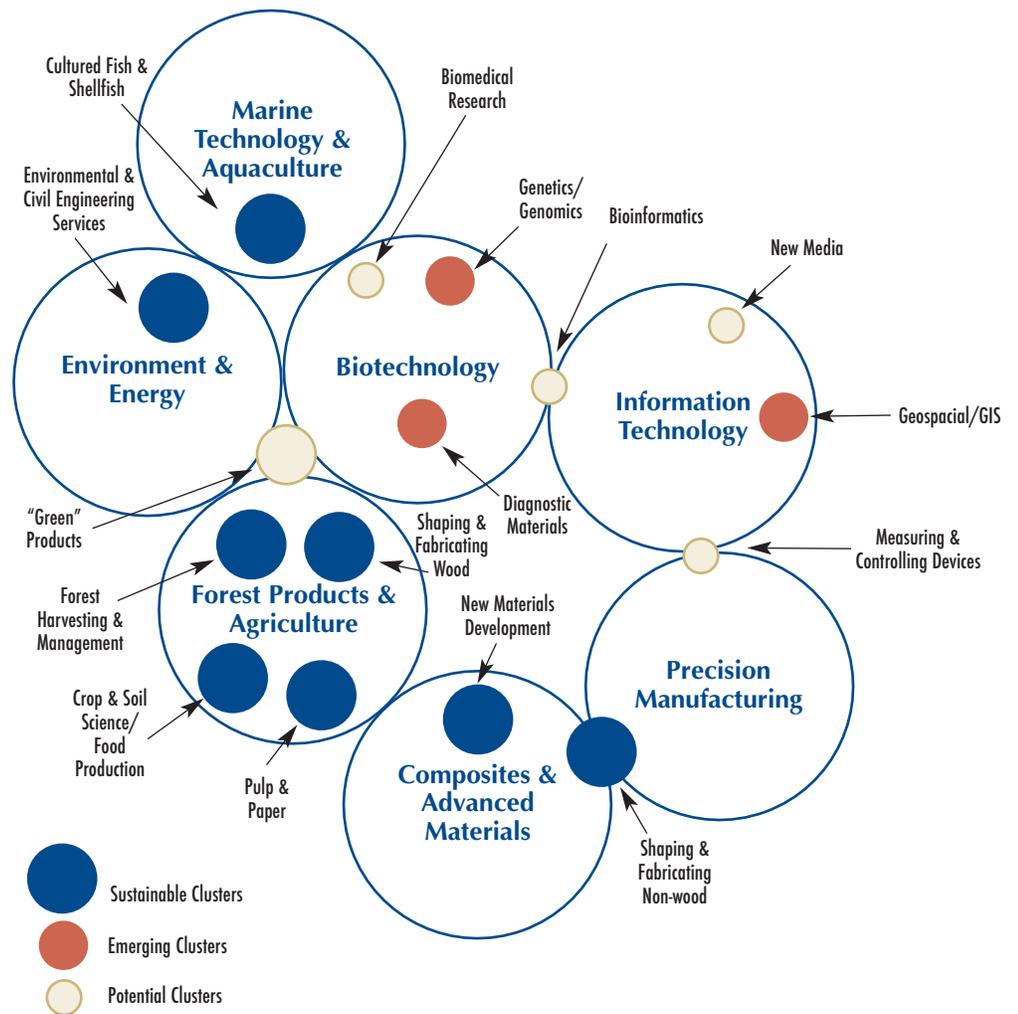


An Introduction to Maine's Technology Sectors and Clusters: Status and Strategy

March 2008



Based on the report, Maine's Technology Sectors and Clusters: Status and Strategy, March 2008, by the team of Dr. Charles S. Colgan, Professor of Public Policy and Management in the Muskie School of Public Service and Associate Director of the Maine Center for Business and Economic Research (MCBER); Marianne Clark of the Technology Partnership Practice of the Battelle Institute; Dr. Charles Lawton of Planning Decisions, Inc.; and James Damcic of PolicyOne Research, Inc.

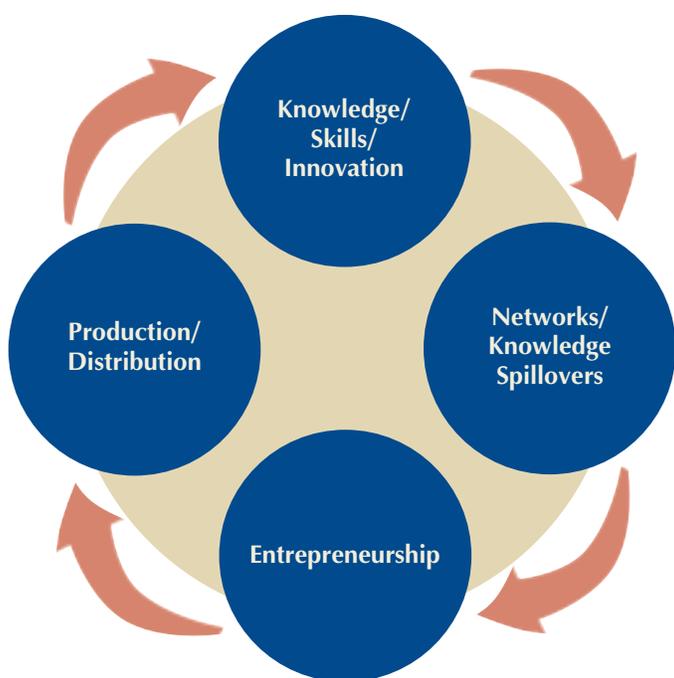
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Clusters are an important driver of business growth and economic development in a region. Maine's technology clusters have grown and evolved significantly since 2002, when Maine's first analysis of its technology sectors was published. Since that time, researchers have learned more about clusters, what they are, how to measure them and how to nurture them. And here in Maine, the Brookings Institution report Charting Maine's Future as well as several Legislative and state committees have called for a greater investment in our high-potential technology clusters.

Last year, the Maine Technology Institute (MTI) Board of Directors commissioned an analysis of Maine's technology sectors and clusters to be led by Dr. Charles Colgan, Professor of Public Policy and Management, Center for Business and Economic Research, the University of Southern Maine, and funded in collaboration with Maine's Office of Innovation. The report team combined the in-state expertise of PolicyOne Research, Inc., and Planning Decisions, Inc., with the expertise of Battelle, a global technology organization. The resulting report, Maine's Technology Sectors and Clusters: Status and Strategy, can be downloaded at the MTI website, www.mainetechnology.org, and the Maine Office of Innovation website, www.maineinnovation.com. A summary of the report follows.

MAJOR FINDINGS

- Clusters, in relation to Maine, are best defined as a collection of knowledge, skills and innovation that reside in a particular area and spread via networks to stimulate entrepreneurship, lead to new products and services that in turn generate economic growth in the area and also spark the creation of additional knowledge, skills and innovation.
- The foundations of knowledge and skills include an active and distinctive research and development effort along with an adequate STEM (science, technology, engineering and math) educated workforce. The report analysis shows adequate patterns of knowledge and skills underlying clusters in Maine.



- Significant research by universities and non-profits is occurring in biomedical sciences, marine sciences, crop/soil sciences and forestry/environmental services, and
- Research in wood/fiber related composites by universities and non-profits is active and a distinctive strength in Maine. IT and manufacturing innovation was found to be lead by private industry efforts.
- However, the percentage of the workforce in STEM occupations in Maine is more than 30% lower than the national average, and
- Maine has seen only modest growth in graduates in the STEM category over the past ten years.

- The report team analyzed the seven Maine technology business sectors by conducting interviews, looking at the MTI Cluster Enhancement Awards since 1999 and quantifying sector employment levels in comparison to the U.S. and six reference states. It found:

For **Biotechnology**, Maine has distinct knowledge and skills bases in genetics/genomics and the development of commercially based products in diagnostics. Accordingly, the diagnostics/antibodies area is an emerging cluster.

Composites and Advanced Materials is the Maine sector that, as a whole, best exemplifies a sustainable cluster in the sense developed in the report. Knowledge, skills and innovation are notable and strongly associated with Maine, formal and informal networks have arisen and there is strong evidence of entrepreneurship through new companies and existing commercially successful firms.

Environmental Services and Engineering, as part of the Environmental Technologies Sector, is a sustainable cluster. Other parts of this sector do not yet exhibit cluster characteristics.

Forest Products and Agriculture contains a number of clusters that are sustainable over time. Cutting edge areas like bio-fuels and bio-plastics will require additional research if they are to be meaningful for Maine's economy.

Information Technologies are widely dispersed and we can look to areas of specialization for clusters. Geospatial technologies are an emerging cluster and there is evidence of potentials for new media, bioinformatics and IT applications for measurement and control.

Aquaculture exhibits the characteristics of a sustainable cluster. The market for its products is strong and a robust skills and research base exist in Maine. Marine Technology research is strong, but has not produced commercial developments.

Precision Manufacturing, metalworking and electronics, shows limited knowledge spillover and networking activity and therefore is not seen as a potential cluster. There are possibilities for this sector to develop closer relationships with other sectors and contribute economically in that way.

- The report identified **16 clusters of economic activity** that fall within or at the intersections between Maine's seven technology sectors, each defined by a distinct set of knowledge and skills. The clusters are at various stages of evolution, from those showing potential for the future, those already emerging and those having shown sustainability over time.
- Eight are sustainable: New and Advanced Materials, Chemistry and Chemical Engineering, Marine Biology/Oceanography/Aquaculture, Forest Harvesting and Management, Design/Shaping/Coating of Materials, Crop/Soil Sciences and Environmental Services/Engineering/Civil Engineering. Five are potential and three are emerging, these residing at the junction of several technology/business sectors.
- The **eight potential/emerging clusters** rank as follows, from farthest along to least developed:
Antibodies and Diagnostic Material/Processes, Geospatial Analysis/GIS, Measuring/Controlling Devices, "New" Media, Biomedical Research, Genetics/Genomics, Creating "Green" Products and Bioinformatics.

RECOMMENDATIONS

- **Feed the Pipeline.** Maine has made great strides in expanding R&D and should continue support at the highest level possible.
- **Catalyze the Emergence and Growth of Clusters.** MTI has the opportunity, through its Cluster Enhancement Award program, to take specific actions beyond the support of R&D activities. Specifically efforts should strive to: develop services, build technology networks, shorten distances and make connections outside Maine and address weaknesses of clusters at all levels of their development.

The report identified 16 clusters of economic activity:

- Eight are sustainable.
- Eight are either potential or emerging.

- **Put a Priority on People.** The major workforce issues that must be addressed for cluster development are: Increasing the numbers of advanced degree STEM graduates, expanding the knowledge transfer between industry and the educational institutions, recruiting more specialized workforce members from outside Maine (the Quality of Place Initiative plays an important role) and addressing workforce shortage resulting from an aging population and the lack of younger people willing to move into production floor occupations.
- **Fund Innovation.** The need exists to create better links between Maine's research and development assistance programs and cluster development strategies. Applicants for funding should be encouraged to review how their initiative might enhance networking or strengthen other cluster characteristics as one of the criteria to be considered in grants and awards.

POLICY FOCUS

- **Maine's cluster enhancement initiatives should be focused to facilitate knowledge and skills transfer** through networks and entrepreneurship or, said another way, facilitate collaboration. It is the networked inter-relationships that matter greatly and should be stimulated. Size and number of organizations are critical and must include companies and entrepreneurs that are commercializing products/services.
- **Emerging clusters should be prioritized and supported to boost their activities and become a sustainable network.** Potential clusters should be pro-actively seeded to develop their prospects and see if, on a planned basis, they can emerge. Clusters should be viewed in terms of how they will help to create viable businesses, contributing jobs and adding to the Maine economy.
- **Maine should continue to evolve its thinking toward technology clusters** that are embedded in our technology sectors and recognize that the two classifications may not always overlap, yet remain two key elements of building the Maine economy.

CONCLUSION

Maine's transformation into a regional economy more and more driven by technological innovation is well underway. The report provides evidence of firm foundations in research, growing internal networks that transmit knowledge and skills within Maine and increased commercial success. Significant needs for more workers with specialized training, particularly advanced degrees in science, technology, engineering and math, remain. There is real potential for growth in many key markets, even in mature industries like forest products and agriculture. Creating and seizing this opportunity remains a long road with many other areas in the U.S. and world competing, but one upon which Maine has a respectable start and a commitment to travel.



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Recommendations:

- **Feed the pipeline.**
- **Catalyze the emergence and growth of clusters.**
- **Put a priority on people.**
- **Fund innovation.**