Data Driven Innovation Clusters for Mini-grids, Advanced Manufacturing, and Innovation Acceleration

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Abstract

Dynamic data, artificial intelligence (including generative AI), and data driven decision support systems will continue to impact our economy. Educating and inspiring flexible, practical, and clever learners in this area requires a focus on attracting industry partnerships, experiential learning opportunities for students, and being ahead of the curve (especially in the areas of energy generation and advanced manufacturing). Innovation and Entrepreneurship clusters, as well as other parts of PSU (including the Enterprise Center), may be leveraged to create this type of innovation acceleration by creating inexpensive data driven connections, conversations, and collaborations with industry, economic development entities, and other institutions to help students discover solutions to real world issues.

Keywords

Innovation Clusters, Experiential Learning, Innovation Labs, Industry Partnerships, Next Generation Learning

Mini-grids and Renewables

It would be interesting to consider management techniques and practices of mini-grids both in Texas and New Hampshire, two completely contrasting states for weather and energy. Currently, New Hampshire has transitioned to huge gas use in energy generation while Texas has significant traditional gas, nuclear and coal generation. To begin to switch away from major grids, which has failed Texas in the past, we must look at mini-grids as an alternative. There are myriad challenges to this, of course and the fundamentals (electronics, software, physics, mechanics, et al) once the energy is received and managed are significant—but so is the value to generate local energy in case of major grid failure. PSU experiences a version of this today with its cogeneration capabilities on campus.

New Hampshire

For New Hampshire we can look at natural resources—such as geothermal—for ground water heating even in winter, solar using thin film solar (as opposed to silicon-based solar), and tall weathervanes for wind-energy generation. We already know there is a supply of gas, but if that fails, we need to be able to come up with alternatives. Specialized coatings, for example, prevent energy loss within buildings and IR scavenging from solar thermal coatings on glass can absorb heat from IR light, converting it into power (that can be transitioned into KW/h).

Texas

For Texas, again looking at similar coatings on glass but for alternative uses; reducing the AC power required in buildings. Unlike New Hampshire, Texas has considerable brownouts and blackouts within the energy grid, making the mini-grid experiments in NH have potentially significant impacts in the south as well. On the generation side, Texas should use predominantly silicon solar cells, but if we are to support US industry, both regions should use First Solar Panels, thin film solar cells made in the US. The wind recourse is strong in the Pan Handle, but significantly reduces when in the lowlands. However, with large singular light masts, there is still significant wind energy above 400 foot mast heights.

Advanced Manufacturing

This is an area that has been neglected, or worse—subsumed into other areas of traditional manufacturing—for years. Because Advanced Manufacturing is a combination of looking at how to construct technology (an art in itself), building up technology on the marketing side that includes planning for specific industries, participating in the development of new and emerging technologies, and finally, managing the federal rules and requirements for advanced product-based tech. We can look at this in a 3-pronged approach, that can be subdivided into multiple areas.

- This would lead to ***project development***, learning the skills in each business, manufacturing, and (often the least explored) state/federal requirements such as conforming to regulatory requirements
- Understanding the concept of ASTM ***standards and independent testing*** to validate claims about the products
- Developing a solid sales and ***marketing plan***, understanding whether the company is going to be a technology platform, a sales and marketing service company, or a B2B (perhaps the value could be in some combination of each)

Innovation Acceleration

Innovation is led, and leadership matters. Merely creating clusters is not enough to incite discovery and specific effort must be given to provide opportunities for connecting, conversing, and collaborating in a propinquitous manner.

An Innovation Laboratory is an excellent approach/method to inspire an environment of creativity and cluster acceleration. Unlike traditional laboratories and practice areas, Innovation labs are discovery zones, enabling *what if* discussions, not just *repeat the experiment* tasks.

Innovation labs can sit in front of an innovation cluster as a *flywheel* to any effort, helping put in motion partnerships, technologies, and learners in new and unique ways.

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