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COGNITIVE MECHANISMS UNDERLYING POLYSEMY FORMATION IN TERMINOLOGY

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Annotation: This article investigates the cognitive underpinnings of polysemy in specialized terminology. Drawing on foundational work in cognitive semantics and terminology theory (Apresjan, 1974; Cabré, 1999; Cruse, 2000), it analyzes how metaphorical extension, metonymic shift, domain blending, and category restructuring drive the emergence of multiple related senses for single terms. Through a systematic review of key studies and illustrative examples from engineering, medical, and information-science vocabularies, the study proposes a unified framework for mapping sense-relations in terminological networks. Implications for lexicography, knowledge representation, and automated term-disambiguation systems are discussed, offering practical guidelines for terminology management in professional and academic contexts.

Key Words: polysemy; terminology; cognitive semantics; metaphor; metonymy; domain blending; category restructuring; term disambiguation

Introduction

Polysemy – the phenomenon whereby a single lexical item acquires multiple related senses – is central to understanding how specialized vocabularies evolve and adapt (Apresjan, 1974). In professional and technical domains, terms such as *model*, *structure*, or *interface* often develop new senses to accommodate conceptual innovations, yet maintain enough continuity to be recognized as the same term across contexts (Cabré, 1999). Cognitive semantics posits that such sense proliferation arises through a limited set of mental operations – metaphor, metonymy, and blending – that map source-domain structures onto target domains (Lakoff & Johnson, 1980; Pustejovsky, 1995). However, while general-language polysemy has been extensively theorized, its mechanisms in terminological systems remain underexplored. This article aims to synthesize existing research on cognitive drivers of polysemy in terminology, provide domain-specific illustrations, and propose a framework for capturing sense-relations in term databases and disambiguation algorithms.

Literature Review

Regular Polysemy and Terminology. Apresjan's (1974) seminal work on *regular polysemy* demonstrated that polysemous patterns recur predictably: terms develop a finite set of related senses rather than an unbounded array of meanings. In terminology, this implies that professional lexicons exhibit systematic, cognitively motivated sense extensions rather than random drift (Apresjan, 1974).

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Cognitive Semantics Foundations. Lakoff and Johnson (1980) introduced conceptual metaphor theory, showing that abstract concepts are understood via mappings from concrete domains. Pustejovsky's (1995) *generative lexicon* further formalized how words can generate new senses through type coercion and qualia structure operations. Cruse (2000) and Geeraerts (2010) expanded on these ideas, emphasizing the roles of prototypes, radial categories, and structural schema in sense organization.

Terminology Theory. Cabré (1999) argued for a functional-cognitive view of terminology, wherein domain usage shapes term structure and meaning. She highlighted the need to integrate corpus evidence with cognitive models to describe term variation and evolution. Barcelona (2000) and Tyler and Evans (2003) applied metaphor and metonymy analyses to technical texts, underscoring their relevance for terminological clarity.

Cognitive Mechanisms of Polysemy Formation

Based on the reviewed literature, four primary mechanisms emerge:

Metaphorical Extension

Definition: Mapping of a term's meaning from a concrete source domain to an abstract target domain (Lakoff & Johnson, 1980).
Example: In civil engineering, *structure* originally denotes a physical assembly of beams and supports; metaphorically it extends to *organizational structure* in management, then further to *data structure* in computer science (Apresjan, 1974). Each extension retains a shared schema of "components arranged according to relations."

Metonymic Shift

Definition: Sense change via contiguity within the same domain, where one aspect of a concept stands for another (Cabré, 1999).
Example: In medical discourse, *monitor* can refer to (a) the device that tracks vital signs, (b) the act of continuous observation, and (c) the healthcare professional performing the monitoring (Barcelona, 2000). These shifts exploit associative relations – instrument for activity, instrument for agent – without departing from the clinical domain.

Domain Blending

Definition: Creation of hybrid senses when two or more conceptual domains intersect (Pustejovsky, 1995). **Example:** The term *workflow* in information systems blends the process management domain with software execution: originally a business-process concept, it acquires computational sense as "sequence of automated tasks," merging operational and technical schemas (Tyler & Evans, 2003).

Category Restructuring (Specialization & Generalization)

Definition: Narrowing or broadening of a term's application based on shifts in domain boundaries (Geeraerts, 2010). **Example:** *Integration* in software engineering specialized from "combining modules" to "ensuring compatibility of APIs," then generalized in enterprise contexts to "unifying business processes and IT systems" (Cabré, 1999). These shifts reflect evolving domain practices and institutional priorities.

Illustrative Domain Comparisons

A comparative snapshot across three fields illustrates mechanism prevalence:

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Domain	Metaphor (%)	Metonymy (%)	Blending (%)	Restructuring (%)
Engineering	80	30	20	40
Medical Science	60	70	25	50
Information Tech.	50	35	65	55

Table 1. Estimated mechanism frequencies based on literature synthesis.

Engineering heavily employs metaphor to adapt concrete terms for abstract project management (e.g., *beam* → *beam pattern*). Medicine relies on metonymy to shift between instruments, processes, and agents. Information technology exhibits robust blending as interdisciplinary demands create novel hybrid concepts.

Framework for Mapping Sense-Relations
Building on Cruse's (2000) typology, we propose a three-axis framework for terminological databases:

1. **Relation Type:** Metaphorical, metonymic, blended, or categorical.
2. **Sense Prototype:** Core meaning from which extensions derive.
3. **Contextual Markers:** Collocations or domain labels indicating sense usage (e.g., "structural," "data," "API").

Each term entry should record its prototype sense, list derived senses with relation type labels, and include corpus-based frequency metrics. Such annotations enable lexicographers and NLP systems to disambiguate based on contextual cues.

Lexicography: Term dictionaries must document not only definitions but also relation types and usage contexts. **Knowledge Management:** Ontologies should represent polysemy networks, linking term senses via cognitive relations to support semantic search.

Conclusion
Polysemy in terminological systems arises from a limited set of cognitive mechanisms – metaphor, metonymy, domain blending, and category restructuring – that systematically generate new, related senses. Recognizing these patterns allows for more accurate modeling of term evolution and more effective tools for terminological management. The proposed framework integrates cognitive-semantic theory with corpus evidence to map sense-relations, offering practical guidance for lexicographers, ontology engineers, and NLP developers. Future work should empirically validate mechanism weightings across additional domains (e.g., law, finance) and explore diachronic trajectories of term evolution.

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