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Editorial

Future-oriented technology analysis: Practice in search of theory?

This Special Issue, like many compendia arising out of a professional conference, offers a sample of the state of the art at a particular point in time. In this case, the window on the state of Future-Oriented Technology Analysis (FTA) is provided by a conference held in 2011 in Seville, at the Institute of Prospective Technological Studies (IPTS) of the European Commission's Joint Research Centre. This was the fourth in the FTA series that started in 2004 and was held again in 2006 and 2008. These conferences, organized by IPTS, aimed to bring together academics, practitioners, and policy makers from across Europe and around the world to discuss FTA. The 2011 conference focused on an important topic, the need and potential of FTA to address disruptive transformations in response to grand societal challenges.

The papers presented in this Special Issue represent only a small selection of the work presented and discussed at the 2011 FTA Conferences. Papers that overall covered a wide range of points-of-view and topics, hailing from many different contexts and academic disciplines. The selection of papers presented in this Special Issue all share the aim of enhancing the usefulness of FTA, but make the case in two different ways:

(a) One set seeks to understand the context in which FTA is currently used, on the grounds that such understanding might help to improve the impact of FTA through better design.
(b) The other set considers how FTA influences practices and disciplines outside of the direct organizational or topical source of the FTA activity.

The papers can also be differentiated on the basis of methodology. Some papers proceed by integrating insights and concepts from other disciplines such as sociology, design and innovation management while others mainly draw on empirical analysis and established FTA theory.

The two papers that most clearly take a contextual improvement perspective (a) are the one by Dannemand Andersen and Baungaard Rasmussen and the one by Rijkens-Klomp and van der Duin. Both papers focus on enhancing the impact of FTA on decision-making and in particular improving the "embedding of Foresight into policy making processes" – goals that have resonated strongly in all four FTA conferences. Towards this end the authors advocate FTA designs that are better tailored to the context. Both papers unpack the widely accepted notion that "context matters" by exploring more deeply what are the relevant context-dimensions to be considered when tailoring FTA processes.

Dannemand Andersen and Baungaard Rasmussen delve into the national policy context for FTA by drawing on insights from sociology and anthropology. The paper stresses national governance culture as the most decisive contextual element to be taken into account in the design of policy oriented national FTAs. Inspired by the classical work of the Dutch psychologist and anthropologist Geert Hofstede they identify *power-distance* and *uncertainty-avoidance* as the key dimensions of national governance culture and thereby critical for FTA design.

Rijkens-Klomp and van der Duin take a less interdisciplinary approach, opting for in-depth case studies as the way to identify and assess differences between policy foresight at the local/regional and national levels. By evaluating six Dutch Foresight exercises from the point of view of policy makers as "users" of foresight studies they highlight the importance of taking into account differences between the national and local level when designing an FTA process.

A third paper, written by Cagnin and Könnölä, can also be allocated to category (a). This paper suggests that endogenous improvement to FTA processes is about tailoring Foresight design to the specific applied context. Cagnin and Könnölä analyze success factors for international FTA processes. Again the authors take a more empirical or applied approach, by focusing on a particular case study, the "Intelligent Manufacturing Systems 2020" project. This case is deemed relevant because it highlights the need to understand interconnected innovation systems, ways of being responsive to diverse languages and cultures, how to build the capacity to reconfigure international networks and methods for appreciating global impact. The

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authors make the case for taking all four of these areas into account in order to ensure the success of large international FTA exercises.

Two papers, De Moor et al. as well as Marinho and Cagnin, adopt the more ''inside out'' stance of category (b) proposing to use elements of FTA to enrich and improve other practices or disciplines. De Moor et al. develop the concept of ''Innovation Foresight'' (IF) as an approach for bringing the future into innovation processes. For this purpose they combine Foresight with elements from market research, innovation management and human-centred product design. On the basis of two case-studies they show how users and other stakeholders can systematically be involved in exploring future opportunities and risks.

Marinho and Cagnin propose the inclusion of elements of FTA processes in strategic management with the explicit aim of ''improving Performance Measurement Systems''. Based on three case studies they suggest that FTA could help overcome some of the limitations of management approaches by setting up stakeholder dialogues and learning processes on the one hand and introducing complex system views on the other. They argue that such a combined approach facilitates the shaping and monitoring of complex dynamic systems and may enable organizations to use long-term visions to effectively link strategy and operations across the whole value chain. Like De Moor et al. this paper uses established Foresight theories applied to selected cases that provide evidence in support of their hypotheses.

Finally the paper by van der Duin et al. is located at the interface between the two groups. On the one hand the authors explore the use of FTA in the context innovation networks and innovation management. At the same time the authors present an approach to adapt FTA practice to the changing nature of innovation and thereby to the requirements of a specific application. Their arguments and analyses bring together theoretical concepts from innovation studies, innovation management and foresight. They use an analytical framework that they call the ''Cyclic Innovation Model (CIM)'' to make the case for the convergent development of innovation and ''networked Foresight''. Based on three case-studies, they conclude that a networked approach to future-oriented activities strengthens the results of FTAs and suggest that networked foresight is ''the logical next generation of futures research.''

The time it has taken to edit and finalize this Special Issue reflects the difficulty of this kind of ex-post process and the far-flung and changing circumstances of its authors and editors. However it does offer one advantage, an ability to see the different strands of theory and practice that made up the 2011 FTA conversation in the light of subsequent developments. Furthermore, the editors of this Special Issue, each from their own vantage point, have been following the evolution of the disparate fields brought together by FTA over the years. Of course the ''story'' of FTA over the last decade can be presented in many ways, ours is only one of many possible versions, but in this introductory editorial we think it is important to share a few observations.

Starting with the very first FTA conferences, participants have signalled their concern that an excessive disparity of interests, theoretical starting points, terminologies and expected outcomes could undermine the utility of such gatherings for both researchers and policy makers. Indeed, a retrospective examination of a range of documents and recollections from all of the conferences underscores a consistent and often vociferous worry that a lack of shared sense-making frameworks might make it impossible to determine if presentations and debates at FTA contribute to a deeper understanding of far-flung experiences and research or, on the contrary, simply provoke conflicts and confusion due to misunderstanding.

Symptomatic of this danger, many voices across all of the FTA conferences call for clarification regarding the impact or utility of FTA in terms of policy making and more general outcomes for society. For instance, in 2008 one of the conclusions noted the ''. . . constant tension between foresight and FTA, with conflicting views on which is a subset of the other.'' Despite persistent calls to build ''the community'' there were equally insistent worries that the failure to articulate shared agendas reflected deeper underlying differences in both theory and practice. Was FTA helping to generate a differentiated but nevertheless interconnected fabric of how to use the future to address technological, research, investment, sectoral and societal choices? Or was FTA revealing the incompatibility of the theory and practice of efforts that deal with closed versus open challenges?

Initially the more mature and recognized technology assessment strand appeared to offer both a stronger research base and a more direct connection to policy. But as time went on the consistent presence of heterogeneous perspectives and the difficulty of making sense of this continued diversity of the FTA voices made another case. Something was missing. None of the existing overarching frameworks was adequate. Looking at the technology side there was the clear problem, even failure, of narrow technological initiatives to achieve specific outcomes or to account for the actual evolution of industrial, research and innovation systems. On the foresight side not only was there considerable confusion and conflict at the level of methods, how to think about the future (epistemology), but even worse a difficulty in defining and connecting 'the future' as an aspect of reality (ontology) with its impact on choice. As a result the foresight voices often appeared internally contradictory, starting out from the premise of the unknowability of the future and ending up with a version of the expert's best guess regarding the best bet for winning the industrial or technological race ten or so years on.

Given this murky context for structuring conversations and research agendas it is little wonder that at times the foresight community expressed concerns, like in 2004, that they were not being taken seriously by policy makers. Or that the reality of technological and societal interaction was being overly simplified even misunderstood. While the technology assessment crowd and the small but regularly present business oriented strategy practitioners voiced worries about the ''scientific'' legitimacy and practical effectiveness of the at times open ended and exploratory nature of thinking about the future. All of this was inter-laced with specific and recurrent displays of interest in and advocacy of cross-disciplinarity, open innovation, and user-driven processes. Was the FTA conversation a cacophony or the prelude, as when an orchestra tunes up, to finding