Beyond Heideggerian Criticism toward Technology: The Implications of Dutch Society-Oriented Philosophy of Technology for STS in Taiwan

Ching Hung*

Abstract
The field of science and technology studies (STS) holds a position that technology and society are co-constructed, but with a critical attitude toward technology, STS in Taiwan barely asks what positive roles technologies can play in shaping a desirable future. This paper aims to argue that Dutch society-oriented philosophy of technology could help STS to reach its goal toward a better social-technical complex. Rising from the empirical turn in philosophy of technology, this approach goes beyond a Heideggerian view on technology and has its focus on the relations between humans and technologies. It is worth much more STS’ attention because it has interacted both academically and institutionally with STS since the 1980s and been getting internationally influential. The technological mediation theory, which is developed at the University of Twente and embodies the spirit of Dutch society-oriented philosophy of technology, serves as an example in this paper to demonstrate how the approach would enrich STS. This theory has its theoretical roots in post-phenomenology and Actor-Network Theory and extensively concerns the moral implication of technology. By taking advantage of the viewpoint of the theory, STS would not only view technology from a more balanced perspective but also overcome the problem due to a preference for descriptive researches. It is hoped that when STS recognizes the intimate interplay of human subjects and technological artifacts, modern technology need not be seen by STS as a threat to humanity and society, and would be enabled to materialize positive values for realizing a better world. This re-understanding and re-constructing of technology would also enhance the feasibility of appropriate technology movements in Taiwan.

* Ph.D. student at the Department of Philosophy, University of Twente, Enschede, The Netherlands. Email: c.hung@utwente.nl
Introduction

Looking deeply into the relationship of technology and society, STS asks for—and has its ambition to build—a better social-technical world. For the goal of STS, I have argued that not only technology itself needs to be reshaped but also do users, and a well-designed artifact would help (Hung, 2009). The case I studied shows that when stairs are highlighted and lifts are hidden in the structure of a building, this combination as a set of technologies would “push” users to take the stairs rather than the lifts, and in this way it contributes to energy conservation. In other words, with its materiality, technology can “direct” users’ behavior toward common—both social and natural—good. However, this idea provokes serious worries about the power effect caused by technology: technological invasions of human freedom and losses of human control over technology.

How would STS, in its tradition of seeing technology as an embodiment of power that induces unfairness, respond to this worry? To me, the worries are not merely specific to my argument; rather, they are general ones that always emerge when we discuss the role of technology in our attempt to reshape the world. In constructing responses to the worries, I found that the works of STS help little, and
in contrast, some works in the field of philosophy of technology (hereinafter, POT) are inspiring. These works led me to Dutch society-oriented POT, a very influential approach in POT nowadays, and to explore its usefulness for easing the worries and reaching STS’ goal. This makes the primary purpose of this paper: to introduce Dutch society-oriented POT, and to argue how and why STS in Taiwan would benefit from it.¹

However, turning to POT also made me surprisingly find that there are only a few philosophical researches on technology in Taiwan, and for Taiwanese researchers who investigate the philosophical aspect of technology, the most familiar philosopher of technology is probably Martin Heidegger.² Actually, Heidegger belongs to “classical POT,” and after the “empirical turn” around the 1980s, new issues and perspectives have arrived, which could be put under the umbrella term “contemporary POT.” Although some articles in Taiwan mention—though not much—certain figures in (early) contemporary POT, for example, Andrew Feenberg,³ and recently a research has been developed from Don Ihde’s philosophical theory,⁴ most contemporary philosophers of technology and their approaches are unfamiliar or even unknown to researchers in Taiwan. If we would like to understand better the breakthrough of Dutch society-oriented POT and how this approach is distinct from the others, it is necessary to have a general picture of the recent development in POT. This leads to the secondary purpose of this paper.

For these two purposes, I divide the paper into three parts, which will proceed from the secondary purpose to the primary. In the first part, I will give a brief introduction to the recent development of POT by describing the empirical turn during the 1970s-1990s and the later rise of the Dutch School, especially the University of Twente, whose importance has been growing since the 1980s. For the primary purpose, it would be helpful to employ a theory in Dutch POT to demonstrate the usefulness of the approach for STS. Therefore, in the second part, I will “zoom-in” on the technological mediation theory, a newly developed philosophical theory at Twente, to introduce its theoretical roots and primary conceptions. I choose this theory as a demonstrating role, rather than the others, not only because it is the starting point of my study in POT, but also because I am currently doing doctoral research at Twente and thus have more first-hand information.

¹ The reverse question, of how contemporary Dutch society-oriented POT would benefit from the works in (Taiwan) STS, will not be addressed.
² For example, Huang (2001 & 2009), Lai (2012 & 2013), Lee (2006), and Yang (2011). In fact, there are only a few researchers in Taiwan interested in philosophy of technology (see below) and most subjects of their researches are information technologies (ITs).
³ See Chang (2011) and (2003).
⁴ See Tsao (2013).
about it. Finally, in the last part, by taking the technological mediation theory as an example, I will argue that Dutch society-oriented POT can serve as a complement to STS’s preference for descriptive researches and thus help STS to pursue its goal in a better way.5

From Classical to Contemporary POT

1. The Rise of Classical POT

Classical POT is a critical reflection on technological optimism, which was widespread before the 20th century. In the 17th and 18th century, an age of Enlightenment, science and its rational way of thinking became prevalent and dominant. Humans would overcome the restrictions of their natural surroundings once they understand the laws of nature and then build apparatus or machines according to their knowledge to control the environment. Philosophers who mentioned technology in their works, such as René Descartes and Francis Bacon, held this “liberative” view and believed that knowledge as well as technology is power to free mankind. Although the industrial revolution in the 19th century brought some miserable situations and provoked Luddites’ movements, as a whole it more or less increased human welfare. For example, people could obtain necessaries for life easier and cheaper, and the mortality due to diseases declined very obviously. In this “progress,” technology was considered by sociologists and philosophers—and of course, scientists and engineers—as a determinative driving force in human history. This is the basic version of technological determinism, implying an optimistic attitude to technology.

The first half of the 20th century saw World War I & II, and during the period, weapons gradually became a symbol of technology. Besides, the alienation of lobar caused by mass production and the later invention of “assembly lines”—a target of satire in Charlie Chaplin's Modern Times (1936)—also eroded public positive view on technology. In this atmosphere, some thinkers, such as Martin Heidegger, Lewis Mumford, Jacques Ellul, and Herbert Marcuse—a representative figure of the Frankfurt School, developed their critical reflections on modern science and technology and led the emergence of classical POT. Their works got a lot of responses in the mid-20th century and later became theoretical resources for various movements targeting technology, for instance, Appropriate Technology and New Age. Classical POT took a critical attitude toward modern technology and claimed that modern technology, opposite to traditional handcrafted one, makes humans

5 As far as I know, there seem to be a few articles contributing to the implications of POT for STS. The only one I have found is about how engineering-oriented POT, not society-oriented one, would help STS education instead of research. See Ankiewicz, Swardt, & Vries (2006).
its slaves and there is hardly a way to escape. Modern technology, for classical POT, is not only harmful to the natural environment, but poses a threat to humankind as well. This thought is still a sort of technological determinism, but in a pessimistic form.

What should be noted here is that there were also engineers who developed their views on technology in the early 20th century. For these engineers, such as Friedrich Dessauer and Eberhard Zachimme, technology is not merely a derived result of scientific knowledge but a specific way to deal with artificial things and has its own role in realizing human creativity (Mitcham, 1994). The focus of this approach is mainly on engineering itself rather than technology embodied in social context, and its successor in the late 20th century can be characterized as engineering-oriented POT. However, although this approach is an important part of POT, it is not as close to STS as classical POT. The later philosophers who have connections to STS, such as Feenberg and Ihde, developed their theories in the tradition of classical POT. So I will not go further in discussing this ancestry of engineering-oriented POT but still leave some space for its successor in latter paragraphs.

2. The Empirical Turn and Its Three Branches
Around the 1980s, STS emerged as an interdisciplinary research field and grew very fast. Originating from the studies of science through several disciplines—history (Kuhn, 1970), anthropology (Latour & Woolgar, 1986), and sociology (Bloor, 1991 [1976])—STS adopts case-study as a major research method and emphasizes the contingency of the development of technology. Different technologies have different tracks in their own social contexts and cannot be determined by the logic of technological thinking (Bijker, Hughes, & Pinch, 1987). With a doubt on technological determinism (Marx & Smith, 1994), case studies on diverse devices have been carried out to argue the “social construction of technology” (SCOT), for example, bicycles (Bijker, 1995), missiles (MacKenzie, 1993) and music synthesizers (Pinch & Trocco, 2009). Inspired by the approach of STS, contemporary POT has started viewing technology in an alternative way.

When technology is not understood as the product of its own logic but of social construction, three reflections on classical POT come about. Firstly, against classical POT’s point of view that technology is unstoppable and nearly autonomous, technology in contemporary POT no longer has a deterministic role in human history and society. Following the first point, the second transformation in POT is the recession of the negative impression of technology. What technology is depends on how it is designed, built, and used, so it can be good or bad. Although technology is still not fully neutral, at least it need not be seen as a “supreme danger” (in Heidegger’s word) or “betrayal” (in Ellul’s word) to humankind. Finally,
technology needs to be studied through various kinds of technologies instead of “Technology-with-a-capital-T”. Classical POT used to start from exploring the essence of technology as an entirety and thus paid no attention to the differences between technologies. In contemporary POT, however, researchers are used to begin their philosophical inquiry of technology from concrete devices, machines, or systems.

In this trend of contemporary POT, three branches can be distinguished: society-oriented POT, engineering-oriented POT, and applied technology ethics (Brey, 2010). Because the latter two are not the primary concerns of the paper, I will introduce them immediately but shortly, and then turn to the first one with more details.

As mentioned earlier, engineering-oriented POT has its roots in the tradition of engineering; we could even say that its “founding fathers” are engineers. Following the claim that “opening the black box of technology” proposed by STS, the philosophers of this approach also declare an “empirical turn” in philosophy of technology and make their efforts to describe the working process of engineering and the formation of technology itself (Meijers & Kroes, 2000). Moreover, for them technology is not “applied science” because technology sometimes creates new phenomena for scientific researches and entails a certain form of knowledge, which deserves an analysis on its own “epistemology” (Goldberg & Poel, 2010). As a result, engineering-oriented POT tends to look at the inner workings of engineering rather than social consequences of technology, and to work on descriptive researches rather than evaluative/normative ones. Thus, this approach is also named “analytical POT.”

The beginning of applied technology ethics could be traced back to the 1970s (Brey, 2010). On the one hand, along with the growth of engineering as a profession in a capitalist world, engineers began self-regulation by calling for their professional ethics, which is known as “engineering ethics” today in many colleges. It is concerned with the moral responsibility of being an engineer, and it provides tools and methods to help engineers deal with ethical dilemmas when conducting their works. On the other hand, some researchers in applied ethics started paying attention to ethical issues regarding introduction of new technology to society. By discussing how a new technology, such as assisted reproductive technology, challenges our moral norms, they try to make a judgment whether it is morally acceptable or should be banned. In short, applied technology ethics evaluates engineering (as a profession) and technologies (as products) according to moral principles in moral philosophy or ethics. This branch in contemporary POT may be less reflective on the construction of technology than society-oriented one.
Society-oriented POT, related closely to STS, sometimes is also called “humanistic.” This approach distinguishes itself from the former two approaches by emphasizing the cultural role of technology and focusing mainly on the relationship between technology and society. Researchers in this approach seldom answer the question of what technology is by tracing backward the essence of technology, but by looking forward into what technologies do in the real world. The leading figures of this approach are presented in *American Philosophy of Technology: The Empirical Turn*, edited by Hans Achterhuis (2001), including six philosophers in North America: Albert Borgmann, Hubert Dreyfus, Andrew Feenberg, Donna Haraway, Don Ihde, and Langdon Winner. According to the book, all these philosophers begin their analyses with a focus on concrete modern technologies and barely presuppose a dystopian and deterministic role of those technologies. For example, although Feenberg is criticized that the “critical theory of technology” in his early work (Feenberg, 1991) is merely a standpoint derived directly from Marxism, he indeed demonstrates in his later work (Feenberg, 1995) alternative technological modernity by comparing some concrete technologies in other cultures with those in America. We can catch the spirit of this less abstract approach via the title of the original Dutch version of the book—*Van stoommachine tot cyborg: Denken over techniek in de nieuwe wereld* (literally, *From steam engine to cyborg: Thinking about technology in the new world*) (Achterhuis, 1997). In short, concrete technologies in reality are starting points to do philosophical researches in society-oriented POT.

3. Dutch School(s) and Twente Model

If one follows a list of philosophers of contemporary POT, he or she would notice that a considerable number of them come from the Netherlands. For example, in 1997 at a biennial meeting of the Society for Philosophy and Technology (SPT), over half amount of papers are submitted by Dutch scholars (Durbin, 2006: 187). Additionally, as Ihde mentioned in his genre review article: “Holland has more philosophers of technology, per capita, than any other country” (Ihde, 2010: 28).

The term “Dutch Schools” was labeled formally for the first time in a journal-book *Philosophy of Technology: In Search of Discourse Synthesis* (Durbin, 2006) and originally as plural with the letter “s.” It was plural because at that time the Dutch POT was developed by scholars at different philosophy departments of Dutch technical universities, including Delft University of Technology, Eindhoven University of Technology, Wageningen University, and the University of Twente, and each of them had its own tendency and objective to make philosophical inquiries into technology (Tijmes, 1997). But to the extent that they have cooperated intimately and shared research resources and outputs since a cooperative institution—3TU.Cen-
tre for Ethics and Technology (3TU.Ethics)—was founded in 2007 by Delft, Eindhoven, and Twente, they now can be labeled as the Dutch School in singular (Liu, 2012).

To understand more about the position of the Dutch School in the field of POT, we can have a look at the number of articles published in the journal *Techné: Research in Philosophy and Technology*, which is established in 1995 as an electronic journal and sponsored by SPT. Although institutionally speaking, *Techné* is like the STS journal *Science, Technology & Human Values* sponsored by the Society for Social Studies of Science (4S), its position and influence in the field of POT is similar to the journal *Social Studies of Science* in STS.6

I made a simple quantitative survey on all issues of *Techné* from 1995 to the newest one (volume 17, issue 2). To the present, in *Techné* there are 288 articles published, including review essays but excluding book reviews, introductory preface, and one special issue (10:2, 2006) as a journal-book by Paul Durbin. The authors come from different organizations: the authors of 275 articles work at university or college, the others of 6 articles at library or private institute, and 7 articles lack information about authors. Table 1 shows all the universities that have more than 3 articles published in *Techné*. The number of articles from Dutch 3TU.Ethics (Twente + Delft + Eindhoven) sums 32 and counts for about 11% of the total. This makes clear the importance of the Dutch School in the contemporary POT. This survey also confirms Ihde’s observation: most leading philosophers of early contemporary POT do their researches alone on a personal basis, not in a group or team (Ihde, 2010). For example, 10 articles come from Virginia Tech but 9 of them are authored by Joseph Pitt. Similarly, 6 in 7 articles from Simon Fraser University are (co-)authored by Andrew Feenberg. In contrast, Twente and Delft have not only a large number of articles but also more authors working on POT, and this institutionalization or “grouplization” characterizes the Dutch School.

### Table 1

<table>
<thead>
<tr>
<th>Name of Universities</th>
<th>Number of Articles</th>
<th>Number of Authors</th>
<th>Authors (with the number of his/her articles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Twente</td>
<td>16</td>
<td>9</td>
<td>Philip Brey (4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Peter-Paul Verbeek (3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mark Coeckelbergh (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Tsjalling Swierstra (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Henk Procee</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Hans Achterhuis</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Wolter Pieters</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mieke Boon</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Pieter Tijmes</td>
</tr>
</tbody>
</table>

6 Another philosophical journal concerning technology is *Philosophy & Technology*, which is very young—initiated from 2011—but getting important in the field of POT.
<table>
<thead>
<tr>
<th>Name of Universities</th>
<th>Number of Articles</th>
<th>Number of Authors</th>
<th>Authors (with the number of his/her articles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delft University of Technology</td>
<td>11</td>
<td>7</td>
<td>Peter Kroes (3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Pieter E. Vermaas (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Marc J. de Vries (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Anthonie Meijers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Jeroen De Ridder</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Lotte Asveld</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Egbert Schuurman</td>
</tr>
<tr>
<td>Virginia Tech</td>
<td>10</td>
<td>2</td>
<td>Joseph Pitt (9)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Thomas W. Staley</td>
</tr>
<tr>
<td>University of Karlsruhe</td>
<td>7</td>
<td>2</td>
<td>Hans Lenk (4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Vitali Gorokhov (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Yannick Julliard</td>
</tr>
<tr>
<td>Royal Institute of Technology</td>
<td>7</td>
<td>4</td>
<td>Sven Ove Hansson (5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>John Cantwell</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Jonas Clausen</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Per Norström</td>
</tr>
<tr>
<td>Simon Fraser University</td>
<td>7</td>
<td>3</td>
<td>Andrew Feenberg (6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Edward Hamilton</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Roy Bendor</td>
</tr>
<tr>
<td>University of Delaware</td>
<td>6</td>
<td>1</td>
<td>Paul T. Durbin (6)</td>
</tr>
<tr>
<td>University of South Carolina</td>
<td>6</td>
<td>3</td>
<td>Davis Baird (4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Chris Toumey</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Christopher Toumey</td>
</tr>
<tr>
<td>State University of New York at Stony Brook</td>
<td>6</td>
<td>6</td>
<td>Don Ihde (6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Brian S. Baigrie</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Patricia J. Kazan</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Edward Andrew</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Graham Longford</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Edward Relph</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ronald Beiner</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sungook Hong</td>
</tr>
<tr>
<td>University of Toronto</td>
<td>6</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Cape Breton University</td>
<td>5</td>
<td>4</td>
<td>Jim Gerrie (3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Lee-Anne Broadhead</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sean Howard</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sylvia Burrow</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Marc J. de Vries (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Wybo Houkes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Krist Vaesen</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Egbert Schuurman</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Agustín A. Araya</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>John P. Sullins III</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dvora Yanov</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Gene Moriarty</td>
</tr>
<tr>
<td>San Jose State University</td>
<td>5</td>
<td>4</td>
<td>Robert Rosenberger (2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Stanley R. Carpenter</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Jim Demmers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dara O’Neil</td>
</tr>
<tr>
<td>Georgia Institute of Technology</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>McGill University</td>
<td>4</td>
<td>3</td>
<td>Darin Barney (3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Aaron Gordon</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mario Bunge</td>
</tr>
<tr>
<td>Name of Universities</td>
<td>Number of Articles</td>
<td>Number of Authors</td>
<td>Authors (with the number of his/her articles)</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-------------------</td>
<td>------------------</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>Purdue University</td>
<td>4</td>
<td>3</td>
<td>Paul B. Thompson (2) Edmund F. Byrne Johannes Strobel Larry A. Hickman (4)</td>
</tr>
<tr>
<td>Southern Illinois</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Erasmus University Rotterdam</td>
<td>3</td>
<td>3</td>
<td>Maartje Schermer Mireille Hildebrandt Jos de Mul</td>
</tr>
<tr>
<td>Free University Amsterdam</td>
<td>3</td>
<td>3</td>
<td>A. C. van der Valk Hans Radder Sytse Strijbos Frederick Ferré (3)</td>
</tr>
<tr>
<td>University of Montana</td>
<td>3</td>
<td>3</td>
<td>Albert Borgmann (3)</td>
</tr>
</tbody>
</table>

One may notice that Delft’s and Twente’s number of publications are salient. In fact, this phenomenon coincides with the distinction of two major approaches—engineering-oriented and society-oriented—in contemporary POT. Delft focuses more on the analyses of engineering itself and the dual nature—function and structure—of technical artifacts (Kroes, 1998; Kroes & Meijers, 2002), whereas Twente emphasizes a “human touch” of technology by analyzing human-technology relations and the social/cultural role of (emerging) technologies. Although Twente is the youngest university founded in 1961, it is productive and makes a considerable contribution to the field of POT in the past 20 years. Actually, Twente could be seen as the “stronghold” of Dutch POT (Ihde, 2009: 20).

Twente approach can serve as a representative of society-oriented POT, and it is worth noticing because of its intimate interaction with STS on both practical and theoretical level. For example, Twente has its role in establishing not only 3TU.Ethics, but also WTMC—the Graduate Research School of Science, Technology and Modern Culture, a primary federation of STS research in the Netherlands. Although Eindhoven is also the establishing institution across 3TU.Ethics and WTMC, its performance in POT is not as high as Twente’s, as we can tell in the survey above. Moreover, the history of Dutch STS is highly relevant to Twente because Twente is the first Dutch university that institutionalized this interdisciplinary study to a master’s degree program named “Philosophy of Science, Technology and Society” and also set up “De Boerderij”—Center for Studies on Problem of Science and Society—for the early development of STS in the Netherlands (Bijker, 1988).

The “style” of philosophical research in Twente is also close to the spirit of STS. Philip Brey, the former chair of the Department of Philosophy at Twente, made an early effort to systematically introduce to POT the “social constructivism” of technology in STS, broadly including approaches such as SCOT, the social shaping of technology, and Actor-Network Theory (ANT)(Brey, 1997). Following the steps
of the empirical turn, scholars at Twente develop their philosophical thinking of technology with investigations on varieties of modern technologies, which has been characterized as "Twente Model," combining descriptive and normative analyses and emphasizing the socially relevant role of technology (Brey, 2008b). By recognizing the interplay character of technology and society, it pays much attention to the relations of humans and technologies, and focuses on the implications of technologies (or engineering science) for ethics, policies, and cultures, for example, Brey (2008a), Boon (2009), Aydin (2013), and Dorrestijn & Verbeek (2013). In short, because Twente approach is getting influential in the field of POT and shares with STS the same concern on the relationship between technology and society, it is a prime candidate for collaboration of STS and POT.

Technological Mediation Theory and Its Moral Implication

In order to show how Dutch society-oriented POT would help STS in Taiwan, I will take the technological mediation theory—a theory developed in this approach—as an example in the next section. So, this section, as a preparation for the primary argument, devotes to introduce the technological mediation theory, including its origin in post-phenomenology, how it is affected by ANT, and a normative issue—morality—it contributes to.

1. From Post-phenomenology to Technological Mediation Theory

Post-phenomenology is an approach developed by Don Ihde (1990) and goes beyond the traditional phenomenology for grasping better the role of technology in the lifeworld. In Heideggerian phenomenology, modern technology is a specific way to reveal the world and it "enframes" how humans understand their world and what the world is for them. Under this enframing (bestellen) of modern technology, the world becomes a "storage" for natural resources—including even humans themselves—waiting to serve humankind; there is no way out, unless everyone knows the essence of modern technology and turns to another way of knowing via "art" (Heidegger, 1977). This Heideggerian way of thinking apparently is pessimistic and leaves no room for future changes. However, Ihde found a different view on technology in Heidegger’s early work (Heidegger, 1996). For Ihde, "Heidegger’s hammer" is a better starting point to clarify and classify the relations of humans and technologies.

When you are using a hammer to nail a nail into a wall, what you are "experiencing" is not the hammer itself, but the reality (the nail and the wall) around you. When the hammer breaks down, it requires your attention and then becomes an "object" of your consciousness. In Heidegger’s words, only when a tool is “ready-
to-hand,” not “present-at-hand,” does it facilitate a certain kind of relation between a user and his or her world. Ihde calls this set of human-technology-world “embodiment relation,” which can be expressed as the schema “(human–technology)—world.” Another example of this relation is when a person sees through his or her glasses. One can use glasses or a hammer easily and “carelessly” because it becomes a part of one’s body, just like a blind man’s walking stick “extends” his or her arm for touching things. However, Ihde argues that it is not the only relation between humans and technologies, and different kinds of technologies make different connections between humans and their world.

The second relation Ihde distinguished is the “hermeneutic” one. Some technologies provide us an access to reality with their ability to “represent” the world. A thermometer, for instance, gives us information about how hot or cold an environment is, and we can easily know how it would feel outside without really leaving our houses. In other words, a thermometer “translates” the world in terms of temperature and reveals a specific aspect of the world. So does a clock (or a watch). We sense “time,” especially a tiny amount of time, when a clock is ticking—what time is seems related to “what time it is.” The hermeneutic relation can be expressed as “human—(technology–world)”. These two—embodiment and hermeneutic—relations play key roles in the development of technological mediation theory, as we will see later.

The third and fourth relations are less mentioned in the technological mediation theory, so I will introduce them shortly. Sometimes we treat technologies as if they are “(quasi-)others.” For example, a vending machine “swallows” the coins we “feed” into it and a few seconds later it “spits out” the drinks or snacks we want. Or, some married men say that they do “love” their cars not less than their wives. We “interact” with these technologies because they possess a kind of independence or we have some feelings for them. This is what Ihde calls the “alterity relation,” and in this relation we are directly connected to a technology, not the world behind it, which can be expressed as “human—technology(–world).” And the last is the “background relation,” which indicates a situation that we do not experience a technology consciously although it functions very well. An example of this kind of relation is an air conditioner in working; it provides us a so stable environment that we are unaware that it is functioning as an autonomous machine. This “absence” of technologies in our relations to technologies and to the world can be described as “human(—technology/world).”

What Ihde attempts to indicate with these four types of relations is, apparently, that technologies shape how we know the world and what the world we know in various ways. That is to say, in contrary to Heideggerian “T”echnology,
technologies are plural and often open up possibilities of knowing the world, rather than set limitations or restrictions to us. Peter-Paul Verbeek, the main developer of the technological mediation theory and now the chair of the Department of Technology at Twente, agrees with Ihde’s comment on Heidegger and argues that the approach of Heidegger’s philosophical view on technology is “transcendentalism” (Verbeek, 2005). Because of departing from questioning the essence of technology for approaching technological phenomena, Heidegger tends to reduce technologies to their condition of possibility, that is, a specific way of reality-revealing. For instance, a hydroelectric power plant on the Rhine is the consequence of modern river-disclosure, rather than the resource of that closure. In line with Ihde, Verbeek suggests a “thingly turn” in POT in order to step out of the limitation of transcendentalism approach.

Verbeek (2005) also noticed that ANT provides another type of relation that technology can build for humans and their world. In post-phenomenology, technology plays a key role in affecting what humans perceive as reality; in contrast, technology in ANT affects what humans do to reality. A hotel manager, for instance, annoyed by customers’ bad behavior—always taking room keys with them and not returning keys when they leave, found a solution besides slogans and warnings to the problem: a piece of heavy metal attached to every key (Latour, 1991). Customers now return the keys to the reception because the “keys with a metal” in their pockets make them inconvenient and call to their mind what they have seen on the slogans and heard from the manager’s warning—“Please return your room key when checking out. Thank you for your cooperation!” The fact that the slogans plus the warnings plus a piece of heavy metal attached to every hotel key turns a “not-returning-key-customer” to a “returning-key-customer” requires a reconsideration of whether an action is activated by a human exclusively or by a human–non-human association.

Technologies, therefore, connect humans to the world via two different ways and Verbeek (2005) call this “effect” of technology “mediation.” He develops these two kinds of mediation to a theory as a synthesis of post-phenomenology and ANT. On the one hand, technologies mediate the relations of humans and the world in terms of experience, as what post-phenomenology holds; they exert influence with their “technological intentionality.” On the other, technologies mediate in terms of praxis, as what ANT holds; they do it as if they are “scripts” of films (Akrich, 1992; Akrich & Latour, 1992). What things do is, accordingly, to mediate. Moreover, technologies have to be understood as “mediators,” but not “intermediaries,” because both two poles in the schema “human—technology—world” are “translated” when technologies take a position between them. Obstetric ultrasound, for instance, not
only discloses a specific aspect of a fetus with a specific type of image—black and white without any other sensorial data, but also makes parents careful caregivers and “watchers” for a life (Duden, 1993; Verbeek, 2008). In short, the technological mediation theory is concerned with how a technology mediates human existence and the connection between a human and a reality. By analyzing the relations between users and technologies, this theory explores what roles technologies play in our interactions with them.

2. Morality with Technological Mediation

Insofar as technology shapes human experiences and actions, it has to do with many aspects of our daily life. One of these aspects is the moral dimension of technology, to which the technological mediation theory extends itself. Let me start with a story that is probably known by some researchers in STS.

Someday morning, Latour was in a bad mood and decided not to buckle the seat belt when driving. At the moment he started his car, the red light “Fasten Your Seat Belt!” flashed and a high-pitched alarm sounded. Ten seconds later, Latour put on the belt because he could not bear those annoying warnings. Concerning his transformation from a law-breaker to a law-abiding citizen, Latour asked: “Where is the morality? In me, a human driver, dominated by the mindless power of an artifact? Or in the artifact forcing me, a mindless human, to obey the law that I freely accepted when I get my driver’s license?” (Latour, 1992: 152) This example shows the hybrid character of morality when technology is a part of it. The scenes like this happen very often in our daily life, no matter when we drive slowly for passing a speed bump with less vibration or when we return a shopping trolley of a hypermarket in order to get the coin back. All these situations ask for a new understanding of the moral role of technology in the lifeworld.

Verbeek (2011) argues that morality should not be seen as exclusively human affair because technologies help us to answer the question “how to act,” which is the major concern of ethics. Moral decisions and actions are co-shaped by humans and technologies, and morality, therefore, is distributed to the realm of humankind and of technology at the same time. However, admitting technologies are capable of exerting influence on our moral behavior always arises the anxiety of whether technologies invade human autonomy. Verbeek (2011) replies to the doubt in two ways. In practice, it is much more likely that a technology gives us more options, rather than eliminates choices. Obstetric ultrasound, again as an example, provides parents “freedom” of choosing to only have a well-conditioned baby and aborting an ill one when they know. This kind of choice scarcely existed before the introduction of ultrasound diagnosis to obstetric practice. In addition, the mediat-
ing effect of technology always depends on its context, and making precise predictions, however, is a difficult task. Telephones, for instance, were originally designed for hearing-impaired people, and only in their later use contexts—chatting with someone without seeing his or her face—telephones started mediating a certain kind of social relationship.

In theory, the fact that technological mediation is everywhere and unavoidable requires a reflection on the existing conception of “freedom.” In the traditional sense, human freedom means the absence of restrictions on human subjects. Nevertheless, this freedom is in a negative form, not a positive one. Firstly, according to Foucault (1975), a subject is the product made by power, coming about in a series of body discipline and knowledge production. Power is not something external to a pre-given subject, but a source of it. Power shapes the content of subjects, so does technology. However, in Foucault’s view, this doesn’t mean that there is no freedom for humans. Moreover, freedom lies in developing relations to powers around us (Foucault, 1997). What can be learned from the ancient Greeks is their attitude to sexual desire. By recognizing the sexual desire is an irremovable part of life, the ancient Greeks deal with it by persistent “self-practice,” which styles one’s sexuality and keeps him or her “free” from becoming a slave of it. In this notion of “freedom as practice,” similarly, ethics is no longer about how to prevent humanity from technological invasions, but concerning how to develop theories, frameworks, and methods that would help people to build their own relations to technologies.

The technological mediation theory opens a new way to understand design activities of technology. Recognizing the mediating role of technology in forming human subjects doesn’t mean that we should stop designing any technologies that would have effects on users, especially when technological mediation is however inevitable. Nor does the unpredictability of technological mediation mean that designers could give up deliberating the scripts within their designs. Rather, the fact of technological mediation requires designers to take responsibilities for designing more carefully and even to think of “doing good with technologies” (Waelbers, 2011). Verbeek (2013), therefore, proposes technology *accompaniments* as a substitution for technology *assessments* because there is no pure external standpoint to criticize technology but the co-constitutions of technologies and values, which needs to be discussed “from within.” The concept of technology accompaniment also links itself extensively to the notion of “the good life,” a topic proposed by

---

7 “The claim that ‘you see power everywhere, thus there in no room for freedom’ seems to me absolutely inadequate. The idea that power is a system of domination that controls everything and leaves no room for freedom cannot be attributed to me.” (Foucault, 1997, p. 293)

8 This is where a disagreement lies between Verbeek and Feenberg. Feenberg (2013) insists that, from his critical theory of technology, the task of public technology assessment is to protect social and moral values from the invasion of technological developments.
Philip Brey and now many scholars at Twente are working on (Brey, Briggle, & Spence, 2012). Brey (2012), for instance, argues that “well-being” as an element of the good life is not only the concern of psychology or economics or general philosophy, but should become a topic in contemporary POT.

As a young theory, however, the technological mediation theory has its issues and problems to deal with. The most debated one is the moral status and moral agency of technology. Not everyone agrees with Verbeek that endowing technologies with moral significance although they admit that technologies do have effects on human moral behavior. For these disputers, it is problematic to attach the concept of (moral) “agency” to technologies (Ihde, Poel, Peterson, Selinger, & Verbeek, 2012; Peterson & Spahn, 2010). This debate has grown to a book of collected articles (Kroes & Verbeek, 2014) and is still going on.

**Dutch Society-Oriented POT and STS in Taiwan**

No philosopher in Taiwan, as far as I know, declares his or her primary research interest is seated in the field of POT, and only few articles written in Traditional Chinese focus on the philosophical aspect of technology. In the biggest database for Taiwanese journal articles (Chinese Electronic Periodical Services, CEPS), there are 228 articles with the word “Heidegger” in its title or as a keyword, but only 10 of them are about technology. STS, the most technology-concerning field among social sciences and humanities, also pays little attention to POT, no matter classical or contemporary one. In all published issues of *Taiwanese Journal for Studies of Science, Technology and Medicine* (科技、醫療與社會 (STM), a journal sponsored by Taiwan Science, Technology & Society Association, only the works by Winner and Latour—two early scholars in the empirical turn of POT—are referred more than twice, and actually they are referred mainly in the sense of sociology, not philosophy.

The reason for this shortage of POT in Taiwan STS is probably the same as the reason for the shortage of philosophy of science. As Ruey-Lin Chen, a philosopher of science who interacts very closely with STS in Taiwan, has pointed out, scholars in Taiwan STS tend to avoid philosophical discussions and debates, which can be seen as symptomatic of a general skepticism in the necessity of philosophy of science (Chen, 2011). However, the exact cause of the shortage of POT is not the theme of the paper; although it is an interesting question. What is at stake here is why STS needs to pay attention to the works of POT.

---

9 Searched on February 5, 2014.
10 Feenberg and Ihde each is referred just twice, both in Chang (2011) and Fu (2013).
For the necessity of philosophy of science for STS, Chen (2011) argues that philosophy of technology is an indispensable condition for STS to “proliferate” different understandings of what science is, and it would help the field of STS become vigorous and flourishing. But, interestingly, Chen doesn’t think that POT is also such important to STS. In answering the question “why not philosophy of technology?” proposed by Francesca Bray (2011), he provides two reasons: 1) STS is itself a kind of science, and 2) although STS could be seen as a technology, philosophy of technology does not really concern world views (Chen, 2011: 44-45). In my interpretation, what he asks for is a “philosophy of STS,” and I agree with him that STS does need its own philosophy. However, this does not mean that philosophy of “non-STS” technology is unnecessary for STS, and I believe that although POT does not put all its effort on discussing world views concerning technology, at least it functions like “lenses,” a notion borrowed from Kuhn (1970), through which researchers look at the technological world. Therefore, my attempt here is also to argue that POT should be a requisite element for STS, but my reasons are not the same as Chen’s: Dutch society-oriented POT is worth STS’ attention and could benefit STS because it can provide us better lenses and also fix the problem induced by the descriptive tradition of STS.

1. How to View Technology?
To STS in Taiwan, the most known philosopher of technology is Winner, who has been invited to Taiwan for giving three lectures in 2008. The Chinese translation of his famous article “Do Artifacts Have Politics?”(Winner, 1986, pp. 19–39) has been published in the most read Taiwan STS reader/textbook Social Aspirations of Technoscience. To the present, the article (Winner, 2004) is still a basic material on the reading lists of many STS courses and seminars in Taiwan. Most of the time, probably because much impressed by the story about Robert Moses’ low-hanging overpasses in New York, researchers in Taiwan STS are very sensitive to the politics hidden behind technology, although sometimes they do not refer to the article directly. For example, the case study of mountain-hiking trials points out that most mountain-hiking trials before 2002 and some till today are user-unfriendly because they are designed and constructed by only state technocrats and landscape architecture professionals, which means that users are excluded from the decision-making processes (Hsu & Lin, 2011). Likewise, the waste facilities in Hsinchu County infect damages to the local residents’ interests because

11 Although Fu (2013) does not agree with Chen that philosophy of science is an “essential” part of STS, he does have a positive attitude to a mutual learning between STS and philosophy of science (and technology).
12 Although there has been a debate on the facticity of the story (Joerges, 1999a, 1999b; Woolgar & Cooper, 1999), it does not lose its value to be a parable for education.
its site and design were decided exclusively by governmental officers and engineers (Fan, 2007). The conception of “politics” in such case studies are in line with Winner’s: “By the term ‘politics’ I mean arrangements of power and authority in human associations as well as the activities that take place within those arrangements” (Winner, 1986: 22). That is to say, technology is to be understood as a practice and embodiment of engineers’ or experts’ power, therefore implying inequality, hierarchy, and hegemony. Apparently, in this way, the imagery of technology is rendered negative.

In addition, the term “risk society” coined by Ulrich Beck (Beck, 1992), indicating that we are living with uncalculated and uncontrolled risks caused by high uncertainty of modern science, also strengthens the negative imagery of technology. Technology is to be regarded as a source of various troubling risks because it is always made by engineers who export scientific knowledge (Chou, 2005). Moreover, the Fukushima nuclear disaster on 11 March 2011 shocked all East Asian countries including Taiwan, and fears for technological harm arose very soon. “No Nukes,” the slogan of anti-nuclear movements against the construction of Taiwan’s Fourth Nuclear Power Plant, turns into a dominated opinion in public as well as in the area of social sciences and humanities. This atmosphere, unsurprisingly, becomes so strong and overwhelming that any “non-anti-nuclear” research would make its author unwelcome. In the 2013 Taiwan STS Annual Conference, for instance, a postgraduate student who presented in the session “Technology for Energy” was confronted with many objections, because he suggested in his paper several indicators of nuclear knowledge to evaluate the public’s qualification for discussing nuclear power issues. An attendee even questioned him that “Don’t you know this is an STS conference?”, and almost everyone laughed. What is becoming evident with this symbolic event is that modern technology in STS means something pretty risky, dangerous, and threatening to humans and their society. This negative imagery of technology has been reinforced again and again in the past several years by mass media, academic conferences, colloquia, journal articles, etc., and eventually turns into a pre-assumption for many STS investigations into technological artifacts.

When one wears such lenses, technology will be seen as something likely going wrong. Any development or introduction of technology has to be “checked” very carefully in order to prevent our society from damages produced by technologies, and therefore the “precautionary principle” is adopted as the first and probably the only rule for monitoring technology. However, as the argument of the technological mediation theory shows, what technologies do is context-dependent and not bound to create bad consequences. Further, because they play significant roles
in mediating human existence, we can never separate humans from non-humans, subjects from objects, or societies from technologies. Insofar as humans and technologies are interwoven profoundly, the Heideggerian style of criticism toward technology becomes inadequate for grasping the relationship between humans and technologies in the real world. We would better leave the negative imagery of technology to the past period of classical POT, otherwise we are to be stuck in the mood of nostalgia.\(^\text{13}\)

According to the notion of the technology accompaniment, what is at stake is how to take responsibilities for developing desirable relations to technologies and “taking care” of the ways in which they are designed. To be sure, keeping an eye on possible side-effects of technology is one way to shape technologies, and keeping distance with technologies is also a kind of relation to them. However, on the one hand everything brings risks to our lives, and it is too difficult to demand risk-free technologies, and on the other hand, there is another plausible way to think of technologies and also exist other relations to them. Only when researchers in STS begin their investigations into existing technologies without pre-embracing the negative imagery of them, unbiased analyses of technologies can be made possible. And only when researchers assess emerging technologies without focusing merely on their possible bad consequences, scenarios of their potential good can be imagined and thus help engineers and designers to improve the artifacts in design.

2. More than Description

As mentioned earlier, STS adopts case-study as its major research method and usually asks for a detailed description of network-building or controversy-closing process of science and technology. This tradition in the past decades has helped STS to produce abundant accomplishments, untangling the complicated relations between science and society, and technology and society. However, a “side-effect” has been resulted, for both the studies of science and of technology.

In science studies, science has proven to be a cultural and societal activity among many others, and the content of scientific knowledge is socially constructed, implying that it is strongly affected by social interests and no more “rational” than other types of knowledge. Accordingly, scientists have no epistemological superiority and no political priority to make decisions for the public. This opens up a space for the development of the field of “public participation in science (and technology),” a very productive and fast-growing branch of STS. However, Harry Collins and Robert Evans (2002, 2007) have argued that although STS has brought fruitful

\(^{13}\) Probably not coincidentally, Steven Fuller, a sociologist/philosopher who works closely with STS, recently has a similar reflection on over-stressing the negative effects of technology and tries to find a way beyond the precautionary principle (Fuller & Lipinska, forthcoming).
achievements to resolve the “problem of legitimacy,” which is the focus of the second wave in STS, it now needs to begin the third wave in which the focus is on the “problem of extension,” that is, “how we set boundaries around the legitimate contribution of the general public to the technical part of technical debates” (Collins & Evans, 2007: 113). The concern of the third wave of STS is, they stress against the mainstream, of normativity, rather than of description. For them, when STS proves that science is the product of social interests, it suspends evaluations on the quality of knowledge at the same time and thus leaves normative issues aside. Their suggestion, controversial though, implies a tension between normative and descriptive studies of science.

Studies of technology in STS fall into the same situation. Inspired by the “empirical programme of relativism,” an approach derived from the sociology of scientific knowledge (SSK) for looking at controversies in science, SCOT was developed to show that technology, just like science, is also constructed by society (Bijker et al., 1987). Similarly, evaluations on the quality of technology are suspended, and again normative issues are left aside. This consequence of preferring descriptive narrative has been criticized seriously for “opening the black box and finding it empty” (Winner, 1993) and a “normative deficit” (Keulartz, Korthals, Schermer, & Swierstra, 2004). To be sure, researchers in STS indeed try to evaluate technology via procedures such as the (constructive) technology assessment, but they often do it with a strong intention to protect humanity from technology, just as discussed earlier. Evaluating technologies becomes an urgent issue because of, according to the technological mediation theory, the fact that technologies inevitably mediate what kind of subjects we are and have effects on what we do. Evaluating technologies is highly relevant to evaluating specific values. For example, in terms of the good life, to evaluate technologies is meant to be the evaluation on the quality of life. We can never evaluate technologies without discussing the values they mediate.

What kind of person do we want to be? What kind of life do we want to live? And what kind of society do we want to build? All these questions are connected to the types of technologies as well as the properties of them, which means, for instance, when we discussed how a good society should be, we have to think what positive roles technologies can and should play in shaping that society. For example, when queuing up is acknowledged as a basic and necessary manner to be a

---

14 After the article on the third wave of STS was published, Collins gets many attacks within STS and has been accused of “anti-democracy” (Jomisko, 2013) even though Durant (2011) has already defended that Collins’ project is as democratic as Brian Wynne’s.

15 A strong descriptivist approach of POT, proposed by Light & Roberts (2000), has a similar problem with normative issues.
qualified citizen and to form a well-ordered society, then the so-called queuing barrier would help a lot. A “material line” helps people stand in line even though they are not well educated to do so; it is a material solution to the problem that people just don’t queue. In fact, we Taiwanese are very used to those queuing barriers as “guide lines” in movie theatres, train stations, department stores, etc., and we barely think they are the representation and practice of power, although indeed they are. That is to say, technologies’ mediation for realizing positive values however cannot be ignored if we would like to do justice to either existing or emerging technologies when evaluating them.

By and large, normative researches have to do with values, and descriptive researches are connected to facts. Latour (2004) has devoted himself to dissolve the distinction between facts and values, which implies the “Great Divide” for modernity, but as Chen (2007) has argued, for making judgments, this distinction is too fundamental to be canceled, and it is logically problematic to slide from “what it is” to “what it ought to be,” although these two categories practically interact with each other. That is to say, both normative and descriptive research are indispensable to STS. With the help of the technological mediation theory, the issues of values regarding technology could be brought back to STS by investigating how values impact and are impacted by technologies, and STS, therefore, would respond better to the challenge flung down by Winner and the others. Normative researches related to values become crucial, especially when our goal is much more about planning the future than about explaining the past.

3. Technology toward Positive Values
When STS is equipped with Dutch society-oriented POT, it would discover the potential of technology in helping us to deal with value issues such as environmental sustainability. Take the case study I have done as an example (Hung, 2009), when people are very used to prioritize personal convenience instead of saving energy for public good and thus prefer lifts rather than stairs, a feasible strategy to “reverse” this priority is to set the stairs at a highlighted place in the building and at the same time hide the lifts. This design, as a material strategy, works effectively without discomforting the users, no matter they have good environmental consciousness or not. No doubt a design like this materializes the power of designers and has politics to “nudge” its users toward being environmentally friendly, but in the light of technological mediation theory, it is not a threat to human autonomy and need not be resisted, rejected, or refused. Rather, it helps to rebuild the habit of taking stairs and gives shape to environment-friendly human subjects toward a sustainable society. Further, with an integrated view of STS and Dutch society-oriented POT, I argued in a later paper (Hung, 2013) that environmental education is
far from enough to improve people’s pro-environmental behavior because of a permanent gap between “knowing” and “doing,” and the gap could be filled up by means of “material education.” Scholars in the field of environmental education, therefore, have to start thinking how to make environmental itself “educational.”

This is particularly the case with Appropriate Technology, the theme of the annual meeting this year; because it refers to a certain kind of technology that is correlated to a specific value—appropriateness. The failure of the appropriate technology movement in 1970s America, as many scholars have pointed out (Beder, 1994; Hughes, 2004; Pursell, 1993; Winner, 1986), resulted from the unawareness of the close relationship between politics and artifacts, and the proponents only aimed to build technologies suitable for, but not helpful with, their ideal society. Although they were promoting a political/social reform, what they did to technologies was de-politicalizing them. In the view of the technological mediation theory, they overlooked how technologies mediate people’s behavior and relevant social values. The mistake should be corrected if we are going to promote an appropriate technology movement in contemporary Taiwan. A renewed conception of appropriate technology, therefore, should include the “directiveness” of technology to human behavior as one criterion of its appropriateness. Concerning environmental sustainability, a design like the set of stairs and lifts mentioned above can be qualified as an appropriate technology because not only is it low-tech and energy saving itself, but also it guides users’ behavior toward being environmentally moral.

Will this suggestion bring us back to the notion of technological determinism, which was overcome by historians of technology in the early stage of STS? No, it won’t, at least not to the strong version of technological determinism. Actually, STS can never avoid the mild version of technological determinism if we do believe technology is a constructive part of society and thus keep studying technological shaping of society as well as social shaping of technology (Wyatt, 2007). Technology is one among various forces shaping our sociotechnical world, and researchers in STS should take responsibilities for helping it to do better. What needs to be done for STS after de-constructing the sociotechnical complex is to re-construct a new one. Nonetheless, STS, with its sociological origin, likes to discuss how to improve our society through laws, educations, and economic systems, but normally not technologies. Possessing the negative imagery of technology, we researchers in STS usually don’t believe in a material utopia, but ironically, most time we do expect the coming true of an institutional one. However, technology itself is an institution, bridging structure and agency, and cognition and practice, as what laws, educations, and economic systems do (Pinch, 2008).
Therefore, it is necessary to consider the institutional effects of technology and pay much more attention to how they play constitutive roles in constructing a society. The technological mediation theory could serve as a philosophical foundation on which we build a theory for the institutional role of technology. The institutional effects of technology need not be seen as threats to human autonomy; rather, technology helps to form human subjects by mediation. If technology is inevitably value-laden, then we need to ask what values should be built-in. Positive values, such as sustainability and (renewed) appropriateness, can be promoted by technologies, and the goal would be achieved more effectively once technological mediation takes place on an institutional level. In so doing with the notion of technology accompaniment, STS would re-tangle technology with society in a better way, after we spent much time to un-tangle them.

**Conclusion: An STS with Dutch Society-Oriented POT Inside**

As a Ph.D. student who has been trained in the field of STS and am now doing doctoral research in the field of POT, I always see the potential of how they would benefit each other and thus attempt to make a connection between them. In this paper, against the background of the recent development of POT, I address that Dutch POT—especially the society-oriented one—is worth attention because its theoretically and institutionally intimate interaction with STS. By introducing the technological mediation theory—an approach developed at Twente—as an inspiration, I also explore how STS would reach its goal in a better way with the help of this approach. For researchers in Taiwan STS, with their respected spirit of activism, the task is not only to analyze the entangled relations of technology and society but also to plan a desirable future co-constructed with humans and nonhumans (Lei, 2002), and appropriate technology is proposed as an entry point to correct blind technological developments in contemporary Taiwan (Fu, 2009). Nevertheless, the constructivist view of technology has its focus mainly on describing the interaction of technology and society and often leaves normative issues outside its scope. Descriptive studies have always shown the possibilities of alternative technological development, but they barely provide specific guidance to lead technological design or innovation and help little with the prescriptive task of STS. With the help of Dutch society-oriented POT, STS would overcome this defect and become able to participate actively in the design process of technology in a broader way.

---

16 Concerning an akin defect of science studies in Taiwan STS, see a recent completed master’s thesis by Ko (2014).
POT has learned a lot from STS and been triggered the empirical turn by the inspiration of STS; it is time for STS to bring POT into the field. By applying the view of Dutch society-oriented POT, STS would extricate itself from the negative view on technology, which would be a better starting point to investigate, analyze, and evaluate technologies. Besides, by recognizing the mediating role of technology in our social lives and value systems, normative issues of technology would be put back on the STS research agenda again. Further, an STS equipped with this approach is not only capable of analyzing the normative aspect of technology in the past, but also able to deal with normative issues mediated by technology in the future. When aiming to build a better society, STS could benefit from Dutch society-oriented POT to explore what positive roles technologies can play for a desirable society. Uncovering the relations between technologies and our lives would help us to deal with normative issues in terms of values, and by recognizing inseparable interplay of technology and society, STS could take technology and other social factors simultaneously into account when planning the future. In this way, the STS with Dutch society-oriented POT inside will play a meaningful role in both the academic and the real world.

References


Brey, P. (2008b). Technology and Everything of Value. Inaugural speech presented at the Occasion of the Acceptance of the Position of Full Professor of Philosophy of Technology at the Faculty of Behavioural Sciences of the University of Twente, Enschede, The Netherlands.


Fu, D. (2007). The Practice of STS and a New Appropriate Technology Movement in Taiwan?
STS的實踐與台灣的新適當科技運動？
In Three Answers to What Science Is: STS, Gender, and Philosophy of Science
回答科學是甚麼的三個答案: STS、性別與科學哲學 (pp. 225–241).
Taipei, Taiwan: Socio Publishing Co

Fu, D. (2013). Positioning and Multiple Boundary-Crossings: A Reconsideration of STS and Philosophy of Science
定位與多重越界：回首重看 STS 與科哲. Taiwanese Journal for Studies of Science, Technology and Medicine
科技·醫療與社會, (16), 49–102.

New York: Palgrave Macmillan.

New York: Springer.


Hsu, M.-C. 徐銘謙, & Lin, T. -H. 林宗弘. (2011). Changing the Path: Civil Society and Technological Change of Taiwan’s Tourist Trail
山不轉路轉: 公民社會與臺灣步道工程技術的轉型. Taiwanese Journal for Studies of Science, Technology and Medicine
科技·醫療與社會, (13), 119–170.

Hung, C. (2001). Heidegger’s Philosophical Thought and Information Technology (IT)

Chicago: University of Chicago Press.

永續建築與適當科技：如何重塑使用者與現代社會. National Tsing Hua University 國立清華大學, Hsinchu, Taiwan.

讓技術設計進入環境教育：技術哲學與 STS 的視野. Presented at the International Conference on Social Environmental Education for an Emerging Eco-Civilization 社會環境教育與生態文明發展國際學術研討會, Taipei, Taiwan.

Ihde, D. (1999a). Do Politics Have Artefacts?
Social Studies of Science, 29(3), 411–431.

Social Studies of Science, 29(3), 450–457.


第三波 STS 的專家政治：以台灣犬貓餵食法爭議為例. National Yang-Ming University 國立陽明大學, Taipei, Taiwan.

Techné: Research in Philosophy and Technology, 3(3).

Techné: Research in Philosophy and Technology, 6(2).


