



Thematic Patterns in Engineering Abstracts: Enhancing Academic Writing Across Cultures

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Abstract

Research article abstracts (RAAs) has a central role in knowledge dissemination as gateways to papers and independent genres (Swales, 1990; Hyland, 2004). Introduced into article structures in the mid-twentieth century (Swales & Feak, 2009), they have been examined from rhetorical, lexical, and grammatical perspectives. Within Systemic Functional Linguistics (SFL), the Theme system offers insight into information organisation and disciplinary style (Halliday & Matthiessen, 2014). While early studies described RAAs as condensed and impersonal (Graetz, 1982; Ventola, 1997), later research showed intradisciplinary variation (Stotesbury, 2003; Lorés, 2004; El-Dakhs, 2018; Alyousef, 2021, 2023). Despite this growing body of work, large-scale corpus studies that focus on thematic organization in engineering remain scarce. This paper presents a sweep of the literature on thematic choices and progression in research article abstracts with a focus on engineering subfields, highlighting disciplinary and cultural variation and drawing pedagogical implications for English for Specific Purposes (ESP) and academic literacy.

Keywords: *Thematic structure, abstracts, SFL, disciplinary variation, academic writing.*

1. Introduction

Abstracts have attracted research attention for many decades because of their crucial function of enabling communication. Abstracts are gatekeepers of knowledge (Swales & Feak, 2009), enabling indexing systems' retrieval functions as well as providing input into first impressions of a work's relevance. For a high and competitive research volume domain such as engineering, the relevance of abstracts to enabling coverage cannot be overstated. Editors and referees often make the choice of continuing with a submission's reading with reference to the clarity of an abstract's rhetorical balance and linguistic structuring.

The initial literature on abstracts pointed out their condensed and formulaic nature. Graetz (1982) described abstracts as concise and non-redundant objective summaries and Ventola (1997) stresses their use as stand-alone texts formatted for indexing. These characterizations framed abstracts as information carriers of a uniform nature across disciplines. However, with the further development of scholarship, it became increasingly clear that abstracts are heterogeneous. Abstracts are rhetorically and linguistically heterogeneous and reflect what Becher and Trowler (2001) define as academic tribes and territories. Hyland (2000, 2004) confirmed that disciplinary groups uphold specific rules of writing abstracts: hard disciplines like engineering are concerned with methods and results, and softer disciplines with context and argumentation.

Disciplinary diversity has also been documented. Lorés (2004) found that applied linguistics abstracts of Spanish lean towards background information more strongly than English abstracts do, while Martín-Martín (2005) noted similar differences for social sciences. These findings support the thesis that abstracts are outcomes of both culture and discipline. Researchers from differing subfields of engineering worldwide are as likely as not to conform to typical disciplinary practices and still reflect local rhetorical traditions. These complexities make systematic frameworks such as SFL more important as a means of describing both linguistic and functional dimensions of abstract writing.

Systemic Functional Linguistics views language as a resource used to make meaning within specific settings (Halliday & Matthiessen, 2014). Genre is staged, socially driven processes of purpose, while register are changes of field, tenor, and mode. Central to textual meaning is the Theme system, specifying the point of departure of a clause. By selecting topical, textual, or interpersonal Themes, writers regulate the release of information and negotiate the reader's interpretation. Fries (1995)



emphasized that thematic development orders the writing and Daneš (1974) explained patterns of progression as invariant, linear, and divided and demonstrated the unfolding of Themes sentence by sentence. Within the narrow confines of an abstract, such decisions are crucial to achieving cohesion and rhetorical effect.

2. From Moves to Themes: a Sweep Through Abstract Research

Work done with abstracts can be separated into different groups. Initial work centred upon prescriptive advice. Tuckman (1978), Rathbone (1985), and Porte (1986) pragmatically made prescriptive claims regarding allocations of words, structural layout, and brevity. These publications positioned abstracts as technical summaries and not as discrete genres. Ventola (1997) disputed this perspective through assertions that abstracts are independent units of discourse and that others such as Swales (1990) held the perspective that they are communicative events with a shaping rhetorical intent. Moreover, Swales alleged that abstracts are generic hybrids and are regulated through familiar rhetorical moves (Swales, 1990; Swales & Feak, 2009). Santos (1996) empirically tested claims through the establishment of practical models of moves assisting writers constructing abstracts and facilitating analysers through comparison of abstracts from a number of disciplines.

This movement-based work paved the way to a second phase of research. Hyland (2000, 2004, 2005) shifted the focus from structure to stance and engagement and demonstrated that abstracts do not merely summarize but also inscribe the author and the claims. He showed that markers of stance, evaluative language and boosters impact how judges evaluate contribution and that what constitutes proper stance varies across disciplines. Lorés (2004) and Martín-Martín (2005) carried the analysis across cultures and registered that English and Spanish abstracts differ in that English abstracts privilege results while Spanish abstracts devote more space to context. These results ratify that rhetorical preferences accompany language groups.

Whereas these investigations characterized rhetorical and evaluative dimensions, a second line of research occupied itself with organization at the clause level, and above all with the Theme system. In Systemic Functional Linguistics (SFL), the Theme system has proved a valuable resource for analyzing abstracts. Lorés (2004) demonstrated thematic choices as organizers of rhetorical flow, while Pho (2008) illustrated Theme as interacting with stance in applied linguistics and educational technology. Nwogu and Bloor (1991) established that medical texts are dependent on constant progression as a means of sustaining focus and confirmed that Theme is more than a grammar label and offers a resource for structuring meaning. From a theoretical perspective, Halliday and Matthiessen (2014) characterized Theme as the point of departure of the clause, while Daneš (1974) and Fries (1995) illustrated Theme and patterns of progression as yielding cohesion and direction of the reader. Paltridge (2002), following Paltridge (1994), then applied such tools as a resource for genre analysis and demonstrated their usefulness as a resource for research on abstracts.

Empirical investigations of Theme ratify discipline-specific patterns. Abstracts of medical articles frequently adopt constant progression in order to preserve a method or patient group; abstracts of applied linguistics articles combine constant and linear progression while progressing argumentation toward findings (Pho, 2008; Lorés, 2004). For technical disciplines, Ebrahimi and Khedri (2011) and Ebrahimi (2016) documented an apparent use of unmarked topical Themes and heavy nominals. Cortes (2013) and Hyland and Jiang (2019) demonstrated at corpus-scale that frequent lexical bundles and markers of stance can correspond with move structure. Alyousef (2021, 2023) has recently offered discerning analyses informed by the Systemic Functional Linguistics tradition that connect patterns of Theme with disciplinary identity and teaching requirement.

A comparatively modest yet expanding corpus of research investigates the distinctions among subfields within a broader academic discipline. Babaii, Atai, and Behzad (2016) identified significant disparities between mechanical and biomedical engineering concerning the types of themes and patterns of progression, whereas Huang (2018) recorded differences among subfields of marine engineering. Collectively, these studies substantiate the assertion that intradisciplinary variation is indeed both substantive and perceivable, indicating that the categorization of engineering as a uniform entity may obscure valuable distinctions.

From the studied corpus of research, two marked patterns emerge. Initially, unmarked topical Themes are familiar in numerous technical abstracts, where writers emphasize objects, processes, devices, or models at the beginning of clauses (Ebrahimi, 2016; Alotaibi, 2020). In the second instance, marked adjunct Themes specifying methods or settings are apparent where writers are attempting to locate a study or emphasize a process (Fries, 1995; Alyousef, 2021). Both of these choices both strongly



influence and are influenced by reader anticipation and understanding: subject Themes favor contributions and findings, while circumstantial Themes emphasize methods and reliability.

Those sources point out typical pitfalls. Recurrent use of a single circumstantial phrase makes an abstract dull; failure of connection from Themes through to preceding Rhemes results in lack of coherence and confusion for the reader as to the connection of the clauses (Daneš, 1974; Fries, 1995; Pho, 2008). Over-density of nominalizations may further befuddle non-specialist audiences (Hyland & Jiang, 2019). These are risks especially relevant for writers with a non-English native language and/or early career researchers since they are the individuals most likely to produce abstracts subject to one or more of these complications (Lorés, 2004; Martín-Martín, 2005).

Pedagogy is a persistent theme throughout this volume of research. Hyland (2007) called out the requirements of academic literacy pedagogy to attend to genre and disciplinary sensitivities while Swales and Feak (2009) vouched for combinations of rhetorical and linguistic models. What the engineering dataset reveals is that where subfields favor alternative thematic modes, pedagogic practice must accustom students to adopting the conventions of their own disciplines. Formulaic generic models are out of the question; English for Specific Purposes (ESP) pedagogy therefore needs to grant novice writers the ability of discerning how abstracts in their domain structurize information and how such patterns of structurization impact impressions as part of international publishing cultures (Babaii et al., 2016; Huang, 2018).

3. Intradisciplinary Variation in Engineering Abstracts

The thematic organization of engineering abstracts reveals both disciplinary coherence and intradisciplinary diversity. The one million word corpus of engineering abstracts, combined with insights from prior research, shows that Theme choices and progression patterns are not uniform but shaped by the epistemological priorities of each subfield. This section synthesizes previous findings, integrates examples from published abstracts, and highlights how thematic variation reflects disciplinary values.

Civil engineering abstracts often foreground procedures and conditions. Ebrahimi and Khedri (2011) demonstrated that unmarked topical Themes dominate in technical fields, and in civil engineering these typically refer to methods. For example, one abstract from *Construction and Building Materials* begins with “Finite element analysis is applied to investigate the behavior of reinforced concrete beams under cyclic loading.” Here, the Theme is the method, reflecting the subfield’s emphasis on replicability and technical rigor. Thematic progression is frequently constant, with multiple sentences maintaining the method as Theme, which ensures clarity but sometimes delays presentation of results. This reliance on constant progression confirms Pho’s (2008) observation that cohesion in scientific texts often depends on method repetition.

Electrical and computer engineering abstracts, by contrast, privilege novelty and performance. Alotaibi (2020) noted the frequent use of textual Themes such as “Furthermore” or “In addition” to link contributions to outcomes. In one *IEEE Transactions on Power Electronics* abstract, the first clause states, “This paper proposes a novel inverter topology that reduces harmonic distortion and improves efficiency.” The Theme highlights innovation, while the Rheme presents the measurable impact. Subsequent sentences follow linear progression, where the Rheme of one becomes the Theme of the next. This reflects the subfield’s evaluative culture, where contribution is defined by technical advancement and quantifiable metrics (Alyousef, 2021).

Mechanical engineering exhibits mixed strategies. Babaii, Atai, and Behzad (2016) compared biomedical and mechanical engineering abstracts and found variation in Theme types. Some abstracts begin with objects, as in “The turbine blade was subjected to high-cycle fatigue testing to determine its failure threshold,” while others begin with models, as in “A computational fluid dynamics model was developed to simulate airflow in the combustion chamber.” These openings show that mechanical engineering abstracts alternate between object-based and process-based Themes. Thematic progression is sometimes constant, focusing on the device, and sometimes split, where one result generates multiple lines of discussion. Huang (2018) documented similar variation in marine engineering, reinforcing that mechanical subfields balance empirical testing with theoretical modeling. Chemical and materials engineering abstracts integrate both method and result. Ebrahimi (2016) reported that chemical engineering abstracts rely heavily on unmarked topical Themes, often naming reaction conditions or experimental settings. A typical example from *Journal of Materials Science* states, “At 800 °C, the alloy exhibited enhanced ductility due to grain refinement.” Here the Theme is a circumstantial adjunct of condition, signaling experimental detail at the outset. Progression



alternates between constant (maintaining the condition) and linear (moving from condition to outcome). This alternation reflects the subfield's dual priority of reproducibility and performance improvement.

Across all subfields, certain problems recur. One is overreliance on repetitive Themes. Civil engineering abstracts often start multiple clauses with "In this study" or "Using finite element analysis," which can flatten the rhetorical dynamism. Electrical engineering abstracts sometimes chain results without synthesis, resulting in linear but fragmented progression. Mechanical engineering abstracts occasionally employ dense nominalizations that obscure agency, a tendency also noted by Hyland and Jiang (2019) as part of broader academic discourse. Non-native writers, especially in international journals, sometimes expand background Themes excessively, echoing findings by Lorés (2004) and Martín-Martín (2005) on cultural rhetorical traditions. Such practices can reduce alignment with global disciplinary norms, which expect early focus on novelty and results.

These thematic tendencies also carry pedagogical implications. Hyland (2007) emphasized that writing instruction must be sensitive to disciplinary practices. If engineering subfields differ in how they use Theme and progression, then ESP pedagogy should avoid generic models and instead train students to analyze abstracts in their specific domain. For example, civil engineering students should learn to balance procedural Themes with early presentation of findings, while electrical engineering students should practice synthesizing contributions rather than chaining them. By raising awareness of thematic variation, teachers can help novice writers produce abstracts that meet disciplinary expectations and achieve visibility.

The SFL framework provides explanatory power for these observations. Halliday and Matthiessen (2014) argue that Theme organizes discourse, and the corpus evidence supports this claim. Fries (1995) showed that thematic development influences textual structure, and in engineering abstracts, thematic choices clearly encode disciplinary identity. Civil engineering Themes emphasize reproducibility, electrical Themes highlight innovation, mechanical Themes negotiate between processes and objects, and chemical Themes balance experimental conditions with outcomes. Daneš's (1974) progression patterns describe these developments precisely, allowing us to see why some abstracts appear cohesive and others less so. By combining SFL with corpus data, researchers can identify subfield-specific norms and provide evidence-based guidance for academic writing.

4. Conclusion

This literature sweep demonstrates that research article abstracts in engineering cannot be treated as a homogeneous genre. They vary significantly across subfields, reflecting distinct epistemological orientations. Civil engineering favors method-driven constant progression, electrical engineering foregrounds novelty and linear progression, mechanical engineering alternates between object- and process-based Themes, and chemical engineering integrates method and result through alternating progression. These thematic choices embody what counts as legitimate contribution in each subfield. The implications are wide-ranging. For discourse analysts, the findings show that Theme is not a static category but a disciplinary signal. For teachers, abstract-writing instruction must be tailored to subfield practices rather than relying on generic templates. For non-native English authors, awareness of thematic organization is essential for aligning with international publication norms while retaining local academic identity.

Future research should build on this sweep with quantitative corpus analysis to measure frequencies and test hypotheses about thematic variation. Pedagogical interventions should evaluate whether explicit training in Theme and progression improves student writing and enhances research visibility. By linking SFL theory with corpus evidence, this project contributes to a deeper understanding of how language mediates knowledge communication in engineering.

In sum, thematic patterns in engineering abstracts are both intradisciplinary and intercultural. They shape how contributions are perceived, how knowledge circulates, and how novice researchers position themselves in global academia. Recognizing and teaching these patterns is therefore essential for advancing academic literacy and fostering inclusive participation in knowledge exchange.



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