

PHILIP SHAPIRA AND JAN YOUTIE  
WITH  
GORDON KINGSLEY AND MARC CUMMINGS

**COORDINATING  
INDUSTRIAL  
MODERNIZATION  
SERVICES**

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IMPACTS AND INSIGHTS FROM THE U.S.  
MANUFACTURING EXTENSION PARTNERSHIP

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SCHOOL OF PUBLIC POLICY • GEORGIA INSTITUTE OF TECHNOLOGY

GEORGIA TECH ECONOMIC DEVELOPMENT INSTITUTE

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This report reflects the analyses and judgments of the authors and does not necessarily represent the views of NIST nor the studied MEP centers.

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## Georgia Tech Policy Project on Industrial Modernization

This report is one of several recent studies of industrial modernization and technology transfer conducted by researchers associated with the Georgia Tech Policy Project on Industrial Modernization. Further information on the project can be found at our world wide web site: <http://www.prism.gatech.edu/~ps25/mod.htm>

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## Acronyms and Abbreviations

<b>CAMP</b>	Cleveland Advanced Manufacturing Program
<b>CMC</b>	Chicago Manufacturing Center
<b>EDI</b>	Economic Development Institute (Georgia Institute of Technology)
<b>GLMTC</b>	Great Lakes Manufacturing Technology Center (Cleveland, Ohio)
<b>GMEA</b>	Georgia Manufacturing Extension Alliance
<b>IRC</b>	Industrial Resource Center (Pennsylvania)
<b>ISO 9000</b>	International Organization for Standardization - quality management and quality assurance reference
<b>MEP</b>	Manufacturing Extension Partnership - of the National Institute of Standards and Technology
<b>MEP-SWPA</b>	Manufacturing Extension Partnership of Southwestern Pennsylvania
<b>MnMTC</b>	Minnesota Manufacturing Technology Center
<b>MTC</b>	Manufacturing Technology Center
<b>MTI</b>	Minnesota Technology Incorporated
<b>MOC</b>	Manufacturing Outreach Center
<b>NIST</b>	National Institute of Standards and Technology
<b>SBDC</b>	Small Business Development Center
<b>SME</b>	Small and medium-sized enterprise (an enterprise with fewer than 500 employees)
<b>SPIRC</b>	Southwest Pennsylvania Industrial Resource Center
<b>STEP</b>	State Technology Extension Program - of the National Institute of Standards and Technology
<b>TRP</b>	Technology Reinvestment Program

COORDINATING INDUSTRIAL MODERNIZATION SERVICES:  
IMPACTS AND INSIGHTS FROM THE U.S. MANUFACTURING EXTENSION PARTNERSHIP

## EXECUTIVE SUMMARY

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Partnerships among and between private and public organizations are increasingly becoming important for technology program service provision in the United States. In the field of technology policy and technology transfer, there are cooperative programs in all fifty states which, from 1992 to 1994, were supported by \$1 billion in funding. Ten federal agencies sponsored public-private collaborative technology programs in Fiscal Year 1994, with funding totaling \$3.1 billion.

The Manufacturing Extension Partnership (MEP) exemplifies this partnership trend. The MEP is a network of technology assistance and service providers which aims to upgrade the performance and competitiveness of small and medium-sized manufacturers in the United States. MEP is a collaborative initiative between federal and state governments which also involves non-profit organizations, academic institutions, and industry groups. The U.S. Department of Commerce, National Institute of Standards and Technology (NIST) is the MEP's federal sponsor. From three Manufacturing Technology Centers (MTCs) in 1989, the MEP has now grown to a network of more than 60 centers in 42 states.

One of the major areas where NIST has sought to identify and disseminate program learning and best practice is that of service coordination. MEP centers usually involve various other organizations to operate their programs and provide services to their small and mid-sized enterprise (SME) customers. Across the MEP system, there are hundreds of these partner organizations, including non-profit technology or business assistance centers, economic development groups, universities and community colleges, private consultants, utilities, federal laboratories, and industry associations.

### Approach

This document reports on a study which has examined the development, operation, and effects of efforts to promote local service coordination in the MEP system. The study probed the extent to which service coordination has grown among MEP affiliates, the organizations and institutional relationships involved, and the impacts on how services are delivered to customer firms. In addition, the study identified and conducted six in-depth case studies of the following centers with exemplary service coordination features: Chicago Manufacturing Center (Chicago, Illinois area), Georgia Manufacturing Extension Alliance (state of Georgia), Great Lakes Manufacturing Technology Center (Cleveland, Ohio area), Manufacturing Extension Partnership of Southwest Pennsylvania (Pittsburgh, Pennsylvania area), Minnesota Manufacturing Technology Center (state of Minnesota), Oklahoma Alliance for Manufacturing Excellence (state of Oklahoma). These efforts were used to distinguish best practices in service coordination.

The study addressed three major questions.

- ❶ Did MEP sponsorship lead to increased service coordination among industrial service providers at the regional level?
- ❷ If increased coordination occurred, did this lead to improvements in the way services were delivered?
- ❸ Can best practices in service coordination be identified and, if so, how might these best practices be more widely known and disseminated?

In pursuing answers to these questions, we considered rival explanations and then investigated these alternatives before arriving at final conclusions.

## MEP Sponsorship and Increased Service Coordination

On the first question — whether MEP sponsorship led to increased service coordination — we found the following:

- Federal initiatives — through such programs as the Technology Reinvestment Project (TRP) and the MEP— stimulated state and local service providers to work together in more coherent ways than they had previously. An analysis of 40 MEP centers showed affiliations and linkages with more than 750 external organizations in the public and private sectors. Without stimulation and support of federal funds, it is unlikely that the often extensive coordination alliances and measures now seen in the industrial modernization field and documented in the case studies would have occurred.
- We did not find that state governments consistently required public providers of manufacturing assistance to coordinate their efforts. Drawing on the six detailed case studies of MEP centers, we saw instances where states had sought to promote service coordination alongside (and occasionally prior to) federal efforts; however, mostly there was “benign neglect” of issues of service coordination at the state level.
- Most of the case study centers had, at their own initiative, developed a wide range of informal (and in some instances, formal) alliances and linkages. But for new programs developed under stimulus of the TRP and MEP, service coordination has been built from the beginning into the program design. And particularly for long-established programs, it really took the stimulation of federal TRP and MEP funding for serious attention to be paid to coordination.

We did not find substantial evidence that coordinated service provision would be self-sustaining in the absence of a federal role. Coordinated service provision appeared as an “externality” which benefits customers and regional economies more than individual programs. In fact, individual program efforts to generate funds through managing external service providers did not generate substantial revenue for the program relative to the costs involved. Continued efforts at coordination are most likely to be encouraged by ongoing attention to this element by federal program sponsors.

## Service Coordination and Improvements in Service Provision

For the second question — whether increased service coordination led to improvements in industrial modernization service provision — our conclusions were:

- Enhanced service coordination has made available a wider range of expertise to firms and, in many instances, a more systematic approach to providing assistance. Involving other partners has allowed MEP centers to maintain flexibility and particularly helped the newly established centers to “ramp-up” their services fairly quickly by “leveraging” existing resources. In these and other ways, the quality of the service provision has been improved.
- While there were benefits from increased coordination, it was apparent that these improvements had some direct (i.e., MEP) and indirect (i.e., non-MEP) costs. For example, MEP programs actively engaged in service coordination incurred various transactions costs, including the expense of information exchange, contracting, consulting, and monitoring. In some cases, the minimization of inter-organizational tensions required the expenditure of “political” capital. It was also noted that the other program resources “leveraged” by MEP centers were not “free” in that they had to be paid for by other public or private sources; at the same time, there was a reduction of inefficient program overlaps.

## Best Practices in Service Coordination

Finally, we probed whether best practices in service coordination could be identified and, if so, how these best practices might be more widely known and disseminated within the national MEP system. Through the case studies, we identified a series of service coordination best practices (Table 1). These practices included:

- Shared system-wide partnership vision, in which centers select certain partners and arrangements that fit their program’s vision. Two models include (1) for newer programs, partnership arrangements involving organizations taking on central program management and delivery roles, (2) for long-standing programs, partnership arrangements in which organizations are selected to fill relatively narrow roles such as providing key services or access to certain segments of new customers.
- Structured flexibility, through which MEP programs consciously consider and anticipate the evolution of partner capabilities and relationships. Strategies, plans, and organizational mechanisms should address partnership development over time and consider how partner relationships might need to be modified.
- Joint marketing efforts — such as uniform marketing materials, jointly sponsored seminars and workshops, and co-locations (two organizations occupying the same office space)—which help to diminish the complexity in the large and diverse number of service providers, and overcome the high cost of marketing to small and medium-sized manufacturers.
- Cross-training, which allows organizations to learn skills and capabilities from one another, as well as imparting the center’s approach and process for delivering services so that manufacturers receive uniform services regardless of the organization managing the project.
- Shared information, through formal methods such as system-wide electronic information systems, regular partnership meetings, or program-wide telephone directories; or through informal means, such as the establishment of personal relationships among individuals in different organizations who perform similar tasks.

- Development, sharing, and usage of tools such as assessment protocol and database systems which save development costs and promote cohesion throughout the MEP system.
- Coordinated referral systems which qualify and disseminate information (through formal interviews with consultants and service providers, and shared databases) and ease access of small and medium-sized manufacturers to the most appropriate service providers (through providing targeted multiple referrals to a customer, and electronic or traditional requests for quotations or proposals).
- Collaborative service delivery of assessments and projects.
- Specific mechanisms (e.g., staff functions, networks) to promote, monitor, and facilitate paperwork and other requirements of partnerships.
- Partnership performance review — both review of individual partnership accomplishments relative to what was promised in a contract or memorandum of understanding and review of partnerships in context of changing industry needs and existing resources.

### Tensions and Benefits of Service Coordination

While service coordination has significant benefits, we also draw attention to the fact that there are costs and potential tensions from this approach. These drawbacks included increased costs (e.g., identifying service providers, lost learning within the organization, information sharing, contract management and monitoring projects), difficulties in maintaining quality across partner organizations, delays in timely service delivery, and inter-organizational tensions. At the same time, the benefits associated with service coordination included avoiding the duplication of services, tapping specialized skills, spreading development costs of new tools, broader marketing to new industrial customers, improving access to particular industries and areas, flexibility in staffing and the delivery of services, improving service quality, enhancing visibility in the locality, and strengthening state and local support.

### Conclusions

We recommend that it would be useful to make these best practices more widely known and disseminated. Attention should also be paid to the required investments and tensions associated with efforts to implement service coordination. The mechanisms to promote knowledge about these best practices (and required investments) could certainly include circulating information about these practices through written and electronic forms. However, most useful in our view would be efforts to promote information and experience exchange across different MEP programs through forums, training events, and exchanges of personnel. The development and dissemination of case examples where firms have been assisted through coordinated services might also prove helpful (several such examples are documented in the full program case studies). And, of course, continued attention to issues of service coordination in program reviews, periodic guidance to program managers, and funding decisions is most important.

**Table 1.**  
**Summary of Best Practices**  
**in Industrial Modernization Service Coordination**

<b>Practice</b>	<b>Description</b>	<b>Observations</b>	<b>Examples</b>
<b>① Shared system-wide partnership vision</b>	Partnerships fit into the goals and vision of the program. Partners may take on central management functions or (in longer-standing programs) play specific roles in providing service or access to new customer segments.	Because programs have different strategies and local conditions, their partnership arrangements are likely to differ.	The Chicago MTC has multi-organizational team management. Georgia has a lead organization using partners to provide specific services.
<b>② Structured flexibility</b>	Strategic and operating plans recognize phases of change in partnership arrangements.	In practice, external changes—e.g., customer needs, budgetary, or political factors—often drive modifications in partner relationships.	Oklahoma and Chicago both used NIST planning grants to evolve their multi-organizational programs
<b>③ Joint marketing efforts</b>	Collaborative activities for increasing outreach to customers, involving marketing materials, jointly sponsored seminars and workshops, and co-locations.	The cost of outreach to new types of potential customers or those in a broader geographic areas is shared. In practice, the partner that gets the first call may keep the project.	Southwest Pennsylvania has a uniform brochure which all partner organizations use
<b>④ Cross-training</b>	Programs to learn skills and capabilities from one another as well as improve inter-organizational understanding	Some centers provide little training to in-house staff or partners.	Georgia's partners have held training sessions in financial analysis, working with the federal laboratories, and other areas.
<b>⑤ Shared information</b>	Regular communication among organizations can occur through periodic meetings, electronic systems, and informal mechanisms. The institutionalization of personal relationships is particularly important.	Implementing shared electronic information systems can be difficult and expensive. Personal links may be weakened as staff turnover occurs.	Southwest Pennsylvania has an electronic information system used by more than 15 partner organizations.

• Continued next page

**Table 1.**  
**Summary of Best Practices**  
**in Industrial Modernization Service Coordination (Continued)**

<b>Practice</b>	<b>Description</b>	<b>Observations</b>	<b>Examples</b>
<b>⑥ Development and sharing of tools</b>	Collaborative development of assessment tools and database systems for distribution to centers throughout the MEP	Saves development costs, promotes cohesion, and enhances expertise of developers	Cleveland has participated with several other MEP centers in the development of assessment tools and an electronic reporting system.
<b>⑦ Coordinated, program-wide systems for making referrals</b>	Program-wide mechanisms for accessing and qualifying common information about external service providers for making referrals	Provides consistency in quality of referrals throughout the program and lowers the cost of finding referrals; quality control a possible problem for referrals	Minnesota has a system-wide shared database of external service providers and bulletin for posting project proposal requests.
<b>⑧ Collaborative service delivery</b>	For assessments and projects, teams involve staff from more than one organization.	May be more objective, leading to new observations and recommendations, but can cause delays	Chicago uses multi-organizational teams to deliver assessments.
<b>⑨ Specific mechanisms to promote partnership</b>	Functions for promoting and monitoring partnerships within the organization	Prevents service coordination from taking a lower priority to daily operational issues; facilitates paperwork	Oklahoma's Regional Coordination Councils organize existing resources to help broker/agents effectively identify service providers. Georgia's Technology Linkages Office facilitates relationships with federal laboratory and university departments.
<b>⑩ Partnership performance review</b>	Evaluation of partnerships against contractual goals or manufacturing needs	Helps deal with changes in partnership performance over time	Chicago and Pennsylvania have modified contractual relationships with partners after review.



## 1. INTRODUCTION: PROJECT CONTEXT, ISSUES, AND APPROACH

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The Manufacturing Extension Partnership (MEP) is a network of technology assistance and service providers that aims to upgrade the performance and competitiveness of small and medium-sized manufacturers in the United States. The MEP is a collaborative initiative between federal and state governments which also involves non-profit organizations, academic institutions, and industry groups. The U.S. Department of Commerce, National Institute of Standards and Technology (NIST) is the MEP's federal sponsor. From three Manufacturing Technology Centers (MTCs) in 1989, the MEP has now grown to a network of more than 60 centers in 42 states.

Drawing on existing and enhanced state and local technical and business assistance resources, MEP centers seek to offer services to small and mid-sized manufacturing enterprises (SMEs) that are needed by these firms and which are not easily available through existing private or public sources.<sup>2</sup> At the national level, NIST not only provides matching funds but also promotes common tools, shared learning, and program best practices to improve the performance of individual centers and the national system as a whole. One of the major areas where NIST has sought to identify and disseminate program learning and best practices is that of service coordination. MEP centers usually involve various other organizations to operate their programs and provide services to their SME customers. Across the MEP system, there are many hundreds of these partner organizations, including non-profit technology or business assistance centers, economic development groups, universities and community colleges, private consultants, utilities, federal laboratories, and industry associations.<sup>3</sup> NIST and its MEP affiliates have promoted local service coordination for a range of reasons, including:

- Leveraging limited resources
- Avoiding the duplication of services

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<sup>1</sup> NIST's sponsorship of Manufacturing Technology Centers was initiated under the Omnibus Trade and Competitiveness Act (Public Law 100-418, 1988), building on the experience of several states who had already established industrial extension programs. More recently, the Manufacturing Extension Partnership has further extended federal-state collaboration in industrial extension. Federal funding to the MEP is about \$80 million in fiscal year 1996. States and other organizations involved in the MEP contribute at least as much again, and there is some additional fee revenue from customer firms. For further information on the MEP, see: <http://www.mep.nist.gov/>

<sup>2</sup> Small and mid-sized manufacturers are generally defined as those with 500 or fewer employees. There are about 415,000 small and medium-sized manufacturing enterprises in the United States, representing 99 percent of all manufacturing enterprises and almost two-fifths of U.S. manufacturing jobs (U.S. Small Business Administration, *The State of Small Business: A Report to the President*, Washington, DC: USGPO, 1992, Tables A.7 and A.22). Evidence about the technology and industrial challenges facing small and mid-sized manufacturers is not reviewed here, but can be found in several recent studies, for example: U.S. Congress, Office of Technology Assessment, *Making Things Better: Competing in Manufacturing*, OTA-ITE-443, USGPO, Washington, DC, 1990; National Research Council, *Learning to Change: Opportunities to Improve the Performance of Smaller Manufacturers*, Commission on Engineering and Technical Systems, Manufacturing Studies Board. National Academy Press, Washington, DC, 1993; and the Modernization Forum, *The Role and Importance of the Manufacturing Extension Partnership Centers*, Dearborn, MI, 1994.

<sup>3</sup> Philip Shapira and Jan Youtie, Analysis of Service Linkages, Memorandum to National Institute of Standards and Technology, MEP Program, March 9, 1995.

- Tapping specialized skills
- Marketing to new industrial customers
- Facilitating access to particular industries and areas
- Flexibility in staffing and the delivery of services
- Improving service quality
- Enhancing visibility in the locality
- Strengthening state and local support

Since 1993, the development of local MEP service partnerships has been greatly stimulated under the program and funding guidelines of the NIST-managed elements of the U.S. Technology Reinvestment Program.<sup>4</sup> But, perhaps more fundamentally, efforts to better coordinate and organize the delivery of local services also reflect a broader interest in making publicly sponsored services more effective, efficient, and responsive.<sup>5</sup>

This document reports on a study which has examined the development, operation, and effects of efforts to promote local service coordination in the MEP system. The study probed the extent to which service coordination has grown among MEP affiliates, the organizations and institutional relationships involved, and the impacts on how services are delivered to customer firms. In addition, the study identified and examined exemplary cases and best practices in service coordination and explored ways by which these practices could be disseminated throughout the national system.

The major questions addressed by the study were:

- ❶ Has MEP sponsorship and intervention led to greater service coordination among industrial service providers at the regional level?
- ❷ If increased service coordination has occurred, has this led to the improvement in industrial modernization service provision, and how?
- ❸ Can best practices in service coordination be identified and, if so, how might these best practices be more widely known and disseminated within the national MEP system?

From a methodological perspective, these represented distinct types of questions. For the first question (how the MEP program is influencing the level of service coordination among industrial modernization providers), information was obtained through a national aggregate analysis of program affiliations and linkages. We used data from program reports to NIST, other available

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<sup>4</sup> The Technology Reinvestment Project (TRP) is a federal initiative to transition defense suppliers and technologies to civilian markets and promote the growth of a more competitive commercial manufacturing base in the United States (see: Advanced Research Projects Agency, *Technology Reinvestment Project, Program Information Package*, U.S. Department of Defense, Arlington, VA, 1993; Philip Shapira, J. David Roessner, and Richard Barke, *New infrastructures for small firm industrial modernization in the USA, Entrepreneurship and Regional Development*, 7, 1994.)

<sup>5</sup> David Osborne and Ted Gaebler, *Reinventing Government: How the Entrepreneurial Spirit is Transforming the Public Sector*, New York, Plume, 1993; Al Gore, *Creating a Government that Works Better and Costs Less: A Report of the National Performance Review*, New York, Plume, 1993.

reports and survey materials, and telephone interviews. This data provided an overview of trends in the coordination of service delivery, including lead, affiliated and linked organizations, enabling us to chart the development of industrial modernization services by state and assess the role of NIST sponsorship.

The second question addressed the consequences and outcomes of service coordination. This was a more complex issue, one which required consideration of the perspectives of different stakeholders. We chose to pursue this question through focused case studies which examined in detail how partnership arrangements were developed at the local level, how these arrangements were subsequently implemented, and how services delivered to industrial customers were enhanced or otherwise changed. These cases drew on interviews with program sponsors and managers, service partners, and industrial customers of selected programs. The methodologies employed for the cases are discussed in detail in Section 3.

For the third question (identifying best practices), we again depended on the case studies to help us in categorizing, understanding, and comparing best practices in service coordination. We drew on the knowledge of the MEP system gained through this and prior studies to consider how such best practices might be most effectively disseminated.<sup>6</sup>

In following sections, the analyses and findings of the study are reported. First, an overview of partnerships arrangements in the MEP system is presented (Section 2). This describes the number and location of partner organizations as well as the types of organizations working with MEP centers and their specialization areas. Then, in Section 3, we discuss the methodology used for the case studies and highlight findings from studies of six centers and their organizational relationships. Cross-cutting insights from these center case studies are detailed in Section 4. The final part of the report (Section 5) focuses on service coordination best practices and how these might be disseminated. Broader policy issues are also discussed. ■

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<sup>6</sup> Philip Shapira, J. David Roessner, and Richard Barke, *Federal-State Collaboration in Industrial Modernization*, Report to the U.S. Department of Commerce, National Institute of Standards and Technology. School of Public Policy, Georgia Institute of Technology, Atlanta, 1992; Philip Shapira, *A Guide to Best Practices in Industrial Modernization*, Project Report, U.S. Department of Commerce, National Institute of Standards and Technology. School of Public Policy, Georgia Institute of Technology, Atlanta, January 1994.

## 2. SERVICE AFFILIATIONS AND LINKAGES IN THE MANUFACTURING EXTENSION PARTNERSHIP: THE NATIONAL PICTURE

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Across the country, MEP centers have a rich and diverse set of relationships and linkages with other organizations and service partners. The scale and scope of these service affiliations have increased with the overall growth of the national MEP program. In this section, we analyze the national picture of service affiliations and linkages associated with the Manufacturing Extension Partnership. We consider the numbers and types of organizations working with MEP centers, the expertise these organizations offer, and the kinds of services they can deliver to the industrial firms who are the customers of the MEP system.

As part of the quarterly information reporting system in place in 1995, NIST asked its MEP centers to report their organizational relationships in two groups: affiliates and linked organizations. An affiliate may have been included in the original funding proposal, serve as a core service partner, or otherwise have a financial tie to the center. Linked organizations tend to be used as service providers on specific projects and generally have a non-managerial relationship to the center. The distinction between the two categories is not always consistent.<sup>7</sup> However, this database of affiliate and linked organizations is the only available source of archival information about organizational relationships in the MEP system.<sup>8</sup>

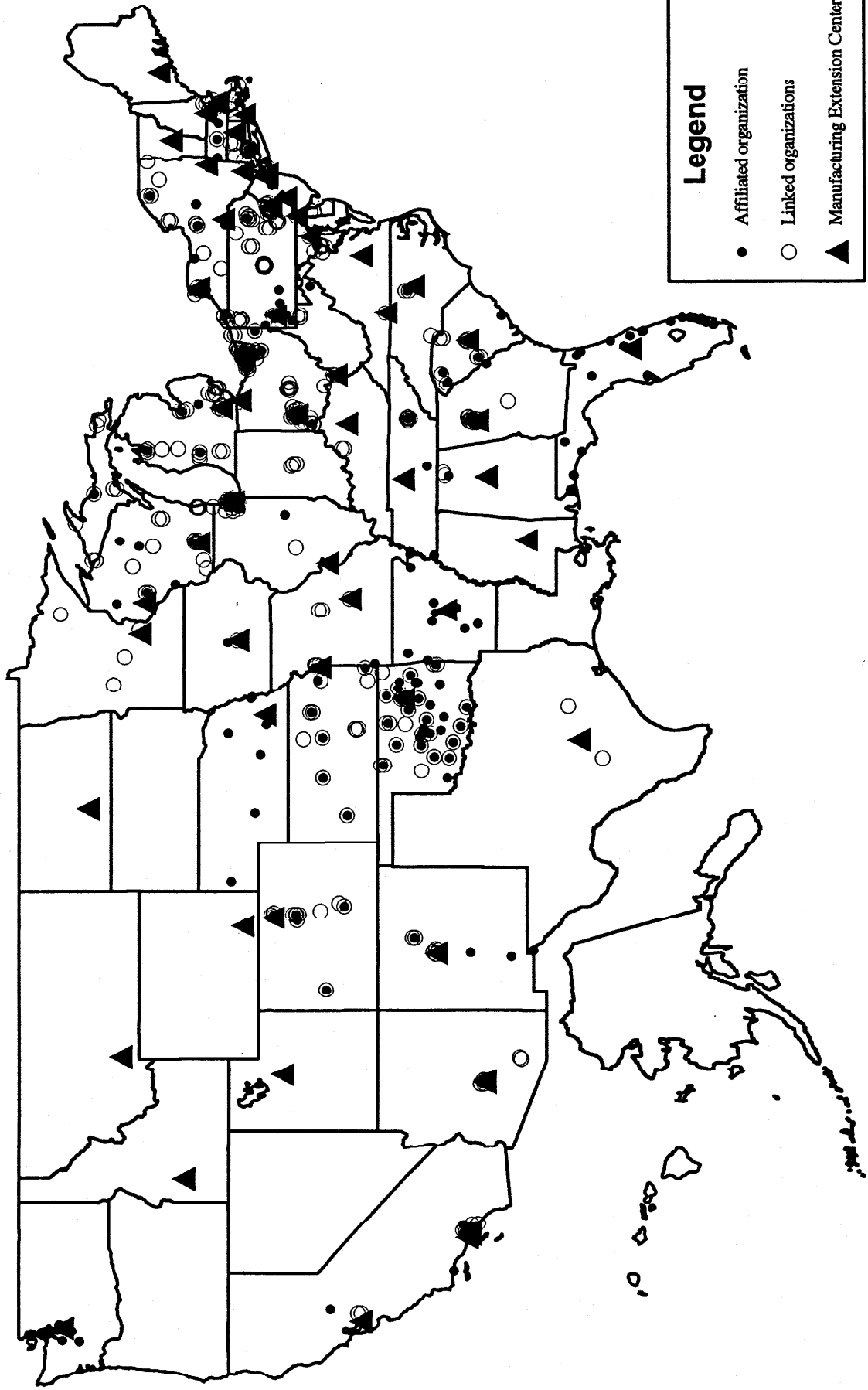
In total, the MEP information system, at the end of 1995, included data on over 750 organizations associated with 40 centers. However, this number understates the actual number of organizations involved in the program because some programs do not report information about organizations with informal relationships with the center or organizations that regularly bid and/or work on center-related projects (See Map 1). Also, additional affiliate and linked organizations have been added with the continued further growth of the MEP (by mid-1996, the program covered 42 states with over 60 centers).

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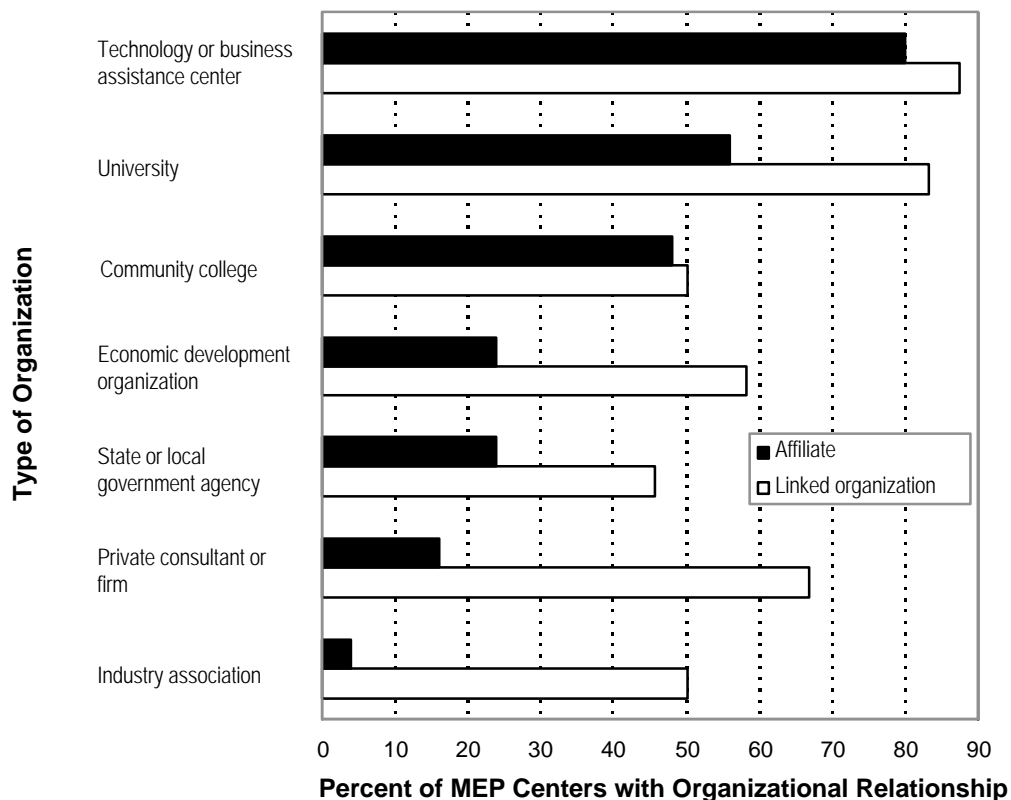
<sup>7</sup> A few points about the data. There is no standard way in which centers report affiliate and linked organization information. Some organizations give great detail, others provide less information. There is also duplication in reporting organizational information. Some centers view their affiliated organizations to be linked organizations as well, so that simply adding the two databases would yield duplicates. Some centers appear give their entire list of organizational linkages in each quarterly report rather than adding new ones. And several centers have established linkages with the same organizations. We have made a sincere attempt to remove duplicates. When we give program wide totals, we exclude all duplicates. When we report by center, we do include those duplicates shared by more than one center. Moreover, centers were not required to report the type of organization, only its name. Therefore, the project team developed its own categories and allocated an organizational type based on the descriptive name and any other available information. In general, the way in which the data was entered and validated in the NIST quarterly reports required considerable data re-entry, checking, and error correction.

<sup>8</sup> NIST/MEP has subsequently revised its definitions of MEP associated organizations.

# Manufacturing Extension Partnership Centers and their Partner Organizations



**Figure 2.1**  
**Affiliate and Linked Partner Organizations**

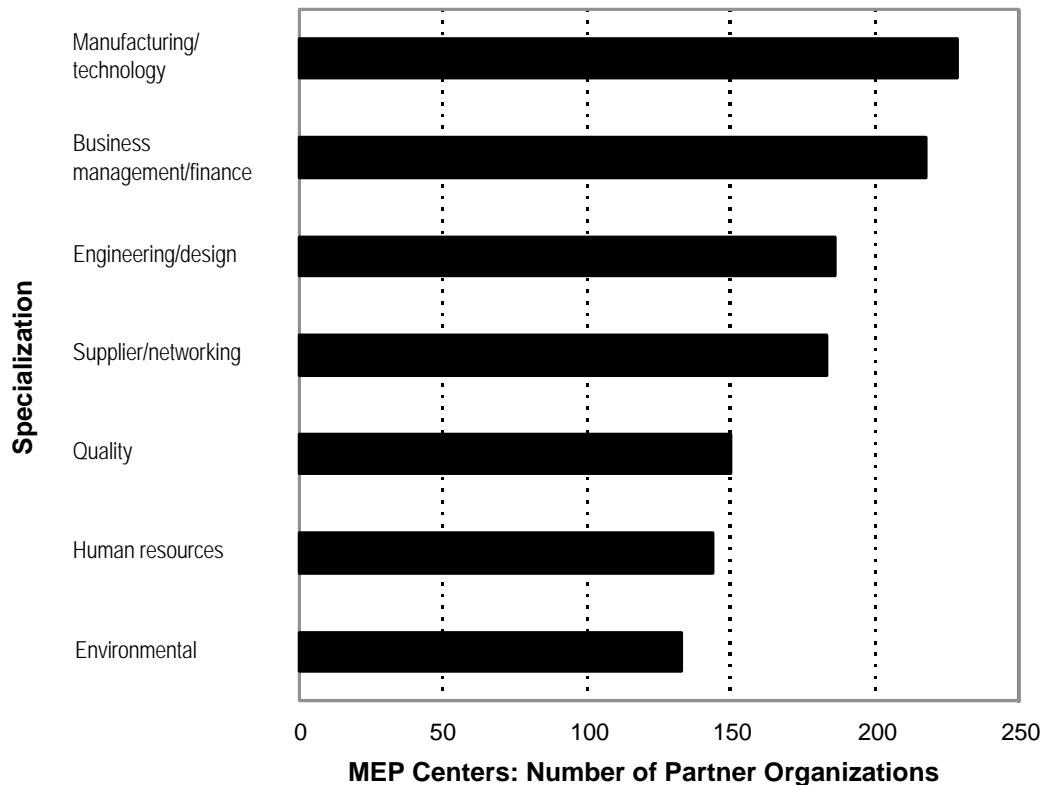


• Source: Analysis of NIST Quarterly Reports as of 4th Quarter 1994

The average center reported 19 organizational relationships, including (with duplicates) seven affiliates and 12 linked organizational relationships. There is a wide range of number of organizational relationships by center. Oklahoma (The Alliance) reported the highest number of affiliates (34) and the Southwest Pennsylvania IRC (MEP of Southwest Pennsylvania) at 15. Cleveland (GLMTC) reported 107 linked organizations, significantly higher than the next tier of centers, with numbers in the 30 to 35 range. (See Appendix, Table A.1.)

Based on the project team's assignment of organizations to project type categories, Figure 2.1 shows that the most common relationship is with technology or business assistance centers. Some of these are university-sponsored, although many are non-profit. Affiliated organizations tend to be clustered in this category. Linked organizations are more dispersed across various types of organizations, particularly private-sector consultants and firms. Eighty percent of centers have affiliate relationships with technology or business assistance centers, 56 percent with universities, and 48 percent with community colleges or vocational institutions. (See Appendix Table, A.2.) Regarding linked organizations, 88 percent of centers have relationships with technology or business assistance centers, 83 percent with universities, 67 percent with private consultants or firms, 58 percent with non-profit economic development organizations, and 50 percent with industry associations or community colleges/ vocational institutes. (Appendix, Table A.3.)

**Figure 2.2**  
**Number of Partner Organizations by Specialization**



• Source: Analysis of NIST Quarterly Reports as of 4th Quarter 1994

Focusing on linked organizations, another way to look at organizational relationships is by area of specialization (Figure 2.2). Centers have the highest number of relationships with organizations having expertise in manufacturing/technology (229 organizations), followed by business management/finance (218 organizations). Centers most often designate these linked organizations to deliver short-term information-related services to clients. (See also Appendix, Tables A.4 and A.5.)

Our analysis of service affiliations and linkages for the Manufacturing Extension Partnership indicates that, in overall terms:

- MEP centers have a large number of partnerships with other service providers
- Technology and businesses assistance organizations, located either in universities or non-profit organizations are the most frequently affiliated partners of MEP. Service linkages with private consultants and industry associations are also common. Linkages with cooperative extension programs, utilities, and federal laboratories are relatively less frequent.
- Linked service providers offer assistance in varied ways, including information-related assistance, help with referrals, and consulting or other hands-on services to companies.

- Manufacturing technology, management and finance, engineering and design, and supplier relationships and networking are the expertise areas provided by the organizations most commonly linked to MEP centers. Organizations offering defense conversion, environmental assistance, and human resource services are relatively less likely to be linked to MEP centers, although in absolute numbers MEP centers maintain numerous links with such service providers.

In aggregate, the MEP has succeeded in encouraging its centers to establish affiliations and linkages with an array of other service providers and organizations. Of course, this raises a further and most critical set of questions about how these service relationships were developed, how they operate now, and whether they are effective in improving services delivered to MEP customer firms. Clearly, while the presence of affiliations and linkages is suggestive, the available quantitative reports of these relationships says little about whether these relationships are significant and how they affect service delivery. Moreover, it is likely that some of these relationships are more important than others, while MEP centers may maintain informal linkages with other service providers not reported in the database. To probe such issues, we have undertaken a series of case studies of service partnering relationships, as the following section describes. □

### 3. PROGRAM CASE STUDIES

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The study focused on the development, organization, and impacts of service coordination services by MEP affiliates. The primary units of analysis were MEP centers and their networks of local service providers established in the United States through NIST-sponsored programs within the MEP framework. These included manufacturing technology centers and other manufacturing extension programs which have received matching funds through NIST's MTC and STEP programs and through the NIST-managed elements of the U.S. Technology Reinvestment Program (TRP).<sup>9</sup>

#### 3.1 Case Study Methodology

The study probed six specific cases of service coordination within the MEP program. These cases were undertaken to examine in particular contexts the development, implementation, and effects of service coordination. The selected cases, with a summarized justification for their selection, are shown in Table 3.1.

A central issue in choosing specific MEP centers was whether the cases should be "representative" of the typical center or "exemplary," i.e., focusing on the most successful centers in terms of service coordination. The study favored exemplary cases based on the view that, given limited resources, this would enable maximum learning about the best practices in the service coordination area, and thus help most in determining relationships between causes and effects.

But how does one know whether or not a case study site is exemplary prior to doing the study? Inescapably, such case selections involve the use of judgment, because exemplary cases are not fully known in advance. Nonetheless, the project team aimed to use varied means to identify exemplary cases. The team analyzed aggregate data reported to NIST about affiliated and linked organization relationships. Nominations were also sought and received from NIST personnel, including MEP regional managers.<sup>10</sup> Candidate case studies were further evaluated by a study review board of industrial modernization professionals. Informal discussions were held with several MEP directors to ascertain levels of receptivity to the study. There was also a concern to consider the variety of MEP centers, including issues of geographic location, historical context,

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<sup>9</sup> The State Technology Extension Program (STEP) is a one-year program-planning project award offered by NIST to help states develop, coordinate, and implement manufacturing assistance programs.

<sup>10</sup> This aspect of the process involved individual discussions with NIST staff and a conference call with NIST regional managers on April 7, 1995.

and types of services offered. Thus, within the broader set of exemplary programs suggested to us, we chose a subset which reflects some differentiation among the programs.<sup>11</sup>

**Table 3.1  
Case Study Selection**

<b>MEP Case Study Center</b>	<b>Justification for Case Selection</b>
① <b>Chicago Manufacturing Center</b> (CMC) - Six county Chicago metropolitan area	In large urban area with many firms, many services providers. The program has a large number of service provider linkages (including a bank) via formal agreements, common approaches, tools, and forms for referrals.
② <b>Georgia Manufacturing Extension Alliance</b> (GMEA) - State of Georgia	One of the oldest manufacturing extension programs (more than 30-year history of mostly state-funding). Was a single provider program for which TRP was a direct catalyst for alliances with other organizations. Ease of access for researchers.
③ <b>Great Lakes Manufacturing Technology Center</b> (GLMTC) - 27 counties in eastern Ohio and northwestern Pennsylvania, in and around metropolitan Cleveland, OH	Original MTC; well-established; in dense urban manufacturing concentration. Often regarded as one of the "best" MTC programs. Has one of the highest number of affiliates recorded in NIST Quarterly Reports, including partnerships with Edison Centers and community colleges.
④ <b>Manufacturing Extension Partnership of Southwest Pennsylvania</b> (MEP- SWPA) - Metropolitan Pittsburgh and SW Pennsylvania	Established in late 1980s as a state program. Developed extensive set of relationships, including joint assessments with other providers. Now part of MEP program.
⑤ <b>Minnesota Manufacturing Technology Center</b> (MnMTC) - State of Minnesota	Second generation MTC. Strong public service mandate from state rather than financial resource incentive for coordination. Extensive use of consultants via formal mechanism.
⑥ <b>Oklahoma Alliance for Manufacturing Excellence, Inc.</b> (The Alliance) - State of Oklahoma	Recent industrial modernization program. Explicit aims to use its staff as brokers to promote coordination. Rural manufacturing base.

<sup>11</sup> In defining this approach, we benefited from a series of review comments about the unit of analysis for the study. The possibilities included focusing on the centers as the key units or on cases of coordinated service provision to firms (see John Redman, Memorandum, April 6, 1995, providing guidelines to reviewers). In comments from Del Shepard (Memorandum, April 17, 1995) the individual firm was favored as the basic unit of analysis. Marianne Hudson, (Memorandum, April 24, 1995) favored the center as the basic unit of analysis. Combining these two views, Bob Springfield, Memorandum, May 8, 1995, suggested that "studying service coordination from both the service provider and the firm perspective will present a more thorough picture." From a practical perspective, given the study's available resources, we chose the two-step process outlined in the text, whereby we first examined a selected group of centers and their service networks and then identified, within each center, cases of coordinated service provision.

A standard protocol was followed during the case study interviews. The information elements probed as part of the case study protocol included:

- Organizational context: number, importance, and missions of organizational partners.<sup>12</sup>
- Change agent: NIST/TRP proposal, lead organization, role of state government.
- Structure: management, formal procedures, plans, financial and contractual arrangements.
- Marketing and outreach, including joint marketing, common or complementary targeting co-locations of service offices, changes in geographic coverage
- Service delivery, service organization, and outputs: assessments, project coordination, joint projects and services, changes in array of services, number and type of firms served, group services, shared tools
- Coordination: sharing of program resources, inter-program referrals, cross-training of personnel
- Feedback: information systems, post-service evaluation.
- Difference: what was different in the area's industrial service delivery system compared with pre-MEP and what might occur without the MEP.

Alongside this information on how each studied center designed, implemented, and maintained institutional and service arrangements with other service providers, we also examined examples within each center where services had been coordinated to individual firms or groups of firms. For these instances of "coordinated service delivery," we explored:

- Characteristics: of the firm and its initial needs
- Access: how the firm gained entry into the MEP system
- Service: what services were offered, how, and by whom, and how these services were coordinated and sequenced
- Difference: how this case differed from what might have occurred before or without MEP coordination
- Impact: what results were experienced by the firm.

It was possible to track and visit only a small number of instances of coordinated delivery of services to firms (two or three instances per center). These examples are thus not representative in a statistical sense. Rather, they are illustrative of the processes and elements which are

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<sup>12</sup> In these cases, we sought to distinguish the group of organizations contractually-bound through the MEP program (the "formal" network) and the network of service providers who significantly work with the MEP program (the "in-place" network). These two networks overlap to varying degrees, and the MEP program may or may not have differential effects on the coordination of both.

combined together when two or more organizations coordinate with one another to serve the needs of manufacturing firms.

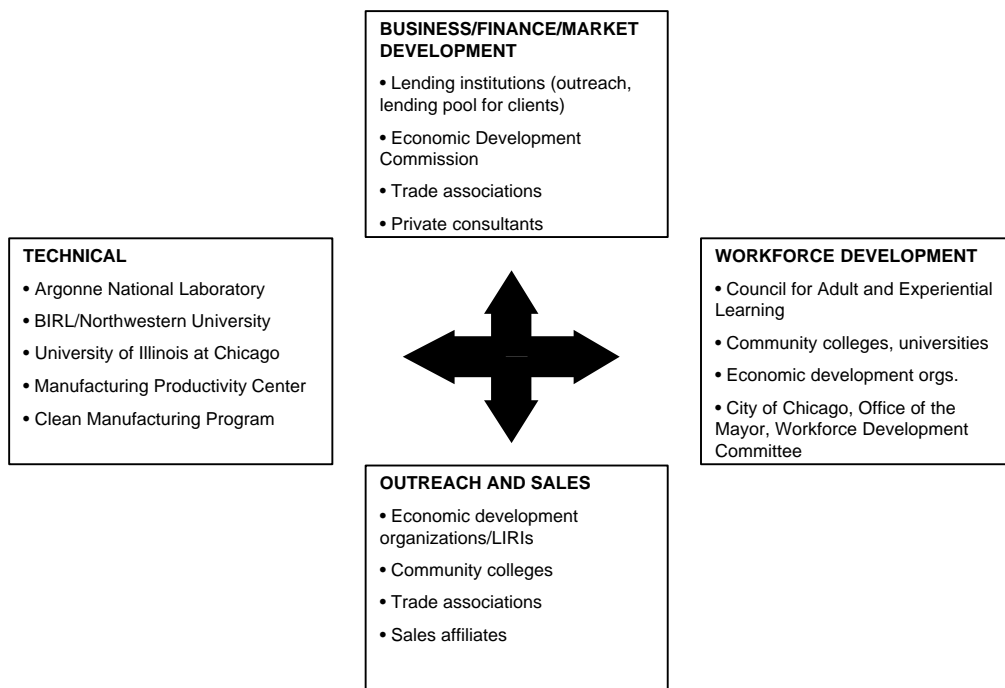
### 3.2. The Cases

The following part of the report discusses, in summary form, our service coordination case studies of six MEP centers. These cases were conducted in the summer and fall of 1995.<sup>13</sup>

#### ❶ Chicago Manufacturing Center

Established in 1994, the Chicago Manufacturing Center (CMC) covers the six-county Chicago metropolitan area. Under a two-year Technology Reinvestment Project (TRP) award, CMC is to receive about \$7 million from NIST, matched by an equivalent amount of state, local, and private funds. Organized as a not-for-profit organization, CMC has developed a flexible, decentralized structure using a core-staff/affiliate model of operation. Some 30 CMC staff provide services and support to firms, as well as supervise a broad network of more than 20 affiliates and subcontractors. This affiliate network is responsible for both marketing and technical services.<sup>14</sup>

**Figure 3.1**  
**Chicago Manufacturing Center:**  
**Organizational Structure**



CMC's affiliates and subcontractors comprise units of universities, a federal laboratory, other technology centers, a training organization, a community college, an arm of a financial institution, several private consultants, a small-business development center, and local non-profit community and economic development organizations (Figure 3.1). At 14 of these organizations, CMC supports at least one extension agent. The services provided by the affiliates include research and engineering consulting, training and work-force development, marketing and financial

<sup>13</sup> Copies of the full cases are available from the study authors.

<sup>14</sup> Further information on CMC is available at: <http://www.ncsa.uiuc.edu/illcoalition/MEC/CMC/Mission.htm>

services, technical information, business management, and industrial retention. In forming its affiliate structure, CMC has sought to combine an array of technical, work-force, and business services with a sensitivity to Chicago's strong neighborhood organizations, many of which have economic and business development functions. Written contracts are established by CMC with its affiliates and subcontractors. These contracts define specific performance objectives and budgets, as well as standard terms and conditions related to such items as accounting procedures, termination, insurance, reporting, and public presentation of the relationship.

A central feature of the CMC's approach to servicing the small and mid-sized companies in its area is the use of a low-cost formal assessment. After an initial visit and the company's agreement to participate, a three-person team is assembled (usually comprising CMC core staff and personnel from affiliates) which then spends one to two days conducting a strategic review. This then leads to the development of recommendations and the definition of further projects. As part of the assessment, Performance Benchmarking is used.<sup>15</sup> Two in five assessments lead to fee-generating follow-on projects, with CMC affiliates often involved in conducting these. In cases where CMC brokers a revenue-generating project with other service providers, CMC receives a small percentage of the project fee.

The use of a network of service partners to conduct assessments brings greater resources to the process, although it still remains a time-consuming task and, as yet, CMC has conducted relatively few assessments compared with the large population base of small firms in the Chicago area. CMC also conducts seminars and workshops for area manufacturers and sponsors a series of industry and group projects. Group projects have been initiated for the plastics, foundry, and electronics sectors, with leadership in each case provided by an affiliate technical center. Industry consortia or industry centers are being promoted for apparel, software, and defense-related industries.

Prior to the funding of CMC by TRP, there were several small but significant initiatives to assist Chicago SMEs. These efforts provided initial experience and helped to define a core group of individuals and organizations who would subsequently become involved in establishing CMC. Pilot projects for manufacturing assessment and technical assistance were sponsored by the state and city in the early 1990s, while a NIST STEP grant assisted the city in developing manufacturing assistance strategies and plans. In addition, strategic assessments had been conducted with large companies for some time by the Illinois Institute of Technology's (IIT) Manufacturing Productivity Center. The addition of significant TRP funds undoubtedly helped to greatly expand this existing network, add new service providers, and offer more systematic service tools and approaches in the metropolitan area.

CMC employs a matrix management structure. Several management teams have been formed, including teams for client development, assessment review, project development, and training. These teams include staff from both CMC and its affiliates. For day-to-day management, program managers at CMC guide affiliates and subcontractors. CMC sponsors quarterly meetings of staff from all its partner organizations to improve knowledge about one another and to conduct cross-training. An internal monthly newsletter is also distributed among staff of CMC and affiliates.

Most of the program's service affiliates are now well-integrated into the CMC structure. The use of cross-organizational teams and team management allows the partners to build strong links with one another. Mechanisms such as the quarterly partner meetings aid this. CMC serves as an active manager and lead sponsor of this service network. Within the overall CMC framework,

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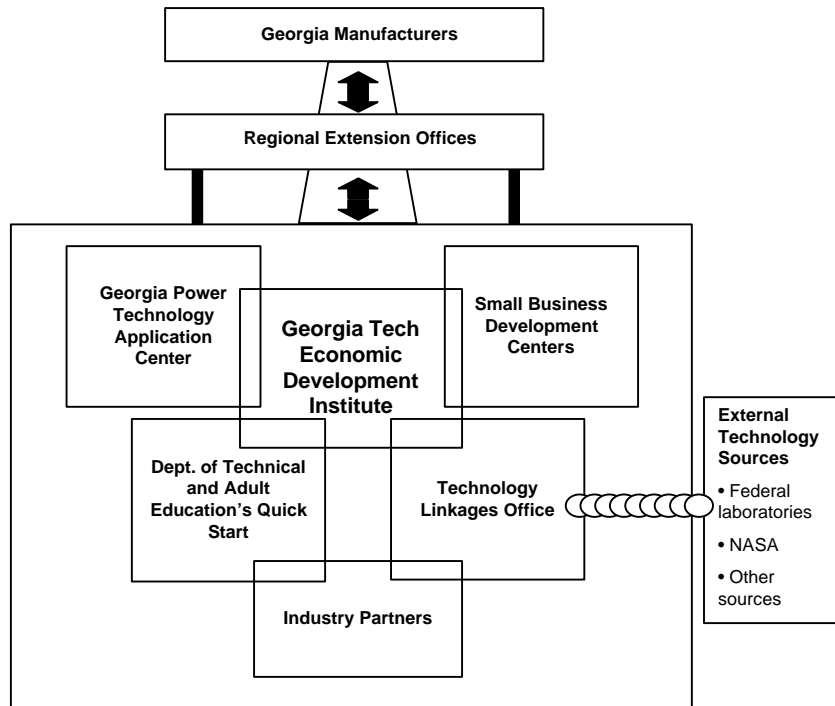
<sup>15</sup> Performance Benchmarking is a service of the Industrial Technology Institute, Ann Arbor, Michigan, providing customized benchmarking reports to companies, both directly and through manufacturing extension services. These reports compare manufacturing plants to other plants in similar businesses on more than 40 metrics and are used for diagnostic purposes in assessing strengths, weaknesses, and opportunities for improvement. For further details see: <http://www.iti.org/pbs/index.htm>

there is flexibility in what each partner does and how deeply it is involved in CMC. The federal funding provided to CMC through NIST is clearly the "glue" now holding this network together. At the same time, working in a complex political environment, CMC has had to make tradeoffs as to the service partners it chooses to work with. Here, CMC's contracting mechanism is useful in allowing specific objectives to be defined for partners and permitting a release procedure when objectives and expectations are not met.

**Georgia Manufacturing Extension Alliance**

The Georgia Manufacturing Extension Alliance (GMEA) is a partnership of four organizations serving some 10,000 small and medium-sized manufacturers in Georgia. The partnership is led by the Georgia Institute of Technology's (Georgia Tech) Economic Development Institute (EDI), and includes the University of Georgia Small Business Development Centers (SBDC), the state Department of Technical and Adult Education's (DTAE) Quick Start program, and the Technology Applications Center (TAC) at one of the state's major utility companies--Georgia Power Company (Figure 3.2). Based on Georgia Tech's three-decades-old Industrial Extension Service, GMEA received a two-year \$6.6 million Technology Reinvestment Project (TRP) award, matched by state and private-sector funding.<sup>16</sup>

**Figure 3.2  
Georgia Manufacturing Extension Alliance:  
Organizational Structure**



Georgia Tech was the only statewide organization with an industrial extension mission prior to TRP. Little cooperative delivery of services to manufacturers existed before TRP, except to varying degrees among Georgia Tech's industrial extension regional offices. State government

<sup>16</sup> For further details on the Georgia Tech Economic Development Institute's programs, see: <http://www.edi.gatech.edu/>

had no mandate for multi-organizational service delivery. Federal funding, and the knowledge that collaborative approaches were an important federal mission, accelerated and encouraged multi-organizational efforts in Georgia.

TRP did not change Georgia Tech/EDI's basic service delivery approach centered around its regional offices. Although virtually all of the TRP budget went to Georgia Tech/EDI (in part because of the non-cash arrangement with Georgia Power), partner activities and joint services never the less were implemented on a consistent statewide basis. Georgia Tech's outreach was augmented by jointly-sponsored workshops and seminars with Georgia Power. Georgia Tech co-located its Center for Manufacturing Information Technology in Georgia Power's offices. The SBDC co-located a counselor on the Georgia Tech campus, and roughly half of the regional offices were moved into facilities with SBDCs and/or other organizations. Other changes in service delivery procedures involved the establishment of a Technology Linkages Office as a central contact point to manage federal laboratory and university researcher relationships, a move which has resulted in more interactions with these organizations, more referrals, and internal program efficiencies.

TRP helped to fill gaps in manufacturing assistance services offerings. Although many new services were added by establishing capabilities within Georgia Tech/EDI, other new services were provided, to varying degrees, through relationships between EDI and the other organizations--SBDC for financial services and assessments, Georgia Tech Research Institute for environmental and safety services, and Georgia Power and the Electronic Commerce Resource Center for information technology services.

TRP affected the program's management structure. Central functions relating to activity tracking and evaluation were created. Information was informally shared between the partners to fulfill NIST reporting requirements. The SBDC held some internal financial analysis workshops to cross-train Georgia Tech field engineers.

Most partners are pleased with the relationships generated through GMEA. Nevertheless, some organizational relationships appeared more effective than others. Partners without significant manufacturing experience, technical expertise, or referral base have been more difficult to establish. Partnership performance review has led to a reduction in one partner's funding and role in the program.

### ❶ **Great Lakes Manufacturing Technology Center, Ohio**

The Great Lakes Manufacturing Technology Center (GLMTC) was established in 1989 as one of the original centers of the National Institute of Standards and Technology (NIST) Manufacturing Extension Partnership (MEP). GLMTC is operated by the Cleveland Advanced Manufacturing Program or CAMP (Figure 3.3). It currently serves more than 11,000 manufacturers in metropolitan Cleveland, eastern Ohio, and northwestern Pennsylvania. With a planned 1996 budget of roughly \$9 million, GLMTC employs a core staff of 51, and the center is linked to an extensive network of some 100 external organizations.<sup>17</sup>

The current organizational network—created under the direction of Cleveland Tomorrow and one of seven Ohio Edison Technology Centers—relies heavily on private non-profit organizations for deploying assistance services to manufacturers. CAMP/GLMTC have drawn on federal funding to support this network. NIST and TRP awards have funded CAMP/GLMTC to outreach and deploy technical assistance services, serve focused markets, develop and leverage its management resources, and participate with other MTCs around the United States in the development of assessment tools and database reporting software.

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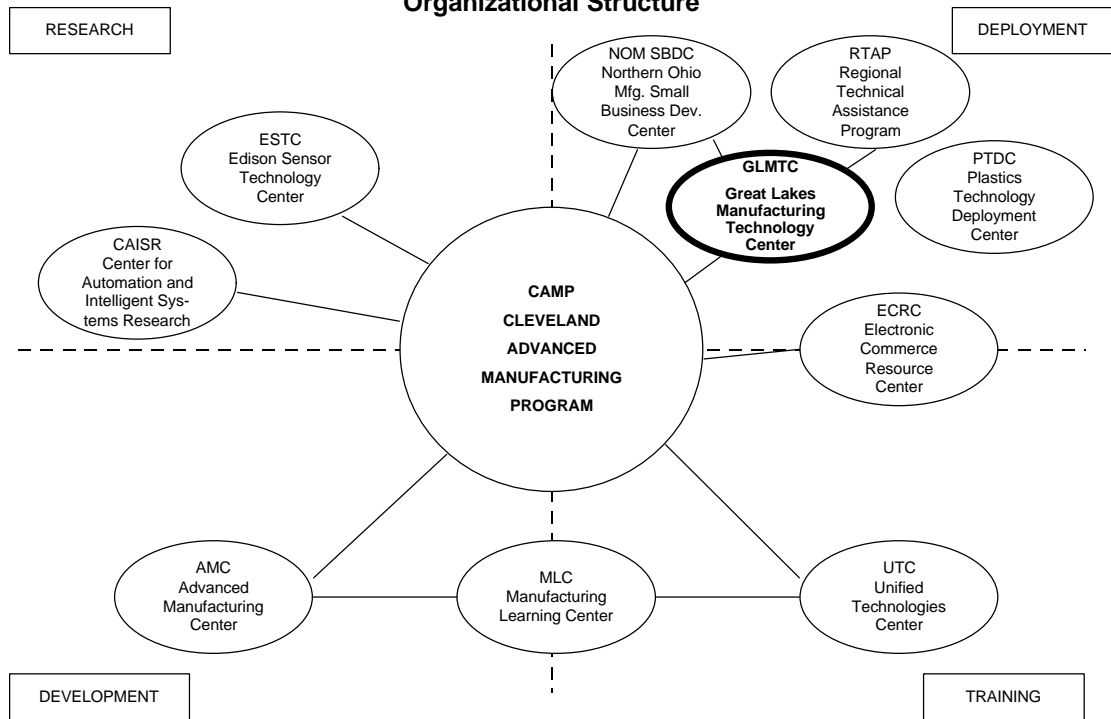
<sup>17</sup> Further information on GLMTC can be found at: <http://www.camp.org/glmtec.html>

In terms of outreach and marketing, the region's various service providers cosponsor events and invite one another to make presentations about service offerings; thereby, exposing manufacturers to additional services. GLMTC staff are co-located within organizations based in diverse geographies—from a Cleveland neighborhood to more distant cities in northeastern Ohio and western Pennsylvania. The western Pennsylvania link was established through a TRP award which created the Plastics Technology Deployment Center (PTDC) at Penn State-Erie. Likewise, GLMTC has referred new customers to several public and private organizations, in one case accounting for 10 to 20 percent of one private organization's new customers.

GLMTC management's conscious decision not to provide certain services in-house has helped create a positive division of labor between GLMTC and other services providers. GLMTC created formal management tools for identifying and qualifying consultants, including an interview process and consultants capabilities database. GLMTC has established links with several community colleges and private non-profit organizations to provide human resources assistance. Interlocking boards of directors and memberships helped to prevent GLMTC and another private non-profit entity from duplicating services in the quality systems (ISO/QS-9000) area. Instead, the two have jointly designed and delivered a number of ISO/QS consortia, an experience which led to other joint projects which address manufacturing process issues from socio-technical perspectives. Ohio state government appears to view GLMTC's link with the manufacturing SBDC as uniquely filling a gap in resources rather than duplicating traditional SBDC financial and marketing service offerings, as evidenced by the state's interest in adding more manufacturing SBDCs in other Ohio regions. On the other hand, GLMTC's relationships with research and development organizations has produced mixed results in terms of commercialization of technologies.

The GLMTC approach to deploying technical assistance has affected state government policy. The state of Ohio has adopted GLMTC's model in designing its statewide manufacturing extension network. Cleveland-area policy-makers believe that withdrawal of federal funding would greatly hamper the private, non-profit organizational approach to deploying technical assistance.

**Figure 3.3  
Great Lakes Manufacturing Technology Center/CAMP:  
Organizational Structure**

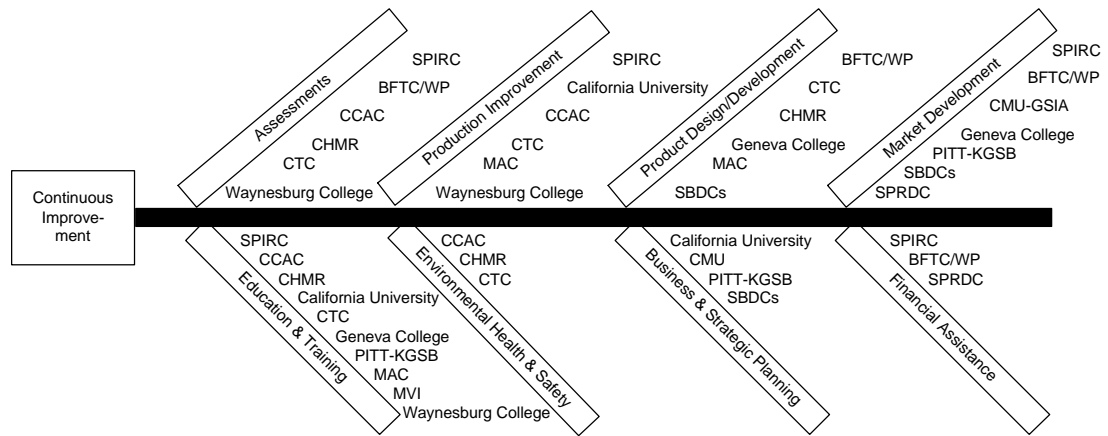


**4 Manufacturing Extension Partnership of Southwest Pennsylvania**

The Manufacturing Extension Partnership of Southwest Pennsylvania (MEP-SWPA) was established in March 1994 as a component of the national MEP program. The core organization of MEP-SWPA is Southwest Pennsylvania Industrial Resource Center (SPIRC)—one of eight Industrial Resource Centers (IRC) sponsored in 1988 by the Commonwealth of Pennsylvania to assist small and medium-sized manufacturers in the state. As part of the expanded MEP-SWPA, SPIRC has now developed a service partnership with 17 other organizations covering a 13-county area of southwestern Pennsylvania (including the Pittsburgh metropolitan region) with more than 4,000 small and mid-size manufacturing enterprises.

MEP-SWPA is marketed to regional firms as "an integrated approach to continuous improvement." The MEP service network offers an array of capabilities in assessment, production improvement, product design and development, market development, education and training, environmental health and safety, businesses and strategic planning, and financial assistance. In concept, any service provider is a conduit into the larger MEP network. MEP-SWPA is also itself a gateway to other sources of expertise and assistance, including private consultants, federal and private laboratories, industry groups, and universities (Figure 3.4).

**Figure 3.4  
Southwestern Pennsylvania MEP:  
Organizational Structure**



The development of the MEP-SWPA service network was a complex process, involving many meetings and negotiations between SPIRC and the other service providers. Concerns about what each partner could and would contribute had to be addressed, while fears about clients of one program being "stolen away" by other programs had to be allayed. Several changes occurred early on in the operation of the service network and as subsequent experience was gained. An effort at start-up to have partners prepare detailed individual operational plans similar to that required by NIST for SPIRC proved to be too cumbersome. But SPIRC does work with each partner organization to determine quantifiable goals and establish annual contracts with each organization. The contracts specify project goals and allocated budgets. These contracts take a considerable amount of time and effort to negotiate and monitor.

SPIRC did have prior experience of working with other centers and service providers in the region. For example, SPIRC had ties with the state-sponsored Ben Franklin Technology Center (BFTC) of western Pennsylvania and is now co-located with BFTC in the same building. SPIRC also formed ties with several service organizations, such as Concurrent Technologies Corporation (a research and development group) and the Southwest Pennsylvania Regional Economic Development Council. However, while SPIRC staff worked with or knew of other service providers in the region, in most instances relationships were infrequent and informal. Federal funding through the Technology Reinvestment Program initiated a more formal and much more extensive process of service cooperation.

While the process of identifying potential customers, soliciting their involvement, assessing needs, providing appropriate services, and evaluating and monitoring the impacts has essentially not altered with the onset of MEP funding, it is now possible to pursue a wider range of projects with a more integrated approach. With the implementation of the MEP program, marketing and outreach to potential new customers is conducted through the larger service provider network. With added service partners and SPIRC's own staff, there has been an increase in the amount and nature of expertise that the program can offer customers and also growth in the number of firms assisted. In 1993 — the last full year before MEP funding — SPIRC conducted about 200 initial meetings and implemented 80 to 100 projects. Most of these projects were operations reviews involving a formal multi-day assessment with recommendations. A further 40 to 50 projects were referred to outside consultants. In the first year of the MEP (March 1994 to March 1995), with additional resources and partners, the program conducted over 650 initial meetings

and implemented more than 160 projects. In this first year, among the most active partners in delivering and implementing projects (after SPIRC itself ) were several of the technology and environmental centers and one of the small business development centers. The universities as a group were slightly behind. Economic development groups delivered the fewest activities relative to their allocated budget. Recognizing the variations in performance and “fit” of its initial partners, SPIRC has subsequently restructured its partner relationships. SPIRC is now seeking a smaller number of “tight” partner links, built around shared strategic business objectives. Other organizations—whether public, private, or non-profit—can still participate with SPIRC in MEP activities, but on a project-by-project basis. SPIRC believes this two-tiered structure will provide more effective control, yet also allow flexibility as needed.

## ⑥ Minnesota Manufacturing Technology Center

The Minnesota Manufacturing Technology Center (MnMTC) was founded in 1992 as one of the seven original NIST manufacturing technology centers.<sup>18</sup> The center was created as the institutional vehicle for coordinating a series of regional economic development and technical assistance offices already existing in the state and to offer various programs designed to provide direct industrial modernization assistance. A new office to serve the Minneapolis-St. Paul "Twin Cities" metropolitan region was also established.

MnMTC's parent organization is Minnesota Technology, Inc. (MTI), a state-chartered not-for-profit corporation set up in 1991 to manage Minnesota's science and technology policy and foster technology infrastructures for economic growth (Figure 3.5). The board of MTI is drawn from business and government leaders in Minnesota. MTI was established in the wake of the Greater Minnesota Corporation (GMC), an ambitious 1980s effort to promote economic development in the state's smaller cities and rural areas. Despite channeling over \$40 million in economic development funds through several dozen regional field offices, GMC achieved poor results and was wound down. MTI reorganized what was left into six regional offices, using these to form the local foundation for the MnMTC. Four of the six regional offices (Moorhead, St. Cloud, Rochester, and Redwood Falls) are branches of MTI located within their respective cities. The Twin Cities Regional Office is co-located with the MnMTC home office and MTI headquarters. The sixth office (Virginia) is operated through a cooperative agreement with the University of Minnesota-Duluth's Center for Economic Development and MTI.<sup>19</sup>

In recent years, managers at both MTI and the MnMTC have encouraged service coordination as a key operating principle for manufacturing modernization. A conscious effort has been made to reduce "turf" lines and to mobilize many available resources from both the public and private sectors. Service coordination has been mobilized as an effective professional practice for delivering services as manufacturing specialists in the field have increasingly shifted from providing engineering services to information about available resources and advice on the use of those resources.

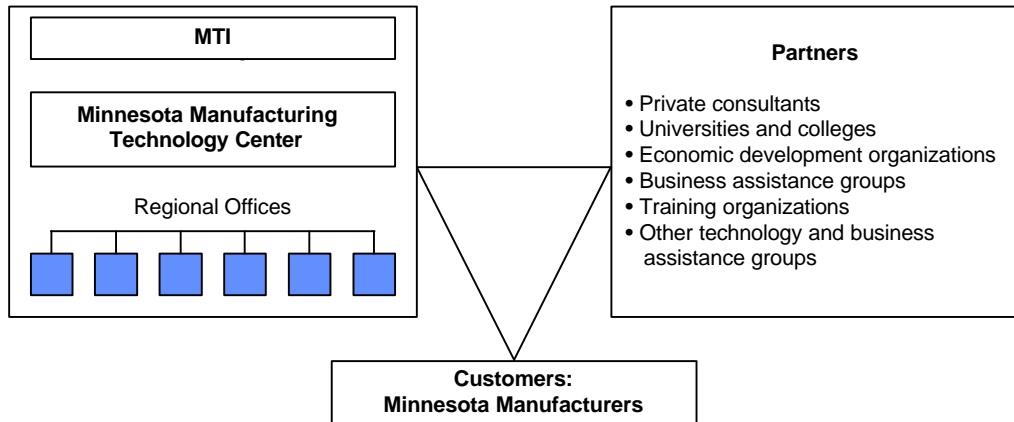
The process used by MnMTC staff to work with companies includes marketing and identifying customers, developing a company profile, distinguishing priority projects for improvement, identifying appropriate resources, and tracking and monitoring projects. For agreed projects, costs are shared between MnMTC and the company. In brokering services and resources for company projects, MnMTC staff most frequently interact with private consultants, Small Business Development Centers, technical colleges, private economic development foundations, and other state and local economic development programs. The company concerned makes the final selection of which private or public service provider will provide project implementation assistance.

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<sup>18</sup> The center was originally known as the Upper Midwest Manufacturing Technology Center.

<sup>19</sup> For further information on MnMTC, see: <http://mtibbs.mntech.org/mnmtec.htm>

**Figure 3.5  
Minnesota Manufacturing Technology Center:  
Organizational Structure**



MnMTC staff stress the importance of industry networks as an important channel for outreach and service delivery. MnMTC works with networks created by other public or private economic development organizations and has also itself sponsored several groups for supplier development, quality, fiber recycling, manufacturing software, and work-force development. These groups frequently involve firms, private associations, and public service providers.

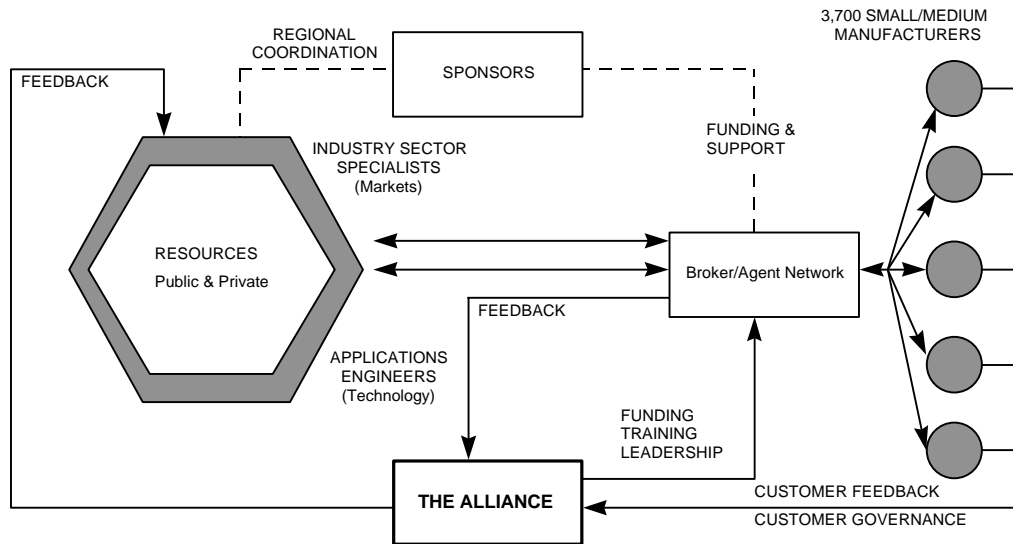
The MnMTC's regional offices continue to have a great deal of autonomy in determining the services to be provided to small manufacturers within their geographic territory. While partly a historical legacy, this autonomy is also an outgrowth MnMTC efforts to be client-driven. Regional directors are responsible for the management of all operations and for the development of local service linkages. A primary responsibility of each office is the creation of an effective plan that matches available services with the needs of manufacturers within the region. Each office also has a regional board, two-thirds of whose members are manufacturers. These boards promote and guide service delivery, participate in the regional service delivery plan, approving the use of matching funds for projects, and monitor service quality.

Unlike several of the other Manufacturing Technology Centers, the creation of the MnMTC did not signal a new partnership between a variety of existing state programs. Rather, the MTC award strengthened the state's commitment to creating a coordinated system of industrial modernization service providers under the umbrella of MTI. Improved coordination between the regional offices and the center has been one of the impacts of the MEP award. Linkages with other organizations have also been strengthened, although mostly these relationships are based on informal understandings and are maintained by individual staff in regional offices and at the center.

**© Oklahoma Alliance for Manufacturing Excellence**

The Oklahoma Alliance for Manufacturing Excellence, Inc. (The Alliance) was established in 1992 to assist the nearly 4,000 small and medium-sized manufacturers in the state. A relatively new member of the National Institute of Standards and Technology (NIST) Manufacturing Extension Program (MEP), the program in 1994 received a two-year Technology Reinvestment Project (TRP) award for \$3 million, matched by a like amount of state and other funds. The program follows an affiliate model comprised of a small central staff, 34 affiliates which host nearly 30 agents and other technical staff, and other organizations linked to the program (Figure 3.6).

**Figure 3.6  
Oklahoma Alliance for Manufacturing Excellence:  
Organizational Structure**



The understanding that there was a need for collaboration existed in the state before the federal funds from NIST. However, state government did not have a formal, consistent approach implemented without federal funds. The NIST STEP planning grant supported a program planning process with extensive ongoing participation from the state's private- and public-sector leaders. The result was the adoption of a broker/agent model and a highly collaborative approach to service delivery. Many elements of the program represent multi-organizational arrangements, including the task force which originally planned the program, consortia of sponsoring organizations, board of directors, regional coordination council, and evaluation task force.

Collaborative partners took on several functions typically provided at program administrative or management levels. For example, the consortia of sponsoring organizations determined the composition and boundaries of regions rather than program managers or government funders. The evaluation plan was designed by the public-private task force, under the guidance of an outside consulting firm. Several private-sector firms are actively involved in the organization and operation of The Alliance, taking roles of additional central office staff in broker/agent training and other areas.

The program's service delivery process has indirect as well as direct benefits for Oklahoma manufacturers. The Tulsa Area Regional Coordination Council helped competitors learn of each others' skills and capabilities, encouraged firms previously focused on large companies and/or those outside the state to serve small and mid-sized Oklahoma manufacturers, and helped

transform potential conflict between public and private providers into cooperation. brokers/agents have little or no backlog.

On the other hand, there are tensions between an emphasis on collaboration and the ability of program management to control the quality and consistency of assistance offered. For example, The Alliance sets standards for broker/agent positions, but the host organizations do the actual hiring, which can lead to uneven qualifications and experience levels across the state. Likewise, service providers are not viewed as equally effective. Brokers/Agents believe that in general private-sector service providers are more timely in responding to Alliance customers than are public-sector ones, although more expensive and therefore out-of-range of some customers. Regarding educational institutions, several of the vocational-technical institutions received high marks, but universities were considered less effective in helping manufacturers with short-term needs. ■



## 4. INSIGHTS FROM THE CASES

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The six case studies summarized in the previous section provided a great deal of information about how these state and local Manufacturing Extension Partnership centers organized their programs and worked with other service partners. In this section, we analyze this information, developing comparisons and contrasts for the following topics.

- State context and history of service coordination
- Pre-MEP and TRP/MEP applications process
- Leadership, organization, role of partners
- Service approach
- Training, information exchange, shared activities, evaluation
- Stability and flexibility of partnership
- Costs and benefits of partnering

### State context and history of service coordination

The prior experience and context of service coordination played a substantial role in the development of centers and their partnerships. States or regions with a history of industrial extension services carried this history forward in the design of their centers. The structure of the pre-existing Cleveland Advanced Manufacturing Program was the foundation for the structure of the Great Lakes Manufacturing Technology Center. The Minnesota Manufacturing Technology Center drew from the existing state program. Even more recent centers, such as the Chicago Manufacturing Center, borrowed ideas and experiences from pilot projects and assessments conducted at the Illinois Institute of Technology's Manufacturing Productivity Center.

Many of these existing organizations, programs, and pilots did not have formal sustainable partnership efforts for manufacturing extension. Within the southwest Pennsylvania program, staff knew of other service providers in the region, but relationships were infrequent and informal. Georgia Tech essentially ran the state's industrial extension service for more than 30 years without formal statewide partners. Georgia Tech's regional offices maintained inter-organizational relationships which differed from region to region.

Other influential contextual factors pertain to the distinction between urban and rural environments and changes in the political climate. State-wide programs, such as in Georgia, acknowledged the lack of rural service providers by setting up capabilities within the center and its field sites. Urban programs, such as Chicago's, addressed the existence of many public and private service

providers by establishing brokers/agents to link these providers with small and medium-sized manufacturers.

Political changes, particularly in the governorship, affected the state context. The Pennsylvania Industrial Resource Center was founded by one governor, the Ben Franklin Partnership was founded by a previous governor, and the merger of the two programs' statewide boards of directors occurred under yet another governor. Table 4.1 presents highlights of the state context and history of service coordination by center.

**Table 4.1**  
**MEP Case Studies:**  
**Pre-NIST/TRP State Context and History of Service Coordination**

MEP Center	Pre-NIST/TRP History
<b>Chicago</b> (CMC)	<ul style="list-style-type: none"> <li>• Prior small-scale services</li> <li>• Projects supported by state, city, and universities</li> </ul>
<b>Cleveland</b> (GLMTC)	<ul style="list-style-type: none"> <li>• Existing state programs (Edison, OTTO programs)</li> <li>• Existing CAMP affiliates structure with universities and community colleges</li> </ul>
<b>Georgia</b> (GMEA)	<ul style="list-style-type: none"> <li>• 30+yr. Georgia Tech-run program</li> <li>• Partnerships varied among different regional offices</li> </ul>
<b>MEP of SW Pennsylvania</b> (MEP-SWPA)	<ul style="list-style-type: none"> <li>• Existing individual state manufacturing assistance and technology programs (Industrial Resource Centers, Ben Franklin Partnership)</li> </ul>
<b>Minnesota</b> (MnMTC)	<ul style="list-style-type: none"> <li>• Prior state economic development program with site offices</li> <li>• State technology development corporation</li> </ul>
<b>Oklahoma</b> (The Alliance)	<ul style="list-style-type: none"> <li>• No prior program</li> </ul>

• Source: Service coordination case studies of six MEP centers.

## MTC and TRP/MEP applications process

The TRP process, announced in 1993 and implemented in 1994 and 1995, was a major service coordination catalyst. The TRP proposal required all proposals to address eight criteria, including the criterion entitled "Coordination and Elimination of Duplication."<sup>20</sup> This criterion required the proposer to (1) understand and link with related service providers in the service region, (2) be consistent with the existing comprehensive state plan, (3) not duplicate existing resources, (4) not clash with existing services. Proposers' partnerships were judged in terms of size (e.g., number of partners), diversity (e.g., skills, target group representation, geography), cohesiveness (e.g., delineation of responsibilities, clear organization), and leadership (e.g., clear management structure).<sup>21</sup> NIST encouraged the state of Pennsylvania to join into a single submission the

<sup>20</sup> Advanced Research Projects Agency, *FY93 Technology Reinvestment Project*, Solicitation, 1993.

<sup>21</sup> National Institute of Standards and Technology, Manufacturing Extension Partnership, "Technology Reinvestment Project Deployment Activity Areas: Lessons Learned Workshops Presentation Materials and Final Attendance Lists," Oakland, CA and Atlanta, GA, March 28, 1994.

separate proposals from the IRC and Ben Franklin Partnership program. Georgia’s proposers were encouraged to include partners such as the Small Business Development Centers.<sup>22</sup>

The cases suggest that prior to TRP, NIST did not have the same degree of impact in altering the partnership structure of the manufacturing technology centers. Both Minnesota and Cleveland models changed little from a partnership perspective. The Cleveland center had roughly the same affiliates before and after NIST funding, although the use of external service providers (in linked organizations) has since increased. Federal funding in Minnesota helped to consolidate and, to a lesser extent, centralize the program’s 80 centers, although such consolidation was already underway prior to NIST’s sponsorship.

Another partnership catalyst is the NIST STEP planning grant. Two new centers—Oklahoma and Chicago—were planned with funding from STEP planning grants. Both brought other organizations into the planning process. The Chicago program also borrowed ideas from other NIST MTCs. Both ended up following the “broker/agent” model in which the agent matches manufacturers’ needs with external service providers rather than delivering the services from within the center. However, STEP grants did not necessarily lead to less political partnering, particularly in the case of Chicago where sensitivity to the city’s strong neighborhood organizations was important. Table 4.2 presents highlights, in a summarized form, of the federal funding application process and its impacts on partnership formation.

**Table 4.2**  
**MEP Case Studies:**  
**NIST/TRP Funding Application Process and**  
**Impact on Partnership Arrangements**

<b>MEP Center</b>	<b>Funding Application Process and Impact on Partnership Arrangements</b>
<b>Chicago</b> (CMC)	<ul style="list-style-type: none"> <li>• STEP planning grant</li> <li>• Partnership inclusion balances technical and political concerns</li> </ul>
<b>Cleveland</b> (GLMTC)	<ul style="list-style-type: none"> <li>• Existing CAMP affiliates became GLMTC partners</li> </ul>
<b>Georgia</b> (GMEA)	<ul style="list-style-type: none"> <li>• Partnership inclusion is a strategic response to TRP</li> </ul>
<b>MEP of SW</b> <b>Pennsylvania</b> (MEP-SWPA)	<ul style="list-style-type: none"> <li>• TRP proposal combined Ben Franklin, IRC plans</li> <li>• Partnership inclusion balances technical and political concerns</li> </ul>
<b>Minnesota</b> (MnMTC)	<ul style="list-style-type: none"> <li>• Existing state economic development program and state technology corporation</li> <li>• Federal funds helped centralize, combine</li> </ul>
Oklahoma (The Alliance)	<ul style="list-style-type: none"> <li>• STEP planning grant</li> <li>• Partnerships developed in response to statewide solicitation</li> </ul>

• Source: Service coordination case studies of six MEP centers.

<sup>22</sup> Also see Christopher M. Coburn, *State Perspectives on the Technology Reinvestment Project Round I: A Report of Interviews of State Technology Program Leaders*, Batelle Memorial Institute, March 30, 1994 which found that state roles in coordinating responses to the TRP varied dramatically, focusing mostly on the matching funds requirement. State leaders mentioned that the proposal’s short time-frame created problems in “establishing a meaningful coordination body” and in doing “proper outreach to businesses and universities, especially in terms of consortia-building.” Nevertheless, 22 states indicated that the TRP competition fostered “ongoing and lasting” partnerships and consortia, benefits so substantial that “their participation in the TRP process was worthwhile on that basis alone, even if they did not win.”

## Leadership and organization

There was considerable variation in the number of partners. Cleveland reported more than 100 “linked organizations.” Georgia reported only three affiliates and 27 linked organizations. Nevertheless, the types of organizations represented were fairly similar: educational institutions (e.g., universities, colleges, community colleges, and technical institutes), non-profit business assistance programs, state and local government branches, utilities, and other private sector companies.

Leadership and organizational approaches varied among the centers. Some centers adopted a program-wide coordination strategy. Partners in Chicago and Southwest Pennsylvania were more involved in center management. Chicago uses a matrix management approach characterized by multi-organizational team management. Southwest Pennsylvania’s organizations are integrated to the extent that they have adopted single, integrated approaches in such potentially divisive areas as management information systems and marketing.

In contrast, the coordination styles in Georgia and Minnesota reflected the use of different strategies at multiple levels. Partnerships occurred to varying degrees in different parts of these centers’ service regions and for different service offerings. In Minnesota, the Duluth region has stronger formal partnerships than do other regions of the state. In Georgia, some service offerings involve partners (for example, manufacturing information technology assistance jointly provided by the state utility and Georgia Tech) whereas other services (for example, human resources assistance) do not. Coordination is much stronger in the technology area of the Georgia program. Georgia’s Technology Linkages Office focuses the coordination function in dealing with the federal labs in the region and with university researchers. The Technology Linkages Office manager makes presentations to university departments and at federal laboratory meetings, organizes on-site visits to federal laboratories, and holds in-house training sessions for the center’s field engineers.

Contractual arrangements differed among the centers. Chicago and Southwest Pennsylvania used detailed contracts which specify project goals and allocated budgets. Georgia has memorandums of understanding and agreements which in some cases had broad scopes of work.

Financial considerations, particularly the notion of structuring partnerships to generate fee income for the center, emerged for some centers without substantial and stable state funding. Although several centers add management fees to projects delivered by external service providers, none appeared to generate financing sufficiently substantial to, for example, offset state or federal funding reductions.

All the centers viewed partnership selection as important. Some adopted formal selection procedures, for example Oklahoma issued a public solicitation for consortia sponsors. Other centers had long-standing relationships with other organizations which contributed to the partnership selection decision. Nevertheless, there were partners selected for “political” or “reputation” reasons. Table 4.3 summarizes leadership, organization, and partnership roles across the centers.

**Table 4.3**  
**MEP Case Studies:**  
**Leadership and Organization**

<b>MEP Center</b>	<b>Structure</b>
<b>Chicago</b> (CMC)	<ul style="list-style-type: none"> <li>• “Broker/agent” model</li> <li>• affiliates, subcontractors</li> <li>• Written contracts</li> <li>• Cross-organizational team management</li> </ul>
<b>Cleveland</b> GLMTC	<ul style="list-style-type: none"> <li>• Center leadership, with small group of core affiliates</li> <li>• Large number of linked service provider organizations</li> </ul>
<b>Georgia</b> (GMEA)	<ul style="list-style-type: none"> <li>• Leadership by Georgia Tech, with three major statewide partners: utility, SBDC, technical institute system</li> <li>• Formal arrangements with regional federal labs, subcontracts with university researchers</li> <li>• Technology Linkages Office</li> <li>• Numerous local partnerships, many informal</li> </ul>
<b>MEP of SW</b> <b>Pennsylvania</b> (MEP-SWPA)	<ul style="list-style-type: none"> <li>• Network of affiliates—seek uniform outreach</li> <li>• Written contracts</li> <li>• Affiliate review</li> </ul>
<b>Minnesota</b> (MnMTC)	<ul style="list-style-type: none"> <li>• “Broker/agent” model</li> <li>• Each region has different way of partnering</li> </ul>
<b>Oklahoma</b> (The Alliance)	<ul style="list-style-type: none"> <li>• “Broker/agent” model</li> <li>• Large number of affiliates (sponsors), many subcontractors</li> <li>• Contractual arrangements with affiliates</li> <li>• Regional coordination councils</li> </ul>

• Source: Service coordination case studies of six MEP centers.

## Partner Characteristics

While the MEP case study centers established relationships with a broad range of external organizations, the most frequent affiliations were with universities, community colleges, and economic development organizations. Less common were relationships with federal laboratories and utilities. Partner organizations were called on to provide or enhance capabilities in specific technical areas (e.g., manufacturing processes, product development) as well as in training, marketing, financial assistance, and business planning. Economic development organizations and state and local governments were frequently added to bolster local support and augment outreach efforts, rather than provide distinct service delivery capabilities.

The differential characteristics of program partners added capabilities yet also made apparent a number of partner limitations. These affected how various partners performed in delivering services to manufacturers. For example, economic development organizations and state and local government agencies typically did not provide technological or longer-term project assistance. Work with federal laboratories and university researchers involved particular technical capabilities in narrow fields, but had the potential to be hampered by asynchronous time horizons and administrative barriers within these large institutions. SBDCs provided needed business planning capabilities, but their lack of manufacturing background sometimes posed problems in face-to-face dealings with manufacturers. Private-sector consultants often had the appropriate skills and background and operated within the manufacturers’ time-frame, but their rates and

operational styles were often geared to large-manufacturer budgets. However, some centers, such as Cleveland were able to negotiate reduced rate structures with private consultants which took into account reduced marketing costs and the opportunities for follow-on work. Further examples of effective partner relationships are noted in Table 4.4, which also summarizes partnership organizational types, capabilities, and traditional limitations.<sup>23</sup>

**Table 4.4**  
**MEP Case Studies:**  
**Partnership Characteristics: Organizational Types, Capabilities, and Limitations**

Type of Organization	Capabilities	Traditional Limitations	Examples of Partnership Practice to Overcome Limitations
<b>University</b>	<ul style="list-style-type: none"> <li>• Technical capability in specialized areas</li> </ul>	<ul style="list-style-type: none"> <li>• Long time horizons</li> <li>• Administrative barriers</li> <li>• Matching university skills with SME needs</li> </ul>	<ul style="list-style-type: none"> <li>• Georgia's Technology Linkages Office promotes and facilitates university department relationships</li> </ul>
<b>Community college or technical institute</b>	<ul style="list-style-type: none"> <li>• Training capabilities</li> <li>• Access to production/technical level workers</li> <li>• Facilities provide local connection</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of funding, e.g. for outreach to manufacturers</li> <li>• Focus on student enrollment</li> <li>• Difficulty in serving individual SMEs</li> </ul>	<ul style="list-style-type: none"> <li>• Cleveland has established a "teaching factory" with a community college and another educational institution</li> <li>• Oklahoma delivers services primarily through community college "hosts"</li> </ul>
<b>Economic development organization</b>	<ul style="list-style-type: none"> <li>• General business support</li> <li>• Financial assistance</li> <li>• Local support</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of technical skills</li> </ul>	<ul style="list-style-type: none"> <li>• Georgia set up existing industry committees at various chambers of commerce</li> <li>• Cleveland jointly funded an employee within a local economic development organization to provide technical assistance</li> </ul>
<b>State, local government</b>	<ul style="list-style-type: none"> <li>• Financial assistance</li> <li>• State and local support</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of technical skills</li> </ul>	<ul style="list-style-type: none"> <li>• Georgia works with the state environmental agency to provide pollution prevention assistance</li> </ul>
<b>Small Business Development Centers</b>	<ul style="list-style-type: none"> <li>• Business planning</li> <li>• Financial analysis</li> <li>• Marketing assistance</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of manufacturing experience</li> </ul>	<ul style="list-style-type: none"> <li>• Cleveland established a manufacturing SBDC to deliver financial and marketing services specifically to manufacturers</li> <li>• Georgia co-located offices with several SBDCs</li> </ul>

• Continued

<sup>23</sup> We should note that there are exceptions to the limitations typically found among different organizational types. Some of these are described in the "examples" column of Table 4.4.

**Table 4.4 (Continued)**

<b>Type of Organization</b>	<b>Capabilities</b>	<b>Traditional Limitations</b>	<b>Examples of Partnership Practice to Overcome Limitations</b>
<b>Private consulting firm</b>	<ul style="list-style-type: none"> <li>• Technical skills</li> <li>• Flexibility</li> </ul>	<ul style="list-style-type: none"> <li>• Expensive for small manufacturers</li> <li>• High “cost of sales” for consultants serving SMEs</li> <li>• Matching consultant skills with SME needs</li> </ul>	<ul style="list-style-type: none"> <li>• Chicago’s affiliation with Shorebank provides business and financial services to local manufacturers</li> <li>• Minnesota uses private firms to deliver services to manufacturers after qualifying project</li> <li>• Oklahoma uses private firms to provide internal staff functions</li> </ul>
<b>Utility</b>	<ul style="list-style-type: none"> <li>• Resources, technical skills, wide service reach</li> </ul>	<ul style="list-style-type: none"> <li>• Technical skills are narrow, related to energy usage</li> </ul>	<ul style="list-style-type: none"> <li>• Georgia set up an information technology demonstration site within a major power company’s existing technology demonstration site</li> </ul>
<b>Federal laboratory</b>	<ul style="list-style-type: none"> <li>• Technical capability</li> <li>• Access to facilities/equipment in specialized areas</li> </ul>	<ul style="list-style-type: none"> <li>• Administrative barriers</li> <li>• Limited commercial manufacturing skills</li> <li>• Matching lab expertise with SME needs</li> <li>• Geographical distance from many SMEs</li> </ul>	<ul style="list-style-type: none"> <li>• Georgia’s Technology Linkage Office promotes and facilitates relationships with federal labs</li> </ul>

### Service approach

Virtually all centers followed the same basic steps in serving manufacturers: outreach, assessment, and service delivery. The way centers used their partners to address these functions was similar in some respects and different in others.

Regarding outreach, all centers had field offices of their own or supported co-locations where a field representative was hired or placed at a local community college, vocational-technical school, or other type of institution in various parts of the centers’ service region. Jointly sponsored seminars and workshops were also common among all centers. Less common was the uniform marketing brochure. In Southwest Pennsylvania, all center affiliates use the same marketing material. This uniform marketing approach reflects the program management’s strong central partnership vision.

It was anticipated that partner organizations would be a great source of customers for the center. Actually, the cases suggested that the reverse was more common. Many partner organizations indicated that referrals from the center provided a significant portion of their business. In Oklahoma, one private-sector organization reported that 50 percent of its business came from the center’s broker/agent. A public-sector organization indicated 60 percent of its customers came through referrals from the center. In Cleveland, a public sector labor management organization estimated that about 20 percent of its business reflected referrals from the center. The public-

sector organizations in particular said they lack sufficient resources to market services themselves. A tension related to referrals noted in Pennsylvania was that in some cases the partner that gets the first call tends to be the one to keep the project.

Several of the centers conduct joint assessments with other organizations. Chicago has a substantial partnership effort in this area. Three organizations are represented on an assessment team, selected according to their capabilities and customers' needs. The team spends one to two days on-site, then another week writing up the assessment. The end product goes before a multi-organizational review panel, then to the client.

As one of the first centers, Cleveland adopted a multi-organizational approach in developing assessment tools for other centers to use. Cleveland has participated in several multi-MTC assessment tool development efforts. Cleveland was part of a coordinating team, along with the MTCs in Michigan, and South Carolina, with active participation from the MTCs in Kansas and New York to develop a human resources assessment tool. Cleveland has been involved with the Michigan center on an environmental assessment tool. Both are used by other centers within and outside of the MEP system.

The biggest differences were evident in the service delivery area. Broker/agent models followed in Minnesota, Chicago, and Oklahoma refer all major projects to outside service providers. Cleveland, Southwest Pennsylvania, and Georgia provide some services in-house and refer other needs to external organizations. The latter group of centers specifically designate certain services for external referral: engineering technical services, legal services, construction, heating or cooling systems, and other specific services directly associated with implementation. The procedures for making referrals varied widely among the centers. Minnesota uses a project hotline to post projects in excess of \$10,000 in rural areas and \$2,500 in the Minneapolis areas, and encourages private-sector consultants to use the hotline as a business development tool. Oklahoma has established regional coordination councils made up of external service providers which assist brokers/agents in identifying public- and private-sector service providers. Cleveland has a formal interview process for consultants.

Inter-firm networks were a common form of collaborative service delivery across the centers. Inter-firm collaborations typically took the form of jointly sponsored service delivery networks or forums organized by industry group (e.g., wood products manufacturers networks) or type of service (ISO 9000 networks). Table 4.5 summarizes key service approach collaborative activities across the centers.

## Training, information exchange, shared activities, evaluation

Centers share information by various means to maintain the partnership. A common partnership activity is cross-training in which organizations hold workshops to teach skills to staff in partner organizations. In Georgia, the SBDC has held workshops on financial analysis for Georgia Tech field engineers. Federal laboratory representatives have made presentations to Georgia field engineers at training sessions. Georgia field engineers have taken utility company representatives out to learn how to do manufacturing assessments. In Cleveland, the Work In Northeast Ohio Council (WINOC), a labor-management partner, has conducted facilitation skill training sessions with Cleveland center managers and staff.

**Table 4.5**  
**MEP Case Studies:**  
**Summary of Current Service Approaches**

<b>MEP Center</b>	<b>Outreach</b>	<b>Assessments</b>	<b>Service Delivery</b>
<b>Chicago</b> (CMC)	<ul style="list-style-type: none"> <li>• Co-locations</li> <li>• Industry sector group events</li> </ul>	<ul style="list-style-type: none"> <li>• Multi-organizational 3-person team</li> <li>• Multi-organizational assessment review panel</li> <li>• Performance Benchmarking</li> </ul>	<ul style="list-style-type: none"> <li>• All formal projects outsourced</li> <li>• Plastics, foundry, electronics, apparel, software and defense-related sector networks</li> </ul>
<b>Cleveland</b> (GLMTC)	<ul style="list-style-type: none"> <li>• Some co-locations</li> <li>• Co-sponsored events</li> <li>• Referral source</li> </ul>	<ul style="list-style-type: none"> <li>• Joint assessment tool development with other MTCs</li> <li>• A few joint assessments with other organizations</li> </ul>	<ul style="list-style-type: none"> <li>• Joint service offerings designed with other MTCs, organizations</li> <li>• More than half of project funds to external sources</li> <li>• Industry sector and ISO/QS- 9000 group events</li> </ul>
<b>Georgia</b> (GMEA)	<ul style="list-style-type: none"> <li>• Own network and some co-located offices</li> <li>• Co-sponsored events</li> <li>• Joint service- or region-specific marketing materials</li> </ul>	<ul style="list-style-type: none"> <li>• Piloting joint Georgia Tech-SBDC assessments</li> <li>• Selective use of strategic audits</li> </ul>	<ul style="list-style-type: none"> <li>• ISO 9000, exporting, and high performance workforce group events</li> <li>• Some joint service offerings designed with other organizations</li> <li>• of projects involving referrals</li> </ul>
<b>SW Pennsylvania</b> (MEP-SWPA)	<ul style="list-style-type: none"> <li>• Uniform marketing brochure for all affiliates</li> </ul>	<ul style="list-style-type: none"> <li>• Joint assessments with utility</li> </ul>	<ul style="list-style-type: none"> <li>• Some formal projects outsourced</li> <li>• Inter-firm group events</li> </ul>
<b>Minnesota</b> (MnMTC)	<ul style="list-style-type: none"> <li>• Some co-locations</li> <li>• Co-sponsored events</li> <li>• Joint region-specific marketing materials</li> </ul>	<ul style="list-style-type: none"> <li>• Company profile and strategic improvement plan</li> <li>• Informal partner (not contractor) review of some company profiles and improvement plans.</li> </ul>	<ul style="list-style-type: none"> <li>• All formal projects outsourced, largely to private sector consultants</li> <li>• Bulletin board advertises projects to consultants</li> <li>• Joint provision of supplier development, fiberglass, software, ISO 9000, defense conversion workforce development group events</li> </ul>
<b>Oklahoma</b> (The Alliance)	<ul style="list-style-type: none"> <li>• Co-locations</li> <li>• Referral source</li> </ul>	<ul style="list-style-type: none"> <li>• Pilot use of assessments</li> </ul>	<ul style="list-style-type: none"> <li>• All formal projects outsourced</li> <li>• Wood manufacturing network</li> </ul>

• Source: Service coordination case studies of six MEP centers.

Shared information procedures range from electronic information systems to regular partnership meetings to informal contacts. Southwest Pennsylvania is unique in that all partner organizations use the same electronic system to record customer and activity information. Cleveland and Minnesota employ consultant databases. Cleveland's formal consultant interview process requires consultants to complete a form and indicate areas of specialization. This information, along with what is gathered during the interview, is entered into a consultant database accessible by all center staff. Chicago holds regular quarterly partner meetings attended by managers of the center's affiliated organizations. In contrast, the Georgia center initially held regular management meetings with affiliated organizations, but currently employs more informal means to communicate with these organizations.

An extension of regular partner meetings is Oklahoma's regional coordination councils. The Tulsa Area Regional Coordination Council (the most active council in the system) has about 80 public- and private-sector members, of which the private-sector members tend to be more regular attendees according to a public-sector organization representative. The Council has many self-sustaining features, including a rotating facilitation role and regular referrals to each other. Council members recruit others to the council rather than relying on the center to do so. For example, when the center's brokers/agents informed the council that many of their manufacturing customers had marketing and finance problems, but there were no representatives from these companies at the council, council members themselves identified and recruited accounting, banking, and marketing consulting firms. One public-sector representative felt that the Council had helped diffuse potential animosity between public- and private-sector organizations.

NIST has developed or sponsored the development of tools which have had a substantial impact on multi-organizational information sharing. NIST's reporting requirements have played a part in centers' ability share information about characteristics, activities, and projects with organizational partners in a structured manner. Some organizations perform this function electronically, others use paper or alternative means. Furthermore, centers have used tools developed with NIST funding to link with other organizations. TECnet, the Tufts University-operated electronic information system which links center field engineers to business and manufacturing experts in other parts of the country, is one example of such a tool. Cleveland's activity-reporting database jointly developed with Martin Marietta Energy Systems and used by some 10 MEP centers is another example.

None of the centers had multi-organizational evaluation approaches at the time of this project, although one (Oklahoma) was planning such an approach. Nevertheless, NIST panel reviews included items requesting information about multi-organizational and partnership activities. Table 4.6 presents highlights of service partner training, information exchange, shared activities, evaluation across the centers.

## Stability and flexibility of partnerships

Partnerships underwent different stages of development in the centers examined. Early efforts created awareness and understanding between organizations. Federal funding from NIST solidified partner relationships. Contracts specifying partner goals and budgets were written. Centers set up various forms of meetings and information reporting systems, designed joint outreach and assessment projects, and established mechanisms for referrals and outsourcing.

Throughout, there have been changes in center affiliations and operations. In Georgia, the frequency of formal partner meetings diminished. The Chicago center dropped individual consultants and closed offices located within some affiliate organizations. Virtually all have added organizational linkages since their initial proposal.

**Table 4.6**  
**MEP Case Studies:**  
**Service Partners: Training, Information Exchange, Shared Activities, Evaluation**

MEP Center	Training, information exchange, shared activities, evaluation
<b>Chicago</b> (CMC)	<ul style="list-style-type: none"> <li>• Cross-training</li> <li>• Quarterly partner meetings</li> </ul>
<b>Cleveland</b> (GLMTC)	<ul style="list-style-type: none"> <li>• Cross-training</li> <li>• Center provides management services for other NIST-funded programs</li> <li>• Formal consultant interviews and consultant database</li> </ul>
<b>Georgia</b> (GMEA)	<ul style="list-style-type: none"> <li>• Cross-training</li> <li>• Technology linkages office</li> </ul>
<b>MEP of SW Pennsylvania</b> (MEP-SWPA)	<ul style="list-style-type: none"> <li>• Cross-training</li> <li>• Inter-organizational electronic systems</li> </ul>
<b>Minnesota</b> (MnMTC)	<ul style="list-style-type: none"> <li>• Consultant database</li> </ul>
<b>Oklahoma</b> (The Alliance)	<ul style="list-style-type: none"> <li>• Evaluation planning task force involving various stakeholders</li> <li>• Regional coordination council monthly meetings</li> </ul>

• Source: Service coordination case studies of six MEP centers.

Every center has partnerships that vary in their level of activity, and some are inactive. In Southwest Pennsylvania, the Ben Franklin Technology Center, the SBDCs, non-profit technology centers, and community colleges delivered the most activities per allocated budget; universities and economic development groups delivered the fewest activities per allocated budget. Other centers have demonstrated similar low-activity levels in working with universities and the federal laboratories. The exception is the Georgia program which is hosted by the state's major engineering research university (Georgia Tech) and which established the technology linkages function specifically to link with university and federal laboratory researchers.

Private-sector consultants have different roles across the centers. In Oklahoma, several private-sector consultants have taken on in-house functions. One private-sector company executive devotes about one day a week to helping train brokers/agents and assisting with other functions. Another private-sector consulting firm has developed a grant proposal to offer environmental regulatory compliance training. In Minnesota, private-sector consultants are a large part of the service delivery system. One issue is the ability of small and medium-sized manufacturing customers to afford private consultants. In Oklahoma, private consultants are largely recommended when the customer has sufficient funds. Cleveland negotiates lower rates with consultants based on reducing their marketing costs through referrals.

Centers have faced difficulties in dealing with inactive partners. To address changes in partnership activity, several centers adopted formal or informal partnership reviews which compare partner deliverables against contractual obligations. A few centers substantially reduced partner roles through funding reductions. Despite centers having reduced some partners' roles, partnerships have stability, particularly when they involve affiliate organizations which were part of the initial proposal. None of the centers completely broke ties with a partner organization, however inactive that organization was.

In some cases, organizational linkages which were inactive for years became more central to the center's service delivery strategy. The Cleveland center's host organization and its sister labor-management service provider (WINOC) were both formed by the same umbrella organization in the early 1980s. The two never worked on joint engagements until 1992 when ISO 9000 services emerged as a manufacturing need. Now the two organizations have run three ISO 9000 networks and jointly provide other types of assistance (e.g., set-up time reduction, manufacturing waste reduction) as well. Partner relationships thus show flexibility as well as stability.

## Costs and benefits of service coordination

The success of coordination among partner organizations is impacted by the costs and benefits of participation. Coordinating with other organizations creates costs, quality control and timeliness issues, and inter-organizational tensions. Service coordination adds costs. Examples include the cost of identifying service providers, lost learning within the organization, information sharing, contract management, and monitoring projects. Outsourcing projects to external organizations can involve additional paperwork and bureaucracy. Minnesota field agents, hired for their technical skills, in a sense have become contract administrators with files of contracts to process and monitor for every project outsourced to a private consultant or other external organization. One solution is for center staff to treat external service providers as referrals and let the manufacturer and the outside service providers independently determine the financial and contractual arrangements for the engagement. However, quality control is more difficult to manage in these instances. Customer satisfaction surveys in Georgia show that referrals receive lower satisfaction ratings than does one-on-one service.<sup>24</sup>

Difficulties in maintaining quality and timeliness may emerge. In Oklahoma, partner organizations do the actual hiring of the brokers/agents, which has led to uneven qualifications and experience levels across the state. Or projects with partners may be of very high quality but take a long time to complete. Many of the centers reported that university partners produced innovative work, but their schedules were not compatible with the short time frame of most manufacturing projects. Likewise, Chicago's multi-organizational assessment and review board process brings in special expertise to ensure high quality and objectivity, but the process consumes more resources and takes longer than assessments in some other manufacturing assistance programs.<sup>25</sup>

In addition, partnership arrangements may create inter-organizational tensions. For example, some Georgia center staff believed that a vocational-technical service partner was competing with the services they provided. In Southwest Pennsylvania, there were concerns about what each partner could and would contribute and fears about clients of one program being "stolen away" by other programs. The latter fears may have contributed to the observation that the organization first called tends to keep the customer. Where non-performing organizations are concerned, these tensions may be exacerbated.

On the other hand, service coordination provides offsetting benefits to these tensions. Service coordination provides access to unavailable resources and capabilities. For example, Georgia's links with the federal labs provided facilities and equipment to customers for product testing which

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<sup>24</sup> Also see Eric Oldsman, "Do Manufacturing Extension Programs Matter?" in Philip Shapira and Jan Youtie, eds. *Evaluating Industrial Modernization: Methods and Results in the Evaluation of Industrial Modernization Programs*, Atlanta, Georgia: Georgia Institute of Technology, 1995. In a discussion of his study of the New York Industrial Extension Service, he states on page 76 that, "...thirty percent of the referred firms never called the referral. Some one-on-one assistance may be better than poorly managed referrals."

<sup>25</sup> See Jan Youtie, Philip Shapira, and J. David Roessner, *Manufacturing Assistance Program Needs Assessment Guide Volume 2: Firm-level Needs Assessment Approaches*, p. 17 which reports that some company wide assessments take just 24 person hours to complete, which is much less than the two or more weeks reserved for multi-organizational assessments.

were unavailable in the private sector. Service coordination allows organizations to reach customers they would not otherwise serve. The Southwest Pennsylvania center reported that activity levels in the first year of MEP funding with additional resources and partners were more than twice as high as in the previous year before MEP funding. Another benefit of service coordination is that it uses excess capacity within other organizations. For example, although the primary mission of community colleges is to educate students, this skill can be leveraged to provide training to manufacturers. Centers leverage this skill for community colleges by providing outreach resources and needs assessment capabilities to link the community college and small and medium-sized manufacturer. Service coordination thus can improve quality through bringing other organizations' special expertise and perspective to more customers.

The benefits of service coordination also include enhanced organizational flexibility, allowing a core organization to involve and use the resources and expertise of other groups on an as-needed basis, rather than hiring (and supporting) dedicated internal staff. This flexibility helps MEP centers to meet evolving or unpredictable needs and fast-changing developments in technology. To some extent, a service partnering strategy further provides latitude in adjusting to changes and uncertainties in funding levels—although it must also be said that service partnering is likely to be most effective when core partners can maintain a long-term perspective and invest in mutually beneficial relationships and projects over time. Service partnering also offers opportunities to generate fee revenue from customer services and projects, as illustrated in the Chicago case, and to involve private-sector resources.

The fact that over 750 external organizations are involved in the MEP indicates that the organizations capable of providing some type of assistance to small and medium-sized manufacturers are numerous and complex. Research in Washington State identified 600 programs serving manufacturers; the New York program referred its customers to over 435 organizations.<sup>26</sup> Service coordination can address this problem by helping to reduce duplicative service provision. In Cleveland, the center and its sister labor-management service provider were simultaneously and independently gearing up to offer ISO 9000 services. Their interlocking oversight boards identified these activities and the two organizations have now collaborated on developing, marketing, and delivering a single, more comprehensive service offering. Their manufacturers do not have two non-profit organizations knocking on their door offering to provide the same service. Helping to rationalize this vast array of assistance programs is a key coordination role for MEP centers. ■

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<sup>26</sup> See Philip Shapira and Jan Youtie, eds. *Evaluation Industrial Modernization: Methods and Results in the Evaluation of Industrial Modernization Programs*, Atlanta, Georgia: Georgia Institute of Technology, 1995, p. 151.



## 5. BEST PRACTICES AND POLICY IMPLICATIONS

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This final section considers best practices and policy implications identified through our studies of service coordination in the Manufacturing Extension Partnership.

### 5.1 Best Practices in Service Coordination

Methods of organizing industrial modernization services vary across MEP programs, reflecting differences in local circumstances, institutional histories, capabilities, funding arrangements, and program and service strategies. Yet, it is also apparent from the case studies that “best practices” in service coordination are observable. These practices—when combined together in ways appropriate to local conditions and coupled with supportive funding, staffing, and other elements—are most likely to result in what is most important to industrial customers: ensuring that delivered industrial modernization services are effective, strategic, and consistent. The best practices in service coordination identified through the cases include:

- ❶ Shared system-wide partnership vision, in which centers select certain partners and arrangements that fit their program’s vision
- ❷ Structured flexibility, through which MEP programs consciously consider and anticipate the evolution of partner capabilities and relationships
- ❸ Joint marketing efforts — such as uniform marketing materials, jointly sponsored seminars and workshops, and co-locations
- ❹ Cross-training, which allows organizations to learn skills and capabilities from one another
- ❺ Shared information, through formal methods or through informal means
- ❻ Development, sharing, and usage of tools such as assessment protocol and database systems
- ❼ Coordinated referral systems which qualify and disseminate information and ease access of small and medium-sized manufacturers to the most appropriate service providers
- ❽ Collaborative service delivery of assessments and projects
- ❾ Specific mechanisms (e.g., staff functions, networks) to promote, monitor, and facilitate paperwork and other requirements of partnerships.
- ❿ Partnership performance review, both review of individual partnership accomplishments relative to what was promised in a contract or memorandum of understanding and review of partnerships in context of changing industry needs and existing resources.

## A shared system-wide partnership vision

For the centers observed in this project, partnerships are a means to an end rather than an end themselves. Centers select certain partners and arrangements that fit their program's vision. Different program visions lead to different partnership coordination styles. For some, particularly newer programs, this approach is reflected in multi-organizational team management of the program. For others, such as long-standing programs, the center designates a role for the partner that fits into the program's strategy; for example, the partner may provide a key service or access to certain segments of new customers.

## Structured flexibility

Partnerships need to combine "structure"—crucial to defining relationships and effective operating frameworks—with "flexibility" to evolve those relationships over time to meet changing conditions and reflect learning about capabilities and limitations. In many cases, existing linkages between MEP centers and other service providers must still be regarded as experimental and formative. Indeed, even over the short period of this study, centers have added partners and either increased or reduced the role of others. In some cases, centers have moved from an initial larger group of partners to define a smaller core set of affiliated organizations. Frequently, contracts with partners have been modified and changes have been made in such mechanisms as strategic plans and formal partner meetings. None of the centers completely broke ties with a partner organization, however inactive that organization was, particularly those organizations which were part of the initial proposal.

Yet, even though partnerships inevitably grow and change over time, this process should not be dictated solely by external events or short-term internal opportunities. Best practice involves the conscious consideration and anticipation of how partner capabilities and links might evolve. Strategies, plans, and organizational mechanisms should address partnership development over time. In several instances, this had been done through STEP planning projects. It is perhaps less evident in MEP plans, partly due to tensions with the need to sustain funding, which encourages centers to propose that they already have all the strategic pieces in place, rather than admit—in writing—that some of those pieces have weaknesses. Yet, verbally, most MEP managers will openly discuss the realities of partner links and how they see those links evolving. In the early years of these partnerships, considerable attention is paid to mechanisms for creating awareness and understanding between organizations such as various forms of meetings, presentations, and cross-training. Later years emphasize differential linkages, more active evaluation procedures, joint outreach and assessment projects, and established mechanisms for referrals and outsourcing. Taking a strategic approach is particularly important for organizations with known problems such as universities and their lack of timeliness, federal laboratories and their administrative barriers, private-sector consultants and their higher cost, and economic development organizations and their limited technical capabilities.

## Joint marketing efforts

Joint marketing among partners efficiently increases the number of manufacturing customers. Often public-sector organizations are asked to provide services which are secondary missions of the organizations—for example, educational institutions providing employee training may not have the funds to market these services. For some private-sector organizations, the cost of marketing to small and medium-sized manufacturers presents a cost barrier which the center can help overcome. However, the center may not be able to access geographically or otherwise inaccessible manufacturers.

Joint marketing practices include uniform marketing materials, jointly sponsored seminars and workshops, and co-locations. Uniform marketing materials diminish the complexity in, and help

make sense of, the large and diverse number of service providers. Uniform materials present a single image to the customer. The ability of the partners to agree on and adopt uniform marketing materials is a reflection of a shared system-wide partnership vision. Joint seminars leverage resources among organizations to cover the costs of reaching many manufacturing customers with a single group event. Co-locations share the cost of placing center staff throughout the state or region. Another impact of co-location is that it encourages synergism.

## Cross-training

Cross-training allows organizations to learn skills and capabilities from one another, as well as obtaining a better understanding of each other's operations. Centers practice two levels of cross-training. One level involves imparting specialized knowledge through running internal seminars and workshops. The partners do not necessarily acquire each other's skills to provide the services themselves. Rather, they teach enough of the skills so that manufacturing assessments can uncover a broader range of needs.

The second level of cross-training involves imparting the center's approach and process for delivering services. Examples include training project managers in facilitation skills so that all project results are presented in the same manner, regardless of which organization manages the project.

## Shared information

Best practice includes regular communication among organizations through system-wide electronic information systems, regular partnership meetings, or other regular informal means. Several centers have electronic information systems accessible by all program partners. This provides a systematic way for sharing information which is unobtrusive--organizations do not have to call one another to obtain recurring information about customers, contacts, projects, or activities. On the other hand, personal knowledge of the partners remains important and is the more common way of sharing information among long-standing multi-organizational arrangements.

## Development and sharing of tools

Federal funding has encouraged several centers to collaborate on projects to develop tools such as assessment protocol and database systems. These tools have in turn been used by smaller centers within the MEP system. Sharing of tools saves development costs, particularly for smaller centers. It also lowers costs throughout the system in that multiple centers are not simultaneously expending resources to develop the same tool. Sharing of tools also promotes cohesion across the MEP system.

## Coordinated, program-wide system for making referrals

Referrals of experts to address manufacturing problems should not vary depending on the program manager or field engineer providing the referral. The best practice is based on a system in which everyone in the program reaches similar conclusions about how to access the subset of service providers capable of addressing the customer's problem. Formal interviews with consultants and service providers and shared databases with information about these providers illustrate ways in which centers aim to ensure that all project staff have common knowledge about referral sources.

There is a tension between providing the best referrals and ensuring equity to all appropriate service providers. One approach involves precise framing of the request for assistance such that only the relevant service providers emerge. The need to ensure equity is established through

allowing all appropriate service providers access to the process. Access may include providing multiple referrals to a customer and electronic or traditional requests for quotations or proposals.

### Collaborative service delivery

Collaborative service delivery extends beyond the realm of referrals. Multi-organizational assessment and project teams produce observations and recommendations that may not otherwise surface in assessments and projects conducted by single institutions. Nevertheless, multi-organizational teams can create problems--administrative delays, lack of appropriate skills and capabilities by one or more organizations represented on the team, inability of the organizations to work well together, legislative or other barriers. The best practice pertains to organizations with high levels of knowledge about each other's core competencies. Hence, good multi-organizational teams take time to build. Teams may pilot or conduct smaller engagements in the early stages to work out roles, procedures, and deliverables before going on to larger projects.

### Specific mechanisms to promote partnership

Partnerships do not happen by themselves. They can take a back seat to project work, outreach activities, and other daily operational issues. Somebody has to promote and monitor partnerships. Furthermore, customers interactions with partners need facilitation, particularly interactions involving larger partners with substantial paperwork requirements. The centers observed in this project established functions to promote partnership within their organizational structure. For example, brokers/agents assess manufacturers needs and link them to public- and private-sector service providers. Oklahoma's Regional Coordination Councils organize existing resources to help broker/agents effectively identify and link the appropriate service providers to small manufacturers who need their services. Georgia's Technology Linkages Office establishes personal relationships with federal laboratory and university departments, then frames customer problems such that these organizations will respond and assist the manufacturer.

In the promotion of partnerships, a key element is interpersonal relationships among key organizational managers and staff members. Effective partner relationships develop where good personal rapport exists between the parties. Institutionalizing communications through cross-training and other mutually beneficial mechanisms providing positive reinforcement creates a deeper level of trust so that the partnership's effectiveness does not hinge on the ability of one individual.

### Partnership performance review

A center cannot be judged as having good partnerships simply by counting the number of organizational linkages. Some partnerships add significant value to the center. Some do not perform tangible functions for the organization or the customer, rather they are included to enhance the center's political acceptability or reputation. Some partnerships fall in between these two extremes in that they have the potential to add value, but their contribution has to be adjusted to accommodate differences in inter-organizational operating style, learning over time, changes in the needs of the region's industrial base, or other factors. Partnership performance review is an important practice for dealing with differences in organizational partner performance.

Two types of partnership performance review are practiced. One focuses on partnership accomplishments relative to what was promised in a contract or memorandum of understanding. When accomplishments fall short of contractual promises, centers practice partnership performance review to reduce partner roles through means such as funding changes. The second is a systematic review of partnerships in the context of changes in the external environment. Changing industry requirements produce new manufacturing assistance needs. When new needs arise, periodic center reviews determine whether the new needs can be addressed through in-

house resources, existing partnerships, or new partnerships. Deliverable reviews determine whether the end product is still appropriate in meeting industry needs. External resource reviews periodically inventory the availability and capabilities of private- and public-sector service providers.

## 5.2 Policy Implications and Conclusions

The study finds that policy choices and strategies have considerable influence on the formation, operation, and sustainability of linkages among and between the numerous organizations that provide industrial modernization services in the United States. These influences are apparent at different levels. At the national level, federal initiatives—through such programs as TRP and MEP—have stimulated state and local service providers to work together in more coherent ways than previously. The analysis of 40 MEP centers showed affiliations and linkages with more than 750 external organizations in the public and private sectors. These linkages were boosted by the TRP process that included a specific item relating to service coordination. TRP proposal advisors also played a role. As we saw in the examples studied, this advice encouraged one state to add partners and another state to merge competing applications submitted by two different consortia. Similarly, NIST STEP planning grants resulted in designing programs around a flexible brokering model with outside service providers rather than developing more comprehensive in-house capabilities.

Without the stimulation and support of federal funds and its explicitly required service coordination, it is unlikely, in our judgment, that the often extensive alliances and partnerships now seen in the industrial modernization field and documented in the case studies would have occurred. This is not a universal rule. In some instances, states and local groups were coordinated prior to federal activity. These centers carried forward their existing inter-organizational arrangements. In a few cases, federal funds are unable to break down deep-rooted “turf” lines between competing organizations. However the role of recent federal funding for industrial modernization mostly has been to promote a great deal of cooperation among different service providers in particular localities, among both pre-existing and new programs. In answer to the first question posed at the outset of the study (see introductory section), we do conclude that MEP sponsorship and intervention has led to greater service coordination among industrial service providers at the regional level.

At the state level, MEP policy initiatives to promote service coordination can be and have been effective in getting different institutions and organizations to better work together. The study showed considerable variation among state policy-makers in their attention to this element. In our case studies, there were instances where states had sought to promote service coordination alongside (and occasionally prior to) federal efforts. Mostly there was “benign neglect” of issues of service coordination at the state level, even with the current interest in performance-based budgeting, quality service delivery, and customer satisfaction among public services across the board. We can therefore also conclude that states largely would not have encouraged service providers to join together to deliver services to manufacturers in the absence of MEP funding.

Within particular programs, MEP funding encouraged centers to develop formal arrangements with outside organizations that would not otherwise have occurred, or would have occurred to varying degrees. In almost all cases, modernization programs developed a wide range of informal alliances and linkages, and in some instances well-developed formal arrangements were established through the program’s own initiative. For new programs, developed under stimulus of TRP and MEP, service coordination has been built from the beginning into the program design. But for the most part, particularly for some long-established programs as our cases found, it really took the stimulation of federal TRP and MEP funding for serious attention to be paid to coordination.

In some ways, service coordination is an “externality” which benefits customers and regional economies more than can be often captured by individual programs for institutional and economic reasons. Indeed, as we noted earlier, there are sometimes costs to coordinating services which are not always recaptured by improved internal efficiencies. In this regard, the role of outside sponsors, such as the federal TRP or MEP, in stimulating industrial modernization programs to work more closely together in strategic and tactical ways is most crucial. Once programs are

better coordinated, it is possible—as the advantages become more apparent—that coordination will be self-sustaining. The growing momentum to “reinvent” and improve the quality of public services will aid this. From a pragmatic perspective, however, continued efforts at coordination are most likely to be encouraged by continued attention to this element by outside program sponsors.

The increased service coordination we observed in our study has, in our view, also led to improvements in the ways industrial modernization services are provided (the second question posed initially for this study). In addition to the increased scale of service provision (an expected effect of increasing funding levels), the encouragement of service coordination has made available a wider range of expertise to firms and, in many instances, a more systematic approach to providing assistance. Drawing on other partners has allowed MEP centers to maintain flexibility and helped them, particularly the newly established centers, to “ramp-up” their services fairly quickly by drawing on existing resources in the locality. In these and other ways, the quality of service provision has been improved. However, the evidence is less clear about the effects of service coordination on increasing the quantity of services provided for a given level of resource expenditure. On the one hand, involving a wider array of local organizations has brought a new set of public and private resources into play with a focus on the industrial modernization mission. In this regard, there has been an important “leveraging” impact. At the same time, it is also apparent that these resources have costs (they are being paid for from either public or private sources, albeit not fully by the MEP program) and that service coordination in itself has expenses, particularly in terms of transaction arrangements, consultation, and monitoring which do occupy resources and which lead to some diminishment of any leveraging effect.

Finally, we do find that best practices in service coordination can be identified (the third question asked at the beginning of the study). Drawing on our cases, we identified a series of service coordination best practices. Discussed in detail in the preceding section, these practices included developing a shared system-wide partnership vision, joint marketing efforts, cross-training of staff from partner organizations, sharing information and tools, coordinating referral systems, collaborating in service delivery to customers, and establishing specific mechanisms to promote the partnership and ensure partner performance review. We believe it would be useful to make these best practices more widely known and disseminated within the national MEP system. The mechanisms to do this could certainly include circulating information about these practices through written and electronic forms. However, most useful, in our view, would be efforts to promote information and experience exchange across different MEP programs through forums, training events, and exchanges of personnel. The development and dissemination of case examples where firms have been assisted through coordinated services might also prove helpful (several such examples are documented in the full program case studies). And, of course, continued attention to issues of service coordination in program reviews, periodic guidance to program managers, and funding decisions are most important. ■

## Appendices

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- Table A.1.  
Manufacturing Extension Partnership Centers: Number of Affiliate and Linked Organizations Reported by Center
- Table A.2.  
Manufacturing Extension Partnership Centers: Affiliated Organizations, By Type
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- Table A.5.  
Manufacturing Extension Partnership Centers: Linked Organizations by Type of Service Provided

**Table A.1**  
**Manufacturing Extension Partnership Centers:**  
**Number of Affiliate and Linked Organizations Reported by Center**

<b>Manufacturing Extension Partnership Center</b>	<b>Number of Affiliated Organizations</b>	<b>Number of Linked Organizations</b>	<b>Total (No Duplicates)</b>
Arkansas Manufacturing Extension Network	14		14
Arizona Regional Office	4		4
Alabama Technology Network	10		10
California Manufacturing Technology Center		16	16
Chicago Manufacturing Technology Extension Center	8	35	43
Connecticut State Technology Extension Program	1	21	21
Delaware Manufacturing Alliance		5	5
Florida Manufacturing Extension Partnership, Inc.	30		30
Great Lakes MTC, Ohio	9	107	108
Georgia Manufacturing Extension Alliance	3	27	27
Idaho Manufacturing Alliance	10		10
Iowa MTC	7	1	8
Montana Manufacturing Extension Center	9		9
Maryland Manufacturing Modernization Network	2	1	3
Mid-America MTC --Kansas	9	26	27
Mid America MTC -- Colorado	8	10	10
Manufacturing Extension Partnership of SW Pennsylvania	15		15
Massachusetts Manufacturing Partnership	9	22	29
Michigan MTC	6	32	38
Mississippi Polymer Institute and Pilot MEC	5		5
Miami Valley Manufacturing Extension Center	1	33	33
North Carolina Alliance for Competitive Technologies	10	3	10
New Hampshire Regional MTC	3		3
New Jersey Manufacturing Extension Partnership	4		4
Northeast Pennsylvania MEP	1	30	31
Nebraska Industrial Competitiveness Service	10		10
New Mexico MEP	9	8	17
Northwest Wisconsin MOC	6	26	32
New York City Industrial Technology Assistance Corp.		5	5
New York MEP	10	18	28
Oklahoma Alliance for Manufacturing Excellence	34	34	52
Pollution Prevention Center, California	6		6
Plastics Technology Deployment Center, Ohio-Pennsylvania	2	19	20
Regional Manufacturing Outreach Center in NE Ohio	3		3
Southeast MTC, South Carolina	11	22	24
Tennessee MEP	6		6
Utah Manufacturing Extension Partnership	5		5
Washington Alliance of Manufacturing	10		10
Western New York Technology Development Center		5	5
Vermont Manufacturing Extension Center	8		8
<b>Total (without duplicates)</b>	<b>305</b>	<b>513</b>	<b>757</b>
<b>Mean (Organizations per Center)</b>	<b>7.4</b>	<b>12.5</b>	<b>18.5</b>
<b>Median (Organizations per Center)</b>	<b>7</b>	<b>5</b>	<b>10</b>

- Source: Analysis of National Institute of Standards and Technology, Manufacturing Extension Partnership, Quarterly Reports, updated through to Fourth Quarter 1995 (based on 40 centers reporting; data for 19 other centers not available). Column totals exclude duplicated organizations. MTC = Manufacturing Technology Center; MOC = Manufacturing Outreach Center; MEP = Manufacturing Extension Partnership. An affiliate may have been included in the original funding proposal, serve as a core service partner, or otherwise have a financial tie to the center. Linked organizations tend to be used as service providers on specific projects and generally have a non-managerial relationship to the center.

**Table A.2.**

**Manufacturing Extension Partnership Centers:  
Affiliated Organizations, By Type**

Type of Affiliated Organization	Number of Affiliated Organizations	Percent of All Affiliated Organizations	Percent of Centers Affiliated With This Type of Organization
Technology center/business assistance center	55	27.5	80.0
Community college/vocational institute	51	25.5	48.0
University/college	37	18.5	56.0
Non-profit economic development organization	15	7.5	24.0
SBDC	11	5.5	40.0
State or local government	10	5.0	24.0
Utility	8	4.0	16.0
Federal lab or agency	4	2.0	16.0
Private consultant or firm	3	1.5	12.0
Other for-profit firms	2	1.0	8.0
Training organization	2	1.0	8.0
Industry association	1	0.5	4.0
Cooperative extension	1	0.5	4.0
<b>Total</b>	200	100.0	-

- Source: National Institute of Standards and Technology, Manufacturing Extension Partnership, Quarterly Reports, Fourth Quarter 1994. Table based on 25 centers reporting. An affiliate may have been included in the original funding proposal, serve as a core service partner, or otherwise have a financial tie to the center.

**Table A.3.**  
**Manufacturing Extension Partnership Centers:**  
**Linked Organizations, By Type**

Type of Linked Organization	Number of Linked Organizations	Percent of All Linked Organizations	Percent of Centers Linked With This Type of Organization
Technology center/business assistance center	94	19.5	87.5
Non-profit economic development organization	78	16.2	58.3
Private consultant or firm	72	15.0	66.7
Industry association	36	7.5	50.0
University/college	58	12.0	83.3
Community college/vocational institute	46	9.5	50.0
State or local government	22	4.6	45.8
Training organization	17	3.5	37.5
SBDC	14	2.9	41.7
Other for-profit firm	14	2.9	25.0
Federal lab or agency	16	3.3	20.8
Utility	12	2.5	25.0
Cooperative extension	3	0.6	12.5
<b>Total</b>	<b>482</b>	<b>100.0</b>	<b>-</b>

- Source: National Institute of Standards and Technology, Manufacturing Extension Partnership, Quarterly Reports, Fourth Quarter 1994. Table based on 24 centers reporting. Linked organizations tend to be used as service providers on specific projects and generally have a non-managerial relationship to the center.

**Table A.4**  
**Manufacturing Extension Partnership Centers:**  
**Linked Organizations by Service Delivery Method**

Delivery Method	Number of Linked Organizations Using Delivery Method	Mean Number of Linked Organizations per Center
Information-related assistance	352	14.7
Referrals	272	11.3
Consulting/hands-on assistance	278	11.6
Training	228	9.5
Assessments	212	8.8

- Source: National Institute of Standards and Technology, Manufacturing Extension Partnership, Quarterly Reports, Fourth Quarter 1994. Table based on 27 centers reporting. Linked organizations tend to be used as service providers on specific projects and generally have a non-managerial relationship to the center.

**Table A.5**  
**Manufacturing Extension Partnership Centers:**  
**Linked Organizations by Type of Service Provided**

Service Type	Number of Linked Organizations Providing Service	Mean Number of Linked Organizations per Center
Manufacturing/technology	229	9.5
Business management/finance	218	9.1
Engineering/design	186	7.8
Supplier interactions/networking	183	7.6
Quality	150	6.3
Human resources	144	6.0
Environmental issues	133	5.5
Defense conversion/marketing	104	4.3

- Source: National Institute of Standards and Technology, Manufacturing Extension Partnership, Quarterly Reports, Fourth Quarter 1994. Table based on 27 centers reporting. Linked organizations tend to be used as service providers on specific projects and generally have a non-managerial relationship to the center.