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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

shared tones and inter-connected, even if differentiated, ways of making sense? Certainly, over time the proportion of papers and discussions preoccupied with forecasting and deterministic road-mapping approaches to the future gave way to a growing awareness and acceptance of other methods, in particular various ways of generating and using scenarios.

In planning subsequent such FTA gatherings, it may be useful to look for signs of shared sense-making frameworks able to encompass, on the one hand, a tightly constrained road-mapping of a given technology within the assumptions of a specific scenario of national/European competitiveness, and on the other hand, an account of ways to think about policy options based on the indeterminacy of complex emergent innovation systems when such systems are not assumed to abide by the definitional and operational parameters imposed by a road-mapping exercise. Without finding ways to cover this range of FTA there is the danger that the FTA conferences become a set of disconnected conversations, unable to generate the cumulative and competitive processes of knowledge creation that make such gatherings powerful vehicles for advancing research and policy.

At the moment it often looks as if FTA tools and Foresight more generally are just used to respond to policy and business questions as they arise, without systematizing the knowledge accumulated into the kinds of sense making frameworks that enable researchers and policy makers to share, compare and accumulate knowledge. This situation seems in part due to the rapid and profuse response by FTA and Foresight practitioners to on-going demands for studies that address our continuously changing complex emergent context. Admirable as such responsiveness may be it has often left theoretical reflections and debates lagging behind. This, in turn, makes it more difficult to ensure that the design and implementation of FTA and foresight avoid incoherence or even contradictions between methods and outcomes. Insufficient theory also makes it harder to explain what might appear, at first glance, to be confused and fragmented perspectives across the field. All of which threatens to undermine the credibility and relevance of anticipatory thinking for decision-making.

With this challenge in mind, we believe that the papers in this Special Issue, offer some clues – both negative and positive – regarding the ways to build shared discourses that cover theory and practice. First of all, on the negative side, the papers clearly display the lack of a strong meta-language or set of shared terms and propositions that would allow both practitioners and users of FTA to situate and relate the wide range of different approaches to thinking about the future within an overarching framework. A second related weakness is signalled by the difficulty of making a credible case for the links between the case studies and the associated methodologies. Almost all the articles in the Special Issue take on this challenge – the rationale for matching particular tools to particular tasks. On the positive side the articles in this Special Issue show a vibrant community of practice that has been actively innovating and experimenting as it attempts to engage in anticipatory activities in a complex emergent reality. FTA is clearly a diverse and inventive field, able to serve a wide array of decision-making process. Indeed it is this paradoxical "short-termism" of FTA–its capacity to meet pressing needs–that may be most symptomatic of a context that is rich not only on the practical side but also the theoretical.

We are aware that research on the theoretical foundations of FTA poses challenges which are not only of academic nature. It requires leadership and adequate platforms for discussion. However, not unexpectedly, the appearance of this kind of gap also spurs efforts to find solutions. In the view of the editors of this Special Issue the FTA and Foresight communities may be at a turning point: on the one hand, there is the opportunity to marshal dispersed efforts into a common direction, consolidating the foundations of the discipline; on the other there are numerous and fluid communities of practice that may be capable of finding shared identities and defining boundaries. At the moment many conversations in the foresight community point towards the emergence of a shared sense-making framework, one that could help to map current undertakings as well as, perhaps more importantly, provide the foundations for systematic design criteria–the case tested theories that allow tools to be tailored to tasks. Although the terminology is by no means settled, indeed the processes for negotiating such shared sense-making frameworks are currently in full-swing,[1] there is evidence of the usefulness of an anticipatory systems approach. This strand of thinking considers anticipation to be a fundamental attribute of this universe and attempts to understand the myriad manifestations of anticipation, including the specific subset that consists of conscious human efforts to use the imaginary future for making decisions.

Taking the proposition that the future only exists as anticipation as a starting point and that efforts to "use the future" can be better understood by considering the different nature and organization of anticipatory systems seems to offer shared sense-making framework for the FTA and Foresight communities. Efforts to sketch the initial contours of a Discipline of Anticipation are already enabling new and inter-connected conversations, across far-flung and diverse communities, about the theory and practice of using the future. There is no assurance that this particular conversation will fully address the lack of a shared sense-making framework made evident by the FTA processes and the papers presented in this Special Issue. What is clear is that such efforts are needed to at once provide more consistent and robust design principles to guide the matching of tools to tasks when attempting to use the future while at the same time helping to facilitate more sharing of knowledge across the disparate communities that use the future. Hopefully the FTA and Foresight communities will be able to continue to build humanity's capacity to understand the future through conferences such as FTA, generating more papers like those found in this Special Issue, and provoking further conversations on to use the future in ways that take advantage of humanity's many anticipatory systems.

[1] R. Miller, R. Poli, P. Rossel, The discipline of anticipation, forthcoming, UNESCO. Also: http://www.projectanticipation.org/.

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