

### “INNOVATION IN COMPLEX SOCIAL SYSTEMS” CONFERENCE AND EDITED BOOK

#### NEMO-supported Conference on “Innovation in Complex Social Systems”

From 10-12 December 2008, Prof. Petra Ahrweiler, one of the core partners of NEMO, organised a conference on “Innovation in Complex Social Systems” in Dublin. The conference was part of the NEMO dissemination activities, but it was also supported by ICT Ireland skillnet ([www.ictirelandskillnet.org](http://www.ictirelandskillnet.org)) and UCD Research ([www.ucd.ie/research](http://www.ucd.ie/research)). The purpose of the conference was to facilitate an exchange of ideas between scientists and policy-makers in relation to the growing complexity of social systems, and of innovation in social systems in particular.

#### Main results to be published in a book

The main contributions to the conference are about to be published in a book, which – according to one of the reviewers - “is really fantastic and can lead to major breakthroughs in innovation research”, and to which the NEMO project has made several contributions. The core challenge the book aims to address is to better understand how societal investment in innovation translates into valuable outputs, outcomes and impacts. Innovation policy-makers, business managers and the public often expect that the current invest-

ments in R&D, higher education, science-industry networks etc. will immediately produce a flow of products and processes with high commercial and social returns. The disappointments and legitimacy problems arising from missing or delayed impacts are considerable and show the limits of policy steering and control. If not a principle apprehension against the importance of knowledge and innovation, the responsible innovation managers mention a frustration with the too messy and complicated features of the innovation process, which simply “does not seem to compute”. Innovation, the creation of new, technologically and commercially feasible products and processes, is – if things go right - emerging from an ongoing interaction process of innovative organisations in various sectors such as universities, research institutes, firms, government agencies, venture capitalists and others. These actors generate and exchange knowledge, financial capital, and other resources in networks of relationships, which are embedded in institutional frameworks on the local, regional, national and international level. Innovation is an emergent property from these interactions on the micro level – if the combination of actors and organisations, their compatible capabilities, and their cooperative behaviours match. No equation will predict this match or warn from a mismatch beforehand.

This edited book sheds a new light on innovation. Its contributions make full use of cutting-edge methods coming from the natural and social sciences, from computer science,

#### THE NEMO NEWSLETTER

The objective of the periodic NEMO Newsletter is to provide a platform of interdisciplinary information exchange and discourse for all sciences concerned with complex interorganisational R&D collaboration networks, and to promote the NEMO project worldwide. The Newsletter will offer regular insights into the NEMO project and document its results including previews of NEMO publications.

Other continuous features include the publication of short articles, comments on interesting links, and information about events or publications which are located in the area of our research. External contributions are welcome and should be addressed to the editor. The Newsletter is published quarterly on the NEMO website <http://www.nemo-net.eu>

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and mathematics to deal with the complex aspects of socio-economic innovation processes and networks - and this without leaving out the messy features of empirical reality and the „human element“, but indeed taking full account of it. Its approach opens up a new paradigm for innovation research, which is announced by its title: the contributions analyse innovation in complex social systems while making innovation understandable and tractable using tools such as computational network analysis and agent-based simulation.

### **Contributors and contributions**

The book comprises contributions of the leading international experts of research in innovation and complexity, and discusses issues of immediate concern to innovation policy makers and innovation business managers. On the theoretical side, it provides systematic knowledge on the nature and characteristics of innovation processes to keep up with the nonlinearities, the complexity, and the self-organising features of innovation performance. With this, it further demonstrates the embeddedness of socio-economic innovation research in complexity science and computational approaches.

On the practical side, it identifies points of intervention and support for innovation and for collaborative networking with partners and stakeholders.

The book introduces the state of the art in international Innovation Research from various angles, but it also goes beyond it by stressing the complex nature of innovation processes throughout the entire book. The first part of the book focuses on the systemic nature of innovation and provides different theoretical perspectives on innovation stemming from complexity research (J.L. Casti) and from the Neo-Schumpeterian tradition (A. Pyka/H. Hanusch and P.P. Saviotti).

The second part addresses the micro- and meso-level of actors and networks. At the regional level phenomena like clustering and their impact on the emergence of high-tech firms (Thomas J. Allen, Ornit Raz, Peter Gloor) as well as patterns of technological specialization and variety are addressed (Bernd Ebersberger and Florian M. Becke). The respective roles of small (Bjoern Asheim) as well as of large multi-national firms for innovation (R. Narula/J. Michel and M. Heidenreich/C. Barmer/K. Koschatzky) are in the focus in three subsequent contributions. The role of public and private policy interventions for the emergence of innovation networks is studied both from a theoretical perspective and em-

pirically for the case of an Italian region (F. Rossi/M. Russo/S. Sardo/J. Whitford). Five further contributions look at the different roles of academic institutions for innovation from a complexity perspective. A general framework is outlined on the role of academic institutions for knowledge-based growth and for economic recovery (H. Etzkowitz/M. Ranga). Three other chapters look at empirical examples of higher education institutions acting as multi-product firms (T.A. Lacy), as scientific entrepreneurs (P. Magin/H.F.O. von Kortzfleisch) and as agents of commercialization (W. Allen/R. O´Shea). An inward looking perspective on patterns of intra-university collaboration is provided using co-authorship data (U. Obermeier/A. Krueger/M. Barber/H. Brauckmann).

A major third part of the book is dedicated to recent efforts of modeling innovation processes, networks and systems from a complexity perspective. Modeling and simulation are increasingly seen as promising inroads for experimenting in a virtual space with different actor configurations and intervention instruments, and their impacts on innovation processes and outputs. Agent-based modeling is one of the approaches that have paved the way for a micro-founded simulation of learning processes in innovation networks (N. Gilbert/P. Ahrweiler/A. Pyka), as exemplified also for the case of the European Framework programmes (R. Scholz/T. Nokkala/P. Ahrweiler; A. Pyka/N. Gilbert). Other modeling approaches are based on the notion of exaptive innovation processes (M. Villani/L. Ansaloni), or look at the linkages and interfaces between product architecture and firm organization (T. Ciarli/R. Leoncini/S. Montresor/M. Valente). An evaluative perspective is taken to model the interplay between innovation and network creation (F. Giardini/F. Cecconi). A final contribution models policy-making processes from a complexity perspective (F. Squazzoni/R. Boero).

In her contributions, Petra Ahrweiler, the editor of the book, gives an outlook on future perspectives for complexity-inspired research on innovation in social systems; research that is meant to better inform policy and management on optimal network structures for innovation performance:

- combine empirical research on innovation networks and systems with modeling using computational methods such as network analysis, agent-based modeling and other types of social simulation
- conduct studies along these methodological lines on single actors as con-

tributors to innovation as well as on specific bilateral cooperations in innovation networks and on the overall innovation process covering each systemic angle

- develop and improve so-called “middleware tools” (i.e. generic computational tools to enable research work) in order to bridge the gap between data and modeling by intelligent interfaces
- conduct qualitative case-studies on innovative organizations in order to provide the required in-depth knowledge

The combination and integration of these kinds of research will also require new combinations of expertise of the researchers conducting the work, i.e. individuals capable of understanding social processes associated to innovation as well as having the necessary modeling expertise to set up the models and simulations.

Further information:

Petra Ahrweiler (ed.)(2010): Innovation in Complex social Systems, Abingdon: Routledge, ISBN 978-0-415-55870-9

## RANKING LISTS AND EUROPEAN FRAMEWORK PROGRAMMES: DOES UNIVERSITY STATUS MATTER FOR PERFORMANCE IN FRAMEWORK PROGRAMMES?

In the context of global higher education markets, universities are competing for staff students, funding and prestige, and adapt their strategies to survive in the new environment. The possibly best-known approach to measuring the market value of universities is through the various ranking lists. The EU Framework Programmes (FP) have become an increasingly important research market for European universities. The aim of our paper is to explore whether established university rankings in their current form are appropriate instruments for predicting the performance of universities in the EU FPs. Thus, we analyse the relative influence of this market value, as measured by the positioning of universities in two different university rankings, on EU FP performance while controlling for other factors like previous experience, availability of national funding sources, university size, relational capital, and institutional factors (EU membership age and English language). We consider three perspectives, the resource-based, the trajectory-based, and the networked economy perspectives, and estimated corresponding econometric models with systematised CORDIS data on EU FP participations. Our analysis builds on existing literature on determinants of university participation in the EU FP, but additionally considers university rankings and corrects for the size of these top-ranked universities.

The main methodology of this paper is to test our hypothesis by means of econometric modelling. We focus on the influence of university rankings – as a proxy for excellence and market value – on the participation of universities in the EU FP. With the *Shanghai Jiao Tong University's Academic Ranking of World Universities (ARWU)* and the *Times Higher Education's World University Ranking (THE)* we use two of the most famous worldwide university rankings and try to quantify their importance within the different explanation attempts. The models we use are Generalised Linear (Poisson Loglinear) Models estimated by Maximum Likelihood.

We find that there is only a small influence of the position in the university rankings on the involvement of universities in the EU FP. Hereby, there seems to be a substantial difference between project coordination and mere project participation: While high scientific excellence or a good reputation is necessary for the university to become a frequent project coordinator, this fact is less important for or even hindering project participation. An explanation may be that the EU FP is indeed to a high degree industry oriented and pure scientific excellence plays a minor role. Nevertheless, scientific lead seems to be important in collaborative projects also for industry, which is more easily obtained with a high reputation of the university. Instead, we find that other variables, such as previous FP experience and relational capital are significant determinants for FP involvement. These results support the findings of others highlighting a generally strong path dependency in the collaboration patterns of EU FP participants. From a funding perspective we find that a high per capita GDP in a country has a positive effect on participations as well as project coordinations in the EU FP. On the other hand, universities from less competitive economies seem to have potential for catching up.

Investigating the difference between the rankings, we find a surprisingly low correlation between *THE* and *ARWU*, which leads us to expect quite different predictive power of these rankings. In fact, the *ARWU* is only significant in those cases where we take into account the size of the university: A high *ARWU* rank positively affects the number of project coordinations while it is not important to be highly ranked for pure project participations in the EU FP. The *THE* ranking, on the other hand, is significant only in the trajectory-based approach, where a high *THE* rank predicts high numbers of project coordinations.

Our results present the current elite university initiatives favoured by many European countries in a new light. Although the FPs represent one specific section of research markets, they are nevertheless important source of research income in an environment where public budgets are squeezed; and receiving FP funding is also reflected in the reputation of the receiving research units. However, our results show that the elite university schemes aimed at boosting ranking status and thus

global competitiveness of the institutions; are not necessarily a suitable way of boosting universities' FP involvement, and might even be counterproductive. Instead, fostering research capacity across the field may be a more efficient way of ensuring successful FP involvement.

Further information:

Terhi Nokkala, Barbara Heller-Schuh, Manfred Paier (2009): European Framework Programmes: A research market for top-ranked universities? CHER 22<sup>nd</sup> annual conference 10-12 September 2009, Porto, Portugal

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PRIME is a Network of Excellence on Policies for Research and Innovation in the Move towards the European Research Area. The final PRIME Forum is dedicated to "European research networks: time to rethink their rationale and governance?" and is organised jointly with the European Economic and Social Committee. Two members of the NEMO consortium have been invited to give presentations at this event. Petra Ahrweiler will give a talk on "Agent-based Modelling of Knowledge Dynamics in FP-funded EU Projects (SKEIN)", and Matthias Weber on "The governance and management of research networks Experiences from the framework programmes".

Further information: [http://www.prime-noe.org/Local/prime/dir/News/Prime%20Agent/PRIME\\_FlyerForum\\_EuropeanResearchNetworks.pdf](http://www.prime-noe.org/Local/prime/dir/News/Prime%20Agent/PRIME_FlyerForum_EuropeanResearchNetworks.pdf)

*Upcoming final NEMO event, Centre for Interdisciplinary Research (ZiF), University of Bielefeld, October 2009*

In October 2009 (20-23), the NEMO project team will meet for the last time together with selected international experts of network analysis and innovation network research to discuss the results of the NEMO project and other related types of research. The purpose of the workshop "Evaluating R&D collaboration networks in Europe: Lessons from a comprehensive interdisciplinary approach" is – apart from disseminating and validating NEMO findings – to forge an agenda for future research directions aiming to inspire the creation of follow-up projects and activities.

Further information: [http://www.universitaet-bielefeld.de/\(en\)/ZIF/AG/2009/10-20-Blanchard.html](http://www.universitaet-bielefeld.de/(en)/ZIF/AG/2009/10-20-Blanchard.html)

## COMMENTS AND FEEDBACK

We welcome feedback on our newsletter and work. Do not hesitate to contact us if you have ideas or comments about what you would like to see covered by the newsletter, or if you would like to write a contribution yourself.

For further information about the project visit [www.nemo-net.eu](http://www.nemo-net.eu) or contact the Project Coordinator:

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