



Rural Indiana Technology Commercialization Initiative

Final Report

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INDIANA OFFICE OF DEFENSE DEVELOPMENT (IODD)

Executive Summary

This report was prepared for the Indiana Office of Defense Development in support of their mission to assist in the commercialization of DoD and other federal intellectual property and assets creating additional high quality jobs for Indiana.

Purdue University (Purdue), through the Purdue Research Foundation (PRF), and the University of Southern Indiana (USI) have mutually beneficial technology commercialization practices and entrepreneurial ecosystems. These systems include processes that exploit innovation discovery by leveraging commercialization ideation, maximizing lean Launchpad principles and entrepreneurs-in-residence (EiRs) expertise, and synchronizing these processes for ultimate capital formation. Using students/faculty researchers, experienced alumni, and trained staff in innovative ways, the integration of these capabilities can produce a model of technology commercialization that can be implemented at a Department of Defense (DoD) laboratory as represented by Naval Surface Warfare Center (NSWC) Crane Division.

The effort was led by Purdue/PRF and was entitled the “Rural Indiana Technology Commercialization Initiative” (RITCI). Commencing in July 2014 through June 2015, the scope of the RITCI was for Purdue and USI to develop an integrated technology commercialization model and demonstrate this model through the identification, marketing, and exploitation of 1-3 NSWC Crane technology opportunities. The intent of the effort was to develop the model such that it would be applicable and compatible with both government-owned technology commercialization opportunities and opportunities produced and owned by the Industry/academia.

Deliverables for this effort included 1) supporting 2-3 companies using Crane related innovation in their pursuit of technology commercialization, i.e. produce success stories, 2) develop and document a model leveraging existing technology commercialization supporting assets, 3) identify “low hanging fruit” of Crane related innovation for additional technology commercialization opportunities, and 4) identify gaps and recommendations.

The RITCI initiative **‘exceeded expectations’** and was successfully executed through strong partnerships and by leveraging everyone’s strengths and resources. Each partner had to secure key leadership support, was willing to expend extensive resources (mostly time), and selflessly executed the initiative with the greater good in mind. Another key realization during the undertaking of this initiative was the additional partnering going on outside of RITCI. Several other entities participated in this effort and should be recognized; Indiana University (IU), through its Maurer School of Law, participated on a pro bono basis supporting startup clients. Multiple Technology Based Economic Development (TBED) entities also participated in meetings for insight and awareness. These included the Growth Alliance of Greater Evansville (GAGE), Current Blend from Dubois County, Bloomington Technology Partnership, and the Indiana Office of Small Business and Entrepreneurship (OSBE).

Key Achievements & Findings

- A total of **132** Crane innovations including technical summaries are posted at the PRF Office of Technology Commercialization (OTC) Intellectual Property marketing website (Flintbox) at prf.flintbox.com/public/group/761/.
- Four companies leveraged the tech comm assets of the participants (Appendix A): Somatics Systems LLC (Jasper, IN); Pivot Engineering LLC (Evansville, IN); H&H Heating Sources LLC (Evansville, IN); and 5D Analytics (Bedford, IN).
- Additional “low hanging fruit” derived from Crane innovations were also identified through the University of Southern Indiana’s (USI) 2015 Technology Commercialization Academy (TCA). Teams listed below took Crane innovations/intellectual property and applied an ideation process to the technology for potential commercial application and/or further market analysis:
 - Blueprint Innovations ~ Volver Reel System
 - EZ-Spooler ~ Fishing Line re and de-Spooler System
 - Liber Innovations ~ The Motor Development Arm
 - NexTech ~ The Hose Helper
 - LOCify ~ Mobile Application
- A technology commercialization model was developed, exercised and documented (Appendix B).
- There were more resources supporting Indiana technology commercialization than previously known (Appendix C).
- An initiative with this many entities and services requires dedicated project management (intentional coordination and communication).
- Business rules need to be established for more effective engagement and handoffs.
- There is a need to establish a fund to help companies develop prototypes, access specialty services, have access to subject matter experts at the lab, etc

Recommendations for taking this effort to the next level:

- Establish a fund (State) to assist and support startups and existing companies who are attempting to commercialize DoD and other Federally funded innovation

- Establish an external entity in the Westgate area to:
 - coordinate and identify other resources in the technology commercialization value stream;
 - establish an online TBED portal to value stream services;
 - manage and administer ‘funds’;
 - establish (or leverage existing) mentoring network;
 - host and coordinate applicable events and activities;
 - provide program management and coordination;
 - manage metrics.

- Leverage the technology commercialization activities supported and/or funded by NSWC Crane, Office of Economic Development Defense Industry Adjustment, and Applied Research Institute; as well as seek other funding opportunities.

Background

On 2 December 2014, key stakeholders and subject matter experts met in Indianapolis, Indiana at the Indiana Rural Technology Commercialization Summit (Summit - report available at www.in.gov/iodd/2362.htm) to respond to the challenge: *How might Indiana achieve rural economic impact and national prominence through the commercialization of the federal lab’s intellectual assets?* Key findings included 1) the State needs to have technology commercialization be an industry lead process, 2) Indiana has the necessary components for technology commercialization but these resources are distributed across the (rural) state, and 3) there is a necessity for an external entity external to coordinate and lead technology commercialization activities. The activities associated with the summit included the development of the RITCI Innovation Model (See Appendix B).

The subsequent RITCI effort was founded upon two premises that came out of the Summit. The first premise is that Indiana has a Federal laboratory (NSWC Crane) producing some of the nation’s best innovation yet has not been fully leveraged for TBED purposes. Second, while geographically disperse across a rural State, Indiana has the necessary “components” to move innovation from the laboratory to the marketplace.

The focus and intent of the initiative was to network the components and exercise them together in a common value stream. Led and funded by the Indiana Office of Defense Development (IODD) and in partnership with the OSBE, the principle participants would be Purdue, USI, IU, and four (4) startups leveraging innovation from Crane. The goals of the initiative were to develop the value stream, produce multiple success stories of companies traveling the value stream, and identify gaps. The initiative is to leverage existing programs in an innovative way to prove “we can do this” while building the entrepreneurship capacity and culture in a rural setting.

Approach

The approach to RITCI was to 1) identify existing technology commercialization related programs and resources readily available in Indiana – initially in the universities and then to expand as other programs and resources were uncovered, 2) connect them in an innovative way and place them in a value stream (model) that helps everyone see where they fit contextually (time and place), 3) identify existing and emerging startups that had been associated with both Crane innovation and one of the existing programs, 4) continue to shepherd the startups through the value stream. While this is seemingly simple, no one had done it in a rural and geographically dispersed setting.

Technology commercialization related programs and resources used/available under RITCI (**bolded** were resources known to be used by one or more of the startup companies) included:

- Purdue University/Purdue Research Foundation:
 - **Burton D. Morgan Center for Entrepreneurship** – provided overall program management for the RITCI.
 - **Purdue Foundry** – world class program with the sole goal of helping faculty, students, alumni (and now Crane related startups) from innovation ideation to its first customer and sales. The Foundry has launched 49 companies in the past two years with licensed Purdue generated Intellectual Property (IP).
 - **Office of Technology Commercialization (OTC)** – marketed and managed 132 separate pieces of disclosed Crane IP into Purdue/PRF related IP marketing and managing systems (FlintBox and SOPHIA).
 - **MBA Program** – Purdue MBA students from the Krannert School of Business routinely conducted financial and market analysis research from identified Crane startups. MBA students were also used to translate Crane patents/IP disclosures for inclusion into the Purdue IP marketing and managing systems (FlintBox and SOPHIA).
 - **Experiential Learning Initiative Classes** – Purdue ELI classes/teams developed key elements of a business canvass model for identified Crane startups.

- University of Southern Indiana:
 - **Innovation Discovery Events** – IDEs was co-developed between Crane and University of Southern Indiana (USI). The goal of the IDEs was to “mine” innovation out of common engineering programs at Crane by asking the question “what tough technical problem did you solve for the warfighter today?”. IDEs have been so successful at changing the culture at Crane that the process is being rolled out across the DoD lab system as a best practice. IDE metrics to date include: 37+ pieces of IP, 4 related startups and 4 licenses.
 - **Technology Commercialization Academy** – 10+ week summer program to ideate on the Crane IP, develop business plans, and launch startups. To date (4 events held), TCA has developed over 1,000 commercialization ideas along with 3 startups that are still in business and working to take their products to market

- **USI Entrepreneurship Class:** A minor in the Romain College of Business, this is a three semester course that guides students through ideation based on existing IP. Outputs include feasibility studies, business plans/models, enterprise development, and exposure to the technology commercialization process.
- **Eagle Innovations Accelerator (EIA):** Provides a series of services to tech-based startups for new ventures in commercialization. These services include guidance on product development, mentorship, prototyping, scale up, and seed funding.
- **Applied Engineering Center:** A 16,000 square foot lab providing cutting-edge manufacturing equipment to support design, prototype development, and manufacturing scale up activities through use of expert faculty, staff, and students.
- Crane:
 - **T2 office** – over 400 pieces of IP available now and the willingness to license and collaborate in support of commercialization. 2015 was a record year for Crane’s licensing and collaboration agreements!
 - **Law Student Externship program** – provides state law school students hands on internships to draft real patent applications. The best semester produced 24 patent applications drafted! This is becoming the best practice in the DoD for a scalable way to handle a growing patent portfolio, provide incredible real world experience and expose these young lawyers to lab T2 and commercialization (1 graduated lawyer has formed a startup in Indiana and licensed a Crane invention).
- Maurer School of Law (IP Clinic) – IU’s **Center for IP Research** offers a pro bono legal counsel using law students and seasoned professional lawyers.
- Indiana Office of Small Business & Entrepreneurship:
 - **Launch Indiana** – Indiana’s Office of Small Business and Entrepreneurship partnered with the very successful Launch Fishers mentoring network to provide startups across the state access to seasoned entrepreneurs.
 - **SBIR Program** – leveraging network of companies who are prime candidates for T2.
 - **SBDC** and Procurement Technical Assistance program.
- Tech-based Economic Development and Entrepreneurial Support Organizations:
 - Growth Alliance of Greater Evansville (GAGE) – GAGE is a traditional economic development with some TBED components. GAGE provides a co-working space, an incubator, and other startup support. A previous GAGE CEO has become part of one company’s management team.
 - Current Blend – Current Blend is an entrepreneurship-based economic development organization that provides incubator space, co-working space and startup support for Dubois County startups, including some of the startups referenced in this study. While not a traditional or academic model for rural technology commercialization, Current Blend’s role in the state’s rural entrepreneurial ecosystem could become a model for other communities as this initiative develops further.

- Bloomington Technology Partnership (BTP) – BTP is a technology-based economic development effort of the Bloomington Economic Development Corporation (BEDC). The BTP fosters the growth of technology companies and startups in the greater Bloomington area by providing mentoring, networking opportunities, job promotion and technical assistance. The BEDC has been involved in bloomingtonswitchboard.com, an online portal connecting entrepreneurs to business resources in Monroe County. In 2015, the BEDC launched B-Start, a pre-accelerator program for IU and Ivy Tech – Bloomington student startups that connects entrepreneurs with local business resources to accelerate their development.

The team came together formally on three occasions: 26 February, 16 April, and 11 June 2015. Most of the interaction was conducted virtually with each of the startup companies being introduced and connected with the different services as each service seemed relevant. Ultimately, the companies had to make the final decision on which service to engage.

Results, Findings, and Recommendations

- Establish a fund (State) to assist and support startups and existing companies who are attempting to commercialize DoD and other Federal innovation ~ \$100k year 1 and \$150k in years 2+.
- Establish an external entity (perhaps an arm of the Applied Research Initiative) in the Westgate area to shepherd startups through process; provide project management with regard to value stream (not to the company).
- Identify Crane employees ‘ripe’ for undertaking the risks of doing a startup.
- Future Considerations:
 - Establish a T2 State portal for the purpose of connecting people, exposing and advertising assets, and to track progress and metrics.
 - Demo an “executive / mentor” team and/or leverage OSBE’s Launch Indiana’s Mentor Network to work with a tech-heavy startup.
 - Initiate an “e/biz” certificate program (fast startup) geared to Crane employees (both technical and non-technical).
 - Investigate the implementation of the business plan competition for Crane employees using Crane technologies/IP.
 - Leverage the PRF/Foundry model for common process/understanding for use “State-Wide”.

- Further recommendations and observations:
 - Technology- and entrepreneurship-based economic development (TBED and EBED) organizations are emerging in Indiana’s rural technology commercialization landscape. These organizations can be traditional economic development organizations that are beginning to rethink their programs and offerings, coworking spaces, and new organizations designed to serve the entrepreneurial community.
 - In the case of these non-academic support organizations (TBEDs and EBEDs), the biggest current challenge is funding the people resources needed to accomplish the tasks and programs outlined in this report. Additional consideration for funding of such organizations would allow for more effective assistance for startups on a local level, and such programs could be replicated to other rural areas that currently do not or cannot offer assistance to startups in their communities.

Conclusion

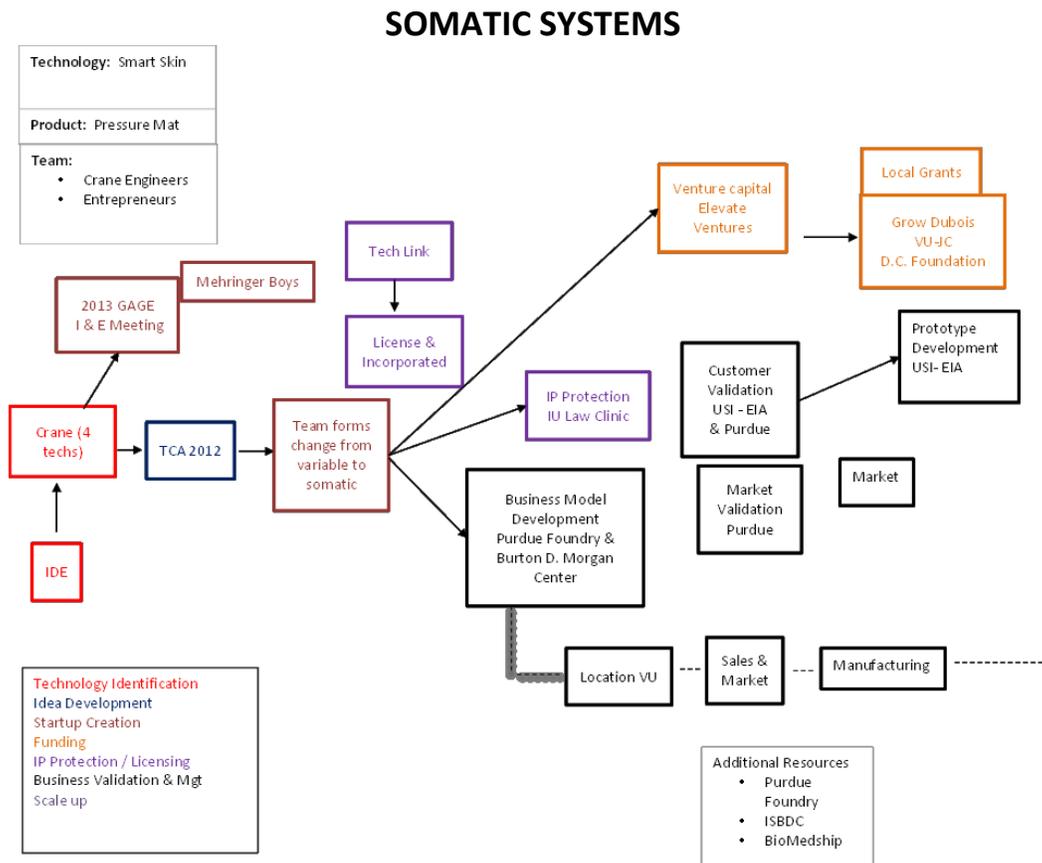
The entrepreneurial ecosystem throughout Indiana is growing rapidly and this expansion will be accentuated in Southwest Central Indiana with the completion of the I-69 corridor, significant enhancements of the applied research environment, and the growing research workforce at NSWC Crane. Indiana must be prepared to exploit this ecosystem for the purpose of maximizing its technology commercialization potential. Our Indiana State agencies, research institutions, and access to defense research laboratories contain a vast and robust number of components in the value stream that need to be connected and coordinated better to optimize chances of technology commercialization success. A mechanism for synchronizing these vast resources should be a major focal point and major arm of any applied research enhancements in the region.

APPENDIX – A

Summary of Services, Results, General Comments of 4 Companies

Company: **Somatic Systems, LLC** (Crane employees) via Todd Mehringer and Deb Dewey:

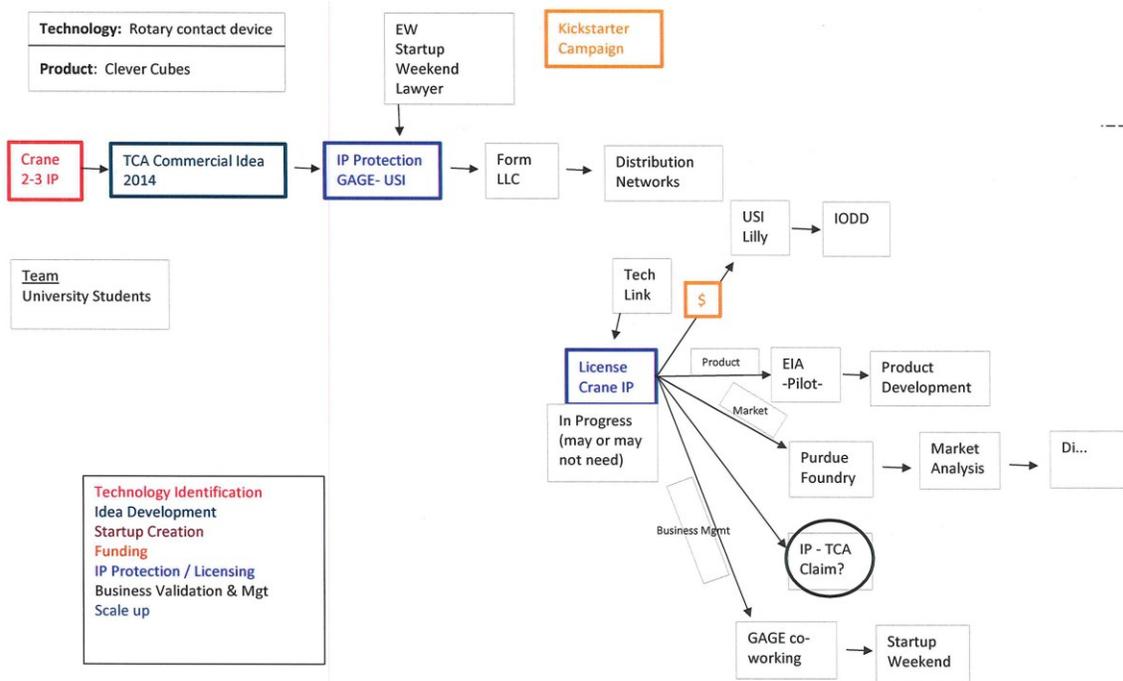
- Activities / events “leveraged” to date:
 - Purdue: Business coaching, market analysis ~ BIOMEDICAL EntrepreneurSHIP class, customer introductions, and access to MBA students
 - USI: TCA identified initial product - repurposed to bedsore detection
 - USI: Initiated software development
 - USI: Helped provide the genesis of their Eagle Innovations Accelerator
 - GAGE: startup support / mgt team development
 - TechLink: license support
 - Crane: Patent License signed for 5 patents
 - Crane: Innovation Discovery Events
 - IU: law clinic session
 - Next Steps: Purdue: Foundry / Purdue business class support
 - Continued Market/Customer Analysis
 - Continued Business Coaching



Company: **Pivot Engineering, LLC** (UI students – TCA grads), via Tyler Fitzsimmons:
 (NOTE: Part of the first EIA co-hort)

- Activities / events “leveraged” to date:
 - USI: TCA identified initial product – repurposed innovation
 - GAGE: Startup support
 - USI: New innovation disclosed and provisional IP filing
 - GAGE/USI: funding of IP filing
 - Purdue: Foundry performed Distribution and Marketing analyses
- Next Steps:
 - Crane: Patent License application being pursued
 - USI Eagle Innovations Accelerator: Supporting Customer/Product Development and support team development
 - IU: law clinic

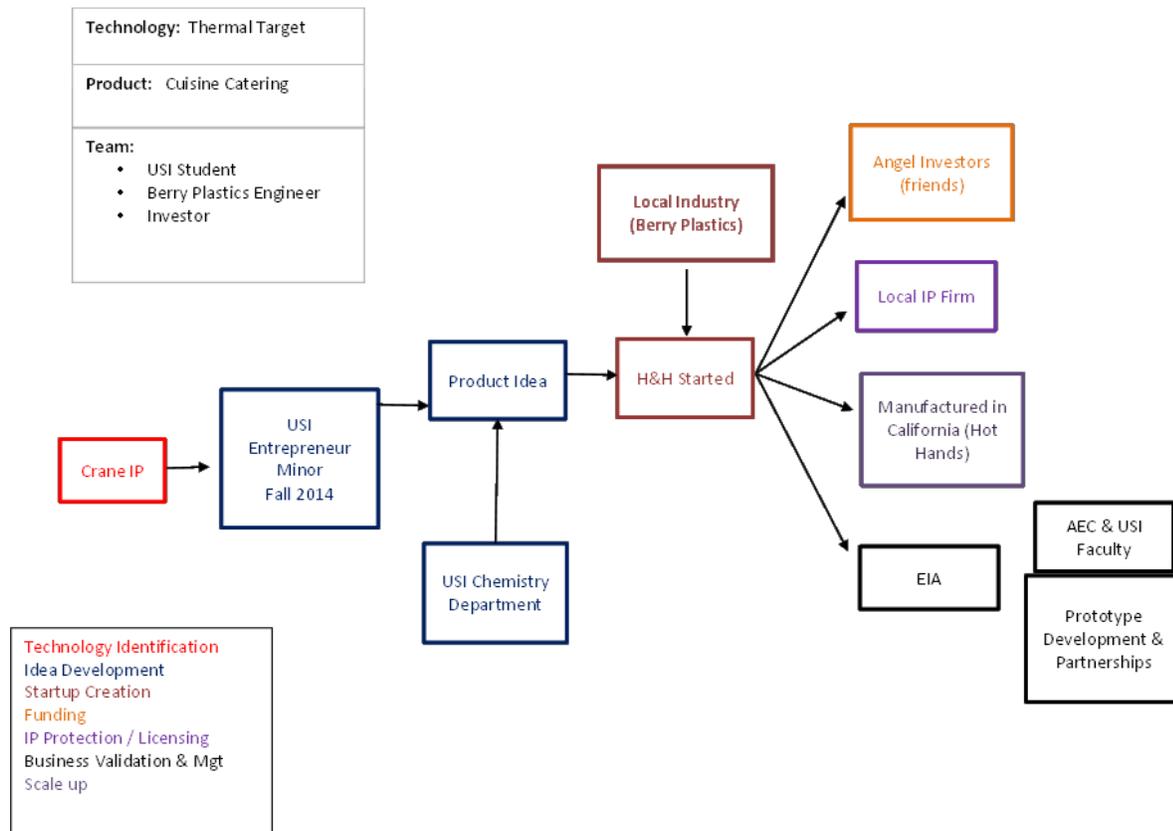
PIVOT ENGINEERING



Company: **H&H Heating Sources, LLC** (NOTE: Part of the first EIA co-hort)

- USI student & Berry Plastics Project Engineer (Logan Hayford & AJ Hale)
- New IP not filed yet
- Activities / events “leveraged” to date:
 - USI: Chemical Formulation
 - USI: Entrepreneurship Classes (JAN 2014 – Present)
 - USI: IP Consultation
 - USI: Manufacturer Visit / received prototypes
- Next Steps:
 - USI: Facilitate Business Consultation/Mentorship
 - USI: Legal/IP Consultation; Patent Filing
 - USI: Customer Development; Product Validation
 - Maybe:
 - Company: develop/submit patent license application
 - IU: Law Clinic
 - OSBE: Launch Indiana

H&H HEATING SOURCES



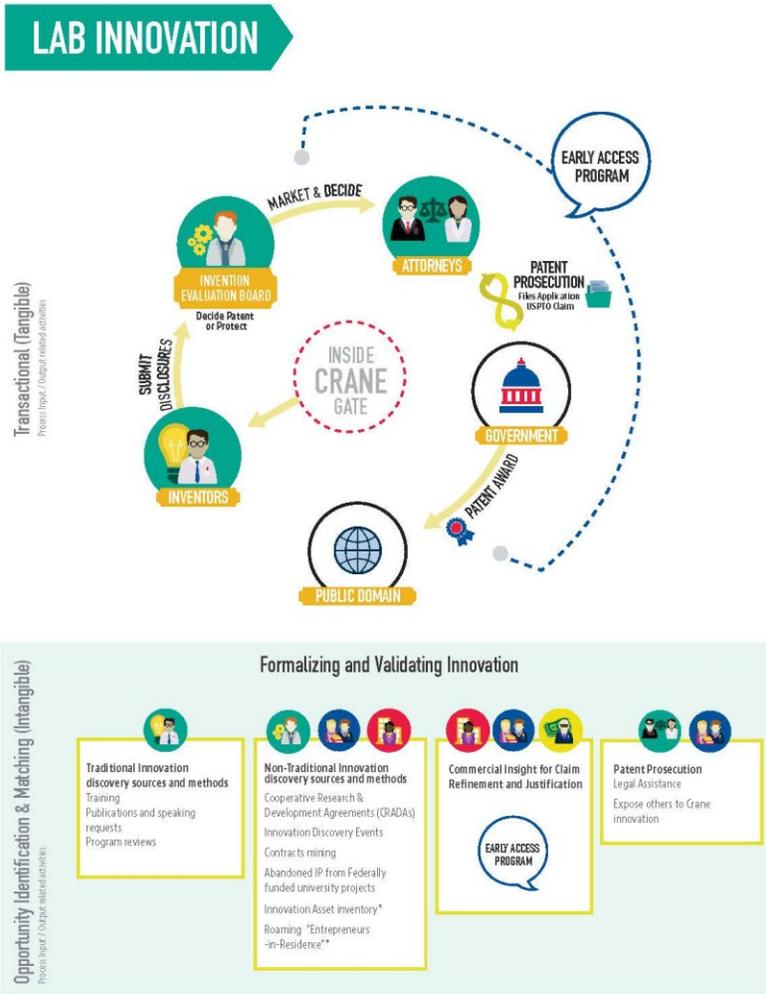
Company: **5D Analytics**, via Wes Evans:

- Activities / events “leveraged” to date:
 - USI: TCA identified initial product – repurposed innovation
 - TechLink: License application support
 - Crane: Patent Licensing
 - Executive Fusion: Corporate Name, Logo, Business Cards, Marketing Scheme
 - IU IP Law Clinic: Patent Licensing support
 - Purdue Foundry: Lean Launchpad startup Training
 - PTAC: Business Registry assistance (DUNS, SAM, CAGE, iRAPT)
 - Chamber of Commerce: Local Incubator support

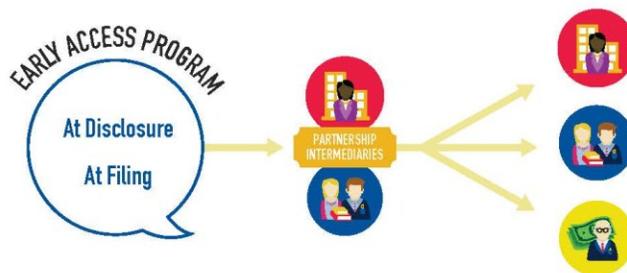
- Next Steps:
 - Economic Growth Council: Lock down Facilities
 - Purdue Foundry: Complete Launchpad Course, Business Coaching, Customer / Market Analysis
 - Purdue Foundry: Introduction to Venture Capitalists / Angel Investors
 - Crane: Delivery of Hardware / Software
 - Contracting: Initiate support opportunities to NSWC Crane

No Process Chart Included.

APPENDIX – B ~ Innovation Model (



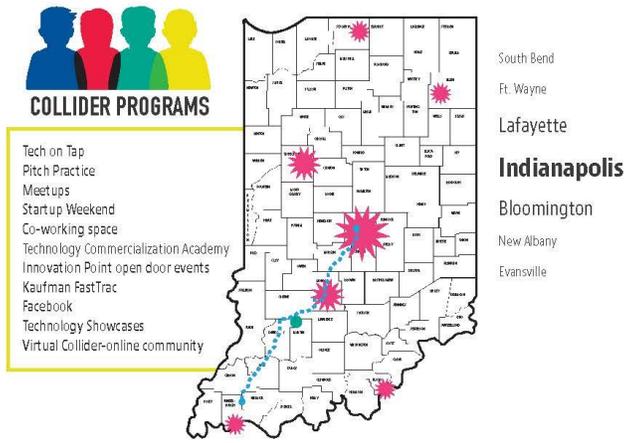
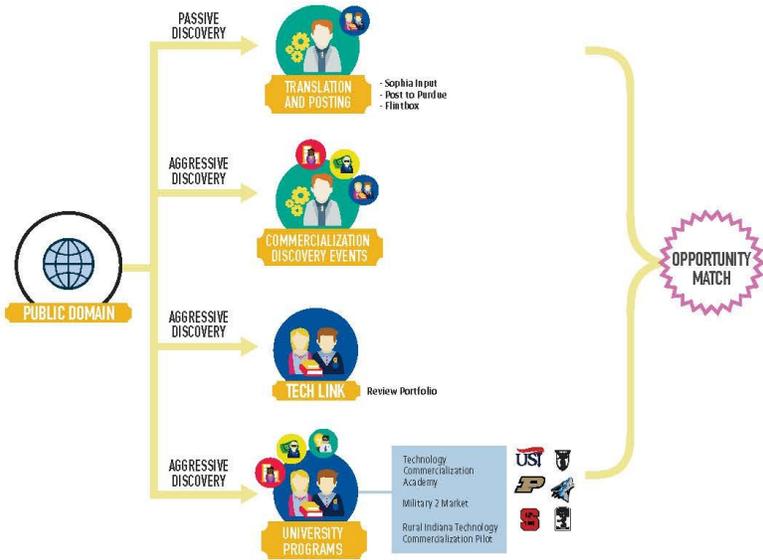
Get external market and commercialization input early to influence patent application development and identify early partners.



Appendix A A-1

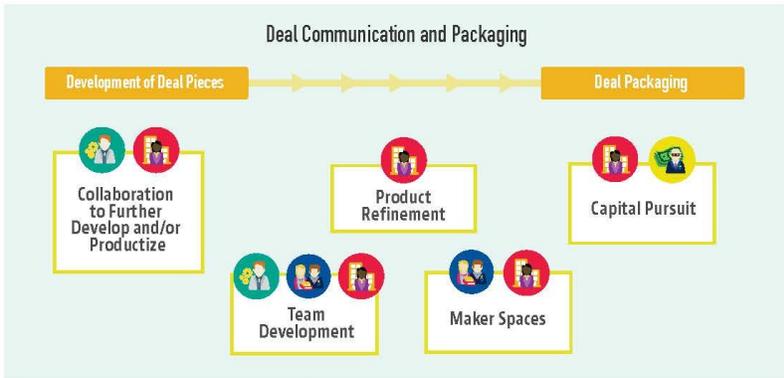
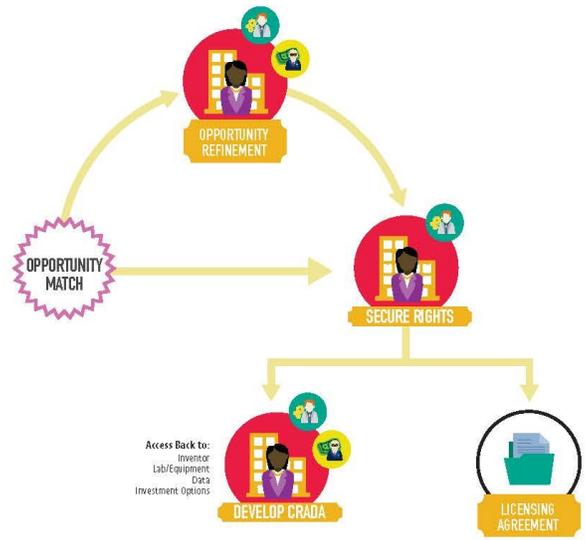
NOTE: The University of Southern Indiana’s Center for Applied Research facilitated the sessions that during the development of this model.

ASSESSMENT



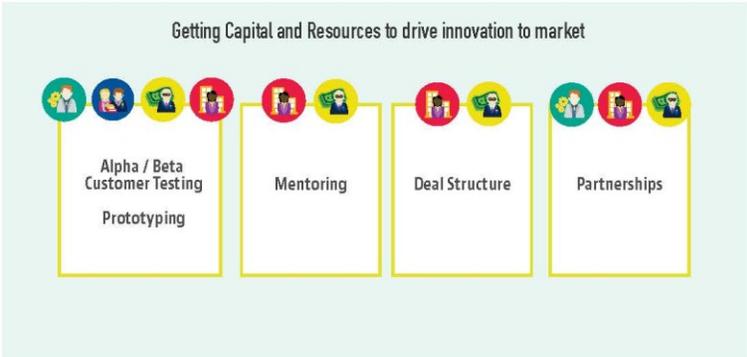
NOTE: The University of Southern Indiana's Center for Applied Research facilitated the sessions that during the development of this model.

DEAL DEVELOPMENT

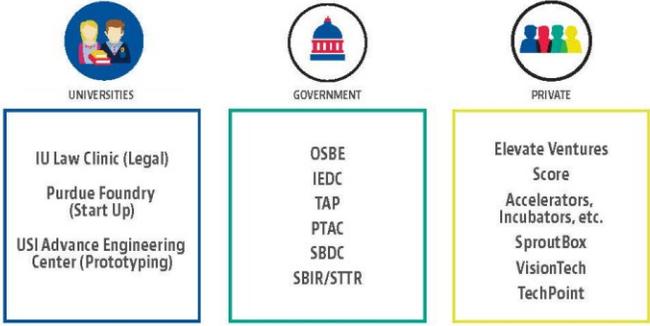


NOTE: The University of Southern Indiana's Center for Applied Research facilitated the sessions that during the development of this model.

TO MARKET



Available Resources



NOTE: The University of Southern Indiana’s Center for Applied Research facilitated the sessions that during the development of this model.

APPENDIX C – Indiana Technology Commercialization Programs and Resources

PURDUE

Office of Technology and Commercialization (OTC): The OTC mission is to serve Purdue University through the commercialization of its intellectual property (IP) and operate a comprehensive technology transfer program. The OTC is responsible for protecting, marketing, and licensing all Purdue IP and is responsible for working hand-in-hand with Purdue faculty, staff, and student-entrepreneurs to provide the resources needed to better understand Purdue policies related to IP. This also includes providing them with comprehensive knowledge of the processes whereby their IP can become an actual product or service (i.e. patents, copyright, trademarks, and tangible research property).

Flintbox: Flintbox software is an online IP marketing store hosted by OTC that lists Purdue's available technologies and Crane NSWC technologies. Flintbox is quickly emerging nationally as the foundation for open innovation software tools and the leading IP exchange.

Sophia: Sophia is an enterprise online Knowledge Management System (database) used by Purdue inventors to file disclosures 24/7 and track in real-time the progress of their innovations and patents. Sophia's intuitive user interface and extensive analysis tools empowers the researcher to search, identify, manage, and exploit their knowledge assets and networks.

Purdue Foundry: The Foundry serves innovators by providing entrepreneurial resources that are aimed at launching new ventures. Based in Discovery Park's Burton D. Morgan Center for Entrepreneurship, the Foundry enhances the outstanding activities already taking place in the facility. The Foundry supports faculty, staff, student and alumni innovators in all Purdue colleges and departments, and actively engages outside businesses and investors to encourage collaborative research and startup development. Foundry professionals can provide guidance to entrepreneurs on business plans, prototype development, funding, grant writing, regulatory requirements, mentoring and other entrepreneurial activities.

LaunchBox: LaunchBox helps inventors/founders find the value proposition of their “early-stage” idea and assists them with identifying the value of that idea. The program gives clients the opportunity to explore potential markets, customers and financial models. At the end of the process, each member has the necessary information to decide if there is value in the idea and if it makes sense to continue moving forward towards developing a startup.

Lean Launchpad: Lean Launchpad is a new method and set of tools for launching successful businesses. Launchpad offers end-to-end solutions to validate business hypotheses, testing for value and accelerating time to market. Launchpad blows up the traditional approach to entrepreneurship education. Instead of writing lengthy business plans in the classroom, students are charged with developing a viable business concept in eight weeks flat.

The Burton D. Morgan Center for Entrepreneurship (BDMCE): The BDMCE is Purdue University's premier interdisciplinary hub for entrepreneurship. Through its sponsored initiatives including the Certificate in Entrepreneurship and Innovation, Technology Realization Program, Entrepreneurial Leadership Academy, and Business Plan Competitions, the BDMCE aims to stimulate entrepreneurship in the Purdue community and serve as a resource for the citizens of Indiana and beyond. Located in Purdue's Discovery Park, the BDMCE plays a key role in facilitating business development for emerging concepts and technologies stemming from Discovery Park research.

Masters of Business Administration (MBA) Program: In close partnership with the Purdue Krannert School of Business, the BDMCE leverages the expertise of 1st and 2nd year MBA students in a variety of ways. These methods include using their talents to assist in executing various business analytics aimed at assisting faculty/staff/student start-up ventures. These analytics consists of, but are not limited to, business model development, market analysis, financial analysis, competitive analysis, technology translation, etc. MBA teams and undergraduate business student teams also assist on a case-by-case basis through existing experiential learning classes taught through Krannert. NOTE: Specific emphasis is being placed on technology transfer by a team of MBA students in direct support of the Crane Technology Transfer Initiative.

ENTR 500/501: The ENTR 500/501 (Technology Realization Program) course seminars focus on topics related to technology realization, commercialization, and entrepreneurship. Graduate level students are exposed to numerous topics dealing with technology realization with emphasis on technology transfer in various multidisciplinary domains. Lectures focus on the commercialization process (IP, licensing, corporate organizational structures, corporate product development, strategy, etc.). Discussions also delve into the issues associated with raising capital (crowd funding, angel investors, venture capital, government funding) and building a STEM related start-up company.

Experiential Learning Initiative (ELI): The ELI is really tied in with the MBA support provided to the BDMCE by the Krannert School of Business. The ELI provides opportunities for teams of MBA students to work side-by-side with graduate students in Science, Technology, and Engineering to undertake semester long consulting projects for existing companies/startups. Since ELI's launch in the Fall of 2009, more than 800 students from 7 colleges and 15 academic units have successfully undertaken over 160 projects for a wide variety of client organizations.

Entrepreneurs-in-Residence (EiR): serve innovators by providing entrepreneurial resources that are aimed at launching new ventures. The Purdue Foundry houses approximately 7 full-time and part-time EiRs that have real-world experience starting their own companies. They are charged with helping faculty and students with research projects, guiding faculty/staff/student innovators from all domains in navigating the commercialization landscape, and helping introduce them to the various funding sources available to them.

UNIVERSITY OF SOUTHERN INDIANA:

Innovation Discovery Events – IDEs was co-developed between Crane and University of Southern Indiana (USI). The goal of the IDEs was to "mine" innovation out of common engineering programs at Crane by asking the question "What tough technical problem did you solve for the warfighter today?" Designed in 75-minute sessions, these discovery events included the scientific/ innovative presentation of specific solutions, as well as, a diverse panel of experts to diverge of potential commercial applications and disclosure. Output from these events provides guidance to Crane's IP protection and pursuit of more promising innovations. IDEs have been so successful at changing the culture at Crane that the process is being rolled out across the DoD lab system as a best practice. IDE metrics to date include: 37+ pieces of IP, 4 related startups and 4 licenses.

Technology Commercialization Academy – 10+ week intensive summer program that guides a cohort of students through ideation based on existing Crane IP, feasibility, prototyping and business plan development. In addition, the students consult with Subject Matter Experts from both academia and industry to employ best practices and present well defined product ideas and preliminary market and business validation to all stakeholders. To date (4 events held), TCA has developed over 1,000 commercialization ideas along with 3 startups that are still in operation and working to take their products to market.

USI Entrepreneurship Class – A minor in the Romain College of Business, this is a three semester course that guides students through ideation based on existing IP. Outputs include feasibility studies, business plans/models, enterprise development, and exposure to the technology commercialization process.

Eagle Innovations Accelerator (EIA) – Provides a series of services to tech-based startups for new ventures in commercialization. These services include guidance on product development, mentorship, prototyping, scale up, and seed funding. To date, EIA has secured 6 start-ups in the Southwest Region.

Applied Engineering Center – A 16,000 square foot lab providing cutting-edge manufacturing equipment to support design, prototype development, and manufacturing scale up activities through use of expert faculty, staff, and students. The equipment at the AEC includes: 3D printing, waterjet, machine centers, welding, plastic extrusion and molding, robotics, and printed circuit board factory.