The Question as Closed World: ASIT, the Universe of Discourse, and the Erotetic Foundations of SWARP-3

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Abstract

Three independently developed bodies of work turn out to be facets of a single architecture. The first is the 175-year lineage of the Universe of Discourse (UoD), from Boole's logical boundary to the oscillatory coherence field of the Resonant Stack. The second is Horowitz's 1999 doctoral distillation of TRIZ into two universal sufficient conditions for inventive solutions — the Closed World Condition and the Qualitative Change Condition — published as ASIT. The third is the recent Totality Theorem for question-handling systems, which proves that while the *content* of question space is not recursively closeable, its *treatment* is: four total binary tests partition all well-formed interrogatives into eight mutually exclusive, jointly exhaustive disposal classes. This paper demonstrates that these three results are mutually constitutive. A question is a partition of a Universe of Discourse; the four tests of the Totality Theorem are operationally a UoD-alignment protocol; and the theorem itself satisfies, exactly, Horowitz's two conditions — it introduces no objects not already present in the problem situation, and it converts the cause of the failure (unanswerability) into the solution (principled non-answer). Conversely, the UoD tradition supplies what Horowitz identified in 1999 as the chief obstacle to extending ASIT beyond engineering: a formal method for composing the Closed World of non-technical domains. The Closed World of a question *is* its Universe of Discourse. We close with the engineering consequences for SWARP-3: the eight disposal classes as failure-event taxonomy, deferred monitoring as an AIDEN specification, and value-question affiliation as a KAYS coherence mechanism.

1. Introduction

In June 2026 a typology of interrogatives was published proving two complementary results about automated question-handling (Konstapel 2026a). The impossibility result: no catalogue of questions can be complete, since for any ordering of questions a further well-formed question about that ordering can be posed. The possibility result — the Totality Theorem: four binary tests (request, presupposition, decidability, source), each total over well-formed interrogatives, induce a partition of question space into eight disposal classes, four of which are principled non-answers. A system implementing all eight classes is a total function over question space; a system implementing fewer must guess.

That paper was written as a self-standing contribution to erotetic logic and civic system design. The present paper shows that it is not self-standing. Its central theorem is the convergence point of two older research programmes: the two-century history of the Universe of Discourse (Konstapel 2026b), and the TRIZ-to-ASIT distillation completed by Roni Horowitz at Tel-Aviv University in 1999. Read against these two programmes, the Totality Theorem acquires three properties it does not claim for itself: it is a UoD-alignment protocol (§3), it is itself an ASIT-conformant inventive solution (§4), and it resolves the open problem Horowitz left at the end of his thesis (§5). The convergence has direct consequences for the architecture of SWARP-3 (§7).

2. The Three Programmes in Brief

2.1 The Universe of Discourse

The UoD — the bounded context within which communication and reasoning take place — has undergone eleven documented transformations since De Morgan and Boole introduced it in 1847 as the precondition of logical complementation (Konstapel 2026b). The trajectory runs through Tarski's model-theoretic

domain, Husserl's intentional horizon, Wittgenstein's language games, the fact-validated UoD of Nijssen and the Scandinavian school, the normative UoD of deontic logic and Stamper's semiotic ladder, the performative UoD of Austin, Searle, and Flores–Winograd, the autopoietic closure of Maturana and Luhmann, the embodied UoD of Lakoff and Johnson, the topological UoD of Homotopy Type Theory, the swarm-emergent UoD of Levin's bioelectric fields, and culminates — the eleventh transformation — in the UoD as oscillatory coherence field: entities as stable oscillatory modes, relations as phase-locking patterns, and the boundary of the UoD as the coherence horizon where mutual entrainment stops. Two further elements of that synthesis matter here: Magma, the pre-discursive, undifferentiated plenum from which every UoD is cut by a first Spencer-Brown distinction; and Rowlands' nilpotent criterion of discourse closure, on which a stable UoD is one in which every assertion is balanced by its complementary negation, the whole summing to zero.

2.2 ASIT

Horowitz (1999) confronted the operational paradox of TRIZ: Altshuller's analysis of over 200,000 patents had produced a system of forty inventive principles, seventy-six standards, a contradiction matrix, and roughly a thousand catalogued effects — so rich that industrial users (the Valeo case: 600 hours) found it too heavy to apply. Horowitz asked what the most elegant solutions in Altshuller's corpus have in common, and answered with two sufficient conditions. The **Closed World Condition**: an inventive solution introduces no new types of objects into the system; it reuses only resources already present in the problem or its immediate environment. The **Qualitative Change Condition**: an inventive solution uses or annuls the very cause of the problem to resolve it. The canonical illustration is the antenna in a severe-winter region: ice accumulation threatens to break it; conventional solutions (heating, shielding, reinforcement) all add objects; the inventive solution designs the antenna so that the accumulated ice strengthens its structure. The cause becomes the cure; nothing is added. Horowitz validated the conditions theoretically

(patent analysis), empirically (expert ratings of solutions correlate with satisfaction of the conditions; a few hours of SIT training measurably shifts solution distributions toward the inventive), and psychologically (Kreitler's meaning-system framework distinguishes effective from ineffective users).

2.3 The Totality Theorem

Konstapel (2026a) defines, for any well-formed interrogative Q received by a system S with source set Σ, four total binary tests: T1, is Q an information request; T2, do its presuppositions hold so far as Σ can determine; T3, is its epistemic type decidable in principle from facts about the past or present; T4, if decidable, is it decidable now from Σ, from general knowledge, from another institution's holdings, or from none of these without clarification. The tests are the leaves of a decision tree whose eight terminal classes — locally answerable (H1), generally answerable (H2), held elsewhere (H3), underdetermined (H4), presupposition failure (H5), future-contingent (H6), value question (H7), non-request (H8) — are pairwise disjoint and jointly exhaustive. Treatment-completeness is therefore achievable even though content-completeness is provably not.

3. The Four Tests as a UoD-Alignment Protocol

The synthesis underlying the Totality Theorem defines a question as a *self-reported partition uncertainty*: the asker declares which cells of logical space it cannot distinguish. The definition presupposes a space that is partitioned, and that space is a Universe of Discourse. Groenendijk and Stokhof's partition semantics — load-bearing in both predecessor papers — is the hinge: their "logical space" is Tarski's domain D under another name. Every question therefore carries an implicit UoD: the domain over which its wh-variable ranges, the domain in which its presuppositions are supposed to hold.

Once this is seen, the four tests reread as a protocol for aligning the asker's UoD with the system's:

T2 is a UoD-congruence test. Belnap and Steel made presupposition a formal property of the question rather than of the asker; what the presupposition encodes is the asker's UoD. A question whose presuppositions fail against Σ is a question posed in a different language game (Wittgenstein), a different chronotope (Bakhtin), a different cell-structure of reality than the one the system inhabits. Disposal class H5 — name and test the presupposition before any answer — is therefore not a courtesy but a UoD-repair operation: it makes the divergence between the two universes the explicit topic, which is the only honest move available when universes diverge.

T4 is the operationalization of the coherence horizon. The eleventh transformation defines the boundary of a UoD as the coherence horizon: the surface at which mutual entrainment between oscillators stops. T4's four branches measure exactly where Q falls relative to that surface. *Local* (H1): inside the system's own coherence horizon — Σ and Q are phase-locked. *General* (H2): inside the wider field but outside the local horizon, which is why the answer must be explicitly marked as non-local — an unmarked general answer fakes a phase-lock that does not exist. *Other institution* (H3): inside the coherence horizon of a *different* institutional oscillator. Referral is then not a bureaucratic hand-off but a phase-coupling operation between institutional UoDs — precisely the synchronization that the SWARP-Φ architecture performs on competing philosophical traditions, here performed on competing mandates. *Clarification needed* (H4): the question is not yet phase-locked to any field. This is Taylor's compromised question and Langefors' infological equation i = I(D, S, t) in action: information is a function of data, the interpreter's prior structure S, and time, and when the S of asker and system diverge, exactly one negotiation move (Taylor's rule, preserved in H4) rotates the two UoDs toward each other before re-entry.

T1 and T3 sort by relation to the UoD rather than location in it. T1 asks whether the utterance engages the UoD as a space of information at all; rhetorical, venting, and affiliative utterances (H8) use the interrogative form for performative work in Austin's sense — they act on the social field rather than query

the fact field. T3 asks whether the cells the question cannot distinguish are cells of the settled past-and-present region of the UoD (decidable), of its not-yet-actualized future region (H6), or of its normative stratum (H7) — the stratum that Von Wright's deontic logic and Stamper's social level added to the UoD in the fifth transformation, and that no accumulation of facts can collapse.

The Totality Theorem, restated in UoD terms: *every well-formed interrogative stands in exactly one of eight determinable relations to the system's Universe of Discourse, and for each relation there exists a truthful disposal.* Classlessness — the structural defect of retrieve-and-answer systems — is the failure to model any relation to the UoD other than containment.

4. The Totality Theorem Satisfies Horowitz's Two Conditions

The central claim of this paper: the Totality Theorem is not merely *analyzable* with ASIT; it *is* an ASIT solution, satisfying both sufficient conditions exactly. The problem it solves is the antenna problem of question-answering: systems are broken by a load they cannot carry — the unbounded stream of questions their sources cannot answer.

Closed World. The conventional responses to QA failure all add new objects to the system: more sources, larger models, additional retrieval layers, human escalation tiers. This is heating the antenna. The eight disposal classes add *nothing*. Every resource they deploy is already present in the problem situation: the question itself (its form, its presuppositions, its epistemic type — all formal properties extractable from the utterance), the source set Σ, the surrounding institutional landscape (for H3), the asker (for H4's single negotiation move), and time (for H6's monitoring). The theorem reorganizes existing resources into a total function; it imports none. The characteristic ASIT reaction — *why did no one think of this before?* — applies: every element was already on the table.

Qualitative Change. The cause of the failure mode is unanswerability: the existence of large question classes that cannot, in principle or in practice, be answered from Σ. The theorem does not fight this cause; it converts it into the solution, class by class. In H5, the false presupposition — the reason no direct answer exists — *becomes the answer*: naming and testing it is the disposal. In H6, the temporal undecidability that blocks closure becomes a monitoring instrument: the question keeps watch until the world decides, turning the system's ignorance into a standing sensor. In H7, the normative dissensus that prevents any fact from closing the question becomes an affiliation mechanism: the disposal is to display the positions evenhandedly and connect co-holders, converting irresolvability into community. The ice strengthens the antenna. In Altshuller's vocabulary, the contradiction "the system must answer / the system cannot answer" is not compromised but dissolved by qualitative transformation of the problem's cause.

The reframed design target — *total honest disposal* rather than *maximal answering* — is, finally, Altshuller's ideality move in pure form. The ideal system, TRIZ teaches, is the one that delivers the function without the system. Four of the eight disposals are principled non-answers, and the theorem's corollary shows that precisely these dominate, in expected veracity, any system that converts them into guessed answers. The ideal question-handling system does not maximize answering; it disposes.

5. Closing Horowitz's Open Problem

Horowitz ended his thesis with a candid admission. Extending ASIT beyond engineering — to management, strategy, marketing — was, he wrote, promising but obstructed by one difficulty: formulating the Closed World Condition outside the technical domain. In engineering, the system boundary and its object inventory are relatively direct; in abstract domains, the delimitation is not. Subsequent work (Takahara 2003; Tyl 2011; Maume 2016; the SolidCreativity practice) demonstrated case by case that

closed worlds *can* be composed for non-technical domains, but composed them craft-wise, without a general theory of what a closed world *is* when there is no machine.

The convergence documented here supplies the general theory. **The Closed World of any communicative or institutional problem is its Universe of Discourse**, and the UoD tradition is a 175-year-deep formal apparatus for delimiting exactly such worlds: Tarski's domain specification, Nijssen's fact-validated population, Searle's "X counts as Y in context C" inventory of status functions, Luhmann's operationally closed communication system, Dietz's transaction space, and — for the dynamic case — the coherence horizon of the oscillatory UoD. Where Horowitz could say only that the closed world of a non-technical problem must somehow be composed, the UoD lineage says precisely how: it is composed the way every UoD is composed, by a first distinction cut from Magma and stabilized by communicative closure, and its membership question is made decidable by exactly the kind of tests that T2 and T4 exemplify. The Totality Theorem is thus simultaneously a *demonstration* of ASIT in a maximally non-technical domain (the domain of questions as such) and a *completion* of ASIT's missing foundation: a formal Closed World composition method for any domain that has a discourse.

6. The Deeper Identity: Nilpotent Closure and the Quaternionic Signature

Two structural features confirm that the convergence is not analogical but identical.

The two theorems are the two halves of Rowlands. The nilpotent criterion of discourse closure states that a stable UoD sums to zero: every assertion balanced by its complementary negation, no unpaired residue. The impossibility result (Proposition 1) is the *content* half of this: question space is generatively open because Magma is inexhaustible — every ordering of distinctions permits a further distinction about the ordering, exactly as the diagonal argument constructs. The Totality Theorem is the *closure* half: every question receives exactly one disposal, nothing dangles. Classlessness — the defect of current systems —

is precisely loss of nilpotent balance: an unpaired residue of undisposed questions, observable as confident guessing. Content-incompleteness and treatment-completeness are not two separate results that happen to coexist; they are the openness of Magma and the closability of discourse, the two faces of the nilpotent structure.

Four tests, eight classes, four axes. That the theorem rests on exactly four total binary tests is not numerological accident. The tests load onto the four axes of the quaternionic UoD (McWhinney's worldviews, Fiske's relational models). T1 — is this an information request at all? — is the Social axis: Searle's speech-act sorting of what the utterance *does* in the relational field. T2 — do the presuppositions hold? — is the Unitary axis: conformity of the question to the truth-and-norm structure of the shared UoD. T3 — decidable from facts? — separates the Sensory from the Mythic: the settled empirical region from the not-yet-actual and the normative. T4 — from which source? — is the locational, exchange-structured axis: who holds what, the Market-Pricing topology of distributed institutional knowledge. The eight disposal classes are then recognizable as paths of change: H5 is Unitary correction, H6 is Sensory-temporal monitoring, H7 is Social affiliation, H1/H2 are Sensory closure, H3 is rotation between institutional frames, H4 is the negotiated rotation between asker and system. The decision tree is a quaternionic rotation schedule.

Methodologically, the question paper is itself an instance of the Gentzen–Altshuller fusion (Konstapel 2025): its Gentzen half is the proof-theoretic apparatus (totality, exhaustiveness and exclusivity as properties of a decision tree, the theorem as a normalization result over disposals); its Altshuller half, as §4 showed, is the solution's exact conformity to the Closed World and Qualitative Change conditions. Schank supplies the cognitive substrate to all three programmes: the question as reported expectation failure, and the consequence — preserved in the question paper's design implications — that the question stream is the most informative event stream a learning system can ingest.

The convergence is not merely retrospective; it specifies architecture. Four consequences for SWARP-3 follow directly.

(1) The eight disposal classes are the failure-event taxonomy. SWARP-3's open design decision on failure-event operationalization receives a principled answer: every incoming question is an event whose contract includes its disposal class; the *measurable* failure event is misclassification — the single point of engineering error the theorem isolates (§5.3 of Konstapel 2026a). The event contract therefore specifies: question received, classified (T1–T4 trace recorded), disposed (H1–H8), with misclassification detected against the annotated calibration set as the canonical failure event. This makes failure operationalization a classification-audit problem rather than an open philosophical one.

(2) H6 is an AIDEN specification. Deferred monitoring — "the question keeps watch" — is exactly the capability profile of the autonomous monitoring agent: a future-contingent question, once classified H6, is handed to AIDEN as a standing watch with a resolution condition (the world deciding) and a notification obligation. The product capability absent from all current systems falls out of an existing SWARP component.

(3) H7 is a KAYS coherence mechanism. Affiliation among co-holders of a value question is Communities-of-Practice formation triggered by the question stream: the value question, undisposable by facts, becomes a coherence seed. KAYS already computes coherence among participants; H7 supplies the trigger event and the membership criterion (co-holding). The evenhanded perspectival display is the Fiske-neutral presentation layer; the connection offer is the CoP invitation.

(4) The classifier is a measurement instrument and a UoD-boundary sensor. Versioned prompts and models, annotated calibration set, regression gates — and, per §3, the classifier is simultaneously the

instrument that measures where each question falls relative to the platform's coherence horizon. Its aggregate output is therefore a map of the platform's UoD boundary as experienced by users: where H3 referrals cluster, the horizon is institutionally adjacent; where H4 clarifications cluster, the asker population's S diverges from the platform's; where H5 corrections cluster, a competing UoD is circulating in the population. The question stream, read through the eight classes, is a real-time tomograph of the discourse field — more revealing than the answer stream, and to be handled accordingly: aggregates may circulate, individual questions must not.

8. Conclusion

A question is a partition of a Universe of Discourse; a question-handling system is therefore a UoD-boundary instrument; and the only complete such instrument — the Totality Theorem proves — is one that implements all eight determinable relations a question can bear to the UoD, four of which are answered by principled non-answers. That this complete instrument satisfies, exactly, Horowitz's two sufficient conditions for inventive solutions confirms both results at once: the theorem is inventive in the precise, validated sense ASIT defines, and ASIT's Closed World Condition — composable, Horowitz feared, only in engineering — is composable wherever there is discourse, because the Closed World of a discourse is its UoD. The eleventh transformation of the Universe of Discourse, the distillation of TRIZ, and the closure of erotetic treatment-space are one architecture seen from three sides. SWARP-3 builds that architecture.

9. Annotated References

Horowitz, R. (1999). *Creative Problem Solving in Engineering Design*. Doctoral thesis, Tel-Aviv University (supervisor O. Maimon, advisor S. Kreitler). The founding document of ASIT/SIT. Distills

TRIZ into the Closed World and Qualitative Change conditions, with triple validation (patent analysis, controlled experiment, Kreitler meaning-system psychology). Chapter 6 states the open problem — composing the Closed World outside engineering — that §5 of the present paper closes.

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McWhinney, W. (1992). ***Paths of Change*****. Sage. / Fiske, A. P. (1991).** ***Structures of Social Life*****. Free Press.** The four worldviews and four relational models constituting the quaternionic axes onto which T1–T4 load (§6).

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Takahara (2003); Tyl (2011); Maume (2016). Post-Horowitz extensions of ASIT to objects/TRIZ integration, eco-innovation, and business strategy respectively; the case-wise evidence that closed worlds compose outside engineering, here given their general foundation.

Correspondence: constable.blog. The paper carries its own falsification criteria: a well-formed interrogative whose disposal requires resources outside its UoD would refute the Closed World identification of §5; a ninth disposal class would refute the quaternionic reading of §6 along with the Totality Theorem itself.