REGIONAL EMPLOYMENT BOARD
OF HAMPDEN COUNTY, INC.

Precision Manufacturing Regional Alliance Project (PMRAP)

Pioneer Valley Region Precision Machining Industry

Phase I Report

Introduction

The **Precision Manufacturing Regional Alliance Project (PMRAP)** is a strategic venture of the Regional Employment Board of Hampden County, Inc., in collaboration with the following partners, to build the capacity and profile of the high technology precision machining industry in the Pioneer Valley Region:

- Regional Employment Board of Hampden County, Inc.
- Western MA Chapter- National Tooling and Machining Association (WMNTMA)
- University of Massachusetts- Amherst
- Springfield Technical Community College
- Economic Development Council of Western Massachusetts
- Holyoke Community College
- Six Vocational Technical High Schools

The **Phase I Report** presents findings from a detailed assessment of the needs of the precision machining industry focused in four interrelated areas that form the basis of the scope of the project's work tasks going forward:

1. Description of the Precision Machining Cluster
2. Identification of the Desired Value-Added Services
3. Validation of the Role of the Applications Engineer
4. Conceptualization of the **Center for Advanced Manufacturing Technology**

The REB developed the Phase I Report by working collaboratively with the project partners, and obtained the information and findings in the Report by accomplishing the following:

1. Questionnaire to WMNTMA member companies and other cluster companies.
2. Discussion with selected cluster company owners.
3. Meetings with selected individual owners.
4. Meetings with the WMNTMA Board of Directors.
5. Research of regional and national models of industry- driven machining/manufacturing centers.

Findings from the work conducted in Phase I were used to create a Phase II work plan that was validated with the cluster companies and other partners, and will be implemented by the Project Manager.

December 18, 2008

OVERVIEW

The **Phase I Report** for the **Precision Manufacturing Regional Alliance Project (PMRAP)** presents a detailed work plan and budget and a detailed framework for interval reporting. This Report provides a baseline profile of the precision machining cluster in the Pioneer Valley Region, refines the needs of the cluster for applications engineering support and technology development, and refines and validates the concept for the development of a sustainable **Center for Advanced Precision Manufacturing Technology**. This Report can also be viewed on the web site of the Regional Employment Board of Hampden County Inc. at www.rebhc.org.

The **Precision Manufacturing Regional Alliance Project** is funded by the Massachusetts Technology Collaborative-John Adams Innovation Institute, with additional funding from the Regional Employment Board of Hampden County, Inc.- E. Herbert Burk Fund, and other private sector match funds.

CONTACT INFORMATION

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For information on the Western Massachusetts Chapter of the National Tooling and Machining Association (WMNTMA), please visit their web site at www.wmntma.org.

For information on the Massachusetts Technology Collaborative-John Adams Innovation Institute, please visit their web site at www.masstech.org.

REGIONAL EMPLOYMENT BOARD
OF HAMPDEN COUNTY, INC.

Precision Manufacturing Regional Alliance Project (PMRAP)

Section 1- Baseline Profile of the Industry

I. Precision Machining: An Industry within the Precision Manufacturing Sector

The Pioneer Valley Region's precision machining cluster has a primary focus on the machining of metals products, and is part of a larger precision manufacturing sector that includes the precision manufacturing of products for the plastics, paper and electronics industries.

The Precision Manufacturing Regional Alliance Project (PMRAP) project will focus on the precision machining sector and the innovation, technology development, work products and lessons learned from the project will be transferred to and shared with the companies in the larger precision manufacturing cluster. The proposed Center for Advanced Precision Manufacturing technology will be structured to respond to the needs of the precision machining sector as a 'core' requirement. The broader precision manufacturing cluster will be a desired target and part of the Center's conceptual tradeoff.

II. Definition of Precision Machining

Precision machining refers specifically to making parts and components to very tight tolerances and high surface finishes using innovative operations and processes. These requirements are maintained for a wide range of geometries, materials and applications. Precision machining requires high performance in areas such as: 1) machine geometry and construction, 2) motion control, 3) thermal and environmental control, 4) tooling selection and application, 6) machining strategy, and 7) real-time performance monitoring and correction.

III. Description of the Precision Machining Cluster

High technology precision machining is one of the most important industry clusters in the Pioneer Valley Region. The high technology precision machining companies in the Region, led by the Western Massachusetts Chapter of the National Tooling and Machining Association (WMNTMA), are contract manufacturers that are primarily engaged in supplying precision mechanical components and sub-assemblies to major commercial manufacturers, aircraft engine builders, and military equipment contractors in the United States and internationally. The companies perform value-added precision manufacturing processes and operations utilizing high technology equipment and world class technology development.

The companies in the cluster have invested extensive resources on building manufacturing capacity by improving operating processes and due to high demands in the aerospace and defense markets are currently experiencing high business volumes. Since these markets are cyclical, the long term prosperity and growth of the precision machining firms as part of various supply-chains might be jeopardized by global changes. The sector faces a shrinking workforce, increased competitive strains from off-shore suppliers, and market pressures that might jeopardize business and employment growth in the Region.

IV. The WMNTMA Precision Machining Companies

The precision machining cluster in the Region is led by the regular member companies of the Western Massachusetts Chapter of the National Tooling and Machining Association. The following is the listing of the companies, by location, and their employment level effective January 1, 2008.

No. of Employees	Company	City
14	G & L Tool Corp.	Agawam
34	O - A, Inc.	Agawam
20	Ben Franklin Design and Manufacturing	Agawam
7	Mechanical Drive Components, Inc	Chicopee
9	Beaulieu Tool & Die Co., Inc.	Chicopee
85	Hoppe Tool, Inc.	Chicopee
5	Poplar Hill Machine Inc.	Conway
30	Techni-Products, Inc.	E. Longmeadow
14	C & G Machine & Tool Co., Inc.	Granby
22	Rock Valley Tool LLC.	Easthampton
15	Mountain Base Machine	Easthampton
6	Easthampton Quality Machine Co.	Easthampton
32	Central Mass. Machine, Inc.	Holyoke
70	Marox	Holyoke
25	Leicester Die & Tool, Inc.	Leicester
10	B & R Machine Inc.	Ludlow
9	Amherst Machine	North Amherst
17	D & S Manufacturing Corporation	Southwick
150	WGI Inc.	Southwick
48	Associated Electro-Mechanics, Inc.	Springfield
27	Mitchell Machine, Inc.	Springfield
195	Advance Manufacturing	Westfield
18	Peerless Precision, Inc.	Westfield
200	Berkshire Industries, Inc.	Westfield
15	Creative Machining and Molding Corp.	Westfield
125	Tell Tool, Inc.	Westfield
7	Precise Turning & Manufacturing Company	Westfield
9	Westfield Tool & Die Inc.	Westfield
14	Mutual Precision, Inc.	West Springfield
6	Numeric Machining Co., Inc.	West Springfield
1	R & S EDM, Inc.	West Springfield
12	True Precision Industries Inc	West Springfield
30	Hayden Corporation	West Springfield
Total: 1281		

The Regular Member companies of the WMNTMA range in size, with the majority of the companies employing between 1 and 30 employees.

Employees	No. of Companies	Employees	No. of Companies
1-4	1	20-49	9
5-9	7	50-99	2
10-19	9	100-249	4
Total			32

In addition to this information on the WMNTMA member precision machining companies, we have included a broader distribution of manufacturing companies in the Massachusetts- Connecticut "Knowledge Corridor" by NAICS Codes and industry (**Attachment A).**

In addition, the size and geographical breadth of the entire precision machining cluster in the Region is significant in terms of numbers and diversification of product mix and services. In August 2008, Regional NetWorks (RENEW), the WMNTMA, and the University of Massachusetts-Amherst collaborated on the development of a data collection and research project conducted by UMass. This five month project resulted in the development of a data base of precision manufacturing companies, the majority of whom could be classified as precision machining companies, that has provided critical business intelligence in establishing a baseline profile of the precision manufacturing/precision machining cluster in the Region. This information can be found on the WMNTMA web site at the following link:
http://www.wmntma.org/uploads/File/DMC-%20DATA%20BASE%20%20Manufactures%20Clear%20Final.xls

PMRAP intends to be inclusive and engage non-WMNTMA member precision machining companies in the project. The membership of the Steering Committee reflects this commitment to be inclusive, and includes a broad representation of WMNTMA and non-WMNTMA companies in the precision machining sector. The REB has extensive relationships with non-WMNTMA members, and intends to include them in completing the project's work tasks and project deliverables.

In calendar year 2007, the regular members of the WMNTNA experienced the following growth in employment levels and estimated gross sales:

Estimated Gross Sales of Regular Member Companies: Adjusted for Changes in Company Membership in WMNTMA

Year	No. of Companies	No. of Employees	Estimated Gross Sales
2005	24	899	$108 Million
2006	29	993	$155 Million
Change '05-'06	(+) 5	(+) 94(10.4%)	(+) $ 47 Million (43.5%)
2007	33	1281	$229 Million
Change '06-'07	(+) 4	(+) 288 (29%)	(+) $ 74 Million (47%)
Change '05-'07	(+) 9	(+) 382 (42%)	(+) $ 121 Million (112%)

Estimated Gross Sales of Regular Member Companies: Adjusted to Compare Same Company Membership in WMNTMA 2005-2007

Year	No. of Companies	No. of Employees	Estimated Gross Sales
2005	**23**	**827**	**$100 Million**
2006	**23**	**915**	**$151 Million**
Change '05-'06	**-**	**(+) 88 (10.6%)**	**(+) $ 51 Million (51%)**
2007	**23**	**923**	**$166 Million**
Change '06-'07	**-**	**(+) 8 (.9%)**	**(+) $ 15 Million (10%)**
Change '05-'07	**-**	**(+) 96 (11.6%)**	**(+) $ 66 Million (66%)**

The dollar added value per employee was $179,848, which is 15% higher than the reported state-wide average of $156,065. In addition, the sectors multiplier effect (4.0) generates comparable growth within their supplier and support network. This level of productivity was achieved with less than a 1% increase in the number of employees, and affirms the sectors commitment to investment in new equipment, and implementation of lean manufacturing processes.

The companies believe that this growth reflects their commitment to cluster development, and the implementation of collaborative activities that add value to the company's long term desire to strengthen their resent markets, infuse new technologies aimed at targeted market growth, and build an infrastructure to support new technology.

In addition, the Northeast Membership Director for the national office of the National Tooling and Machining Association (NTMA) indicated that the Western Massachusetts Chapter is one of only six chapters in the country that is presently experiencing net membership growth and retention. The following data reflects this national growth pattern:

Rank	NTMA Chapter Location/Region
1	Philadelphia/Delaware
2	Los Angeles, CA
3	**Western Massachusetts (WMNTMA)**
4	St. Louis, MO.
5	Rockford, Ill
6	Rocky Mountain

The REB will work with the Northeast Membership Director to identify initiatives in these areas that could inform our decision- making going forward. The Director has indicated a willingness to collaborate with the REB in this matter.

V. The Strategic Organizing Principles

The high technology precision machining companies have adopted the following strategic organizing principles that they believe will result in job retention, wealth creation, job growth, and continued economic development in the Region and in the State:

- Record growth in their principal market areas of aerospace and defense has created a new-found confidence in the members' perception of their global competitiveness, and has provided the impetus for long-term investment decisions.

- The companies must continue to develop new partnerships, embrace new technologies and business models, seek out new markets, and build a more responsive and integrated training infrastructure that can respond to the technical skills needed by our new technology and insure the availability and sustainability of a qualified and appropriately sized workforce.

- Their ability to respond to surges in demand in their present markets, and their capacity for product and market diversification and expansion are directly tied to their access to new technology and their ability to provide applications engineering support that will reduce cost, improve lead time and enhance the quality of their parts and components.

- Transparency, sharing of new technology and operational strategies, and cross fertilization of ideas and operations will benefit individual member companies and the precision machining cluster as a whole.

- The companies need to remain agile.

VI. The Cluster Goals Going Forward

The cluster has established the following goals and action initiatives that will define and validate its commitment to develop true cluster identity and collaborative actions that will achieve measurable and sustainable growth going forward.

Goal 1.Transform Industry Capability to Improve Manufacturing Processes and Operations

Action 1.1: Hire a Technology Innovation and Applications Engineer who will provide small companies with value-added applications engineering support.

Action 1.2: Develop a partnership with a research university/college to investigate new technology development that will improve the companies' productivity and competitiveness as suppliers in their present markets, and position them to commercialize work in the design and manufacturing stages in growth markets.

Action 1.3: Study the feasibility of establishing a Center for Advanced Precision Manufacturing Technology which would become the convening venue for growth initiatives aimed at the infusion of new technology development and manufacturing applications, diversification of market opportunities, and implementation of various workforce development initiatives.

Goal 2. Strengthen Cluster Development and Increase Business Competitiveness

Action 2.1: Implement initiatives, activities and events that will strengthen companies' position in present markets, and identify new collaborative business strategies to increase penetration in new and emerging markets.

Action 2.2: Develop a Precision Manufacturing Legislative Agenda that defines sector needs and concerns, and advocate for State legislature support and action.

Action 2.3: Enhance www.wmntma.org content to increase sector coherence, and improve and broaden company involvement and communication.

Goal 3. Build a Well-Educated, Technologically Skilled and Highly Adaptable STEM Workforce.

Action 3.1: Strengthen and expand working relationships between high technology precision manufacturing companies and educational institutions.

Action 3.2: Build a more responsive and flexible education and training infrastructure that can meet the technical skills needed by new technology, and can move education and training to an acceptable scale in response to surges in demand.

Action 3.3: Increase student enrollment and graduation rates in Manufacturing Technology programs.

Action 3.4: Expand career ladder training programs and courses for incumbent employees.

Action 3.5: Support the implementation of education and career awareness programs that will inform educators, parents and students of the viability of precision manufacturing/machining as a career-directed, financially rewarding profession.

Goal 4. Develop a Marketing Plan to Promote the Economic Viability of the Precision Manufacturing/Machining Industry.

Action 4.1: Collaborate with state and local officials to develop and fund a Marketing Plan for the Precision Manufacturing/Machining industry.

Action 4.2: Implement multi-media marketing campaign focused on identified target audiences.

Action 4.3: Establish measurable metrics to evaluate the success of the marketing campaign and return on investment.

VII- The Steering Committee

The project Steering Committee initially will include the contracted partners, and representation from a wide range of companies representing the precision machining sector. As the project matures, the composition of the Committee will be augmented to include representatives from companies representing the broader precision manufacturing cluster. This expansion will maximize the size of the cluster and should assist in sustainability initiatives going forward.

Section 2- Industry Needs Assessment

The REB conducted a survey of selected precision machining companies during the month of October 2008. The Questionnaire (Attachment B) asked the companies to identify the requests for manufacturing services that they are getting from their suppliers or customers that are creating the need to access manufacturing engineering support or new technology development in order for them to respond to this demand or to be more competitive.

The questionnaire also asked the companies to identify specific technical assistance, supports, or activities that would be of most value to them in making the transition to more value-added manufacturing. We were particularly interested in identifying what they need internally to improve productivity and competitiveness as suppliers in their present markets a well as their internal needs in order to move up the supply chain in new growth markets such as medical devices, laboratory instrumentation and alternative energy.

Based on a summary of their reported needs (Attachment C), the following categories of services and supports that they require to respond to those needs emerged:

1. New Materials Technology
2. Tooling, Fixturing and Machining Technology
3. Work Process Improvements
4. Quality Assurance, Process Control and Inspection
5. Value Added Assembly Processes
6. Customer Technical and Contractual Demands
7. Employee Training
8. Marketing and New Business Development

Industry needs were charted against these categories to get a clearer perspective of the how the project work tasks and initiatives can best respond to those needs. The following chart reflects that perspective:

Industry Needs

Categories of services / Needs	New Materials Technology	Tooling, Fixturing and Machining Technology	Work Process improvements (cost/schedule reduction)	Q.A. Process Control and Inspection	Value Added Assembly Processes	Customer Technical and Contractual Demands	Employees Training	Marketing/New Business Development
Needs imposed by suppliers/customers	1	2	3	4	1	3		
Needs to transition to value added and new markets	1	4	5	2	1	3	1	
Need to improve competitiveness in current market		7	6				2	
Need for internal capacity to grow business in new markets	1	3	1	1			2	2

This information indicates the following initial assessment:

a. In order to respond to current customers and improve competitiveness, the most valuable services provided by the project (shared resources or future center) are in the area of Q.A processes/quality improvement, innovations in tooling, fixturing and machining technologies, and processes improvements aimed at cost or schedule reductions.

b. In order to facilitate transition to new market or to acquire added value operations, the most valuable services the project can provide are related to process improvement (cost/schedule), innovations in tooling and machining and some support in workforce development and marketing. We estimate that once the new markets are better defined and the barriers better understood, the workforce and marketing (primarily in match-making with prime/OEM suppliers) will get stronger emphasis.

Precision machining cluster needs will continue to be identified throughout the project and refined through additional surveys, interviews and inputs from steering committee members.

Section 3 -Technology Innovation and Applications Engineer

The questionnaire referenced above also gave the companies statements of possible responsibilities/work tasks of the Technology Innovation and Applications Engineer and asked them companies to respond to the following:

1. Importance of the Responsibility to their Company
2. Examples of **Specific** Work Tasks of the Technology Innovation and Applications Engineer

The **specific** responsibilities/work tasks where they believe the Technology Innovation and Applications Engineer can most assist them were identified and were very similar to the categories of services, supports and activities that the companies indicated they would require in order to move to more value-added manufacturing. The following chart reflects this analysis:

Technology Innovation and Applications Engineer- General Responsibilities

Categories of services / Needs	New Materials Technology	Tooling, Fixturing and Machining Technique	Work Process improvements (cost/schedule reduction)	Quality Assurance & Process Control and Inspection	Value Added Assembly Processes	Customer Technical and Contractual Demands	Employee Training	Marketing/New Business Development	% of Companies - High Level of Importance
Develop processes, procedures and tooling used to produce final assembly products and related sub-assemblies.		2	6	2	1				87%
Evaluate current manufacturing processes, and recommend new measures to improve productivity and reduce	1	7	8	11					100%

production costs.									
Monitor costs, efficiency and utilization rates, and effective use of resources in order to maximize quality and minimize cost.		2	6						100%
Support operational problems effecting production, and work with internal staff to identify solutions.			1						87%
Prototype development of new products, and assess and develop manufacturing processes that will enable the use of advanced materials.	3	1							50%
Identify new machining processes and techniques and communicate information, share data and reference resources with partnering companies.	1	2	1						75%

This preliminary data indicates the following initial assessment:

a. Members of the precision machining sector see current need for support primarily in areas of manufacturing and quality process improvements, and tooling/machining technologies.
b. The recruitment of candidate for the technology innovation & application engineer should focus on solid expertise and qualifications in these areas. However, we believe that once topics such as future

markets, technology development and research integration are further explained and demonstrated to industry members, they will emerge as additional required qualifications.

Section 4. Concept of Center for Advanced Precision Manufacturing Technology (CAPMT)

1. Strawman CAPMT Project

Our general assessment of the Precision Manufacturing cluster as a whole and the Precision Machining industry in particular, indicates the need for intense cluster development and collaborative activities, shared services for small companies (e.g. applications engineering), diversification of markets, infusion of new technologies aimed at targeted market growth, and implementation of various workforce development initiatives.

Our approach in this project for a CAPMT development is to offer a cost-effective yet comprehensive and critical assessment of many of the factors that might impact a decision to proceed with such concept. Based on this assessment we will be able to validate the feasibility of the idea and provide a plan for next steps.

Our long term vision is that services and growth initiatives will be focused in a future center for advanced precision manufacturing technology. This Center will require intensive development, validation and investment, therefore, our proposal is to implement and test major elements of the Center, pilot some of the initiatives, and assess the feasibility for a sustainable organization (see figure 1) as well as study benchmark center models and/or broad stakeholders opinion collection.

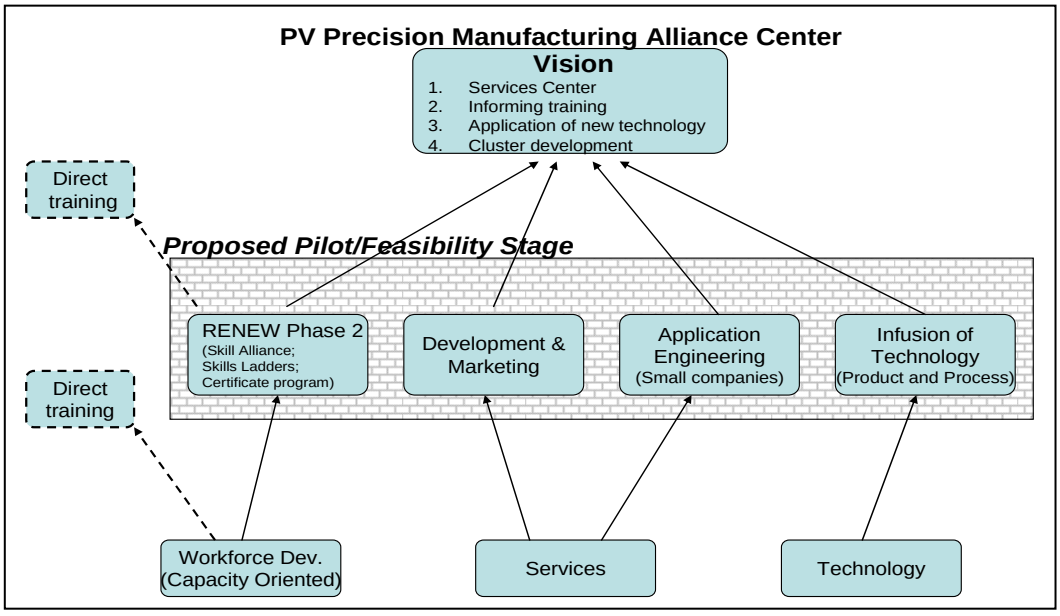


Figure 1

The development of the virtual/functional pilot center and feasibility assessment in the interim phase will be led by the Steering Committee representing regional stakeholders who will build the foundation for a sustainable Alliance and services.

The study will be looking at the Center from the perspective of existing technical strengths in the region's research and industrial enterprise, the available resources in the region (especially at UMass Amherst and the city of Springfield), and the leadership that can undertake such endeavors. As a result, we plan to identify various optional concepts and specific programs that can be located within the Center and support the vision for an effective Precision Manufacturing Center with significant regional economic development benefits.

Our Center's assessment and development will consider the following basic elements contributing to such organization (see figure 2[1]):

Research base - The research element will be considered independently of university academic departments, thus allowing the Center to leverage research and technology agenda that is compatible with industry requirements, market needs and funding sources.

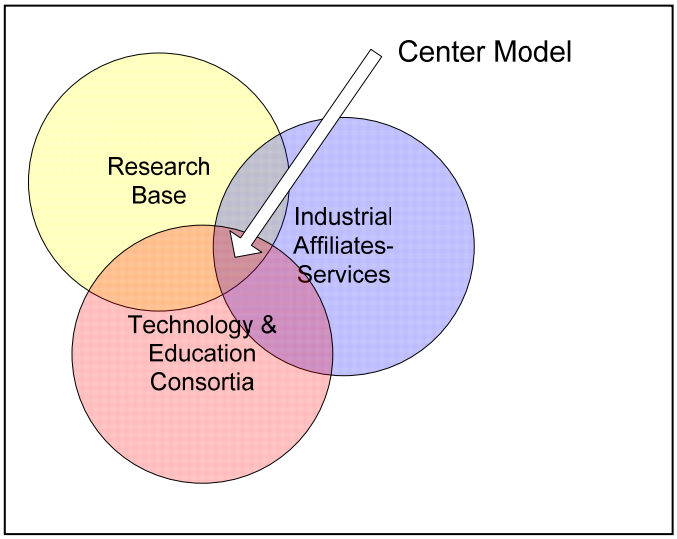


Figure 2

Technology & Education consortium - Technology development should be defined by contributions of research results from an available source (universities, industry, etc.) with primary emphasis on "market pull" rather than "push" by research institutions or government perceptions. Education elements will consider skills required by new technology and markets as well as applicable innovative workforce development measures throughout the k-12 pipeline.

Industrial Affiliates - The Center will be structured as a collective of affiliated institutions/companies. Therefore, its services and technology development programs will respond to the interest of multiple stakeholders rather than to an individual client.

Additionally, in order to support the underlying objectives of the program and allow for a trade-off/decision that takes into consideration local parameters, we intend to start by extending the vision for the Center to be as broad as possible and not limited to advanced technology only. This approach will allow for consideration of a technical center associated with a university (or universities) as well as a university-industry cooperative technology application and commercialization center, a services center, etc. Our evaluation will attempt to looks at the full range of concepts and provide a recommendation for an

[1] Managing the Industry/University Cooperative Research Center. Denis Gray, George Walters, Battelle Press. Adapted

implementation plan that is based on multiple contexts and various considerations as detailed in the following preliminary models.

a. Strategic Vision

The strategic vision is connected to the original proposal goals and planned work tasks. The results from the Phase 1 industry Questionnaire, which solicited feedback and input from the companies to queries #2 and # 3 only, confirmed these original goals, and indicated that the companies are heavily engaged and interested in value engineering and not product development. The needs of the companies, as identified from the questionnaire, are clearly aligned with our original goals. Our long term vision for the Center is driven by these industry identified needs, and is the platform from which we will develop the Center's major functions.

In order to operationalize this vision, we will be guided by the following industry-driven strategic objectives:

1) Insure that the following categories of need, as identified by the precision machining companies in the questionnaire, can be responded to in designing and implementing the Center's functional framework:
   - Technology Development
     - Work with research and education institutions throughout the State to stay abreast of evolving manufacturing technologies relative to materials, tools and processes.
     - Develop internal capabilities in conjunction with UMass to develop and test new technologies as identified by local precision manufacturing companies.
     - Develop collaborative initiatives in technology development with UMass
   - Engineering Services:
     - Develop an engineering services team that can work with local precision manufacturing companies to develop more efficient manufacturing processes.
     - Supplement applications engineering efforts at small, precision manufacturing shops in order to assist them in meeting growth goals.
   - Skilled Labor Pipeline
     - Provide training for incumbent workers in order to insure they stay abreast of evolving technologies and techniques.
     - Develop educational programs for grades 5-12 which educate youth about career opportunities in precision machining.
     - Work with Manufacturing Technology Programs at local Vocational High Schools and Community Colleges to insure that students and faculty are trained for the "jobs of tomorrow."

- Marketing
  - Develop programs to identify strategic markets for Western Massachusetts precision manufacturing companies and coordinate activities to promote the industry and region in those markets.
  - Facilitate joint new product development projects between OEM/Prime contractors with marketing channels and local precision manufacturing companies.

2) Increase sector communication, coherence, and commitment to collaborate to develop a broad consensus on the final functional elements of the Center. Develop a realistic implementation timetable that is both aggressive and reflective, but one that moves the decision making process forward in a deliberate and timely manner.

3) Leverage the research capabilities from a broad range of regional and national educational institutions to insure that the sector's needs can be addressed in a comprehensive manner. The "pull" side of the process must clearly dominate the final design of the Center's functions.

4) Insure that the marketing and workforce development needs of the sector, as identified in the questionnaire, are included in the final design of the Center. The work of the EDC and STCC in these two areas must be clearly aligned to respond to the needs of the sector.

2. Preliminary Model for CAPMT

a. Various models

In developing the conceptual framework for the Center and assessing local capabilities/ needs, cluster environment and sustainability strategies, we will be looking at various examples of similar centers as models in the following categories:

1) Education and Workforce Development Center-

Example1: Precision Machining Institute[2] –offers comprehensive training programs designed for men and women who want to learn the technical skills needed to enter the field of manufacturing technology. It also offers incumbent workers the opportunity to advance their skills. The curriculum was developed by the National Tooling and Machining Association (NTMA), and is structured to include both technical knowledge and hands-on skills.

Example 2: Plastic Engineering Program and Lab's at UMass Lowell- In addition to BS and MS in Engineering, the program of study includes a Certificate of Plastics Engineering Technology- a model of interest for precision machining certificate. The program combines hands-on laboratory experiences relevant to the industry, with the fundamental theory found in courses of mathematics, science, and engineering to produce a well-rounded curriculum.

[2] www.mxcc.commnet.edu/mxhome/mxpr_cbis.htm

2) Industry Affiliation for Technology Development Services

Example 1: The Connecticut Center for Advanced Technology, Inc. which offers services through manufacturing modeling and simulations. One part of the CCAT's services is utilizing technology to make process improvements to factory floor layout, testing the feasibility of a manufacturing cell, or implementing lean concepts in the manufacturing process. The other part of CCAT's services employs physics-based machining process modeling solutions to help manufacturers improve the efficiency of their machining processes (e.g. milling, turning and drilling operations, specifically examining chip formation, cutting forces, temperature and residual stress in both the tool and part with the goal of generating an optimized toolpath that will decrease machine tool cycle times.)

Example 2: The Institute for Plastics Innovation at the University of Massachusetts Lowell- develops and provides knowledge-based plastics manufacturing expertise to partners. The IPI addresses industry-wide concerns in a multi-disciplinary manner in order to develop new plastics manufacturing technologies and standards.

3) Manufacturing Service Center

(A manufacturing laboratory to develop and demonstrate innovative manufacturing methods and technology that will be implemented in regional companies. Work is aimed at developing industry processes to reduce cost, improve lead time and enhance parts' manufacturing.)

Example 1: The National Center for Defense Manufacturing and Machining (NCDMM) - NCDMM participates in a full range of initiatives to resolve production issues that challenge the manufacturing and machining efforts of defense organizations and their contractor communities. Services include: depot and production manufacturing assessments innovative state-of-the-art solutions that ensure the quality, affordability, maintainability, and rapid deployment of the DoD system, demonstrations to reduce risk of implementation, transition of best solutions to the stakeholder facility.

4) Technology Transfer and Research Partnering Center

Example 1: Sections of the ATMC at UMass Dartmouth- Research and Partnering Laboratories- laboratories were conceived and implemented to apply University expertise in the solution of technical problems. Additionally, these laboratories create research opportunities for faculty and educational opportunities for students. The laboratories support research and partnering with industry. Additionally, partner companies can have access to these facilities via work orders to support their product development. ATMC involvement in Business Development and Technology Transfer which includes efforts with a particular focus on technology transfer from a variety of sources (including federal research centers) so that the technologies can be applied to meeting contemporary needs in industry, government, and academia.

Example 2: The Aerospace Manufacturing Technology Centre (AMTC), one of five laboratories at the NRC Institute for Aerospace Research in Québec, Canada (NRC Aerospace) - aimed at developing core competencies and demonstrates modern aerospace manufacturing technologies that have the potential for significant cost savings, while also maintaining high levels of quality, reliability and performance. Partnerships are focused on investigating technologies in four major research areas:

forming and joining of metallic products; fabrication and joining of composite structures; automation, robotics and intelligent manufacturing systems; and advanced material removal. A major focus is to facilitate the transition to next-generation manufacturing, particularly among small and medium-sized enterprises (SMEs).

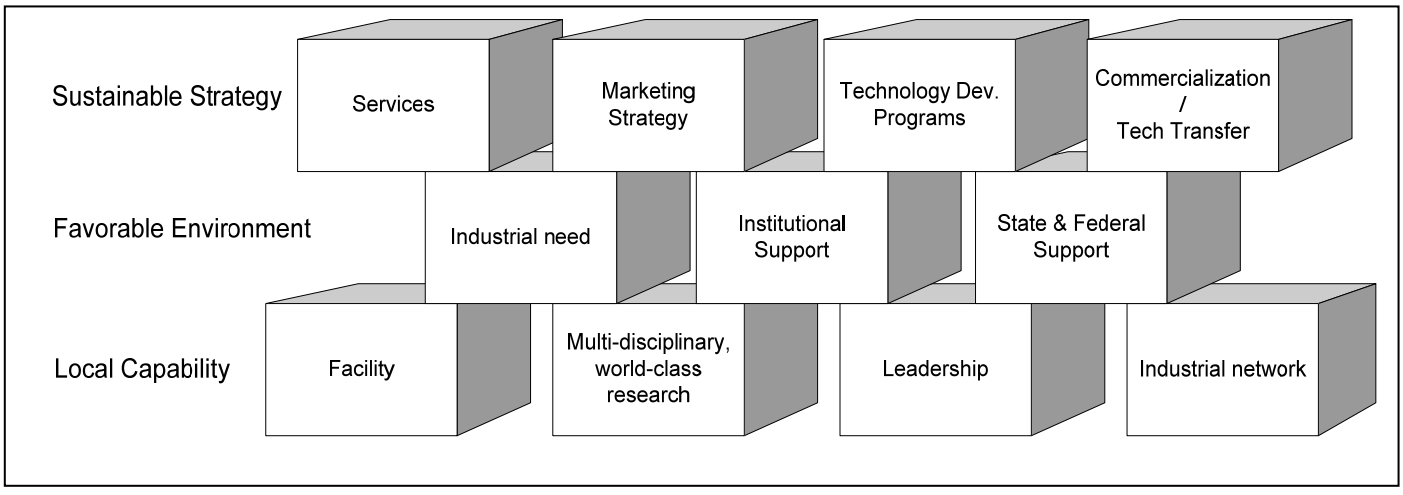
The REB believes it is important to analyze these models in their entirety, and to expedite the process to identity the functions that the sector companies believe should be incorporated into the initial stages of the Center's development. Although we will approach this work from a broad perspective, we believe, based in part on the results from the Phase 1 industry questionnaire, that the following models, in no priority order, are most aligned with the needs of the companies:

Model Category	**Model Example**
2.Industry Affiliation for Technology Development Services	Connecticut Center for Advanced Technology
3.Manufacturing Service Center	National Center for Defense Manufacturing and Machining
2.Education and Workforce Development Center	Institute for Plastics Innovation at the University of Massachusetts Lowell

2. Building Blocks/Context

Our study will start with an assessment and analysis of background/context information related to the desired technology center. This analysis will focus on shaping a Center-model and will include the required information to effectively determine the feasibility of creating a Precision Manufacturing Center in the Pioneer Valley.

The context analysis (market needs, competition, existing strengths/gaps, technology trends, etc.) that we propose will be as broad as possible. Therefore, our information collection and analysis will be looking at the basic building blocks of a successful Research and Technology Center model (see figure 3[3].)



[3] Same. Adapted

Figure 3

3. Integrated Model

The various models and the context analysis detailed above, contribute to an initial concept for a Center that is integrated and broad (see figure 4.) During the project, we will ask questions, evaluate feasibility and refine this concept with input from all stakeholders to put forward a realistic implementation plan. The assessment of this model, the decision what to include and how to accomplish the selected functions will be guided by the following considerations:

1) An agreed upon selection criteria (see e. bellow for preliminary criteria)
2) Models of existing organization with similar mission and track record of success
3) Success/lessons learned from pilot projects undertaken in this program (e.g. shared technical resources, innovation forums, technology transfer, etc.)
4) Realism of extending the interim project (focused on precision machining) to a broader precision manufacturing cluster
5) Available resources and Return-on-Investment (including long term sustainability)
6) Regional leadership- preferences and commitment

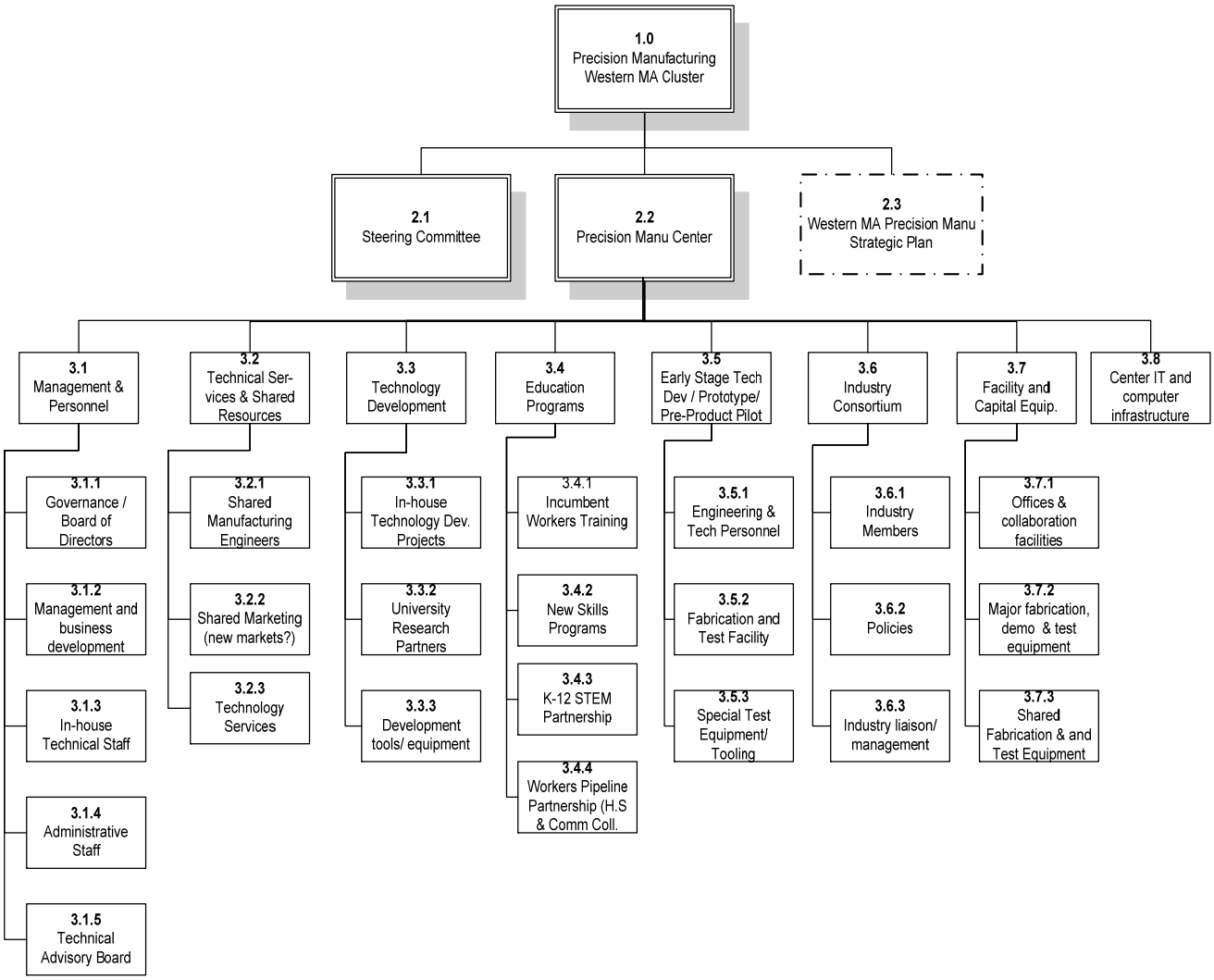


Figure 4

4. Preliminary criteria

The Criteria for selecting functionality and operation of the Center will be determined by the needs of the industry primarily the precision machining and secondarily the precision manufacturing. In general, the criteria will include the following elements (not in order of priority):

- Fit with current strengths and maximizing response to present needs of Precision Manufacturing industry in the region
- Maximize services for future needs (new markets/new technology/industry trends) of Precision Manufacturing industry in the region
- Leverage education/workforce training capacity of local community colleges and universities
- Effectiveness/realism of possible operating procedures and policies (e.g. IP)
- Return on Initial Investment- TBD
- Self sustainability over time (early transition to self sustainability is high priority.)

- Maximize economic development benefits (business growth/retention or jobs creation)
- The Center's facilities and each of its associated operation (functional elements) shall have the potential to be a nationally recognized manufacturing services entity.
- Support of strong local champions (interest, knowledge and "clout")
- Indirect impact on Springfield and/or neighboring towns (e.g. service industry, education institutions, public infrastructure.)
- Facility recommendation- utilization of existing town infrastructure and fit within town growth plans.
- If phased implementation is considered, "built out" to steady state size/operations should be done as soon as practical- as soon as possible but in not more than 7 years.

5. Application of Services

As indicated earlier in section 1, the precision manufacturing sectors are diverse in size and capabilities, therefore, services the center provides need to be tailored to this potential 'client' base. Our initial assessment of the fit of the various functions detailed in figure 1 to company size is as follows:

No. of Employees / Functional Breakdown	**1-4**	**5-9**	**10-19**	**20-49**	**50-99**	**100-249**	**250-499**	**500+**
3.1 Management & Personnel	--	--	--	--	--	--	--	--
3.2 Technical Services and Shared Resources	H	H	H	H	M	M	L	L
.3.3 Technology Development	M	M	H	H	H	M	M	L
3.4 Education Programs	H	H	H	H	H	H	H	H
3.5 Early Stage Tech Dev/Prototyping/Pre-Production Pilot	L	L	L	M	H	H	H	H
3.6 Industry Consortium	H	H	H	H	H	H	H	H
3.7 Facility & Capital Equipment	H	H	H	H	H	M	M	L
3.8 IT and Computer Infrastructure	M	M	M	M	--	--	--	--

Key: H- High fit of services

M- Medium fit of services

L- Low fit of services

This fit will be further studied and assessed during the conceptual development of the Center, and will have a major impact on the consideration of context, SWOT analysis and sustainability considerations.

6. Work Plan

Our Center development will attempt to looks at the full range of concepts and provide a recommendation that is based on multiple contexts and various considerations as detailed in the following tasks.

1. Assumptions and Criteria (Task 1)

Sub-task 1.1: Finalizing assumptions and criteria for selection of final concept.

Sub-task 1.2: Summarizing working assumption and selected criteria. Distribute & collect responses.

2. Context & Analysis (Task 2)

Sub-task 2.1: Identifying and assessing existing strengths and gaps (Local Capacity

Sub-task 2.2: Use the results from the industry questionnaire and Innovation Forums to map industry needs with the capacity of UMass and other collaborating educational institutions. Identify research/technology 'gaps' and propose ways to respond to such mismatch (Institutional Capacity)

Sub-task 2.3: Identifying and assessing key markets, needs and trends (Favorable Environment)

Sub-task 2.4: Identifying technical services, technology trends, and specific candidate programs (Sustainable Strategy)

Sub-task 2.5: Identifying value of the Center to stakeholders and in key markets-including potential for government support (sustainability)

Sub-task 2.6: Preliminary SWOT report

(The evaluation conducted in Subtasks 2.1 to 2.4 above will be analyzed and summarized in a Strengths, Weaknesses, Opportunities and Threats (SWOT) report that will contribute to the conceptual assessment, the strategic development of the Center (tasks 3 and 4 below) and the implementation plan.)

3. Center Development (Task 3)

Our approach to the Center's development is very much like developing a business plan for a small business. Our development process will utilize all the data collected in Task 2, and leverage the SWOT analysis to provide a realistic, competitive and sustainable model for the Center.

Sub-task 3.1: Sector companies must determine early in the process (July 2009) a fundamental understanding of how they will arrive at investment decisions.

Sub-task 3.2Develop facility concept and organizational mission, including:

a. Organizational Mission

b. Intellectual Property/Confidentiality issues

c. Facility Concept

d. Participant Organizations.

e. Sponsors.

Subtask 3.3: Create high-level staffing plan and related budget

Sub-task 3.4: Develop preliminary capital and operating budget, including estimates of initial investments for facilities and outfitting with equipment.

Sub-task 3.5: To the extent possible, identify and discuss logical funding sources for major activities at the proposed Center.

Subtask 3.6: Identify critical issues, such as IP, that will impact the development of the Center, and consider solutions.

Sub-task 3.7: Create high-level schedules. Indicate estimates with high degrees of uncertainty.

4. Springfield/Pioneer Valley Site Analysis (Task 4)

Sub-task 4.1: Identify the specific (and unique) characteristics of the location of the Center, and possible implementation options

Sub-task 4.2: Consider Pioneer Valley workforce needs and relevant partnering companies, organizations and universities.

Sub-task 4.3: Identify Pioneer Valley sites that can be considered to locate this facility and why.

Sub-task 4.6: Highlight and discuss any key gaps along with preliminary recommendations on how they might be bridged.

5. Financial Modeling (Task 5)

Sub-task 5.1: Develop preliminary start-up budget

Sub-task 5.2: Develop Proforma operating financial model (5 years?)

6. Summary Recommendations and Next Steps (Task 6)

Sub-task 6.1: Summarize findings and develop an Implementation Plan- Deliverable.

Sub-task 6.2: Provide presentation to JAII selected stakeholders

B. **Validation of model (thinking) with cluster companies**

The fundamental aspects of the conceptual thinking presented herein was validated through various presentations to industry stakeholders (and presented to the Steering Committee.)

1. The questionnaire detailed in section 2 above included inquiries into needs/services that will be provided by the Center.
2. The concepts, development considerations and functional breakdown were presented at a board meeting of WMNTMA and suggestions/concerns informed the development of the conceptual thinking.
3. Figure 4 above and the work plan were distributed to various members of the manufacturing network, and their feedback was incorporated in the current thinking.
4. The concepts, descriptions and work plan were approved by the Steering Committee (future)

C. **Pathways to cluster economic impact** (speculations)

A preliminary evaluation of economic impact was considered in three major areas:
a. Stable and growing employment (jobs retention/creation)
b. Stable and growing local economy (directly and indirectly related to precision manufacturing)
c. Recruit and attract new industry

A pathways/outcomes analysis was initiated (see figure 5) and the economic development benefits are clearly articulated. As a demonstrated example, the Center, through its technology development functions can improve competitiveness of local industry, resulting in retained or growing employment (see red path in figure 5), or the Center, through its education and workforce development functions will increase the 'efficiency' of the workforce pipeline (in the k-12 system, the vocational schools or the community colleges) resulting in a larger available/skilled workforce which can result in improved recruiting and attracting of new industry to the region (see blue path in figure 5.)

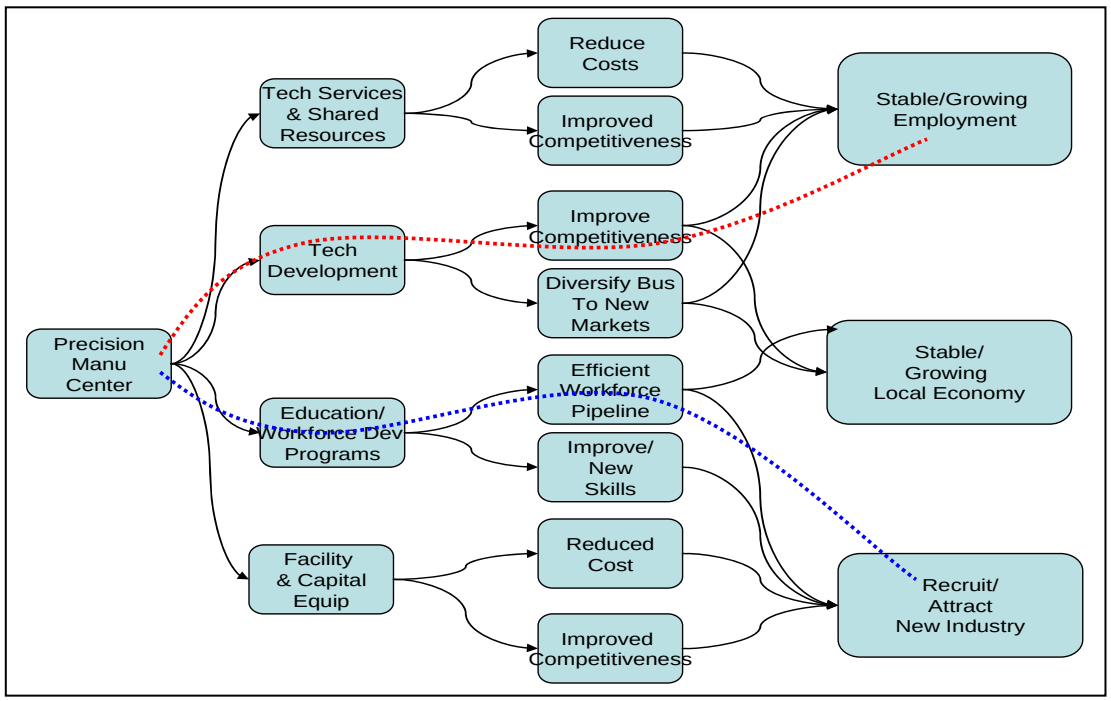


Figure 5

Throughout the Center development tasks, we will refine this evaluation and will try to judge the various pathways for economic impact, thus assessing the "return on investment" and the value each function is providing.

D. **Pathways to center sustainability** (speculations)

Our approach to sustainability is based on the principle that for small and medium size companies' service enterprise sustainability is highly dependent on value -- the Center will be sustainable if it provides undisputed value. Therefore, as part of the planning, and the business

plan development, we will consider how each of the proposed functions serves the regional stakeholders and what value is being offered. Accordingly, to support its operation, we envision that the Center will be charging for use of services or facilities, as well establish membership fees. We will be looking to leverage current resources as much as possible and will undertake the development of sustainability strategies as part of the implementation plan. The plan might include the following elements: a) Fee for service, b) Extension of existing programs with no or little additional funding, c) Federal contracts (e.g. DoD value engineering on machined parts), d) State follow-up funding based on demonstrated successes of the planning phase; e) Private sector funding and cost sharing to various programs; and f) Royalties on new intellectual property for technology development or technology transfer projects.

Section 5-Revised Work Plan and Schedule

Attachment D- Work Plan and Schedule
Attachment E- Preliminary Work Tasks.

ATTACHMENT "A"

Total Number of firms by size 4 digit Naics - Knowledge Corridor MA + CT

Source Special queries of Info USA Employer Database (from Jennifer at MA Dept of WD)

Naics code	*naics title*	*1-4*	*5-9*	*10-19*	*20-49*	*50-99*	*100-249*	*250-499*	*500-999*	*1,000+*	*all sizes*
3221	Pulp, Paper, and Paperboard Mills	4	4	4	9	4	7	2		0	34
3222	Converted Paper Product Manufacturing	13	9	9	14	12	11	3	2	0	73
3231	Printing and Related Support Activities	332	121	54	42	15	11	4	1	0	580
5111	Newspaper, Book, & Directory Publishers	175	132	27	33	22	12	8		1	410
	TOTAL PAPER, PRINTING and PUBLISHING	**524**	**266**	**94**	**98**	**53**	**41**	**17**	**3**	**1**	**1097**
3261	Plastics Product Manufacturing	19	26	32	23	27	16	1	1	0	145
3262	Rubber Product Manufacturing	6	5	4	5	3	1			0	24
3271	Clay Product & Refractory Manufacturing	7		1	2	1				0	11
3272	Glass and Glass Product Manufacturing	7	4	5	2		2			0	20
	TOTAL PLASTIC, RUBBER & GLASS	**39**	**35**	**42**	**32**	**31**	**19**	**1**	**1**	**0**	**200**
3311	Iron and Steel Mills and Ferroalloys	2	6	6	3	4	2			0	23
3312	Purchased Steel Product Manufacturing	3	4	4	4	2			1	0	18
3313	Alumina and Aluminum Production	3		2		1		1		0	7
3314	Other Nonferrous Metal Production		4	3	1	1	3			0	12
3315	Foundries	10	4	12	11	2	1			0	40
3321	Forging and Stamping	18	10	18	26	8	12	3		0	95
3322	Cutlery and Handtool Manufacturing	14	8	13	6	4	1	1	2	0	49
3325	Hardware Manufacturing		4	3	4	5	2			0	18
3326	Spring and Wire Product Manufacturing	9	5	10	9	5	4			0	42
3327	Machine Shops and Threaded Products	275	142	93	70	27	10	1		0	618
3328	Coating, Engraving & Heat Treating Metal	36	34	26	25	17	9			0	147
3329	Other Fabricated Metal Product Mfg	16	12	18	11	9	7	4	1	1	79
3331	Ag., Construction, and Mining Machinery	9	10	7	3	1				0	30
3332	Industrial Machinery Manufacturing	12	13	9	4	3	4			0	45
3333	Commercial & Service Industry Machinery	18	31	19	10	4		1		0	83
3334	HVAC and Commercial Refrigeration Equip	8	3	2	5	3	1	4		0	26
3335	Metalworking Machinery Manufacturing	50	43	51	31	8	8	1		0	192
3336	Turbine and Power Transmission Equipment	5	10	4	2	4	6			1	32
3339	Other General Purpose Machinery Mfg	35	35	27	20	8	5	1	1	0	132

ATTACHMENT "A"

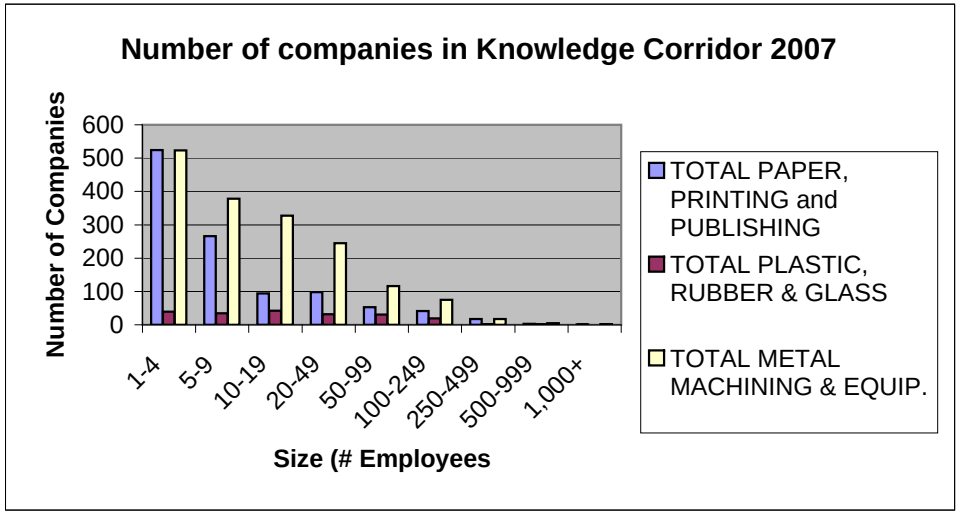
Total Number of firms by size 4 digit Naics - Knowledge Corridor MA + CT

Source Special queries of Info USA Employer Database (from Jennifer at MA Dept of WD)

Naics code	*naics title*	*1-4*	*5-9*	*10-19*	*20-49*	*50-99*	*100-249*	*250-499*	*500-999*	*1,000+*	*all sizes*
	TOTAL METAL MACHINING and EQUIP.	**523**	**378**	**327**	**245**	**116**	**75**	**17**	**5**	**2**	**1688**
3341	Computers and Peripheral Equipment	2	4		1		1	1		0	9
3342	Communications Equipment Manufacturing	6	1	5	6	1	1		1	0	21
3343	Audio and Video Equipment Manufacturing	4	1							0	5
3344	Semiconductor and Electronic Components	12	16	12	11	10	12	2	2	0	77
3345	Electronic Instrument Manufacturing	20	17	23	11	9	6	3		0	89
3346	Magnetic Media Manufacture & Reproducing	3	1	2						0	6
3351	Electric Lighting Equipment Mfg	3	2	8	1		1		1	0	16
3352	Household Appliance Manufacturing	5	1	2	1	2				0	11
3353	Electrical Equipment Manufacturing	9	4	8	6	3	4	2		0	36
3359	Other Electrical Equipment & Components	6	3	7	15	2	2	2		0	37
3364	Aerospace Product & Parts Manufacturing	10	7	10	22	14	12	4	1	2	82
3391	Medical Equipment and Supplies Mfg	77	28	24	33	8	10	3	5	0	188
3399	Other Miscellaneous Manufacturing	191	68	78	40	16	8			2	403
	OTHER RELEVANT INDUSTRY	**348**	**153**	**179**	**147**	**65**	**57**	**17**	**10**	**4**	**980**
	all industries	2868	1664	1284	1044	530	384	104	38	14	7930

No. of Employees	1-4	5-9	10-19	20-49	50-99	100-249	250-499	500-999	1,000+	all sizes
TOTAL PAPER, PRINTING and PUBLISHING	524	266	94	98	53	41	17	3	1	1097
TOTAL PLASTIC, RUBBER & GLASS	39	35	42	32	31	19	1	1	0	200
TOTAL METAL MACHINING & EQUIP.	523	378	327	245	116	75	17	5	2	1688

No. of Employees	1-4	5-9	10-19	20-49	50-99	100-249	250-499	500-999	1,000+	all sizes
TOTAL METAL MACHINING & EQUIP.	523	378	327	245	116	75	17	5	2	1688



Attachment B

REGIONAL EMPLOYMENT BOARD
OF HAMPDEN COUNTY, INC.

Precision Manufacturing Regional Alliance Project (PMRAP) Questionnaire

Company: _____ ***Contact Person:*** _____ ***Tel. No.*** _____

Please complete the following queries that relate to your manufacturing operations needs as well as your guidance on specific ways that the Technology Innovation and Applications Engineer (identified in the cover letter) can add value to the work within your particular company. Please be as specific as possible. Thank you for completing this survey.

****

Industry Needs Assessment

A. Please identify the categories or requests for manufacturing services that you are getting from your suppliers or customers that are creating the need to access manufacturing engineering support or new technology development in order for you to respond to this demand or be more competitive**.**

Specific Categories or Requests

1.
2.
3.

B. Please list those engineering activities or supports that would assist to your company in transitioning to more value-added manufacturing or being able to access new markets.

Specific Activities or Supports

1.
2.
3.

C. Please identify specific technical assistance or supports that your company needs **internally** to improve productivity and competitiveness as suppliers in your **present** markets.

Specific Technical Assistance or Supports

1.
2.
3.

D. Please identify specific technical assistance or supports that your company needs to consider **internally** in order to move up the supply chain in **new growth** markets such as medical devices, laboratory instrumentation and alternative energy.

Specific Technical Assistance or Supports

1.
2.
3.

****

Technology Innovation and Applications Engineer

General Responsibilities

E. Provide manufacturing and applications engineering support to develop processes, procedures and tooling used to produce final assembly products and related sub-assemblies.

Important to your company: Yes No

Examples of Specific Work Tasks

1.
2.
3.

F. Provide manufacturing and applications engineering support to evaluate current manufacturing processes, and recommend new processes, product, and equipment and tooling technology to improve productivity and reduce production costs.

Important to your company: Yes No

Examples of Specific Work Tasks

1.
2.
3.

G. Provide manufacturing and applications engineering support to monitor the cost of production costs or processes, efficiency and utilization rates, and effective use of resources in order to maximize quality and minimize cost.

Important to your company: □Yes No □

Examples of Specific Work Tasks

1.
2.
3.

H. Provide manufacturing and applications engineering support on operational problems effecting production, and work with the appropriate internal staff to identify workable solutions.

Important to your company: □Yes No □

Examples of Specific Work Tasks

1.
2.
3.

I. Provide manufacturing and applications engineering support in prototype development of new products, and assess and develop manufacturing processes that will enable the use of advanced materials.

Important to your company: □Yes No □

Examples of Specific Work Tasks

1.
2.
3.

J. Identify new machining processes and techniques and utilize new section on the WMNTMA web site to communicate information, share data and reference resources with partnering companies.

Important to your company: □Yes No □

Examples of Specific Work Tasks

1.
2.
3.

Attachment C

Precision Manufacturing Regional Alliance Project (PMRAP)

Query No. 2- Industry Needs Assessment

A. Please identify the categories or requests for manufacturing services that you are getting from your suppliers or customers that are creating the need to access manufacturing engineering support or new technology development in order for you to respond to this demand or be more competitive.

1. Customers supplying minimally dimensioned drawings requiring company to work directly from solid models rather than to prints with all dimensions and tolerances.
2. Requirements for Statistical Process Control on more parts.
3. Requirements for complete First Article Inspection Reports.
4. Reduced costs and shortened lead times.
5. New technology, IE: cutting tools, fixturing, and machine tool technology.
6. Machining with new materials (titanium, ceramics, etc.).
7. 3- D CAD modeling.
8. Nuclear related.
9. Energy Related.
10. Value Added Assembly of parts and components.
11. Ability to perform all operations (finish complete).
12. Higher quality standards.
13. AS 9000 certification and GAP analysis.

B. Please list those engineering activities or supports that would assist your company in transitioning to more value-added manufacturing or being able to access new markets.

1. New materials technology.
2. New and evolving cutting tool technology and applications.
3. Quick change over for tooling and fixturing.
4. More efficient ways to lay out jobs.
5. Process techniques to reduce set-up time.
6. Increased ability to create 3D models from customer drawings.
7. Software programming.
8. Processing a job to lower total costs.
9. Machine tool capability study and statistical process control recommendation.
10. Current and targeted cost of quality.
11. Programming priority study with short medium and ling term projects with make/but analysis.
12. Broader knowledge of government contracting.
13. Training for assembly personnel in areas such as helicoil installation, use of automated assembly equipment, drawing and BOM interpretation.

C. Please identify specific technical assistance or supports that your company needs internally to improve productivity and competitiveness as suppliers in your present markets.

1. New and evolving cutting tool technology and applications to improve and streamline production flow.
2. Fixture Design (Work holding)
3. Computerizing tool/ fixture crib.

4. New employee training.
5. Support in continuous improvement (possibly introducing “technology audits”).
6. Reprocess existing parts to exploit “lights out” manufacturing.
7. Expand the automation of deburring.
8. Expand the utilization of cellular manufacturing.
9. Software programming.
10. Electrical interface.
11. CE requirements and regulations for machinery.
12. Make /buy analysis on certain key machine tool processes.
13. Work center cost study and database for estimates and pricing.

D. Please identify specific technical assistance or supports that your company needs to consider internally in order to move up the supply chain in new growth markets such as medical devices, laboratory instrumentation and alternative energy.

1. Identifying targeted markets that fit our manufacturing niche.
2. New materials technology.
3. New and evolving cutting tool technology and applications.
4. Training more qualified employees.
5. Establishing a Clean Room.
6. Automated inspection.
7. Market studies discussing evolving markets and needs.
8. Software programming.

Query No. 3- Technology Innovation and Applications Engineer

General Responsibilities

1. Provide manufacturing and applications engineering support to develop processes, procedures and tooling used to produce final assembly products and related sub-assemblies.

Important to your company: Yes 87% No 13%

Examples of Specific Work Tasks

1. Process Engineering ie; developing operation sequences and job routers to break jobs down in to manageable pieces.
2. Design of assembly/process flow.
3. Test latest tooling for quality improvements.
4. Investigate latest quality techniques/approaches to facilitate gathering/ using quality data.
5. Create operation sheets.
6. Cycle time reduction.
7. Tooling use to lower tooling costs.
8. On line tool kitting database and pre-kitting magazine.

2. Provide manufacturing and applications engineering support to evaluate current manufacturing processes, and recommend new processes, product, and equipment and tooling technology to improve productivity and reduce production costs.

Important to your company: Yes 100% No 0

Examples of Specific Work Tasks

1. New techniques to improve cycle times.

2. Knowledge of new cutting tool technology.
3. Continuous improvement to benefit from new tooling or technology.
4. Machining process for new materials i.e. thin wall titanium.
5. Technical support when evolving from 3 & 4 axis milling to 5 axis.
6. Quick set-up and changeover.
7. Consolidate tooling used in multiple operations.
8. Develop a quick change fixturing system.
9. Evaluate how "one of a kind manufacturing" can introduce lean manufacturing techniques.
10. Recommend new processes to lower costs.
11. Make /buy analysis on certain key machine tool processes.
12. Work center cost study and database for estimates and pricing.

3. Provide manufacturing and applications engineering support to monitor the cost of production costs or processes, efficiency and utilization rates, and effective use of resources in order to maximize quality and minimize cost.

Important to your company: Yes 100% No 0

Examples of Specific Work Tasks

1. Cost accounting.
2. Overhead and depreciation analysis.
3. Developing quick-change tooling/fixturing to reduce machine down time.
4. Time Studies.
5. Standard work development.
6. Analyze estimating methods and procedures.

4. Provide manufacturing and applications engineering support on operational problems effecting production, and work with the appropriate internal staff to identify workable solutions.

Important to your company: Yes 87% No 13%

Examples of Specific Work Tasks

1. Use quality data to select specific projects for improved yield.

5. Provide manufacturing and applications engineering support in prototype development of new products, and assess and develop manufacturing processes that will enable the use of advanced materials.

Important to your company: Yes 50% No 50%

Examples of Specific Work Tasks

1. Search for new materials or cheaper manufacturing operations to expedite manufacturing.
2. Advanced materials such as titanium and ceramics.
3. Rapid prototyping models.
4. Exotic metals machining.

6. Identify new machining processes and techniques and utilize new section on the WMNTMA web site to communicate information, share data and reference resources with partnering companies.

Important to your company: Yes 75% No 25%

Examples of Specific Work Tasks

1. Consult fellow companies and or vendors to see the latest in manufacturing technology.
2. Share new technologies and tooling.

Attachment D

Work Plan and Schedule

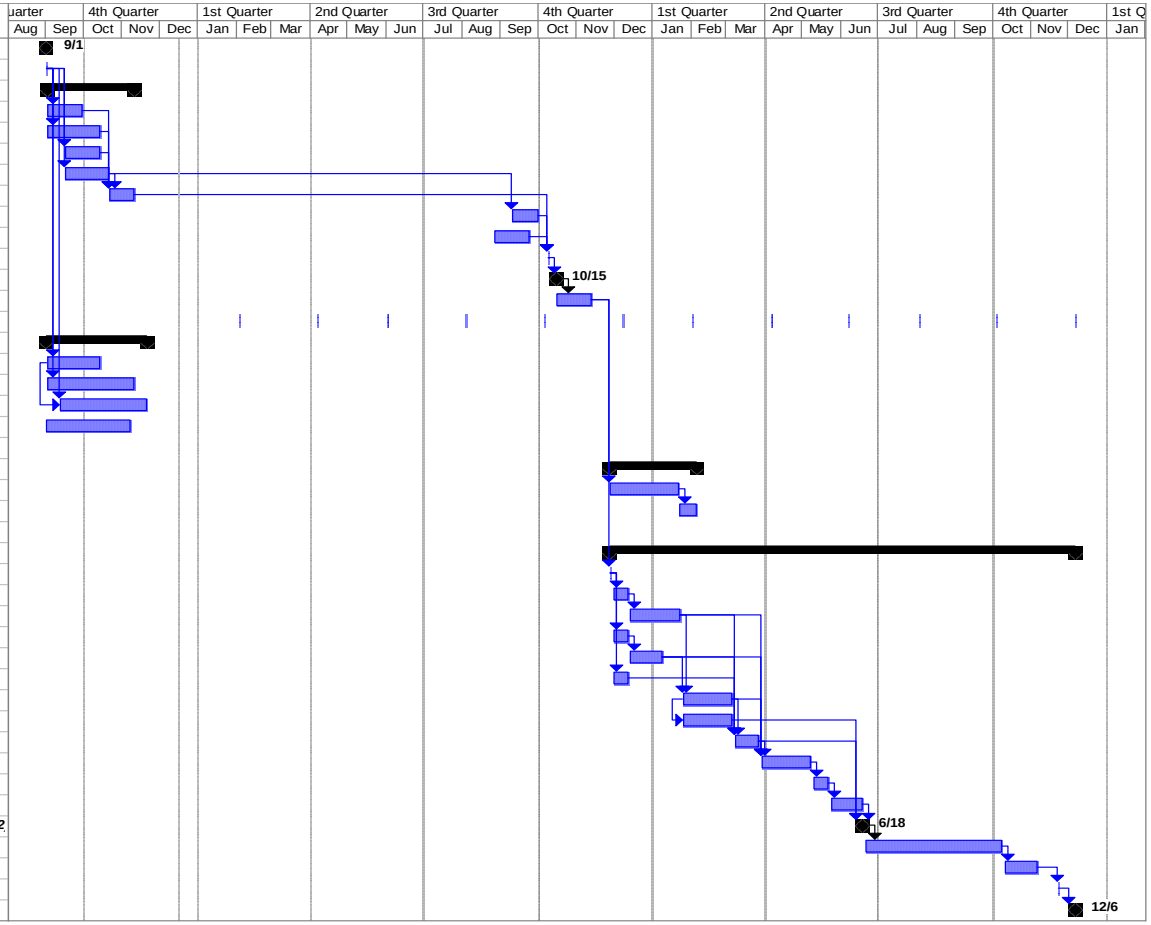
Project Work Plan		
Task/ Milestone	**End Date**	**Responsible Party**
Project Kick Off Meeting	12/01/08	REB
1. Convene Partners and Collaborators to review Goals and Project Deliverables.	12/15/08	Project Manager
Deliverable #1- Memorandum of Agreement among **Sector Companies**	12/31/08	Project Manager
1. Meet with WMNTMA Board of Directors to develop industry priorities.	12/15/08	Project Manager WMNTMA BOD
2. Submit DRAFT MOA to WMNTMA Board and Companies.	12/15/08	Project Manager
3. Obtain company owners signature on MOA.	12/31/08	Project Manager
Deliverable #2- Preliminary **Manufacturing Center Feasibility Study**	8/14/09	Project Manager
1. Study kick-off meeting	1/12/09	Project Manager
2. Complete Center SWOT analysis	5/22/09	Project Manager
Deliverable #3- Market Opportunities Forum	04/01/09	Project Manager
1. Establish Forum Planning Committee, conduct planning meetings, and develop Forum agenda and protocols	01/30/09	Project Manager
Deliverable #4- Licensing Agreement	2/15/09	Project Manager
1.Facilitate licensing agreement between WMNTMA and WISER	1/31/09	Project Manager
Deliverable #5- New **Market Opportunities** section.	2/15/09	Project Manager
1. Contract with WMNTMA web site design company to create new section.	1/15/09	Project Manager
Deliverable #6- Memorandum of Agreement between the REB, WMNTMA, and UMass-Amherst	02/15/09	Project Manager UMass PI
1. Convene meeting with college representatives to develop MOA Agreements and Conditions.	1/31/09	Project Manager UMass PI
2. Meet with WMNTMA Board of	1/15/09	Project Manager

Directors to develop industry priorities for MOA		UMass PI
3. Finalize MOA Agreements and Conditions, obtain signatures, and begin implementing MOA agreements.	2/15/09	Project Manager UMass PI
Deliverable #7- Hire **Applications Engineer**	3/6/09	Steering Committee Project Manager
Deliverable #8-Technology Innovation Forums	12/14/10	Project Manager UMass PI Applications Engineer
1.Plan Innovation Forums series-topics & participants	4/17/09	Project Manager UMass PI
2. Conduct 1st Forum	5/25/09	Project Manager UMass PI Applications Engineer
3. Conduct 3rd Forum	11/25/09	Project Manager UMass PI Applications Engineer
4. Conduct 5th Forum	5/28/10	Project Manager UMass PI Applications Engineer
Deliverable #9- Technology Transfer Pilot	11/4/10	Project Manager UMass PI Applications Engineer
1. Identify technology opportunity and initiate collaborative activities	12/30/09	Project Manager UMass PI Applications Engineer
2. Develop technology transfer plan (with target company)	4/28/10	Project Manager UMass PI Applications Engineer
Deliverable #10- Memorandum of Agreement between Companies and Educational/Training Institutions	1/31/09	Project Manager
1. Convene meeting with education representatives to develop MOA Agreements and Conditions.	1/31/09	Project Manager
2. Meet with WMNTMA Board of Directors to develop industry priorities.	1/15/09	Project Manager
3 .Finalize MOA Agreements and Conditions, obtain signatures, and	1/31/09	Project Manager

implement agreements		
Deliverable#11-Certificate Program in Mechanical Engineering Technology	12/01/09	Project Manager
1. Meet with STCC to discuss course offering and scheduling.	4/01/09	Project Manager
2. Facilitate meeting between industry and STCC to discuss program goals, structure and curriculum.	6/01/09	Project Manager
3. Facilitate curriculum development	10/15/09	Project Manager
Deliverable #12- Create **Regional Precision Manufacturing Technology Advisory Council**	1/31/09	Project Manager
1. Convene meeting of School Principals to discuss Council concept.	12/31/08	Project Manager
2. Identify industry members from regional Program Advisory Boards to serve on Council and meet with each industry member.	12/31/08	Project Manager
Deliverable #13- Business Impacts Survey and Report	06/30/10	Project Manager
1. Oversee development and implementation of Survey and Report	01/15/10	Project Manager
Deliverable #14- Center for Advanced Precision Manufacturing Technology-Final Implementation Plan	2/1/10	
1. Finalize Implementation Plan-Validate Center concept and structure, and sustainability plan	12/4/09	Steering Committee Project Manager
Deliverable #15- Implementation Replication Manual	12/31/10	Project Manager
1. Prepare Implementation Replication Manual	10/01/10	Project Manager

PMRAP Project Schedule (Selected tasks)

ID	Task Name
1	Program Start
2	Meeting with JAII
3	**JAII Phase 1 Tasks**
4	Query 1- Precision Manu/Machining profile
5	Query 2- Refined needs assessment
6	Query 3- Applications Engr. Preliminary Job Des.
7	Query 4- Refined Center Development Concept
8	Phase 1 summary
9	Develop Detailed Project Plan
10	Dev/Recruit Steering Committee
11	Convene first Steering Committee
12	Submit Phase 1 summary to JAII
13	JAII Review and authorization of Phase 2
14	**Steering Committee Meetings (every 2 months)**
27	**Refine Project Details with partners**
28	Refine understanding with WMNTMA
29	Refine understanding with UMass
30	Refine understanding with STCC and HCC
31	Refine understanding with EDC
32	
33	**Hire Applications/Manu Engr. ???**
34	***RECRUIT APPLICATIONS/MANU ENGR***
35	Train/Introduce New hire
36	
37	**CENTER DEVELOPMENT**
38	***KICK-OFF MEETING***
39	Prep questions for local interviews/focused group meetings
40	Conduct Initial Interviews and meetings
41	ID "Reference/examples" of Centers
42	Collect Benchmarking data for Example Group
43	Develop & Release Assumptions & Priorities
44	Develop Context and Analysis
45	Develop Prelim analysis for Springfield Site
46	***SWOT ANALYSIS***
47	Center Development/Concepts
48	Conduct Final Interviews (if needed)
49	Preliminary Feasibility Summary and Implem. Plan
50	***SUBMIT PRELIMINARY FEASIBLITY STUDY (DELIVEABLE #2***
51	***FINALIZE IMPLEMENTATION PLAN***
52	Edit Final Implem. Plan
53	Approval of Implem. Plan by Steering Committee
54	***RELEAS FINAL IMPLEMETATION PLAN (DELIVERABLE #14)***



ID	Task Name	Duration	Start	Finish
56	**New Technology Identification**	**85 days**	**Mon 1/12/09**	**Fri 5/8/09**
57	Define Industry Tech needs/Survey (current)	20 days	Mon 1/12/09	Fri 2/6/09
58	Conduct Market Opportunities Forums (Future needs assess)	35 days	Mon 1/12/09	Fri 2/27/09
59	Dev Tech objectives document (needs summary for UMass)	15 days	Mon 3/2/09	Fri 3/20/09
60	Identify Research and Plan meetings with Faculty	10 days	Mon 3/23/09	Fri 4/3/09
61	Conduct Visits by Appl. Engr and Industry at UMass	15 days	Mon 4/6/09	Fri 4/24/09
62	Conduct visits by Faculty at Industry	15 days	Mon 4/6/09	Fri 4/24/09
63	Summarize and Publish Tech Opportunities	10 days	Mon 4/27/09	Fri 5/8/09
64				
65	***TECHOLOGY INNOVATION FORUMS***	**442 days?**	**Mon 4/6/09**	**Tue 12/14/10**
66	***PLAN INNOV. FORUMs SERIES- TOPICS & PARTICIPANTS***	10 days	Mon 4/6/09	Fri 4/17/09
67	**First Innovation Forum**	**91 days?**	**Mon 4/20/09**	**Mon 8/24/09**
68	Develop Objectives and Agenda- 1st Forum	10 days	Mon 4/20/09	Fri 5/1/09
69	***CONDUCT 1st FORUM***	1 day?	Mon 5/25/09	Mon 5/25/09
70	Summarize Roadmap of Outcomes of 1st Forum	5 days	Tue 5/26/09	Mon 6/1/09
71	Application Research (UMASS)- Forum Specific	60 days	Tue 6/2/09	Mon 8/24/09
72	Support/Follow up actions from 1st Forum	40 days	Tue 5/26/09	Mon 7/20/09
73	**Second Innovation Forum**	**91 days?**	**Tue 7/21/09**	**Tue 11/24/09**
74	Develop Objectives and Agenda- 2nd Forum	10 days	Tue 7/21/09	Mon 8/3/09
75	Conduct 2nd Forum	1 day?	Tue 8/25/09	Tue 8/25/09
76	Summarize Roadmap of Outcomes of 2nd Forum	5 days	Wed 8/26/09	Tue 9/1/09
77	Application Research (UMASS)- Forum Specific	60 days	Wed 9/2/09	Tue 11/24/09
78	Support/Follow up actions from 2nd Forum	40 days	Wed 8/26/09	Tue 10/20/09
79	**Third Innovation Forum**	**91 days?**	**Wed 10/21/09**	**Wed 2/24/10**
80	Develop Objectives and Agenda- 3rd Forum	10 days	Wed 10/21/09	Tue 11/3/09
81	***CONDUCT 3rd FORUM***	1 day?	Wed 11/25/09	Wed 11/25/09
82	Summarize Roadmap of Outcomes of 3rd Forum	5 days	Thu 11/26/09	Wed 12/2/09
83	Application Research (UMASS)- Forum Specific	60 days	Thu 12/3/09	Wed 2/24/10
84	Support/Follow up actions from 3rd Forum	40 days	Thu 11/26/09	Wed 1/20/10
85	**Fourth Innovation Forum**	**91 days?**	**Thu 1/21/10**	**Thu 5/27/10**
86	Develop Objectives and Agenda- 4th Forum	10 days	Thu 1/21/10	Wed 2/3/10
87	Conduct 4th Forum	1 day?	Thu 2/25/10	Thu 2/25/10
88	Summarize Roadmap of Outcomes of 4th Forum	5 days	Fri 2/26/10	Thu 3/4/10
89	Application Research (UMASS)- Forum Specific	60 days	Fri 3/5/10	Thu 5/27/10
90	Support/Follow up actions from 4th Forum	40 days	Fri 2/26/10	Thu 4/22/10
91	**Fifth Innovation Forum**	**91 days?**	**Fri 4/23/10**	**Fri 8/27/10**
92	Develop Objectives and Agenda- 5th Forum	10 days	Fri 4/23/10	Thu 5/6/10
93	***CONDUCT 5th FORUM***	1 day?	Fri 5/28/10	Fri 5/28/10
94	Summarize Roadmap of Outcomes of 5th Forum	5 days	Mon 5/31/10	Fri 6/4/10
95	Application Research (UMASS)- Forum Specific	60 days	Mon 6/7/10	Fri 8/27/10
96	Support/Follow up actions from 5th Forum	40 days	Mon 5/31/10	Fri 7/23/10
97	**Sixth Innovation Forum**	**91 days?**	**Mon 7/26/10**	**Mon 11/29/10**
98	Develop Objectives and Agenda- 6th Forum	10 days	Mon 7/26/10	Fri 8/6/10
99	Conduct 6th Forum	1 day?	Mon 8/30/10	Mon 8/30/10
100	Summarize Roadmap of Outcomes of 6th Forum	5 days	Tue 8/31/10	Mon 9/6/10
101	Application Research (UMASS)- Forum Specific	60 days	Tue 9/7/10	Mon 11/29/10
102	Support/Follow up actions from 6th Forum	40 days	Tue 8/31/10	Mon 10/25/10
103	Summarize Results & Lessons Learned from Innovation Forums	20 days	Tue 10/26/10	Mon 11/22/10
104	Approve Summary of Innov Forums by Steering Comm.	1 day?	Tue 12/7/10	Tue 12/7/10
105	***SUBMIT INNOV. FORUMS SUMMARY (DELIVERABLE #8***	0 days	Tue 12/14/10	Tue 12/14/10
106				
107	**TECHNOLOGY TRANSFER PILOT**	**196 days?**	**Thu 2/4/10**	**Thu 11/4/10**
108	***SELECT TECHNOLOGY FOR PILOT PROJECT (WITH COMPAN***	10 days	Thu 2/4/10	Wed 2/17/10
109	Facilitate IP agreement	30 days	Thu 2/18/10	Wed 3/31/10
110	***DEVELOP TECHNOLOGY TRANSFER PLAN***	20 days	Thu 4/1/10	Wed 4/28/10
111	Facilitate Implemention Plan	100 days	Thu 4/29/10	Wed 9/15/10
112	Summarize Lessons Learned	20 days	Thu 9/16/10	Wed 10/13/10
113	Approve Summary of Tech Trans. By Steering Comm.	1 day?	Thu 10/28/10	Thu 10/28/10
114	***SUBMIT TECH. TRANSFER SUMMARY (DELIVERABLE #9)***	0 days	Thu 11/4/10	Thu 11/4/10