

## Chapter 9

# A New Space for Biotechnology Innovation? Comparison of Physical and Virtual Collaboration in Early Drug Discovery<sup>1</sup>

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### ABSTRACT

*New technological opportunities and online communication constantly gain importance for knowledge integration and knowledge creation in any innovation-driven environment. The cooperation between firms and individual actors in biotechnology was characteristically organized in local or regional clusters, based on face-to-face communications and strategic temporary linkages to other clusters. However, this archetypal configuration can change with the emerging use of open innovation models such as online research communities. A qualitative case study including an analysis of forums within an open source biomedical research platform portrays how knowledge integration mechanisms, and hence, innovations are implemented in virtual space. In this newly created environment, a number of geographical patterns are inverted: The strong role of physical co-location is partly substituted by enabled online proximity and new opportunities of virtual “prototype-sharing”; the former global pipelines are transformed to local and virtual cross-community pipelines. Yet mechanisms of creating social coherence and stability illustrate noteworthy similarities with “localized capabilities” of regional agglomerations. Eventually, knowledge integration capabilities ensure that the network can operate as a successful knowledge provider.*

### INTRODUCTION

The organization of biotechnology research and development (R&D), and the development of pharmaceutical product inventions in particular, has often been challenged over the past years by

a difficult market environment with rising R&D costs (Hu et al., 2007), a general lack of innovations (Hu et al., 2007; The Economist, 2008), and a decreasing number of small start-up firms which used to support the innovativeness of the industry (Audretsch & Cooke, 2001), while blockbusters are

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running off patent and generics are being launched (The Economist, 2008). Hence, a paradigm shift in drug discovery is mainly motivated by the pressure on the pharmaceutical-R&D pipeline. Firstly the decreasing R&D productivity pushes pharmaceutical researchers and managers towards applying new and innovative research approaches in order to antagonize the declining drug approvals (Hughes, 2009; Mullard, 2012). Secondly, a significant shift in the pharmaceutical R&D model can partly also be explained by the recognized number of assets residing outside large pharmaceutical companies (Mayhew, 2010). This leads to a push towards partnering and collaborating among companies and institutions. The industry is therefore facing times of partly reconsidering its organizational model (Everts, 2006) through increasing horizontal cooperation and development partnerships, growing in-licensing (Hull & Clancy, 2006) and out-sourcing activities as well as Mergers and Acquisitions (McCaughan, 2010). However, besides the severe challenges, promising opportunities arise through a new perspective on external knowledge made available outside a firm for instance through open innovation approaches (Smits & Boon, 2008; Koch, 2010; Perakslis, Van Dam, Szalma, 2010). New mechanisms and tools to innovate can potentially grow through web-based interaction. This idea is brought to attention by the fact that new communication channels have transformed the process of product invention in many industries. Users, for instance, have tremendously contributed to innovations in sports industries (Hienerth, 2006), computer games (Jeppessen, 2001), or medical devices (Lettl, 2005). A significant success factor is often internet-based interaction where communities of like-minded, interested lays and networks of experts are built up to exchange and create knowledge. Open communities in healthcare research recently evolved for neglected tropical diseases: e.g. Malaria, Schistosomiasis, Sleeping Sickness; and diseases such as Parkinson and Alzheimer.

## **The Study**

The work is based on industrial cluster research revealing that, in the past decades, biotech R&D cooperation was typically organized in specialized agglomerations (Link & Rees, 1990) consisting of strong local ties (Audretsch & Stephan, 1996), top universities (Niosi & Bas, 2001), and local political and institutional embeddedness (Kaiser, 2008). Moreover temporary external linkages (Torre, 2008) served as 'global pipelines' supporting innovations (Owen-Smith & Powell, 2004; Bathelt, Maskell & Malmberg, 2002), and avoiding lock-in effects (Grabher, 1993) and overembeddedness (Uzzi, 1997).

However, in another stream of research, spatially rather unstable and de-territorialized organizations such as project networks (Sydow & Staber, 2002) and project ecologies (Grabher 2002; 2004) have been studied through network approaches. Apparently geographical proximity is not necessarily a precondition for successful knowledge transfer (Gallie, 2009) and creation of knowledge is possible through spatially dis-embedded communities of practice (Brown & Duguid, 1991; Lave & Wenger, 1991) and through virtual communities of practice (Dube, Bourhis & Jacob, 2005). Economic interaction and the innovative and creative potential of communities have therefore been explored in newly emerging virtual space (Amin & Roberts, 2008) and not only in industrial clusters. Approaches such as open source, permanently beta (Neff & Stark, 2004), and open- and user innovation (Chesbrough, 2003; von Hippel 1988; 1987), often applied through non-geographically bound interaction mechanisms, have proven successful.

Recently this idea has been linked to the biotechnology sector: Open source biotechnology (Hope, 2007; Maurer, 2008; Munos, 2006) and advanced ideas on the integration of physicians and patients into drug development processes (Demonaco, Ali & von Hippel, 2006; Smits &

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