Introduction and Summary

... It is far more expensive to continue handicapping America than it would be to begin rehabilitating America. Keeping disabled people in dependency is costing us many times more than would helping them to independence.

—Frank Bowe

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FIGURE

1.
Introduction and Summary

Many people have significant limitations in their ability to perform one or more important life functions. These limitations either are present from birth or result from injury, disease, or aging. They often result in disability and, less often but still commonly, in handicaps. Whether a disability becomes a handicap depends on the interaction of the disabled person with the physical and social environments surrounding that person, and many other factors. Technology is one of those other factors. This report is about technol-

ogy, handicaps, and the ways in which technology may be used to keep impairments from becoming disabilities and disabilities from becoming handicaps. It is about the processes involved in developing and distributing technologies and about the governmental and social role in directing those technological processes to assure the appropriate distribution of technology. The report's major conclusion is that despite the existence of numerous important problems related to developing technologies, the more serious questions are social
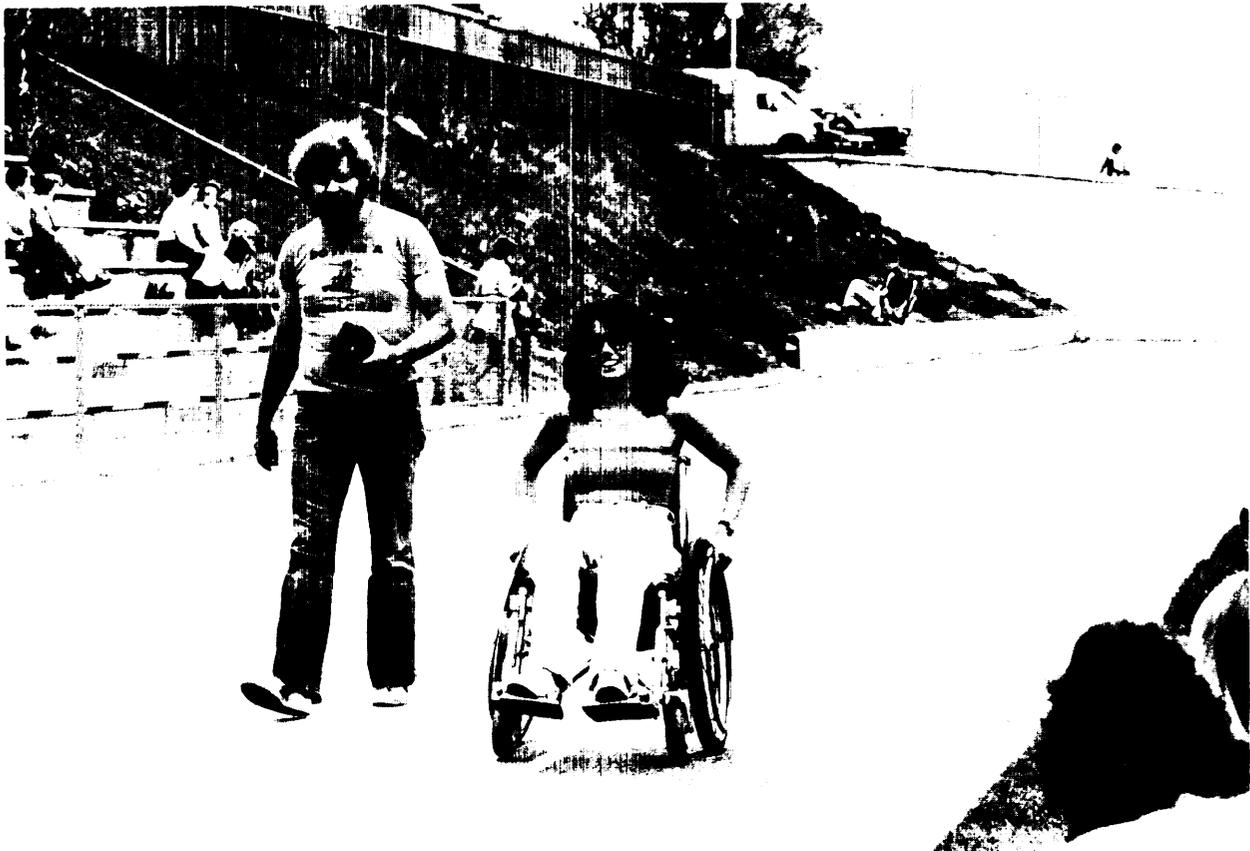
Photo credit: **Barry Corbet** Courtesy of North American Reinsurance Corp

Sports and physical activity are an important part of the lives of all people. Technologies, such as special wheelchairs or sound-emitting baseball ls, are often used to allow the fuller participation of disabled people. Mary Wilson, shown above, believes that sports builds self-esteem and confidence, and improves attitudes toward and among disabled people

ones—of financing, of conflicting and ill-defined goals, of hesitancy over the demands of distributive justice, and of isolated and uncoordinated programs.

The influence of technology is felt in nearly every dimension of the lives of disabled people and in policies relating to disabilities. In some cases, technology is the cause of impairments, disabilities, and handicaps. Industrial accidents, adverse drug reactions, and automobile injuries illustrate this. In other instances, technology, especially medical technology, can eliminate or reduce impairments and keep them from becoming disabilities. Knee implants and prescription eyeglasses are examples of medical technologies designed to do this. Furthermore, technology is used to facilitate "mainstreaming" in education, to prepare disabled people for employment or reemployment and to adapt the tasks and physical sites of jobs to the capabilities of disabled persons, and to create a controllable home environment. It is also used extensively to prevent disabilities from becoming handicaps—e.g., making transportation systems and accommodations accessible. Technology enters the lives of disabled people in ways that people without disabilities may consider mundane—e. g., in the form of special utensil attachments or uniformity of traffic light bulb placements. Yet even these types of technologies are far from mundane. They may fulfill important needs and, when applied appropriately, may make life easier, safer, and more fulfilling for disabled and nondisabled people alike.

The state of technological capability in part determines what legislation and regulations are possible. It very clearly affects their implementation. The Federal and State Governments have created dozens, perhaps hundreds, of programs that relate to the "needs" of disabled persons. At the Federal level, with which this report is most concerned, there are programs (and agencies) concerned with research, income maintenance, health care, education, transportation, housing, independent living . . . the list continues. An overview of much of the primary legislation for these programs is presented in appendix B. Many of the programs are described in the main body of this report, especially in chapter 9. It is important to understand the goals and operations of these pro-

grams, because not only are they affected by the state of technology, they in turn very much affect the development and use of technologies.

Increasingly, attention is being focused on how to effectively and efficiently implement the laws and programs that are already in place rather than on the passage of additional laws or establishment of new programs. The State and Federal involvement continues to lack a comprehensive, responsive, and coordinated mechanism to administer existing laws in the disability area. The volume, diversity, and often contradictory goals of many of the initiatives have tended to produce an administrative "gridlock," where movement of any kind, in any direction, is increasingly difficult. Other byproducts of this Federal-State blend of intervention and action are inconsistent definitions of "disability" in the laws and confusing payment or jurisdictional problems resulting from the definitional issues.

This report presents the results of a study requested by the Senate Committee on Labor and Human Resources. To support its broad responsibilities in the area of disabilities, the committee asked OTA to take a comprehensive look at the role played by technology in that area, identify technology-related problems, and suggest policy options for congressional consideration.

Congress and the executive agencies must create and implement policies that are of various natures: Some policies are concerned with broad questions of social goals, while others are directed at more narrowly defined objectives. Discussions with congressional staff, executive branch agency personnel, the advisory panel to this study, and other experts convinced OTA that in the area of disability-related technology, most of the focus has been on the latter. Accordingly, OTA decided that a study approach that first mapped the overall policy field, paying special attention to the connections between the individual parts, was necessary. Then, specific technology-related processes and problems were analyzed and broken down into manageable questions. Finally, and most important, the specific analytical information was synthesized in the context of broader social questions.

The study concentrated on specific problems by examining the development and use of technology as a lifecycle process—a complex flow of ideas and technologies from conception, through research and development (R&D), through diffusion (including marketing where appropriate), to delivery and use. For each of these areas, OTA examined the decisionmakers and the influences on them, the other relevant parties at interest, and the status of the area—including problems and missed opportunities. This flow was examined against a backdrop of appropriate development and use of technology. And this backdrop in turn was analyzed in relation to the demands of and influences on resource allocation processes. These last two steps were a process of synthesis—a combining of the more specific information gathered with information on broader goals and methods of decisionmaking. Policy options were generated from both the specific analyses of problems and from the more systems-oriented activities.

STUDY BOUNDARIES

OTA uses a broad definition of technology: the practical application of organized bodies of knowledge. Such a definition covers both hardware and process technology. The present study, however, limits the definition of technologies, so that the focus is on technologies that are intended for and applied to individuals. Broader technologies, such as transportation systems, are covered in this report only in the context of program and societal-leveI examination of costs and benefits— that is, the resource allocation and decisionmaking framework.

The study's involvement in certain disabilities and handicaps, as defined above and as expanded on in Part One, has been tempered by pragmatism. For example, chronic diseases often lead to major limitations in significant life functions; the study does not ignore issues related to chronic disease, but has tried to avoid becoming too involved with medical issues that are not substantially related to technology and the functional disabilities that stem from chronic illness. Similarly, the aging process often carries with it a gradual lessening of functional abilities in various areas; such disabilities are covered, but only as part of the central theme of handicaps. Admittedly, it is difficult and often impossible to separate issues related to aging from issues directly related to disabilities. Some aspects, however, are clearly outside of the study boundaries. Others will be of the same generic policy implications as more directly handicap-related issues and thus can be covered profitably. In effect, the staff has tried to exercise common sense and make boundary decisions as the study required.

Prevention of impairments, disabilities, and handicaps is covered only briefly, The issues involved in a full-scale inclusion of prevention technologies (e. g., highway safety technologies, prenatal screening and diagnosis, diet) are of such magnitude that they deserve attention on their own. Their importance should be recognized and they should occupy a high priority in policy research agendas. To illustrate some of the issues regarding prevention, a case study on passive restraint systems in automobiles is being issued as a separate background paper.

This report was prepared during a time of uncertainty regarding Federal block grants to the States for disability and other social programs. * Whether substantial numbers of these programs will become block grant programs in fiscal year 1983 is unclear, but the major conclusions and most of the options of this study will not be greatly affected because development and use of technologies will most likely still be guided by much the same forces as at present. The conclusions regarding the lifecycle of technology and assuring appropriate development and use should be affected very little by block granting, It is possible that there would be substantial positive effects if the States organize their use of the block grants around a comprehensive approach to delivering and financing technologies and services. The ma-

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'The brief discussion concerning the possible effects of block granting refers to the use of block grants as opposed to the use of categorical grants or programs. It does not refer to the possibility of a **25** percent across-the-board cut in grant funds, which would certainly affect the use of technologies by disabled persons.

terial on resource allocation, of course, may have to be viewed in the context of a different set of

decisionmakers, but the generic issues would remain essentially the same.

ORGANIZATION OF THE REPORT

The rest of this chapter presents a summary of the report and briefly lists the policy options. The body-of the report-is then organized into four

parts. The relationship of the parts and the individual chapters to one another is shown in figure 1.

Figure 1 .—Organization of the Report
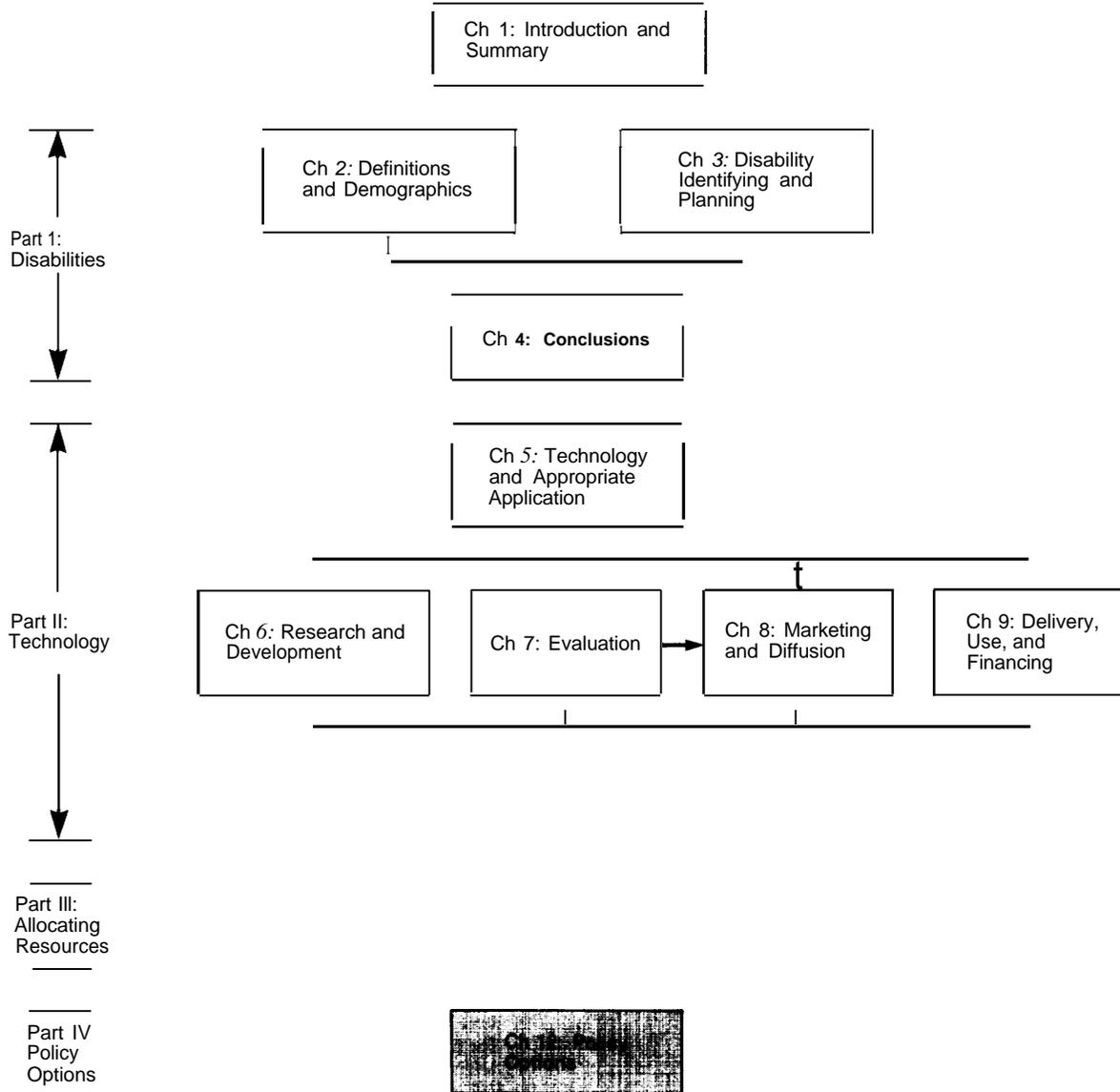
SOURCE Office of Technology Assessment

Part One provides information on impairments, disabilities, and handicaps. Chapter 2 provides definitions and a discussion of the implications of definitions. It also covers the problems of demographic information on disabilities and handicaps. The third chapter presents the processes of identifying impairments, disabilities, and handicaps, assessing those characteristics, and developing individual plans for reducing them. The goal of Part One is to provide background information for the examination of technology-related issues. Chapter 4 sets out conclusions from Part One.

Part Two presents chapters on the technology lifecycle and the concept of appropriate technology. Chapter 5 covers the elements that should be part of a framework for planning the appropriate development and use of technologies. Chapters 6 through 9, respectively, address R&D, evaluation, diffusion and marketing, and financing and use of technologies, The final chapter of Part Two contains conclusions on the development and use of technology.

Because many of the critical problems of the appropriate use of technology are financial and social ones, Part Three then moves to questions of resource allocation. Chapter 11 first presents a brief historical sketch of resource allocation in relation to disabilities. The main part of the chapter then discusses a series of critical issues of resource allocation, including conclusions regarding resource allocation and its relationship to technology development and use. It also discusses a number of elements of decisionmaking that might improve the process of allocating resources.

Part Four presents the policy options of the study.

Appendix A describes the method used by OTA to conduct the study and lists the background papers published as separate volumes. Appendix B is a brief overview of pertinent legislation. Appendix C contains the acknowledgments, the membership of the Health Program Advisory Committee, a glossary of acronyms, and a glossary of terms. Appendix D is a description of a public outreach survey used by OTA to identify problems and opportunities related to disability policy.

A series of case studies was used to provide specific examples of issues and problems. The report will make reference to the case studies throughout. The full cases themselves are printed in a separate volume of background papers.

In addition, a summary booklet is available. It contains information similar to the following two sections, summary and policy options.

SUMMARY

What constitutes an impairment, a disability, or a handicap? OTA's approach to definitional issues begins with the idea that society defines, implicitly, a population of people with "typical" functional ability. In contrast, society defines those who cannot perform one or more life functions within the broad range of typical as "disabled" or "handicapped. "

There are many possible definitions of the terms "handicap" and "disability. " Definitions are important because they affect the methods for identifying, and actual identification of, people in need of assistance. OTA found that it is most accurate to use the phrase "having a disability" in describing a person with some type of functional 1 imitation, given no specific background information.

A "handicap" has to be specified within its environmental and personal contexts. Disabilities and handicaps arise from impairments, which are the physiological, anatomical, or mental losses or "abnormalities" resulting from accidents, diseases, or congenital conditions. Generally, an impairment results in a disability when a generic or basic human function such as eating, speaking, or walking is limited. It results in a handicap when the limitation is defined in a socially, environmentally, or personally specified context, such as the absence of accessible transportation to take the disabled people to work.

Technology for disabled people plays the role of improving the fit between individuals and their environments. By making a distinction between

"disability" and "handicap," OTA recognizes the necessity of studying both individuals and the environments in which they function.

Another critical issue, closely related to definitions, is that of demographics—the numbers and distribution of disabled or handicapped people. In large part because impairments and disabilities are not as objectively measurable as is desirable and because handicaps may change depending on their context, there is no dependable count of the total number of disabled or handicapped persons. Nevertheless, considerable time is spent by researchers and various groups in making such estimates. Some of these estimates range as high as 45 million, including more than 10 million children. Typical lower range estimates are from 15

million to 25 million people. Higher numbers may reflect and attempt to count people with impairments; lower ones may be reflecting attempts to count people with disabilities or handicaps. For example, one study has estimated that approximately 12 percent of children have impairments but that only about 3.9 percent have a limitation of activity (see ch. 2).

Estimates of the number of people with disabilities are plagued by practical as well as conceptual problems. There is double counting of some people with more than one disability, underreporting of some disabilities (in part due to the stigma attached to being included on a list of disabled people), overcounting by organizations seeking to make a strong case for the extent of

Photo credit Provided to OTA by **Pat** *Berilgen, Great* Oaks Center, Silver *Spring,* Md

This photograph shows Pat Berilgen assisting Danny Naylor in the use of a mercury head switch. The head switch activates the music on the tape recording when Danny holds his head i n proper position. This training is used to give a person greater control over the use of muscles and nerves to position the head

a particular disability, and incomplete counting of some disabled people, particularly those in institutions. A perhaps more important problem with reported counts is that such counts usually do not take into account the severity of the functional impairment reported. Agencies and organizations who attempt to identify populations needing services should be very careful in designing surveys so as to take into account severity and functional status as well as type of disability and handicap.

Basic to the development and use of appropriate technology are the procedures by which disabilities and handicaps are identified, goals for their amelioration established, and resources to meet the goals expended. The planning and assessment methods used under three Federal programs—vocational rehabilitation services, services for developmentally disabled persons, and special education services—are examined in this report as a potential management information system in order to analyze their effectiveness and efficiency in aiding or determining the appropriate use of resources for modifying handicapping and disabling conditions.

To determine the effectiveness of planning and assessment methods, it is necessary to examine the degree to which data collected meet the needs of Congress and the Federal agencies concerned with the proper expenditure of public funds, and the needs of the actual participants in the assessment and planning process. Because the methods are costly, their efficiency (outcomes in relation to costs) must also be analyzed.

Technology

One of the necessary conceptual bases for an examination of policies related to technology and disabled people is a framework of "appropriate technology."*

A technology may be considered appropriate when its development and use: 1) are in reaction

to or in anticipation of defined goals relating to problems or opportunities in the disability area, 2) are compatible with resource constraints and occur in an efficient manner, and 3) result in desirable outcomes with acceptable negative consequences or risks to parties at interest. A framework of appropriate technology and the attendant role of parties at interest in its definition serve to put policies regarding the development and use of technologies into perspective.

The key to appropriate development and use of technologies lies in finding a compromise fit between: 1) the needs, desires, and capabilities of users and other relevant parties; and 2) the costs, risks, and benefits of technologies. Analyzing such a compromise may be relatively straightforward when, for example, deciding to prescribe or wear eyeglasses. In a case in which the disability in question is of the type for which technologies such as an artificial, myoelectric limb are being considered, however, the compromise decision process becomes extremely complex, and a framework for analyzing alternatives becomes very important. Chapter 5 of this report presents several factors —e.g., explicitly stating the goals of the technology's use—that should be part of a policy approach to appropriate use. The factors presented are not intended to comprise a definitive analytical framework. Furthermore, no framework is a solution; at the most, it will be an organized method of structuring policy and technological problems.

The disability-related research and development system includes both public and private organizations: Federal, State, and local governments; individuals; companies; universities; special interest associations; and a number of other actors. The people that the system is intended to assist possess a broad range of handicaps and disabilities of varying severity. The technologies that the system produces cover an even broader range, both in type (including devices and process technologies or services), in sophistication, and in purpose.

The Federal role in disability-related R&D has been steadily increasing in scope and magnitude, although it remains small in comparison to the number of people affected and the complexity of the research problems involved. The organizations

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● By appropriate technology" OTA is not referring to the *same* concept as "Intermediate technology' or ''low-capital technology Instead, the term refers to the appropriate development and, especially, application of technologies, See ch. 5 for a discussion of this idea.

expending the greatest effort, as measured by the size of their relevant R&D budgets, are the National Institute of Handicapped Research (NIHR), the Veterans Administration (VA), the National Institutes of Health (NIH), and the Office of Special Education. The National Aeronautics and Space Administration (NASA) is also involved in this area as a result of technology transfer efforts stemming from its primary mission. It collaborates with the above agencies to transfer new technologies evolving from its R&D base.

A recent survey conducted for NIHR found that the U.S. Government spends about $66 million a year on R&D related to technologies for disabilities. However, the U.S. Government also spends about *$36* billion a year to support the income of disabled people. *Thus, its R&D expenditures in this area represent only 0.2 percent of its transferpayments.* By comparison, the Government's total health care R&D accounts for about 2 percent of its total health care costs.

Private sector involvement in R&D is difficult to characterize or quantify. The companies and organizations that conduct R&D range from multibillion dollar companies to small businesses to nonprofit organizations, associations, and disease-specific foundations. Often, these companies and organizations are the primary actors in the development, delivery, and purchase of new technologies for their constituent groups. The R&D funds used may come from the companies and organizations themselves or from the Federal Government. *Debate continues to surround the issues of how much R&D is enough, who should do it, and who should benefit financially from the complex interaction of private, public, and nonprofit-sponsored research* efforts.

Significant efforts have been made at the Federal level in recent years to systematically establish a comprehensive plan for identifying R&D needs so that efforts may be coordinated in attempting to meet them. The National Council on the Handicapped, which sets priorities for NIHR, and the Interagency Committee for Handicapped Research, which coordinates Federal efforts, are important contributors to this effort. Still at issue, however, is how the technical expertise of the various Federal agencies and the private sector can

be combined within current resource constraints to continue to respond to the changing needs of disabled people.

Despite problems, disability-related R&D is characterized by innovation. Given sufficient funding and an effective organization of efforts, the predicted "explosion" in relevant technologies could become reality. Advances in solid-state electronics, other communications/information developments, new alloys, microcomputer-aided movement (e.g., of artificial limbs), and biomedical knowledge, including neurochemistry, are already producing dramatic new possibilities. The future may see an acceleration of technological developments. Some advances, such as writing aids for physically disabled children, may have great value; others may turn out to be useless. Most important, though, is planning for and identifying the appropriate ways to evaluate, distribute, and use the breakthroughs.

Evaluation of technologies involves a broad spectrum of activities and a number of criteria. Safety, efficacy, feasibility, and profitability are the criteria often used first in evaluation efforts. Criteria that follow include effectiveness, reliability, cost, repairability, convenience, affordability, esthetics, consumer satisfaction, patent protection, legal impacts, liability concerns, accessibility, economic impact, reimbursement status, social implications, cost-effectiveness determinations, and ethical concerns. However, these important criteria are rarely, if ever, applied consistently to new technologies for disabled people in the public or the private sectors.

There is, however, no shortage of agencies, organizations, and universities interested in the various issues surrounding the evaluation of technologies. The level of the Federal effort in terms of money spent on evaluation efforts is impossible to determine fully. The lead agency in evaluation of technologies for disabled people is NIHR. Evaluation research supported by NIHR is conducted along with basic research, applied research, and technology development at the various NIHR-funded research centers, In theory, evaluation research is an integral part of the R&D process. In reality, it is often done only in an oversimplified fashion or with inadequate funding.

HR does support some evaluation of devices produced outside of its research centers. However, the problems that there are not enough of these activities. The Food and Drug Administration (FDA), the National Bureau of Standards (NBS), and NIH are three other agencies that focus on evaluation of technologies at the Federal level, but their efforts do not meet the evaluation needs in the area of technology for disabled or handicapped persons. FDA evaluates *medical* devices and drugs only; the NBS is short on time and money; and NIH, through its Consensus Development Program and its clinical trials, cannot be expected to maintain an adequate focus on relevant evaluative criteria (for the needs of this area) or on disability-related technologies. The private sector is also involved in the evaluation of technologies, particularly technologies that it develops or distributes.

OTA finds that the public-private sector partnership is inadequately designed to support fully useful evaluation efforts *and* that *a coherent, adequately funded and focused program of evaluation is needed at all levels of diffusion and adoption* of technology for *disabilities.*

Such a finding *is* particularly crucial in view of the possibility of an increase in the number of technological advances becoming available, such as communications devices and mobility aids.

Diffusion and marketing of technologies for disabled people require quite different methods, goals, and information than the R&D and evaluation efforts. The public-private sector interrelationship is particularly complex and close, and each sector brings with it attributes which assist as well as impede the process. In the disability field, models of diffusion and marketing in the general health care system and models of diffusion of innovations in the private sector—which are not necessarily complementary—are often at work simultaneously.

There are a number of successes in the diffusion and marketing of technologies that have been directly related to Federal efforts to bring a product developed under a Federal R&D program to private manufacturers for mass marketing and distribution. VA, NASA, and NIHR are lead agencies for these successes. However, such suc-

cesses appear to be the exceptions. There are a number of reasons: The disability market population is ill-defined; the economic status of users is often far below the median; disability-related technologies often do not appear viable from a strictly "market" perspective, resulting in a lack of private interest in their production; product liability is often perceived by manufacturers to be a problem, and, especially, the systems for reimbursement of devices sometimes provide disincentives to the marketing of certain types of technologies. Two additional issues in this area are the problem of rapidly changing technology and the need to involve consumers to assure that diffusion and marketing efforts are appropriate and effective.

The use of technologies by disabled people appears to depend primarily, but certainly not entirely, on the public and nonpublic programs for which the individuals users are eligible. This is partly because many disabled people have lower than average earnings and partly because the variety of programs which exist are the primary source of information on available technologies. Through their affiliation with these programs and services, users either receive technologies directly, have them financed, or learn about them.

Although there are over 100 different Federal programs serving disabled people, the majority of public services are in the form of: 1) income maintenance, 2) health and medical care, 3) social services, 4) educational services, and 5) vocational rehabilitation and independent living. The greatest expenditures have been and continue to be for income maintenance, related transfer payments, and health and medical care.

The major income maintenance programs are Social Security Disability Insurance, Supplemental Security Income, VA pensions for nonservice-connected disabilities, and VA compensation for service-connected disabilities. Individual beneficiaries of these programs receive cash payments with no restrictions on their use. The programs influence the use of technologies not only because they provide the funds to purchase the technologies, but also because they establish eligibility for health, medical, and vocational-related services and technologies.

The major publicly financed health and medical care programs serving disabled people include Medicare, Medicaid, and VA medical services. The use of technologies is significantly affected by the amount of funds provided by these programs, either to individuals or providers, by the methods used to authorize payments, and by the organization of the provision of services. Policy issues that affect eligible Medicare and Medicaid recipients include: what technologies are covered and how are those decisions made, what types of professions and institutions are recognized as providers, what amount is reimbursed for the cost of covered services, what technologies are determined to be medically necessary, and what effects the Medicare and Medicaid programs have on the type and location of services to disabled beneficiaries.

The prime social services programs that serve disabled persons are those authorized under title XX of the Social Security Act and the develop-

Photo credit Courtesy of Phonic Ear, Inc , Mill Valley, Calif.

Aiding in preparing employment and carrying out job functions has always been one of the prime uses of technologies for disabilities. This photograph shows a woman using the Phonic Mirror Handivoice to communicate with her fellow workers. The Handivoice speaks the words which the person manually enters into it

mental disabilities program authorized under the Developmental Disabilities Assistance and Bill of Rights Act. Under these programs, a wide range of technologies are directly provided to disabled people. Thus, the major issue affecting the delivery and use of technologies is the determination of eligibility for these programs.

The two largest education programs for disabled people are authorized under the Education for All Handicapped Children Act and the Vocational Education Act. If necessary for receipt of services under these programs, devices may be funded. The programs are more important, however, for preparing disabled people to use technologies and for providing information on what is available. The vocational rehabilitation and independent living programs authorized under the Rehabilitation Act directly provide technologies to eligible recipients for use in the workplace or to live outside of institutions (in the case of severely disabled individuals).

Although the availability of public funds in support of public policies has greatly shaped decisions in the private sector, nonprofit and for-profit private organizations are usually the actual providers of services under public programs. In addition, they provide services and funding not covered by the public programs. Private insurance companies provide income maintenance, although the total amount is much less than the public programs. Health and medical care is also provided; device technologies are funded using criteria similar to the public programs.

Several issues, related to the public programs in general, affect the use of technologies by disabled people. They include: 1) the degree to which services and funding are coordinated from program to program or are consistent from State (or region) to State (or region), 2) the effect, on coordination and consistency, of the methods for determining eligibility, 3) the extent of the gaps in eligibility for services under public and nonpublic programs, 4) the degree to which maintaining rehabilitative device technologies is difficult or costly, 5) the degree to which consumers are effectively involved in services delivery, and 6) the shortage of rehabilitation providers.

OTAs examination of the current system of disability-related research, development, evaluation, diffusion, and use finds that the system suffers from a number of significant weaknesses. The system is, or could be, capable of a great deal more. *There is a critical lack of attention being paid to the concept of appropriate technology.* Analytical methods for determining and attaining appropriateness need to be developed and applied at each point in the lifecycle of technology development and use.

Information on available technologies is currently disseminated through publicly financed or publicly operated programs for disabled people. *Information is often fragmented,* since many of the programs cover discrete subject areas and are uncoordinated. *Strengthened information dissemination in a coordinated* fashion is *urgently needed.*

Providing disabled individuals with the advantages offered by technology requires the resolution of several policy issues. For example, what type of provider is needed to match a technology with a potential user? That is, who shall be responsible, in cooperation with the user, for identifying possible technologies, selecting a technology, fitting it to that specific user, and training the user in its use? Strategies for encouraging the use of appropriate types of providers need to be developed. Another issue concerns the criteria for selecting a particular technology once the type of technology and its purpose have been decided. Federal policies, including those involved with financing, should encourage the consideration of criteria such as rate of obsolescence, ease of maintenance, ease of actual procurement, and users' preferences. Selection of a manual wheelchair over a power wheelchair, for example, should be based in part on criteria such as these.

Resource Allocation

Clearly, the development and use of technologies for disabled persons are greatly affected by available resources and the ways in which they are allocated. In fact, all decisions about the development and application of such technologies are ones of resource allocation. Efforts to improve resource allocation must take into account the incentives and controls currently operating on the development, evaluation, diffusion, and use of technologies. They must also examine the "fit" between the intentions of policy makers to assist disabled people (create opportunities for disabled people to help themselves) and the actual assistance afforded by the available resources and the rules governing their allocation.

Effective resource allocation must take into account a number of current issues in the disability-related area. For example, to what degree should definitions of disability and handica$_p$ used in Federal programs focus on people's abilities as well as disabilities? An increased concentration on abilities could lead to the expenditure of a greater portion of resources to alter aspects of the environment that turn disabilities into handicaps. Another example of a current issue in resource allocation is the extent to which the Government should encourage and financially support independent living and the involvement of people with disabilities in pertinent actions, such as evaluation of technologies or the determination of the types of personnel who will prescribe or fit technologies.

Other issues have to do with the types of outcomes sought in allocating resources, the degree to which society and other decisionmakers support the development and application of technologies to prevent disability, the influence of an increasingly aged population has on resource allocation, and the proper role and use of analytical techniques in allocation decisionmaking.

Since the quality of analysis directly affects the resource allocation process, more attention needs to be given to the development and use of analytical techniques. This report presents a series of suggestions for helping to inform and *structure* the decision process in order to: 1) clarify and make explicit why a decision is being made and what problem is being addressed, 2) assure that all assumptions being made are explicitly stated and subject to examination, and 3) force the orderly examination of all relevant potential consequences of any decisions. The goal is not to produce perfect decisions, but rather to *make the* allocation of resources more sensitive to uncertainty and to a broader range of interests and possibilities.

POLICY OPTIONS

The final chapter of this report presents policy options for congressional consideration. Rather than recommending specific actions, OTA's policy is to provide Congress with a series of alternative actions and discussions of the possible consequences of implementing them. The options are organized by issue area. In chapter 12, each issue is described, findings related to that issue are discussed, and a series of options is presented for each issue. The issue areas for which policy options are provided are:

- How can the production, marketing, and distribution of technologies for disabilities be encouraged and improved?

- How can the involvement of disabled persons and other pertinent consumer be increased and made more effective?
- How can the process of research, development, and evaluation of technologies related to disabilities be made more responsive to the needs of disabled people?
- How can financial barriers to the use of technologies by disabled people be reduced?
- How can Federal policies assure a well-trained and adequate supply of personnel in disability-related disciplines and services?