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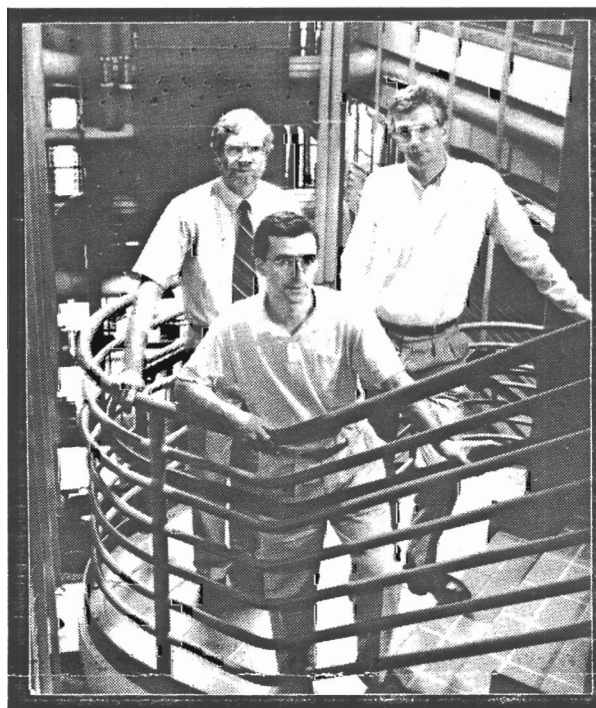
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## IMPROVING TECHNOLOGY TRANSFER TO SMALL AND MID-SIZED U.S. FIRMS: RESEARCHERS SUGGEST IMPROVED INDUSTRIAL EXTENSION COLLABORATION

Concern about lagging U.S. industrial modernization has heightened in recent years as other major industrial countries have surpassed the United States in adoption and use of new technologies and techniques. Now, three Georgia Institute of Technology professors suggest a potential solution: better collaboration between federal and state governments and the public and private sectors on industrial extension programs, which can help smaller U.S. firms to modernize.

Why the focus on small companies? Firms with fewer than 500 workers are the bedrock of U.S. goods production. There are about 355,000 of these small firms in the United States, comprising almost 99 percent of all U.S. manufacturers. These firms employ some 40 percent of the country's manufacturing workforce, said Dr. Philip Shapira, assistant professor in Georgia Tech's School of Public Policy and director of this research project.

"The majority of these smaller companies are lagging in the use of modern technology," he said. "If these companies are not performing well, the whole American industrial base will



*A study by Dr. Philip Shapira, front, Dr. David Roessner, back left, and Dr. Richard Barke addresses improved technology transfer to small and mid-sized firms. (Color Slides/B&W Prints Available)*

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suffer."

The Georgia Tech study, sponsored by the U.S. Department of Commerce, National Institute of Standards and Technology, fills an important information need. Not much research has focused on the best ways to upgrade technology in small firms, Shapira said. The new

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study finds that the problems facing small firms involve not only technology, but also management, organization, business relations, finance, and state and federal policies. Shapira, with Georgia Tech Public Policy School professor Dr. J. David Roessner and associate professor Dr. Richard Barke, interviewed industrial extension professionals, company managers, business organization representatives, and state and federal policymakers. The researchers found that small U.S. companies are slow to use new technologies such as computer-controlled machine tools, flexible manufacturing systems, and robotics. Small firms also lag in upgrading quality control, training, and management methods. Short-term relationships with major customers compound these problems. Assistance to small firms is also generally inadequate from trade associations, education and training institutions, and existing business development programs.

One bright spot is the increasing interest around the country in developing industrial extension and modernization programs which can specifically help small firms improve their manufacturing capabilities. About 30 states now offer industrial extension assistance. Some of these programs are modeled on the successful U.S. agricultural extension system, using field agents to diagnose problems in industrial firms and provide one-on-one technological assistance. In other places, technology demonstration facilities have been established. Industrial networks also are being formed, where groups of small firms come together to find solutions to common problems, share information and technologies, and develop new markets. However, state efforts are still patchy. Program funding, range of services, and geographical coverage are still low, with fewer than three percent of U.S. small firms being aided annually.

The federal government has initiated new efforts to aid state extension programs and organize new manufacturing technology centers. However, Shapira, Roessner, and Barke point out that federal and state support for industrial modernization is only about \$80 million a year. This is considerably less than the \$1.4 billion invested in the U.S. agricultural extension system or the nearly \$500 million Japan invests in its network of 170 public technology and testing centers for small manufacturers.

The researchers suggest that U.S. industrial extension and modernization efforts be expanded. Public support needs to be enhanced and made more stable. There is also a need for much greater private-sector involvement by small and large firms, trade associations, labor, and other private, non-governmental groups. Better collaboration is required among existing state

business, training, and technology programs, and between the federal government and the states. The federal government should provide better leadership and make a strong long-term commitment to industrial modernization, the researchers say.

In their study, Shapira, Roessner, and Barke detail four different models for improving collaboration in industrial modernization:

- a full research-industrial extension model, similar to agricultural extension;
- modified extension, emphasizing the use of qualified professionals working with firms out in the field;
- a center-satellite-gateway system, built around regional manufacturing technology centers anchoring university and college sites and local offices;
- and an industrial networking model, where local brokers organize groups of small firms to collaborate on problem solving and upgrading. Different aspects of these models can be combined, depending on local conditions.

These alternatives vary according to the way assistance to smaller firms is organized and funded, but they all share several characteristics. The programs should be designed at the state level to provide maximum flexibility, while the federal government provides coordination, information exchange, and partial funding, but no rigid control or mandates, Barke noted.

"The emphasis would be on building local and state programs that are appropriate for local conditions and driven by the needs of individual firms," he said. "The federal role is to provide leadership, stimulus and support to allow state and local programs to flourish and be effective."

The study, targeted at both the public and private sectors, aims to stimulate discussion at national and state levels on how to improve technology deployment in small U.S. firms, Shapira said.

"In an era when technological mastery is ever more important, the inadequate system of support for U.S. industrial modernization puts small firms, their larger customers, and the national industrial base at a disadvantage," he said.

"Although success in manufacturing depends on many factors, one of the most critical is an effective industrial extension system to help firms modernize their operations and products," Shapira added. "A stronger national commitment to modernization, better federal and state collaboration, and increased involvement by firms will allow us to build an effective industrial upgrading system -- one with positive payoffs in terms of small firm performance and benefits to workers, communities, and the nation as well."