



Project Profile: Rhode Island

Impact Statement

Rhode Island's STEAMengine project has successfully instilled a culture of innovation in the state's defense manufacturers through Design Thinking. OEA Industry Resilience (IR) funding has seeded the Innovation Center for Design Manufacturing and the Manufacturing Innovation Challenge which focus on materials innovation, particularly textiles and composites, and on closing the gap between IP generators and manufacturers to accelerate new product development, business growth, and diversification. An even larger effort for a connected RI Innovation Campus is now envisioned. The project has allowed companies to think differently and more boldly in improving their products for the military, while generating commercial market opportunities, leaving RI defense manufacturers more prepared for fluctuations in military contracts, providing a more reliable support to the DoD in years to come.

Key Project Takeaways

Through its Industry Resilience grant, the Rhode Island IR team has implemented a Design Readiness Service Package Program, developed curriculum for a Design-Manufacturing Certificate of Training, created an Innovation Center for Design and Manufacturing, and managed and communicated with partners and stakeholders to support the implementation of grant activities. Among the principal benefits to DoD from the OEA funding in Rhode Island has been the development of a design for manufacturing innovation ecosystem throughout the state. In Rhode Island, there is now added industry and stakeholder awareness of new and relevant opportunities, demonstrated growth in participating companies, the development of new connections between design and manufacturing partners, acknowledgment of the role and value of design within manufacturing, and a new, active network of manufacturing leaders with a mindset and skill sets to help them advance innovation within their companies' and collaboratively across the entire defense sector. Providing an effective set of technical assistance and business services to defense-related manufacturers strengthens the nation's defense industrial base.

Project Description

Rationale

More than \$4 billion in economic output was generated from defense spending in the Rhode Island economy. Among the state's 1,600 plus manufacturers, 220 generate revenue from defense related projects. Almost all of the 220 defense-related companies employ between 5 and 30 people. Many are family owned. Few of the defense companies produce a "complete" product, instead making component parts that are sold and assembled into products that others sell. Small manufacturers need to adopt new technologies at an ever-increasing rate to retain a competitive advantage. New technologies such as 3D printing and additive manufacturing are lowering barriers to market entry and promoting innovation for both new and mature companies. In response, the Rhode Island Commerce Corporation (Commerce RI), the state economic development organization, requested a grant from the



Department of Defense's Office of Economic Adjustment (OEA) to launch STEAMengine USA--a program to assist manufacturers with new product development, business diversification, and skills training.

Program Activities

With the OEA funds, Rhode Island advanced national defense priorities for Resiliency and Readiness outcomes. Commerce RI leveraged several resources unique to Rhode Island that led to several innovations in program design and service offerings. These included the use of Design Readiness Assessments (DRAs) conducted by Polaris MEP, technical assistance provided by Polaris MEP and Design Catalyst, and workforce training provided by the Rhode Island School of Design and Bryant University.

The Rhode Island program has been through two phases, representing separate rounds of funding from the OEA. In Phase I, Commerce RI received a grant to begin an effort supporting defense industry diversification. During Phase I, the project:

- Collected data and conducted analysis on defense industry companies and markets;
- Built a stakeholder network;
- Designed and piloted the Design Readiness Assessment;
- Developed an outline for a curriculum on design thinking for defense;
- Developed an innovation strategy for technology commercialization; and
- Identified and evaluated a shared space model for businesses and service providers.

In this initial phase of the project, 20 companies received Design Readiness Assessments in a pilot program established by Commerce RI. The foundation of the DRA process is a 360-degree assessment of the company to bring "fresh eyes" from a multi-disciplinary team with expertise across a range of functional areas: 1. Financial Performance & Business Strategy; 2. Innovation & Product Development; 3. Sales & Marketing; 4. Manufacturing Execution; 5. Supply Chain; 6. Facilities & Equipment; 7. Information Technology; and 8. Organizational Development. As a follow up to the assessments, companies could then request up to \$35,000 for projects related to the recommendations they received.

Phase II of the state's OEA grant involves the expansion of the STEAMengine USA efforts – with additional DRAs conducted by Polaris MEP and Design Catalyst, execution of Design for Manufacturing Innovation (DfMI) certificate programs, and a plan to launch an Innovation Center for Design Manufacturing (ICDM). The DfMI certificate program is a new, customized business development program that helps manufacturers innovate using principles of design thinking. The ICDM plan will determine what a shared equipment space utilized by multiple defense contractors would entail and how it would best serve the industry.

Rhode Island was also an active member of the Regional Aerospace and Defense Exchange (RADE), which is an OEA funded effort to catalyze the entire New England region to work together around their shared interests in good Aerospace & Defense data, workforce issues, better communications, and overall improvements to regional competitiveness.



In June 2019, the RI Commerce Corporation Board of Directors approved an Innovation Network matching grant to help implement the new Innovation Center for Design Manufacturing (ICDM). Matching funds are being sought from other partners (e.g., the Office of Naval Research (ONR), the US Economic Development Administration (EDA), and NIST). The Center will provide space and programming to support Navy initiatives for technology commercialization and partnering with private industry.

Resiliency Impacts

Commercial Diversification of Defense Companies to Sustain the Industrial Base

Design Readiness Assessment (DRAs) are a multi-phase program that features an evaluation of company operations by an expert panel followed-up by an in-depth, collaborative process where experts and company leaders work through a design-driven process for improving operations. With the DRA approach, a range of defense manufacturers were invited to reflect and evaluate possible new directions that could enable them to expand or extend their existing businesses into adjacent markets.

The DRAs, Level (2.1) generated the following results: Completion of 30 assessments with RI defense manufacturers. Level (2.2) consisted of 29 implemented company projects that focused on the priorities established in the assessments. The priorities included: strategic planning, product development, (including parts and assemblies), and sales and marketing. For 18 of the 29 Phase 2.2 companies, there was a total increase of \$15 million in company revenue, representing a 12:1 return on the DoD investment. Level (2.3) generated the following results: Three companies developed new products and in one case, Clear Carbon & Components, established a new business and product line under the name Clear Carbon Interiors, producing high-end furniture for yachts and back-yard decks.

While the impact of the program was different for every company, Polaris MEP and Design Catalyst identified several common themes:

- The needs of companies are almost always interdependent and can only be solved through cross-functional problem solving. For example, when a company has a sales challenge, it often also faces challenges with marketing, with culture, with organizational clarity, and capacity to produce.
- Formal strategic planning is rare. Many of these small businesses are largely focused on the day-to-day business of making high quality parts and goods. However, after the assessment process concluded, it was discovered that more companies are actively undertaking some form of strategic near-term and long-term planning. The focus is equally on stability and growth.
- Most companies have assumptions about their most pressing issues; these priorities often shifted in the course of the DRA assessments. For example, a company thought their greatest need was marketing to win new customers; through the course of the assessment, this shifted to the need to improve efficiency and output to better serve existing customers.
- In follow-up conducted months later, feedback from leaders of DRA participating companies consistently praised the impact of external, unbiased expert opinions as sparking momentum



and communication across their organizations, forging ahead with a clear view of risks and priorities.

Two companies' experiences with the DRA process and subsequent technical assistance illustrate the impact of the services. Pilgrim Screw began as a jewelry screw manufacturer in 1932 and transitioned to defense work during World War II. The company has been through several transitions in terms of their target market and product offering. A family-owned business, the company operates on thin margins and has adjusted its product offerings over the years to work with federal and commercial clients. Since 2000, the company has been focused on aerospace and defense companies exclusively. Polaris MEP invited Pilgrim to join the Manufacturing Innovation Challenge and began with a Design Readiness Assessment. Polaris helped Pilgrim adopt the LEAN manufacturing model to streamline its processes, having decided to initially focus on achieving operational excellence. The DRA also reignited a connection that had been made with a fastener distributor in the United Kingdom, which led to the company applying for research and development assistance through the University of Rhode Island.

Mearthane Products Corporation (MPC) is a components parts manufacturer using polyurethane chemicals to develop the ball valve seat for cooling systems in nuclear submarines, in addition to a variety of office supplies and sporting equipment. Polaris MEP invited MPC to join the DRA pilot program in early 2015. MPC was particularly interested in investing in machining to become more independent from defense spending, in addition to working to better understand and control its role in supply chains and to vertically integrate. After identifying key areas of improvement such as marketing, workforce development, and supply chain improvements, Polaris MEP assisted in several efforts including market research, website improvement, and process improvements in manufacturing.

By helping these companies diversify and grow their business, the DoD has increased their resilience to future economic and DoD spending downturns, ensuring a steady base of support for the DoD that can weather turbulent economic conditions.

Readiness Impacts

Training and People Support

Defense manufacturers learn with "design thinking" the critical principles to "think outside the box." With OEA funds, the Rhode Island School of Design Executive Education (RISD EE) created the Design for Manufacturing Innovation (DfMI) certificate program. RISD EE was engaged to provide and pilot a robust and comprehensive certificate level Design and Manufacturing learning program:

- Responsive to the existing and evolving learning needs of Rhode Island based defense-related manufacturers;
- Acknowledged by a well-researched, official industry-wide Design and Manufacturing certificate;
- Provides participants from companies and all identified job families within the defense manufacturing sector with higher end design learning orientated towards diversification, strategic development and innovation; and



- Documented in ways in which the approach, values and impact can be shared with and understood by defense related manufacturers and broader audiences.

The Design for Manufacturing Innovation certificate program was developed in partnership with Polaris MEP and Rhode Island Manufacturers Association (RIMA). The certificate program focuses on:

- Developing new solutions to complex problems that arise in organizations, work and client relationships by utilizing design thinking, tools and methodologies
- Realizing the sustainable business and innovation potential of developing entrepreneurial, design-driven cultures
- Using design to translate future trends into stronger manufacturing growth and breadth, with opportunities for business advancement, diversification and resilience
- Leading manufacturing innovation in Rhode Island, by having the knowledge and network to accelerate design thinking, processes, strategy and management

The RISD DFMI certificate program generated the following results: Twenty-seven (27) leaders from twenty (20) companies participated in the RISD program, resulting in a new cohort of practice within the RI manufacturing sector. 76% of participants indicated that their work was different as a result of the program, with notable increases in design knowledge and awareness, and design leadership across their companies. One example of putting the certificate program into practice was visiting an OEM customer to get them to demonstrate how they use the supplier's products. From the visit the supplier noticed extra steps the OEM customer was taking to make use of their products, which led the company to conceptualize and prototype dozens of new fasteners using 3D printing and they are now in process of commercializing a new, more complete solution.

Two other companies' experiences with the process illustrate the impact of the services as well. Navatek develops and sells inflatable woven fabric boats as part of its larger boat manufacturing activities. Navatek's RISD experience brought about two major changes: First, their process for developing inflatables became more human- and customer-centered. Naval Undersea Warfare Center communicated to Navatek the constraints facing the DoD and helped determine a better collaboration methodology. Second, Navatek connected with RISD-trained designers, hiring a full-time in-house designer to create a design thinking-based process that allows for examination of a range of options, rather than jumping to a manufacturing solution, which had been the company's primary approach previously. Navatek now plans to expand the use of design thinking company-wide.

VR Industries produces circuit boards. As a result of their RISD experience, the company created a dedicated space internally to serve existing and prospective customers, called the Customer Innovation Center. The Center aims to: convert prospects into customers, design cost control/reduction means through process improvements rather than beating down the suppliers, and foster collaboration and design thinking with its physical environment, by creating spaces that allow lots of back and forth communication throughout the process. Ultimately, the Center will become a maker space that will attract the future VR workforce with specialized tools, including CAD and 3-D printers.



Commerce RI developed an inventory of existing equipment and facilities in the state that can be utilized by defense manufacturers as they seek to diversify and look for rapid prototyping opportunities. The equipment information that is available includes:

- Type and description of equipment and characteristics (i.e. capabilities, model information, reliability score, etc.)
- Location and access descriptions
- Availability information (i.e.; hours of operation, reservation information)
- Fees and any other requirements associated with the equipment
- Contact information for access

This inventory is posted on an online database that also includes profiles of expertise (individuals and organizations) and other resources that can serve defense manufacturers.

The inventory, training resources, and emphasis on design thinking work processes lead companies to be more resilient and adaptable and to develop products that better meet customer needs. This in turn may lead to a stronger, healthier defense industrial base, bolstering the DoD's mission.

Lessons Learned

Challenges

An overarching challenge was to help manufacturers understand the concept of Design Thinking --and that it was worth their time and effort to participate in the DRA process and help shape the recommendations section of their individual reports.

Most Important Lessons Learned

Persevere and hold firm to your commitments in the statement of work, yet, acknowledge that bumps in the road will force you to reassess and adjust accordingly. To that end, one key task in Rhode Island was to establish an ICDM that would link designers to manufacturers, and manufacturers to Design Thinking. The grantees identified this as the most complex and labor-intensive task to implement. Even though it had the smallest part of the budget, the grantee shifted gears twice and jettisoned the TechShop business model¹ for a home-grown model – that also was cast aside – and are now advocating an Advanced Materials ICDM named the “401 Tech Bridge” to foster innovative research and development, and to accelerate products from composite and textiles manufacturers – two key sectors for military applications.

Sustainability

The Rhode Island IR team has achieved sustainability for its key STEAMengine programs. Polaris MEP continues the Design Readiness Assessment program, now named Strategic Assessments, as part of

¹ After working many months with TechShop administrators, RI opted to pull back and reassess its plans, eventually severing our ties with the company. In the fall of 2017, TechShop filed for Chapter 7 bankruptcy (liquidation), instead of Chapter 11 that would have allowed TechShop to reorganize its business and restructure its debt. Their business model required heavy financial support and subsidies.



their list of manufacturing services. Bryant University continues to offer DTC 102, its Design Thinking certificate of training through its Executive Development Center (EDC). Rhode Island School of Design (RISD) began offering the DfMI (Design for Manufacturing Innovation) training certificate in Fall 2019.

The grantees also stay in touch with the companies they work with once the technical assistance is completed. The RI Commerce Corporation maintains a CRM system called Salesforce to maintain and monitor relations and program services, and have communicated with the companies by distributing the final reports through the www.steamengineusa.com website. Additionally, the project partners/contractors all maintain communications with their customers. Polaris continues to offer Design Readiness Assessments (DRAs) by soliciting more manufacturers to participate in the program. Bryant University and RISD maintain an alumni mailing list to communicate updates on Design Thinking curricula. Similarly, the many subcontractors that worked for Polaris serve to advocate the DRAs and other services offered by Polaris, as well as RI Commerce and the two universities.

Finally, stemming from the establishment of the Innovation Center for Design and Manufacturing, Rhode Island is launching an innovative triage system, the ICDM IP Throwdown to close the gap between IP generators and manufacturers. With the throwdown model, Intellectual Property is qualified, the selected IP is matched with vetted RI manufacturers, and successful matches are seeded with a \$20,000 award to take the next steps in the commercialization process. The even larger, ongoing effort is to generate \$8M in funding for a connected RI Innovation Campus with nodes between different universities and a collision space for shared programmatic activities. The design of this approach is based on extensive research regarding the need in Rhode Island for maker space and collaborative manufacturing space in general. This would scale efforts in order to create a critical mass.