# An interview with Loet Leydesdorff: the past, present, and future of the triple helix in the age of big data

**Han Woo Park**

**Abstract** The triple helix (TH) of university–industry–government relations can be considered as one of the most popular innovation models in the last two decades. In this brief interview with Leydesdorff, we show how the TH can be used to improve knowledge-based innovation systems in some developing and transitional economies and provide some concrete examples of TH applications in the age of big data.

**Keywords** Triple helix · Leydesdorff · Big data · Developing economy · Transitional economy

Many have long considered Professor Loet Leydesdorff of the University of Amsterdam to be one of the founding fathers of the triple helix (TH) model. Etzkowitz and Leydesdorff (1995) are the first to suggest the TH of university–industry–government (UIG) relationships for research on knowledge-based innovation. Since then, the TH concepts and methods have been extended through many workshops, conferences, and special issues of journals (Khan & Park 2012; Leydesdorff 2012). Several countries, including Sweden, Brazil, and India, have actively developed national innovation programs under this paradigm. The Asia TH Society recently invited Professor Leydesdorff to its Daegu Meeting in South Korea (March 26, 2013), and one of the guest editors suggested an extended discussion with him through this Special Issue. This interview provides a sense of possible approaches to applying the TH model to some developing and transitional economies in the context of South Korea. Given the idiosyncratic characteristics of Korea's national innovation systems as well as those of other aggressive catch-up countries (Kwon 2011), there is a need for exploring the UIG relationships through the TH model.

Q1: Are there any emerging TH models for developing and transitional economies in terms of their conceptualization and implementation?

H. W. Park (✉)
Department of Media and Communication, YeungNam University, 214-1, Dae-dong, Gyeongsan-si, Gyeongsangbuk-do 712-749, South Korea
e-mail: hanpark@ynu.ac.kr; parkhanwoo@hotmail.com

A1:    This question (like some of the others) asks for the political implications of different TH models. It seems to me that developing countries can be in different stages of development. Some developing countries, for example, may be too "triple-helixed" (Ye et al. in press). That is, they may place too much emphasis on good relations and not sufficiently on the division of labor. The task is to find a balance between integrating organizations (e.g., under the leadership of the state or a "regional innovation organizer") and functional differentiation based on the division of labor within UIG relationships.

More specifically, it seems to me that South Korea is a modern pluralistic society, and therefore the role of the government can only be that of a catalyst. This catalyst should operate autocatalytically. That is, it warrants that different partners in collaborative arrangements have opportunities to develop their own interests. In the case of academia, these interests are also *knowledge interests*. Can research questions be generated and research programs be articulated in relation to external demand? The articulation of knowledge interests implies a shift from the "how" question of the process to "what" and "why." Here "what" and "why" can facilitate research, whereas "how" can easily degenerate into a procedure.

Q2:    Can you please tell us some success stories involving the enhancement of international, national, or regional innovation systems based on the TH model? In what ways can universities, businesses, and governments co-innovate to solve ongoing social challenges?

A2:    Let me emphasize that I have no prescriptions or panacea. One needs to construct a balance between the division of labor and exchanges. In my own TH research, I have focused on measuring possible synergies between the *distribution* of firms in terms of their size, technological capacity, and locations. The location can then be considered as a proxy for governance; firm size, as a proxy for economic dynamics (e.g., SMEs); and technological capacity (e.g., NACE codes of the OECD), as a proxy for organized knowledge (Leydesdorff & Strand 2013).

The possible synergy in a system of three partners is like a happy marriage with a child. Here uncertainty can be reduced in a configuration and not in specific relations. One cannot attribute this reduction to a particular partners or specific link. That is, what is crucial is the configuration. We have developed a TH indicator that measures "configurational information." It is like a spurious correlation in that answers of the mom and dad are coordinated at the level of the latent construct of the marriage.

It seems to me that in a knowledge-based economy, the articulation of demand can be further stimulated and not be left solely to the market and/or the central (or regional) government. The stimulation and democratization of "demand" can stimulate variations for innovation activity. How can universities be disclosed to general audiences? Currently, disclosure focuses on bureaucratic demand (reporting) or the market (transfer). Other fields such as the arts and humanities may require different models of interaction (Venditti et al. in press).

Q3:    How can we make best use of methodological strategies such as webometrics (Park 2010), scientometrics (Khan & Park 2013), and informetrics (Cho and Park 2012) for TH research? This question is related to the development of the TH indicators and tools.

A3:    The first question is about the unit of analysis? We have thus far used firms and documents (e.g., patents and the Internet). We may need some creativity here and also use network relationships (communication) as a unit of analysis. In general, one should not only focus on existing relations and networks ("best practices") but also envisage other

possible relations such as "adjacent others." Here, the TH indicator may be useful for differentiating between domains (or regions) in which the likelihood of success is higher than in others. However, for policy reasons, one may wish to follow other options. For example, one may focus on "less favored regions" instead of on the most successful ones.

Q4:   How does the TH approach correspond to the rise of global challenges, including unemployment, little or no growth, increasing welfare needs, and global warming, which are likely to intensify?

A4:   It does not seem likely to me that a single (set of) model(s) could address these huge questions. However, we may draw some conclusions from the above about how a knowledge-based economy can be stimulated and how it can be measured in terms of regions and nations or how its contributions can be specified in terms of sectors such as knowledge-based services.

Q5:   How can the TH model contribute to the building of the "enterprising" nation-states and/or universities? What is the role of the TH in driving innovation and entrepreneurship, particularly in small and medium-sized enterprises and universities?

A5:   The main issue seems to me the longer-term transition from a political (or market) economy to a knowledge-based economy. How can the dynamics of organized knowledge production and control be endogenized into the model? The study of scientific communication is, in my opinion, important here because discursive knowledge is generated in communication processes that enhance codification.

Q6:   How can the TH foster open and innovative markets? More specifically, South Korea's new President Park Geun-hye has emphasized that her administration would build a new "creative economy" to facilitate innovation. What is the role of the TH innovation system in South Korea?

A6:   We have yet to measure Korea's innovation system as we have done for some other countries. However, we have analyzed Korea's publication system in considerable detail (Kwon et al. 2012; Park and Leydesdorff 2010).

Q7:   In recent years, many people, including industry researchers, have tried to develop new conceptual and methodological frameworks to examine today's emerging data-driven environment. However, I believe that we have not made satisfactory progress in terms of providing newer lenses and tools for decomposing this trend. Can you point to some possibilities and directions for the TH model to be applied to research on societies driven by big data? (Park and Leydesdorff 2013).

A7:   Knowledge-based innovations reconstruct cognitively and are diffused for economic, political, or organizational reasons. Therefore, the three dimensions of organized novelty production in science, wealth generation in the economy, and normative control in governance are always relevant. Here more dimensions may be relevant in an N-tuple of helices (Leydesdorff 2012). Innovations "tumble" through different environments with feedback loops such as patents as outputs of science and technology, inputs to the economy, and the protection of intellectual property right in the context of the state.

We have different databases for all these dimensions with their own institutional dynamics and need flexible interfaces (like "lenses") that allow movements back and forth and thus follow nonlinear dynamics as they evolve, bifurcate, and sometimes merge (Leydesdorff et al. 2013). Mergers and acquisitions, for example, are important for

business and can be necessary because of emerging relations between the fields of science and technology.

The reduction of the TH of UIG relations to "collaborations" should be avoided, in my opinion, because structural patterns of relations (that is, correlations) may be as important as individual relations (e.g., "brokerage" or betweenness centrality). Stories about "best practices," however, tend to focus on unique relations, while scientometricians may wish to study both the "best" and nonexisting practices (that is, zeros) and test for statistical significance. In other words, one should address "big data" not in terms of instances—data that already occurred—but in terms of theoretically informed and relevant variables, including instances that may occur under various conditions.

## References

Cho, S. E., Choi. M. G., & Park, H. W. (2012). Government-civic group conflicts and communication strategies: A text analysis of TV debates on Korea's Import of US Beef. *Journal of Contemporary Eastern Asia, 11*(1), 1–20. http://eastasia.yu.ac.kr/Park_cho.pdf.

Etzkowitz, H., & Leydesdorff, L. (1995). The triple helix—university–industry–government relations: A laboratory for knowledge-based economic development. *EASST Review, 14*(1), 14–19.

Khan, G. F., & Park, H. W. (2012). Editorial: Triple-helix and innovation in asia using scientometrics, webometrics, informetrics. *Scientometrics, 90*(1), 1–7.

Khan, G. F., & Park, H. W. (2013). International collaboration within electronic government research domain: A triple helix network analysis of collaboration at the regional, country, and institutional levels. *Government Information Quarterly, 30*(2), 182–193. doi:10.1016/j.giq.2012.09.003.

Kwon, K. S. (2011). Are scientific capacities and industrial funding critical for universities' knowledge transfer activities? A case study of South Korea. *Journal of Contemporary Eastern Asia, 10*(1), 15–23.

Kwon, K. S., Park, H. W., So, M., & Leydesdorff, L. (2012). Has globalization strengthened South Korea's National Research System? National and International dynamics of the triple helix of scientific co-authorship relationships in South Korea. *Scientometrics, 90*(1), 163–175. doi:10.1007/s11192-011-0512-9.

Leydesdorff, L. (2012). The triple helix, quadruple helix,…, and an N-tuple of helices: Explanatory models for analyzing the knowledge-based economy? *Journal of the Knowledge Economy, 3*(1), 25–35. doi:10.1007/s13132-13011-10049-13134.

Leydesdorff, L., Rotolo, D., & de Nooy, W. (2013). Innovation as a nonlinear process, the scientometric perspective, and the specification of an "innovation opportunities explorer". *Technology Analysis & Strategic Management, 25*(6), 641–653. doi:10.1080/09537325.2013.801948.

Leydesdorff, L., & Strand, Ø. (2013). The swedish system of innovation: regional synergies in a knowledge-based economy. *Journal of the American Society for Information Science and Technology, 64*(9), 1890–1902. doi:10.1002/asi.22895.

Park, H. W. (2010). Mapping the e-science landscape in South Korea using the webometrics method. *Journal of Computer-Mediated Communication, 15*(2), 211–229.

Park, H. W., & Leydesdorff, L. (2010). Longitudinal trends in networks of university–industry–government relations in South Korea: The role of programmatic incentives. *Research Policy, 39*(5), 640–649.

Park, H. W., & Leydesdorff, L. (2013). Decomposing social and semantic networks in emerging "big data" research. *Journal of Informetrics, 7*(3), 756–765. doi:10.1016/j.joi.2013.05.004.

Venditti, M., Reale, E., & Leydesdorff, L. (in press). The disclosure of university research for third parties: A non-market perspective on an Italian University. *Science and Public Policy*; available at http://arxiv.org/abs/1111.5684.

Ye, F. Y., Yu, S. S., & Leydesdorff, L. (in press). The triple helix of university–industry–government relations at the country level, and its dynamic evolution under the pressures of globalization. *Journal of the American Society for Information Science and Technology*; available at http://arxiv.org/abs/1209.1260.