Disruption, Disruptors and Disruptiveness of Scholarly Communication: An Actor-Network Theory Approach

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Abstract: The rise of Open Access, the increasing pace of scientific work, the serial crisis and the need for interdisciplinary research are just some examples of the current disruptions of traditional scholarly communication. As publishing is a significant practice for distributing scientific knowledge and therefor for academic knowledge management, an understanding of the current disruptions in the field is necessary for the future development and maintenance of the system. The paper presents a conceptualization of disruptions drawing from Latour's Actor-Network-Theory with reference to current understandings of disruption. The aim of the research is the identification and mapping of current disruptions, their disruptors and the disruptiveness in scholarly communication in the field of economic and social sciences by analyzing scientific editorials. Therefore, a short overview about previous analyses of scientific editorials is presented. For the sampling of editorials, a systematic literature search was conducted using Web of Science, followed by an application and comparison of Text Mining operations using R. Afterwards an in-depth investigation of the disruptors as source of disruption and disruptiveness as potential of disruption will be following using qualitative content analysis. The insights of this research will be helpful for anticipating and overcoming the current disruptions as well as for identifying and dealing with future disruptions in the field.

Keywords: scholarly communication, actor-network theory, text mining, disruption

1. Introduction

Publication of research is a crucial process for knowledge dissemination and exchange in the global research community and therefore for academic knowledge management. Through developments like Open Science and Access or the serial crisis scholarly communication had and has to constantly modify its business model (Marple, 2018), leading to changes e.g. for authors, reviewers and editors. Therefore, it is evident, that scholarly communication is confronted with "large-scale disruptions" (Barbour, 2019, p. 151).

The aim of the work-in-progress is to investigate, by analyzing scientific editorials, which disruptions can be identified in the scholarly communication of economics and social sciences, what their origins are, and what potential of disruption they provide. For doing so, a conceptualization of disruptions is provided drawing from Latour's Actor-Network-Theory (ANT).

In the ANT, a network consists of a web of relations among different actors, whereby an actor is everything that acts or gets activity by others (Callon and Latour, 1981). Following Latour (1996), ANT uses properties of nets and adds an actor undertaking some work, leading to a redefinition of spatial metaphors (far – close, local – global, inside – outside, small – large), which are substituted by the metaphor of connections that exist or not. Regarding disruptions, two common approaches are referred to: Disruptive innovations describe a specific type of innovation entering a market, thereby causing leading companies to fail as they are not predictable by standard management methods (Christensen, 2001). Societal disruptions are events that affect society as a whole (Camillus et al., 2020) by changing the way society lives together, disturbing the function of everyday processes, thereby negatively impacting infrastructure and markets (Schrijvers, Prins and Passchier, 2021).

Following neutral terms of ANT (Latour, 2005) disruption refers to a radical disturbance or irritation, which necessitates an adaptation in reactive adjustment or transformation processes to maintain the actor-network. A disruptor refers to the actor(s) causing the disruption by possessing a specific potential of disruption, called disruptiveness.

2. Scientific editorials as database

For answering the research question, scientific editorials are used as an expression of expert views about the current developments and changes in scholarly communication. Considering the small amount of research using

scientific editorials as data basis (del Árbol, 2005), it can be assumed that they are underrepresented in research. Although, most research is limited to scientific articles, some researchers have made use of editorial analysis, since editorials have DOIs and are citable sources (Waaijer, van Bochove and van Eck, 2011). Heterogenous methods can be identified in relation to editorials in research, which range from bibliometric mapping (Waaijer, van Bochove and van Eck, 2011) over sensitivity analysis combined with clustering (Waaijer, 2013) to interpretive analysis (Miller et al. 2006).

3. Method

This work adopts a mixed-method approach, which combines quantitative text mining (TM) with in-depth qualitative content analysis of editorials. The research process is shown in Figure 1.

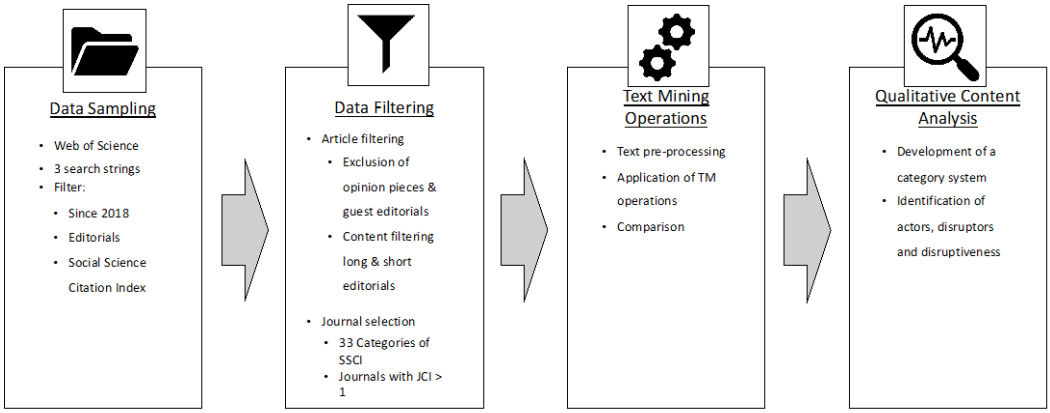

Figure 1: Research Process

3.1 Sampling strategy

For sampling editorials in the field of economics and social sciences, a systematic literature search was conducted in Web of Science using the Social Science Citation Index (SSCI) and combining three search strings. A field narrowing seems reasonable due to different disciplinary publication practices. For article selection, the results were filtered regarding their document type to exclude guest editorials and opinion paper. Additionally, the shortest and longest editorials were content reviewed to reduce dimensionality. On Journal Level 33 categories of the SSCI were included. A further selection based on the Journal Citation Index > 1 was conducted to only include Journals with an at least average impact in their field. Resulting in a final sample of 367 editorials.

3.2 Text mining operations

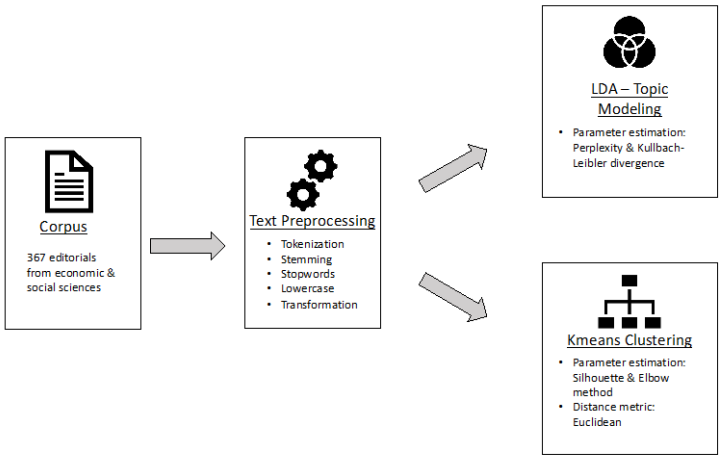

Figure 2: Text Mining Process

The purpose of TM is to extract information or patterns from a big amount of unstructured textual data (Grimmer and Stewart, 2013). Two unsupervised methods are used and compared, and their applicability to scientific editorials is examined. The TM process is visualized in Figure 2 and was conducted using the Quanteda

(Benoit et al., 2018) and topicmodels package for R. In text preprocessing, the data is prepared to reduce the dimensionality and transformed into a document term matrix. For topic modeling the Latent Dirichlet Allocation (LDA) a probabilistic topic model that sees documents as a mixture of topics is used (Blei, Ng and Jordan, 2003). A topic is thereby modeled by the co-occurrence of words (Grimmer and Stewart, 2013). Perplexity and Kullbach-Leibler divergence were calculated to estimate the number of topics, resulting in an optimum between 20 and 21.

For Clustering, the K-means algorithm was used, resulting in a single-membership approach. A Cluster is generated by identifying document subsets that minimizes the squared Euclidean distance within them (Grimmer and Stewart, 2013). The silhouette and elbow methods were used to determine the optimal number of centroids, leading to the optimum of 2. Prospectively, TM results will be compared and validated by a qualitative content analysis.

4. Preliminary results

In this work-in-progress the results of K-means Clustering and LDA topic model with a k of 20 are presented.

4.1 K-means clustering

The K-means clustering results can be seen in Figure 3, which shows that the clusters are not distinct but cluster 1 is in cluster 2. Also, increasing the number of k does not lead to distinct clusters. Therefore, the paper focuses on topic modeling results.

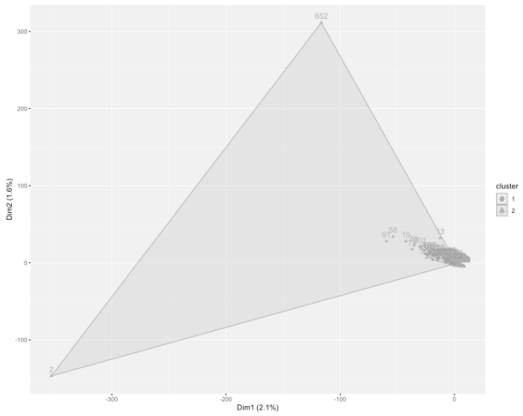

Figure 3: K-means cluster plot (k=2)

4.2 LDA topic modeling

Based on the top words per LDA topic, visualized in Figure 4, a cautious description of the editorials is possible. Broadly three groups can be identified:

The first category refers to general publication issues, concerning all scientific disciplines. Publication formats like theoretical contributions (T11), research studies (T14) and methodological issues (T16) are part of editorials. In the context of the ongoing debate on quality assurance in science, the review process (T18) as well as publishing ethics (T19) are addressed. Furthermore, new questions arising in science like Open Science and Access (T8) and data research and transparency (T15).

The second group of topics includes discipline-specific questions of particular research fields e.g., educational research (T7) or spatial economics (T12). These topics are probably currently discussed objectives in the respective discipline.

The third group of topics covers societal issues and developments that enter scientific or disciplinary debates. The rise of communication technology and media (T13) affects the scientific publication system as well as the Covid-19-pandemic (T2). Women and gender issues (T17) or politics and state security (T10) are also addressed.

Furthermore, the topics seem to have different temporal dimensions: Some topics concern events with transformational character and other can be brought in association with ongoing debates or processes like the gender balance.

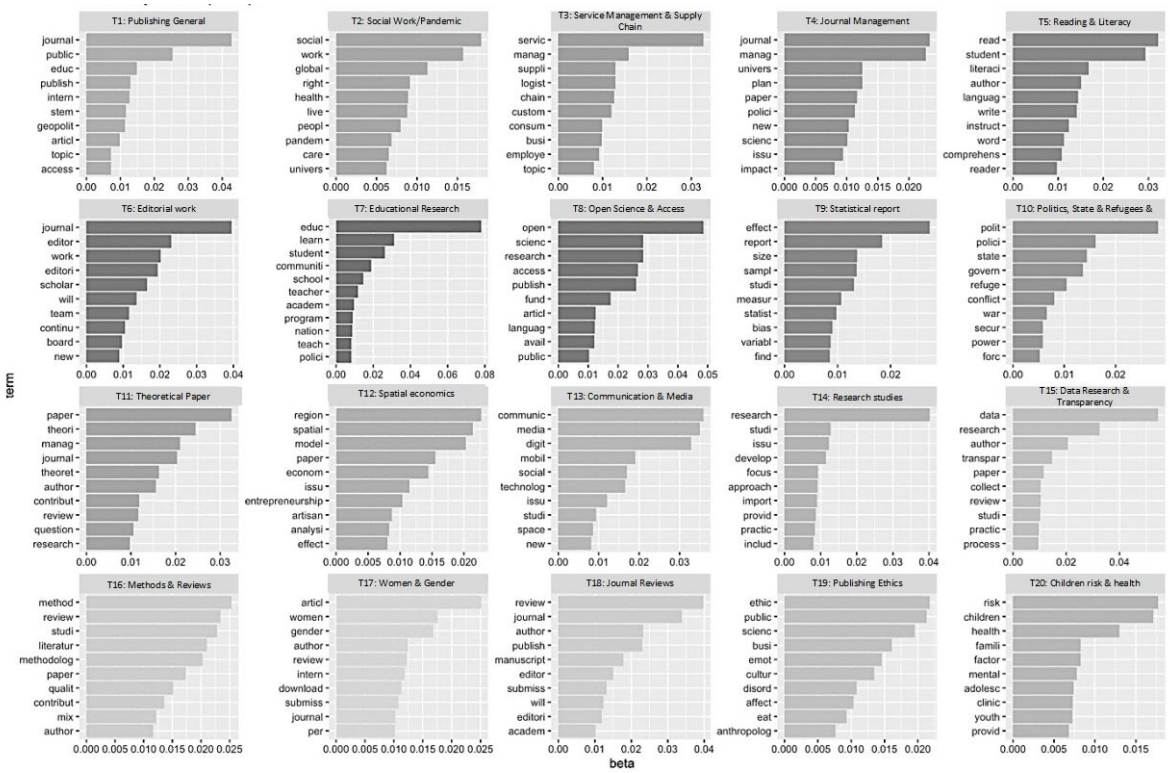

Figure 4: Probability of Top Terms per LDA-Topic

5. Discussion and implications

The analysis of editorials provides insights into future research developments. Relating the results with disruptions, some general publishing themes are referred as disruptions in the literature like Open Access and Science (Barbour, 2019), which changes the model of access and business (Allahar, 2017), the pandemic that accelerates scientific pace (Preiser and Preiser, 2020), or the rise of data science (Lagoze et al., 2015). The disruptions described in the literature could be shown to occur as statistical topics in the editorials, but no information can be provided yet about the editors' perceptions and attitudes. Also, the disruptive character still has to be made explicit and topics have . to be further validated. With an in-depth analysis, it will be explicated which disruptions are apparent and by whom and how disruptions are triggered. Methodologically, TM and the use of editorials is a novel approach to gain insights into the scientific system. Additionally, it allows the analysis of a large amount of data, which, after validation, has an impact on the informative value of the results. Nevertheless, it could also be shown that not all TM applications are equally suitable.

Acknowledgement

“Disrupt!Research” is part of the Excellence measure "Disruption and Societal Change" at TU Dresden (TUDiSC) and is funded by the Federal Ministry of Education and Research (BMBF) and the Freestate of Saxony within the Excellence Stategy of the German Federal and State Governments.

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