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Future pathways of a sector in transition: an STS perspective on the scholarly publishing market and Open Access

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Abstract

The future of scholarly publishing, in particular the growth of Open Access publishing and how it is financially sustained, is hotly debated. Many different models, advantages, and disadvantages are being discussed. Yet, there is little consensus about what a future system should look like or how it should be governed. To describe the ongoing dynamics in scholarly publishing, this paper introduces the multilevel perspective on socio-technical transitions (MLP). This explorative application of the MLP addresses five possible transition pathways: transformation, reconfiguration, substitution, de-alignment & re-alignment, or a sequence. The analysis shows that incumbents survive by adapting to niche innovations and withstanding landscape pressure by innovating themselves, in terms of technology, business models and through acquisitions. In other words, the current trajectory reproduces the oligopoly of incumbents. This means that the sector is, at minimum, on a trajectory of transformation or, potentially, reconfiguration. This diagnosis may change when the dynamics change, for instance if niche innovations and landscape pressure converged stronger on an alternative pathway.

Keywords

scholarly publishing, Open Access, socio-technical system, science and technology studies, sustainability transition

Introduction

The future of scholarly publishing and in particular the growth of Open Access publishing and how it is financially sustained are hotly debated. Observers are discussing facettes such as costs and oligopolies (Butler et al. 2022; Björk & Solomon 2014), the growth of Open Access (Björk 2017), the impact of transformative agreements (Widmark 2021; Hinchcliffe 2019), knowledge as a public good (Neylon et al. 2019) or a radical restructuring of the scholarly publishing system (Adema & Moore 2018). Publishing platforms and Diamond Open Access are gaining attention, too. Notwithstanding some attempts to assess different scenarios for the future of scholarly publishing (van Barneveld-Biesma et al. 2020), there is little consensus about its future features or governance arrangements.

To better describe these dynamics, this paper introduces the multilevel perspective on socio-technical transitions (MLP) to scholarly publishing. It is a heuristic tool to analyse structural change of a sector (Geels & Schot 2007; Geels 2011) which allows integrating

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most elements outlined above. This explorative application of the MLP also addresses five possible transition pathways: transformation, reconfiguration, substitution, de-alignment & re-alignment, or a sequence (Geels & Schot, 2007), which can inform stakeholders in setting their own priorities.

Public goods, interventions, and large firms

MLP was developed to analyse changes of socio-technical systems that are unlikely to be addressed by markets alone, usually in sectors striving to be more environmentally sustainable (International Science Council 2019) such as transport (Geels 2005) and agriculture (El Bilali 2019).

Three characteristics should be met to apply the MLP (Geels 2011, 25). First, it should concern public goods, be directional, and goal-oriented. Specific governance solutions are needed when private actors are not incentivised to provide public goods. Second, due to the public-good aspect, ”changes in economic frame conditions" (ibid.) are created through policy interventions. Incumbents are likely to resist attempts to alter the system. Finally, sectors are "characterised by large firms" (ibid.). If these firms undergo a reorientation they can have a large impact on the transition.

All three can be mapped to scholarly publishing with relative ease. First, Open Access is 'goal-oriented' and invokes knowledge as the “quintessential public good” (Willinsky 2006, 9). Commons-based approaches are being explored to govern knowledge (Hess & Ostrom 2007) which requires specific incentives and regulatory frameworks (Neylon et al. 2019).

Second, policy intervention is evident. Research funders mandate Open Access to articles (Aspesi et al. 2019) and secondary publishing rights are being adopted in many countries. Power struggles are visible in the reactions to Plan S, to public access mandates in the US, and between commercial actors disagreeing about the modalities of the transition (see e.g. Else 2019; Brainard & Malakoff 2019; Frontiers 2022).

Third, scholarly publishing is dominated by few large firms and has been called an "oligopolistic market" (Larivière et al. 2015). Stakeholders are even concerned about incumbents abusing market power (EUA 2018; Tennant & Brembs 2018). However, firms show signs of strategic reorientation by introducing new publishing and business models (Evans 2020; Hinchcliffe 2019; Kwon 2019). Altogether, the scholarly publishing system appears to match the MLP’s typical characteristics.

Regime, landscape, and niches

MLP differentiates between three interacting levels: regime, landscape, and niches. The dynamics across these levels dictate the future development of a sector.

Scholarly publishing as a sociotechnical regime

A *sociotechnical regime* combines technological regimes, including their path dependency, with the societal rules and behaviours that stabilise them (Geels 2005, 449–50). "Legally binding contracts, cognitive routines, core capabilities and competences, lifestyles and user practices, favourable institutional arrangements and regulations" (ibid.) are crucial in creating longevity and interdependence.

Scholarly communication has long been described as a sociotechnical system (Borgman 2007, 48). A core element is the scientific article providing registration, validation, dissemination and archiving of research results (Rallison 2015). Articles have been tied to a pay-to-read business model in different shapes. Some journals convey prestige and researchers compete to publish in them for career progression. Publication-based university rankings add to competition. In turn, accessing the knowledge contained in these journals is essential to be informed about recent findings. These arrangements have become stable over time through contracts, routines and user behaviour.

Moving towards Open Access challenges these arrangements. Many regime features are under scrutiny. Academia’s "obsession" with journal prestige has been called out (Brembs et al. 2013; Neff 2020) and initiatives are aiming to change the research assessment system. Business models such as subscription big deals have been described as anticompetitive (Dewatripont et al. 2006; EUA 2018; Larivière et al. 2015). Customers demand transparency and price stability and cancel big deals . New models like transformative agreements may even exacerbate these oligopolistic tendencies (Copernicus Publications et al. 2020; Kwon 2019a; Mckenzie 2019).

How landscape pressure affects the regime

A wider *sociotechnical landscape* is an exogenous environment whose political, cultural, or economic developments create shifting expectations towards the regime (Geels & Schot 2007, 400). Factors which induce change include "demographical trends, political ideologies, societal values, and macro-economic patterns" (Geels 2011, 28).

Here, the role of the internet cannot be overstated. Digital technologies led to changes about how digital resources are shared, forcing the media, film, and music industries to adapt (Neylon et al. 2019, A40). The genesis of Open Access publishing is a result of these shifts and follows the realisation that information can be cheaply shared online (Willinsky 2006; Ginsparg 2011; Budapest Declaration; Berlin Declaration). Open Access has since evolved into a major policy goal, most recently at global level with the 2022 UNESCO Recommendation on Open Science.

Niche innovations bringing change

Niche innovations are “seeds for systemic change" (Geels 2011, 27), emerging technologies or services and the environments where they are developed. Often, they are supported by small communities and their structures are less stable (Geels & Schot 2007, 400-402). They may become embedded in a regime or even replace it entirely.

In the case of scholarly publishing, these are usually technologies and services that add to or substitute journal publishing, and innovative business models. To give some examples, Herman et al. (2020) differentiate between enhanced models, innovative models and alternatives to traditional journals. They include multimedia integration, embedding of data, open peer review, overlay journals, cascade journals, repositories, aggregators, scholarly social networks, data sharing platforms etc. Preprint repositories are said to offer a viable alternative for the traditional journal model, too (Rodrigues et al. 2017; Ross-Hellauer et al. 2019). Publishing platforms should also be mentioned here.

Turning to business models, Speicher et al. (2018) name APCs, book processing charges, institutional funding, co-funding through book sales, and others. Wise and Estelle (2020) identify business models for Open Access publishing by society publishers. New models

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are also developed for national consortia (Schönfelder 2020; Schönfelder & Pieper 2020). Born-OA publishers similarly innovate to compete with big deal agreements (frontiers 2020; FWF 2017; Jisc 2019; National Library of Sweden 2018; Peet 2020). Innovations have garnered attention at political level (Smith 2015). The European Commission created Open Research Europe and a strong push for diamond Open Access is underway with the *Action Plan for Diamond Open Access* (Ancion et al. 2022).

Potential transition pathways

Equipped with this brief description of regime, landscape, and innovations, it is time to turn the attention towards the direction of change. The MLP describes five different scenarios: transformation, reconfiguration, de-alignment and re-alignment, substitution, or a sequence (Geels & Schot 2007).

Option 1: Transformation

In a transformation, incumbent actors modify their own activities under "moderate landscape pressure" (ibid. 406) and face limited niche innovations. “Cumulative adjustments and reorientations" (ibid.) slowly change regime actors and eventually result in a transformed regime. It implies the survival of incumbents and integration of niche innovations into the regime.

Looking at the dynamics in scholarly publishing, innovations such as hybrid journals, fully OA journals, megajournals and platforms are implemented or acquired by incumbents. This is accompanied by new business models such as APCs, off-setting deals, read-and-publish, publish-and-read and transformative agreements. These new business models may bolster incumbents (Butler et al. 2022; frontiers 2022). Niche innovators have emerged (e.g., arXiv, PLoS) but have not replaced incumbents. This survival of incumbents through gradual adjustments, including through acquisitions of innovators, lends support for a possible transformation pathway.

Option 2: De-alignment and re-alignment

De-alignment and re-alignment occur when "landscape change is divergent, large and sudden" (Geels & Schot 2007, 408). Confidence in the whole erodes, creating opportunities for competing niche innovations. Sudden, surmounting challenges to the existing regime lead to the emergence of a dominant paradigm leading to "re-alignment and re-institutionalisation in a new sociotechnical regime" (ibid.).

No event has so far fundamentally challenged the current publishing system and its major actors and it is too early to say whether the Coronavirus pandemic will have a lasting impact. The surge of preprints, accelerated review processes, and the commitment of publishers to Open Access (Eisen et al. 2020; Flier 2020; Kupferschmidt 2020) might be temporary. Lasting impacts could also remain confined to specific domains, mirroring existing differences in publishing behaviour (Severin et al. 2018) and availability of Open Access journals (Kramer & Bosman 2019). In short, a de-alignment and re-alignment pathway would require much stronger disruptive change.

Option 3: Reconfiguration

During a reconfiguration, accumulated innovations, "initially adopted in the regime to solve local problems" (Geels & Schot 2007, 411), lead to regime change. Regime actors use these

niche innovations and slowly alter "the regime's basic architecture" (ibid.), even though main actors and incumbents survive. It differs from 'transformation' through the stronger alteration of a regime's basic architecture.

Initial, local approaches like offsetting, hybrid journals, or embargo-based Open Access were rather isolated and compatible with the subscription system. However, continued customer and landscape pressure to reach full and immediate Open Access requires models which replace the subscription system in a more fundamental way.

Such a shift is being attempted through transformative agreements with traditional publishers (Hinchcliffe 2019; Kwon 2019) as well as large-scale deals with Open Access publishers (e.g., frontiers 2020; FWF 2017; Jisc 2019; National Library of Sweden 2018; Peet 2020). All could be harbingers of the reconfiguration of the regime's basic architecture which enables Open Access with a new business model. In this scenario, current incumbent companies likely keep their dominant positions.

One scenario developed by van Barneveld-Biesma et al. (2020) represents a more radical change. Here, incumbents provide publishing platforms and other related services and cease journal publishing which in practice would signal a reconfiguration. However, while there is experimentation with such models, they are not at a scale yet to indicate a reconfiguration of the entire regime. Moreover, they would be less compatible with other features, e.g. research assessment using journals.

Another possibility is that community-driven publishing replaces commercial publishing (Adema & Moore 2018). This would be a reconfiguration in the sense of how the system is governed and funded (Becerril-García & Aguado-López 2018), albeit not necessarily replacing the journal. Through Plan S, funders, too, have embraced Diamond Open Access. Yet, Plan S also accepts commercial publishing. It is unlikely to expect a reconfiguration solely based on non-commercial publishing if there is no high landscape pressure for this alternative. Moreover, Diamond OA can also function with commercial incumbents (Dellmann et al. 2022).

Option 4: Substitution

Substitution materialises through shocks or disruptive change. High landscape pressure and niche innovations converge during a window of opportunity to replace a regime. The outcomes are similar to re-alignment and de-alignment (Geels and Schot 2007, 409).

Digital publishing already replaced print publishing without fundamentally altering regime features. Realising Open Access publishing would probably imply not just a substitution but a transformation or reconfiguration because it requires reinventing business models and routines. This concerns the question how radical change has to be to be considered a substitution. New types of publishing infrastructures such as preprints archives or publishing platforms may be able to distribute the traditional function of journals – registration, validation, dissemination and archiving – across layers and services (Rodrigues et al. 2017; Ross-Hellauer et al. 2019; Sever et al. 2019). But while some fields make more use of preprints (Severin et al. 2018) they are still far from replacing journals altogether.

Option 5: Sequence

In a sequence, subsequent transitions across all types are possible, depending on the type of landscape pressure and the impact of niche innovations on the regime architecture (Geels and Schot 2007, 413).

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Identifying a sequenced transition may depend on the chosen time frame. Moving from print to digital publishing probably constituted a first step of this sequence, followed by the move towards commercial publishing (Fyfe et al. 2017), and then to Open Access publishing and from pay-to-read to pay-to-publish in parallel. From this perspective, the Open Access transition is but one step in a sequenced transition that started with the arrival of digital technologies in scholarly communication.

Looking ahead, a notable development and possible next step in this sequence is the creation of entire research tool portfolios and workflows by commercial publishers (Aspesi et al. 2019; Posada & Chen 2018; Schonfeld 2017; Schonfeld 2018).

Conclusion

This paper argued that the MLP helps analysing the dynamics in (Open Access) scholarly publishing. It was shown that scholarly publishing can be described using the concepts of sociotechnical regime, landscape, and niches. The MLP also provides a vocabulary to examine the possible trajectories of the sector.

The analysis points at minimum towards transformation and, potentially, reconfiguration. First, incumbents are adapting and innovating on technology, business models, and with acquisitions. For a transformation path speaks that a deeper change has not taken place yet, for example through preprints or community-driven initiatives. Second, deeper-going change appears on the way through various pay-to-publish models. Since they fundamentally alter the regime's structure, their growth may be a sign of reconfiguration.

Some obvious limitations and missing perspectives must be mentioned. First, many journals fall out of the scope of an analysis focussed on large commercial players (Khanna et al. 2022). Second, questions of equity, diversity and inclusion (Sawahel 2022) are increasingly acknowledged but could not be addressed. However, the survival of incumbents suggests that these questions will be salient for the foreseeable future. Lastly, a stronger analysis would be possible with more developed definitions and concepts.

The overall diagnosis can also change when landscape and niches evolve. The current trajectory which reproduces the oligopoly of incumbents, for example, may be altered if niche innovations and landscape pressure converge stronger on an alternative pathway. This understanding may help actors develop strategies and interventions in their preferred direction.

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