What is technology assessment?

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Technology is generally defined as "science or knowledge applied to a definite purpose." Technology assessment has been defined as a form of policy research that examines short- and long-term consequences (for example, societal, economic, ethical, legal) of the application of technology. The goal of technology assessment was said to be to provide policy makers with information on policy alternatives. Health technology assessment (HTA) grew out of this field and was developed in the U.S. Office of Technology Assessment (OTA). However, the OTA was closed in 1995. The links between technology assessment and health technology assessment were more-or-less lost after the dissolution of OTA, and few workers in the field of HTA seem familiar with the roots of the field in the more general and social-oriented technology assessment.

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Technology is a broad concept that deals with use and knowledge of tools and crafts and how its use affects the ability to control and adapt to the social and physical environment (15). Technology is a term with origins in the Greek "technologia", "$\tau\varepsilon\chi\nu o\lambda o\gamma\acute{\iota}\alpha$": "techne", "$\tau\acute{\varepsilon}\chi\nu\eta$" ("craft") and "logia", "$\lambda o\gamma\acute{\iota}\alpha$" ("saying"). Technology can refer to material objects of use to humanity, such as machines, hardware or utensils, but can also encompass broader themes, including systems, methods of organization, and techniques. The term can either be applied generally or to specific areas: examples include construction technology, health technology, or state-of -the-art technology.

TECHNOLOGY ASSESSMENT

The term "technology assessment" came into use in the 1960s, especially in the United States, focusing on such issues as the implications of supersonic transport, pollution of the environment, and ethics of genetic screening (16). The term is said to have first been used in the Subcommittee on Science, Research, and Development of the House Science and Astronautics Committee of the U.S. Congress under its chairman, Emilio Daddario (12).

The Subcommittee, in a series of hearings and reports, examined issues surrounding technology and proposed technology assessment as an approach to problems surrounding technology, its development and use.

In early studies on technology assessment, it was defined as a form of policy research that examines short- and long-term consequences (for example, societal, economic, ethical, legal) of the application of technology) (1;4;5). The goal of technology assessment was said to be to provide policy makers with information on policy alternatives.

Technology assessment was (and is) an extremely broad field (16). Assessment of technology is not the only activity advocated or carried out. Such subjects as the diffusion of technology (and technology transfer), factors leading to rapid acceptance of new technology, and the role of technology and society, are some related subjects that form part of the field of technology assessment.

The main accomplishment of the years of work of the Subcommittee was the establishment of the U.S. Congressional Office of Technology Assessment.

THE OFFICE OF TECHNOLOGY ASSESSMENT

The Office of Technology Assessment (OTA) was an office of the U.S. Congress from 1972 to 1995 (14). OTA's purpose was to provide Congressional members and committees with objective and authoritative analysis of the complex scientific and technical issues of the late 20th century. OTA was a "leader in practicing and encouraging delivery of public services in innovative and inexpensive ways, including distribution of government documents through electronic publishing. Its model was widely copied around the world" (14).

Congress created the OTA in 1972, by Public Law 92–484. OTA was governed by a twelve-member board, comprising six members of Congress from each house, equally divided by political party. The Chairmanship rotated every 2 years from the Senate to the House of Representatives, with the party holding control of that particular house of Congress also holding the Chairmanship of OTA. In the early days, Senator Edward Kennedy (D-Mass) and Olin "Tiger" Teague (D-Texas) were often the chairman for 2-year terms. During its 24-year life, OTA produced approximately 750 studies on a wide range of topics.

Criticism of the agency was fueled by *Fat City*, a 1980 book by Donald Lambro that was regarded favorably by the Reagan administration; it called OTA an "unnecessary agency" that duplicated government work done elsewhere. OTA was abolished in the "Contract with America" period of Newt Gingrich's Republican ascendancy in Congress (14).

At the time that the 104th Congress withdrew funding for OTA, it had a full-time staff of 143 people and an annual budget of $21.9 million. The OTA closed on September 29, 1995.

The OTA Legacy site at Princeton contains "in electronic form the complete collection of OTA publications along with additional materials that illuminate the history and impact of the agency." Critics of the closure saw the closure as an example of politics overriding science and a variety of scientists have called for the agencies reinstatement (14).

INTERNATIONAL DEVELOPMENTS IN TECHNOLOGY ASSESSMENT

OTA served to stimulate activity in technology assessment in many U.S. institutions, but also internationally. A Google search in late 2007 led to finding of more than 100 million "hits." A substantial percentage of these concerned health technology assessment, perhaps as many as half. However, there have been many other developments in technology assessment. There are technology assessment programs in universities, research institutions, industry, and so forth. Governments fund technology assessments of many technologies in many fields. Moreover, there are many assessments being done that are not necessarily labeled "technology assessment."

One gains the impression from the Internet, however, that these developments are largely confined to North America and Europe (except for HTA itself). The only visible development in the public sector in Europe is the European Parliamentary Technology Assessment Network, made up of twelve organizations in as many countries, plus associate members in other European countries, and including the Scientific Technology Options Assessment (STOA) of the European Parliament (16). These organizations have all, in some way, tried to follow the OTA precedent through parliamentary action, by either being literally part of the parliament of a country or working closely in cooperation with the national

parliament. Some health reports have been done, notably a report concerning developments in HTA in the Netherlands (3). These organizations are not very visible in Europe, and are generally quite small (for example, the STOA has only three permanent staff).

For several years in the 1980s and early 1990s, the European Commission funded and helped organize annual international conferences in technology assessment, and health technologies were sometimes on the agenda. However, these conferences have not been continued. Health technology assessment has continued to go its own way, with little or no acknowledgement of the broader field of technology assessment.

MEDICAL OR HEALTH TECHNOLOGY ASSESSMENT (MTA OR HTA)

In its early years, a health-related technology assessment was called a "medical technology assessment" (MTA). In the 1980s, the term "healthcare technology assessment" became the dominant term. In the 1990s, "health technology assessment" (HTA) came into wide usage, and the other two names are seldom seen now. The change to healthcare technology assessment was quite logical, because "medical technology" seems to allude to physicians, whereas technology related to health is much broader. On the other hand, agencies and programs dealing with such technology do not usually go beyond technology as used in the healthcare system, so "health technology" does not seem to be the most appropriate term. Nonetheless, it is accepted, and we will use that term in these studies.

It may be risky to say what was the earliest HTA. However, several U.S. public agencies were attracted to the ideas of technology assessment and attempted to apply them to health technologies. In 1973, the U.S. Academy of Sciences published a report that examined the broad implications of four health technologies: in vitro fertilization, choosing the sex of children, retardation of aging, and modifying human behavior (6). The National Institutes of Health carried out a rather comprehensive assessment of the totally implantable artificial heart in 1973 (10), which was examined in depth in OTA's first examination of how technology could in the health field could be assessed (13). Internationally, the Swedish Organization, Spri, carried out a cost-effectiveness analysis of the computed tomography (CT) scanner (7), although it was not called an assessment project on a HTA. Thus, the roots of technology assessment were laid in approximately 1973–75.

LINKS BETWEEN HTA AND TECHNOLOGY ASSESSMENT

Although early work in HTA was inspired by general perspectives of health technology, early work in the field tended to focus on efficacy, safety, and cost-effectiveness.

In part, this may be due to the earliest reports from OTA and from Sweden. Banta, as a physician, was most concerned about efficacy and safety, and his concerns reflected those of the Congress at the time. Jonsson carried out the first HTA outside of the United States, examining the cost-effectiveness of the computed tomography (CT) scanner, reflecting the orientation of the Swedish Parliament and hospitals in Sweden. "In effect, the field has been driven since its early days by policy-makers concerns about expenditures (costs)" (2).

Social concerns associated with health technology have become increasingly prominent in recent years, and several commentators have criticized the field of HTA for overemphasis on efficacy and cost-effectiveness issues (2;8;9). In particular, healthcare ethics are usually given short shrift in HTA reports, despite growing interest in ethics in health and among some experts in HTA (11). Broader inquiry into the sociopolitical context of health technologies almost does not exist in HTA (9). Stated shortly, there are few links between the broader field of technology assessment and its concerns with HTA. HTA is increasingly institutionalized, focusing on cost-effectiveness of health technologies. It may be that this model will become increasingly and visibly dysfunctional.

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