Capturing new developments in an emerging technology:
An updated search strategy for identifying nanotechnology research outputs

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Abstract

Bibliometric analysis of publication metadata is an important tool for investigating emerging fields of technology. However, the application of field definitions to define an emerging technology is complicated by ongoing and at times rapid change in the underlying technology itself. There is limited prior work on adapting the bibliometric definitions of emerging technologies as these technologies change over time. The paper addresses this gap. We draw on the example of the modular keyword nanotechnology search strategy developed at Georgia Institute of Technology (Georgia Tech) in 2006. This search approach has seen extensive use in analyzing emerging trends in nanotechnology research and innovation. Yet with the growth of the nanotechnology field, novel materials, particles, technologies, and tools have appeared. We report on the process and results of extensively reviewing and revising the Georgia Tech nanotechnology search strategy.

The initial nanotechnology search strategy was devised with three principal aims in mind (see Porter et al., 2008).   First, each search term component had to add value to the overall search by attracting a non-trivial number of unique publication records. Second, the search approach had to be relatively uncomplicated yet also comprehensible to domain experts. Finally, the search strategy had to allow for the addition, removal, or modification of terms as the field evolved over time.

Although a given search approach may have performed well historically, inevitably it will begin to lose both precision and recall over time and will need to be

reviewed. As a scientific domain evolves over a period of years, we ask when is it appropriate to update a bibliometric search strategy? In a domain as sizeable as nanotechnology this is a critical issue, as the updating process will likely require significant investments in time and resources to implement. This research question is at the heart of this paper, which develops an approach to updating our nanotechnology search terminology to reflect the evolving nature of the field.

By employing structured text-mining software to profile keyword terms, and by soliciting input from domain experts, we identify new nanotechnology- related keywords. We retroactively apply the revised evolutionary lexical query to twenty years of publication data to produce a powerful and rich panel dataset. Our findings indicate that the new search approach offers an incremental improvement over the original strategy in terms of recall and precision. Additionally, the new strategy reveals several emerging cited subject categories particularly in the biomedical sciences, suggesting a further extension of the nanotechnology knowledge domain. The implications of the work for applying bibliometric definitions to emerging technologies are discussed.

References

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