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On the Philosophy of Applied Social Sciences

Abstract

The distinction between basic and applied research, widely used for the purposes of science policy, is notoriously vague and ambiguous. In earlier papers, I have argued that there is nevertheless a viable and systematic way of separating these two types of research.[1] An important form of applied research includes design sciences or "sciences of the artificial" in the sense of Herbert Simon.[2] Applied social sciences, which pursue knowledge with the purpose of influencing social behavior and social institutions into a desired direction, can be counted as important examples of such design sciences.

1. Research and development

The OECD office introduced in 1966 definitions which have ever since been widely used within science policy. *Research* (R) is defined as "the pursuit of new knowledge", and *development* (D) is the use of results of research "to develop new products, methods, and means of production".

Historically the division of R and D can traced back to Aristotle's distinction between knowledge (Gr. *episteme*, Lat. *scientia*) and productive arts (Gr. *techne*). For a scientific realist, the R&D divide is essentially the same as the distinction between science and technology: *science* is systematic and critical knowledge-seeking by research, and *technology* is the design and use of material and social artifacts, the art and skill of this activity, and its products.[3] In these terms, development is the same as science-based technology.

For pragmatists and instrumentalists, the situation is different: science is seen as a problem-solving activity, which uses Operations Research (OR) as its typical method. In my view, this blurring of R and D can be avoided if we make a proper distinction between cognitive and practical problems: solution of the former are

1 See Ilkka Niiniluoto, "The Aim and Structure of Applied Research", in: *Erkenntnis* 38, 1993, pp. 1-21, and Ilkka Niiniluoto, "Approximation in Applied Science", in: Martti Kuokkanen (Ed.), *Idealization VII: Structuralism, Idealization and Approximation*. Amsterdam: Rodopi 1994, pp. 127-139.

2 See Herbert Simon, *The Sciences of the Artificial*. Cambridge (Mass.): The MIT Press, 1969. (2nd ed. 1981).

3 See Ilkka Niiniluoto, *Is Science Progressive?* Dordrecht: D. Reidel, 1984, Ch. 12.

H. Andersen et al. (eds.), *New Challenges to Philosophy of Science*, The Philosophy of Science in a European Perspective 4,
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new knowledge claims, and those of the latter human decisions to act in a certain particular situation.[4]

R&D is today associated with "national innovation systems". In economics, following Schumpeter, *innovation* means the development of technical discoveries into profitable market products or commodities. A recent definition used in Finland states that innovation is "an exploited competence-based competitive asset".[5] In this sense, innovation is a part of development (D) which is usually processed in industrial laboratories. In Finland, mainly due Nokia's investments, privately funded industrial development covers about 70% of R&D.

The so called "social engineering" and "culture industry" are also parts of the innovation system. Cultural and social sciences may produce as their outcomes cultural and social innovations, if their results are developed in the public or private sector. Examples include democracy, public school, Finnish comprehensive school, social security, the Nordic welfare state, child day-care, maternity pack and clinics, and social media.[6]

2. Basic vs. applied research

The OECD manual made a further distinction between two types of research: *basic* or *fundamental* research is systematic search of knowledge "without the aim of specific practical application", and *applied* research "pursuit of knowledge with the aim of obtaining a specific goal". The former is often characterized as "curiosity-driven" or "blue skies research", the latter as "goal-directed" or "mission-oriented" research.

This distinction is not part of the classical legacy of science, since Aristotle's famous division of theoretical and practical philosophy is quite different: practical sciences, which are concerned with the goals of good human life, include ethics, economy, and politics.

The OECD definitions serve to separate applied research from development (technology) and applications of science (innovation), but they are stated in vague and ambiguous terms. Even the "purest" research is in some cognitive sense goal-directed, and even mission-orientation involves some element of curiosity. There may differences in the speed of utilization of research results, but otherwise the term "aim" could refer to more or less accidental personal motives and knowledge

4 See Ilkka Niiniluoto, "The Foundations of Statistics: Inference vs. Decision", in: Dennis Dieks, Wenceslao J. Gonzalez, Stephan Hartmann, Michael Stöltzner, and Marcel Weber (Eds.), *Probabilities, Laws, and Structures*. Dordrecht: Springer 2012, pp. 29-41.

5 See *Evaluation of the Finnish National Innovation System: Policy Report*. Helsinki: The Ministry of Education and The Ministry of Employment and Economy, 2009, p. 23.

6 See Ilkka Taipale (Ed.), *100 Social Innovations from Finland*. Helsinki: Baltic Sea Centre Foundation, 2006.

of individual scientists, or to the goals of research sites (university vs. research institute) or funding institutions. It is thus no wonder that this division has been heavily criticized. For this reason, it is worth while to ask whether the proposed pragmatic division could be replaced by a systematic distinction.[7]

3. Utilities

One approach might be based on utilities, understood not as variable personal or institutional motives but as objective standards for assessing quality or success. The science – technology division is reflected in the separation of *epistemic utilities* (like truth, information, truthlikeness, confirmation, understanding, explanatory power, predictive power, simplicity) and *practical utilities* (effectivity of a tool in relation to its intended use, economic cost-benefit efficiency, ergonomical, ecological, esthetic, ethical, and social criteria). The former are relevant for the knowledge claims in science, the latter are principles to be used in technology assessment.[8]

Applied research can be assessed both by epistemic utilities (it pursues knowledge by usually applying the result of basic research) and practical utilities (its knowledge has instrumental relevance for some human activity). This can be seen in typical examples of natural and social applied sciences: engineering sciences, agricultural and forestry sciences, biotechnology, nanotechnology, clinical medicine, public health, pharmacology, nursing science, didactics, pedagogy, applied psychology, social policy studies, social work, political science, business economics, communication studies, development studies, urban research, library science, peace research, military research, and futures studies.

At the same time it is again important to emphasize that all science is not applied. In his classification of sciences Jürgen Habermas suggests that natural science is governed by the "technical interest" of controlling nature.[9] This idea was indeed the key to Francis Bacon's 1620 vision that knowledge of causal laws allows us to control nature and "to subdue the necessities and miseries of human life", but it was in fact only realized at the end the 19th century by new engineering and agricultural sciences. To elevate this model of applied science to a principle of all natural science is to assume the instrumentalist view of science which ignores the theoretical or epistemic interest of scholarly activities.[10]

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7 See Niiniluoto, "The Aim and Structure of Applied Research", *loc. cit*.

8 See Isaac Levi, *Gambling With Truth: An Essay on Induction and the Aims of Science*. New York: Alfred A. Knopf 1967, and Paul Durbin and Friedrich Rapp (Eds.), *Philosophy and Technology*. Dordrecht: D. Reidel 1983.

9 See Jürgen Habermas, *Knowledge and Human Interests*. Boston: Beacon Press 1972.

10 Cf. Niiniluoto, *Is Science Progressive?*, *op. cit*., p. 221.

4. Descriptive Science vs. Design Science

Another approach is based on the logical structure of the knowledge claims in basic and applied research. Fundamental research is *descriptive science* in the sense that it describes reality (nature, mind, and society) by establishing singular facts about the past and the present and general laws (deterministic and probabilistic) about natural and social systems.[11] Typical causal laws of the form

(1) X causes A in situation B

can be used for the purposes of *explanation* (A has occurred in B because X) and *prediction* (A will occur in B after X).

Examples of descriptive sciences include physics, chemistry, geology, biology, ecology, medicine, history, ethnology, anthropology, psychology, legal dogmatics, sociology, and social psychology.

Predictive sciences, which develop and use methods for predicting and forecasting future events and phenomena, include predictive astronomy, meteorology, social statistics, econometrics, and futurology. They are descriptive sciences which traditionally have been regarded as examples of applied science.

Herbert Simon in 1969 was perhaps the first who called attention to another type of applied sciences: the "sciences of the artificial" are not concerned with how things *are*, but "how things *ought to be* in order to attain goals, and to function".[12] They can be called *design sciences*, in the broad sense that design is concerned with shaping and planning artificial human-made systems (e.g., engineering design, environmental and social planning). As attempts to seek knowledge about design activities, design sciences should not to be confused with science-based design itself. In the same way we have distinguished above science from technology and practical problem-solving.

Thus, my proposal is to define descriptive science so that it includes basic research and predictive science, and applied research so that it includes predictive science and design science.

Design sciences usually have instrumental relevance to some professional practices and arts. For example, the profession of nurses practices nursing and the related art of caring the patients, and their activity can be studied and hopefully improved by nursing science. Similarly, we have the combinations politician/administrator – politics – political science, merchant – trade – business economics, soldier – warfare – strategy – military science, and librarian – library work – library science.

A profession Z, as a human or social activity, can of course be studied from many perspectives, among them the history of Z, the psychology of Z, the sociol-

11 This realist view is opposed to social constructivism which claims that scientific facts are artificial productions of scientific investigations. Cf. Ilkka Niiniluoto, *Critical Scientific Realism*. Oxford: Oxford University Press, 1999, Ch. 9.

12 See Simon, *op. cit.*, p. 7.

ogy of Z, the economics of Z, and the ethics of Z. Some of these perspectives, which are usually included in the professional educational programs for Z, belong to fundamental basic sciences. But design science can be viewed as the practical kernel of Z-studies which has the goal of improving the practice or art Z.

These observations also explain the typical historical emergence of design sciences by the "scientification" of Aristotelian productive arts.[13] First the practical skills are based on cumulative everyday experience and trial-and-error, then they are expressed by rules of thumb which are further developed into guide books. The next step is the scientific study of the rules by testing their efficacy and function with experiments.

An example is provided by *evidence-based medicine* (EBM): a medical doctor applies conditional commands or rules of the form

(2) If patient has symptoms S, use treatment X!

Such rules as such are not true or false, but we can gather clinical evidence for their validity by testing whether X cures or heals the disease with symptoms S without side effects. The implicit value premise of (2) that medicine wishes to maintain and improve health is presupposed. Basically the same model of *evidence-based practice* (EBP) can be applied in nursing science.[14]

A similar account can be given for *evidence-based policies* in society. Such principles formulate policy recommendations relative to evidence justified by statistical and social scientific research. When this kind of up-to-date critically evaluated scientific knowledge is disseminated to decision-makers, and the values used decisions are democratically negotiated, legitimate improvements can accomplished in environment, population, housing, education, health, economy, work, and services.

5. Technical norms

Already Simon hinted that design sciences are a special kind of normative science which give us justified knowledge about means – ends relationships. In my view, this idea can be expressed by formulating the knowledge claims of applied design sciences by conditional recommendations of the form

(3) If you want A, and believe that you are in situation B, then you ought to do X.

13 See Ilkka Niiniluoto, "The Emergence of Scientific Specialties: Six Models", in: W. E. Herfel, W. Krajewski, I. Niiniluoto, and R. Wojcicki (Eds.), *Theories and Models of Scientific Processes*. Amsterdam: Rodopi 1995, pp. 127-139.

14 See Ilkka Niiniluoto, "Vårdvetenkapen – vetenskapsteoretiska anmärkningar", in: Kristian Klockars and Lars Lundsten (Eds.), *Begrepp om hälsa*. Stockholm: Liber, pp. 103-114; Sam Porter and Peter O'Halloran, "The Use of and Limitation of Realistic Evaluation as a Tool for Evidence-Based Practice: A Critical Realist Perspective", *Nursing Inquiry* 19, 1, 2012, pp. 18-28.

G. H. von Wright calls such statements *technical norms*.[15] Even though unconditional recommendations of the form "You ought to do X!" or "Given B, you ought to do X!" lack truth values, technical norms are true or false, depending on whether X causes A in situation B. As statements with a truth value, they can be results of scientific research. The technical norm (3) can be justified from above (by deriving it from a basic theory or law of the form (1)) or from below (by supporting the generalization (1) by empirical or experimental experience).[16] It is important that such justification can be *value-neutral* in the sense that commitment of the researcher to the value A is not needed. Still, the conditional norm (3) is *value-laden* in the sense that it essentially involves a value premise as its antecedent. In von Wright's terminology, a person, who accepts the value of A and believes to be in situation B, has a "technical ought" by the norm (3).

The formulation of technical norms involves the language of actions and oughts. Thus, they presuppose the idea of agent causality: X is a factor or variable which can be manipulated by us. Design research makes sense only with respect to artificial systems where human intervention is possible.[17]

Von Wright was primarily concerned with the case where X is a necessary cause A. Variants of (3) can be given in cases where X is a sufficient cause of A (so that it is rational to do X) or X is a probabilistic cause A (so that it is profitable to do X). In the most general case, the end A is expressed by a utility function, the situation B by an epistemic probability distribution over states of nature, and the recommendation of doing X is relative to the conception of rationality (such as minimax or expected utility).

A special issue for applied social sciences is the question whether there are laws about society which can serve as basis of social technical norms. The existence of such laws is often denied by noting that acting against prevailing social trends is always possible at least in principle, so that they are at best ideological or social constructions. However, for the purposes of applied social science, deterministic and permanent "iron laws" are not needed, but temporary statistical regularities in human behavior may be enough. Still, the manipulability condition presupposes that such regularities are just not accidental constant conjunctions but are based upon propensities or some sort of generative powers of causal mechanisms.

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15 See Georg Henrik von Wright, *Norm and Action*. London: Routledge and Kegan Paul 1963. For a treatment of so-called technological imperatives as technical norms with a hidden value premise, see Ilkka Niiniluoto, "Should Technological Imperatives be Obeyed?", in: *International Studies in the Philosophy of Science* 4, 2, 1990, pp. 181-189.

16 Illustrations of both of these derivations in the case of ballistics are given in Niiniluoto, "Approximation in Applied Science", *loc. cit*.

17 Theo Kuipers formulates design laws as causal regularities of the form "Functional property A in situation B can be achieved by imposing structural property X", where the term "imposing" involves agent causality. See Theo Kuipers, "Philosophy of Design Research", forthcoming in *EPSA 2011*.

6. Values in applied social sciences

The traditional ideal of value-free science has often been challenged in the context of the social sciences, where the researchers have social positions and political interests. Even though social scientists can empirically study the valuations of human beings in various cultures, it is not legitimate to appeal to one's own values as grounds for accepting or rejecting scientific hypotheses. For descriptive sciences, this demand of value-freedom has been interpreted so that all axiological or normative value terms should be excluded from the language of science. However, for design research the situation is quite different: as we have seen in Section 5, technical norms speak conditionally about values and goals, but the relation between means and ends can be defended in a value-neutral way.

This view agrees with the famous defense of objective social science by Max Weber in 1904.[18] Weber, who accepted the fact – value distinction, held that ultimate or categorical values cannot be proved scientifically, so that they do not belong to the goals or results of scientific inquiry. On the other hand, statements about instrumental value, or relations between given ends and rational means of establishing them, can be defended by empirical scientific investigations.

A related view was defended by Lionel Robbins in his widely read essay on economics.[19] According to Robbins, "economic is the science which studies human behavior as a relationship between ends and scarce means which have alternative uses." But Robbins added that economics is "entirely neutral between ends". This demand of neutrality is misleading, however, as applied sciences typically are interested in socially *relevant* ends.

Design sciences with technical norms of the form (3) can be used for rational planning and decision-making, when the end A is accepted as a basis of social action. The relevant value goal A may be characteristic to the design science: for example, health for medicine and nursing science, profit for business economics, welfare for social policy studies and social work, and peace for peace research. But already the case of medicine shows that for many design sciences the choice and specification of the relevant value goal may be a matter of philosophical, legal, ethical, and political debates. The sources of values of technical norms may thereby be in philosophical arguments, general morality and ethics, empirical value studies, value profiles of institutions and funding bodies of research, and political debates.

This kind of multiplicity of values could be avoided, if moral or axiological realism would hold, so that there are objective goals to be determined by scientific or philosophical arguments. Then the antecedent A could be eliminated from the

18 See Max Weber, *The Methodology of the Social Sciences*. New York: The Free Press 1949. See also Carl G. Hempel, "Science and Human Values", in: *Aspects of Scientific Explanation*. New York: The Free Press 1965, pp. 81-96.

19 See Lionel Robbins, *An Essay on the Nature and Significance of Economic Science*. London: Macmillan 1932.

norm (3) which would be transformed to a simple recommendation (cf. (2)). But such a realist position has its problems, as values are human-made social constructions.[20] A democratic society should be open to free value discourse. In particular, futures studies should allow different value goals for its scenarios, including estimates of the values of future generations.[21]

The technocratic and conservative approach is to accept the value A uncritically, maintaining the status quo. The reformist strategy, exemplified by Karl Popper's "piecemeal social engineering", specifies A with small improvement in social conditions.[22] The emancipatory approach proposes a goal A which is critical of the existing situation and implies radical changes in the social order.[23] In this way, action research and critical social science can be included in the same model of social design science.

The notion of technical norm illuminates also the existence of *policy conflicts* in many fields of study. Disagreement about the best policies X may be due to differences in the knowledge about situation B, in the decision to keep B stable or change it, in the knowledge about the law X&B → A, or in the valuation of goal A. It is important task of philosophical conceptual analysis in applied ethics to distinguish these different sources of disagreement.

7. Examples of applied social sciences

Applied social sciences, their values and organization can be illustrated by examples. The cases show what kinds of sciences have been neglected by philosophers of science.

Richard Titmuss, Professor of Social Administration at the London School of Economics in 1950–73, was pioneer in making social work an academic discipline. He received in 1960 an order from the Governor of Mauritius who wished to know how the population on the island could be controlled. The answer of the Titmuss report was clear: to reduce the need of large families with many children,

20 For a critical assessment of moral realism, see Ilkka Niiniluoto, "Facts and Values – A Useful Distinction", in: Sami Pihlström and Henrik Rydenfelt (Eds.), *Pragmatist Perspectives*. Acta Philosophica Fennica 86. Helsinki: Societas Philosophica Fennica 2009, pp. 109-133.

21 For an account of futures studies as a combination of visionary plans for improving the world and a design science for realizing these goals, see Ilkka Niiniluoto, "Futures Studies: Science or Art?", in: *Futures* 33, 2001, pp. 371-377. Alternative scenarios, which indicate paths from present situations to alternative futures, can be understood as generalizations of the notion of technical norm. For a different approach, where categorical value and ought statements are taken to be empirically justifiable assertions, see Wendell Bell, "Moral Discourse, Objectivity, and the Future", in: *Futura* 28, 1, 2009, pp. 43-58.

22 See Karl Popper, *The Poverty of Historicism*. London: Routledge 1957.

23 See Habermas, *op. cit.*

introduce security by social policy programs.[24] This recommendation can be formulated as a technical norm: if you wish control population growth in poor countries, you should improve social security.

Today *social work* examines the conditions required by people to function and survive day-to-day. The study of individual survival skills and strategies include child welfare, problems facing the youth, pressures in the family, ageing, and marginalized groups like homeless women, HIV-positive, drug addicts, and prisoners. The City of Helsinki and University of Helsinki have together established Heikki Waris Institute as a research and teaching clinic for urban social work.[25] While social work is concerned with a minimal "survival" level of individual human life, the ultimate value premises of *social policy studies* and urban planning is the good of human beings, their quality of life, measured by subjective experiences (satisfaction, happiness) and objective social indicators (basic needs, food, housing, health, wealth, security, and education).

The Nordic model of welfare state is based on the goal of well-being, defined in 1975 by the Finnish sociologist Erik Allardt with three conditions: *having* (material and economic resources), *loving* (human relations), and *being* (self confidence, life politics).[26] Connections to Amartya Sen's account of the quality of life in terms of a fair distribution of capacities or capabilities are obvious.[27] The mean of three value goals is also included the Human Development Index, produced by the United Nations Development Project (UNDP) since 1990: health (life expectancy at birth), education (adult literacy, years of schooling), and living standards (wealth measured by GDP per capita).

The Genuine Progress Index (GPI), proposed by Redefining Progress, adds to GDP other economic factors like income distribution, services outside the market, and costs of negative effects (crime, resource depletion, pollution, loss of wetland). The Happy Planet Index (HPI), published by the New Economic Foundation since 2006, takes seriously the value of environmental protection and sustainable development. It uses the formula: life satisfaction x life expectancy per ecological footprint. These new measures of social progress are today actively discussed by governments in many countries, including the United Kingdom, France, and Finland, but applied research programs with these value goals still wait for their realization.

The City of Helsinki, the Ministry of Education and the University of Helsinki agreed in 1998 about the establishment of six new professors of *urban studies*, and

24 See Richard M. Titmuss and Brian Abel-Smith, *Social Policies and Population Growth in Mauritius*. London: Routledge 1968.

25 Heikki Waris, Professor of Social Policy at the University of Helsinki in 1946–68, introduced social work into the academic curriculum in Finland in the 1950s.

26 See Erik Allardt, "Having, Loving, Being: An Alternative to the Swedish Model of Welfare Research", in: Martha Nussbaum and Amartya Sen (Eds.), *The Quality of Life*, Oxford: Oxford University Press 1993, pp. 88-94.

27 See Nussbaum and Sen, *op. cit*.

later in 2003 the nearby cities of Espoo, Vantaa, and Lahti joined with the Helsinki University of Technology. The fields of the professors cover both descriptive basic research and applied design research: European metropolitan planning, urban history, social policy, urban sociology, urban economics, urban ecology, urban ecosystem, urban technological systems, and urban geography. The underlying values of these studies could be related to the classical ideals of *urbanité* (as opposed to rural life) – elegance, sophistication, politeness, fashion, learning, education, free thinking, public power, close services, interplay of work and leisure, and avoidance of decadence, criminality, poverty, slums, dirt, noise, haste, and loneliness. The City has its own "Helsinki vision", stating that "Helsinki will develop as a world-class innovation and business centre based on the power of science, art, creativity, and good services". The City Planning Department has formulated a "Future City" mission of Helsinki as a multicultural metropolis, a Baltic Sea logistics centre, a European centre of expertise, a world-class business centre. The "official" values of the City are health, safety, and beauty, and additional values include customer-orientation, sustainable development, justice, economy, safety, and entrepreneurship. The statistical office, Helsinki City Urban Facts, promotes strategic decision-making by gathering reliable information.

Brundland's report *Our Common Future* in 1987 made sustainable development as a fashionable theme. In the Johannesburg Summit in 2002 *sustainability* was defined to include environmental protection, economic development, and social development.[28] An interesting example of a new type of research unit, which mixes natural and social sciences, is ICIPE (International Centre of Insect Physiology and Ecology),[29] founded in Nairobi in1970. Its mission is to support sustainable development by the conservation and utilization of Africa's rich insect biodiversity, but at the same time work for human, animal, plant and environmental health. ICIPE aims at improving the overall well-being of communities in tropical Africa by addressing the interlinked problems of poverty, poor health, low agricultural productivity and degradation of the environment.

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28 See Taina Kaivola and Liisa Rohweder (Eds.), *Towards Sustainable Development in Higher Education – Reflections*. Helsinki: Ministry of Education 2007.

29 See Liz Ng'ang'a and Christian Borgemeister (Eds.), *Insects and Africa's Health: 40 Years of ICIPE*. Nairobi: International Centre of Insect Physiology and Ecology.