Ecological Economics 126 (2016) 139–151

Contents lists available at ScienceDirect

Ecological Economics

journal homepage: www.elsevier.com/locate/ecolecon

Analysis

A framework of attitudes towards technology in theory and practice

Christian Kerschner [a,*,1], Melf-Hinrich Ehlers [b,c,1]

[a] Department of Environmental Studies, Masaryk University, Žerotínovo nám. 9, 601 77 Brno, Czech Republic
[b] Humboldt-Universität zu Berlin, Lebenswissenschaftliche Fakultät, Fachgebiet Ressourcenökonomie, 10099 Berlin, Germany
[c] The James Hutton Institute, Aberdeen AB15 8QH, Scotland, UK

ARTICLE INFO

Article history:
Received 28 December 2014
Received in revised form 8 January 2016
Accepted 18 February 2016
Available online 18 April 2016

Keywords:
Attitudes
Technology
Sustainability
Optimism
Pessimism
Content analysis

ABSTRACT

A trend analysis of Eurobarometer data shows that attitudes towards science and technology are diversifying in the EU, with enthusiasm clearly losing out to more ambivalent stances. In the past any diversion from unquestioned optimism was interpreted as a bad sign and attributed to the public's ignorance. Today it is often welcomed as a sign of an increasingly emancipated public. In the sustainability sciences, including Ecological Economics, attitudes towards technology also cover a wide spectrum, the formalisation and exploration of which are the goals of this paper. Drawing on social and philosophical studies of technology and insights from Ecological Economics and related fields, we develop a framework of attitudes towards technology consisting of four main categories: Enthusiasm, Determinism, Romanticism and Scepticism. We illustrate the empirical relevance of our framework with a qualitative content analysis of Ecological Economics lecture material. The analysis uncovered and mapped a diversity of views, which co-exist without an open debate. It suggests difficulties of scholars to consistently articulate their techno-attitudes, except for enthusiasm. Our framework could help to amplify underlying vocabularies and visions of research and teaching in Ecological Economics and beyond. It could be applied in both deeper qualitative and broader quantitative analysis.

1. Introduction

Throughout history technological change had significant effects on human society, which today are commonly seen as advancements. However, military technology and technological disasters such as Chernobyl or Bhopal have generated more critical and differentiated perspectives in the second half of the twentieth century (Mitcham, 1994). After decades of ambitions of governments and science advocates to streamline public attitudes towards science and technology into one dominating voice of cheer and consent, scepticism and divergent views now also seem desirable for some (e.g. Bauer, 2009; Stirling, 2011, 2008). According to Latour (2002) moral claims about technology are as unstable as the means and ends of technology. Because nature, society and technology are intertwined "(w)e have never been modern" and technology can go wrong, but is not necessarily bad (Latour, 1993). However, in the days of increasing control of the private sector over scientific research, critical attitudes are regarded as an asset rather than a problem (Bauer, 2009). Irrespective of such considerations, scepticism and diversity of attitudes towards technology seem on the rise, at least in Europe. Empirical analysis in this area still faces many challenges such as irregular production of national survey data and identification of adequate measurements for knowledge in science and technology. A particular problem is the distinction between attitudes towards technology, which are specific to certain technologies and general attitudes, which are transferable across technologies (Besley, 2013). As academics tend to aim for generalisable claims, an investigation of general attitudes towards technology among academics is particularly important.

Increasingly scientists are acknowledging internal disagreements, controversies and subjectivity of their findings (e.g. Castán Broto et al., 2009; Nowotny et al., 2006).[2] Subjectivity also implies that the presence and personal convictions of researchers influence the outcomes of their work, comparable to attitude guiding behaviour (Ajzen, 1991). Hence, just like in the general public, attitudes towards science and technology are bound to vary considerably among individual scientists both as lay persons and as experts.

With the exception of technological regimes, there is very little research, mapping and describing attitudes towards science and technology. We argue that such an endeavour is a pre-requisite for both scientists and the general public to contextualise and evaluate research outcomes and for an open debate about which attitude may be appropriate in a given situation. If such attitudes are reduced to optimism versus

Abbreviations: PUS, Public Understanding of Science; STS, Science and Technology Studies; PNS, post-normal science; EU, European Union.

* Corresponding author.
E-mail address: christian.kerschner@mail.muni.cz (C. Kerschner).

[1] Both authors contributed in equal shares to this article.

[2] It is suggested that the number of scientists acknowledging these problems is increasing. Moreover it appears that at least in some sciences and research areas individual scientists became increasingly concerned, e.g. in climate change (Hulme, 2009; Sarewitz, 2004) and environmental management (Ison et al., 2007; McLain and Lee, 1996).

http://dx.doi.org/10.1016/j.ecolecon.2016.02.010
0921-8009/

pessimism, without historical, socio-psychological and theoretical context and validation, there is a danger that particularly critical attitudes are easily rejected as non-rational and life-denying. Moreover such approaches ignore the large diversity of views in between these two poles.

It is common to study attitudes towards both science and technology together. Nevertheless we propose a separation of this common marriage of terms and relate technology to the urgent challenge of creating a sustainable society. There are many definitions of technology, some focusing more on technology as an object and others on its implications (Brey, 1997; Faulkner et al., 2010).[3] One we find most useful for our analysis is Mitcham's (1994, p. 160) "making and using of artefacts". The role of technology for sustainability is subject to enormous differences in terms of the initial framings by sustainability researchers. As such, Ecological Economics and related sustainability research disciplines have long criticised and departed from blanket technological optimism (Costanza, 1989) in favour of "prude pessimism". Røpke (1996) specifically criticises the unified attention to technology for solving environmental problems in the mainstream in accordance with Daly and Cobb who concluded in 1994 that "… the assumption that new technology will solve the problem, …, does not hold up." (Daly and Cobb, 1994, p. 311). There are also warnings about the rebound effect (Alcott, 2005; Binswanger, 2001) and the biophysical limits to technological improvements (Georgescu-Roegen, 1971; Giampietro et al., 2011; Reijnders, 1998). Mostly without an explicit mutual engagement, others are enthusiastic about the "green economy" (e.g. Hamdouch and Depret, 2010; Machiba, 2010; OECD, 2010), "environmental innovation" (Ayres, 2008; von Weizsäcker et al., 1997) and "technological transfer" (Ockwell and Rydin, 2006). Such technological optimism is inherent in eco-modernism (Cohen, 1997; Ecomodernist Manifesto, 2015), for example.

This paper is a first attempt to address the apparent gap in empirical and theoretical research on attitudes towards technology in general and attitudes of Ecological Economists in particular. In the next chapter we provide background on empirically measured attitudes towards technology (and science) in the European Union (EU) and related insights from the fields of "Public Understanding of Science" and the sustainability sciences represented by Ecological Economics. In Section 3 we describe materials and methods. We reviewed the literature to elicit a spectrum of attitudes towards technology, which we subsequently used in a content analysis to uncover implicit and explicit statements on technology in lecture material of an Ecological Economics summer school. Section 4 presents a generic framework of attitudes towards technology, which we derive from the literature and support with examples from the analysis of the lecture material. Additionally we relate the attitudes conveyed in the lectures to the background of respective lecturers using a small survey. In Section 5 we discuss our observations, before we draw conclusions in Section 6.

2. Background

In European Union policy technological innovation tends to be equated with competitiveness and economic growth. The European Commission's 2020 strategy (EC, 2010) for example sets out to stimulate economic growth and improve employment, while making the economy "greener" and more innovative.[4] Even though economic, political and social innovations are conceivable, the main focus is on technological innovation. A special Eurobarometer opinion poll was initiated, to monitor public support for such strategies and their funding (Eurobarometer, 2013). One of its goals is measuring public attitudes towards science and technology, according to agreement with the statement "Science and technology make our lives healthier, easier and more comfortable".[5] Optimistic attitudes towards technology and science are indicated with agreement and pessimistic attitudes with disagreement, while neither agreeing nor disagreeing responses suggest ambiguous attitudes. Fig. 1 shows that on average optimistic attitudes declined in recent years in the European Union, with increasing divergence among Member States.[6] Pessimistic attitudes are historically less frequent and on a bumpy ride. There are again notable differences among Member States, with The Netherlands and Germany showing contrary trends, for example (see Fig. 1b).[7] Ambiguous attitudes have been rising sharply by almost ten percentage points in most Member States and on average. Overall, however, optimism dominates clearly, with consistently more than half of all respondents agreeing that science and technology increases the quality of life. But context matters. The majority feels threatened, when science and technology are related to religion, human rights, morals or terrorism. Moreover, in a recent survey (Eurobarometer, 2013), 62% thought that science and technology made their ways of life change too quickly. Overall these patterns suggest a potential erosion of the still dominant technological optimism, while ambiguous attitudes become more widespread and differences among countries larger.

Public attitudes towards technology are studied alongside attitudes towards science in the field of 'Public Understanding of Science' (PUS).[8] The Royal Society of London published a report in 1985 (Bodmer, 1985), suggesting a trend towards negative or ambiguous views on science (and technology), which would make funding for research increasingly difficult to defend politically (Miller, 2001).[9] Such attitudes would be detrimental to the EUs Lisbon and Europe 2020 strategies. The underlying assumption was that non-positive public attitudes towards science and technology are rooted in a knowledge deficit of the public — the so called "deficit model" (Bauer, 2009). Motivated by the axiom "the more you know, the more you love it", PUS set off to examine progress in public "science literacy", interest and attitudes. Even though this deficit model has now been replaced by more contextual approaches (Miller, 2004), it remains popular in policy-making.

Towards the end of the twentieth century the Descartian notion of scientists as the beholders of "truth" and "sound science" (Funtowicz and Ravetz, 2008), which is implicit in the deficit model, came under attack. In the UK, a crisis of confidence and trust in scientists was anticipated during the BSE crises and the debate over GM food in the 1990s (House of Lords, 2000). In what Bauer (2009) calls the Science-in-Society approach, the knowledge deficit in the deficit model is now seen as an expert deficit. Participation and deliberation became the tool to repair the public's trust in science and technology. Thus PUS shares similarities with Ecological Economics, where critical post-normal science (PNS) positions became popular in the 1990s (e.g.

[3] A common understanding of technology is "science-based design and control of material artefacts, processes and systems"(Brey, 1997). For Ellul (1980) technology includes all methods which are pursued to meet the demands of efficiency and Marcuse (1964) is even more critical, seeing technology as a tool of the elite to control the masses. Heidegger (1977) is more general. For him technology is a state of being in the world. Social constructivists argue that technology is socially shaped and thus defined according to social constructions (e.g. Bijker, 1997; MacKenzie and Wajcman, 1985). Definitions of technology range from technology being a material object with a function, over being a production function or scientific knowledge to immaterial social institutions, such as money (see Faulkner et al., 2010).

[4] In a similar tone, Lisbon Strategy of the year 2000 aimed at making the EU the most competitive and dynamic knowledge-based economy in the world, for which effective investment in R&D and innovation was seen as key (EC, 2010).

[5] There are other optimistic statements in the survey, but this one focuses on some notion of "quality of life" and is generally used in Eurobarometer studies as a proxy for optimistic attitudes. Moreover it is one of the statements that have been surveyed consistently over the years.

[6] It is possible that the declining trend from 1992 was interrupted with more optimistic attitudes brought in by accession countries during the EU's period of greatest expansion from 2001 to 2005.

[7] Attitudes in accession countries may also have influenced the declining trend in average pessimism from 2001 to 2005. The large jump in pessimism in 2001/02, on the other hand seems influenced by the fact that in those two surveys interviewees only had three options to choose (agree, disagree, don't know) instead of the five that were used for all others (totally agree, tend to agree, neither agree nor disagree, tend to disagree, totally disagree, don't know).

[8] Also known as Public Awareness of Science (PAwS) or more recently Public Engagement with Science and Technology.

[9] In the US a similar trend had been observed earlier (see Goodell 1997; cited in Miller, 2001).