

***N*-Tuple of Helices**

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- Heading: *N*-Tuple of Helices
- Synonyms:
- Definition: As a generalization of a biological double helix and an institutional triple helix, the *n*-tuple of helices is based on Luhmann's distinction of symbolically generalized media and codes of communication that can be functionally differentiated as the economy, polity, science, etc.
- Cross-References: innovation systems, self-organization, triple helix, expectations

In response to Carayannis & Campbell's (2009) introduction of a Quadruple Helix and the further extension to a Quintuple Helix by Carayannis & Campbell (2010), Leydesdorff (in press) argued that an *N*-tuple of helices can be expected in a pluriform and differentiated society. The metaphor of a Triple Helix (TH) of university-industry-government relations (Etzkowitz & Leydesdorff, 2000) more or less invites proposals to extend the model to more than three helices.

In a discussion which focused on bringing "society" or "the public" back into the model as a fourth helix, Leydesdorff & Etzkowitz (2003) argued that the helices represent specialization and

codification in function systems which evolve from and within civil society. A pluriform “society” is no longer coordinated by a central instance, but functions in terms of interactions among variously coded communications. Money, for example, can be considered as a prime example of a symbolically generalized medium of communication (Parsons, 1968): it enables us to pay without having to negotiate the price of a commodity. Power, truth, trust, and affection are other “performative” media (Luhmann, 1975, 1995).

Following Merton (1957), Luhmann (1995) historicized the possible functionalities in social communication in terms of “performative” media. For example, one can raise the question of whether a new code has emerged at the interface between the sciences and the economy since patents became increasingly organized at the interfaces as a vehicle for the protection of intellectual property rights (Leydesdorff, 2008). Simon (1962, at p. 478) conjectured that any complex system operates with an alphabet. Thus, there may be 20+ symbolically generalizable media of communication available in interhuman interactions. While this plurality of codes can be expected to resound latently in inter-human interactions, some of the codes of communication can be specifically deselected in institutional settings. A discourse in court, for example, is structured differently from a scholarly discourse.

The differences in meaning provided in the various communications can be translated by reflexive (human or institutional) agency. From this systems perspective, communicative competencies thus are developed in the plural (cf. Habermas, 1981; Leydesdorff, 2010).

University-industry-government relations, for example, can be expected to flourish when all

partners in the arrangement are provided with feedback from the interactions meaningfully to their own further development.

In a knowledge-based economy, in other words, one should not only optimize the retention of “wealth from knowledge,” but also nourish the generation of further research questions from social and economic demand. Variety is required in the different dimensions of a triple or n -tuple helix so that differently coded discourses can select upon each other and interact (Ashby, 1958). One may wish to move beyond the Triple Helix model with three relevant selection environments, but every further dimension requires substantive specification, operationalization in terms of potentially relevant data, and sometimes the further development of relevant indicators (Leydesdorff & Sun, 2009).

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