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Disruptions in global industries caused by controversial Technologies: The case of lead-free soldering in electronics

Technologies, which are praised initially as problem solvers, frequently evolve into problem causers themselves. Increased awareness about potential adverse effects and undervaluation due to lower public perception of their utility are shaping the future scenarios of technologies. They become controversial. Well-known but almost already past representatives are asbestos, fluorine chlorinated hydrocarbons (CFCs) and the biocide DDT. Current examples are Bisphenol A or lead-bearing electronic equipment. Affected companies are facing the threat of technological obsolescence and fundamental change processes. We have developed a framework to analyze the social environment and the value creation chains of a company in such situations, and during case study research, we have analyzed the example of the phase-out of lead-bearing solders in the electronics industry due to environmental concerns. In this paper, we outline mechanisms in the social environment and the value creation chain of electronics components. Implications for the management of controversial technologies are derived.
(p. 1).

…*2.1 The framework*

According to Kay, "a valid framework is one which focuses sharply on what the skilled manager, at least instinctively, already knows."34 Our research framework is based on the actornetwork theory35 and the approach of **the Social Construction of Technology**36.
(p. 7 – emphasis added).

…Changes in public acceptance and new regulations do not happen over night. There are long evolutionary processes going on that can be identified and monitored.38 As Maguire has identified in the case of the insecticide DDT, social discourses about a controversial technology can significantly influence their future.39 Especially in the public discourse, different pictures of realities are constructed that are accepted by actors. **Research in the field of scientific uncertainty stresses the importance of such considerations** as well.40
(p. 8 – emphasis added).
…*2.2 Science*

For many decades, the prevailing understanding was that the science had the "monopoly on truth in society".44 Therefore, society addresses questions about adverse effects typically by scientific studies, but the results of such epidemiological studies or laboratory experiments are far from being certain.45 In contrast, outputs of scientific studies are

always uncertain and conditional46 and therefore, scientific consensus cannot be reached for many years. Examples are the cases of dioxin47 or Bisphenol A48 (see figure 3). Recent events indicate that rules of media attention are adapted by some scientists in order to bypass peer review mechanisms.49 **In the public, scientific uncertainty is often neglected,50 which leads to misinterpretation of the research outputs. Scientifically unfounded reactions can result.**
(p. 9 – emphasis added).

...2.3 Public

Intensive research has been undertaken in the last decades to gain an understanding of the social perception of risks and the resulting reactions.53 The importance of the public is at least known since the public outcry concerning the application of certain chemicals in the 1960s.54 **Public and scientific risk assessments apply different logics. As Slovic shows, ranking of risk varies greatly by laypeople and experts.55 In order to analyze public behavior towards a controversial technology, technocratic and populist dimensions have to be considered.**56
(p. 10 – emphasis added).

2.4 Regulators

Governments dispose of a variety of different means to influence the development and application of a technology…**To cope with the increasing speed of the technological change, regulators apply a strategy known as the precautionary principle** which legitimates regulations even before a presumed adverse effect has been empirically proven.
(p. 10 – emphasis added).

Nowadays, it is widely applied in international treaties as well as in national law. 60 Its application is not without controversy: Industry and politicians claim hidden intentions of precautionary regulations mainly in terms of protectionism. 61

61 Kogan (2003): 3
(p. 11).

…4.4 Regulators – European ban of lead triggers global transition

Since electronic waste has grown with the advent of consumer electronics dramatically, the European Union has emphasized to remove toxic substances out of electric and electronic equipment.
(p. 16).

…In mid 2006, People's Republic of China will enforce a similar law as the European directive, which bans the use of lead in electronics, as well.90 The

intended implementation of this law is not yet defined and firm information is rare.91 In the United States, no national environmental regulation banning the use of lead in electronics is in force, single states are preparing corresponding environmental laws92 and federal laws to reduce the use of lead are in preparation since 1991.93 In Japan, no ban of lead-bearing solders in electronics is enforced or planned up to date.94
(p. 17).

…4.5 External Actors – Charges of protectionism offending WTO agreement

Industries outside Europe claim that banning lead-bearing solders from electronics would build-up technical barriers to trade which might be a breach of the corresponding agreement within the World Trade Organization.96 This conflict has not yet been solved.

96 Kogan (2003): 13; ZVEI (1999): 8
(p. 18).

…**7 References**

…Kogan, L. A. (2003): Looking behind the curtain: The growth of trade barriers that ignore sound science: Executive Summary. Washington: National Foreign Trade Council, Inc.