‘Don’t Change Something Unless It’s Broken’ – Stretching as an Interorganizational Practice in a Semiconductor Industry Network

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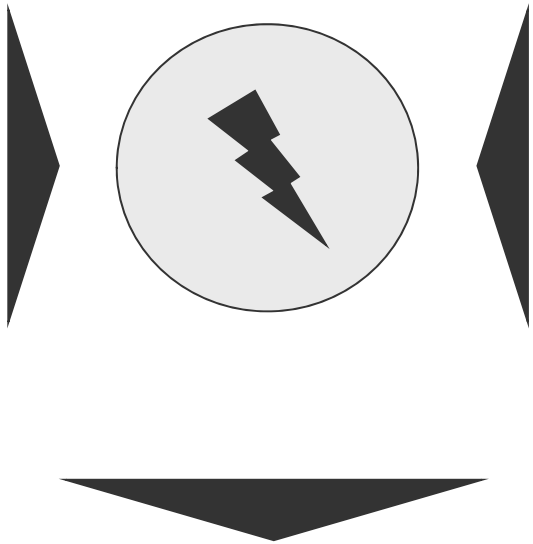
Technological development in interorganizational networks faces usually high degrees of uncertainty

Uncertainty in networks

- Networks as…
  - … omnipresent phenomenon
  - … the locus of innovation
  (Powell et al. 1996)
- Uncertainty vs. risk
  (Knight 1921)



Open issues

- A network governance perspective cannot remedy everything (e.g. agreeing upon a joint agenda)
- Despite different interests and capabilities

Guiding research question and managerial challenge

How do interorganizational networks deal with extremely high levels of uncertainty when pursuing differing technological options in science-based industries?

Interorganizational networks and uncertainty: From governance to practices

- *Interorganizational networks* (Powell 1990)
  - three or more organizations
  - reflexive coordination on a repeated basis in time-space
  - key approach to face uncertainty: „network governance“ (Provan, Kenis 2008)

- *Uncertainty vs. risk* (Knight 1921)

- Managing firm-specific and market-level uncertainty by deepning and/or broadening network relations (Beckman et al. 2004)

- *‚Practicing uncertainty‘* (Giddens 1984)
  Recurrent social activities by (in this case organizational) actors re: the monitoring/making sense of and actually coping with uncertainty

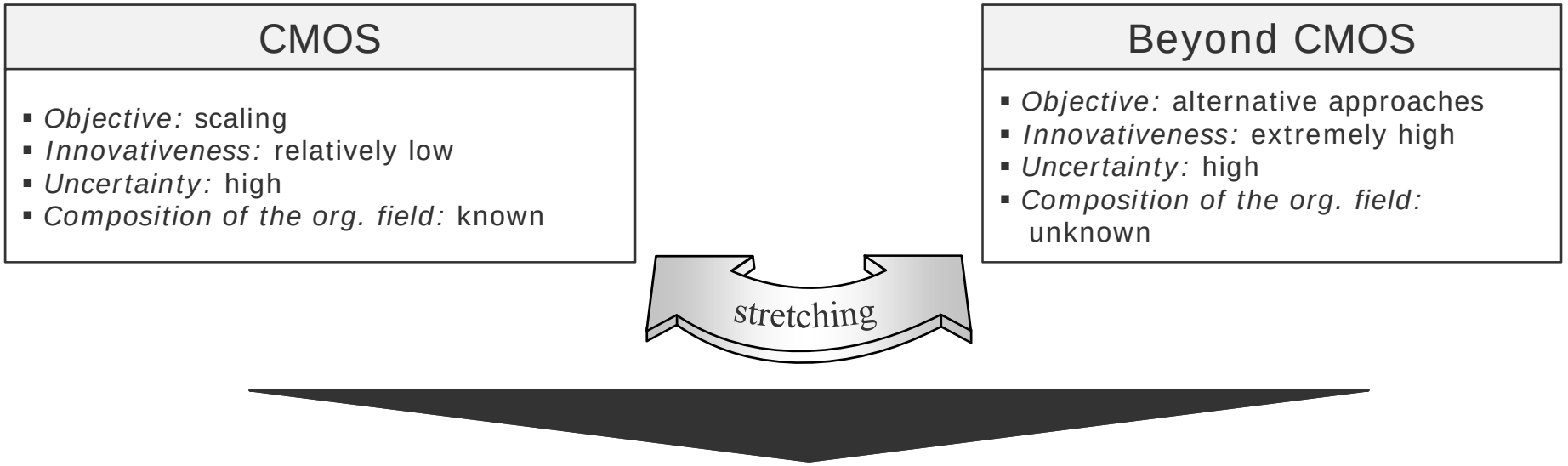
→ From dealing with untertainty with the help of *network governance* to *network (management) practices* (Sydow et al. 2013)

We researched the ITRS*, a global network *and* roadmap by the same name, that coordinates the semiconductor industry

- *Founded* by the U.S. government, nowadays a global network with 32 member organizations and one consortium (SEMATECH)
- *Objective:* providing an arena for pre-competitive, joint research and development for CMOS and, nowadays, Beyond CMOS
- *Heterarchical* network, organized in Technological Working Groups (TWGs) and overseen by the International Roadmap Commitee
- *Data collection and analysis in two consecutive projects*
  - 2003-2009 / 2008-2013
  - field documents, semi-structured interviews (143, out of which 38 were exclusively devoted to Beyond CMOS, including panel interviews), and participant observation at conferences between 2001 and 2011)

* ITRS = International Technology Roadmap for Semiconductors.

Stretching allows to „bridge“ technological paradigms



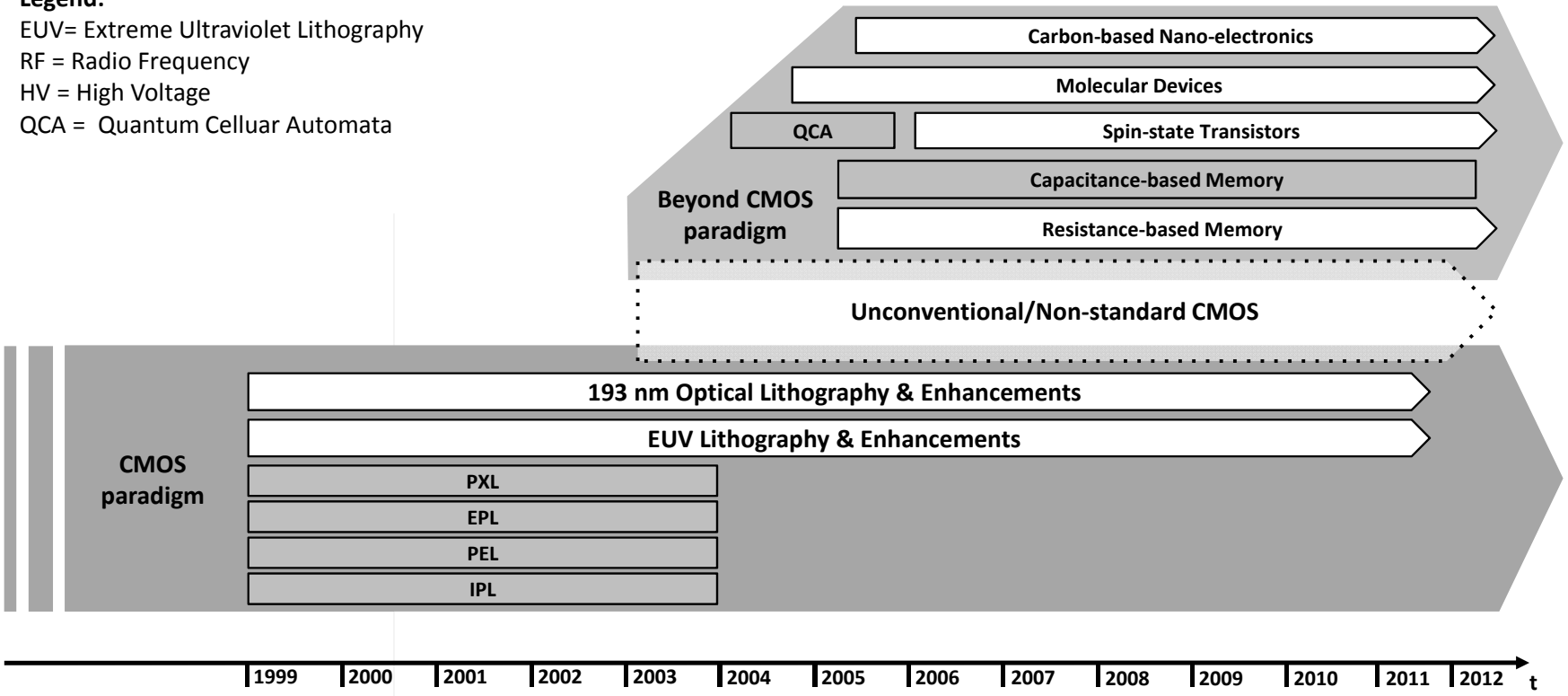
Stretching practice

Recurrent activities that aim to transfer a common way of dealing with the uncertainties of an existing (in our case: technological) paradigm to an as yet unknown (technological) paradigm.

▶ Stretching practices represent an activity that allows for adaptation and transformation at the same time.

Development of technological options over time

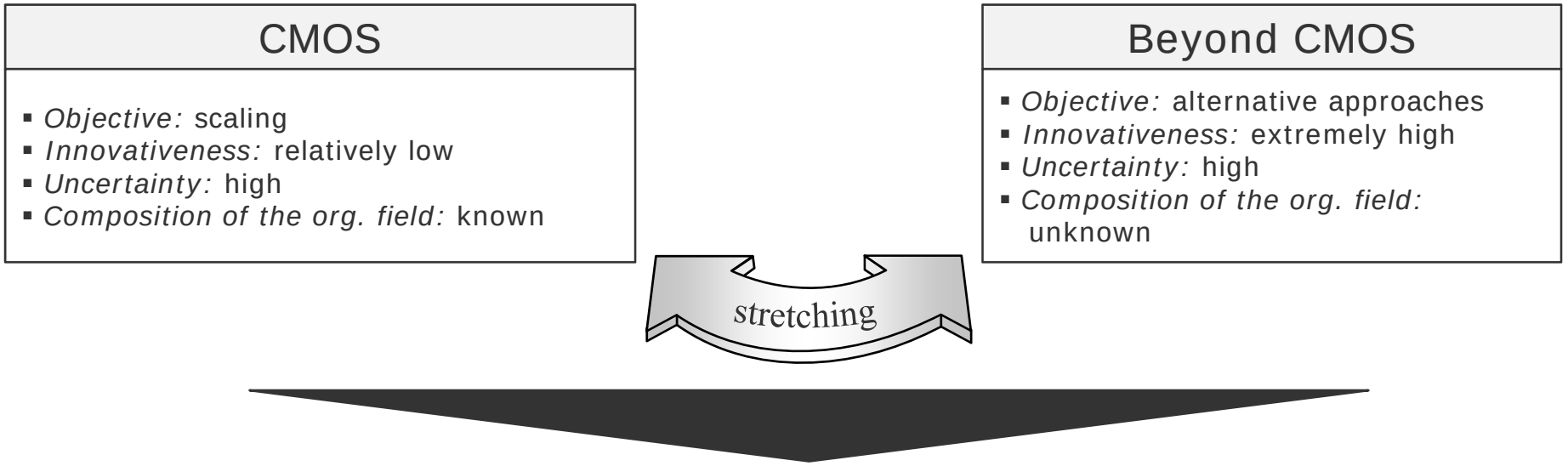
Legend:
EUV= Extreme Ultraviolet Lithography
RF = Radio Frequency
HV = High Voltage
QCA = Quantum Celluar Automata



Evolution of technological working groups over time

* Not geared towards any specific existing or alternative technological paradigm and only ephemeral TWGs.

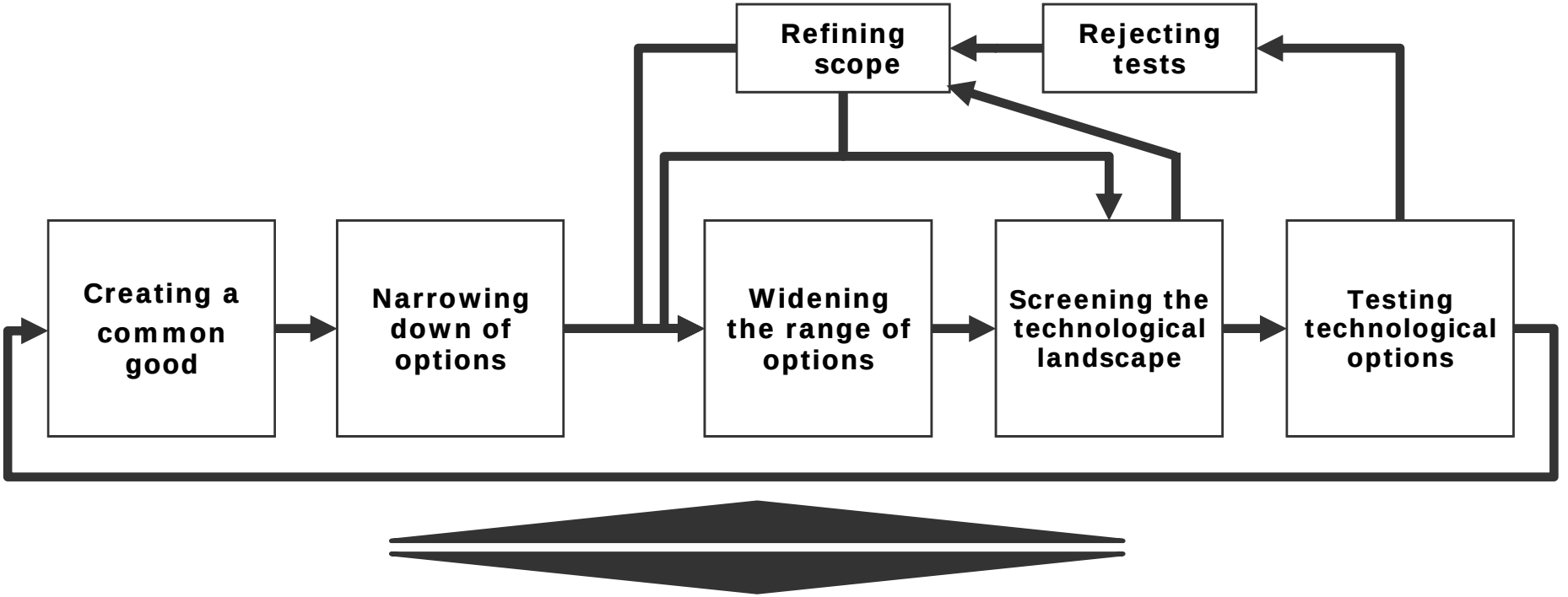
The stretching practice differs according to the technological uncertainty targeted



Identified key stretching practice: Roadmapping <-> FCE

- **CMOS activities**
  - regular meetings
  - optimizing supply chains
  - reducing tech. uncertainty
- **Beyond CMOS activities**
  - introducing new ‚Chapters‘
  - modifying the roadmap in meetings
  - inducing uncertainty (e.g. new partners)

An initial framework for collaborative stretching practices for facing uncertainty on the whole network level



Exploring an existing technological path

- *Strategic focus:* exploration of *existing* technological paths
- *Encountered uncertainty:*
  - technology-related
- *Reproduction* of a practice

Stretching

Risk of overstretching

Exploring unchartered technological landscapes

- *Strategic focus*: exploration of *unchartered* technological landscapes
- *Encountered uncertainty:*
  - technology-,
  - partner- and
  - procedure-related
- *Transformation/adaption* of a practice

Contributions

- **Managing uncertainty** on a **(whole) network level** (Provan et al. 2007)

- Identifying **consensus-driven arenas / interorganizational practices** (e.g. jointly defining future technological milestones) vis-a-vis hierarchical settings

- More nuanced, process-based understanding of **uncertainty** (Knight 1921)
  - not only *technological* uncertainty, but also…
  - *partner and procedural* uncertainty

- **Stretching** as a key **practice** to…
  - …**reduce** *and in parallel*
  - …***induce*** uncertainty *(despite the risk to overstretch!)*