



**Vermont Advanced
Manufacturing Partnership**

FINAL REPORT
January 2013



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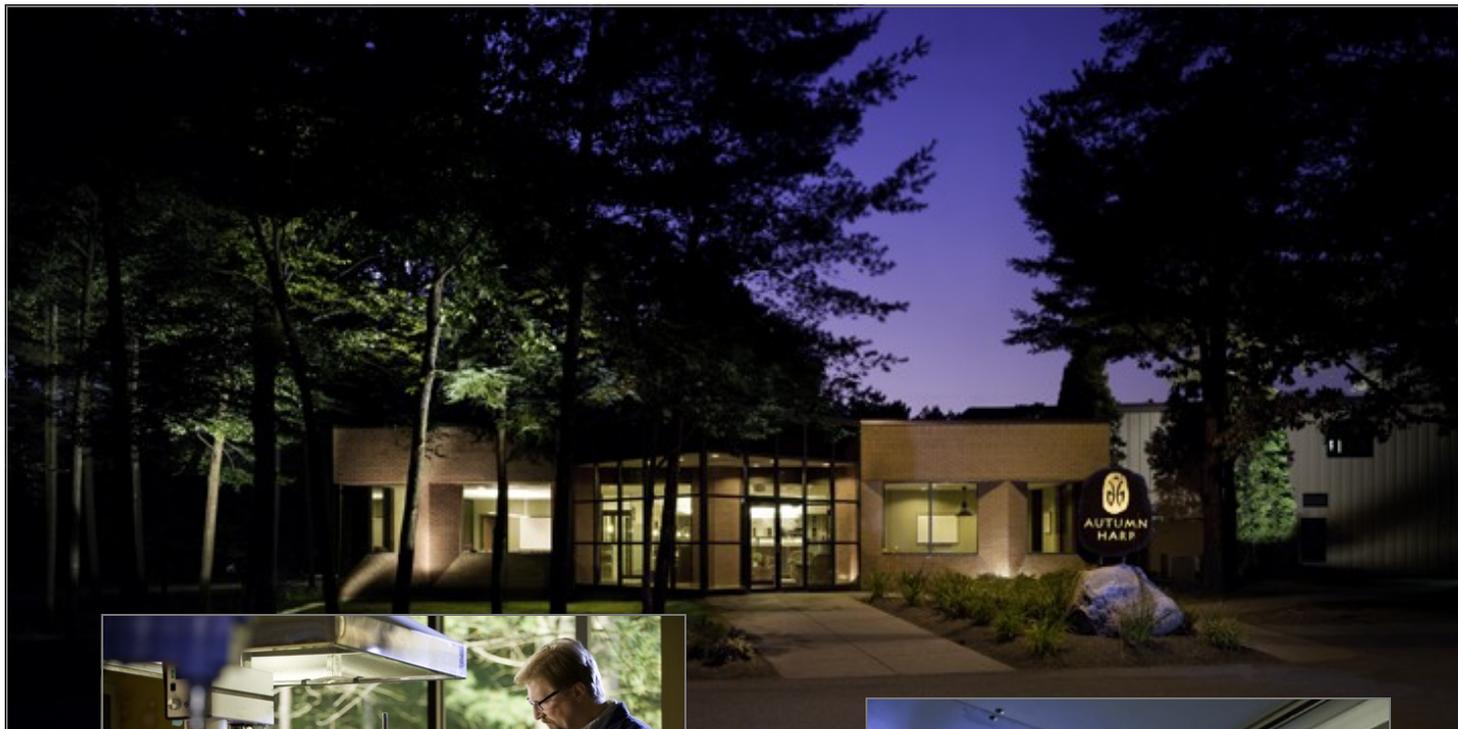
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Foreword

This report is in response to Governor Shumlin's directive in his January 2012 Budget Address to create the "Advanced Manufacturing Partnership" to bolster Vermont's manufacturing sector. It comprises the recommendations given by a group of forward-looking Vermont manufacturers, higher education, government and other leaders interested in manufacturing who first came together in July 2012 under the leadership of Lawrence Miller, Secretary of the Agency of Commerce and Community Development, to discuss ways to help strengthen and grow manufacturing in the state and suggest some first steps toward the design and implementation of a strategic plan for manufacturing in Vermont.

The future health of Vermont's manufacturing sector will have a *significant impact* on sustainable opportunities for high-paying skilled jobs, our K-16 education system, opportunities for research and intellectual property development, state and local tax revenues, and the overall economic well being and capacity for wealth creation for our citizens for generations to come. Vermont can and must do more to help foster an environment that allows existing and new entrepreneurs to take risks, learn, create new products and services, and grow their business ventures. Toward this end, a menu of recommendations and opportunities for action is presented in this report.

"Manufacturing" may be broadly defined as what happens when innovation turns into products. Innovation is the creation and capturing of value in new ways. It involves "meaningful uniqueness" and can apply to all

areas of business—new products, new services, new processes, or new business models, for example.

"Advanced Manufacturing" is a family of activities that (a) depend on the use and coordination of information, automation, computation, software, sensing, and networking and/or (b) make use of cutting-edge materials and emerging capabilities enabled by the physical and biological sciences. Examples of advanced manufacturing include nanotechnology, chemistry, and biology—and it involves both new ways to manufacture existing products and the manufacture of new products emerging from new advanced technologies. (Definition: President's Council on Science & Technology, 2011).

Say the word "manufacturing" and you might conjure up a picture of large, ugly factories with plumes of dark smoke spewing from multiple stacks. It's not an image that fits Vermont's pristine reputation or its current manufacturing climate. Many Vermonters would be surprised to know how many manufacturers there are in the state, the variety of products, and how important manufacturing is to the state's diverse economy. But these manufacturers aren't the giant, polluting industries of old filled with low-paid workers on assembly lines.

Today's manufacturing landscape is characterized more by small, technologically sophisticated companies with skilled workers, extensive supply chains, and global markets. *Over 1,000 Vermont manufacturers employ 5 or fewer workers.*

The *facts* about manufacturing underscore why it is essential to Vermont's economic prosperity, and why our



taxpayers, state government, and the legislature must understand and support *Next Generation Manufacturers*—manufacturers who are planning for the growth of their businesses, investing in their employees by providing the necessary skills training for them to do their jobs, and seeking innovative new products and services, customers and markets, processes and business models.

Profitable growth of *existing* manufacturers, targeted attraction of *new* manufacturers and support of start-up manufacturers are all vital to Vermont's future. The following *facts* underscore why manufacturing is so critical for Vermont and the United States.

Manufacturing in Vermont...

- Manufacturers account for over 1,000 firms in Vermont. Most are small, with about 60% having fewer than 10 employees. About 87% have 50 or fewer employees. Fewer than 20 have 500 employees or more. [Source: VT DOL, BLS]
- Manufacturing employs about 31,300 Vermonters (July 2012), or about 10.25% of Vermont's total workforce of about 305,300 (July '12). [Source: VT DOL]
- Average annual earnings in Vermont manufacturing is about 36% above statewide average earnings (i.e. \$51,829 in manufacturing vs. \$38,124 on average). [Source: Vermont Economy Newsletter – June 2011]
- Manufacturing contributes about 11.1% or \$2.9 billion (in Year 2009) of Vermont's Gross Domestic Product (GDP). By comparison, Government was 14.3%, Health care was 10.4%, Retail was 7.9%, Finance/Insurance was 6.7%, Hotel and Restaurant 4.5%, Construction 3.7%, Private Education 2.4%, and Agriculture/Forest/Fishing 1.1%. [Source: VT DOL]

- Fifteen years ago in 1997, there were 44,000 Vermonters working in manufacturing; by 2010 there were about 31,000, a 25%+ decline. Yet, the U.S. Bureau of Economic Analysis reported that in 1997 Vermont's manufacturing sector produced \$1.69 billion worth of output; and in 2009 that figure had climbed to \$2.9 billion worth of output (both in inflation-adjusted dollars). That's a 70% increase in output in a little over a decade. The average worker produced nearly 2.5 times more in 2009 compared to 1997.

Manufacturing in the United States...

- The United States is the world's largest manufacturing economy, producing 24% of global manufactured products in 2010. China is second at 15% and Japan is third at 12%. [Source: U.S. Department of Commerce]
- The U.S. has about 331,000 manufacturing establishments that produce about \$1.7 trillion of value each year, or 11.7 percent of U.S. GDP in 2010.
- Manufacturing has the largest secondary impact of any economic sector—or multiplier effect—with an estimated \$1.35 added to the economy for every \$1.00 in final sales of manufactured products. In 2010, only U.S. agriculture came close at \$1.20 followed by construction at \$0.97 and transportation at \$0.95. Retail trade (\$0.58) and wholesale trade (\$0.55) sectors have the lowest impact per dollar of economic activity. [Source: National Advanced Mfg. Partnership Steering Committee 2012, based on U.S. Bureau of Economic Analysis Tables – www.bea.gov]
- Manufacturing supports an estimated 17 million jobs in the U.S.—about 1 in 6 private sector jobs. Nearly 12 million Americans (about 9% of the workforce) are



employed directly in manufacturing. [Source: U.S. Department of Labor statistics]

- On average, each manufacturing job supports 2.5 jobs in other sectors. [Milken Institute, June 2009 – www.milkeninstitute.org]
- Manufacturing offers premium jobs. In 2010, the average U.S. manufacturing worker earned \$77,186 annually, including pay and benefits. The average non-manufacturing worker earned \$56,436. [Source: National Assoc. of Manufacturers 2012 - www.nam.org]
- U.S. manufacturers are the most productive workers in the world—far surpassing the worker productivity of any other major manufacturing economy.
- Manufacturing spurs innovation and research wherever it occurs. U.S. manufacturers perform about 70% of all business R&D in the U.S. Manufacturing domestic business R&D spending in the U.S reached \$195 billion in 2009 alone. [Source: National Science Foundation]
- Manufacturing is responsible for about 90% of all patents. [Executive Office of the President of the U.S., “A Framework for Revitalizing American Manufacturing” - December 2009]
- Over the last two decades, manufacturing is employing higher skilled and more highly educated workers. Over 50% of manufacturing workers have some education beyond high school. In 2011, 53% of all manufacturing workers had at least some college education. [U.S. Dept of Commerce – “The Benefits of Mfg Jobs” - May 2012]
- An estimated 19% of all U.S. manufacturing firms are owned by women, and women have comprised about 33% of the manufacturing workforce since the 1980s. [Source: U.S. Department of Labor and Executive

Office of the President of the U.S., “A Framework for Revitalizing American Manufacturing – December 2009”]

- Among all U.S. exports, manufactured products account for about 57% of total value .
- 95% of all consumers live outside the U.S., making it critical for manufacturers to have access to global markets. [Source: National Assoc. of Manufacturers 2012 - www.nam.org]
- About 70 % of U.S. manufacturers pay income taxes at individual rates, making any tax increase on individuals a tax increase on manufacturers. [Source: National Assoc. of Manufacturers 2012 - www.nam.org]
- Taken alone, U.S. manufacturing would be the 9th largest economy in the world, or roughly the size of the entire Canadian economy. [Executive Office of the President of the U.S., “A Framework for Revitalizing American Manufacturing” - December 2009]

Productivity remains the name of the game, in Vermont as well as throughout the world. According to the Vermont Manufacturing Extension Center (VMEC) and the Hollings NIST Manufacturing Partnership (NIST MEP), in order for Vermont manufacturers to keep pace with their global competitors *they must maintain a rate of 15% productivity growth annually or lose market share and customers to the competition.*

Today, the most successful companies are *growing* companies that are constantly developing profitable new customers and markets by offering meaningfully unique products and services where customers see value that they are willing to pay more for. These companies are often relying on new technologies and next generation manufac-



turing systems and methods, have empowered and highly skilled and educated workforces, have a vibrant culture of innovation and continuous improvement, and are building a complex web of suppliers and partners that may stretch across the globe.

Continuous innovation throughout the manufacturing enterprise is no longer optional in order to remain viable long term.

Niche businesses now make customized products at costs that once could only be attained through mass production. Manufacturers expect their suppliers to be nimble, responsive and competitive. Customers expect quality products delivered on time.

These expectations underscore the importance of a dependable, skilled labor force, training in the latest technology, and continuous improvements throughout the manufacturing company. They also require investments not only by the manufacturers themselves, but also by the government (in technical assistance and infrastructure) and educational institutions (to train workers and sponsor research).

In states and countries around the world, manufacturers, government, academia and research organizations are investing in manufacturing to help companies compete successfully. The returns include high-paying jobs, opportunities for new, supporting businesses, and tax revenues into government coffers. If Vermont makes necessary investments, the state can anticipate revenue returns.

The actionable recommendations of the 2012 Vermont Advanced Manufacturing Partnership (VT AMP) contained in this report provide both a new foundation and the energy from which to build a more vibrant and stronger manufacturing sector. The manufacturers, academics and other leaders with a strong passion for manufacturing who worked on this important initiative have expressed their eagerness to aggressively move forward and become actively engaged by continuing to seek and implement the solutions accepted for follow-on action.

They also recognize that for Vermont to remain competitive in 21st century manufacturing and reap the associated significant economic and social rewards, our leaders must urgently press forward and begin making strategic decisions, make appropriate investments, and develop relevant public policies that ensure the success and sustainable growth of manufacturing in Vermont. Of course, it is also understood and acknowledged that government cannot advance this industry by itself. Ultimately the businesses themselves are responsible for their future growth and success.

The recommendations in this report are critical for preparing government—state and federal,—educational institutions, and the industry to work in concert to help Vermont manufacturers compete in the highly competitive global economy.



Executive Summary

There are a number of creative and valuable recommendations contained in this report, and it is our intent to use them as a reference for future discussions that can guide public policy development to bolster manufacturing in Vermont.

There is a shorter list of eight major critical recommendations that have greater urgency if we are to begin the process of helping Vermont's manufacturing sector to compete in the global marketplace and, thereby, create quality jobs for Vermonters. They are grouped in four categories and ranked in no particular order of importance.

Workforce

Manufacturing's life blood is its workforce.

We must secure our talent pipeline, making sure that Vermonters possess the skills needed for today's rapidly evolving advanced manufacturing sector. Manufacturing is more than CNC (computer numeric controlled) machining. Today's manufacturing environment depends upon a workforce that is proficient in automation, software, sensing and a myriad of other new skill sets that have yet to emerge but are inevitably a part of technological advancement that enables innovation and discovery.

It would be a mistake, however, to simplistically begin to create training programs for these skills. The fact of the matter is that Vermont companies have discovered that when they try to implement these new efforts, many enrollees in the training fail the basic math competency necessary to take the courses. Our educational system

needs a strong STEM (Science, Technology, Engineering, and Math) foundation – with the emphasis on *math*.

The level of math being taught in our schools today is not sufficient to meet the new skills required for manufacturing going forward, and the math competency of Vermont workers is not adequate or acceptable. Compared to other nations that compete directly with Vermont such as China and Germany, we are woefully underperforming.

One plant executive of a major manufacturer in Vermont has labeled this situation as a *crisis* that requires urgent action on the part of our K-16 educators, industry and government.

This includes, but is not limited to, proficiency in math, science, technology, engineering (STEM) and problem solving.

Recommendation #1:

Develop and implement an education model (K-16) to adopt competency-based math standards for students and teachers that can support advanced manufacturing skills development based on models developed by Boston University and the University of Michigan no later than 2014.

Vermont must also aggressively promote and teach entrepreneurship skills and innovation at *all* education levels (K-16). We must support and promote robust internships and mentoring programs related to manufacturing to attract and retain our current workforce and develop future workers and leaders.



According to the *Next Generation Manufacturing* study completed in 2011 by the American Small Manufacturers Coalition (ASMC) and Manufacturing Performance Institute (MPI), nearly 6 out of 10 U.S. manufacturers could have a new leader in the next 5 years.

Recommendation #2:

Develop and implement entrepreneurship curricula in Vermont schools and state colleges such as Champlain College's "BYOBiz" program. Support and build on the successes and investments of the Vermont Manufacturing Extension Center (VMEC) and its federal partner NIST MEP, to teach and encourage the use of "Innovation Engineering" as a proven system to accelerate the creation and commercialization of meaningfully unique ideas while working with higher education in Vermont to develop a post-secondary curriculum modeled after the Innovation Engineering degree program at the University of Maine.

It goes without saying that without access to relevant, dynamic, and appropriate training for both incumbent workers and those entering the workforce in critical positions in the industry, Vermont will not outpace the competition. Access to lifelong learning opportunities through workforce training and post-secondary education is critical to our economic future. This requires investing heavily in workforce training programs like the Vermont Training Program, the Workforce Employment Training Fund (WETF), adult education at the regional tech centers, and our state and community colleges. These programs provide necessary customized training for Vermont workers in critical transferable skills.

Simply put, investing in workforce training is an investment in the Vermont workforce that pays real and critical dividends.

Recommendation #3:

Restore full funding to the Vermont Training Program in the Agency of Commerce and Community Development and create a special fund targeted to upgrading the math skills of Vermont workers.

If Vermont is to create and sustain innovation, a culture of innovation that leverages collaboration among industry, academia and government is essential. There are a number of existing institutions that should collaborate much more including, but not limited to the Dartmouth Regional Technical Center (DRTC) in Hanover, NH and the Technology Transfer Office at the University of Vermont.

It is interesting to note that this issue of encouraging innovation has surfaced *independently* in discussions and work being done by the legislature's study committee on enhancing the Vermont Information Technology industry, a project of Vermont's Technology Council, and several working groups of this *Advanced Manufacturing Partnership*. All have slightly different visions – but the core concept is very similar.

There are exciting models including the Albany (NY) Nanotechnology Center and incubation centers in Quebec and other states including Connecticut's Center for Advanced Technology.



Recommendation #4:

Help create an “Innovation Ecosystem” to sustain a culture of ongoing practical research and development by developing a non-profit Vermont Advanced Manufacturing Innovation Center modeled after the Nanotech Center in New York and the Dartmouth Regional Technical Center (DRTC) leveraging the resources of the University of Vermont, Vermont Technical College and the other Vermont state colleges, Norwich University and others as appropriate.

Measuring our progress is essential in sustaining an ongoing effort to improve Vermont’s manufacturing sector. Developing key metrics on our performance will help us in the process of continuously improving on our goals and justifying the investments made by both public and private entities.

Maine’s Innovation Index 2011 is a compilation of 24 indicators measuring Maine’s economic capacity and progress toward competing in an innovation-driven economy. The indicators are organized into five categories representing key components of an innovation-based economy:

- Research and Development Capacity
- Innovation Capacity (i.e. number of patents issued, SBIR/STTR funding, venture capital investment, entrepreneurial activity using the Kaufman Index)
- Employment & Output Capacity
- Education Capacity (Math & Science skills levels assessment, higher education enrollment, Science & Engineering degrees and graduate enrollments, educational attainment)

- Connectivity Capacity (broadband connectivity)

Maine’s annual index can be a model for Vermont perhaps administered by the Vermont Technology Council.

Recommendation #5:

Develop a “Vermont Innovation Index” with dashboards to monitor trends and compare Vermont to national metrics to measure performance and guide policy and financial investments.

Advocacy

Manufacturing currently has no defined “champion” within state government. Unlike value-added agriculture or forestry, there is no specific division or department for the largest private economic sector. The mission and functions of the Agency of Commerce and Community Development encompass manufacturing, but the role of the agency is much broader than a single sector or industry.

Individual companies with a few exceptions do not allocate resources to advocate for regulations and policy that will help them provide quality jobs, and although the Associated Industries of Vermont and Vermont Chamber of Commerce lobby the legislature, they represent their members and take positions accordingly.

Furthermore, the public perception of manufacturing as “dark, dangerous, and dingy” places to work that offer low-wage jobs – the “smokestack” image – is far from the reality of high-technology environments that offer high-



paying career paths. And there are no significant efforts underway or organizations dedicated to changing that perception.

It is not state government's role solely to be an advocate for manufacturing. The industry must share the responsibility to help educate the legislature and policymakers on the critical issues they face to remain competitive, and to inform the public as to the current state of the industry and its contributions to the community.

The Agency of Commerce and Community Development has a long history and proud track record of spawning a number of private trade associations including the Vermont Wood Manufacturers Association, the Vermont Environmental Consortium, and the Vermont Software Developers Alliance (now the Vermont Tech Alliance).

Recommendation #1:

Study the possibility of creating a Manufacturing Division within the Department of Economic, Housing and Community Development and report back to the Governor and legislature no later than June, 2013.

Networking

Vermont is a small state. That can be a real strength when it comes to sharing information and resources, and we have several examples where networking and collaboration have been successful.

The Agency of Commerce and Community Development has coordinated several Supply Chain Open Houses. A host manufacturer invites interested potential vendors

from around the state to a presentation on their procurement needs and process. In many cases the host company learns about a Vermont company that can supply them, obviating the need to source from out of state or out of the country. The fact of the matter is, not surprisingly, they simply did not know about the in-state supply option.

The Vermont Procurement Technical Assistance Center (PTAC) within ACCD has coordinated several Matchmaking Events pairing up Vermont companies with larger prime contractors in a "speed dating" format that has resulted in millions of dollars of contracts for Vermont suppliers.

The Vermont Manufacturing Extension Center (VMEC) has sponsored periodic Manufacturers' Forums with Vermont manufacturers coming together to share their experiences and gain valuable insights from their peers. Simply put, networking among manufacturing works.

Recommendation #1:

Direct ACCD, working with VMEC, to create a low-cost virtual tool for manufacturers to exchange information on supply chain issues, excess capacity availability, equipment and space sharing, and other general information to connect Vermont's manufacturers.

Recommendation #2:

Facilitate and accelerate expanded access by Vermont manufacturers to global markets using primarily existing technical assistance resources to help them reach the 95% of consumers who live outside our nation's borders.



1. The goal is to help Vermont manufacturers develop and execute customized plans to begin or expand exporting into global markets in ways that stimulate the growth of profitable new customers, markets, partnerships and local investments. Reduced risk, increased success, and sustainable sales growth are desired outcomes.
2. Examine company needs and the current focus, offerings, and staffing of existing Vermont export assistance providers / resources, including: the VT Global Trade Partnership (VGTP) within ACCD, the local U.S. Dept of Commerce Export Assistance Center (USEAC), the Vermont International Trade Alliance (VITA), VtSBDC and VMEC.
3. Move to rapidly deploy and pilot the local use of ExporTech, a proven "Export Acceleration System." In development and use since 2006, ExporTech is a system / process (versus just training) to help companies enter or expand into international markets. The results for each participating company include a customized, actionable "Strategic Export Growth Plan" vetted by a panel of international growth experts, plus coaching support. Recently reinvigorated and promoted by the nationwide NIST MEP program (with whom VMEC is affiliated) in close partnership with the U.S. Commercial Service, ExporTech has effectively been used in 25 states and by more than 415 companies. On average, it has reduced entry time into international markets from about 18 months to less than 6 months. Support is immediately available through NIST MEP using experienced third-party contracted resources who can help organize Vermont's resources and help jump start this program in Vermont.

Public Outreach

There is much work to be done to overcome the "smokestack" perception of manufacturing.

Guidance counselors need to understand the career opportunities and the nature of the skills required in today's manufacturing companies. Teachers need to understand the competencies required by their students to pursue these careers.

Legislators need to hear the stories of the world-class innovation being done by companies "holed up in the hills" of our state.

Investors and entrepreneurs need to know the technologies and the capabilities of Vermont's manufacturers to pursue further opportunities and synergies that grow quality jobs in Vermont.

Businesses and site relocators from outside our state need to know about the innovation and opportunities made possible by our "innovation culture" and a workforce that is second to none in the nation as asserted in testimonials by our existing companies.

Perhaps most importantly, our young people need to "get hooked" on the "cool" jobs that pay high wages that will pay for that first car and keep them working here at home in Vermont. They don't know the kinds of jobs or wages or career opportunities available to them – IF they work in the classroom to obtain the math skills needed to get those jobs. Parents oftentimes are the biggest impediment in dissuading their children from pursuing manufacturing careers due to misperceptions they harbor.



What do jobs in IBM look like? Are there jobs making robots in Vermont? Can I get a job working on the next generation of solar cells or hybrid electric cars in Vermont? That's the kind of information that the public needs to know about Vermont manufacturing.

Recommendation #1:

Develop an ongoing public relations campaign to tell the manufacturing story. Strategies could include, but are not limited to:

1. Promote an annual Manufacturers Open House and/or Manufacturers' Summit.
2. Create a website and other possible ways to showcase Vermont manufacturers.
3. Encourage local manufacturers in reaching out to local educators and guidance counselors to conduct tours and hold speaking engagements in the classroom.
4. Create annual Innovation Awards for the most exciting research and best practices by Vermont manufacturers.
5. Promote manufacturing speakers for VT National Education Association conventions and local civic organizations such as Rotary International, Lions Clubs, etc. to tell exciting success stories.



Purpose, Structure, Participants & Process

Purpose of the Project

"I have asked Secretary Lawrence Miller to lead an Advanced Manufacturing Initiative that will bring together education, industry, labor, and government to make recommendations about how to advance the manufacturing gains we (in Vermont) are making."

Governor Peter Shumlin

January 2012

It is important to note that the work of the 2012 Vermont Advanced Manufacturing Partnership (VT AMP) Initiative focused on both "manufacturing" and "advanced manufacturing" in Vermont. Since manufacturing in all forms and industries is so critical to the state and since the Governor's directive in January, 2012 for the VT AMP Initiative included making "recommendations about how to advance manufacturing gains we (in Vermont) are making," the VT AMP Steering Committee could find no reason to limit its study and actionable recommendations to only "advanced manufacturing,"

Recognizing many of the challenges facing manufacturing and business generally, Governor Peter Shumlin and the Agency of Commerce and Community Development decided to take action. The Agency initiated an Advanced Manufacturing Partnership project and invited representatives from Vermont's industrial, academic, and government sectors to participate in a conference on the topic in July 2012.

A steering committee was appointed to spearhead the initiative and to help choose a focus for the conference and

working groups in each of four major areas of concentration. The four areas identified as key next generation attributes for success were:

- **Customer-focused innovation**, delivering new and better customer solutions at a faster pace than the competition;
- **Advanced talent management**, gaining competitive advantage through best practices in talent recruitment, development and retention;
- **Systemic continuous improvements**, achieving recurring productivity gains that exceed the competition through enterprise-wide commitment to continuous improvement; and
- **Extended enterprise management**, leveraging a flexible network of suppliers and partners to provide competitive advantages in speed, cost and quality.

The Agency of Commerce and Community Development engaged a neutral facilitation team to oversee a discussion process among Vermont manufacturers, prepare notes from the discussions, and write a report on the process and the recommendations that emanated from it.

The first meeting of manufacturing representatives took place in July 2012 at Vermont Technical College in Randolph. After a plenary session, four work groups went to work in each of the above four areas to discuss problems and possible solutions. Preliminary results were reported back to the plenary session that afternoon. In August each of the work groups met again at different locations, facilitated by the same team.



This time the emphasis was on selecting the highest priority recommendations, identifying actionable steps to be taken, a recommended timeline, and responsibility for implementation (by business, academia, or government).

The notes from the working group sessions form the basis for this report.

Advisory Council Membership

Attendees at AMP July 12 Conference

Karen Abrahamovich, IBM
Thomas Alderman, Vermont Department of Education
Sam Andersen, Central VT Economic Development Corp.
Cindy Bernier, Superior Technical Ceramics
Janette Bombardier, IBM
David Boswell, Manufacturing Solutions, Inc.
David Bradbury, VT Center for Emerging Technologies
Shelley Brown, Norwich University
Curt Carter, Greater Burlington Industrial Corporation
Ciaraldi Penne, Norwich University
Philip Conroy, Vermont Technical College
William Driscoll, Associated Industries of Vermont
Kent Eldridge, Mylan Technologies
Jim Fay, Country Home Products
Steve Follett, Rutland
Patricia Giavara, VT Manufacturing Extension Center
Joan Goldstein, Green Mt. Economic Development Corp.
Lisa Groeneveld, Logic Supply
John Harris, IBM
James Hermanowski, Nathaniel Group, Inc.
Garret Hirschak, Manufacturing Solutions, Inc.
Joyce Judy, Community College of Vermont
William Layman, WCW, Inc.
William Lucci, Stafford Technical Center

Steven Lutton, Vermont HITEC
John Mandeville, Lamoille Economic Development Corp.
Brian Maroney, VABIR
William McGrath, LED Dynamics, Inc.
Joel Melnick, Nathaniel Group, Inc.
Doug Merrill, Sunward Systems LLC
Paul Millman, Chroma Technology, Inc.
Ann Nygard, Center for Rural Entrepreneurship
Randy Ouellette, General Electric
Tariq Quadir, Superior Technical Ceramics
Brenan Riehl, GW Plastics
Dave Rogerson, Fab Tech, Inc.
Robin Scheu, Addison County Economic Dev. Corp.
Daniel Smith, Vermont State Colleges
Tim Smith, Franklin County Industrial Corp.
Carissa Tomczyk, Norwich University
Francis Walsh, Town of Rockingham
Bob Zider, Vermont Manufacturing Extension Center

The Plenary Session

During the plenary session at the July conference, a panel of industrial spokespeople provided an excellent backdrop for further discussion in each of the four areas of concentration. The panelists made many points that were instrumental in 'priming the pump' for later workgroup discussions. Some of the panelists' major points follow.

Lawrence Miller, Secretary

Agency of Commerce and Community Development:

- Main outcomes I expect from the conference are strengthened networks and a better understanding of what can be done to improve manufacturing opportunities in Vermont;



- What can we do to create innovative support, link resources that might be underutilized to take advantage of the capital base that is here?
- All of us here have different perspectives—a cross section will surely help to spark vibrant conversations.

Paul Millman, CEO, Chroma Technology Corporation, Bellows Falls

- Finding a dependable software package to keep track of operations can be time-consuming but is essential to improved enterprise management;
- Sometimes customers don't know what they want until you show them;
- Important to create an atmosphere in which the customer wants to talk to you;
- Because we are basically a rural state, it is sometimes difficult to recruit urban-oriented skilled labor, but satisfaction is wrapped in the high quality of life here; and
- Changes in technology on the factory floor are a challenge, but workers expect innovations to be adopted.

Janet Bombardier, IBM Vermont Director of Site Operations and Senior Location Executive, IBM, Essex Junction:

- Math skills are seriously lacking in young graduates in Vermont, especially boys, who are not achieving as well as in other places.
- Converting trash to valuable raw materials and finding markets for them has been a challenge but has had large, positive and measurable economic success;
- Developing a more sophisticated and efficient supply chain has resulted in reducing the inventory (and space required) at any one time;

- Often something as obvious as more appropriate packaging of a product can make a difference in cost and efficiency for the customer;
- We must cultivate a culture of innovation with the customer clearly in mind;

Brenan Rhiel, President and CEO, GW Plastics, Bethel:

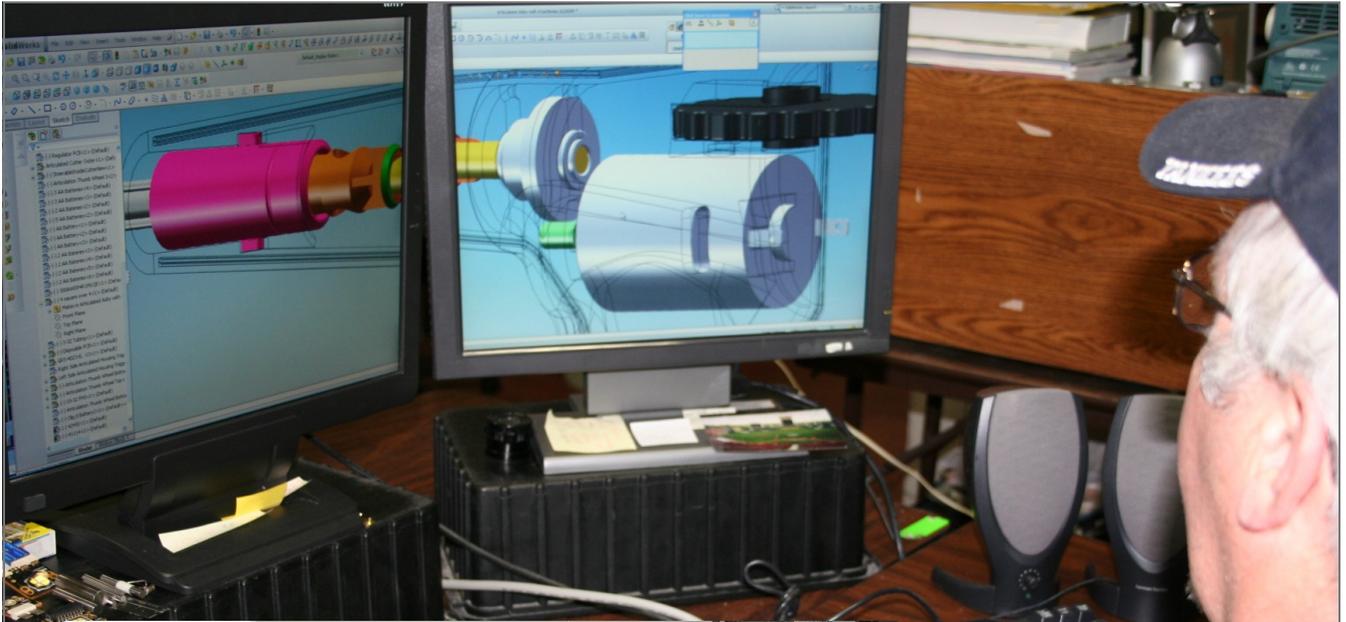
- You have to work hard in Vermont to keep up-to-date, but the resources are here; Given Vermont's rural environment, companies have to work harder to stay current with industry trends and technology advances but the resources are here.
- VMEC is a valuable partner, and centers like the Dartmouth Regional Technical Centers is another.
- Hard manufacturing realities include the fact that by some accounts Vermont is in 47th place in terms of being a tax-friendly state – largely a function of its size, and;
- There is plenty of room for more collaboration and best-practice sharing among the state's firms including more tours of facilities.

Enthusiasm generated by this project led several participants and working groups to volunteer to monitor progress toward achieving its objectives. Some have offered to be leaders in implementing recommendations and suggested periodic dates for reviews of progress.

The main element of this report is the recommendations that emanated from the Working Group discussions.

NATHANIEL GROUP—VERGENNES, VT

Specialized Design & Manufacturing in Illumination, Medical Devices, Opto-Electronics & Miniaturization





Working Group Recommendations

The following represents the raw work product of the various Working Groups and provides the detailed recommendations verbatim.

At the Advanced Manufacturing Partnership conference on July 12, 2012, subgroups were formed to discuss four areas of advanced manufacturing: Customer-Focused Innovation; Advanced Talent Management; Systemic Continuous Improvement; and Extended Enterprise Management. Progress in these areas was identified by the Vermont Manufacturing Extension Center as necessary for the next generation of Vermont manufacturers to be competitive in the global manufacturing marketplace. Conference participants broke into small groups to identify and discuss the special challenges that Vermont manufacturers face in moving forward in these four areas.

Each of the four breakout groups met once again after the conference, during the month of August 2012, to pull out from the conference deliberations specific recommendations for business, academia, government, and non-profit sectors to do to meet the challenges identified in the breakout group's area of focus. The similarity of some of the recommendations of the four working groups was surprising. The similarities were combined for the Critical Major Recommendations in the Executive Summary.

This section of the report lists the priority recommendations given by each of the breakout groups. In addition to the recommendations, participants identified who should implement each recommendation and on what timeline.

For further detail, see the notes from each meeting in Appendix A.

Customer-Focused Innovation Group

Future growth and profitability in manufacturing will be achieved by meeting the increasingly complex and segmented needs of customers. To do this, a manufacturing culture based on partnerships, investments, and standards focused on translating customer needs into products and services, and streamlining the delivery of these products, needs to develop.

The benchmarks for success in this area will include rapid delivery of products to market; innovative business processes and practices; unique solutions to customers' needs; and adequate resources focused on research and development.

Recommendation #1

Create and sustain a statewide "Innovation Ecosystem" or "community" that produces value.

- Consider a virtual front-door and a centralized facility that would provide support to a community of partners, innovators, and entrepreneurs and incubators, around the state.
- Provide access to a manufacturing and process lab run by UVM and/or VTC that could lower the cost of product development.
- Solicit consulting support from business and engineering schools.
- Visit and learn from the New Hampshire DRTC—this center provides lab support, patent support, etc.



Who does it?

An active collaboration between businesses, manufacturing organizations, educational institutions, and state government, including, for example: Vermont Technology Council; Vermont Chamber of Commerce; Vermont Technical College; Vermont Manufacturing Extension Center; VtSBDC; VCET; UVM; Norwich University; Vermont State colleges; Middlebury College; Champlain College.

Timeline

- Begin immediately with an initial discovery process.
 - Look at other states' models
 - Talk to Greg Fairbrothers at DRTC, Maine, Montreal, etc.
- Create a planning group to refine ideas/communicate with partners – with balanced representation from state government, the manufacturing sector, and academia.

Recommendation #2

Encourage student interest in innovation and entrepreneurship.

- Stimulate K-16 students to be innovative and show and explain how to create, communicate and commercialize ideas—the notion of being an entrepreneur is specific to driving customer-focused innovation.
 - Introduce tools for developing a sustainable culture of innovation.
 - Start with upper level students for immediate results, but also develop a feeder system at lower grades.

- Add a state K-12 education standard for innovation.
- Encourage industry to partner with educational institutions—state should organize sessions to discuss options.
 - Internship/apprenticeship/field trips.
 - Don't stop at state lines—Tuck Business School, Babson, Bentley.
- Promote visibility of the innovation happening in manufacturing in Vermont.
 - Promote Manufacturing Open Houses across the state.
 - Promote the Vermont Innovation Marketplace at <http://www.vermontinnovation.org>
- Stress cross-discipline learning in higher education by, for example, requiring accounting/business training for manufacturing education.
- Consider that older entrepreneurs may also need help/ educational opportunities (a role for CCV?).

Who does it?

Academia, state, industry.

Timeline

Sooner is better.

Recommendation #3

Start a public relations campaign to raise awareness & understanding of manufacturing in Vermont.

- State should help manufacturers raise their profiles—hold open houses across the state.
- Train companies on how to promote themselves through webinars, press releases, etc.



- Get media interested — “spotlight” on a manufacturer.
- Give “inside tours” of manufacturers.
 - For educational purposes—guidance counselors, students, parents.
 - Highlight the manufacturing aspect of existing tours.
- Advertise that math/science = jobs.
- Promote Annual Recognition Awards: Vermont Business Magazine—5x5 Growth Awards; Dean Davis Award—Chamber of Commerce.
- Make manufacturing “cool” —not a dirty word.

Who does it?

Associated Industries of Vermont, Vermont Chamber of Commerce, State, VMEC, media

Recommendation #4

Provide financial incentives to bring manufacturing to Vermont.

- Consider tax breaks and business loans with fewer hurdles and lower interest rates.
- Review current regulations and promote patent-trolling legislation.
- Help find angel funders through the Vermont Venture Network.
- Seek better coordination among existing resources: VCET, VSJF, VEDA, VEGI.
- Talk with DRTC—Greg Fairbrothers.

Who does it?

State, banks, Vermont Venture Network, other angel networks

Recommendation #5

Develop a Vermont Innovation Index.

Consider an index approach similar to one used in the State of Maine: www.maine.gov/decd/innovation/reports_and_publications/index.shtml. Use it to measure success, track trends and progress, and benchmark Vermont’s relative position.

Who does it?

State, perhaps Vermont Technology Council

Advanced Talent Management Group

Shifts in population are making it more difficult to find and hire skilled, experienced workers. Manufacturers can recruit globally and retain recruits by offering effective programs to educate, train, and challenge them. The result will be a diverse, empowered workforce that enables businesses to anticipate and adapt to rapid change, practice continuous improvement, and increase productivity.

The benchmarks for success in this area will include: recruiting from diverse sources; continuing investment in education and training of workers and partners; decision-making and accountability throughout the workforce, not just at the top; organizational focus on developing and retaining human capital.



The Department of Education will need help from business centers.

Recommendation #1

Promote the adoption of competency- or proficiency-based standards in math through online petitions, testimony from business leaders; media input; regional forums for business and educators (businesses invite school boards to business location).

Rationale:

- The state needs public support as it makes the transition to educational quality standards and learner outcomes and moves graduation requirements to a proficiency-based process.
- Math education is still ‘up in the air’ because the Department of Education wants students to demonstrate math proficiency rather than accept test scores. Currently many Vermont math students haven’t been exposed to certain math skills because schools don’t have requirements for specific courses.
- The strategy for determining standards will be different in the future because the Department of Education is becoming an agency. What was determined by legislation in the past will now be determined through government.
- With new standards (common core) coming, business needs to support student progress based on standards in lieu of seat time. Business input will be needed in the next legislative session, in particular during the public hearing.
- Tech centers currently have competency lists for different areas of standards. These may need to be updated.

Who does it?

Business & Department of Education (DOE will get info out on Sharepoint and other venues)

Timeline

Begin immediately to give input in public meetings and legislative sessions and hearings.

Recommendation #2

Increase student and faculty exposure to advanced manufacturing through apprenticeships, internships, job shadows, and increased opportunities to tour businesses. Involve parents and middle-school students.

- *Practical:* internships, apprenticeships, tech center coordinators.
- *Educational:* tours, job fairs, VSAC meetings of guidance counselors.
- *Media:* exposure to local manufacturing and business; VPR.
- *Government:* Tax credit for employers who provide internship programs.
- *Business and education:* expand academic credit for internship programs.

Who does it?

Business, state, education



Timeline

Now!

Recommendation #3

Hold an open house weekend for all Vermont businesses and advanced manufacturers - targeting schools, parents, and general public including job seekers.

- Change the advanced manufacturing narrative about kids leaving the state by getting out the good stories
- Piggyback on governor's campaign "Make Vermont Home"
- Help public understand skills and education needed for manufacturing jobs
- Engage VPR in promotion on a regular basis
- Target guidance counselors on Vermont Education Exchange

Who does it?

Business: Chambers, Assoc. Industries of Vermont, Agency of Commerce and Community Development, Tech Alliances

Timeline

2013, possibly during Parents' Weekend

Recommendation #4

Increase employer awareness of existing resources.

- Market current programs that support business (wet funds, etc.).
- Improve accessibility to training in different parts of the state.

- Encourage businesspersons to teach.
- Use technology. The Learning Network of Vermont in every school provides opportunity to train virtually. Business could provide lab space.
- State: create catalogue of programs, trainings, etc. (Agency of Commerce and Community Development).

Who does it?

State employers, regional development agencies

Systemic Continuous Improvement Group

In the hyper-competitive environment of next-generation manufacturing, companies will need annual productivity gains of 15% or more to stay in the game. Such performance will be fueled by continuous company-wide improvement in quality. Manufacturers must commit to such continuous improvement in their products and operations.

The benchmarks for success in this area will include: continual measurement of performance against world-class standards; developing a culture and a methodology for continuous company-wide improvement; continuous improvement at every level throughout the enterprise; and investing in the technology and training necessary for continuous improvement.

Recommendation #1

Enhance and promote collaboration and connections among Vermont manufacturing businesses and between those businesses and academia. This includes sharing various companies' experiences with different tools and methods of doing continuous improvement.



Rationale: A “give and take” attitude between manufacturers and academia encourages sharing of ideas and technology that is necessary for continual improvements within companies and in the manufacturing sector generally.

- Create a database of manufacturing businesses and related academic institutions.
- Develop a strategy for considering who will “own” (maintain) the database long term; recruit IT-savvy person.
- Engage and encourage VMEC to focus on manufacturer training and to consider being among the possible database holders.
- Identify businesses and academic institutions that should participate.
- Measure success: conduct surveys and collect data – e.g., track number of hits, participants, contacts, recorded exchanges, services and resources used, money saved, and individual, corporate and industry benefits, etc.
- Create a social media platform for the Vermont manufacturing community.
- Create a statewide on-line forum and incentives for businesses/academia to join it and/or create formal networks.
- Promote “give and take” mentality through, e.g., visits to other firms to discuss common problems and share solutions.
- Brainstorm ideas for business/academia collaboration (such as senior projects sparked by the needs listed in the database).

Who does it?

Advanced Manufacturing Steering Committee plus a subgroup of the Systemic Continuous Improvement working group – volunteers: Pat Giavara, Dave Rogerson, John Harris.

Timeline

Subgroup would meet soon after 9/25/12 Steering Committee meeting to develop a strategy. Committee will reconvene in one year to measure and discuss progress.

Recommendation #2

Strengthen the relationships between Vermont’s manufacturers and K-12 educational institutions, emphasizing the role the latter can play in fostering manufacturing-related education of Vermont students and the promotion of jobs within the industry. More explicitly, have employees available for hire such as “operators” or “production workers” who have the requisite skill set coming out of secondary school to be able to undertake continuous improvement work in the manufacturing workplace.

Rationale: Vermont businesses cannot compete with other areas on labor costs but can compete on the quality of workers and products – think of a “supply chain” of technically trained workers that would come from Vermont schools committed to producing well-prepared workers for manufacturing businesses.

- Create and develop an educational-manufacturing pilot program with a few secondary schools or within one school district.
- Invite the key potential participants in the pilot program to discuss objectives and means available.



- Impetus for the program should come from the top echelons of both business and educational institutions.
- Attracting workers for manufacturers must begin early in the educational system.
- “Here’s what we (manufacturers) need and how we can help you (educational institutions) give it to us.” A strong commitment by businesses will help educators buy in.
- Explain to schools how skills (basic math, etc.) are relevant to the local community.
- Explore hiring teachers to work in manufacturing in summers.
- K-12/tech centers are needed to prepare students to enter manufacturing.

Who does it?

Create a subgroup to flesh out plan for a pilot program. Cindy Bernier volunteered to help.

Timeline

Start laying groundwork immediately, and implement during 2013-14 school year.

Recommendation #3

Strengthen the relationships between Vermont manufacturers and postsecondary educational institutions and research facilities, emphasizing the greater role the latter can play in fostering manufacturing-related education of students, in conducting practical research of interest to Vermont manufacturers, and in promoting jobs within the industry.

WORKING GROUP RECOMMENDATIONS

Rationale: Other states and regions of the country have been developing strong relationships between their research and education sectors and their manufacturing sectors. This needs to happen in Vermont.

- Create strong relationship between Vermont manufacturers and engineering and business schools and research organizations in Vermont and neighboring states.
 - Invite key academics/researchers in this evolving program to meet with manufacturers and discuss the objectives and means available for the program.
 - Support for the program should come from the top echelons of business and educational institutions.
 - Consider the creation of a regional research center.
 - Explore the possibilities for greater sharing of workers and equipment between academic/research organizations and business.

Who does it?

TBD

Timeline

Start soon to develop an exploratory group to convene a meeting of the heads of interested manufacturing firms and the leaders of post-secondary educational institutions. Hold a meeting within the next nine months and review progress in one year.

Recommendation #4

Make it a state priority to retain and grow the manufacturing businesses that Vermont already has.

Rationale: Businesses want to stay in Vermont but are “geographically challenged.” Manufacturing is equally as



important to the sustainability of the state as agriculture and tourism, and has unique needs such as creating capable and skilled workers, cooperation in meeting environmental regulations, and support for training and retraining programs. While it would be good to encourage new businesses to come to Vermont, it is more important at this point to ensure that the state retains its current companies, many of whom are increasingly tempted by more favorable environments and assistance in other states and regions.

- Appoint a permanent manufacturing advocate (Commissioner and Deputy Commissioner of Manufacturing) to identify unique needs of the industry and promote support for manufacturers.
 - Develop a broader recognition that the costs of doing business in Vermont are higher than in most other states; however, businesses remain here for a higher quality of life.
 - Encourage business and state leaders to work together to find the ways and means for funding and support of continuous improvements in manufacturing.
 - Develop a state policy to reflect what is comparable to the philosophy of “Keeping the customers [businesses] you have now is easier than recruiting new customers [businesses].”
 - Create awareness of a “crisis”: that manufacturing is in trouble.
- Consider establishing a cap on manufacturing costs (such as for unemployment taxes) – perhaps establish different tax rates for different industries.
- Develop a public relations campaign with specific job compensation and availability to attract students.

- Reverse the public perception that manufacturing is a ‘dirty’ word.

Who does it?

Invite Pat Moulton-Powden to head this initiative and solicit other participants, including Jim Fay of Country Home Products, from the manufacturing sector and state government; perhaps Vermont Businesses for Social Responsibility might have a role.

Timeline

Meet with Patricia Moulton-Powden soon after the 9/25 Steering Committee meeting.

Recommendation #5

Increase federal funding to the State to develop manufacturing.

Rationale: Federal funding/support is necessary to supplement other efforts to keep Vermont manufacturing businesses in the state and globally competitive.

- Demonstrate that Vermont manufacturers are willing to tackle challenges to advanced manufacturing in the state.
 - Focus on first four recommendations (above), then approach Vermont congressional delegation with an account of efforts and successes to justify increasing federal expenditure.
- Continue to support VMEC in receiving federal funds through the Department of Commerce / National Institute of Standards and Technology/Manufacturing Extension Partnership Program.

Who does it?

Systemic Continuous Improvement working group?



Timeline

Next 24 months?

Extended Enterprise Management Group

Current business practice is often to view the supply chain as a chain of discrete functions with little or no connection to each other. For greater efficiency and value, next-generation manufacturers will need to network their supply chains into one extended enterprise including such functions as material suppliers, logistics, accounting, transportation, and R&D. They will also need to view government and public resources as partners in the extended enterprise. Then, manufacturers will be able to leverage this extended, networked enterprise for competitive advantage, to gain access to new markets and to acquire advanced business capabilities and resources.

Benchmarks for success in this area will include: value chains that have been rebuilt on the basis of a network of partners and suppliers; open and continuous communication across the extended enterprise in such functions as strategic planning, customer and competitor information and new opportunities; and establishing standards and processes for improving the performance of the extended enterprise.

Recommendation #1 (Short-term)

Establish an online networking vehicle, for manufacturers to share capabilities and needs.

- Could be similar to federal bid system (Procurement Technical Assistance Center - PTAC) specific to

Vermont – users publicize capability or need and providers respond.

- Make more general than just government contracts.
- Also, expand use of open houses as tool to bring together manufacturers in the supply chain.

Who does it?

VMEC should lead the effort by researching different networking models and their implementation, but could be private sector that actually implements. This could be an opportunity for a private business, which would charge a fee for use.

Timeline

By March 31, 2013

Recommendation #2

Create a division of the Agency of Commerce and Community Development to advocate for manufacturers in Vermont.

- The charge of this division would be to determine the vision for manufacturing in Vermont, considering Vermont's economy, values, landscape. What kinds of manufacturing does Vermont want to attract?
 - Set up a study to find out what kind of manufacturing we want to invite - fit with tourism and other things that are part of Vermont economy.
- A new division would coordinate the vision, the infrastructure needed, education needed, innovation center needs.
- Division needs to educate legislators and administration on value of manufacturing.

WORKING GROUP RECOMMENDATIONS

- Use real data about manufacturing: manufacturing pays lots of taxes, provides high-paying jobs.

Who does it?

The Administration should propose the new division, then the Legislature would create it.

Timeline

Propose in January 2013 legislative session, create no later than 2015.

Recommendation #3

Develop the infrastructure needed to meet the needs of Vermont's industries: internet, power, transportation, water, access to capital.

- Broadband isn't for business yet, geared to residential use. Need high speed internet for business.
- New interstate highway in Canada is coming to the Vermont border in 2017, needs a Vermont corollary.
- Access to capital can be seen as a core infrastructure issue. Need source of low-interest funding for equipment purchases, etc. and tax credits for manufacturers to encourage and grow manufacturing.

Who does it?

This should be community-driven, by regional plans developed by Regional Development Corporations (RDCs) and Regional Planning Corporations (RPCs). The actual implementation would be a collaboration of many entities, including state and federal congressional delegations; Agency of Commerce and Community Development; Agency of Transportation; Public Service Board; Public



Service Department; Vermont Telecommunications Authority; Vermont Economic Development Authority.

Timeline

Develop plans by 2017.

Recommendation #4

Develop an education model, from K-12 up, to support advanced manufacturing in Vermont.

- Model should focus on skills development and include at least: curricula for tech centers, manufacturing engineering processes, systematic continuous improvement, and ERP; apprenticeships & internships; innovation management.
- Models are Boston University and University of Michigan.
- Include both secondary and post-secondary.
- Tech centers for those not suited to college.

Who does it?

Secretary of Education, in partnership with the Department of Labor and others.

Timeline

By 2015.

Recommendation #5

Develop a Vermont Advanced Manufacturing Innovation Center.



- State could facilitate getting the site ready (at a university, for example) for an innovation center, lay groundwork, get permitting (Act 250).
- Not-for-profit, fee-for-service - you bring your idea to them, for a fee they prototype for you.
- Nanotech in Albany – modeled on Asian industrial park. Financially engineered so that state has some contribution, industry has others. Nonprofit entity provides property; industry shares cost of setting up offices and research centers, funds research, shares the results; universities provide researchers and technicians.
- Companies pool resources and compete with each other to solve the 10 most important building blocks – companies work on those, and the research output is the product.
- Shopping mall is metaphor for the concept: anchor store is the manufacturing site, government is laying groundwork, mall developer is putting in infrastructure, university is providing labor.

Who does it?

Chancellor of state colleges, in partnership with the presidents of Vermont colleges (including Vermont Technical College) and universities and high schools.

Timeline

By 2015.

REVISION MILITARY—ESSEX JCT & NEWPORT, VT

Developing & delivering purpose-built protective soldier equipment for military use worldwide.





Appendix A: Work Group Notes—August 2012 Meetings

Customer Focused Innovation

Advanced Manufacturing

Workshop #2, August 16, 2012

Facilitator: Cynthia Kingsford

Notetaker: Amy Shollenberger

Participants:

Penne Ciaraldi, CCV

Brenan Rhiel (Ben), GW Plastics,

Bob Zider, VMEC,

David Boswell, MSI

Doug Merrill, Sunward Systems

Issues that Rise to the Top from Previous Session:

(Cynthia lays them out)

- Visibility and Marketing
- Feasibility / Financing / Liability Costs
- Getting Out Information – Eg, Patent Expirations, etc.

Proposed Ideas:

What will help accelerate customer focused innovation and is transformational? (Bob)

1. Put entrepreneurial activity and support for manufacturing at the top of the State's economic agenda
 - a. Support new *and* existing companies
 - b. Raise profile of manufacturing in Vermont

2. Create and sustain an Innovation Ecosystem (or 'community')
3. Promote / teach Entrepreneurship Skills and Innovation Attribute at *all* education levels
4. Develop and Use a "Vermont Innovation Index" similar to the State of Maine's: (www.maine.gov/dec/d/innovation/reports_and_publications/index.shtml)
5. Support and Maximize use of existing, proven technical assistance programs/entities

Discussion of Bob's Ideas

- These are the Broad Goals – we need to come up with specific to meet them
- Growth occurs most in businesses that have fewer than 20 employees
- Innovation Ecosystem is a new term that encourages breaking out of "stovepipes" and working collaboratively towards common goals– see www.innovation-ecosystems.org.
- Innovation Ecosystem frames both issue and opportunity

A lot of companies, particularly in mid-cap range could use some help. Innovation takes a number of forms – some companies have proprietary products, some are not proprietary. Innovation has to have a number of different tentacles.

TWO GOALS: encourage new companies & encourage growth of existing companies

- Ag is 1.5% of GDP, while Manufacturing is 11.5%, but focus is on Ag right now
- We have lots of resources, but whenever a new problem comes up, we tend to build something new, rather than using existing resources



- Should try to minimize duplication and try to align more among entities/programs
- Our focus should be customer-focused innovation. We want everyone to raise the profile of innovation in general, but our group is supposed to be focused on innovation.
- Have we defined what “manufacturing” actually is?
- Broad thinking on this currently – yogurt to software
- See “Growing State Economies” from National Governors Association (www.nga.org/files/live/sites/NGA/files/pdf/11HEINEMAN12ACTIONS.PDF)

Specific Ideas that Represent these Broad Goals:

ACTION ITEM #1: Create and Sustain an “Innovation Ecosystem” or “community” that creates Value

WHO?

Should be an active collaboration between business, educational institutions, and state government (both admin and legislature should be on board), key existing assistance providers

- State might initially facilitate / – help set vision
 - Encourage UVM to get behind idea
 - Provide logistical support and visibility
- Critical that manufacturers are directly involved in planning; make sure it’s useful
- Balance of interested parties is necessary
- Vermont Technology Council should be involved – empowered by Gov to create a science and technology plan for the state
- They will have a piece on Advanced Manufacturing I their report
 - Vermont Chamber of Commerce
 - VTC (has 11 campuses in the state)

- VMEC
- VtSBDC
- VCET
- UVM – only school in VT with Engineering School
- Needs leadership and focus
- State & Mfg leaders should meet with new UVM President to discuss
- Norwich University has an Engineering Degree and largest MBA program in the state
- VSC – VT State Colleges
- Middlebury College
- Champlain College
- Others, including key private sector manufacturers?

WHAT?

- Centralized Entity that provides support and network of partners around the state
- Funding to get started
- Important to brand the idea
- Something like VCET? – maybe expand VCET?
- Access to a Manufacturing and Process Lab run by UVM or VTC to lower the cost of doing development – prototyping, patents, etc – developing a culture
- Place for Information and Cross-Pollination of Ideas
- Gets business people to Center; interact with people working in labs (students)
- Need to make sure all entities are making cross referrals
- “NO WRONG DOOR” – anyone coming in for information/assistance is helped
- Consulting support from business schools, engineering school; financing support...have branches that are all working together to drive and sustain innovation



- Network of incubators and centers? Centralized or decentralized?
- Ecosystem concept – what makes it strong is partnership aspect
- Incubators maybe need to be pulled together as a network so they can work together and have some consistency re: funding, etc.
- Visit Lebanon DRTC – this Center provides lab support, patent support, etc – is getting at innovation ecosystem (Greg Fairbrothers) – www.thedrtc.com o Important to build partnerships...we need to have a good discussion with Dartmouth to see how we could partner
- Also, similar facility in Montreal

WHEN?

Now

Discovery Process

- Benchmark other state models
- Talk to Greg Fairbrothers at DRTC, Maine, Montreal, etc.
- Create Planning Group to refine idea/communicate with partners
- Equal representation of state, manufacturing, academia

HOW?

Develop and Use a “Vermont Innovation Index” similar to the State of Maine’s. (www.maine.gov/decd/innovation/reports_and_publications/index.shtml)

ACTION ITEM #2: ENCOURAGE INNOVATION ACROSS ACADEMIA

WHO?

- Academia

- State
- Industry

WHAT?

- Important to encourage students to be innovative and show what that means K-16.
- Need to get at how to create, communicate and commercialize ideas – needs to be a learning continuum – notion of being an entrepreneur is specific to driving customer focused innovation
- It involves tools and developing a sustainable culture of innovation
- Is it long term? Maybe...but not necessarily...you can start with upper level students for immediate results, but we also need the feeder system at lower grades
- Add a State Education Standard for Innovation K-12
- Encourage Industry to partner with educational institutions – STATE should organize/promote/facilitate sessions to discuss options
- Internship/apprenticeship/field trips
- Don’t stop at state lines – Tuck Business School, Babson, Bentley, e.g.
- Promote Visibility of Innovation that is Happening in Manufacturing in VT
- Manufacturing Open Houses across the state
- www.vermontinnovation.org – promote this more
- Spark Decks (already happening through VMEC)
- Need to stress/require cross discipline learning in higher education
- Require accounting/business training for manufacturing education
- Engineering majors need to be able to write well; emphasize writing



- Don't lose sight of the whole continuum – older entrepreneurs may also need help/educational opportunities (CCV?)

WHEN?

Sooner is better (ditto for all recommendations)

HOW?

- Develop and Use a “Vermont Innovation Index” similar to the State of Maine’s. (www.maine.gov/decd/innovation/reports_and_publications/index.shtml)
- Use to measure success of all recommendations

ACTION ITEM #3: PUBLIC RELATIONS CAMPAIGN TO RAISE AWARENESS & UNDERSTANDING OF MANUFACTURING IN VERMONT

WHO?

- Industry – AIV? Chamber?
 - How can industry help itself?
- State
 - There is a condition and a habit in the state to forget about/take for granted existing companies who are providing the jobs.
- VMEC is doing a good job – need to promote it, so companies can be more successful
- Media

WHAT?

One issue is that manufacturing has a bad rap. Possible action item for STATE is to help manufacturers raise their profile – for example, they could do a manufacturers trail

– open houses across the state over a period of time to highlight the innovative businesses that are here.

- Could Tech Centers get involved?
- Training for companies about how to promote themselves
- E.g., webinar about press releases, etc.
- How to get media interested – “spotlight” on a VT manufacturing company
- Tours to State for “inside tours”
- Mostly useful for educational purposes – get guidance counselors, students, parents on tours to show opportunities
- Get “manufacturing” out of the closet – highlight the manufacturing aspect of tours that are already happening
- Talk about importance of math/science = jobs
- Annual Recognition Award – need to develop strategies for recognition
- VT Business Magazine – 5x5 Growth Awards
- Dean Davis Award – Chamber
- Make Manufacturing “Cool” – not a dirty word
- Show that engineering/manufacturing is behind most great achievements (ex: Buzz Aldrin landing on the moon)

ACTION ITEM #4: FINANCIAL INCENTIVES TO BRING MANUFACTURING TO VT

WHO?

- State
- Vermont Banks
- VT Venture Network
- Other Angel networks



WHAT?

- Tax breaks
- Loans with lower hurdles
 - No personal guarantee of funds
 - VEDA innovation fund
 - Lower rates
- Regulations
 - Patent Trolling legislation
- VT Venture Network
- Help find Angel Funders
- Better coordination between existing resources
 - VCET
 - VSJF
 - VEDA
 - VEGI

Talk with DRTC – Doug Fairbrothers

ACTION ITEM #5: VERMONT INNOVATION INDEX

WHO?

State

- Maybe Vermont Technology Council?
- Monitor and release report every 2 years

WHAT?

- Develop and Use a “Vermont Innovation Index” similar to the State of Maine’s. (www.maine.gov/decd/innovation/reports_and_publications/index.shtml)
- Measure success
- Track trends and progress
- Benchmark our relative position

Advanced Talent Management

Follow-up Meeting, August 7, 2012

Facilitator: Dave Edwards

Notetaker: Juliette Avots

Participants:

Penne Ciaraldi CCV

Pat Nagy VDOL

Linda Conrad Plasan Carbon,

William Driscoll AIV

Jay Ramsey Vt. Dept. of Education

Tom Alderman

Joan Goldstein GMEDC

Hark Heyman Logic Supply,

Session Goals: 3-5 actionable recommendations

Considerations for each recommendation:

What can business do?

What can academia/research do?

State action, policy & legislation

Federal action or policy

Education

Competency standards in math

Rationale:

The state needs public support as it makes the transition to educational quality standards and learner outcomes and moves graduation requirements to a proficiency-based process. The process of review will gather people beyond the field of education.



Math is still up in the air because the department of education wants students to demonstrate math proficiency rather than accept test scores. Currently many Vermont math students haven't been exposed to certain math skills because schools don't have requirements for specific courses.

The strategy for determining standards will be different in the future because the Department of Education is becoming an agency. What was determined by legislation in the past will now be determined through government.

Business needs to advocate for reform of competency standards in math. With new standards (common core) coming, business needs to support student progress based on standards in lieu of seat time. Business input will be needed in the next legislative session, in particular during the public hearing.

Tech centers currently have competency lists for different areas of standards. These may need to be updated. The Dept of Ed will need help of business centers. Key questions regarding education posed by the group:

- How does business best support education without taking over business time?
- How can business best sign on to STEM initiatives and other educational initiatives?
 - Suggested answers: online petitions, becoming regional advisory board members
- How can AM best advocate for competency standards?
- How to best measure success? There is a conflict between federal government's standard testing and multiple demonstrations of understanding.

- How to create incentives for student pathways to AM beyond high school. (higher wage)

Recommendation #1 Education

Advocacy for Competency-based standards/ Proficiency-based especially in math

Who? Business & Department of Education (DOE will to get info out on SharePoint, and other venues)

When? Input in public meetings & legislative sessions and public hearings

How? Online petitions; business leader testimony; media input; regional forums for business and educators (businesses invite school boards to business location. Develop business engagement school kits & talking points)

Recruitment and Retention

Recruitment and retention issues:

How to educate public on skill preparation and education available for

AM jobs

How to make employers aware of existing resources

Workforce training for existing employees

Cost Barriers

o Affordable housing in Vermont

o Vermont tax burden

o Carrying loan debt

Recommendation #2 Recruitment

Increase exposure to AM through apprenticeships, internships, job shadows & increased opportunities to tour businesses. Involve parents and middle school students.

Practical Educational Media



Internships Tours Exposure to local AM and business
Apprenticeships Job Fairs VPR
Tech center coordinators VSAC Meetings of Guidance
Counselors

Who? Business, state, education

Where? State-wide

When Now!

How? Gov't: Tax credit for employers who do internship
programs Business and education: Expand academic
credit for internship programs

State & labor education: agency compile the information

Recommendation #3 Recruitment & Retention

Rationale: Create a buzz for business. Change the AM
narrative about kids

leaving the state by getting out the good stories. Piggy-
back on governor's
campaign "Make Vermont Home".

**Deconstructive job share: Open house weekend for all
Vermont businesses
and AM targeting schools, parents and general public
including job seekers.**

Who? Business: Chambers, Bill (AIV) and Pat (ACCD),
Tech Alliances

Where? Statewide tech centers and businesses

When? 2013, possibly during parents' weekend

How? Education needed. Promote career opportunities.
Break down what goes into business with emphasis on
skills as part of engaging public. Engage VPR in promo-
tion on a regular basis. Promote: "We're open for business
in Vermont." Use tech centers to help public understand
skill preparation and education needed and available for
job opportunities.

Recruitment & Retention notes:

Guidance counselors have monthly meeting in tech
centers.

The tech center group has a listing on the Dept of Ed web-
site. They will be moving to a new website.

AM information based on interest groups such as guid-
ance counselors can
also be housed on the Vermont Education Exchange.

Recommendation #4 Workforce training

Make employers aware of existing resources

Who? State employers, regional development agencies

What? Market current programs that support business
(wet funds, etc.) to increase ability to get critical mass in
training and to train employees who need advanced train-
ing that is not available in-state.

Increase mobility for training from different parts of the
state.

How?

- Use businesses to teach
- Use technology. The Learning Network of Vermont ex-
ists in every school providing opportunity to train virtu-



ally in different areas. Business could provide lab space to apply what learned.

- State: Create catalogue of programs, trainings, etc. (Agency for Commerce and Community Development/ ACCD)

Addendum or Preface

Areas overarching to that prohibit the promotion of AM in Vermont:

1. Housing & Costs. Why is Vermont more expensive? Is it possible to ease up permitting for housing?
2. Tax credits
3. Loan forgiveness
4. Overall tax structure

Above varies with business. Can't find a fix for all.

Talent management: Cost of housing and tax structure impacts ability to do

business, expand and grow. What impact do policy changes have on ability

to live in Vermont?

o Dept of Commerce needs to look at the costs that make it difficult for

people to come to Vermont.

Discussion: Next Steps

Advanced Talent Management meeting will follow-up after Advance

Manufacturing Partnership steering committee meets and disseminates its

report.

Bill Driscoll will host

Address how to avoid crossing initiatives

Explore possible virtual meetings. Use Hangout Google and/or Skype.

Need to keep everyone engaged

Hope people take ownership

Systemic Continuous Improvement Group

2nd Meeting, August 14, 2012

Facilitator: Barry Lawson

Note Taker: Roni Coleman

Participants:

John Harris (IBM)

Dave Rogerson (FabTech)

Cindy Bernier (Superior Technical Ceramics)

Tariq Quadir (Superior Technical Ceramics)

Jim Fay (Country Home Products)

Patricia Giavara (VMEC)

Meeting Focus:

Create specific recommendations for steering committee review (Who, What, When, How)

**The steering committee is looking for specific recommendations – the committee will clear up redundancies across groups – encouraged to add “random suggestions” to the specific recommendations.*

Meeting Themes:

“How to create community and connectivity within manufacturing sector”

“How to keep and grow the manufacturing businesses VT already has”



#1 Business Recommendation: Greatly enhance and promote collaboration and connections among Vermont manufacturers businesses and between those businesses and academia. This includes sharing various companies' experiences with different tools and methods of doing continuous improvement

Justification: A "give and take" attitude among manufacturing businesses and with academia encourages sharing of ideas and technology that is necessary for continual improvements within companies and in the manufacturing sector generally.

Specific Steps to be Taken:

- Create and maintain a database (matrix-style) of manufacturing businesses and related academic institutions (competitive vs. noncompetitive);
- Explore existing social media platforms for ideas and create a platform that works well for the Vermont manufacturing community;
- Foster cohesiveness among manufacturers through a statewide online forum and create incentives for businesses/academia to join and/or to create formal networks among companies;
- Promote "give **and** take" mentality through, as an example, visits to other firms to discuss common problems and share possible solutions - reciprocity will be required; and
- Brainstorm business/academia collaboration ideas (such as senior projects sparked by the needs listed in the matrix)

How:

- Develop a strategy for considering resources and the time involved and who will "own" (maintain) the database long term; recruit IT savvy person;
- Engage and encourage VMEC to focus more sharply on manufacturer training and to consider being among the possible database holders or clearinghouses;
- Identify businesses and academic institutions that should participate and their sharable resources and skills; and
- Measure success: conduct surveys and collect data – e.g., track number of hits, participants, contacts, recorded exchanges, services and resources used, money saved, and individual, corporate and industry benefits, etc.

Who: Steering Committee plus subgroup of the Systemic Continuous Improvement working group – volunteers: Pat Giavara, Dave Rogerson, John Harris

When: 6-month time line to implement actions

- Subgroup for this Action would meet soon after September 25 Steering committee meeting to develop an implementable strategy
- Committee will reconvene in one year to measure and discuss progress

Subsequent goals to tackle:

1. Promote awareness of manufacturing as a career choice (may overlap with Talent Recruitment working group); and
2. Bring to the public's attention the critical nature of the crisis in Vermont manufacturing to create interest, concern and support among the State's residents, schools, legislature and others.



#2A Academia Recommendation: Strengthen the relationships between Vermont's and neighboring states' academic institutions and Vermont manufacturers, emphasizing the greater role these institutions can play in fostering manufacturing-related education of VT students and the promotion of jobs within the industry. More explicitly, have employees available for hire such as "operators" or "production workers" who have the requisite skill set coming out of secondary school to be able to do continuous improvement work in the manufacturing workplace.

Justification: VT businesses cannot compete with many other areas on labor costs but can compete on the quality of workers and products – in this regard one can think of a “supply chain” of technically trained workers that would be built on schools committed to producing well prepared workers to help manufacturing businesses prosper.

Specific Step to be Taken: Create and develop an educational manufacturing relationship pilot program with a few secondary schools or within one school district.

How:

- Invite the key potential participants in the pilot program to a meeting to discuss with an appropriate manufacturing group the objectives and means available for the program. This would include school counselors, department heads and teachers. This might be related to a job fair or similar event;
- Encourage the Impetus for the program from the top echelons of both business and educational institutions, elevating the recognition that attracting workers for

manufacturers must begin early in the educational system;

- Frame the issue for academia as follows: “Here’s what we (manufacturers) need and how we can help you (educational institutions) give it to us”. This will take a strong resource
- commitment by businesses because it will help educators’ buy-in if businesses are willing to drive the initiative and give of themselves;
- Explain the specific justification to the schools – explain why skills (basic math, etc.) are important and how they are relevant to the local community and for those who will be in a supply chain for eventual manufacturing jobs; and
- Explore the idea of hiring teachers to work in the manufacturing sector in summers –K-12/tech centers are needed as active players to share knowledge and inspire and prepare students to enter manufacturing field.

Who: Create a subgroup to flesh out plan for a pilot program – there is a possible overlap with other working group (Talent Recruitment and Retention) – Cindy Bernier volunteered time to establish this program

When: Implement during 2013-14 school year, but start laying groundwork immediately.

#2B Academia Recommendation: Strengthen the relationships between Vermont's and neighboring states' academic institutions and the Vermont manufacturers, emphasizing the greater role these institutions can play in fostering manufacturing-related education of VT students and the promotion of jobs within the industry.



Justification: Other states and regions of the country have been developing strong relationships between the research and higher education and their manufacturing sectors. This needs to happen in Vermont and is at the other end of the supply chain for workers as well as stimulating technological research and partnerships between researchers and Vermont manufacturers.

Specific Step to be Taken: Create strong relationship between accessible engineering and business schools and research organizations and Vermont manufacturers. This could involve not only Vermont post-secondary educational institutions but also neighboring Dartmouth College, Rensselaer Polytechnic Institute and others.

How:

- Invite the key potential academic/research participants in this evolving program to a meeting to discuss with appropriate representatives from interested manufacturers group the objectives and means available for the program. This would include university presidents, research leaders, and others.
- Encourage the impetus for the program from the top echelons of both business and educational institutions, underscoring the economic and educational value of cooperation between academia and manufacturers;
- Consider the creation of a regional research center and explore ways to bring it to fruition; and
- Explore the possibilities for greater sharing of workers and equipment among companies and between academic/research organizations and business.

Who: TBD

- When: Start soon to develop an exploratory group to convene a meeting of the heads of interested manufacturing firms and the leadership of appropriate post-secondary educational institutions. Hold a meeting within the next nine months and review progress in one year.

#3 State Recommendation: Actively work to retain and grow the manufacturing businesses that Vermont already has.

Justification: Continuous Improvement is critical to the staying power of businesses – businesses want to stay in VT but are “geographically challenged”. It is not often recognized that manufacturing is equally as important to the sustainability of the state as agriculture and tourism and has unique needs such as creating capable and skilled workers, cooperation in meeting environmental regulations and assistance in supporting training and retraining programs. While it would be good to encourage new businesses to come to Vermont, it is more important at this point in time to ensure that the state takes step to retain its current companies, many of whom are increasingly tempted by more favorable environments and assistance in other states and regions.

Specific Step to be Taken:

- Develop a broader recognition that the specific costs of doing business in Vermont are higher than in most other states; however, businesses do want to remain here to enjoy the generally higher quality of life, but also face the need to stay competitive within their fields;



- Business and state leaders need to work together perhaps through a face-to-face legislative forum, to find the ways and means to assist in the funding and support of continuous improvements in manufacturing; and
- Reverse the public perception that manufacturing is a 'dirty' word;

How:

- Appoint a permanent manufacturing advocate (Commissioner and Deputy Commissioner of Manufacturing) to identify unique needs of the industry and promote support for manufacturers;
- Create an awareness of a current "crisis": that manufacturing is in trouble as the impetus to solve this issue – encourage state to mitigate this crisis.
- Create a supply of workers (using the supply chain analogy mentioned above) that are already well trained so that individual businesses will not be required to expend as many resources as they now must do in this area;
- Develop a public relations campaign to include specific compensation and job availability information on manufactures as incentives to attract students into manufacturing – include dollar amounts to the salaries and other benefits in the field;
- Provide incentives for local businesses to stay in Vermont– develop a state policy to reflect what is comparable to the philosophy of "Keeping the customers you have now is easier than recruiting new customers";
- Consider establishing a cap on manufacturing costs (such as for unemployment taxes) – perhaps consider different tax rates for different industries (such as those subjected to global challenges or "job shops" that make

products to order "just in time"). Currently there is only program for all – need exceptions for specific businesses.

Who: Invite Pat Moulton-Powden to head this initiative and solicit other participants, including Jim Fay of Country Home Products, from the manufacturing sector and state government; perhaps Vermont businesses for Social Responsibility might have a role.

When: Meet with Patricia Moulton Powden soon after the 9/25 steering committee meeting

#4 Federal Recommendation: Increase federal funding to the state to develop manufacturing.

Justification: Federal funding/support is necessary to supplement other efforts to keep VT manufacturing businesses in the state and globally competitive. However, the current feeling is that the other above recommendations are a higher priority and that specific federal assistance may be necessary and sought at a later date.

Specific Step to be Taken:

- Demonstrate that VT manufacturing businesses are willing to give of themselves to tackle these issues by acting

How:

- Focus on first four recommendations then approach VT congressional delegation with account of efforts and successes to justify increasing federal expenditure
- Continue to support VMEC in receiving federal funds through the Department of Commerce/National Institute of Standards and Technology/Manufacturing Extension Partnership Program to sustain manufacturing the



state already has and grow what businesses are already doing

Who: This group?

When: Next 24 months?

This group maintains its commitment to:

1. be sustainable & tackle one recommendation at time
2. reconvene to evaluate the initiatives it has set forth (using data to evaluate progress/success including: how many businesses participated in the matrix, the # of businesses that stayed in VT + those that left + those that came in, profitability of manufacturing) Extras:

Extended Enterprise Management Group

Second Meeting, August 21, 2012

Facilitator: Merryn Rutledge, Barry Lawson Assoc.

Notetaker: Lynne Lawson, Barry Lawson Assoc.

Participants:

Ken Horseman, ACCD

John Mandeville, Lamoille Economic Development Corp.

Carissa Tomczyk, Norwich University

Jim Hermanowski, Nathaniel Group, Inc.

Tim Smith, Franklin County Industrial Dev. Corp.

Purposes of the Meeting:

1. Identify 3-5 priority recommendations for advancing EEM in VT.
2. Identify the party or parties responsible for implementing each recommendation.
3. Set a deadline for completing each recommendation.

The group agreed that EEM includes ERP; that the term “value chain” is sometimes used in place of “supply chain;” and that suppliers are now viewed as partners.

Summary of Recommendations

(Further discussion on each of these recommendations is described in the second section of these notes.)

Short-term

1. Establish an online networking vehicle, perhaps modeled after the University of Maine innovation in engineering initiative, for manufacturers to share capabilities and needs. Also, expand use of open houses as tool to bring together manufacturers in the supply chain.

Who should implement?

VMEC should lead the effort by researching different networking models and their implementation, but could be private sector that actually implements. Could be an opportunity for a private business, which would charge a fee for use.

Deadline for implementation?

March 31, 2013

Broad, Longer-term Recommendations

The following recommendations were seen as much broader than EEM, but as necessary to implementing EEM.



2. Create a division of the Agency of Commerce and Community Development to advocate for manufacturers in Vermont.

The charge of this division would be to determine what is the vision for manufacturing in Vermont, considering Vermont's economy, values, landscape.

What kinds of manufacturing does Vermont want to attract?

Who should implement?

The Administration should propose the new division, then the Legislature would create it.

Deadline for Implementation?

Propose in January 2013 legislative session, create no later than 2015.

3. Develop the infrastructure needed to meet the needs of Vermont's industries: internet, power, transportation, water, access to capital. Who should implement?

This should be community-driven, by regional plans developed by regional development corps. (RDCs) and regional planning corps. (RPCs). The actual implementation would be a collaboration of many entities, including state and federal congressional delegations; Agency of Commerce and Community Development; Agency of Transportation; Public Service Board; Public Service Dept.; Vt. Telecommunications Authority; Vt. Economic Development Authority.

Deadline for implementation?

Develop plans by 2017.

4. Develop an education model, from K-12 up, to support advanced manufacturing in Vermont.

Such a model should focus on skills development and include at least: curricula for tech centers, manufacturing engineering processes, systematic continuous improvement, and ERP; apprenticeships & internships; innovation management.

Who should implement?

Secretary of Education, in partnership with the Dept. of Labor and others. Deadline for implementation? 2015.

5. Develop a Vermont Advanced Manufacturing Innovation Center.

Begin by exploring alternative models to determine which will work best in VT.

Who should implement?

Chancellor of state colleges, in partnership with the presidents of Vermont colleges (including Vermont Technical College) and universities and high schools.

Deadline for implementation?

2015.

Discussion of Recommendations

#1 – Online Networking Vehicle

Could be similar to federal bid system (Procurement Technical Assistance Center - PTAC) specific to Vermont – users throw out capability or need and providers respond.



Portal for exchanging information. Make more general than just government contracts.

#2 – Create a Division of Commerce and Community Development

ACCD gives much attention to tourism and housing, not enough to manufacturing. A new division would coordinate the vision, the infrastructure needed, education needed, innovation center needs. Like Vt. Telecommunications Authority – government has made telecom a priority, should make manufacturing a similar priority.

Need person or organization tasked with making this happen, resources made available, or it won't happen.

No leadership yet – no one is saying we want to make Vt. a manufacturing state. The message is: We don't want manufacturing in Vermont. Need to find out if manufacturing is a priority.

On administration side, no vision, no drive, no initiative from Governor. Need to educate legislators and administration on value of manufacturing. "Manufacturing is a dinosaur," said Shumlin – but he has since changed his attitude.

Sell the vision: use real data about manufacturing: manufacturing pays lots of taxes, provides high-paying jobs.

Tourism is cash cow, but manufacturing is even more so.

Farm-to-plate initiative brought 500 jobs in last year, but how much do those jobs pay – but it's a feel-good story.

90% of Vermont's revenue comes from the income tax - manufacturing pays people good wages, which drives up income tax receipts.

If you train someone to get them in a higher income bracket, they pay more taxes.

Return on investment mentality – governors have not embraced – spend a buck, get three back – not believed by administration.

What do we get back from investment in agriculture vs. manufacturing?

Set up a study to find out what kind of manufacturing we want to invite. Not nuclear refining, for example. But we have forests - fit with tourism and other things that are part of Vt. economy.

Cold Hollow Cider is a manufacturer that serves tourist industry, also coffee, cheese, vodka, peanut butter – these are manufacturers!

#3 – Infrastructure

Manufacturers need a guaranteed infrastructure.

Broadband isn't for business yet, geared to residential use. Need high-speed internet for business.

In St. Albans, town manager has a vision to renovate downtown, brownfields.

He wants to grow the tax base, looking into alternative energy to distribute steam, road construction, railroad. He



goes to Leahy's office, Dept. of Transportation. Towns initiate, then the federal delegation comes up with funds.

New interstate highway in Canada is coming to the Vermont border in 2017, needs a VT corollary.

Access to capital can be seen as a core infrastructure issue. Need source of low interest funding for equipment purchases, etc. and tax credits for manufacturers to encourage and grow manufacturing.

#4 – Education Model

No higher education in state turning out engineers ready to go into manufacturing careers. This is a role for schools like Norwich, UVM. Norwich is trying to get supply chain management emphasis at Norwich. Models are Boston University and University of Michigan.

Academia needs to alter its model, add emphasis on manufacturing.

Secondary and post-secondary - include both. No apprenticeships available anymore except in trades like electricity, plumbing, cosmetology.

High schools are focused on sending students to college, but there should be an alternative: tech center for those not suited to college.

#5 - Innovation Center

State could facilitate getting the site ready (at a university, for example) for an innovation center, lay groundwork, get permitting (Act 250), so individual businesses don't have to. Businesses come in; center is the central resource.

In Albany, the state facilitated creation of Nanotech Center.

Not for profit, fee for service, you bring your idea to them, for a fee they prototype for you, then turn over to you at end – that's how Connecticut defined its innovation center.

Innovation center has to be defined – there are various models.

Nanotech in Albany – modeled on Asian industrial park (industrial park is not negative term there). Financially engineered so that state has some contribution, industry has others. Non-profit entity provides property; industry shares cost of setting up offices and research centers, funds research, shares the results; universities provide researchers and technicians.

Companies pool resources and compete with each other to solve the 10 most important building blocks – companies work on those, and the research output is the product.

Technology transfer, commercialization model for products – make it commercially viable.

Shopping mall is metaphor for the concept: anchor store is the manufacturing site, government is laying groundwork, mall developer is putting in infrastructure, university is providing labor.

President of University of Baltimore has created a center for STEM education – private biotech company is affiliated



with the college, uses graduates, it's part of the STEM education process.

NIST is building 11 innovation centers nationwide, specific to particular areas of focus. But this is beyond VT even to think of.

VERMONT FLEECE CO.—MORRISVILLE, VT

Makers of custom embroidered
Polartec® Fleece blankets.





Appendix B:

'Honorable Mention' Recommendations

Extended Enterprise Management Group

1. VMEC should help companies to understand the value of EEM/Enterprise Resource Planning (ERP).
2. VMEC could be a clearinghouse for EEM software packages, help companies select which one is best for them.
3. Post-secondary schools can teach about the EEM software options: SAP, Oracle, Microsoft, Quicken/QuickBooks, Peachtree, for examples.
4. Regional industrial corporations should be proactive in keeping communication lines open with local companies, helping them to solve problems by leveraging influence with state legislature, helping to adjust state policies before a problem becomes the reason for the company to leave.
5. State (with federal funding that is available for this) can clearly map existing facilities and infrastructure in the state (gas, broadband, electric) and also planned infrastructure expansion, so a potential company knows what's available and coming.
6. State and federal governments can facilitate cross-border transportation, creating, for example, "Frequent Shippers" similar to Frequent Flyers to expedite border crossing for shippers.

Advanced Talent Management Group

1. Hold career fairs for students.
2. Create a matrix for students and employees: how to train or get experience to be what you want to be.

3. Schools should collect data about K-12 career decision-making by rural students –get a grant for a longitudinal data system (VSEC collects some data about high school students).
4. Businesses could attend statewide meetings of guidance counselors.
5. Businesses could attend school board meetings or invite the school board to their facility.
6. The State should create a common set of titles for classes, i.e., what does Math I or Math II actually mean?
7. The State can create a database of available Vermont jobs.
8. The State should add jobs and skills needed for them to the Department of Labor database.
9. Businesses should get involved in local politics to influence policies that affect the attraction of an area to potential recruits (cost of living, for example).
10. Businesses should meet one-on-one with local representatives and senators.
11. Businesses can offer to pay the down payment on a house for potential employees relocating here.
12. Businesses should recruit locally and promote and train from within.
13. The State could help businesses with the process of recruiting foreign workers (visas and immigration issues).

Customer-focused innovation Group

1. Support and maximize the use of existing, proven technical assistance programs
2. Issues – feasibility, financing, and liability costs



Systemic Continuous Improvement Group

1. There is an over-engineering of products, better to find out what the customer really wants and the realistic level of specificity required – need to forge more of a direct manufacturing-customer relationship (see customer-focused innovation).
2. VMEC could focus more training specifically on manufacturers, e.g., a January online forum of ‘continuous improvement time-to-market.’
3. Maybe teachers should work in the manufacturing field in the summers to bring experience of the real world to the school room.
4. Encourage the state to fund continuous improvement – a lot of other states and countries do.
5. Need a legislative forum (quarterly) to present issues to legislators about state manufacturing – meet face-to-face about challenges regarding competition from other states.
6. Need to decrease supply chain red tape.



Innovate Vermont

A proposal for fostering innovation and job
creation in Vermont's Innovation Ecosystem

Lawrence Miller, Janette Bombardier, Lisa Ventriss,
Briar Alpert, Frank Cioffi, Dr. John Evans, David Bradbury



Context

Upon reading the recommendations of the Governor's Commission on the future of UVM and their report "New Ideas for Changing Times" we thought that we should offer some suggestions to improve the Vermont Innovation Ecosystem.

The report recommends that "the state and UVM work together to create sustainable long-term models to support and promote a Vermont Institute that attracts great thinkers and innovators to solve world problems, modeled on the Aspen Institute concept." And further recommended to "Develop and implement strategies at UVM to create an on-campus or off-campus Vermont University Innovation Center to develop new delivery models that address economic development needs across the state to enhance entrepreneurship and job creation."

As long standing economic development professionals, business and industry experts, technology incubation and innovation ecosystem developers and members of the faculty and Board of the University of Vermont we see this as an opportunity to improve the Vermont Innovation Ecosystem.

Vermont has a history of coming up with a seemingly new idea, then doesn't adequately launch the idea with sufficient initial and/or ongoing resources. Entities continue to be under-resourced and under-supported until someone or some group comes up with yet another novel idea. In this instance Vermont already has much of what is needed to provide a meaningful and productive statewide Innovation Ecosystem that exist in several state and UVM related entities, not for profit economic development organizations, an Emerging Technology Center, instrumentation prototyping center, fab lab modeling center, manufacturing extension center, IP and commercialization offices, procurement technical assistance center, small business development centers, a seed fund etc.

It is the intent of this presentation to outline the essential elements, competencies and characteristics necessary to create an effective statewide innovation ecosystem. We believe that much of what is necessary is already in place in several entities. The problem is that there is no "front door" in order to have statewide impact and the entities are under funded and under resourced. We believe that if properly funded and sustainably resourced with the creation of a virtual front door and with appropriate cross training of professionals, the ecosystem could greatly support innovators and entrepreneurs which will lead to job creation and innovation with statewide positive economic impact.



Innovation is the creation of better or more effective products, processes, services, technologies, or ideas that are readily available to markets, governments, and society. Innovation differs from invention in that innovation refers to the use of a better and, as a result, novel idea or method, whereas invention refers more directly to the creation of the idea or method itself. Innovation differs from improvement in that innovation refers to the notion of doing something different rather than doing the same thing better.

– Wikipedia *adj.*

Essential Elements, Characteristics, and Competencies of an Innovation Ecosystem:

- A place where entrepreneurs can find expert business mentoring, support infrastructure, and early stage seed capital
- Providing IP expertise available to the General Public, Employers, and Institutions of Higher Education in Vermont
- A prototyping facility for consumer, medical, and industrial products
- A place where more students around Vermont are encouraged to invent
- Provide Federal grant assistance: notice, submission, grant management, etc.
- Expertise in product flow and systems solutions for innovative and growing manufacturers
- A support system for knowledgeable navigation of a complex economic provider and delivery system



Vermont Innovation Ecosystem:

A catalyst for fostering a dynamic, sustainable, and collaborative eco-system of support



Vermont Innovation Virtual Front Door:

The Virtual Integrator to the Resources & Providers of Vermont's Innovation Ecosystem

Vermont Center for Emerging Technologies (VCET) Headquartered at UVM www.VermontTechnologies.com	Technology Commercialization Resources	Instrumentation and Modeling Facility (IMF) Headquartered at UVM http://its.uvm.edu/u/IME/	Vermont FabLab Headquartered at UVM www.vermontfablab.org	Experimental Program to Stimulate Competitive Research (EPSCoR) Headquartered at UVM http://www.uvm.edu/~epscor/new02/	Vermont Manufacturing Extension Center Headquartered at VTC http://www.vmec.org/	Department of Economic Development Montpelier www.accd.vermont.gov/business/
<ul style="list-style-type: none"> • Next generation jobs for this generation of Vermonters. • Mentoring, incubation programs, two facilities, and \$5M VermontSeed Capital Fund. • Focus on general public and UVM. • 500 start-ups served across VT and \$50M in capital in the past 4 years. • Independent 501(c)(3) formed by UVM, Tech Council, State of VT, and Senator Patrick Leahy. 	<ul style="list-style-type: none"> • Business, technical, and financial advice. • IP talent cloud • OTC to provide: (1) a FAQ sheet about IP for innovators and (2) a list of IP attorneys 	<ul style="list-style-type: none"> • Designs and fabricates instrumentation and prototypes for private and academic clients. • Single custom part or low volume production. • 3,500 sq. ft. machine, welding, and electronics shop and 3,900 sq. ft. of office space. • Focus on UVM and general public. • Part VP of Research Office as a self-supporting, non-profit 509(a)(1) within UVM. 	<ul style="list-style-type: none"> • 3D scanning and printing, laser cutting, circuit board fabrication, and basic electronics design. • Facilities at UVM and Essex High School. • Focus on UVM, high school students, and general public (pending) • Launched in 2012 under UVM's College of Engineering and Mathematics. 	<ul style="list-style-type: none"> • Provides support and technical expertise in navigating federal grants under the EPSCoR program (SBIR Phase 0, Innovation Fund, etc.) • Collaboration with NSF, NASA, USDA, NIH, and DOE allows for ample research and development opportunities. • Grant opportunities for small Vermont businesses to use UVM lab facilities for data gathering to apply for SBIR Phase 1 and Phase 2 grants. 	<ul style="list-style-type: none"> • Provides new techniques for innovation in manufacturing. • Helps to eliminate waste in the production flow with best practices. • Improves the supply chain process, from sourcing to delivering. • Provides networking and leadership opportunities within the manufacturing industry. 	<ul style="list-style-type: none"> • Support Vermont business • Specialized programs • Guidance for businesses • Region Profiles



Vermont Innovation Virtual Front Door:

The Virtual Integrator to the Resources & Providers of Vermont's Innovation Ecosystem

<p>RDCs Addison, Bennington, etc. www.accd.vermont.gov/business/partners/rdc/</p>	<p>Small Business Development Center (SBDc) Randolph www.vtsbdc.org/</p>	<p>Procurement Technical Assistance Center (PTAC) Montpelier accd.vermont.gov/business/start/vtptac</p>	<p>Vermont Technology Council Burlington www.vttechcouncil.org/</p>	<p>Higher Education (Over 20 Colleges in Vermont)</p>	<p>Vermont Economic Development Authority (VEDA) Montpelier www.veda.org</p>	<p>Vermont Technology Alliance (VTA) Burlington www.vermonttechnologicalalliance.org/</p>
<ul style="list-style-type: none"> • Serve every geographic region of the state • Provide local knowledge and facilitate assistance in communities • Offer loans, access to grants, training, advocacy, referrals, site selection services, and other resources. • Communication and utility infrastructure for a complete range of business. 	<ul style="list-style-type: none"> • No-cost, confidential business advising • Low-cost training services to all small businesses advise. • Covers all areas of business from start-up planning to loan package development to long term growth strategies. • Strengthen existing business entities, and assist start-ups 	<ul style="list-style-type: none"> • Help Vermont businesses succeed in obtaining government contracts. • One on one counseling and training. • Increase the percentage of federal contracts awarded to Vermont businesses • Ensure that Vermont businesses are awarded the maximum number of contracts possible 	<ul style="list-style-type: none"> • A catalyst for the creation of science- and technology-based business in Vermont. • Partners with UVM Innovations, VASE, VCET, VT EPSCoR, VITC, VMEC, VT SBIR • Focus on: Biological sciences, Environmental technology, Information technology, advanced manufacturing. 	<ul style="list-style-type: none"> • Provide young innovative talent that, when working together, surpass the capabilities of any one location alone. • Emphasize collaboration between college entrepreneurs to increase job creation in VT • Colleges and universities often provide small grant opportunities for university teams. 	<ul style="list-style-type: none"> • Agricultural and Commercial financing • Partners with banks to provide low interest loans to businesses and farms, both large and small. • Partners with regional, state, and federal entities 	<ul style="list-style-type: none"> • Represent and support the growing number of technology companies • Dedicated to helping and promoting Vermont's technology industry, creating technology jobs in the state, and advocating policies that strengthen Vermont technology companies. • Sponsors monthly "Lunch and Learn" information and education sessions for technology companies



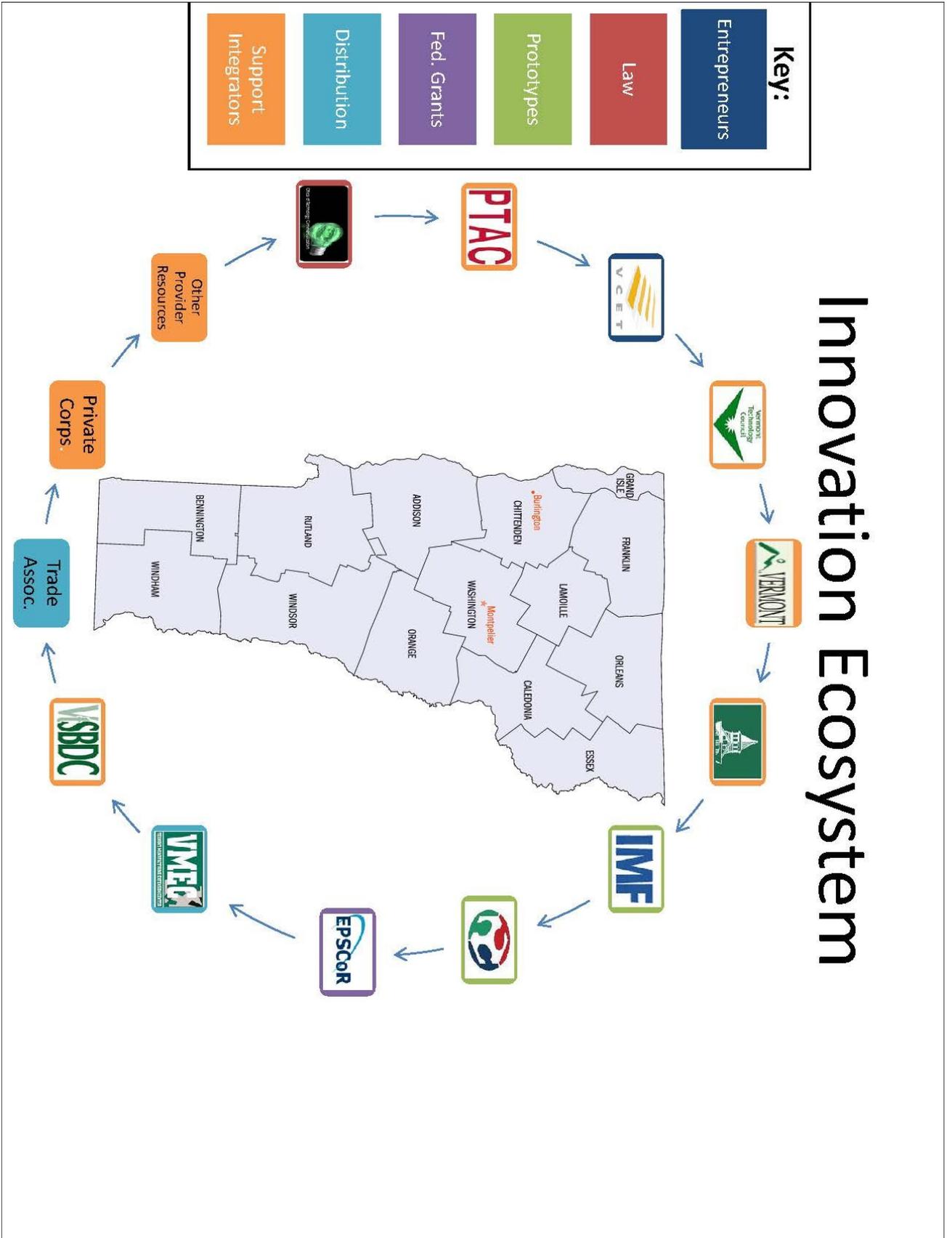
Vermont Innovation Virtual Front Door:

The Virtual Integrator to the Resources & Providers of Vermont's Innovation Ecosystem

USDA Rural Development Brattleboro, Montpelier www.furdev.usda.gov VT/	SBA Montpelier http://www.sba.gov/about-offices-content/1/2/3156	UVM SEED in College of Engineering Headquartered at UVM http://www.uvm.edu/~cems/soe/?Page=seed/default.php	Innovation Events Throughout VT	Student Career Development Throughout VT
<ul style="list-style-type: none"> Committed to the future of rural communities Partners with state, local, private and non-profit agencies to deliver programs that provide equity and technical assistance Foster growth in homeownership, business development, and critical community and technology infrastructure 	<ul style="list-style-type: none"> Offers information on small business loans, grants, bonds, and other financial assistance Finds local lenders who can help with loan applications Focus on general public and UVM. supports a vast network of highly successful small business ventures, ranging from home-grown, self-employment operations to larger businesses of up to 500 employees. 	<ul style="list-style-type: none"> Capstone projects originate as statements of need from local companies and/or faculty research projects . Students relish the opportunity to engage in engineering practice as preparation for work in industry and as application of the theory they have been learning. Real-world projects often involve teams of both EE and ME students 	<ul style="list-style-type: none"> I2V: Workshops in Technology Entrepreneurship Tech Jam: show Vermont's myriad of high-tech career opportunities Makers Faire: gives the public the opportunity to learn from their creativity and innovation. Tech Alliance Lunches VCET Tech @ : Vermont Meetup, Office Hours & Idea Exchange for local Entrepreneurs, Investors, and Professional Service people 	<ul style="list-style-type: none"> Internships Career Introduction opportunities Co-Op programs

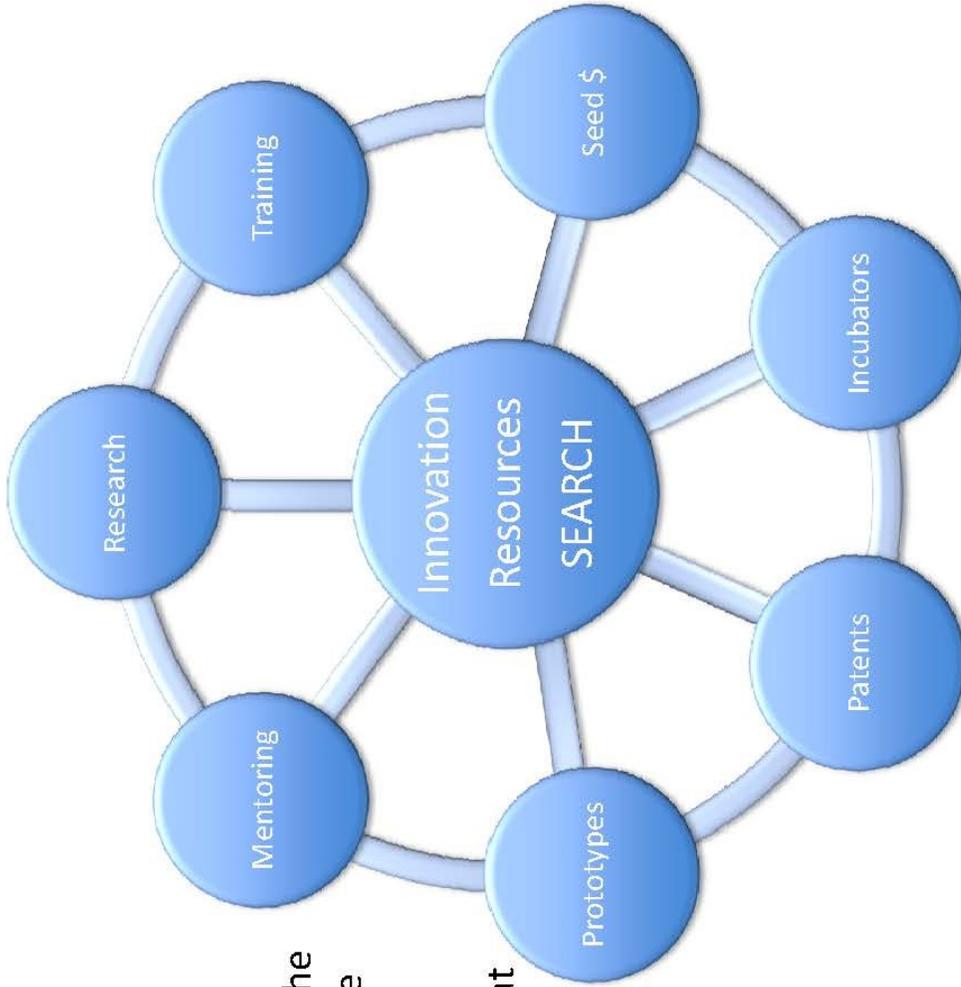


Innovation Ecosystem





Design for Innovators



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Each circle is a button that, when clicked, leads the entrepreneur to the most beneficial resources within the category.

Each branch signals other topics that might be of interest to the entrepreneur.



Vermont Innovation Hub (Physical Presence)

(Phase 1)

- Virtual
 - Create a virtual front door similar to the “Design for Innovators” map, and make it an app that can be added next to Facebook and Twitter buttons on all affiliate websites

(Phase 2)

- Physical
 - IMF @ UVM
 - Or other location
 - Human Hub



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