real function of the object.

A boundary may be fragmented. Different parts are evaluated separately, but the whole object remains unclear.

A boundary may be outdated. It no longer reflects the object's current condition, environment, or use.

A boundary may be hidden. Important internal interfaces are not recognized.

A boundary may be inferred but treated as verified.

A boundary may be designed but not realized.

A boundary may be crossed without control. Responsibility, risk, information, pressure, material, or function moves across the boundary without evidence or accountability.

Boundary errors can lead to weak Quality Factors, wrong Indicators, poor Quality Outcome Criteria, and misleading Quality Claims.

This is why WQI treats boundary definition as a structural step, not a minor description.

15. Boundary Discipline in Whole-Quality Work

Boundary discipline means that WQI does not allow the quality claim to float freely.

The claim must be tied to the object, function, evidence, and scope.

Boundary discipline asks:

Is the Quality Object defined?
Is the claim boundary clear?
Are internal and external boundaries identified?
Are key interfaces visible?
Does the boundary match the intended function?
Is the boundary designed, inferred, discovered, realized, or verified?
Do failure-mode families reveal missing boundaries?
Does the evidence support the full boundary of the claim?
Are uncertainties stated?
Has the boundary changed over time?
Is the claim too broad, too narrow, or properly bounded?

This discipline helps prevent overclaiming.

It also helps prevent underclaiming.

A well-defined boundary can show that a claim is valid within a specific scope even when broader uncertainty remains.

For example, WQI may determine that one component, one service episode, one lifecycle stage, one body-system condition, or one tested operating condition is sufficiently evidenced, while the broader object remains uncertain.

This is useful because quality determination does not always need to answer everything at once.

It needs to answer responsibly within a declared boundary.

Conclusion

Boundaries are one of the core tools of Whole-Quality thinking.

A boundary shows what is inside a quality interpretation and what is outside it.

It connects the Quality Object to its function, interfaces, failure-mode families, evidence, and Quality Claim.

Boundaries exist at different scales. They may apply to whole systems, subsystems, activities, components, lifecycle stages, relationships, body systems, cells, information flows, subsurface zones, or operating states.

Boundaries also differ by the nature of the object.

Human-created objects often have designed boundaries.

Subsurface and complex natural systems often include inferred, discovered, and partially verified boundaries.

Biological objects often have discovered boundaries.

Human beings have biological, conscious, social, relational, dignity-related, and lived-experience boundaries.

Subsurface and complex systems may have designed or inferred boundaries that require evidence before they can be treated as realized or verified boundaries.

In infrastructure, this means that physical components, operating limits, pressure boundaries, environmental interfaces, and connected-system boundaries must be interpreted with evidence.

In underground and subsurface infrastructure, it also means that geological, reservoir, cavern, cement, casing, and pressure boundaries may remain uncertain unless they are supported by sufficient verification.

In human services, care, healthcare, employment support, family assistance, and other relational systems, boundaries become especially complex because the internal states of one human being interact with the internal states of another human being.

A support relationship may therefore have three connected boundary levels: the internal boundaries of each person, the relational interface between them, and the external boundaries of the dyad with the surrounding service system.

This is why a service may appear complete on paper while failing at the human interface where support, dignity, autonomy, protection, understanding, and function realization actually occur.

In Whole Quality, the purpose of defining boundaries is not to reduce reality. It is to make the quality claim responsible.

A boundary does not replace the whole. It helps make the whole visible through the right scope.

Without boundaries, quality claims become vague.

With boundaries, Whole Quality can ask what object is being evaluated, how its function is realized, where failure can occur, what evidence applies, what uncertainty remains, and what claim can be responsibly made.

Boundaries make quality visible.

They make quality claims honest.

They allow WQI to examine objects of different scale and different nature without pretending that all objects are the same.

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appropriately bounded, evidenced, and interpreted within the relevant quality object, field, context, and Reference Layer.