TU/e Technische Universiteit Eindhoven University of Technology

Economics of Innovation, Evolutionary Modelling and Complexity Theory

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An Overview of my Research

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Current position:
Postdoctoral researcher in Innovation Sciences at TU/e (Dec 2011 – Nov 2013)

Previous position:
PhD fellow in Economics of Innovation at the Univ. of Bordeaux (Oct 2006 – Aug 2011)
PhD defended on 4th January 2012

Technology and Social Networks

Decentralized Innovation for New Product Development

Question: How the communication structure of an organization should mirror the complex technological interdependencies of a new-product's components?

Method: An agent-based model of simulations articulating a NK-model as a complex technological network and an organization design as a social network.
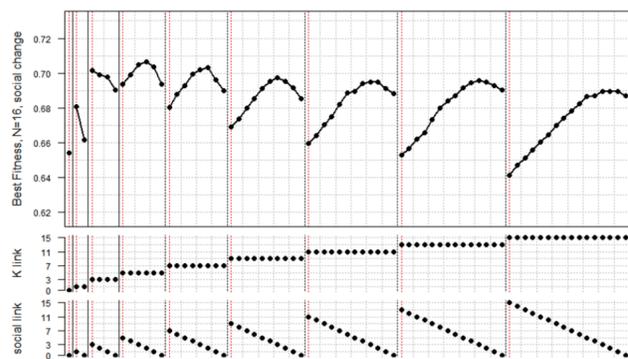
Results:

Figure 1: Performance levels of complex technological artifacts.

Given a level of complexity of the artifact (K-link), performance increases by limiting communication within the social network.

Source: Frenken & Querbes-Revier, "On ignorance in organization design", *Working Paper*.

An example: Open Platforms for Smartphones

Question: How open innovation is a coherent strategy for firms to address the reconfiguration of the mobile phone industry?

Method: A case study of three "open source" consortia: Symbian and LiMo Foundations, and Open Handset Alliance (Android).
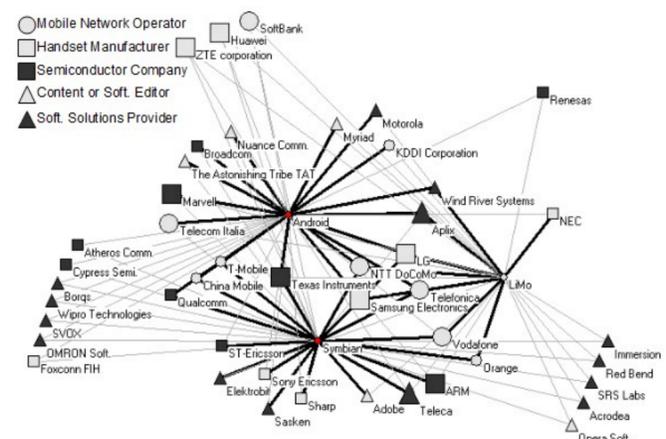
Results:

Figure 2: Example of open innovation network, showing multiple partnerships in competing consortia.

Firms find it difficult to produce standards by vertical coordination. What about horizontal collaborations between these consortia?

Source: Querbes-Revier, 2011, "The strategic trade-offs for beneficial open innovation: the case of 'open source' consortia in mobile OS development", *Journal of Innovation Economics*.

Innovation as an Evolutionary Process

Industrial Dynamics and Technological Inertia

Question: How the discovery of new functionalities from existing technological artifacts (*exaptation*) creates an advantage for late movers vs. industry incumbents?

Method: An agent-based model of simulations where technology are *exapted*. Agents differ by their responsiveness to the discovery of new functionalities, when exploring a rugged (complex) technological landscape (generalized NK-model).
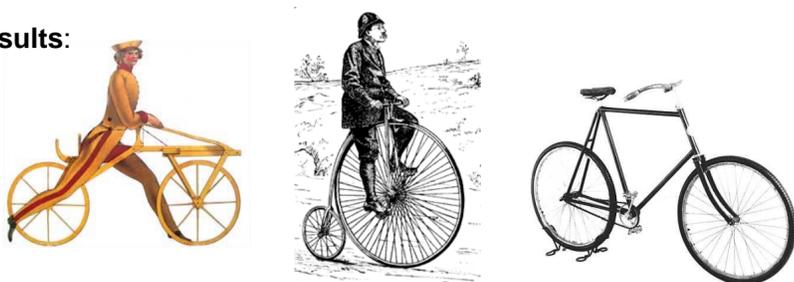
Results:

Figure 3: Examples of the bicycle's evolution ("Draisienne" 1818, "Ordinary" 1879, "Safety" 1896).

The more exaptation events take place after a new technology has been introduced and the higher the complexity of the technology, the more likely late-movers will take over the leadership of first-movers.

Source: Querbes-Revier & Frenken, "Exaptation as a source of late mover advantage", *Working Paper* (submitted).

An example: The Emergence of Apps on Mobile Phones

Question: What were the driving forces of the emergence of digital services on mobile phones?

Method: An historical analysis of the industrial dynamics between 1992 and 2011 with an international perspective.

Results:

	Technological Change	Industrial Structuration	Competition Source
Stage 1: Device *customization*	**Digitalization**	Initiate the dialogue	Infrastructure -> modularity
Stage 2: Service *portability*	Convergence of digital networks	**Institute the spaces of dialogue**	Technological platform -> standardization / interoperability
Stage 3: Service *mobility*	Digital Swiss army knife	Reconfiguration centered on end users	**Apps** -> responsiveness

Table 1: The three driving forces and the three historical stages of the emergence of digital services on mobile phones

Source: Querbes-Revier, 2012, "Emergence and evolution of an industry: the case of mobile data services", *PhD Dissertation*, Chapter 1.