Editorial

Lukas Scheiber*

GSaME – Graduate School of Excellence advanced
Manufacturing Engineering,
Universität Stuttgart,
Keplerstrasse 17, 10a,
70174 Stuttgart, Germany
Email: lukas.scheiber@gsame.uni-stuttgart.de
*Corresponding author

Steffen Roth

Department of Sociology,
Yerevan State University,
Alex Manoogian 1,
0025 Yerevan, Armenia
Email: srot@me.com

André Reichel

ECS – European Center for Sustainability Research,
Zeppelin University,
Am Seemooser Horn 20,
88045 Friedrichshafen, Germany
Email: andre.reichel@zeppelin-university.de

Biographical notes: Lukas Scheiber received his MA in Sociology, Business Administration and National Economics from the University of Stuttgart, Germany. He worked on several projects in the area of sustainable regional development. After graduating from the University of Stuttgart, he worked at Lucerne University of Applied Sciences and Arts, Switzerland, with a focus on innovation management in SMEs. Currently, he has submitted his PhD on Next Taylorism as a Fellow of GSaME – Graduate School of Excellence advanced Manufacturing Engineering at the University of Stuttgart.

Steffen Roth is an Associate Professor at the Department of Sociology, Yerevan State University as well as Docent of Sociology at the Zurich University of Applied Sciences in Business Administration. He holds a master's degree in Sociology and a doctoral degree in Innovation Management from the Chemnitz University of Technology, and is currently completing a PhD in Sociology at the University of Geneva. He has a strong affinity for research topics related to functional differentiation, organisational theory and economic sociology.

André Reichel is a Senior Researcher at the European Centre for Sustainability Research at the Zeppelin University in Friedrichshafen Germany. He holds a master's degree in Management and a doctoral degree in Economics and Social Sciences from the Universität Stuttgart. His main research interest is on

degrowth (décroissance in French, Postwachstum in German) with a special emphasis on the firm level (e.g. company size, business model, legal form). He is also leading the CSS project on civil society involvement in sustainable development which is funded by 7th framework programme of the European Union. His theoretical background is social systems theory (Niklas Luhmann) and its extensions towards studies on the next society (Dirk Baecker).

The concept of innovation is as omnipresent in the media, in politics and in the economy as it is intangible and fuzzy. Focusing on its technological dimension, we find a hybrid interplay of technological and social systems. Accordingly, we observe an ongoing and increasingly complex co-evolution of technological innovation, enabling technologies and socio-economic structures of society, which all have high impacts on the form of innovation (products, product architectures, organisational and institutional arrangements) as well as on the innovation process itself.

Following Max Bense's (1965) idea of a technical ontogenesis within trans-classical technology, we have to ask how new information and communication technologies determine innovation processes. The so-called computer communication (Baecker, 2007) – broadly perceived as communication either disseminated by computers (internet, web 2.0, blogs, open innovation software, Google) or made by programmed computers (artificial intelligence, simulation, multi agents) – affects innovation. Today, vanguard practitioners use information and communication technology as enabler for rounding off innovation processes by means of stimulation and acceleration of communication, creativity and reliability. For example, Swiss open innovation service provider Atizo AG organises an online innovation network where virtual communities and companies get in contact and jointly develop ideas or products (Roth, 2009; Roth, 2010). Some companies use e.g. MakerBot – an open source 3D printer robot – for advanced rapid prototyping that transfers communicative accessible design into fully functional goods. Yet others simulate entire innovation processes from cradle to cradle to make profitable organisational decisions.

Against this background, the focus of the following contributions is on the technological dimension of innovation and the corresponding technological construction of social reality within organisations. In general, technological and social evolutions are intertwined. As Trist (1981, p.24) outlines, "[t]heir relationship represents a coupling of *dissimilars* which can only be jointly optimized". Both domains do not condense as one socio-technical system but have severe reciprocal impacts on each other. Conclusively, if these dissimilars are changing, then we can expect a new mutual adjustment.

From our point of view, we can observe such a new adjustment in the domain of innovation itself. Innovation was most often associated with material products, economic goods or technology-based processes. For as long as mechanisation and industrialisation had been the predominant technological mechanisms of modern societies, the hard core of innovation could have been reduced to these categories. By contrast, today, it seems as if the interplay of artefacts, available computer technology and 'techne' as the technical craft fundamentally changes innovation and innovation processes. The focus is on informatisation (Spinner, 1998) and virtualisation (Rifkin, 1995; Rifkin, 2000) and it is not clear yet, how this technological change affects organisational innovation processes.

At least, organisations as social loci of innovation, their innovation routines and tools seem to change as well. Former classical innovation processes within organisations were mostly driven by a hierarchical order, run as an economical investment and controlled by

technology-like structures of innovation management tools. Today, network structures of locally distributed interaction and open innovation communities like Linux or Mozilla challenge the logic of former closed innovation processes.

Furthermore, the temporal dimension of innovation also seems to be affected by a new technology-driven order. Today we can narrow down and generalise this perception as the problem of simultaneousness of different times. Profoundly characterised by Ernst Bloch (1935), this paradox describes an increase of temporal dispersed information that is simultaneously present and communicatively accessible. These temporal conditions of innovation mainly depend on telematic communication, which is based on information and communication technology. Correspondingly, the virtualisation of communication leads to a hypertrophy of simultaneousness, which is invalidating the "modern concept of absolute chronology" (Esposito, 1997, p.17).

Accordingly, we can observe several technology-induced changes on the objective, social and temporal dimension of innovation. The following contributions address these changes both from a theoretical and empirical perspective. They raise questions and give answers about how to observe the coupling of technology and innovation and they also literarily demonstrate how information and communication technology affects the organisation and the management of innovation processes.

The contribution of *A. Reichel* develops a profoundly new insight into the coupling of technology and society. Theoretically based on system theory, the paper precisely shows how technology can irritate society and its innovation processes. Additionally, it demonstrates what kind of impacts we can expect for dealing with the upcoming ecological crisis. Correspondingly, *J. Holzer*, *P. Wolf* and *P-Y. Kocher* investigate how single artefacts-in-the-making become constructed and socially accessible in organisational innovation processes and how both domains – technology and innovation processes – react on each other by constructing objects, which couple both worlds. Subsequently, *M. Regenfelder* and *A.P. Slowak* broaden this perspective on innovation processes by observing collaborative R&D consortia, which initiate technological change. Their contribution shows, what on an organisational level happens, when conflicting technological trajectories bump into each other.

After having provided the reader with knowledge about the coupling of technology and social processes of innovation, *J. Klasen* and *D. Neumann* offer insights into how agent-based simulation as technology can be applied for planning innovations and for making better forecasting models. Correspondingly, the contribution of *R. Moch*, *A. Merkel*, *L. Günther* and *E. Müller* shows how new information and communication technology in form of cloud computing and web 2.0 technologies can influence cooperation processes in manufacturing and how these technologies can be improved in order to realise optimised conditions for knowledge sharing and its diffusion. Likewise, the contribution of *U. Reuter* discusses from a resource- and competence-based perspective how innovative computer-aided technology such as online auctions, catalogue management and electronic marketplaces can foster innovation and can lead to a change of process innovation. *E.G. Hansen*, *A.C. Bullinger* and *R. Reichwald* discuss how open innovation contests can be used to generate new sustainable products and services. However, the technological potential to organise worldwide open innovation contests also offers several pitfalls, which may lead even to non-innovation. Likewise, *J. Pénin* and *T. Burger-Helmchen* critically reflect possibilities and limitations of the crowdsourcing of inventive activities, which become possible due to a progress in information and communication technology. However, it seems that this progress

enforces new practices for handling the shared knowledge in terms of codification and legal protections. Additionally, such technological progress triggers also questions in the realm of traditional theories of the firm, their further existence and their boundaries. Finally, the huge progress in semantic technologies of innovation can only be understood and used, if it is embedded in social routines. *B. Pelka* and *C. Kaletka* highlight the idea, that new information and communication technologies, e.g. web 2.0, are social innovations as well due to the inherent communication of user-generated content.

Conclusively, the papers of this special issue contribute and refer to the need of developing a deeper understanding for the technological evolution and its connection to the social world. The focus is on how communication and information technologies affect innovation and will affect innovation in future. In general, we perceive a technological progress, which is driven by algorithmisation. Much more information could be produced, gathered, stored, activated and disseminated than ever before. Additionally, it seems that we miss ways of dealing with these released potentials. If we will be able to use it for enabling better innovations, depends mostly on how we succeed with the 'joint optimisation' of dissimilars – technology and society.

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