PHILOSOPHIA

Philosophia
ISSN: 0328-9672
ISSN: 2313-9528
philosophia@ffyl.uncu.edu.ar
Universidad Nacional de Cuyo
Argentina

HEVIA MARTÍNEZ, Germán
Can we apply the science/technology distinction to the Social Sciences? A brief analysis of the question*
Philosophia, vol. 79, núm. 2, 2019, pp. 33-57
Universidad Nacional de Cuyo
Mendoza, Argentina

Philosophia 79/2 ▌2019 ▌pp. 33 a 57

CAN WE APPLY THE SCIENCE/TECHNOLOGY DISTINCTION TO THE SOCIAL SCIENCES? A BRIEF ANALYSIS OF THE QUESTION*

¿Podemos aplicar la distinción entre ciencia y tecnología a las ciencias sociales? Un breve análisis de la cuestión

Germán HEVIA MARTÍNEZ
UNIVERSIDAD DE OVIEDO (ESPAÑA)
ghmhevia@gmail.com

Abstract: In this paper, I address the problem of applying the philosophical distinction between science and technology to the disciplines that deal with social phenomena. First, I will expose the demarcation problem regarding this distinction. Second, I will exhibit the arguments of those researchers who consider that it is possible to talk about technological disciplines in the fields that deal with the social world. I shall discuss then the "sociotechnology" (Mario Bunge) and the "social technology" (Olaf Helmer) approaches, apart from contemporary works of other scholars. Finally, I am going to defend why the science/technology distinction should be applied to the social disciplines.

Keywords: Social Engineering, Operations Research, Systemic Materialism, Demarcation Problem.

Resumen: En este artículo, abordo el problema de aplicar la distinción filosófica entre ciencia y tecnología a las disciplinas que se ocupan de los fenómenos sociales. Primero, expondré el problema de la demarcación con respecto a esta distinción. En segundo lugar, expondré los

 ▌ISSN 0328-9672 (impresa) ▌ISSN 2313-9528 (en línea)

argumentos de aquellos investigadores que consideran que es posible hablar de disciplinas tecnológicas en los campos que se ocupan del mundo social. Discutiré luego los enfoques de la "sociotecnología" (Mario Bunge) y la "tecnología social" (Olaf Helmer), además de los trabajos contemporáneos de otros académicos. Finalmente, defenderé porque la distinción ciencia/tecnología debería aplicarse a las disciplinas sociales.

Palabras clave: ingeniería social, investigación de operaciones, materialismo sistémico, problema de la demarcación.

1. Introduction

"Gentlemen: Without technique man would not exist and never would have existed".[1] These are the words that the Spanish philosopher Ortega y Gasset pronounced at the opening of his course about the technique in 1933.[2] Although this statement is nearly one hundred years old, the argument still holds today. We cannot understand society without technology. The social is embedded in the technical, and the technical is embedded in the social.

However, not all technical designs are material ones. Or, in other words, not all techniques and technologies are referred to the transformation of material objects.[3] We have other techniques whose aim is to modify human behavior and social systems. This is the idea that I am going to defend in this paper. My hypothesis is that we can apply the distinction between scientific and technological fields to the realm of social studies. And

* This research has been supported by the Office of the Vice President for Research of the University of Oviedo, through the Research Support and Promotion Plan for 2019 [16.01.541A.481.22]

1) José Ortega y Gasset, Meditaciones de la técnica y otros ensayos sobre ciencia y filosofía (Madrid: Alianza, 2000), 13.

2) He is considered as one of the pioneers of the philosophy of technology, being the first professional philosopher to approach the question of technology in his work Meditaciones de la técnica. Carl Mitcham, Thinking through technology: the path between engineering and philosophy (Chicago: The University of Chicago Press, 1994), 45.

3) I am using this notion of "material objects" in a general sense, to refer to those concrete objects or raw objects whose transformation is part of the objectives of common technical systems. It should not be inferred from this statement a distinction between a class of "material objects" and "immaterial or non-material" ones: all the objects, including cultural objects such theories or social norms, are material. Mario Bunge, Scientific materialism (Dordrecht: Reidel, 1981), 109-160.

therefore, we can speak of sociotechnological fields or social technologies. In other words, I going to defend that some of the knowledge produced by social disciplines should be considered, from an epistemic point of view, as technical knowledge.

But before that, I want to make explicit my philosophical framework. An honest philosopher must make explicit its own philosophical assumptions and compromises, because, after all, all of us think about reality from the point of view of a philosophical system –either explicit or implicit, organized or diffuse-[4] I consider that the task of philosophy is to analyze the underlying assumptions of theories, models and frameworks used in science and in technology. From this point of view, philosophy should discuss problems along with science and technology, using the knowledge gained by these fields as a starting point. These are the roots of the systemic materialism or *hylorrealism*[5] developed by Mario Bunge, whose framework I follow in my research activities.

Although I use the word sociotechnology or social technology in this work, in the end we are talking about something that in most disciplines – and of course, in the public sphere- has a bad connotation: social engineering, or the ways in which we can take an engineering approach to the transformation of the social world.[6]

Regarding this topic, we have classical thinkers that have talked about the use of a technological approach to the social world. Karl Popper talked

4) I thank professor David Alvargonzález Rodríguez, from the University of Oviedo, for this idea, that he usually repeats in his classes.
5) Mario Bunge, Chasing reality: Strife over Realism (Toronto: University of Toronto Press, 2006), 279-280
6) For an overview of the development of the different ideas of sociotechnology, the work of Rūta Tamošiūnaitė is a good point to start. Rūta Tamošiūnaitė, "Integrated Social Technologies for Citizen Participation in Modern Public Governance Decision Making", in The 5th European Interdisciplinary Forum 2017 (EIF 2017). Drivers for Progress in the Global Society, eds. Agota Giedrė Raišienė and Yuriy Bilan (Vilnius: Editografica, 2018), 27-29.

about piecemeal social engineering,[7] Jacques Ellul talked about human techniques,[8] Hebert Simon talked about the sciences of the artificial,[9] and so on. Even today we can find researchers addressing the same problem in the field of philosophy of social sciences. That is the case of researchers such as Andreas Pickel, Javier Echeverría, Harald Stelzer or Ivan Ferreira da Cunha.[10]

But there is an unresolved problem. This philosophical problem has two faces. On one hand, there is the theoretical use of the notion of social technology. On the other hand, there is the theoretical foundation of the notion of social technology. Although a lot of researchers have talked about this topic, they did not develop -at least in an explicit way- epistemological or ontological arguments to support their views about social technology. They used this notion in the first sense described: only as a *tool* to address other issues.[11] That is why the main references on this paper are quite old: Mario Bunge and Olaf Helmer are the only ones that have addressed the second part of this topic. Or to use other words, they are the only ones that used epistemological arguments to hold this notion.

To address all these issues, first, I will expose the demarcation problem and the distinction between science and technology. Then differences between scientific and technological enterprise should be highlighted. Second, I am going to exhibit the arguments of those researchers that have considered the possibility of talking about technological fields in the realm of social studies. In this case, I will exhibit the arguments of Olaf Helmer's *social*

7) Karl R. Popper Alan Ryan, and E. H. Gombrich, The open society and its enemies (Princeton: Princeton University Press, 2013); Karl R. Popper, The poverty of historicism (New York: Harper & Row, 1961).
8) Jacques Ellul and Robert K. Merton, The technological society (New York: Vintage Books, 1964)
9) Herbert Alexander Simon, The Sciences of the Artificial (Cambridge, Massachusetts: MIT Press, 1996)
10) See Section 5.
11) That is the case of Andreas Pickel, who used this notion in the field of Post-Communist Transformation Studies to highlight the embedded ideology of the plans used in some countries in their transition from communist economical system to capitalist ones. For the reference, see note 53.

technology and Mario Bunge's *sociotechnology*. Third, I am going to discuss their ideas and try to link them to modern discussions. And, finally, I am going to resolve the main question of this paper and defend why nowadays this topic should be an object of philosophical inquiry.

2. The demarcation problem: Science and technology

The demarcation problem is not only related to the problem of distinguishing between scientific and pseudoscientific knowledge: it is also related to the problem of distinguishing science from non-science.[12] That is: it is related to the problem of distinguishing scientific knowledge from other forms of *genuine knowledge.*[13]

As Martin Mahner have said, the best way of doing this is focusing on fields of knowledge. In that way we can make explicit the criteria to differentiate between the different knowledge genera. Roughly speaking, an epistemic or a research field is a group of people and their practices, aiming at gaining knowledge of some sort. For the purposes of the present study, the attention should focus in only two types of research fields: science and technology.[14]

Is important to consider this characterization as both descriptive and normative or evaluative. Descriptive because it includes many elements that should be considered when we analyze science and technology. Normative

12) Martin Mahner, "Science and Pseudoscience. How to Demarcate after the (Alleged) Demise of the Demarcation Problem", in Philosophy of Pseudoscience: Reconsidering the Demarcation Problem, eds. Massimo Pigliucci and Maarten Boudry (Chicago: University of Chicago Press, 2013), 31. Angelo Fasce, "What do we mean when we speak of pseudoscience? The development of a demarcation criterion based on the analysis of twenty-one previous attempts", Disputatio. Philosophical Research Bulletin 6:7 (2017), 461.

13) That is, knowledge that is at least partially true. Mario Bunge, Treatise on Basic Philosophy. Volume 6: Epistemology and Methodology II: Understanding the World, (Dordrecht: Reidel, 1983), 195.

14) It must be noted that a further distinction should be made between basic science/applied science/technology, and even between applied science and the application of science following the work of Niiniluoto. But that is way beyond the scope of this paper. Ilkka Niiniluoto, "The aim and structure of applied research", Erkenntnis 38:1 (1993).

because it can be regarded as an ideal that every field should satisfy to be considered as scientific or technological.[15]

Bunge holds that we cannot characterize science by a single peculiar trait. That is why in his characterization he uses a ten-tuple to take into account the different components of the scientific enterprise.

For a bungean perspective,[16] an epistemic or a research field is scientific if the elements of the ten-tuple approximately satisfy a set of twelve conditions regarding each one of the elements of the ten-tuple plus two additional ones: (1) there is at least one other contiguous scientific research field and (2) the membership of every one of the last eight components changes as a result of scientific research (see Figure 1).

Figure 1. Epistemic fields: science and technology characterization

$R=\langle C, S, D, G, F, B, P, K, A, M\rangle$

1. Research Community
2. Society
3. Domain
4. General Outlook
5. Formal Background
6. Specific Background
7. Problematics
8. Fund Of Knowledge
9. Aims Or Goals
10. Methodics

PLUS

(1) There is at least one other contiguous research field.
(2) The membership of every one of the last eight components changes over time.

$F=\langle C, S, D, G, F, B, P, K, A, M, V\rangle$

1. Professional Community
2. Society
3. Domain
4. General Outlook
5. Formal Background
6. Specific Background
7. Problematics
8. Fund Of Knowledge
9. Aims
10. Methodics
11. Values

PLUS

(1) There is at least one other contiguous research field.
(2) The membership of every one of the last nine components changes over time.

15) I borrowed this distinction between “descriptive” and “normative” from Miguel A. Quintanilla, who regards these elements as constitutive parts of philosophy. Miguel A. Quintanilla, Tecnología: un enfoque filosófico y otros ensayos de filosofía de la tecnología (México D.F.: Fondo de Cultura Económica, 2005), 40.

16) Martin Mahner and Gustavo Esteban Romero have been working in the development of the bungean characterisation of science and technology. In this occasion I am going to use the original proposal from Bunge, although the other new revisions from Mahner and Romero should be taken into account for anyone interested in the study of this topic in a deeper way. Gustavo Esteban Romero, Scientific Philosophy (Springer International Publishing, 2018). Martin Mahner, “Demarcating Science from Non-Science”, in Handbook of the Philosophy of Science: General Philosophy of Science – Focal Issues, ed. Theo Kuipers (Amsterdam: Elsevier, 2007).

Source: adaptation from Mario Bunge, *Treatise on basic philosophy*.[17]

In the same way as he characterizes science, Bunge uses an eleven-tuple to consider the main elements of technological research fields. In opposition to science, here we have another element in the tuple: values.

For him, we should distinguish between internal and external values in technological research. Or the *endoaxiology* and *exoaxiology* of technology. Bunge holds that the latter has no counterpart in basic science, and that is one of the main differences between scientific and technological fields.[18] Of course, as Ernan McMullin and Hillary Putnam point out, science has values too[19]. But in the case of technology, the exoaxiology or external values shapes and sets the technological design, implementation and praxis. Technologist are not free: they follow orders of what to create and modify from his employer or client[20]. Then, they adopt the values of the latter. And this is a key question: values limit technological praxis and what can and should be done.

One of the main differences between these two types of fields is in their goals. Science relates to cognitive problems, and its goal is understanding reality. For that, it uses theories as a guide to understand how things works. By the other hand, technology relates to practical problems, and its goal is to do things, using for that theories as a guide for action. It is important to keep in mind that for technology, scientific knowledge is a means to an end. In this case, a means to modify reality.

17) Mario Bunge, Treatise on basic philosophy. Volume 6, 202-203. Mario Bunge, Treatise on basic philosophy. Volume 7: Epistemology and Methodology III: Philosophy of Science and Technology. Part II. Life Science, Social Science and Technology (Dordrecht: Reidel, 1985), 231-232.
18) Ibid., 236.
19) Ernan McMullin, "Values in science", PSA: Proceedings of the Biennial Meeting of the Philosophy of Science Association. Volume Two: Symposia and Invited Papers 1982 (1982). Hilary Putnam, The Collapse of the Fact/Value Dichotomy and other essays (Cambridge, Massachusetts: Harvard University Press, 2002).
20) Mario Bunge, Treatise on basic philosophy. Volume 7. Part II, 234, 307 & 310.

That is why the core values of each field are different. As Miguel Angel Quintanilla points out, the core value of technology is not truth, but efficiency.[21] Quintanilla has extended Mario Bunge's philosophy to the field of philosophy of technology. In his account, technology has these main key elements: a) it refers always to a system of actions, b) its core value is efficiency, and c) its output should be considered valuable.

So, techniques always refer to systems of intentional actions whose goal is to do something in an efficient way to gain a result that is considered valuable. Or, to use other words, technology is the design of things or processes of possible practical value to some individuals or groups with the help of knowledge gained in basic or applied research.

It is possible to say that in the field of Philosophy of Science there is a broad consensus about this distinction between scientific and technological fields.[22] But this basic ideas about science and technology are often used only to refer to the disciplines that deals with the natural world (either those who study it or those who transform it).[23] Nevertheless, this basics notions can be used to refer to a broader range of disciplines, beyond the natural sciences.

3. Olaf Helmer's social technology

If humanity can use the basic forces of the physical world and use them through technology to make our lives better, why do not we do that with the

21) Miguel A. Quintanilla, Tecnología: un enfoque filosófico, 30.
22) It must be noted, nevertheless, that despite this general and tacit agreement we do not have yet a consensus about the demarcation problem. In fact, we are far from reaching it nowadays, as has been noted in a comparative study done by Angelo Fasce: there has not been any progress in the past decades. Angelo Fasce, What do we mean when we speak of pseudoscience?, 474.
23) In general, in the discussion about the demarcation between different knowledge genera, philosophers use an implicit classification of the scheme of science. Specifically, a scheme that separates the natural sciences from the social sciences, focusing on the first when generating its characterization of scientific knowledge. It is difficult to find demarcation proposals that address this problem considering all types of scientific disciplines (natural and social). This is one of the issues that philosophy and epistemology should resolve in the next years.

social world?[24] That is the idea of social technology in Olaf Helmer's work.[25] A synonym of operations research.[26] A discipline that seeks to exercise effective control without the need of a strong theoretical understanding of all the underlying phenomena[27]. It is a practical field of social science, whose aim is to deal with social problems. How? By producing knowledge about the future that can be used by policymakers and heads of corporations and governments. Knowledge gain using highly developed mathematical modeling, simulation techniques and the systematic use of experts (for example, the DEPHI technique).

He considers that decision-making processes in politics and in corporations should use the knowledge from this new type of social discipline: a discipline that can forecast the future and then offer that knowledge to create more efficient ways of transform social systems. For him, sociotechnologists then are advisors that should help policymakers in their decisions and warn them about the possible outcomes of their actions.[28] But they do not choose what patch should be followed regarding the desired future states of the social system: that is the work of politicians or of the heads of the corporations.[29] As has been said before, technologists adopt the values scheme of their employers: they are, practically speaking, *neutral* in the sense that they can create both harmful or harmless artifacts or plans depending of the values of its employers.

24) P. D. Aligica y Herritt, R., "Epistemology, social technology, and expert judgement: Olaf Helmer's contribution to futures research", Futures, 41:5 (2009), 257.
25) Olaf Helmer was a German-American philosopher and mathematician, who worked as researcher at the RAND Corporation in its early days. He was also a futurologist, who founded the Institute for the Future. Among other things, is considered the father of the famous DELPHI technique, developed at the RAND Corp.
26) Ibid., 253.
27) Olaf Helmer, Bernice Brown and Theodore Gordon, Social Technology (New York: Basic Books, 1966), 5.
28) Ibid., 10.
29) Ibid., 37.

To hold this, Helmer use two arguments or theoretical foundations: an epistemology of inexact sciences and the ability to make predictions in social sciences. Helmer argues that social sciences should not be regarded as inexact disciplines. This is related to the problem of finding laws in social sciences. For most researchers, even today, social sciences can only find general trends or *quasi-laws.*[30] That is the reason why social sciences can only obtain an inexact knowledge about their domain: because they cannot obtain those exact laws used in natural sciences, due to the intrinsic inexactness of its domain. But for Helmer and Nicholas Rescher, this distinction between exact and inexact disciplines is a fiction[31]. They argue that only a small section of natural sciences satisfies this ideal of exactness. In fact, they hold that when those natural laws are used in technology, they become like the so-called *quasi-laws* of social sciences. For them, there is no clear-cut dichotomy between exact and inexact sciences. The only difference should be found in the forecasting process.

Then, "the use of experts for prediction does not constitute a line of demarcation between the social and the physical sciences, but rather between the exact and the inexact sciences".[32] In the case of social sciences, forecasting should rely on the use of these *quasi-laws* and the systematic use of experts (for example, through the DELPHI technique).

In his opinion, social sciences should follow this approach towards the establishment of a social technology as a new type of discipline. This new field could be used to guide the decision-making process of key institutions,

30) Helmer and Rescher called quasi-laws the restricted or limited generalizations used by sciences (natural and social). In the same sense, Bunge uses the term to refer to empirical generalizations that cannot be considered as scientific laws for not being precise and part of a broader theory. Olaf Helmer and Nicholas Rescher, "On the Epistemology of the Inexact Sciences", Management Science 6:1 (1959), 30. Mario Bunge, Las Ciencias Sociales en Discusión: una perspectiva filosófica (Buenos Aires: Editorial Sudamericana, 1999), 136 [Translation from the original, Social Science under Debate: A Philosophical Perspective (Toronto: University of Toronto Press, 1998)]

31) Olaf Helmer and Nicholas Rescher, On the Epistemology, 25.

32) Ibid., 41.

using forecasting techniques to know the possible future states of many social systems regarding the implementation of public policies and other sociotechnical plans.

4. Mario Bunge's sociotechnology

Sociotechnology is a "discipline that studies the ways of maintain, repair, improve or replace" existing social systems and processes. To do that, it "designs or redesigns each other to deal with social problems".[33]

For Bunge, sociotechnology is one of the six branches of technology -along with physiotechnology, chemotechnology, biotechnology, psychotechnology and general technology[34]-, on an equal footing with all the others. In his opinion, we should regard disciplines like management science, normative economy, law, city planning, military science and public policy studies as sociotechnologies.

This management of society can be society-wide or restricted to a subsystem of society. We can talk then of two branches of sociotechnology. The first one, large scale public management or social engineering; the second one, management science or operations research. These two types of sociotechnologies deals with different types of problems: as the scale of social organizations grows, new problems emerge.[35]

The idea of sociotechnology in Mario Bunge is based in three statements or arguments. One regarding an ontological characteristic of social systems, and the others regarding a wide use of the concepts of "artificial" and "technology".

33) Mario Bunge, Las Ciencias Sociales en Discusión, 323.
34) Mario Bunge, Treatise on basic philosophy. Volume 6, 215.
35) Mario Bunge, Treatise on basic philosophy. Volume 7. Part II, 275.

In his ontology, he considers that management is part of the concrete holding any social group together.[36] So, we can find management relations in every social organization. Relations that do not need to be explicit. In his opinion, without some sort of management, sociosystems would become anarchical and break down. When we use some learned knowledge to guide our managerial action, we are then using sociotechnological knowledge.[37]

Let us now turn to his wide use of the concept of "artificial". For him, artificial is "the totality of concrete things and processes […] made or done by rational beings or their proxies with the help of knowledge".[38] To rate something as an artificial, the object or thing should be the outcome of a decision to do an activity or work to make it. And that activity or work should be guided by some learned knowledge. This wide conception of "artificial" includes things inside the realm of social sciences. For example, for him we should regard the entire economy, polity and culture of any society as artificial.[39] That is because these systems could be different from what they are, and their creation, preservation or reform requires some learned knowledge.

At last, his comprehensive notion of technology makes room to broaden the scope of traditional accounts of technological fields. As has been said before, Bunge regards technology as the design of things or processes of possible practical value with the help of scientific knowledge gained in basic

36) Mario Bunge, Treatise on basic philosophy. Volume 4: Ontology II: A world of systems (Dordrecht: Reidel, 1979) 201-202.
37) Think for example of any organization with a strong bureaucracy, such as Universities. In them we can find people that acts as plumbers: professionals that, apart from its highly specialized knowledge and jobs as teachers and researchers, know how to move themselves in the organizational framework around them and how convince others to make changes. They do not need to be the ones that are in charge, in the position of President or Vice Chancellor of the University: but a University (or other type of organization) without them would collapse. It needs plumbers to keep things running according to the sociotechnological plans approved by the University Council. A similar idea has been proposed by Esther Duflo, when she refers to economists acting as plumbers. Esther Duflo, "Richard T. Ely Lecture: The Economist as Plumber.", American Economic Review 107:5 (2017)
38) Mario Bunge, Treatise on basic philosophy. Volume 7. Part II, 220.
39) Mario Bunge, Treatise on basic philosophy. Volume 4, 204-205.

or applied research. The key element of this idea of technology is that it makes room to consider some action-oriented fields that in most of the discussion about technological fields are excluded. And that is what Bunge does when he considers sociotechnology as one of the branches of technology.

There is an important question that, however, has not been addressed in this section for being beyond the scope of this research, although it is an important component of the way Bunge understands -from a normative point of view- his sociotechnology. He considers that this technical approach to the social cannot lead to a technocratic management style, specifically when we are talking about social engineering. That is why he uses in his latter discussion about sociotechnology the notion of *technoholodemocracy*,[40] to highlighted not only the need of sociotechnical plans if we want to make effective changes in our societies, but also the need to legitimize those proposals through citizen participation.[41]

The bungean notion of sociotechnology has been further develop by Miguel A. Quintanilla and Dan Alexander Seni. In the first case, he included this notion into his own development of the bungean philosophy of technology.[42] And in the second case, Seni developed the idea of sociotechnology and the concept of “plan”.

40) Mario Bunge, Las Ciencias Sociales en Discusión, 468-470.
41) This topic of public participation and the challenges of using scientific and technical knowledge in society has been addressed in the field of Science, Technology and Society studies, but only in reference to disciplines that belongs to the so-called natural sciences (see the works of José A. Cerezo for a concise introduction). José A. López Cerezo, "Democracia en la frontera", Revista CTS 3:8 (2007). José A. López Cerezo, "Gobernabilidad en la sociedad del conocimiento", EIDOS 6 (2007).
42) Miguel A. Quintanilla, Tecnología: un enfoque filosófico, 94-99.

Seni stated that "the idea of plan ought to have a central role in the philosophy of technology",[43] and be the equivalent of the idea of theory in the philosophy of science. For him, a plan is a "construct describing the future state of an object along with the trajectory resulting from its action",[44] whose conceptual structure can be summarized in Theoretical backing + Ends and Desiderata = Conclusion or Instruction set.[45] In the case of sociotechnical plans, a further distinction must be made: in this case, the target of the plan is both agent and subject. The agents of sociotechnologies are, for Seni, sociotechnical systems (for example, an entrepreneurial firm): those are who decided to take action and made a plan which goal is to transform themselves as organizations.

Following the distinction made by Bunge between *management science* and *social engineering*, Seni considers that sociotechnology should refer to "technology employed by sociosystems which are agents themselves",[46] that can manage other objects, sociosystems or themselves. This is an important clarification: only sociotechnical systems -or active social systems in his words- can deployed sociotechnological plans. If their aim is the transformation of an object, other organization or themselves we are talking then of *management science.* If its aim is to resolve social problems of a broader sociosystem (a large region or State), then we are talking about *social engineering*, because in this case the subject of transformation cannot act as *agents* of change; rather like *patients.*[47]

43) Dan A. Seni, "The Sociotechnology of Sociotechnical Systems: Elements of a Theory of Plans", in Studies on Mario Bunge's Treatise, eds. Paul Weingartner and Georg J. W. Dorn (Amsterdam: Rodopi, 1990), 438.
44) Ibid., 438-439.
45) It must be noted that, along with Bunge and Quintanilla, Seni considers technology as an action-oriented field in which knowledge always refers to actions.
46) Ibid., 444.
47) Ibid., 445

Regarding social engineering, its plans for repair and transform social systems have a strong ideological and moral component. This is a shared characteristic between sociotechnology and all other technologies. As Seni states, "all technology is in a sense sociotechnology",[48] because when engineers design a technical system that is going to provide a new service or to made new artifacts they create it from a value scheme that is embedded in a broader ideological framework.[49]

We must keep in mind that there is always an alternative technical plan to resolve any problem, and that ideology and values shape the development and realization of any plan. This is the same for sociotechnical plans. Think for example of any public policy using this idea of sociotechnology. There is not only one way to deal with a social problem. There is always an alternative policy proposal, but its development depends on our values and ideological roots. In the case of social engineering these plans "calls for consensus, coordination, and contract between components of a larger system".[50]

5. Towards a Philosophy of Social Technology: old and new approaches

Although there are some differences between Helmer's and Bunge's accounts, their approaches are highly compatible between themselves.[51] As has been said before, they are the only ones that have proposed philosophical arguments to hold and justify their notion of social technology: others only make use of superficial arguments or takes for granted the

48) Ibid., 431
49) For example, computer programs: if you consider that your piece of software is valuable for the market, it is going to have characteristic that a non-market version would not have (code to protect the intellectual property, the need of a key or license to run the program, etc.)
50) Ibid., 444
51) Although Bunge does not cite the work of Helmer, he considers the field of operations research -aka social technology in Helmer's work- as a sociotechnological field (along with law, normative economy or social work). Bunge, Treatise on basic philosophy. Volume 7. Part II, Chapter 5.

adequacy of the translation of the distinction from the natural disciplines to the social ones. But their goals are different.

Bunge's main goal is to achieve a general characterization of science and technology that can be used to describe the wider range of disciplines. That is why in his characterization of social technology he uses examples of current disciplines (such law, management, forestry, etc.). The case of Helmer is quite different. His goal is not the understanding and classification of the type of knowledge created by well-established disciplines, but the creation of a new and distinct discipline. It is important to remember that the first one is a philosopher, an academic working at the University; the second one is a mathematician working for a think-tank involved mostly with practical problems. Helmer, truth be told, uses philosophical arguments to justify his position, but only to create the theoretical foundation of his proposal of a new discipline.

And he does that in a quite unique way. In fact, his discussion -with Nicholas Rescher- about the distinction between exact and inexact sciences relates to the demarcation problem, although nowadays it is hard to find explicit discussions on this distinction. They even give some tips for a new way of understanding the problem of the classification of the sciences and the differences between natural and social disciplines.[52]

Nevertheless, they are the exception in what refers to be the philosophical insights about social technology. In general, you should expect that before talking about this issue is mandatory to talk about the epistemological and ontological foundations of these notions of technological fields in the realm of social studies. Something like what Olaf Helmer, Mario Bunge and his followers did with their proposals. But contemporary discussions on this topic goes the other way around. They talk about social

52) To see a good account of different classification proposals, see David Alvargonzález, “La clasificación de las ciencias desde la filosofía del cierre categorial”, Revista de humanidades 37 (2019).

technology assuming that is possible to translate the distinction between scientific and technological fields from the natural sciences to the social sciences. And they do not give explicit arguments regarding the philosophical roots of their claims. We shall remember what has been said at the beginning. This topic has two sides: the theoretical use of the notion of social technology and the theoretical foundation of the notion of social technology. And contemporary research only addresses the first one. That is the case of classical authors such as Karl Popper or Jacques Ellul, as noted in the introduction. And that is also the case of other contemporary approaches to this problem.

For example, Andreas Pickel uses the concept of social technology in the field of Post-Communist Transformation Studies, following the works of Karl Popper and Mario Bunge. For him, the relationship between social science and social technology should be studied to understand the role of the latter in systemic change, paying attention to the influence of ideology in the design and deployment of the reform proposals in the framework of the post-Cold War transitions from planned to market economies.[53]

By the other hand, Benjamin K. Sovacool propose that corporations should be considered as a type of technology -in fact, as *failed* technology-[54] and Maarten Derksen and Anne Beaulieu dedicated an issue of the journal

53) Andreas Pickel, "Between Social Science and Social Technology: Toward a Philosophical Foundation for Post-Communist Transformation Studies", Philosophy of the Social Sciences 31:4 (2001).
54) Benjamin K. Sovacool, "Broken by Design: The Corporation as a Failed Technology.", Science, Technology and Society 15:1 (2010).

Theory and Psychology[55] and a chapter in the SAGE handbook of philosophy of social science to the notion of social technology.[56]

Joseph Agassi has discussed the need of scientific foundations for public policies and its public debate in a commentary about the work of Bunge.[57] He also discussed the problem of expertise knowledge in the framework of democratic regimes. Also,[58] Javier Echeverría had considered that innovation studies should be regarded as a social technoscience[59]. Harald Stelzer has defended Popper's conception of *piecemeal social engineering* to address philosophical problems of public policies.[60] Ivan Ferreira da Cunha discussed the need to develop a philosophy of social technology using the works of Otto Neurath and Nancy Cartwright.[61] And Elkin Pineda-Henao and Carlos Tello-Castrillón have analyzed the epistemological status of administration studies and its possible consideration as a technological discipline.[62]

Together, these studies indicate that this topic must be studied in a deeper way. In fact, some of them highlight the need for more epistemological and ontological analysis regarding this issue.

55) Maarten Derksen, Signe Vikkelsø, and Anne Beaulieu, "Social Technologies: Cross-Disciplinary Reflections on Technologies in and from the Social Sciences." Theory & Psychology 22:2 (2012).
56) Maarten Derksen, and Anne Beaulieu, "Social Technology", in The SAGE Handbook of the Philosophy of Social Sciences, eds. Ian C. Jarvie and Jesus Zamora-Bonilla (London: SAGE Publications, 2011).
57) Joseph Agassi, "Bunge Nevertheless.", Philosophy of the Social Sciences 43:4 (2013).
58) Joseph Agassi, "Experts within Democracy: The Turner Version", Philosophy of the Social Sciences 45:3 (2015).
59) Javier Echeverría, Innovation and Values. A European Perspective (Center for Basque Studies: University of Nevada, Reno, 2014), 103.
60) Harald Stelzer, "Principles and Policies: What Can We Learn from Popper's 'Piecemeal Social Engineering' for Ideal and Nonideal Theory?", Philosophy of the Social Sciences 46:4 (2016).
61) Ivan Ferreira da Cunha, "Constructing dystopian experience: A Neurath-Cartwrightian approach to the philosophy of social technology", Studies in History and Philosophy of Science Part A 72 (2018).
62) Elkin Fabriany Pineda-Henao and Carlos Tello-Castrillón, "¿Ciencia, Técnica y Arte?: Análisis Crítico Sobre Algunas Posturas Del Problema Del Estatus Epistemológico de La Administración." Revista LOGOS CIENCIA & TECNOLOGÍA 10:4 (2018).

6. Conclusions: Why demarcate?

Science and technology are different research fields, and they produce different knowledge. Thus, we cannot evaluate their cognitive product in the same way. For science, truth is all that matters. And for technology, efficiency is the core value.

We have a lot of social sciences and humanistic disciplines. Sociology, social work, human resources, management studies, law, anthropology, economics, and so on. And although they are different, we consider them to be on the same page. Think for example of the distribution of fields into different disciplines, degrees and Faculties at our Universities. It is not hard to find the degrees of Social Work, Sociology, Audiovisual Communication or Work Relations being taught under the same Faculty of Social Sciences.[63] Or even Faculties labeled with the strange name of "Faculty of Law Sciences".[64]

My point is that nowadays, in social sciences and other related fields, we are mixing up socio-scientific fields with socio-technological fields. And there lies the issue. The cognitive outputs of these fields are very different and should not be confused. We cannot use the same criteria to evaluate social sciences and social technologies, in the same way that we do not use the same criteria to evaluate scientific and technological outputs.

May main statement then is that some of the knowledge produce by social disciplines today should be considered as technical knowledge. The notion of sociotechnology can be used as a powerful tool to clarify some aspects of the research in the social sciences that had not been address properly.

Philosophy started to study technology last century. That helped us to understand in a deeper way how technology works. And that helped us to

63) That is the case of the Faculty of Social Sciences at the University of Salamanca, in Spain.
64) This is the case of the University of Las Palmas de Gran Canaria, also in Spain.

uncover the ideological roots of some technological developments, the role played by experts and some authoritarian use of technological products. Although this topic should be studied in a deeper way, I tried to show that there are good arguments to consider that is possible to apply this philosophical distinction between scientific and technological fields to social studies and to talk then about social technologies.

If we do that, we are going to be able to uncover the sociotechnological knowledge that nowadays is disguised and accepted as social science. And we are going to be able to evaluate it with the right tools.

Bibliography

Agassi, Joseph. “Bunge Nevertheless”. *Philosophy of the Social Sciences* 43, no. 4 (2013). https://doi.org/10.1177/0048393111428793 (Accessed July 18, 2019)

Agassi, Joseph. “Experts within Democracy: The Turner Version”. *Philosophy of the Social Sciences* 45, no. 3 (2015). https://doi.org/10.1177/0048393114550807 (Accessed July 18, 2019)

Aligica, P. D. y R. Herritt. “Epistemology, social technology, and expert judgement: Olaf Helmer’s contribution to futures research”. *Futures*, 41, no. 5 (2009). https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2149091 (Accessed March 24, 2017)

Alvargonzález, David. “La clasificación de las ciencias desde la filosofía del cierre categorial”. *Revista de humanidades,* no. 37 (2019). http://revistas.uned.es/index.php/rdh/article/view/21202 (Accessed October 13, 2019)

Bunge, Mario. *Chasing reality: Strife over Realism.* Toronto: University of Toronto Press, 2006.

Bunge, Mario. *Las Ciencias Sociales en Discusión: una perspectiva filosófica.* Buenos Aires: Editorial Sudamericana, 1999. [Available in English, *Social Science under Debate: A Philosophical Perspective*. Toronto: University of Toronto Press, 1998]

Bunge, Mario. *Scientific materialism*. Dordrecht: Reidel, 1981.

Bunge, Mario. Treatise on basic philosophy. Volume 4: Ontology II: A world of systems. Dordrecht: Reidel, 1979.

Bunge, Mario. Treatise on Basic Philosophy. Volume 6: Epistemology and Methodology II: Understanding the World. Dordrecht: Reidel, 1983.

Bunge, Mario. Treatise on basic philosophy. Volume 7: Epistemology and Methodology III: Philosophy of Science and Technology. Part II. Life Science, Social Science and Technology. Dordrecht: Reidel, 1985.

da Cunha, Ivan Ferreira. “Constructing dystopian experience: A Neurath-Cartwrightian approach to the philosophy of social technology”. *Studies in History and Philosophy of Science Part A* 72 (2018). https://doi.org/10.1016/j.shpsa.2018.05.012 (Accessed July 22, 2019)

Derksen, Maarten and Anne Beaulieu. “Social Technology”. In *The SAGE Handbook of the Philosophy of Social Sciences*, edited by Ian C. Jarvie and Jesus Zamora-Bonilla, 703-720. London: SAGE Publications, 2011.

Derksen, Maarten, Signe Vikkelsø, and Anne Beaulieu. “Social Technologies: Cross-Disciplinary Reflections on Technologies in and from the Social Sciences”. *Theory & Psychology* 22, no. 2 (2012). https://doi.org/10.1177/0959354311427593 (Accessed July 18, 2019)

Duflo, Esther. "Richard T. Ely Lecture: The Economist as Plumber". *American Economic Review* 107, no. 5 (2017). 10.1257/aer.p20171153 (Accessed October 25, 2019)

Echeverría, Javier. *Innovation and Values. A European Perspective*. Center for Basque Studies: University of Nevada, Reno, 2014.

Ellul, Jacques and Robert K. Merton. *The technological society*. New York: Vintage Books, 1964.

Fasce, Angelo. “What do we mean when we speak of pseudoscience? The development of a demarcation criterion based on the analysis of twenty-one previous attempts”. *Disputatio. Philosophical Research Bulletin* 6, no. 7 (2017), https://disputatio.eu/vols/vol-6-no-7/fasce-pseudoscience/ (Accessed April 4, 2019)

Helmer, Olaf and Nicholas Rescher. “On the Epistemology of the Inexact Sciences”. *Management Science* 6, no. 1 (1959). https://www.rand.org/pubs/reports/R353.html (Accessed March 6, 2017)

Helmer, Olaf, Bernice Brown and Theodore Gordon. *Social Technology.* New York: Basic Books, 1966.

López Cerezo, José A. "Democracia en la frontera", *Revista CTS* 3, no. 8 (2007). http://www.revistacts.net/volumen-3-numero-8/60-dossier/138-democracia-en-la-frontera (Accessed February 18, 2019)

López Cerezo, José A. "Gobernabilidad en la sociedad del conocimiento", *EIDOS* no. 6 (2007). http://rcientificas.uninorte.edu.co/index.php/eidos/article/view/1492/962 (Accessed January 18, 2019)

Mahner, Martin. “Demarcating Science from Non-Science”. In *Handbook of the Philosophy of Science: General Philosophy of Science – Focal Issues*, edited by Theo Kuipers, 515-575. Amsterdam: Elsevier, 2007.

Mahner, Martin. “Science and Pseudoscience. How to Demarcate after the (Alleged) Demise of the Demarcation Problem”. In *Philosophy of Pseudoscience: Reconsidering the Demarcation Problem*, edited by

Massimo Pigliucci and Maarten Boudry, 29-35. Chicago: University of Chicago Press, 2013.

McMullin, Ernan. “Values in science”. In PSA: Proceedings of the Biennial Meeting of the Philosophy of Science Association. Volume Two: Symposia and Invited Papers, 3-28. Chicago: The University of Chicago Press, 1982.

Mitcham, Carl. Thinking through technology: the path between engineering and philosophy. Chicago: The University of Chicago Press, 1994.

Niiniluoto, Ilkka. “The aim and structure of applied research”. *Erkenntnis* 38, no. 1 (1993): 1-21.

Ortega y Gasset, José. Meditaciones de la técnica y otros ensayos sobre ciencia y filosofía. Madrid: Alianza, 2000.

Pickel, Andreas. “Between Social Science and Social Technology: Toward a Philosophical Foundation for Post-Communist Transformation Studies”. *Philosophy of the Social Sciences* 31, no. 4 (2001), https://doi.org/10.1177/004839310103100401. (Accessed July 10, 2019)

Pineda-Henao, Elkin Fabriany and Carlos Tello-Castrillón. “¿Ciencia, Técnica y Arte?: Análisis Crítico Sobre Algunas Posturas Del Problema Del Estatus Epistemológico de La Administración.” *Revista LOGOS CIENCIA & TECNOLOGÍA* 10, no. 4 (2018). http://revistalogos.policia.edu.co/index.php/rlct/article/view/605 (Accessed March 23, 2019)

Popper, Karl R. *The poverty of historicism*. New York: Harper & Row, 1961.

Popper, Karl R., Alan Ryan and E. H. Gombrich. *The open society and its enemies*. Princeton: Princeton University Press, 2013.

Putnam, Hilary. *The Collapse of the Fact/Value Dichotomy and other essays.* Cambridge, Massachusetts: Harvard University Press, 2002.

Quintanilla, Miguel A. Tecnología: un enfoque filosófico y otros ensayos de filosofía de la tecnología. México D.F.: Fondo de Cultura Económica, 2005.

Romero, Gustavo Esteban. *Scientific Philosophy*. Springer International Publishing, 2018.

Seni, Dan A. "The Sociotechnology of Sociotechnical Systems: Elements of a Theory of Plans". In *Studies on Mario Bunge's Treatise*, edited by Paul Weingartner and Georg J. W. Dorn, 431-452. Amsterdam: Rodopi, 1990.

Simon, Herbert Alexander. *The Sciences of the Artificial*. Cambridge, Massachusetts: MIT Press, 1996.

Sovacool, Benjamin K. "Broken by Design: The Corporation as a Failed Technology". *Science, Technology and Society* 15, no. 1 (2010). https://doi.org/10.1177/097172180901500101 (Accessed July 13, 2019)

Stelzer, Harald. "Principles and Policies: What Can We Learn from Popper's 'Piecemeal Social Engineering' for Ideal and Nonideal Theory?". *Philosophy of the Social Sciences* 46, no. 4 (2016). https://doi.org/10.1177/0048393116639226 (Accessed July 13, 2019)

Tamošiūnaitė, Rūta. "Integrated Social Technologies For Citizen Participation In Modern Public Governance Decision Making" In *The 5th European Interdisciplinary Forum 2017 (EIF 2017). Drivers for Progress in the Global Society*, edited by Agota Giedrė Raišienė and Yuriy Bilan, 27-34. Vilnius: Editografica, 2018.

El autor es graduado en Sociología por la Universidad de Salamanca y Máster en Lógica y Filosofía de la Ciencia por la misma universidad. Ha participado como ponente en diversos congresos nacionales e

internacionales. Es investigador predoctoral en la Universidad de Oviedo. Sus áreas de interés son la filosofía de la tecnología y el ámbito CTS.

Recibido: 19 de marzo de 2019.

Aprobado para su publicación: 3 de mayo de 2019.