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Terminology Mediation In Information Technology: Linguistic And Computational Perspectives

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Abstract: The rapid evolution of Information Technology has intensified terminological dissonance, as identical terms increasingly acquire divergent meanings across disciplines, professional communities, and languages. This article examines terminological mediation as a linguistic and computational response to this challenge, with particular attention to semantic clustering and ontological mapping. Drawing on Richards's (2015) Termediator model and recent pedagogical research by Du Toit et al. (2025), the study demonstrates how mediation tools make hidden conceptual structures visible rather than enforcing fixed definitions. The analysis shows that IT terminology functions as a dynamic, polysemic network shaped by metaphor, semantic extension, and specialization. By integrating computational modeling with multilingual educational practices, terminological mediation supports clearer interdisciplinary communication, reduces semantic ambiguity, and promotes linguistic inclusivity in technology education.

Keywords: Information Technology terminology; terminological dissonance; terminology mediation; semantic clustering; ontological mapping; multilingual education.

Introduction: The persistent challenge of terminological dissonance in Information Technology has stimulated the development of terminology mediation tools—systems designed to detect, analyze, and reconcile meaning discrepancies across specialized vocabularies. Among these, the model proposed by Richards (2015), known as Termediator, represents an innovative attempt to merge linguistic analysis with computational ontology. Rather than functioning as a conventional glossary or dictionary, Termediator operates as an interdisciplinary mediation system that clusters semantically related terms, identifies potential overlaps or divergences, and visualizes how distinct communities conceptualize shared terminology. Its ultimate goal is not to impose a single "correct" meaning, but to make underlying conceptual structures visible, thereby facilitating understanding among specialists who use the same lexicon differently.

At the heart of such mediation tools lie two complementary linguistic principles: semantic clustering and ontological mapping.

Semantic clustering draws on corpus linguistics and distributional semantics, grouping terms according to their contextual co-occurrence and semantic proximity. By analyzing textual corpora—academic papers, technical documentation, or code repositories—algorithms identify words that tend to appear together or in similar contexts, revealing implicit conceptual relations. Linguistically, this reflects the cognitive principle that meaning is usage-based (Langacker, 2008; Evans & Green, 2006); that is, words derive sense from patterns of contextual association. In practice, semantic clustering enables mediators to visualize polysemy and synonymy within IT terminology, exposing clusters of related meanings rather than isolated lexical entries.

Ontological mapping, in turn, applies the logic of formal semantics to the representation of specialized knowledge. Borrowing from ontology engineering and semantic web technologies (Gruber, 1995; Guizzardi, 2024), it encodes terms as nodes linked to conceptual entities and relations. Whereas semantic clustering reflects linguistic association, ontological mapping formalizes those associations into definitional hierarchies that computers can interpret. Linguistically, this process corresponds to what Cruse (2011) calls hyponymy and meronymy—hierarchical relations that structure the lexicon. By aligning terminological clusters to ontological models, mediation tools make visible both the linguistic variation and the conceptual architecture underlying IT discourse.

Richards's Termediator integrates these principles by enabling dynamic comparison of terminological sets across domains such as software engineering, data management, and human–computer interaction. The system identifies semantically similar yet contextually divergent terms, suggesting potential equivalence or conflict. For example, it may map session, transaction, and process as overlapping but distinct nodes in a shared ontology, allowing users to trace how meaning shifts between database design and network programming. Through this process, Termediator transforms linguistic ambiguity into structured knowledge: it mediates, rather than suppresses, variation.

Beyond Richards's implementation, terminology mediation has evolved into a recognized research area at the intersection of linguistics, information science, and computational lexicography (Wright & Budin, 2001; Faber & León-Araúz, 2016). Modern systems employ multilingual corpora and machine learning to expand mediation across languages—linking, for instance, English IT terms to equivalents in Russian, Uzbek, or Arabic. This expansion aligns with Du Toit et al.'s (2025) pedagogical findings: by mapping terminological networks across languages, such tools not only reduce miscommunication but also promote linguistic inclusivity in technology education.

Du Toit et al. (2025) present one of the most insightful contributions to the discussion of linguistic access in technical education by investigating how multilingual terminology lists can function as mediating instruments in technology teacher training. Their study, conducted in South Africa, highlights that technical comprehension in fields such as Information and Communication Technology (ICT) is often hindered not by conceptual complexity alone but by linguistic inaccessibility—specifically, the dominance of English technical vocabulary in multilingual learning environments. In a context where learners speak diverse indigenous languages, the specialized lexicon of technology becomes a linguistic barrier that can impede both understanding and participation. To address this, Du Toit and colleagues developed terminology lists that provided equivalent technical terms in students' home languages alongside English, enabling cross-linguistic comparison and conceptual reinforcement.

From a pedagogical perspective, these multilingual terminology lists operate as cognitive and communicative scaffolds. They help students connect new technological concepts to familiar linguistic frameworks, promoting deeper understanding through what Vygotsky (1978) terms language-mediated conceptualization. Rather than simple translation, the process involves semantic negotiation—students discuss whether a home-language equivalent fully captures an English term's meaning, thereby engaging in metalinguistic reflection. This practice enhances their awareness of meaning boundaries and fosters bilingual academic literacy.

From a sociolinguistic perspective, the use of multilingual terminology represents a form of linguistic empowerment. It challenges the monolingual ideology often embedded in STEM education and acknowledges that languages other than English can serve as legitimate vehicles for scientific and technical thought (Heugh, 2015; Deumert, 2010). In the study, students expressed that encountering technical vocabulary in their mother tongues increased both confidence and motivation, illustrating how linguistic inclusivity contributes to a more equitable educational experience. The approach also aligns with theories of linguistic citizenship (Stroud, 2018), emphasizing the right to access knowledge through one's own linguistic repertoire.

Du Toit et al.'s findings thus extend beyond the classroom to a broader epistemological insight: that terminology itself is socially situated. IT and technology education do not merely transmit fixed definitions; they mediate between worldviews encoded in different linguistic systems. Translating or localizing terminology across languages requires more than lexical substitution—it involves reconciling differing conceptual schemas and metaphorical mappings. For example, the English term network may metaphorically emphasize connectivity, while its equivalent in another language might highlight structure or hierarchy, subtly influencing how learners imagine digital systems.

Ultimately, the study demonstrates that multilingual terminology lists function as linguistic mediators, parallel in purpose to Richards's computational Termediator, but applied to educational contexts. Both aim to bridge semantic gaps, one through algorithmic ontology mapping, the other through human-centered multilingual pedagogy. By integrating such linguistic mediation into technology teacher education, Du Toit et al. advocate a shift from linguistic dependency to linguistic agency, where learners navigate and construct knowledge across multiple codes rather than being confined to a single linguistic norm.

To operationalize the comparative conceptual synthesis, the study employs a combination of linguistic and computational tools designed to trace, compare, and visualize patterns of meaning across terminological systems. These tools facilitate both the structural analysis of IT terminology and the exploration of multilingual mediation strategies proposed in education research. Among the most suitable analytical instruments are glossary comparison, term clustering, and semantic mapping, each serving a distinct yet complementary function in the research process.

Glossary comparison provides a foundational step in identifying cross-disciplinary and cross-linguistic variation in terminology. By comparing specialized glossaries or term lists—such as those from software engineering, data management, and technology education—it becomes possible to detect semantic overlap, divergence, and gaps between domains. For example, comparing English, Uzbek, and Russian IT glossaries may expose how metaphorical extensions (e.g., cloud computing) are localized or reinterpreted in different linguistic environments.

Term clustering involves grouping related lexical items according to semantic similarity or contextual co-occurrence. Computational tools such as word2vec, AntConc, or Sketch Engine can be used to process corpora of IT discourse—academic papers, documentation, and educational materials—to identify clusters of terms that share similar contextual distributions. Linguistically, this corresponds to mapping semantic fields (Cruse, 2011) and helps uncover patterns of polysemy and synonymy that underlie terminological ambiguity. In multilingual applications, clustering may reveal how certain concepts converge across languages while others diverge, providing empirical evidence for semantic mediation in practice.

Semantic mapping then translates these relationships into a visual and conceptual format. Drawing on ontology engineering and cognitive linguistics, semantic maps represent the interconnections between terms, meanings, and conceptual domains. Tools such as Protégé, Gephi, or VOSviewer allow the researcher to construct network models showing how IT concepts (e.g., network, protocol, interface) relate hierarchically and metaphorically. Semantic mapping serves both analytical and pedagogical functions: it visually demonstrates where meanings overlap, where dissonance occurs, and how multilingual mediation can bridge conceptual gaps. This mirrors Du Toit et al.'s (2025) emphasis on terminological visibility—the process of making hidden meaning relations explicit for learners.

Richards (2015) highlights that terminological dissonance in Information Technology frequently arises not from misuse of words but from disciplinary divergence—the same term developing distinct meanings and pragmatic functions across technical, managerial, and educational domains. The terms interface, process, and network exemplify this phenomenon, showing how linguistic form remains constant while conceptual interpretation shifts according to disciplinary context.

The term interface represents perhaps the clearest case of polysemy in IT. In software engineering, it denotes a structured point of interaction between components—such as an Application Programming Interface (API)—that defines how one module communicates with another. Here, interface functions as a formal and operational construct within system architecture. In human–computer interaction (HCI), by contrast, interface takes on an experiential dimension, referring to the visible or tactile layer through which users engage with digital systems (e.g., graphical or voice interfaces). In education technology, the term may be used metaphorically to describe the relationship between learner and content, emphasizing accessibility and usability. Richards observes that these meanings coexist but rarely overlap: a systems engineer's "interface optimization" concerns code efficiency, while a designer's refers to visual ergonomics. Both are correct, yet without explicit contextualization, their interpretations diverge—producing classic terminological dissonance.

The term process shows a similar polysemic pattern. In computer science, it refers to an executing program or thread—an instance of code in operation, often managed by an operating system. Within business process management (BPM) or information systems, however, process signifies a sequence of coordinated tasks designed to achieve an organizational outcome. Meanwhile, in pedagogical technology or instructional design, the same term might describe a cognitive or learning process—how knowledge is acquired or internalized through interaction with digital tools. Such overlaps create hidden semantic tension: when a software developer discusses "process optimization," they refer to computational performance, whereas an education specialist interprets it as streamlining human or instructional workflow. The term's generality promotes communication across fields but simultaneously conceals the boundaries between distinct conceptual models.

The case of network reveals an even more layered semantic evolution. Technically, a network denotes a configuration of interconnected devices or nodes that enable data transfer—embodying a structural and topological sense rooted in computer science and telecommunications. In social network analysis, however, network describes patterns of human relationships and information flow, adopting a sociological perspective on connectivity. In neural computing, it refers to algorithmic structures modeled after human cognition, introducing a cognitive metaphor that merges linguistic and computational domains. This can be identified as a paradigmatic example of semantic expansion, where metaphorical borrowing between sciences creates conceptual hybridity. The term thus bridges material, social, and cognitive realities, each governed by its own logic of "connection."

From a linguistic perspective, these examples demonstrate how IT terminology behaves as a polysemic semantic network in itself—a web of interrelated senses rather than isolated definitions. Each term's meaning depends on its functional frame: in system design, interface functions as a boundary; in education, as a mediation channel. Similarly, process alternates between physical computation and abstract procedure, while network alternates between infrastructural and conceptual domains. Richards (2015) interprets this variability not as lexical disorder but as evidence that terminology operates according to cognitive economy—the natural linguistic tendency to extend existing words to new but related concepts.

In practical terms, such domain-specific divergence necessitates terminological mediation, both in professional and educational contexts. Without recognizing these layers, interdisciplinary teams may misalign assumptions, and learners may transfer inappropriate meanings from one context to another. By applying tools like semantic mapping or multilingual comparison, educators and IT professionals can expose these variations explicitly, transforming potential confusion into a deeper understanding of how language structures technological thought.

Three mechanisms—metaphor, semantic extension, and specialization—constitute the principal forces driving this lexical transformation. Together, they illustrate how linguistic creativity coexists with technical precision, resulting in a lexicon that is both innovative and unstable. Metaphor serves as a primary engine of meaning creation in IT terminology. Rooted in conceptual metaphor theory (Lakoff & Johnson, 2003), metaphors enable speakers to understand abstract, intangible digital phenomena through reference to concrete physical or social experiences. Richards (2015) notes that many key IT terms originated as metaphorical transfers from everyday domains: cloud evokes atmospheric diffusion to conceptualize distributed data storage; firewall transfers the physical notion of a fire barrier to the realm of cybersecurity; virus borrows from biology to describe self-replicating malicious code. These metaphors simplify the unfamiliar, translating complex systems into cognitively accessible imagery. Yet, as Cruse (2011) and Lehrer (1990) point out, such metaphors can later solidify into conventionalized meanings, losing their figurative transparency. Once established, the metaphorical origin often becomes invisible to domain insiders, while remaining confusing to outsiders—a linguistic process known as metaphor fossilization. This explains why, for instance, non-specialists may interpret cloud computing literally, while professionals treat cloud as a standardized technical category.

A second mechanism shaping IT lexicon is semantic extension, whereby existing words acquire new, related meanings as technology redefines human experience. Richards identifies this as a key source of terminological dissonance: as disciplines borrow and repurpose common words, polysemy multiplies. The term window, once denoting a physical architectural feature, was extended to describe framed sections on a computer screen—an analogy that later evolved into the standardized noun Windows, designating an entire operating system. Similarly, surfing extended from a physical activity to online browsing, and bookmark from a reading aid to a digital shortcut. These examples illustrate how extension operates through conceptual proximity: speakers project existing cognitive schemas onto new contexts, preserving partial meaning overlap while introducing technological specificity. Linguistically, this process exemplifies the economy principle—creating new terminology by adapting familiar linguistic structures rather than inventing entirely new forms.

Conversely, specialization—the process by which a general term acquires a more restricted technical sense—functions as a counterbalance to metaphor and extension. In specialized discourse, the communicative demand for precision compels the narrowing of lexical meaning. For example, driver, a general term for one who operates a vehicle, became specialized in computing to denote a software component that controls hardware devices. Similarly, thread evolved from a literal filament to signify a sequence of executable operations within a program. Richards (2015) classifies such cases as examples of contextual determinacy: meaning becomes tightly bound to functional parameters within a technical system. While specialization increases precision within a domain, it simultaneously reduces cross-domain intelligibility, contributing to terminological fragmentation across subfields.

CONCLUSION

In conclusion, this article has shown that terminological dissonance in Information Technology is not a sign of conceptual disorder but a natural outcome of cognitive, linguistic, and disciplinary dynamics. Through the combined mechanisms of metaphor, semantic extension, and specialization, IT terminology evolves into a polysemic network whose meanings shift across technical, educational, and social contexts. The analysis demonstrates that terminology mediation tools—such as Richards's Termediator and multilingual pedagogical practices described by Du Toit et al. (2025)—play a crucial role in making these hidden semantic variations visible. By integrating semantic clustering, ontological mapping, and multilingual mediation, such approaches transform potential misunderstanding into structured knowledge, supporting clearer interdisciplinary communication and more inclusive technology education.

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