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Changing topologies of innovation diffusion and their implications for generativity

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The term generativity has been coined by Erikson [1] to describe a concern in human beings for establishing and guiding the next generation. In cognitive science, Epstein [2],[3] has propagated the usage of the term to explain creativity, spontaneity, and the emergence of novelty. Innovation research has lately started using the term generativity to describe the ability of organizations and larger business ecosystems to stay innovative over time, coming up with attractive new offerings when the old ones have penetrated their markets [4].

Most approaches to generativity in this field study heuristic methods of engineering design [5],[6] or structural properties of innovation hotspots [7], [8]. These approaches are informed by evolutionary models of innovation as reproduction and survival under selective pressure from the environment [9]. They have provided numerous interesting insights, but still leave many questions unanswered. In particular, they do add much to a better understanding as to why innovation hubs in developing countries are hardly able to reach the generativity that can be observed in industrialized countries, despite immense efforts put into their establishment and operation [10].

The work presented here therefore advocates a different approach. Inspired by earlier contributions to the Diffusion Fundamentals series [11] [12], it argues that generativity is not sufficiently explained by the description of design processes and conditions of their application. It is also necessary to give account of the structural changes in society that each successful innovation entails. An innovation must be considered as a vehicle that transports a narrative of value creation, which affects the conditions under which all follow-up innovations can spread through society. In other words, each innovation sets the stage for the diffusion of future innovations in its own way. This effect needs to be considered in the discussion of generativity as well.

Formally speaking, this dynamic can be described as a change of topological structure. Using a cellular automaton as a model for innovation diffusion, such a change would need to be addressed on two different levels. On the one hand, prior innovations would need to be considered to have an effect on the adoption/ infection probabilities of the single cells for new innovations. On the other hand, prior innovations would also need to be considered to have a more radical effect, changing the neighborhood relations of the cells. A simple example is the spread of new means of transportation, which change the paths on which subsequent innovations spread. Overall, each innovation can be expected to have such an effect, although it might be not as obvious as in this example. Regarding the two levels of change in the model of the cellular automaton, it should be mathematically possible to reflect changing adoption/ infection probabilities and neighborhood relations in the same distance measure. This, however, will not further be explored here.

To give more insight into the explanatory power of this approach to generativity, we present findings from a comparative case study in Morocco. For the subject matter at hand, Morocco is particularly interesting, because parts of the country are highly industrialized and offer standards of living comparable to Western Europe, while other parts are still in an earlier stage of socio-economic development. Each case in this study concerns a recent Moroccan innovation, which is assessed in terms of its technical inventiveness and sophistication, its value proposition and target audience, as well as its effect on the topological structures for the spread of further innovation. The assessment is based on document studies and expert interviews.

After initial screening or 247 candidates, 13 innovations were finally studied in detail, ranging across numerous application domains and value propositions. The level of technical sophistication and innovativeness of the innovations varies a lot, with some of them qualifying rather as user innovations, while others can be considered as state-of-the-art high-tech. Interestingly enough, however, none of the innovations were estimated to have a significant impact on the topological structures for the spread of further innovations. In view of these results, innovations preceding the ones studied in these cases were analyzed as well. Most of these preceding innovations originated in highly industrialized countries. Moreover, their impact on topological structures was found to be much stronger than for the others.

The study has various implications for theory and practice. Regarding theory, it shows the added value of diffusion models for the study of generativity in innovation research. Such models make it possible to address the topological implications of subsequently spreading innovations, which have so far not received the attention that they deserve. Moreover, the study shows how research on diffusion processes can step beyond the analysis fixed structural conditions under which something spreads, using a more dynamic approach to space that takes the possibility of change over time into account. Where social phenomena are concerned, this seems to be highly important. Regarding practice, the study can inform future steps of policy-making to increase generativity in developing countries, as it shows that investments should not only be taken to increase technical sophistication and inventiveness, but also to anticipate future implications of the innovations that are encouraged and subsidized.

Future work in this area will have to move from qualitative, exploratory studies to more robust, quantitative empirical work. Furthermore, simulations may help to learn more about the phenomena studied here and to distinguish different patterns of structural change of diffusion topologies.

References

[1] E.H. Erikson, Childhood and society, London: Penguin Books (1950).

[2] R. Epstein, Skinner, creativity, and the problem of spontaneous behavior, Psychological Science, 2 (1991) 362-370.

[3] R. Epstein, Generativity theory and education. Educational Technology, 33 (1993) 40-45.

[4] L.D. Thomas, R. Tee, Generativity: A systematic review and conceptual framework, International Journal of Management Reviews, 24 (2022) 255-278.

[5] D. Tilson, K. Lyytinen, C. Sorensen, Digital infrastructures: The missing IS research agenda, Information Systems Research, 21 (2010) 748–759.

[6] P. Le Masson, A. Hatchuel, M. Le Glatin, M., B. Weil, Designing decisions in the unknown: A generative model, European Management Review, 16 (2019) 471-490.

[7] J.L. Zittrain, The generative internet, Harvard Law Review, 119 (2006) 1974–2040.

[8] J.M. Bauer, Platforms, systems competition, and innovation: Reassessing the foundations of communications policy, Telecommunications Policy, 38 (2014) 662–673.

[9] D.E. Goldberg, The Design of innovation: Lessons from and for competent genetic algorithms, Boston: Kluwer (2002).

[10] V.Y. Atiase, O. Kolade, T.A. Liedong, The emergence and strategy of tech hubs in Africa: Implications for knowledge production and value creation, Technological Forecasting & Social Change 161 (2020) 120307.

[11] A. Fritzsche, Spreading Innovations, Models, Designs, and Research Directions, in: A. Bunde, J. Kärger, J. Caro, G. Vogl (Eds.), Diffusive Spreading in Nature, Technology and Society, Springer, Cham, 2018, pp. 277–294.

[12] A. Grunwald, The spreading of techno-visionary futures, in: A. Bunde, J. Kärger, J. Caro, G. Vogl (Eds.), Diffusive Spreading in Nature, Technology and Society, Springer, Cham, 2018, pp. 295-309.