

New Hampshire's Innovation-Led Growth Opportunities are Found in Advanced Manufacturing, Information Systems and Biosciences

The “line-of-sight” analysis identified six niche areas of industry innovation in New Hampshire that fall within three broad industry clusters:

Below is a brief overview of each of the specific innovation niches falling within these broad industry clusters. A profile of each these innovation niches areas is provided in Appendix A to provide a fuller explanation of the industry innovation context, the industry connections, the university research alignment and the growth potential.

Biosciences

Biotech Analysis Tools, Techniques and Products – New Hampshire's patent activity in biopharmaceutical compositions, screening and assay analysis of biological materials and measuring processes involving enzymes and micro-organisms is strong. While a small industry presence of just over 2,500 jobs, the growth across biological product manufacturing and biotechnology research in New Hampshire is hefty – growing 84% from 2009 to 2014.

- **Industry presence:** Although not large from an industry employment standpoint, there is a presence of both emerging and established companies, including Adimab, AgaMatrix, CPEX Pharmaceuticals, DEKA, Enchi Corp., Avitide, Celdara Medical, ImmuNext, and Synta Pharmaceuticals Corp. Most promising for the future is the healthy level of venture capital funding in medical therapeutics and biotechnology, and an active SBIR presence in immunotherapies and vaccines, biomarkers and next generation genetic sequencing. Venture capital funding for medical therapeutics and biotechnology in New Hampshire reached \$137.8 million over the 2009-2015 period with investments made in six New Hampshire companies.
- **Growth outlook:** Market research studies suggest that biotechnology already serves large markets in diagnostics, cell and tissue analysis, and immunoassays and project modest annual growth for these areas in the 3% to nearly 5% range. A high growth market projected to exceed 10% annual growth is drug discovery technologies.
- **Research capacity:** There are strong ties between Dartmouth College and this innovation sector with many fields of biotech-related scholarly activity going forward in the state. Dartmouth has two extensive areas of focus contributing to the growth of this innovation area: 1) immunology and microbiology reaching across cancer, lung biology and antibiotic resistance and 2) engineering in medicine with strengths in protein engineering, biomaterials and nanotechnology. Other areas of major grants include psychiatry involving substance abuse and traumatic brain injury and systems biology involving molecular epidemiology, quantitative biology and structural biology. It is notable that Dartmouth College has a very pro-active approach to forming new companies in the biosciences through Celdara Medical, which is closely affiliated with Dartmouth. Plus, Dartmouth's NIH-funded Clinical and Translational Sciences Institute, known as Synergy, is active in promoting translational research among faculty.

Medical Devices – New Hampshire's patent strengths in medical devices include syringes, injectors and infusion pumps, surgical and wound healing devices, implantable medical devices and diagnostic sensors and medical imaging. Medical device industries in New Hampshire are specialized. Its share of industry employment is at a 42% higher level of specialization when compared to the nation, but New Hampshire job growth in medical devices has declined sharply by 12% from 2009 to 2014.

- **Industry presence:** Although a small industry with just over 2,100 jobs, New Hampshire has many companies driving new innovations in this area, including DEKA, Vapotherm, Simbex, Gamma Medica and AgaMatrix.
- **Growth outlook:** The global market for medical device coatings and equipment is growing at about 7% with growth expected in the area of implantable devices, such as stents and grafts, and clinical sensors and monitors, while the global medical imaging market is increasing at an annual growth rate of approximately 5%.

- **Research capacity:** University strengths are found in many areas pertaining to medical devices, with publications in surgery, radiology, and health care sciences. Major research centers led by Dartmouth College include the Center for Surgical Innovation, Advanced Imaging Center, Center for Technology and Behavioral Health and the Dartmouth Institute for Health Policy and Clinical Practice.

Agricultural, Marine and Bio-based Products – This is a mid-sized industry in the state with about 9,400 jobs, but job growth has declined by 2.2% from 2009 to 2014. Forestry and marine fisheries are major resources in New Hampshire. There are significant efforts to create new community forests to conserve this natural resource, led by the Northern Forest Center. Advancing agricultural, marine and bio-based products have potentially strong overlaps with the activities found in biotechnology analysis tools, techniques and products. Continued efforts are needed to understand how best to apply these innovation capacities to promote natural resource development. An example is Mascoma, a spinoff from Dartmouth, which is converting biomass into biofuels and other specialty chemicals.

- **Industry presence:** There are a variety of companies in the state working in the agricultural, marine and bio-based products areas, including Monadnock Paper Mills Inc., Stonyfield Farm Inc., Gorham Paper and Tissue, Burgess BioPower, and Cedar Point Shellfish. Despite the presence of a large base of natural resources, including extensive woodlands and coastal resources, venture capital and SBIR activity in this area is low.
- **Growth outlook:** The global market outlook varies by application with the synthetic biofuels projected to have an annual growth rate of 78%, while biorefinery technologies are at the lower end of the range with a 5% global annual growth rate projected.
- **Research capacity:** Universities in New Hampshire have much to contribute to this innovation niche. In scholarly activity as measured by publications, universities stand out in many fields connected with bringing innovation forward for agricultural, marine and bio-based products including: forestry, marine biology, fisheries, biodiversity conservation and environmental sciences. Existing strengths in the UNH School of Marine Science and Ocean Engineering and a recent cluster hire made in natural resources at the College of Life Sciences and Agriculture are key drivers of new research and technology. Dartmouth College also has leading faculty researchers in bioprocessing, advancing biofuels and biomass processing. Plus, through Agricultural Extension and the Thompson School of Applied Sciences at UNH, there is capacity to advance new applied research.