

Year 1 Evaluation of the Maine Technology Institute Grant Programs

For Development Awards and Seed Grants Ending as of June 30, 2002

**Center for Business and Economic Research
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USM UNIVERSITY OF
Southern Maine

Center for Business and Economic Research

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Introduction

The Maine Technology Institute has engaged the Center for Business and Economic Research (CBER) at the University of Southern Maine to conduct an evaluation of its Development and Seed Grant Programs to fulfill the requirements of reporting to the Maine Legislature. This project focused on collecting and analyzing information from the first year of the evaluation process.

Sixty-nine grantees completed their projects on or before June 30, 2002, which is the cutoff date for projects evaluated in this report. All organizations with completed grants were mailed a survey by CBER in August 2002. The responses from the sixty-four recipients who returned their surveys are analyzed in this report. Of the five grant recipients who did not return surveys, four had gone out of business and could not be contacted. The remaining recipient, who did not return this survey in this period, will be resurveyed in the next round of surveying in early 2003.

The sixty-four projects examined here represent 16 development awards and 48 seed grants. The total grant amounts awarded to these projects was \$1.81* million, of which \$1.36 million was from the Development Award Program and \$0.45 million represents Seed Grant support. These grants were matched by the recipients with \$2.73 million in cash or in-kind value, bringing the total available resources for research and development to \$4.54 million.

This is the first evaluation of MTI's grant programs. Because the MTI programs provide assistance at the early stages of research and product development, the effects of these grants are likely to only become fully visible with the passage of time. All grant recipients will be resurveyed annually for a period of five years.

Professor Charles Colgan was the Principal Investigator for this project and author of this report. Professor Bruce Andrews served as Project Director. Professors Frederic Aiello and John Sanders served as Research Associates conducting interviews with a sample of MTI clients. Svet Kirtchev served as Research Assistant.

** MTI has awarded a larger amount of grants than that reported here. The figure of \$1.81 million represents only grants closed as of June 30, 2002.*

Summary

At this early stage, MTI support is already showing itself to be very important for the future of Maine's technology-based industries, as evidenced by a high degree of success in supporting research that is capable of generating private sector support and intellectual property protection.

- *MTI grant recipients have undertaken significant product development leading to intellectual property protection.*
 - Recipients have received 19 U.S. and foreign patents, already filed for 45 patents, and intend to file for over 100 additional patents.
 - Firms in Composites & Advanced Materials are most active in seeking patent protection, followed by those in Marine Technologies & Aquaculture.
 - Grant recipients have registered 34 trademarks, copyrights, and trade secrets, and filed to register 23 more. They indicate that they intend to file 71 additional registration requests for trademarks, copyrights, and trade secrets.
 - This level of intellectual property protection activity is significantly higher than in Maine as a whole.

- *MTI grant awards have leveraged \$1.81 million in MTI funds into more than \$16.3 million in additional public and private funding. MTI grants, matching funds, and related grants, loans, and equity investments have added over \$18 million in funding for R&D in Maine.*
 - Additional funding has included \$2.73 million in matching funds from the recipients themselves, \$4.97 million in Federal and other research grants, \$2.93 million in loans, and \$5.72 million in equity financing.
 - This high level of private investment in MTI grant recipients is particularly impressive in light of recent declines in equity markets and Maine's historic lags in attracting equity investments in small companies.
 - Both seed grant and development award recipients attracted grant, debt, and equity funding. Consistent with their purposes, the Seed Grant Program has been most successful in attracting grants, while the Development Award Program has been most successful in attracting equity investments.

- *MTI grant assistance is noted as an important factor in establishing the credibility of firms and projects for securing external funding.*

- *MTI grant recipients are located in thirteen of Maine's sixteen counties.*
 - The largest number and dollar volume of development awards went to recipients in Cumberland County.
 - The largest number and dollar volume of seed grants went to recipients in Penobscot County.

- *Employment increased or was unchanged in 45 of the 57 companies. Net employment across all companies decreased slightly, primarily because of the influence of one company. Small employment effects are expected at this stage of the product development supported by MTI.*

- *MTI's assistance is furthering the process of cluster development in Maine. There is early-stage evidence of promise for commercial success in the various technology sectors. Firms are already having success in national markets, although few are having much success in international markets as yet.*

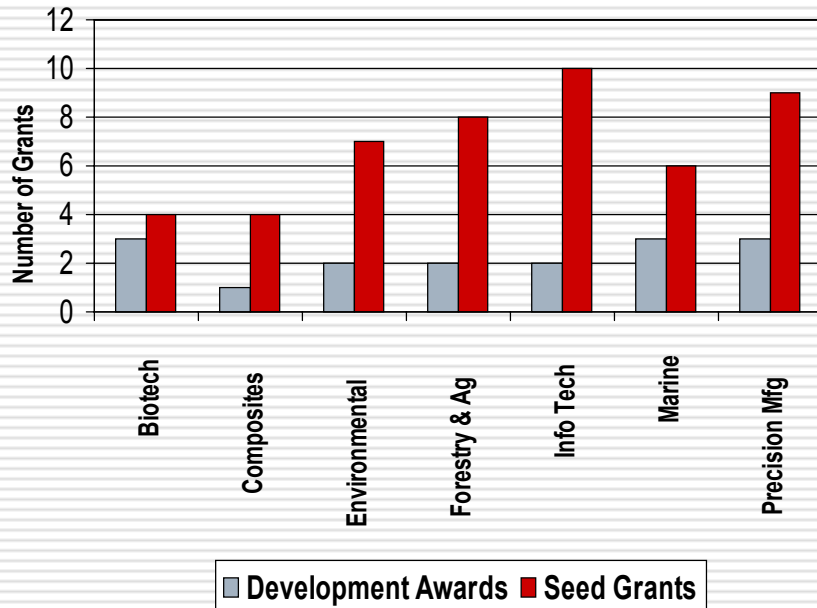
- *Grant recipients give MTI very high marks for providing critical financial and other support .*

Use of MTI Grants

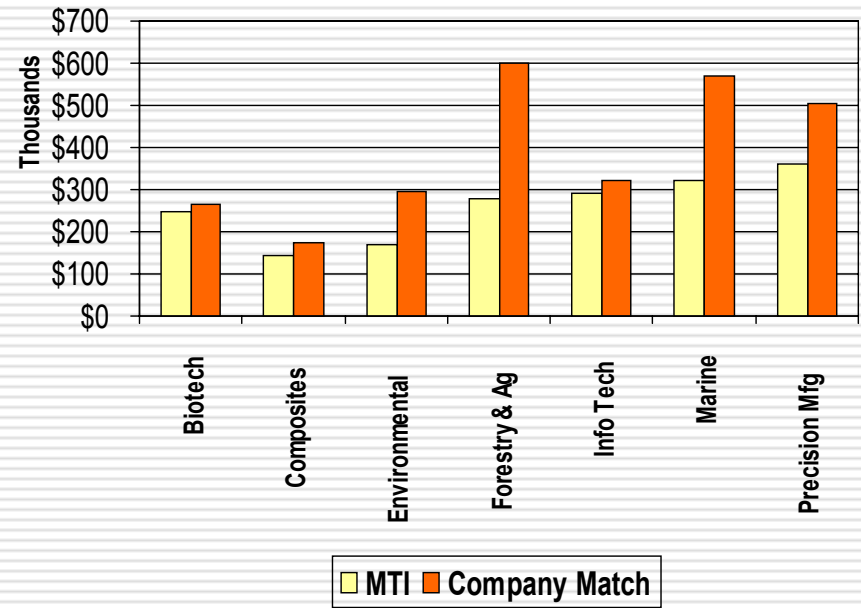
The 64 survey respondents received \$1.81 million from MTI. There were 16 development awards and 48 seed grants. Firms in Information Technology received the largest number of seed grants, while Marine Technologies & Aquaculture received the largest number of development awards.

MTI grant recipients pledged significant resources of their own to the projects they undertook. Recipients matched \$1.81 million of MTI funds with \$2.73 million in their own resources (cash or in-kind), a match ratio of \$1.51 in recipient funds for every \$1.00 in MTI funds. Firms in Forestry & Agriculture (\$2.16 to \$1.00) and Marine Technologies & Aquaculture (\$1.77 to \$1.00) provided the largest match ratios.

Number of Grants by Award Type and Recipient Technology Sector *



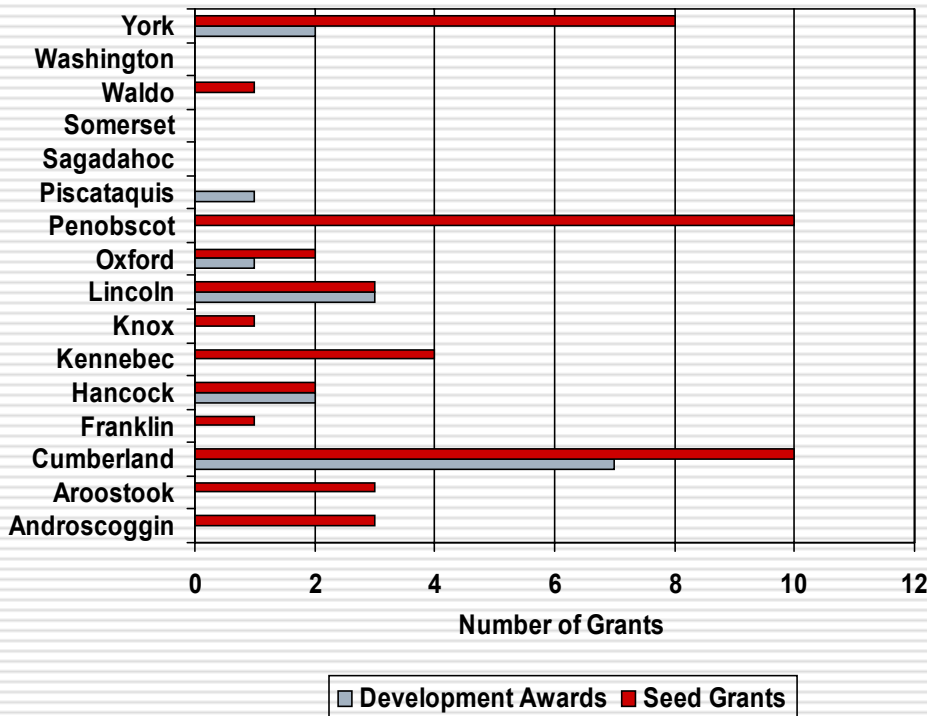
MTI and Matching Funds by Technology Sector*



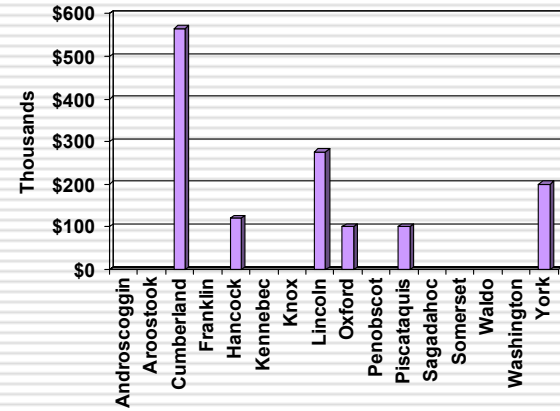
* More detailed information is available in Appendix A-1.

Even in the early phase of MTI's grant programs, funds have been widely distributed across Maine. Survey respondents were located in 13 counties. The 16 development awards were distributed across 6 counties. The 48 seed grants were distributed across 12 counties. The largest number of development awards went to recipients in Cumberland County, while the largest number of seed grants went to recipients in Penobscot County. Cumberland County recipients also received the largest proportion of development award funds, while Penobscot County recipients received the largest portion of seed grants.

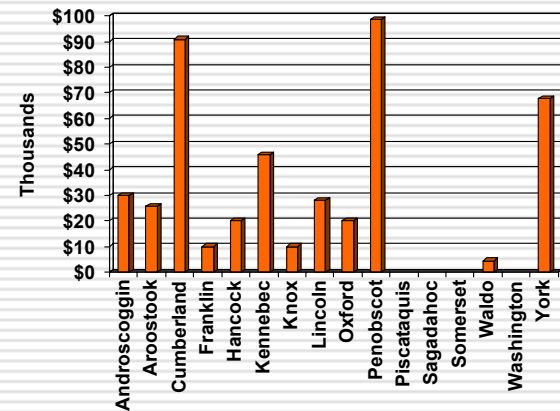
Number of Grants by County



Development Award Funds by County

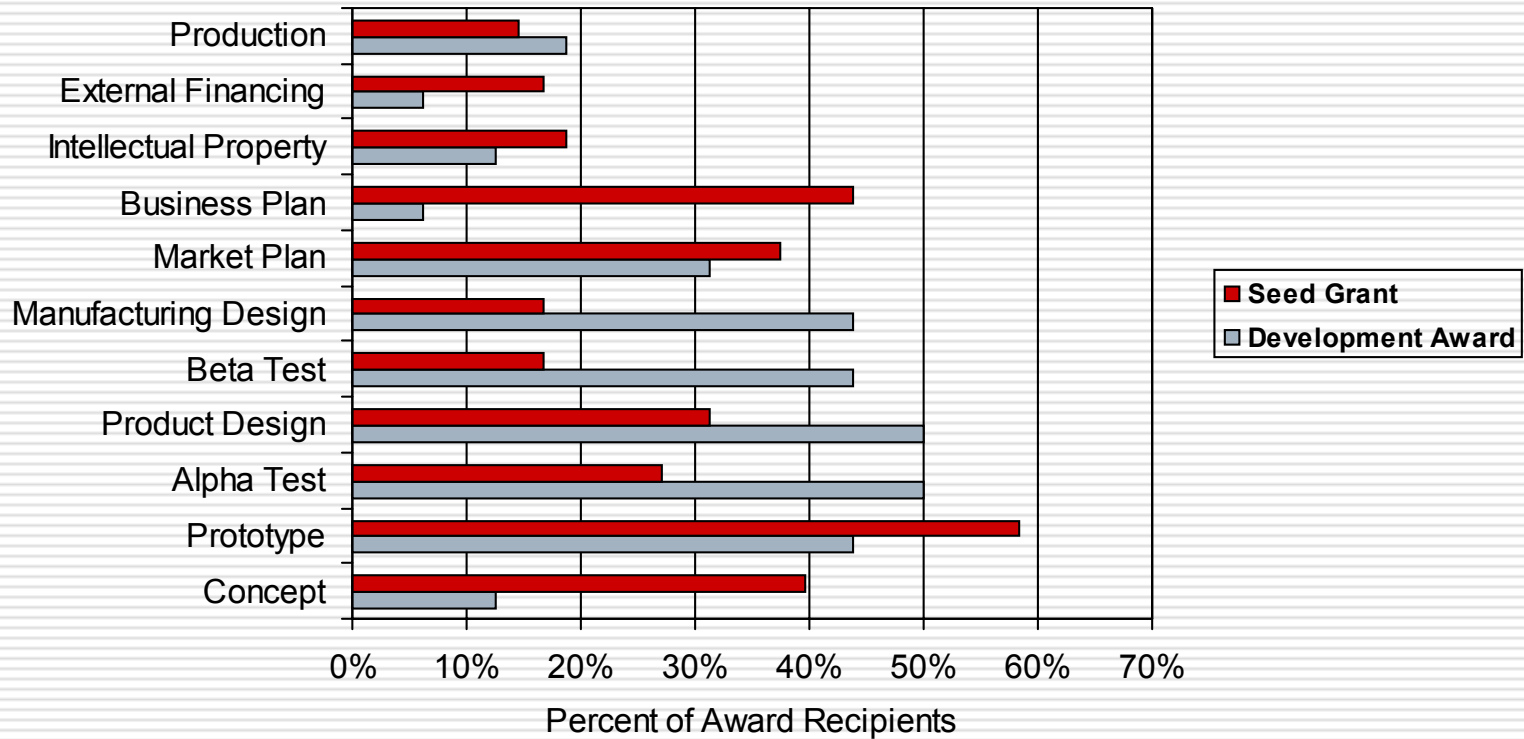


Seed Grant Funds by County



A major feature of MTI's assistance is that it is flexible. It may be used for a variety of purposes related to research and development. All grant recipients reported using the assistance for multiple purposes. Development award recipients were most likely to use funds directly for product development, from prototype development through beta-phase product testing. Seed grant recipients were also most likely to use funds for prototype development, but also commonly used the funds for developing business and marketing plans.

Use of MTI Grants by Grant Type



Changes in Companies

Because this is the first evaluation of MTI grants, there was relatively little change in the grant recipients to be observed. In particular, there was little in the way of revenue growth or employment growth that is likely to be observed at such an early stage. Most recipients of MTI funds were very small organizations, averaging 16 employees. Respondent firms reported little change in their organizational structure; only two firms reported being acquired or merged with other companies.

However, the funding assistance provided by MTI is designed to encourage firms to undertake activities leading to future growth. Critical steps include securing additional funding for research or for taking products from research to market. Also important is the securing of intellectual property protection for the results of the research and development efforts supported by MTI.

Results shown in this next section indicate that MTI firms have been very successful in both endeavors, leveraging (on average) over \$7.50 in additional grant, loan, and equity financing for every \$1.00 of MTI support.

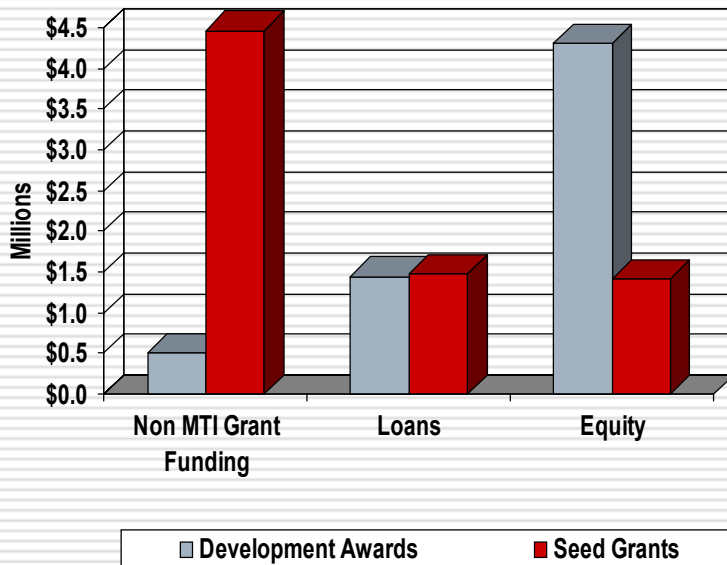
MTI grant recipients also reported aggressive efforts to secure intellectual property protection using U.S. and foreign patents, trademarks, copyrights, and trade secrets.

MTI funds of \$1.81 million leveraged an additional \$13.6 million in funding. Of this additional funding, MTI grantees raised an additional \$4.97 million in grant funding, \$2.93 million in loans, and \$5.72 million in equity investments. Development award recipients were most successful in securing equity investments, while seed grant recipients were most successful in attracting additional grant funding. These results are consistent with expectations for each of these programs.

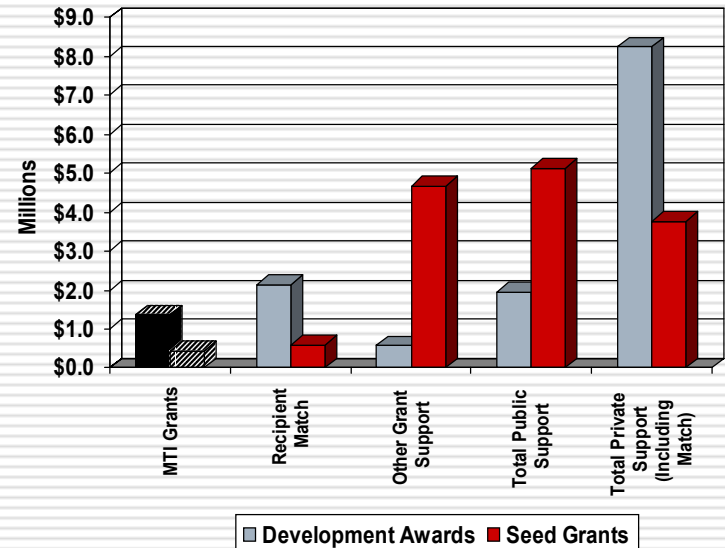
Of the additional funding received, MTI grant recipients raised about \$1.68 in private funds for every \$1.00 in public funding (including MTI support.)

Particularly impressive has been the \$5.3 million in venture capital and "angel" investor funding. This funding came at a time when such capital was becoming more scarce in the wake of the financial market declines. Moreover, as the Maine Science and Technology Foundation *Innovation Index 2002* shows, Maine has historically lagged significantly behind the U.S. in securing such funding.

External Funding for Grant Recipients



MTI Funding Compared with Other Funding for MTI Grant Recipients

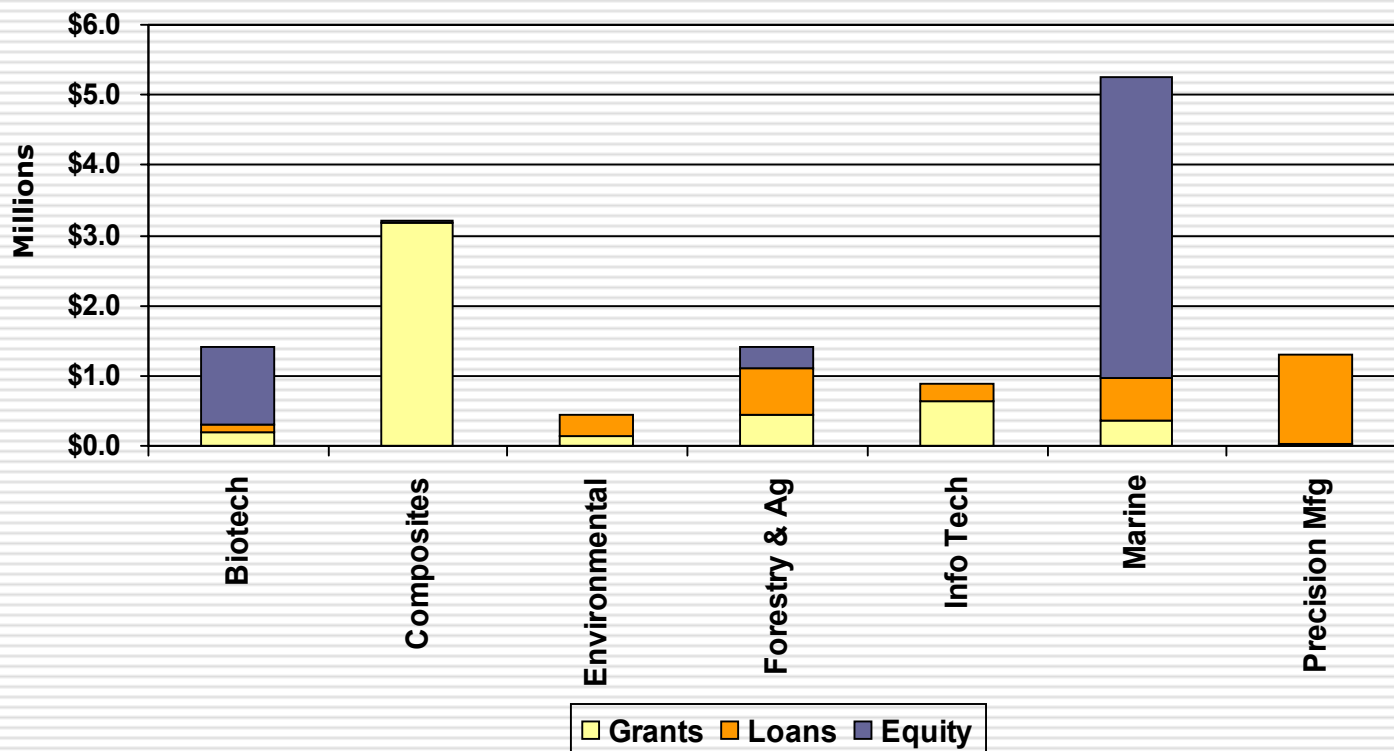


More detailed information is available in Appendix A-2.

Additional funding varies substantially by technology sector, as perhaps would be expected with the relatively small number of recipients at this early stage. Additional research grant funding has been greatest in Composites & Advanced Materials. Marine Technologies & Aquaculture has been the largest recipient of equity funding, followed by Biotechnology. Precision Manufacturing received the largest amount of loan funding.

Care should be taken in interpreting these data, as the large concentration of funding in any one sector was largely the result of a single firm's success. More reliable identification of sectoral trends will need to wait for additional data from subsequent surveys.

External Funding by Technology Sector



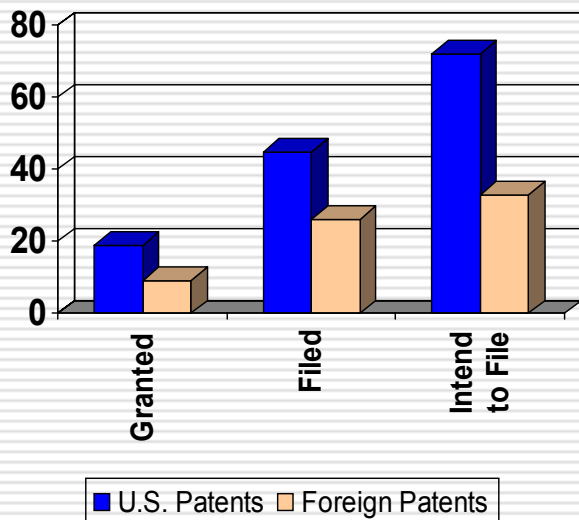
More detailed information is available in Appendix A-3.

MTI recipients have been very active in seeking intellectual property protection for their research and development. They have received 33 U.S. and foreign patents, and indicated that they intend to file for an additional 70 U.S. and foreign patents. They also indicated that they intend to file nearly 100 additional patent applications in the future.

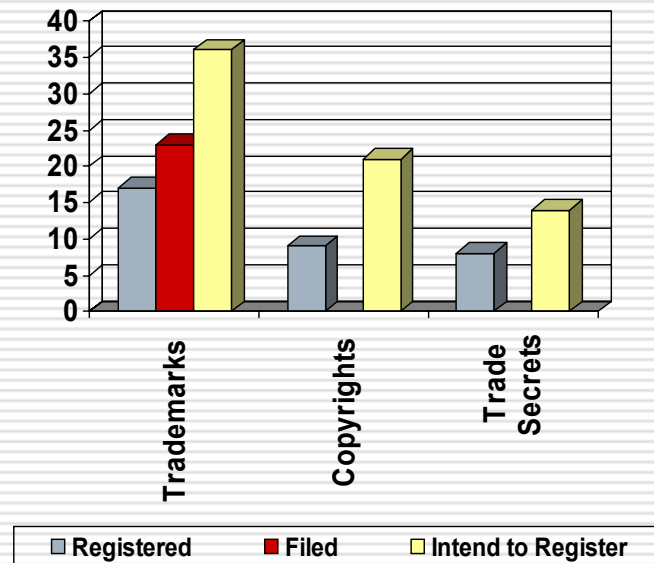
They were also active in using copyrights, trademarks, and trade secrets. Firms reported having registered over 34 of these additional forms of intellectual property protection (half of which were trademarks), and that they intend to submit over 90 applications for protection of their research results.

This level of intellectual property protection, particularly in terms of patent activity, is another important sign of potential future success. As MSTF indicates in the *Innovation Index 2002*, Maine patent activity (adjusted for population) has been essentially constant for 20 years, while activity has significantly risen in the U.S. as a whole. If MTI clients can sustain the level of patent activity suggested by these early results, Maine's patent activity will greatly improve in the near future.

Patent Activity



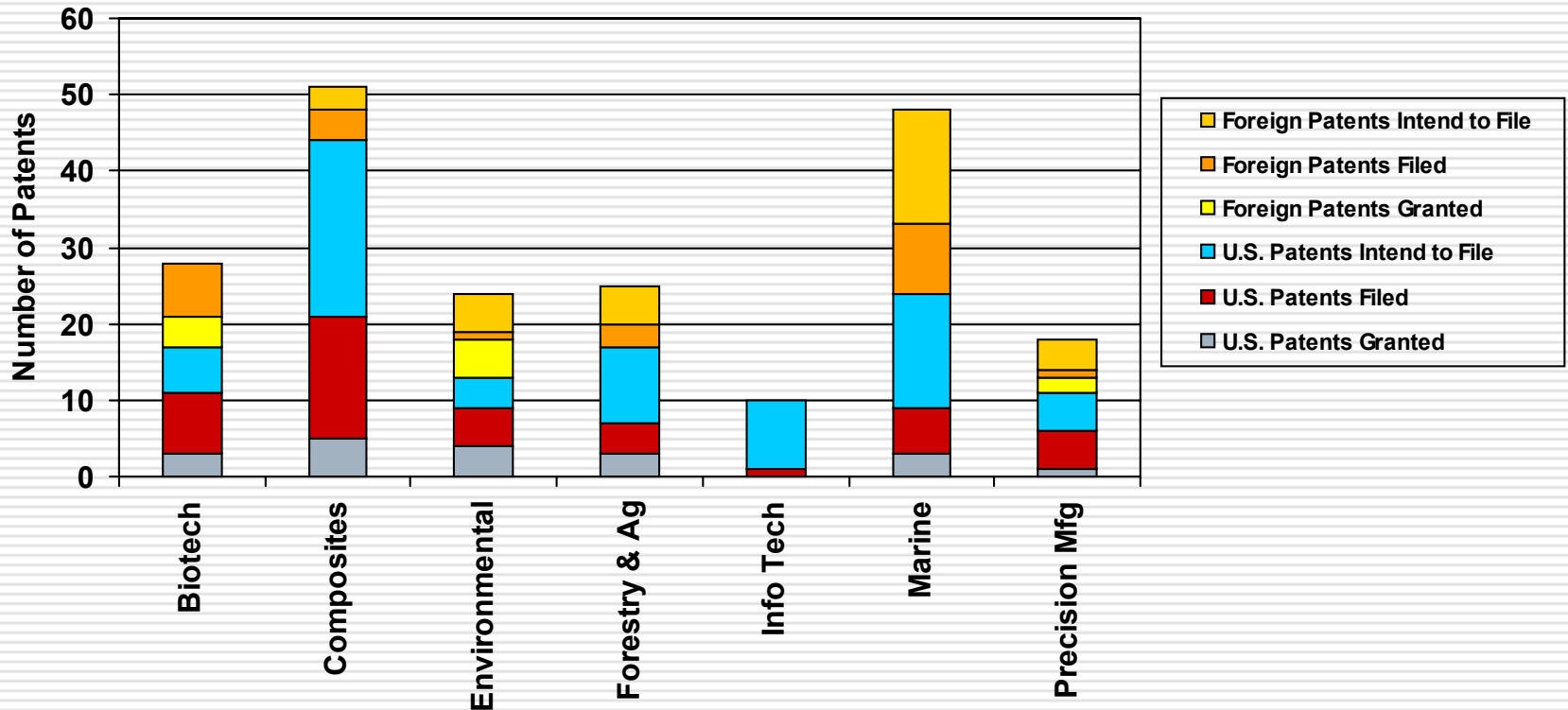
Other Intellectual Property Activity



Note: Copyrights and Trade Secrets are only registered

Firms in Composites & Advanced Materials and in Marine Technologies & Aquaculture have been the leaders in patent activity, although the number of patents held was about equal across five of the sectors. (Since patents are rarely used for software, they tend to be less common in Information Technology.)

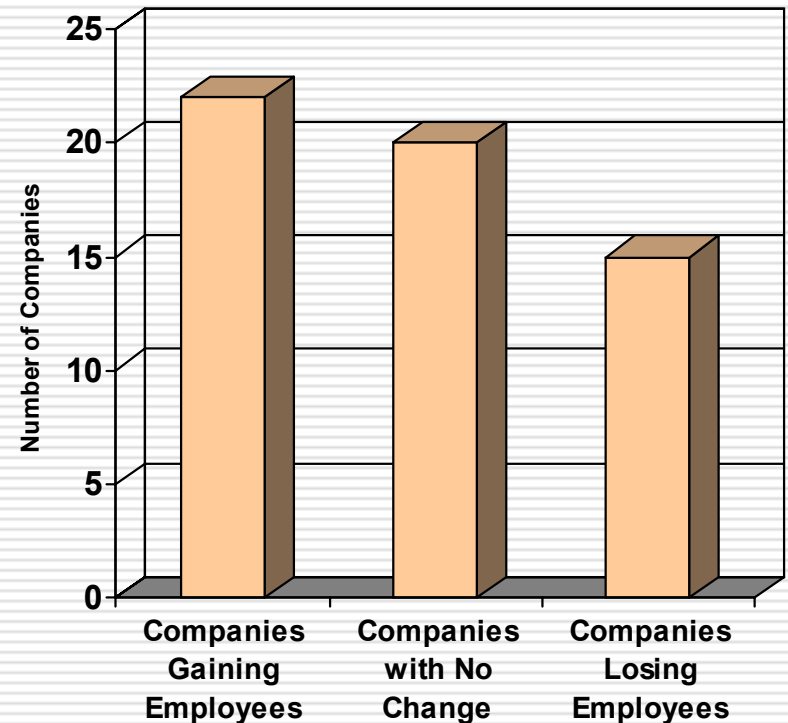
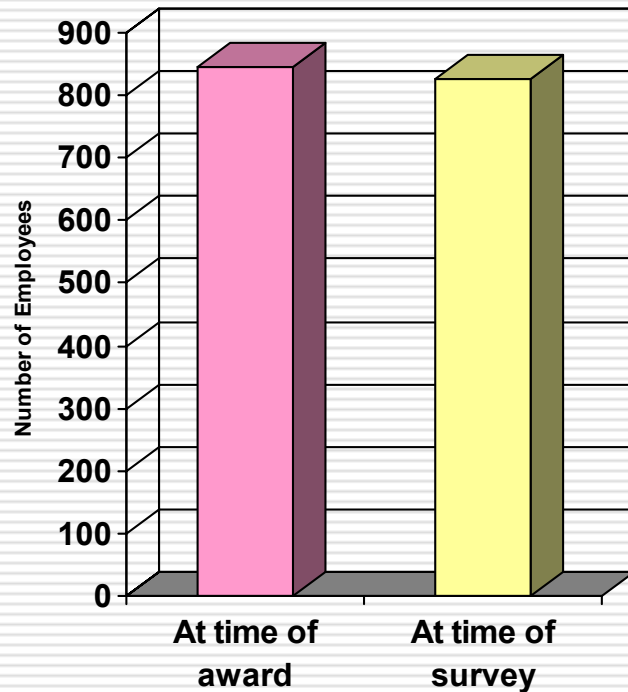
Patent Activity by Technology Sector



Survey respondents employed a total of 843 full- and part-time employees at the time of their awards and 825 after their grants ended, a decrease of 2.1%. The reduction in employment is primarily due to one company. Excluding this company, job gains outnumbered job losses by about 1.5:1. Overall, 22 companies reported growth in employment, 20 respondents indicated no change in employment, and 15 companies reported a drop in employment.

At the early stages of the MTI grant programs, large employment growth in the companies is not expected, since most companies have not moved their products to commercial production. However, it should be noted that MTI assistance often comes at a critical time for small firms, which enables them to maintain operations and retain employees.

Employment in MTI Companies Before and After Grants



Cluster Development Effects

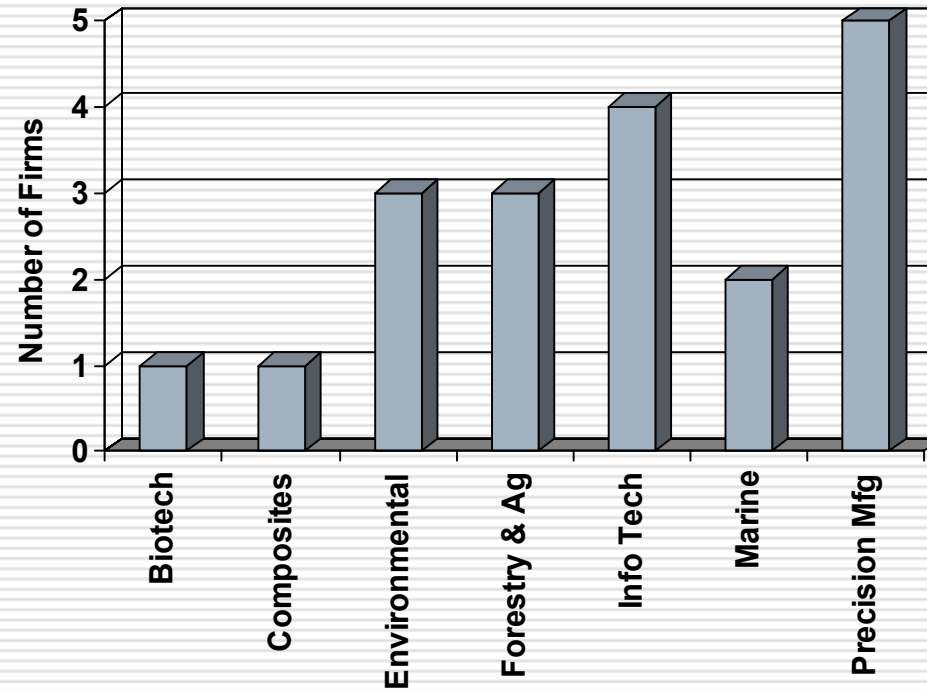
An important goal of the state's research and development initiatives (such as MTI) is to increase the competitiveness of Maine firms by strengthening the "cluster" characteristics of the seven targeted technology sectors. These characteristics are discussed in detail in the MSTF report entitled *Assessing Maine's Technology Clusters* (2002).

Among these characteristics are the kinds of external financing and intellectual property protection activities discussed in the previous section. Findings in that section suggest that MTI grant recipients are likely to make potentially significant contributions to cluster growth, particularly in Composites & Advanced Materials and Marine Technology & Aquaculture. Other cluster characteristics are discussed in this section, including the diversification of revenue sources in the firms and the extent to which firms have been working with other firms (inside and outside of Maine) to compete successfully.

In general, the findings suggest that MTI clients have been undertaking activities that are consistent with strengthening clusters. MTI assistance is leading directly to commercial products, and firms are earning substantial portions of their revenues from the sales of those products rather than relying on grant funding. Firms have a mix of markets inside and outside of Maine, although none of the firms have significant foreign sales as yet. However, MTI recipients rely on Maine suppliers for less than half of their raw material and service inputs. Improving these links will be an important part of improving cluster formation.

Nineteen of the respondents (30%) indicated that the MTI assistance had contributed directly to the creation of products now offered for sale. Nearly half of the respondents who indicated this were in Information Technology and Precision Manufacturing, although there was at least one firm in each of the technology sectors where MTI assistance led to a marketed product.

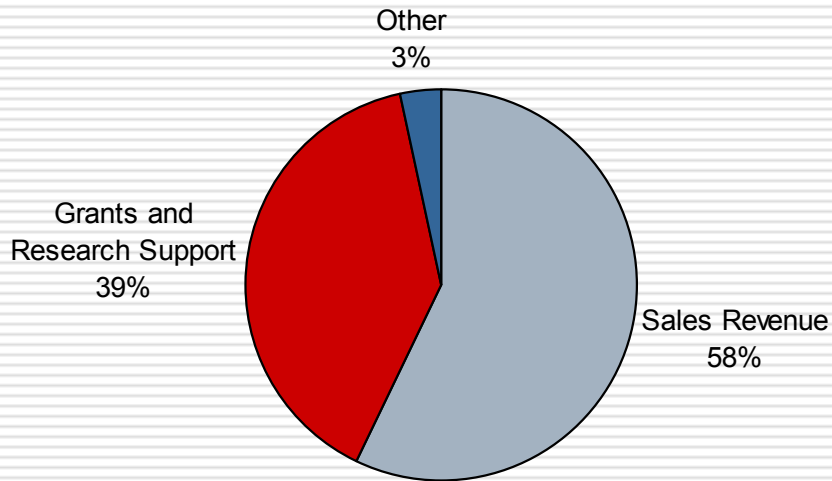
Number of Firms Indicating MTI Assistance Led to Product for Sale



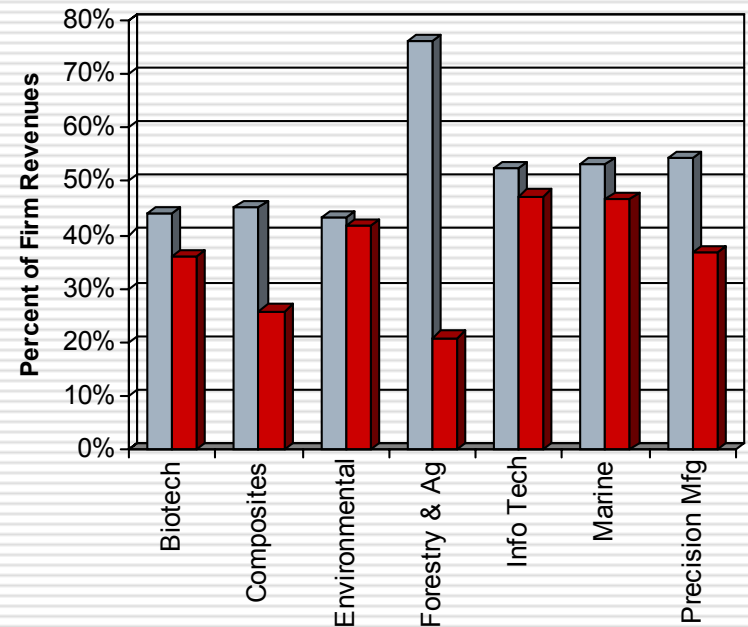
Most of the firms that MTI has assisted were small and heavily focused on research and development leading to new products. Grant assistance is an important part of these firms' potential success, as evidenced by the fact that grant and research support comprised almost 40% of firm revenues. But research grants should give way to product sales over time, if commercial success is to be achieved. MTI clients in this survey had over half of their firm's revenues from product sales.

Forestry & Agriculture firms had the highest proportion of sales to grants, with Composites second. Firms in Marine Technology & Aquaculture were about equal in grants and sales revenues.

Sources of Firm Revenues*



Source of Firm Revenues by Technology Sector*



■ Sales Revenues ■ Grants and Research Support

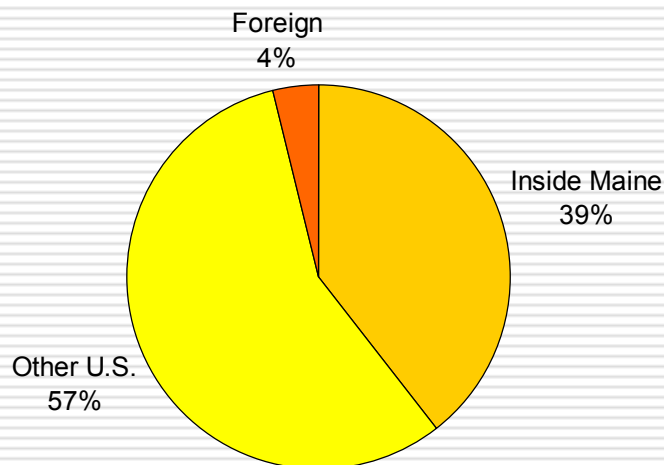
* Percentages are approximate due to missing data.

Overall, respondents indicated that over half of their revenues were derived from sales outside of Maine, which indicated an ability to compete in national markets. However, foreign sales were still very low.

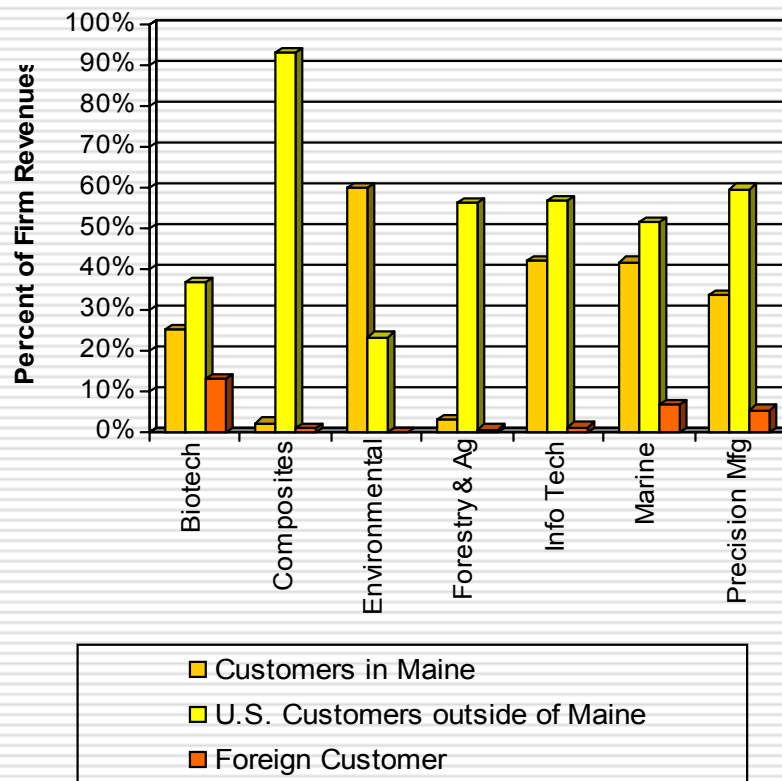
Four of the technology sectors (Composites, Environmental Technologies, Information Technology, and Marine Technologies & Aquaculture) were about split between sales inside and outside Maine. Only firms in Biotechnology and in Forestry & Agriculture had a majority of their sales outside of Maine, and only firms in Environmental Technology and Marine Technology & Aquaculture had export sales.

Destination of Product Sales*

(Among Firms with Products for Sale)



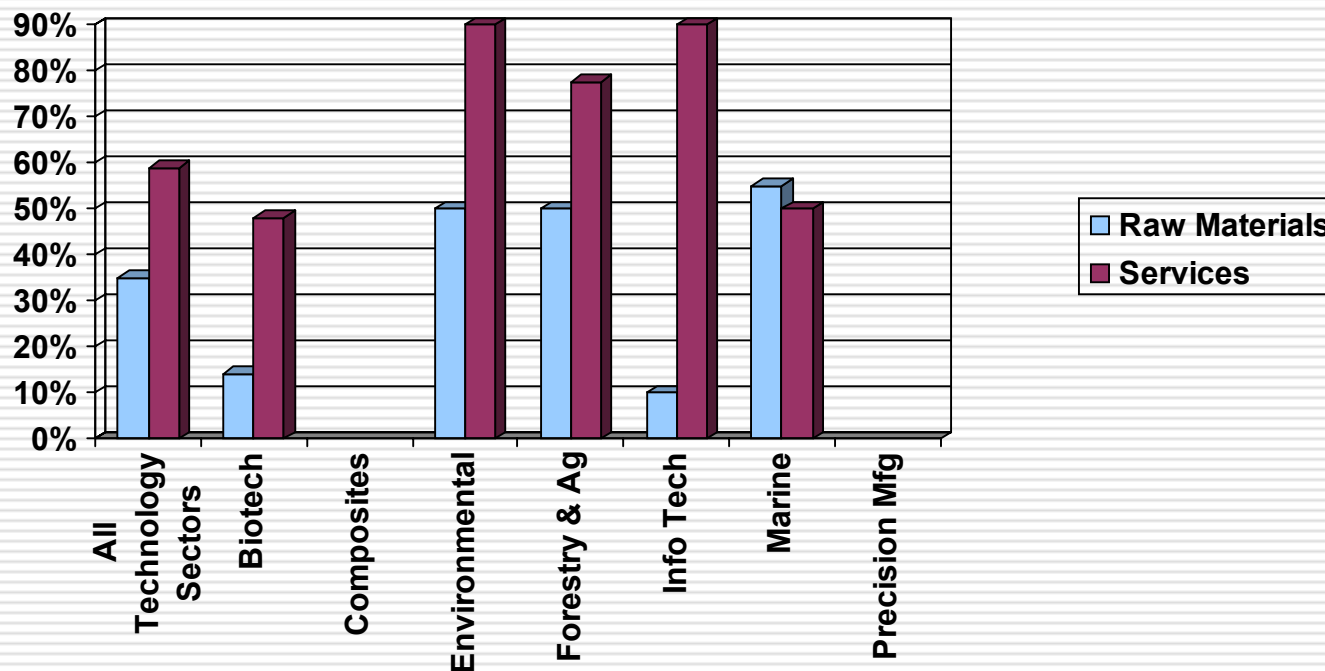
Distribution of Company Revenues*



* Percentages are approximate due to missing data.

Another important element of a successful cluster is the extent to which firms purchase a large proportion of their inputs from other firms in the same region. MTI clients indicated that, in general, they purchased 36% of their material inputs and 61% of their services inputs from other firms within Maine. Only firms in Marine Technology & Aquaculture purchased a higher proportion of raw materials than services in Maine.

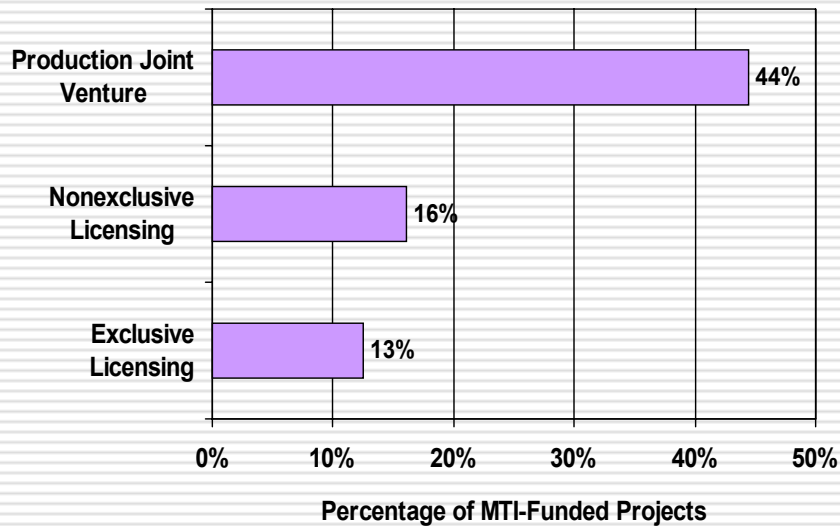
Percentages of Raw Materials and Services Purchased in Maine



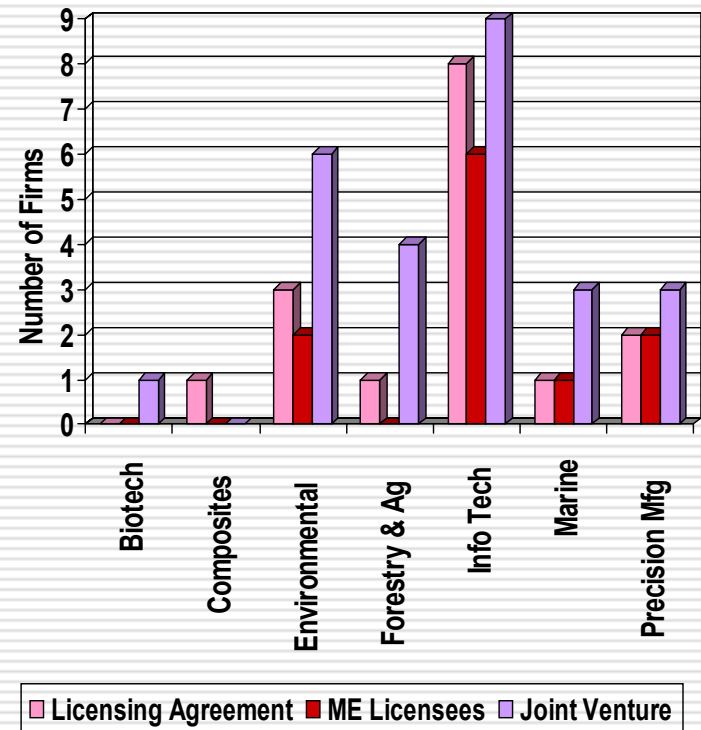
Note: Respondents in Composites and Precision Manufacturing did not respond to this question.

Over 44% of the recipients indicated that they have entered into joint venture arrangements for production of their products. Over a quarter (29%) were entering into licensing arrangements, mostly on a non-exclusive basis. Less than one quarter of licensees were in Maine. By far the most active sector invoked in joint ventures was Information Technology, which led in both the number of licensing arrangements and production joint ventures. Environmental Technology firms also had a significant number of production joint ventures. A lagging sector in this regard was Biotechnology.

Joint Venture Production and Licensing Activity



Production Joint Venture Activity and Licensing by Technology Sector



Evaluation of MTI Programs

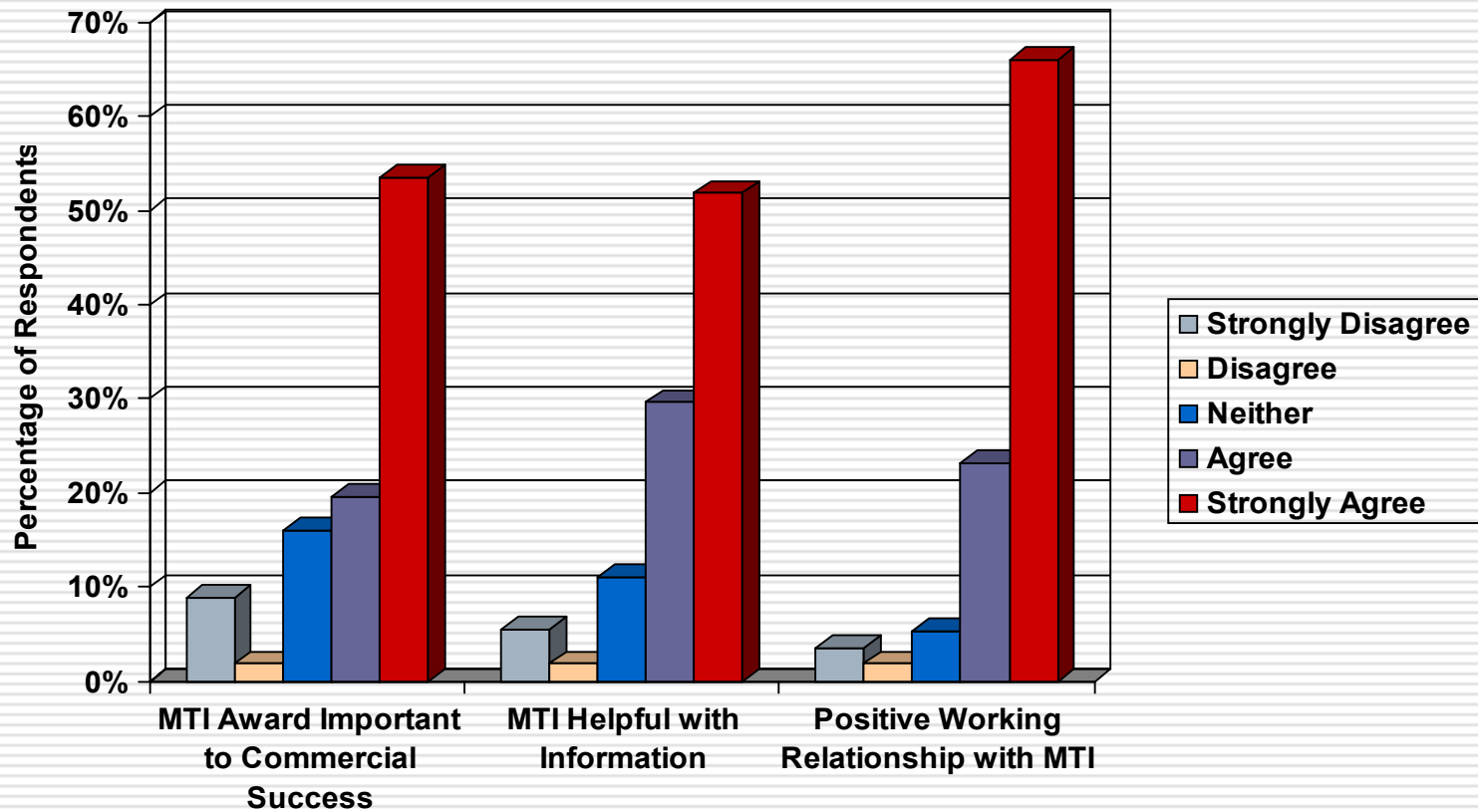
Survey respondents were asked about their relationships with the Maine Technology Institute and many organizations providing support services for research and development in Maine. MTI received very high marks from most of its clients, both for the importance of its support and the quality of intervention with companies. MTI was also among the most frequently cited and highly rated of the organizations supporting R&D, along with campuses of the University of Maine System and out-of-state firms.

Grant recipients who rated their experience with MTI least favorably were interviewed, along with a sample of other recipients. The major concerns raised were with the flexibility of allocations and disbursement schedules as circumstances change. There was also concern that, while MTI provided very high quality assistance through its various workshops and seminars, the organization was not adequately staffed to provide regular follow-up throughout a project's life.

Other comments received in the interviews reflected concern about the knowledgeability and objectivity of the technology review boards and concern that the maximum amount of the seed grant at \$10,000 was inadequate.

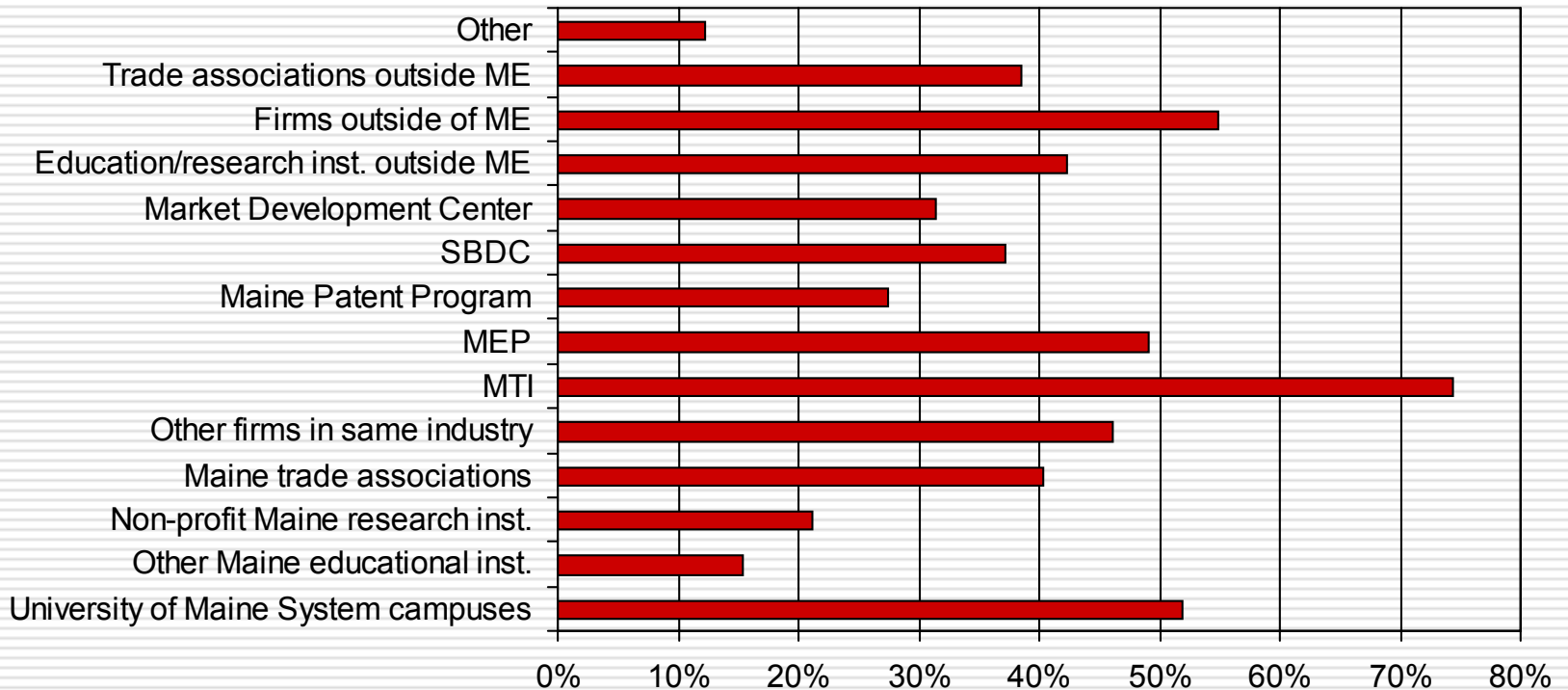
Respondents also indicated that the very act of winning an MTI award increased the credibility of the company. This credibility is important to companies seeking funding from other sources.

MTI clients gave the Institute very high marks for the quality and usefulness of their services. A substantial majority of MTI grant recipients agreed or strongly agreed that MTI assistance had been important to their commercial success and in finding other funding. An even larger percentage strongly agreed that they have had a positive working relationship with MTI.



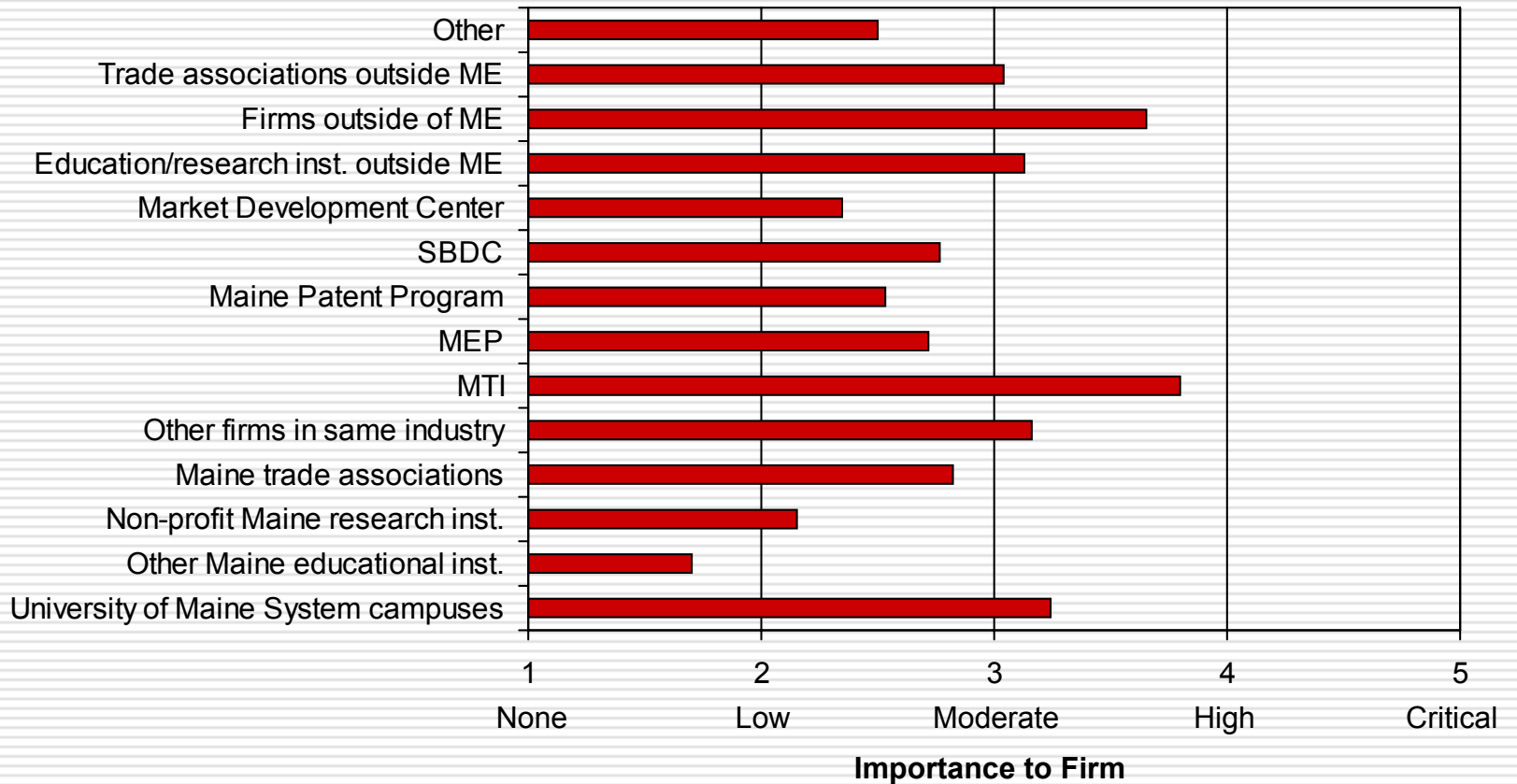
MTI grant recipients made good use of a variety of organizations for support in their research and development and commercialization efforts. Not surprisingly, MTI was the most frequently cited, and the campuses of the University of Maine System were also frequently cited. Other firms in their same industry, both inside and outside of Maine, were also frequently cited as important, as were trade associations.

Percentage of Respondents That Received Assistance From Listed Organization



MTI clients rated consultant organizations based on the overall level of importance of their contributions using a scale of 1 (no importance) to 5 (critical to success). The most valued organizations were also those that were most commonly used, including MTI, the University of Maine System campuses, and firms in the same industry. Both inside and outside of Maine.

Mean Rating of Organizations Consulted



Appendix Tables

Appendix A-1

Grant Summary

Grants Completed as of June 30, 2002

Technology Sector	Number of Awards		Amount of Awards		Amount of Match		Total Planned Expenditures		
	Development Awards	Seed Grants	Development Awards	Seed Grants	Development Awards	Seed Grants	MTI	Match	Total
Biotechnology	3	4	\$210,000	\$36,902	\$210,000	\$56,920	\$246,902	\$266,920	\$513,822
Composites & Advanced Materials	1	4	\$100,000	\$45,089	\$100,000	\$72,749	\$145,089	\$172,749	\$317,838
Environmental	2	7	\$107,500	\$60,900	\$207,500	\$86,000	\$168,400	\$293,500	\$461,900
Forestry & Agriculture	2	8	\$200,000	\$76,745	\$516,000	\$82,690	\$276,745	\$598,690	\$875,435
Information Technology	2	10	\$199,954	\$92,180	\$199,997	\$123,287	\$292,134	\$323,284	\$615,418
Marine Technology & Aquaculture	3	6	\$266,311	\$55,432	\$508,455	\$62,157	\$321,743	\$570,612	\$892,355
Precision Manufacturing	3	9	\$278,366	\$84,150	\$402,137	\$101,252	\$362,516	\$503,389	\$865,905
Total	16	48	\$1,362,131	\$451,398	\$2,144,089	\$585,055	\$1,813,529	\$2,729,144	\$4,542,673

Appendix A-2

External Funding Received by MTI-Grant Recipients

	Development Awards	Seed Grants	Total
Grant Financing			
NIST Adv Tech Program		\$18,000	\$18,000
SBIR Phase 1	\$56,000	\$370,614	\$426,614
SBIR Phase 2	\$142,560	\$450,000	\$592,560
Small BusTech Trans Res			\$0
Other	\$307,169	\$3,630,160	\$3,937,329
Total	\$505,729	\$4,468,774	\$4,974,503
Debt Financing			
Bank Loans	\$1,400,000	\$727,000	\$2,127,000
SBA Loans		\$125,000	\$125,000
Family Loans	\$45,000	\$170,500	\$215,500
Other Loans		\$462,100	\$462,100
Total	\$1,445,000	\$1,484,600	\$2,929,600
Equity Financing			
Venture Capital	\$3,000,000	\$750,000	\$3,750,000
State Seed Capital	\$135,000	\$250,000	\$385,000
Angel Investors	\$1,180,000	\$362,500	\$1,542,500
Family Equity		\$5,000	\$5,000
Other		\$41,000	\$41,000
Total	\$4,315,000	\$1,408,500	\$5,723,500

Appendix A-3 External Financing by Technology Sector

	Biotech	Composites	Environmental	Forestry & Ag	Info Tech	Marine	Precision Mfg
Grant Financing							
NIST Adv Tech Program					\$8,000		\$10,000
SBIR Phase 1	\$178,114	\$100,000		\$148,500			
SBIR Phase 2			\$142,560		\$390,000	\$60,000	
Small BusTech Trans Res							\$9,000
Other	\$7,250	\$3,084,910		\$300,000	\$246,000	\$290,169	
Total Grants	\$185,364	\$3,184,910	\$142,560	\$448,500	\$644,000	\$350,169	\$19,000
Debt Financing							
Bank Loans			\$43,000	\$480,000	\$210,000	\$300,000	\$1,094,000
SBA Loans							\$125,000
Family Loans	\$30,000		\$150,000	\$18,000		\$15,000	\$2,500
Other Loans	\$85,000		\$120,000	\$151,500	\$27,000	\$15,450	\$63,150
Total Loans	\$115,000	\$0	\$313,000	\$649,500	\$237,000	\$330,450	\$1,284,650
Equity Financing							
Venture Capital	\$750,000					\$3,000,000	
State Seed Capital	\$250,000			\$10,000		\$125,000	
Angel Investors	\$50,000			\$312,500		\$1,180,000	
Family Equity					\$5,000		
Other	\$25,000	\$10,000					\$6,000
Total Equity	\$1,075,000	\$10,000	\$0	\$322,500	\$5,000	\$4,305,000	\$6,000