RESEARCH
IMPROVING FEDERAL TECHNOLOGY COMMERCIALIZATION:
SOME RECOMMENDATIONS FROM A FIELD STUDY

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This study identified three distinct roles of the federal technology-transfer process in the Huntsville, Alabama region: sponsors, developers, and adopters. The basic structure of transfer barriers and measures during the prospecting and developing of the federal technology-transfer process is also discussed. Sponsors attributed transfer problems to adopters' lack of awareness, while developers cited long development and payback times. Adopters admitted their lack of transfer expertise and their resistance to technologies with long paybacks. None of the role-players were measuring technology transfer very well. While sponsors agreed with adopters that long-term outcome measures were important, sponsors relied on measures of input effort and intermediate results. Developers with the most transfer experience reported the lowest use of measures. Recommendations are made for each role to help improve federal technology transfer.

Federal mandates, such as the Federal Technology Transfer Act of 1986 and the National Competitiveness Technology Transfer Act of 1989, were passed with the intent of helping US industries become more competitive by making the technology developed in federal laboratories, agencies, and programs more accessible. Although the Chapman Report (1) suggested potential benefits from such technology transfers could be enormous, success of government-to-private-sector transfers has generally been less than satisfactory.(2,3) For example, by the mid-1980s, only about 5% of more than 30,000 federal patents had been licensed for commercial use.(4) By 1988, revenues from technology patent licenses from the 700 US federal laboratories totaled less than $4 million.(5)

This low rate of transfer may be the result of inabilities to reach consensus on how to define, track, or measure transfer progress and success. Organizational, financial, behavioral, and other barriers in federal-to-private technology-transfer processes may also effectively limit if not nullify the spirit behind the above federal technology-transfer mandates. This paper reports the results of a field study that identified the fundamental structure of transfer barriers and measures. Recommendations are made to technology-transfer sponsors, technology developers, and technology adopters for actions they can take to overcome these barriers. Recommendations are also made on the use of some important measures of transfer progress and outcomes.

BACKGROUND
Technology transfer has been defined as the managed process of conveying a technology from one party to its adoption by another.(6)
Figure 1 presents the guiding model for this study, which was based on four streams of research on technology transfer. One stream deals with technology transfer as a staged process. A second addresses the roles of various players within this process. A third emphasizes barriers that inhibit the process. The last stream focuses on ways of measuring technology-transfer performance. Following is a brief summary of these four streams of thought and an explanation of how each contributes to the model in Figure 1.

Transfer Stages and Roles
Technology transfer can be viewed as a multi-stage process. In this study, two aggregate stages were examined: prospecting and developing (see Figure 1), which differ in scope and purpose. Prospecting refers to activities aimed at screening alternative technologies and selecting those that fit user requirements. It describes both the efforts of sponsors and developers to find potential adopters in searching for technologies. Developing activities include R&D, field trial, and final development activities for specific technologies. Developing activities are technology- or project-specific activities intended to solve a specific problem for a given organization, but prospecting usually involves many technologies, problems, and organizations.

Several roles influence activities within the transfer process. We studied three roles: sponsors, developers, and adopters. Sponsors fund technology development, disseminate information about government technologies, and/or facilitate their transfer. Developers develop and apply technology under government or private funding and sponsorship. Adopters include users and potential users of government technology. These roles may be found in adopting organizations, as well as in federal agencies and government contractors. We investigated the degree to which barriers to technology transfer and measures of technology transfer differed among the roles played by various parties, at each stage of the transfer process.

Barriers to Technology Transfer
Barriers to technology transfer are factors