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Steffen Roth is based at La Rochelle Business School, La Rochelle, France and Yerevan State University, Yerevan, Armenia.
Loet Leydesdorff is based at the Universiteit van Amsterdam School of Communications Research, Amsterdam, Noord-Holland, The Netherlands.
Jari Kaivo-oja is based at the University of Turku, Turku, Finland.
Augusto Sales is based at KPMG Global Strategy Group, Rio de Janeiro, Brazil, Fundacao Getulio Vargas, Rio de Janeiro, Brazil and Ibmec Business School, Rio de Janeiro, Brazil.

1. Introduction

On June 5, 2018 the US-based aerospace and defense giant Boeing signed a memorandum of understanding ("MoU") with Embraer, its Brazilian competitor in the regional jet market, to establish a strategic partnership that promises to accelerate the growth of both companies in global aerospace markets. According to the joint press release published by the Boeing Media Room (2018) on the same day, "the non-binding agreement proposes the formation of a joint venture comprising the commercial aircraft and services business of Embraer that would strategically align with Boeing's commercial development, production, marketing and lifecycle services operations" in the form of a joint venture "comprising the commercial aircraft and services business of Embraer that would strategically align with Boeing's commercial development, production, marketing and lifecycle services operations".

The deal had faced a lot of criticism [AvioNews (World Aeronautical Press Agency), 2018] from a number of stakeholders of Embraer in Brazil, including industry and employee associations, high-ranking federal government officials and politicians. The negotiation was even halted by injunctions before the venture was finally cleared by Brazilian justice (Chicago Tribune, 2018), ironically, one day after Christmas, on December 26, 2018.

The drama is likely to continue. A master transaction agreement was executed by both parties on January 25, 2019, but not without a lawsuit (New York Times, 2018), which was now filed by the Brazilian investors' association (Abradin) and made public on January 22, 2019. To cooperate, these two competitors entered in a complex partnership that will create two joint ventures (the first to focus on executive jets; and the second to focus on the development of the KC 390, a defense aircraft), will require exchange of shares between Boeing and Embraer and shared management with unusual characteristics: the commercial aviation joint venture will be led by Brazil-based management, including a president and chief executive officer; at the same time that Boeing will have operational and management control of the new company, reporting directly to Boeing's Chief Executive Officer in the USA.

Boeing is expected to pay US$4.2bn for its 80 per cent stake in the new joint venture to be formed. Embraer is estimated to receive net proceeds of $3.0bn (after taxes and transaction costs totaling US$1.2bn approximately) (Reuters, 2018).

We know organizations may get trapped by their traditional ways of doing things. However, what if firms like Embraer and Boeing were offered viable alternative options to cooperate openly with each other joining forces to innovate minimizing all the hassle, costs and heavy bureaucracy involved in this complex cross-border business combination?

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Defined as a situation where rival firms simultaneously compete in some contexts and cooperate in others (Bengtsson and Kock, 2000), "coopetition" has attracted a substantial body of research, particularly about innovation-related coopetition, with some of the most prominent examples including the cooperation between Sony and Samsung, SAP and Oracle, Thales and Airbus, Sanofi and BMS or Apple and Amazon. Yet, these examples are particularly instructive not only due to the sheer size and importance of the involved companies and budgets but also indicative of the fact that the focus of most studies has remained confined to the analysis of the properties and outcomes of these classic forms of coopetition (Salvetat *et al.*, 2013).

On the other hand, open innovation commonly refers to co-creation processes with complementary rather than competitive partners. For example, Enkel *et al.* (2009) report that although many companies count their competitors among their most important knowledge sources, most companies prefer to engage in open innovation with customers, crowdsourcing platforms, universities or companies from non-competing markets. This tendency appeared natural in the light of the typical open innovation risks and obstacles.

Only a few years after its formulation (Chesbrough, 2003), open innovation had already been studied at all relevant levels of analysis including at the individual and organizational level as much as at the level of value networks, industries and national institutions (West *et al.*, 2006).

Early groundwork (Tether, 2002) notwithstanding, the mainstream of the field of innovation studies has long ignored the possibility that open innovation could also be conducted with competitors.

In this article, it is our ambition to extend the classic view of coopetition and to explore the broader context of open coopetition, i.e. open innovation cooperation between competitors that includes third parties such as networks, platforms, communities, ecosystems and partners from politics, science and other areas of society.

2. Open coopetition: the open-source of the concept

The origins of the term open coopetition can be traced back to an article entitled "Open Source Coopetition Fueled by LF Growth" written by the journalist Jay Lyman in 2012. In this work, the author uses a more specific concept of open-source coopetition in the context of his report about how the Linux Foundation mediates cooperation between competing companies in the Linux open-source software ecosystem. Similar observations were also reported from the financial service industry, where it was found that highly competitive market actors such as J. P. Morgan, IBM or BMC may coordinate their activities to support the development of open-source solutions to shared IT problems and challenges.

Still, with a clear open-source focus, Teixeira and Lin (2014, p. 6) first coined the term open coopetition in their case study on "Collaboration in the open-source arena" as they:

> [. . .] witnessed a peculiar extent of collaboration between rival firms from the evolving network [. . .] leading us with the proposition that the open-source community can also be a great arena to observe the phenomenon of coopetition [. . .]. However, we were not able find published Management or Information Systems literature exploring coopetition features in the open-source arena, an area that we will further explore while proposing already a neologism:
>
> Open-coopetition: A portmanteau of cooperative competition in the open-source arena, where R&D is jointly performed by competing firms by open-source manners, giving-up authorship-granted intellectual property rights for maximizing both blueprints transparency and collaborative benefits."

The lead author has continued this research program focusing on management- and business-model-related aspects of intra-ecosystem coopetition, and then extended research from inter-ecosystem competition to the broader context of open coopetition between open-source ecosystems. The link between the concepts of open coopetition and open innovation, however, has remained rather implicit in these pioneering studies.

While this pioneering research has made it reasonably evident that open coopetition is a recurring phenomenon in the open-source software industry, the narrow industry focus might suggest that open innovation between competitors and third parties is limited to this industry. The absence of the label open coopetition in non-software-related industries, however, is not an indicator for the absence of open coopetition in other industries. Quite the contrary, typically *dyadic* coopetition has been discovered in virtually all industries (Nemeh and Yami, 2016).

In our opinion, there is no need to confine the concept of open coopetition to specific industries, *dyadic* constellations or levels of analysis. Rather, we may generally define open coopetition as simultaneously collaborative and competitive open innovation between competitors and third parties such as networks, platforms, communities or ecosystems.

In the remainder of this study, we argue that open coopetition not only takes place in a growing number of industries but also constitutes both a management challenge at the individual or inter-firm level and as an organizing principle of many regional or national innovation systems.

3. Open coopetition beyond open-source: a management-research program

Situations in which rivals collaborate both upstream and downstream and, moreover, expand their collaboration to third parties have not yet been systematically explored, and therefore, constitute a veritable management (research) challenge. Typically, coopetition for product development implies the sharing of knowledge and resources (Salvetat *et al.*, 2013). Notwithstanding the potential advantages of this cooperative approach, there remain considerable risks in open coopetition because the strategy creates opportunities not only for the gain but also the loss of knowledge or – as knowledge is never lost if it is shared even with an ultimately hostile competitor – rather the loss of a knowledge-based competitive advantage (Barlatier and Josserand, 2018).

Thus, partners in open innovation are regularly confronted with paradoxes of openness and disclosure (West *et al.*, 2006; Schneckenberg, 2015), which are intensified if the open innovation partners are competitors within the same industry in general and if coopetitive open innovation is extended to include larger networks or communities in particular. So far, however, the management literature on open innovation has mainly studied the classic open innovation relationships between competitors where the involved actors can easily be identified (Fernandez *et al.*, 2014). The identification of techniques and strategies for the management of open innovation between competitors and within the multi-partner arrangement, therefore, remains a major challenge for future research in open coopetition research.

One can consider addressing this challenge by exploring the management principles identified in the management-of-coopetition and the open innovation-management literature. In the former context, the dominant concepts are the separation principle, the integration principle and the co-management principle. The first principle suggests that individual members of coopeting organizations remain incapable of navigating the paradox of coopetition, and therefore, need to be separated into either competitive or cooperative divisions located in different parts of the organization (Bengtsson and Kock, 2000). By contrast, the second principle rests on the assumption that this internal separation strategy causes intra-organizational tensions, and therefore, suggests the strategic integration of the collaborative and the competitive aspects of coopetition management, whereas a recent study by Felzensztein *et al.* (2018) suggests that coopetition becomes more important (again) as the coopetition relationships mature.

As with many actual or perceived dichotomies, there have also been attempts to combine the extremes, which result in the proposition of a co-management approach (Fernandez *et al.*, 2014). These three principles could now be related to the three basic logics of open innovation, i.e. the inside-out, the outside-in and the coupled process of open innovation (Chesbrough, 2003; Schneckenberg, 2015). As a result, one can construct a 3 × 3 matrix of nine options for the management of open coopetition (Table I).

A future research challenge would be to find out whether specific open innovation processes correspond to specific coopetition management principles in the context of open coopetition. Furthermore, the matrix can be expanded by referring to the literature in which one distinguishes four or more types of innovation openness on the one side and to advance yet to be identified coopetition management principles on the other side. In fact, open coopetition might well lead to a revaluation of management functions such as customer relationship management or community management, and thus, have a significant influence on the redefinition of organizational architectures, including particularly visible examples such as the strategic re-design of corporate workspaces in the context of the emergence of open corporate co-working spaces.

Considering the framework for classifying open innovation research as provided by West *et al.* (2006, p. 288), we furthermore suggest that future challenges in open coopetition research would not only be limited to the analysis of individual or organizational issues and aspects of open coopetition but also to imply research on the level of value networks, industries or sectors and entire national economies including their specific institutional environments. In Section 4, we shall, therefore, develop an outline of research challenges that emerge if we extend the open coopetition research agenda to the level of the broader institutional contexts of both competition and open innovation.

4. Open coopetition and the triple helix: the research program extended

The open innovation model can be compared with the triple helix model of university–industry–government relations as both refer to attempts to find surplus value in stimulating industrial innovation. The triple helix model was first articulated as a metaphor at the institutional level, that is, in relations among universities, industry and government (Etzkowitz and Leydesdorff, 1995). The lead questions were: When do these relations provide surplus not only for the individual partners but also on top of that, at the level of the interactions as a non-zero-sum game? When is a viable system shaped that can sustain innovation? National or regional systems of innovation can be flourishing or in decline. How can one assess whether a system is mature and perhaps locked-in; or in the upswing of the strategic vector?

In the triple helix context, these questions can be reformulated in terms of when do the institutional relations contribute synergy to the system? Synergy, however, is a systems property as the underlying dynamics are not to be attributed to the agents “carrying” the system but to specific qualities of their relations. While the institutional triple helix model focused on agency leading eventually to studies of the “entrepreneurial university” and entrepreneurship more generally, these agents can be considered as the visible

Table I Nine yet to be explored options for open coopetition management (authors provided)

	Separation	*Integration*	*Co-management*
Inside-out			
Outside-in			
Coupled			

representatives of different subdynamics from an evolutionary perspective. The three subdynamics are the industrial one of wealth generation, the academic one of knowledge production and the need of regulation and control. The institutional networks can then also be considered as the retention mechanisms of an evolutionary dynamics among these three (or more) functions.

5. Competing logics: open coopetition beyond the triple helix

Universities, companies and governments compete not only with other institutions of the same type but also with each other as they follow and pursue different and often competing logics and goals. The arising tensions between institutional isomorphism and the need for innovative reforms and structural adjustments are probably most apparent not only in the context of university–industry collaborations but also may occur in all types of triple helix partner configurations. Prominent cases beyond the university–industry–government context include relations among competing institutional logics in health, economy and politics within the context of national and regional health-care systems.

These cases are also indicative of the circumstance that the relative importance of the competing logics may not only differ among national or regional systems but also change over time. The increasing importance or even dominance of economic considerations over health-related logics is legion in a large body of research on health system reforms, and similar constellations have been studied, e.g. for the reason of the increasing dominance of money and power issues in higher education. Against this backdrop, coopetition among partners that follow different institutional logics appears as a most critical yet under-researched aspect of innovation systems and further organizational or network constellations at the regional, national or international scale.

Triple helix coopetition itself can be considered as open coopetition to the extent that the cooperation among the competing triple helix partners takes place against the background of "fourth parties" as suggested by Quadruple Helix models of innovation (eco-) systems. The fourth helix is associated with increasingly interactive and co-productive public audiences in the civil society. This perspective makes an even stronger case that triple helix coopetition is open coopetition as it systematically involves cooperation or even again coopetition with fourth-party stakeholders.

The metaphor of a Triple Helix invites to extending the model to more than three helices (Leydesdorff, 2012, p. 30). A major challenge to research in open triple helix coopetition remains the identification of strategies for adequate and probably context-specific extensions of the triple helix model, for example, along the lines of an exploration of a full spectrum of function systems (such as politics, economy, science, education, art, religion or mass media system). This approach might well-result in the design of context-specific helices beyond the standard case of university–industry–government relations, such as a classical triple helix complemented by the mass media or combinations of politics, art and mass media in the context of creativity-oriented innovations.

Moreover, as the current importance of the individual competing logics within triple helix constellations may differ not only between national or regional contexts but also change in time, another line of triple helix coopetition research would need to address the question how to measure the relative importance that political, economic, scientific, educational or religious logics have to a particular (innovation) system. While early attempts to address similar challenges at the macro level (Roth *et al.*, 2017) are definitely inspiring, they have hitherto remained too abstract for the analysis of concrete national, regional and organizational innovation systems.

6. Conclusions: open coopetition and the exchange rates of society

In this article, we defined an updated research program of open coopetition, a term so far confined to designate mediated cooperation between rivals in open-source software ecosystems. Unlike standard coopetition, open coopetition refers to a situation where competitors cooperate not only with each other but also with third parties such as networks, platforms, communities, ecosystems or triple helices. We demonstrated that this open form of coopetition does exist not only in the software industry and outlined a potential research program on open coopetition between partners from other industries and even partners from contexts as different as an industry, university, government and further institutional settings.

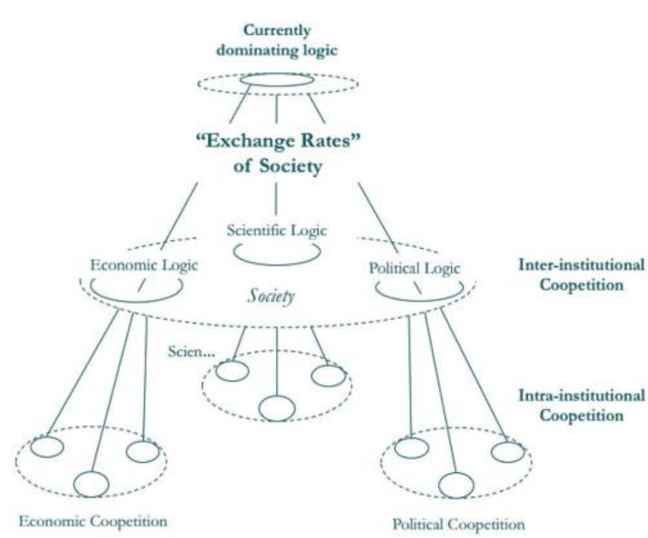
In this context, we also addressed open coopetition management challenges, which we suggested to meet by exploring coopetition management with open innovation management principles. Finally, we discussed research challenges that emerge if we extend our open coopetition research program to the level of regional or national innovation systems. At this level, we suggest that coopetition between partners that follow different institutional logics and between these partners and a broader public or the civil society, respectively, remains a yet under-researched field of open coopetition research.

As an elaboration of the triple helix model of university–industry–government relations, we furthermore argued that partners from academia, politics and business regularly both cooperate to achieve higher goals such as positive regional or national structural effects and compete as they all try to establish their respective institutional logic and goals as dominant logic and as the main goals both within the triple helix context and in relation to broader audiences.

One particularly challenging stream of research in open coopetition may, therefore, examine how coopeting organizations that follow different institutional logics decide on the relative significance of these logics (Figure 1).

As depicted in Figure 1, one can distinguish between intra-institutional and inter-institutional open coopetition. An example of intra-institutional open coopetition would be two

Figure 1 Intra- and inter-institutional open coopetition



Source: Updated from Roth (2010, p. 75) competing firms (e.g. Boeing and Embraer) that cooperate with each other (e.g. in R&D as already the case with Boeing and Embraer) and with a community of users or customers (not present in the existing configuration of the Boeing–Embraer coopetition model). In the case of inter-institutional open coopetition, however, one would expect cooperation between partners from different institutional backgrounds that both compete for legitimation from a broader social context and may nonetheless cooperate to achieve synergies or higher goals for this social context. An example might be coopetition between a firm and an academic research unit and probably further parties such as stakeholders from the respective markets, publics or *arenas*.

In such contexts of inter-institutional coopetition, an interesting question is, indeed, which of the coopeting institutional logics is dominant in a given social setting. Research on inter-institutional coopetition, therefore, also raises the issue of what can be dubbed as the "Exchange Rates of Society" in Figure 1, an expression we have chosen to designate as the concept of the regularly changing relative significance of the different institutional logics both for each other and for the larger social context. In other words: our extension of the open coopetition concept (which originally was limited to the open-source industry) to other industries and to the level of the broader institutional context of both coopetition and open innovation ultimately raises the question about the deeper meaning of competition and innovation at the national, regional or organizational level.

Keywords:
Coopetition,
Open innovation,
Triple helix,
Functional differentiation,
Open coopetition,
Social differentiation

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Corresponding author

Steffen Roth can be contacted at: roths@excelia-group.com