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Doctor Custos, Doctor Opponent, ladies and gentlemen.

People have been fascinated about future since the dawn of civilisation. In a hope to know what will happen, people have turned to different fortune tellers or oracles, who have claimed to know the future, but have often given rather cryptic answers. Nowadays divination and fortune tellers are not taken too seriously, but anticipating what the future might bring is still popular. Foresight is one of the modern ways of knowing about the future.

Foresight has gained popularity since the 1960s and is an established practice in policy-making and corporate strategy. It offers a systematic approach and a broad set of methods in order to help structure and cope with the complexity and uncertainty inherent in futures. In foresight alternative futures are explored and reflected back to the present in order to come up with actions to reach a desirable future. The process is becoming increasingly participatory, engaging multiple stakeholders to have their say on what they think will happen and what they hope will happen - as well as what should be done now and by whom. However, the increase in participation poses problems with regards to synthesizing the opinions expressed and moving back from the alternative views of what is a desirable future to what should be done now.

The conventional view of knowledge production in foresight is rather linear. Roughly put, the idea is that insightful experts are gathered, foresight methods are systematically applied and out comes futures knowledge in the form of tangible outcomes. These outcomes will then advice decision makers. Following this logic, increase in participation will bring more ideas and thus improve the quality and implementation of the outcome. However, the knowledge creation itself remains a black box. Furthermore, the focus is on the outcomes and the different ideas that are expressed in the process, but which do not make it into the final outcome are ignored. In addition, little is said on what influences the process or whose images of the futures are presented in the outcome.

In order to better understand knowledge creation in foresight, it is necessary to first define what is meant by futures knowledge. In my dissertation I describe four different types of futures knowledge, based on literature on knowledge management and foresight. The tangible outcomes from a foresight process mentioned before could include descriptions of future developments, depictions of new technological breakthroughs, scenarios, visions or roadmaps. I call these outcomes codified knowledge: it is written down and encapsulated with the hope that it will be clear for a wide audience - that is also to those who have not been involved in creating it. However, there are also other forms of futures knowledge. During the process, in the various discussions, there is articulated knowledge – expressed ideas that are highly context dependent. These ideas make sense in the context of the discussions, but not necessarily to an outsider. Articulated knowledge is largely based on embodied knowledge, that is the skills, capabilities and ways of thinking of the participants to the process. This includes the expertise of the participant but also the mental models which influence the thinking. In a foresight process the participants discuss and explore alternative futures drawing from their embodied knowledge as well as codified knowledge and articulate it. If the process permits and encourages it, they may start to build upon each other's ideas, reframing topics and challenging existing assumptions. This may lead to out-of-radar knowledge - future-oriented knowledge that seems irrelevant in the context, is ignored or outside the scope of the process, but can open up new directions for the discussion. Rather than a specific form of knowledge, out-of-radar knowledge is manifested in the process, as the reframing of a topic or as a new view to the topic.

In order to understand the dynamics of knowledge creation better, I looked at what happens in a foresight workshop, using the typology. Generally speaking, the participants articulate and share their embodied knowledge. New ideas emerge when someone asks a question that reframes the discussion, or challenges implicit assumptions. If the atmosphere is supportive of exploration, this leads to out-of-radar knowledge – to something that was not thought before or associated with the topic, but which opens up an alternative image for the future. For example in the case of a workshop on building services held in 2006, one of the ideas was that houses could generate more energy than they use. While not a new idea to us, at the time it was something that suggested a different image of the city of the future.

In order to understand knowledge creation more broadly and not just in a workshop situation, I framed foresight as a system. This systems view to foresight looks at the interaction between different participants and actors – called agents – of the foresight processes. The agent might be an individual, a project group or an organisation. The agents gather around a common topic or interest – called strategic object – and interact in workshops, seminars, meetings or through surveys – that is through some kind of mediating event. The participants have some ideas of what the future might be as well as views on what the present situation is, and these ideas and views are shared and built upon in the interaction. In a foresight system, codified knowledge is presented as memory objects – artefacts containing images of alternative futures created in earlier projects. Articulated knowledge is presented as metaphors and shared perceptions and embodied knowledge relates to the cognitive schemes, that is the mental models of the agents. Together these elements form a foresight system.

The dynamics between the elements in the system can be simplified as the cycle between capabilities, relations and process knowledge. Simply put, process knowledge – the ideas expressed in a workshop for example – shapes capabilities, that is the mental models of the agents. These in turn influence the behaviour of the agents as well as who is considered as a relevant stakeholder. In other words the capabilities influence the relations and interactions between the agents. And how agents interact and with whom influences what knowledge is created in the process.

In the linear process view futures knowledge is seen as an object. What the systems view suggests is that futures knowledge should instead be seen as a network of concepts used when thinking about the future. The concepts are linked to each other, for example economy and growth, and some concepts are emphasised more than others. Different participants of a foresight process have different views to the network. The concepts can be traced from codified knowledge – that is the tangible outcomes. This codified knowledge reflects reflects the discussions and the mindsets captured as articulated and embodied knowledge.

In a foresight process the emphasis of concepts change as well as the linkages between them, thus the network changes. Reaching out-of-radar knowledge in this view means introducing a new concept or making connections that reframe an existing concept. What I found when analysing foresight processes is that it is

more common to just change the emphasis of concepts than it is to introduce new concepts or reframe existing ones. Reframing seems to require intensive interaction among a suitably diverse group of agents.

To return to the topic of the dissertation, I describe two complementary views to knowledge creation in foresight. The first view is focused on futures knowledge itself, and describes a cycle of knowledge conversions between four different types of knowledge. The conversions take place through the interaction of the agents. An intensive interaction and an atmosphere encouraging listening and building upon others' ideas are conducive to reframing, challenging assumptions and thus embodying and articulating out-of-radar knowledge.

The second view frames futures knowledge as a network of concepts. Knowledge creation in this view is about shaping the network: changing the emphasis of concepts, creating new links between the concepts and to a lesser extent introducing new concepts. The shared perceptions about futures are gradually shaped in the interaction between agents from existing perceptions. Furthermore, new knowledge is not necessarily replacing the old perceptions, but rather creating new additional perceptions.

The two views to knowledge creation in foresight have implications for the practice of foresight. Instead of large all-encompassing projects, the systems view encourages flexible and continuous foresight processes, which are seen as parts of a larger whole and which interact with each other. Foresight as a system is not centrally controlled. In the systems view, following the complex adaptive systems theory, control is impossible. But while the system cannot be controlled, it can to some extent be influenced by strategic objects, which influence the content, and mediating events, which influence the interaction between agents.

In terms of who should participate, the diversity of the agents matters more than the number. More is not better, if it is more of the same and some agents are ignored. Furthermore, while subject matter experts definitely can add their knowledge to the discussion, expertise on embracing and articulating multiple perceptions of a future is perhaps even more crucial. This expertise accumulates during the separate foresight processes.

Finally, instead of focusing on the outcomes of a single foresight process – "knowledge as a blocks" – the focus should be on shaping the networks of concepts used when talking about the future. What we think and

hope might happen in the future shapes our actions in the present. Therefore it is important to understand how these perceptions about alternative futures are created.

This concludes my lectio praecursoria, which, I hope, makes it easier for the audience to follow the examination of my dissertation.

I ask you, Doctor Matthias Weber, as the opponent appointed by the Aalto University School of Science to make any observations on the thesis which you consider appropriate.