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Proposal of indicators for the structural analysis of scientific articles



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ABSTRACT

This study aims to identify variables and indicators that substantiate the development of rules that focus on the structural analysis of scientific articles. Variables and indicators for structural analysis are derived from hypotheses deduced from editorials in important scientific journals. To exemplify and test the indicators, a structural analysis was conducted of 108 scientific articles published in important journals in the field of Management. The hypotheses were mostly tested in accordance with the idea of estimation statistics. The approach that was developed for the structural analysis of the network of texts innovates by employing network analysis indicators (indegree and outdegree). For this purpose, the text matrix is employed through the identification and encoding of cross-references between sections and subsections of each article under study. For the context in question, the field of Management, twelve rules were developed. The interpretations of the possible values for the indicators, expressed in the form of rules, are applied as directives to less experienced scholars in preparing their scientific articles, and for the generation of information to support activities concerning the classification and analysis of scientific articles.

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1. Introduction

The importance of the structure of an article has been highlighted by the editors of prominent journals. Sun and Linton (2014, p. 571) wrote an editorial that pointed out that “paper writing is a critical step in publishing research work. Structure offers a basis, skeleton and acts as a guide – especially for multi-author collaborations”. Bansal and Corley (2012), in an editorial, addressed the structural differences between the front end and back end of qualitative articles. This was one of seven editorials of the Academy of Management Journal, in which the editors gave suggestions and advice for improving the quality of articles to be submitted to the journal. The essence of these editorials is that there are common structural aspects among the articles published in high-impact journals that should be observed by researchers who intend to publish through these channels. These editorials, together with others such as that of Sparrowe and Mayer (2011), Zhang and Shaw (2012), invited us to reflect on the theme, especially on the possibility of identifying and defining discriminatory characteristics in scientific articles published in high-impact journals.

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Considering that “a good editorial is an opinion maker” and “what it analyses can be the basis of the production of new evidence” (Singh & Singh, 2006; p. 15), we used the information from the cited editorials as a source of inspiration for the present study. The opinions found in editorials encouraged us to consider the structure of the scientific article, how it is divided into sections and the number of words, as commonly employed features. Some authors, such as Cargill and O’Connor (2009) and Sun and Linton (2014), make use of these features to represent graphically the predominant side view of the structure of scientific articles.

The focus and innovation of this study is to consider the structure of scientific articles in terms of the relationships between the sections of the article. Internal relationships are characterized by cross-references and other devices discussed in this study, which will be identified and encoded in text matrices for each of the articles in the sample. The analysis of the interrelations between sections will be based on indicators using network analysis techniques, applied to the context of textual documents, in accordance with the AnaCoTeX approach proposed by De Sordi, Meireles and De Oliveira (2016). The analyses of section size and the relationships between sections will include statistical tests to analyze the opinions of experienced researchers and editors, as declared in editorials and presented in this study in the form of hypotheses. As the analyses of the editors are mostly specific, according to the type of research, whether qualitative, quantitative or qualitative-quantitative (Creswell, 2003), the hypotheses and variables will be segmented by these types of research.

The high number of scientific articles rejected by prominent journals (Linton, 2012) and the importance of structural aspects (distribution of words, sections and subsections between front end and back end article texts, according to the demands of each type of research) for the quality assigned to the article (Sun & Linton, 2014), were among the principal motivations for this study. The study aims to identify variables and indicators that substantiate the development of rules that focus on the structural analysis of scientific articles. For this purpose, we analyzed 108 articles published in important journals in the field of Business Management. The knowledge derived from this study is of direct concern to a wide range of professionals involved in the development, analysis and classification of scientific articles.

2. Structure of scientific articles

“Empirical social science journal articles normally consist of six parts: (1) Introduction, (2) Literature review, (3) Methodology, (4) Result, (5) Discussion, and (6) Conclusion” (Sun & Linton, 2014; p.571). This standard structure was used in an analysis that considered only the volume of the sections (word count). For this study, which also addresses the interrelations between sections in terms of cross-references, we made two alterations to the standard structure described by Sun and Linton (2014): a) exclusion of the Conclusion section, as it has no association with cross-references (it does not cite, and is not cited by, the other sections) and is treated by many authors as a subsection of the Discussion; b) addition of the Appendix, as many articles have one or more appendices, resulting in many cross-references. These adaptations will be revisited and justified in Section 4, based on what was identified in the articles of the study sample. Thus, the standard structure of the scientific article considered in this study is composed of six sections: Introduction, Theory/Literature-review, Method, Results/Findings, Discussion and Appendix.

2.1. Size of sections

Sun and Linton (2014) used the number of words in the sections to conduct a comparative analysis of two groups of articles: 50 desk-rejected manuscripts recently submitted to Technovation and ten highly cited papers from Technovation. Bansal and Corley (2012) also worked with the idea of size, but rather than section, they worked on parts of the text, using the concepts of front end and back end of the articles, described and analyzed as follows:

The front end of a quantitative article typically includes an introduction, literature review, and the development of new theory by way of hypotheses. The literature review, therefore, sets the background for the hypotheses. Because qualitative papers fulfill a different purpose, their front end is shorter, yet it serves more functions.

[...]

long, robust back end

[...]

Qualitative works, on the other hand, reserve the biggest punch for the back end. A strong Discussion section should not only summarize the findings and ultimately delineate the theoretical and practical implications that are also demanded of quantitative papers [...] (Bansal & Corley, 2012; p. 510).

The relationships highlighted in the editorial are “front end shorter” and “back end robust and long”. Considering that we analyzed articles from different journals, encompassing different types of research, we will work on part of the analyses with the front end and back end concept. Like Bansal and Corley (2012), we will consider as the front end of the article all the sections that precede the Method section, with all the others being considered as the back end of the article. Thus, we will analyze the opinion of these authors using the following hypothesis:

H1–The ratio between the volume of words of the front end and the back end is a discriminatory characteristic of the type of research, whether qualitative, quantitative or qualitative-quantitative, being more equal (closer to one) for quantitative

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