I.

Introduction

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Background

The topic of industrial robots has recently been given increased attention. Articles in the technical and popular press have discussed the potential of robots to boost U.S. industrial productivity and enhance international competitiveness (1,2). Others have concentrated on the effects of robots on employment and their potential to change the workplace environment and alter the nature of work (3,4).

This same interest in robotics technology has been expressed informally to OTA by congressional staff from several committees. Other OTA studies in such areas as information policy, educational technology, innovation, and industrial competitiveness have touched on the impacts of robotics technology in light of those issues.

To date, a primary thrust of domestic U.S. interest in robotics seems to be the belief that robots, along with other new automation technology will be an important tool for improving the competitiveness of U.S. manufacturing. The use of robots may lower production costs, improve the quality of manufactured goods, and reduce workplace hazards. A clear theme has been the concern that foreign competitors may be gaining a significant edge over the United States both in using this new production technology and in establishing a competitive position in the potentially major export market for robots.

Some writers have also expressed concern about possible impacts of this technology on workers as it becomes more widely used. They have stressed possible unemployment, the need for new and different skills, and effects on the work environment.

Abroad, interest in robotics has been intense. England, Japan, Germany, Norway, Italy, and Sweden have initiated government and private efforts to develop robotics technology and stimulate its use in manufacturing. Some of these countries have also undertaken studies to assess ways in which automation may create or eliminate jobs.

In response to congressional interest in public policy issues related to robotics, the rapid advances in computer technology and its applications, and public concern about the state of the U.S. industrial economy, OTA sponsored an exploratory workshop to discuss the future of industrial robotics and its likely impact on public policy. The purpose of this paper is to summarize the results of this effort and to make available several informal papers prepared for that workshop. Most of the information is based on discussions at the workshop, commissioned papers, * and other material collected prior to the workshop.

The summary presents background information and identifies key questions and issues that were raised to the OTA staff during the course of the project. It does not contain analysis or evaluation of these issues. It also does not present any options for Federal policy or analysis of such options.

*Attached to this report as app. B.

Workshop Goals

The workshop had several goals:

- assess the current and likely future state of robotics technology;
- examine the structure of the robotics market, including domestic and foreign users and producers;
- determine how robotics relates to other manufacturing technologies such as computer-aided design and flexible manufacturing systems; and
- determine whether significant Federal policy issues were likely to be raised by the expected growth in industrial robotics.

General agreement was found on the following points:

- the use of robots for industrial automation is growing rapidly; robots are likely to be heavily used by the end of the decade in many settings;
- robotics, while perhaps the most visible and dramatic one, exists in a wide spectrum of technologies that contribute to the automation of manufacturing;
- any major impacts on productivity and employment within this decade will be attributable to the general trend toward automation (including robotics), computer-aided design, the use of information systems to control operations and support managements, and the integration of all these technologies into flexible manufacturing systems; and
- robots, themselves, may have important impacts in the long run as they evolve toward intelligent, stand-alone devices that can perform a variety of complex tasks, and thereby substantially broaden their range of potential application.