

ExLENT Beginnings Track National Convening

Facilitating Experiential Learning for Emerging and Novel Technologies

What does “Systems Thinking” mean in the context of a successful ExLENT project?

George Ligler, Texas A&M University, GTL Associates, and Convening Committee Chair

“Systems Thinking”

Let’s define the term for today’s discussion

- The term is used in multiple ways in science, engineering, and STEM education
- In the context of this Convening,
 - “Systems Thinking” is considering definition, refinement, execution, sustainability, and the potential impact of ExLENT Projects within the broader education and workforce ecosystems in which the work of the Projects takes place, including consideration of how those education and workforce ecosystems intersect and interact
- There are certainly a number of aspects of “systems thinking” that are evident in the ExLENT Project slides provided to this Convening—can we apply “systems thinking” to further benefit, particularly though not exclusively with regard to sustainability and scalability/potential impact of ExLENT Projects?

Education and Workforce Ecosystems

Every ExLENT Project is Proposed and Performed in the context of multiple ecosystems

- We heard interesting perspectives from multiple ecosystems in this morning's discussions
- Academic Institution(s) themselves have, for example, constituent ecosystems, e.g., innovation, administrative, outreach/extension services, alumni, students, faculty, legislative/government affairs (we're sure that you can name more)
- Industry provides further ecosystems, e.g., the ecosystem of semiconductor manufacturers, the ecosystem of pharmaceutical/biotechnology/medical companies, the ecosystem of the aviation industry, professional societies, and many more
- Federal and State Governments and Non-Profits—legislatures, federal funding agencies, Government Associations
- Ecosystems both within and outside of academia often interact in ways which can greatly benefit ExLENT project, e.g., execution, sustainability, and broadened impact

Identifying the Relevant Ecosystems

The earlier the identification for ALL Project phases, the better

- Project formulation: NSF and as many of those below as possible
- Project execution: industrial partners for internships and training as well as development of a scalability strategy—e.g., can we find a way to avoid high capital cost of entry, share project results among potential industrial competitors, etc.
- Project sustainment: potential additional funding sources as well as industrial partners for, e.g., marketing
- Project Impact: partners for development and execution of a strategy for expansion of the Project to additional institutions/industrial partners—and resources for longitudinal confirmation of Project results

Establishing the “Value Proposition” for each Participating Ecosystem

An articulated “value proposition” for

- NSF
 - ExLENT Project Students
 - PIs, co-PIs
 - Your educational institution and for each of its relevant ecosystems
 - Your industry partners for initial Project execution and Project sustainment
 - Potential additional institutions in academia and industry to join a consortium for Project execution and/or extended impact
 - Additional funding sources for sustainability
-
- Express consideration of value propositions as early as possible may help refine the Project execution plan, e.g., make scalability an earlier priority, remove specific institutional (both educational and industrial) dependencies from the Project

Develop a “marketing plan” for sustainability and impact

Articulating a marketing plan with potential participating partners/ecosystems is a key step to sustainability and expansion of Project impact

- The ExLENT Project’s educational institution team need not do all of the marketing
- Consider what industrial partners can do from more than a funding perspective, e.g., supporting sustainability of an ExLENT Project with state/federal governments
 - Many faculty at educational institutions find it very difficult to go beyond “standard” proposal submission and project execution processes
- Consider how to expand the reach of an ExLENT Project to additional educational institutions and industrial partners

“Systems Thinking”

At first may seem “obvious” but in an ExLENT context...

- Builds/uses significant project management skills beyond those needed in most standard disciplinary research grants
- Necessarily leads a PI/project team to transdisciplinary approaches that frequently involve stakeholders beyond science and engineering
- Can lead to building additional bridges within educational institutions as well as between educational institutions as well as between academia, government, and industry