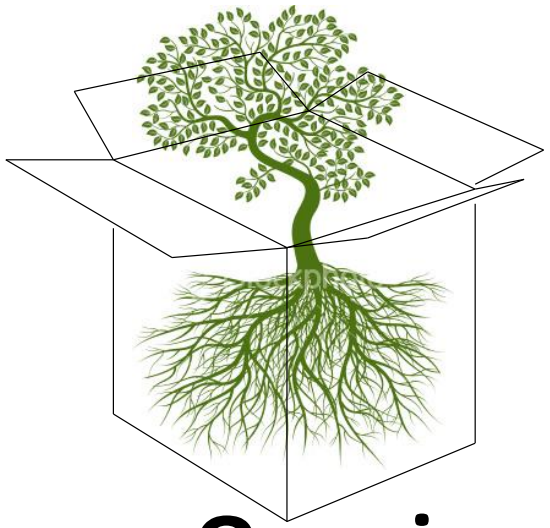

Opening the Black Box of Innovation: Evaluating Interim Impacts and Supply Chain Dynamics Early in a Product Life Cycle

AEA October 17, 2013

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Rosalie Ruegg, TIA Consulting Inc.
Jonathan Mote, George Washington University

Opinions expressed are solely those of the authors.

Early Stage Assessment of Investments in New Energy Technologies: An Evaluation Framework

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The Logic of Public Interventions to Accelerate Development of New Products and Supply Chains

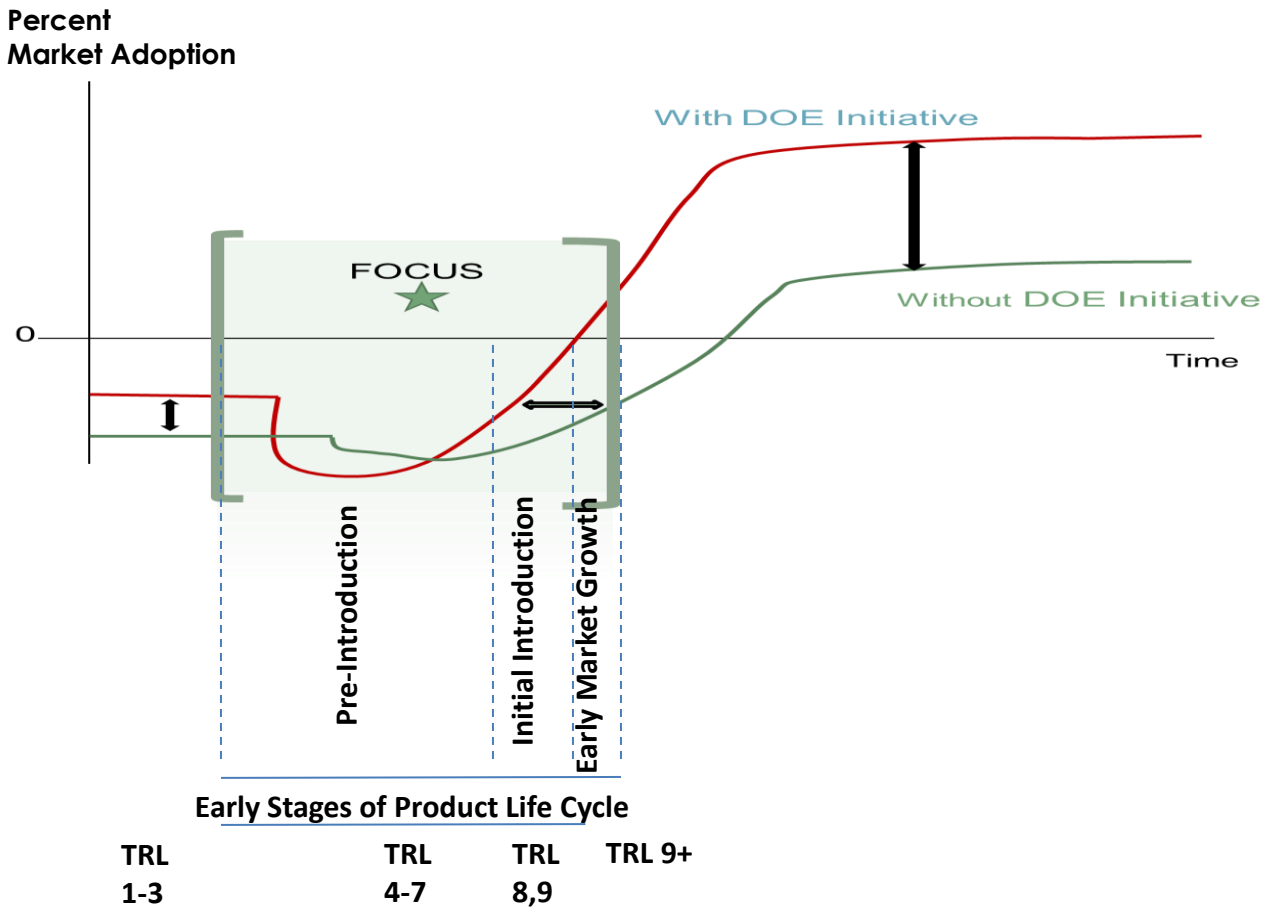
AEA October 17, 2013

Gretchen Jordan, 360 Innovation LLC

Objectives for the Framework

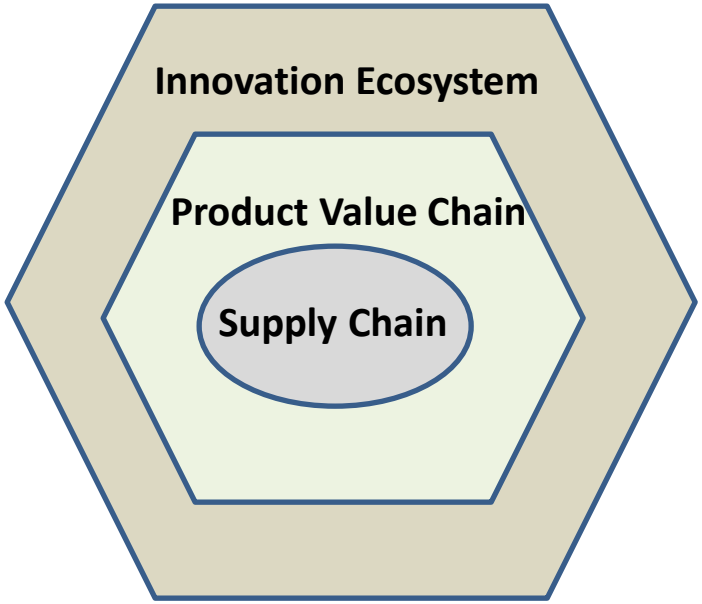
- Provide a more timely, interim view of dynamics unfolding in the "black box of innovation" during early phases of the product life cycle.
- Focus on measuring changes that occur within an initial five-year window of relevant investment.
- Bring to bear best practices in program evaluation associated with rigorous methods of research design and analytical approaches
- Add ***analysis of product value chain networks*** to the evaluators' toolbox—as a means of assessing interim changes in a targeted technology's domestic supply chain and value chain

Focus: Technology Readiness Levels 4 – 9 and early market

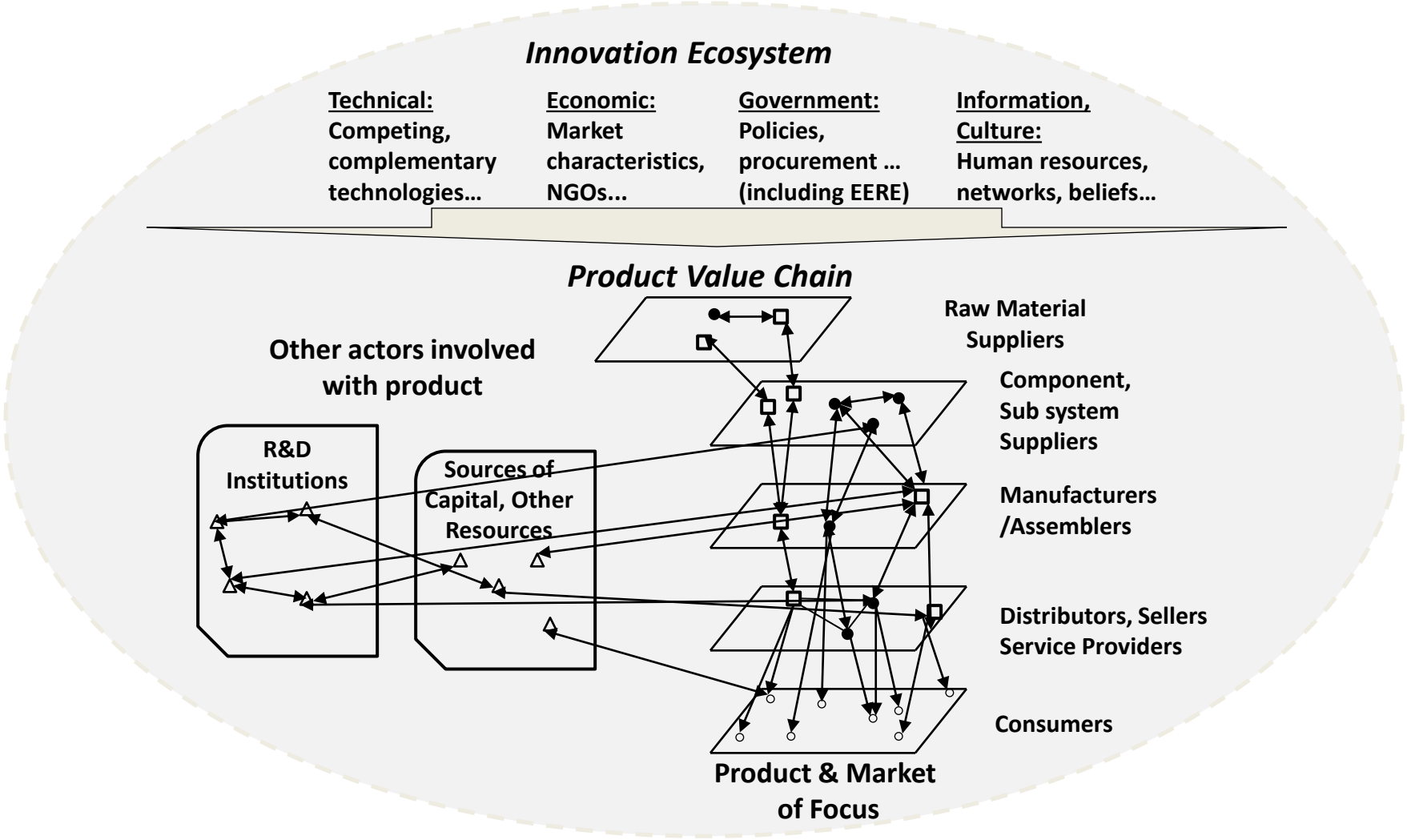


Important Relationships in the Framework

- product value chain is a broader network or set of networks than a supply chain
- comprised of a web of ties among firms that contribute all of the critical factors needed to develop and deliver a product to consumers motivated to purchase it—from R&D, to finance, support services, distribution and even retail infrastructure.
- All of this is influenced by the innovation ecosystem within which these are located.



A Product Value Chain and Innovation Ecosystem



□ Product Supply Chain firms
● Other firms in the industry
△ Other elements contributing to product, market

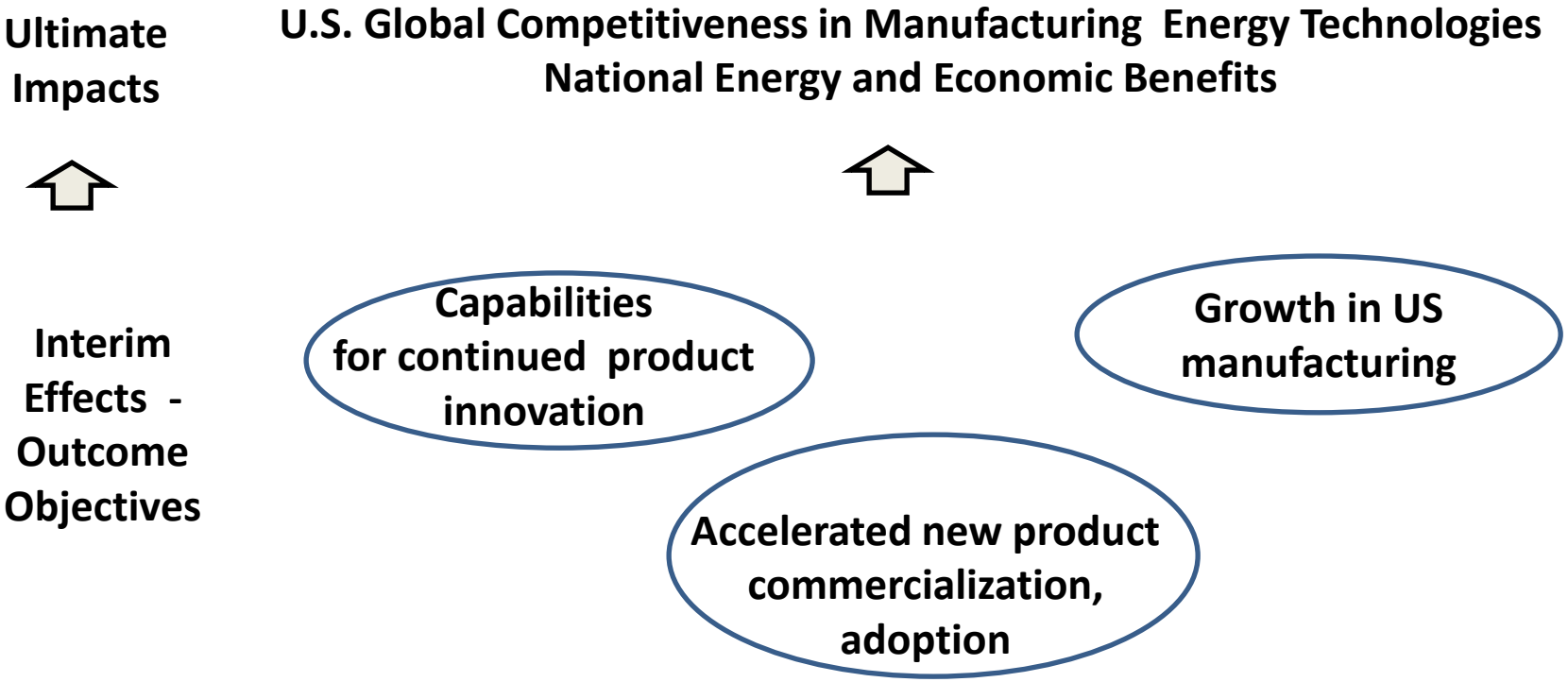
A Theory-based logic model

A logic model provides a sequential diagram of program resources supporting a set of activities which yield outputs targeting users/customers and presumably adopted by them, which in turn results in short-run outcomes, followed by intermediate-run outcomes, and eventually long-run or ultimate impacts which are aligned with and serve the program's ultimate mission.

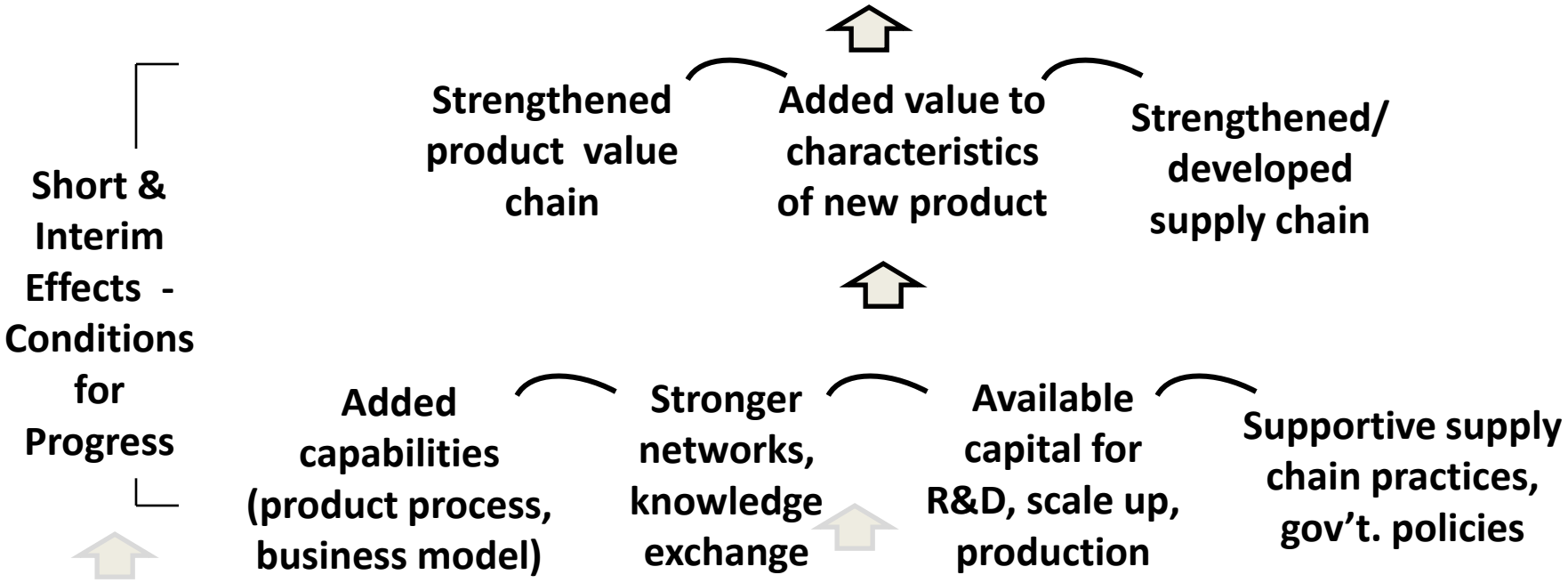
This Framework logic model is derived from theories in

- science and innovation policy
- network analysis applied to innovation and supply chains
- supply chain models such as that presented in Lowe et al. 2010
- expert advisory reports to the White House on manufacturing competitiveness (Executive Office of the President 2009, 2011), and
- interviews with EERE staff of current relevant programs.

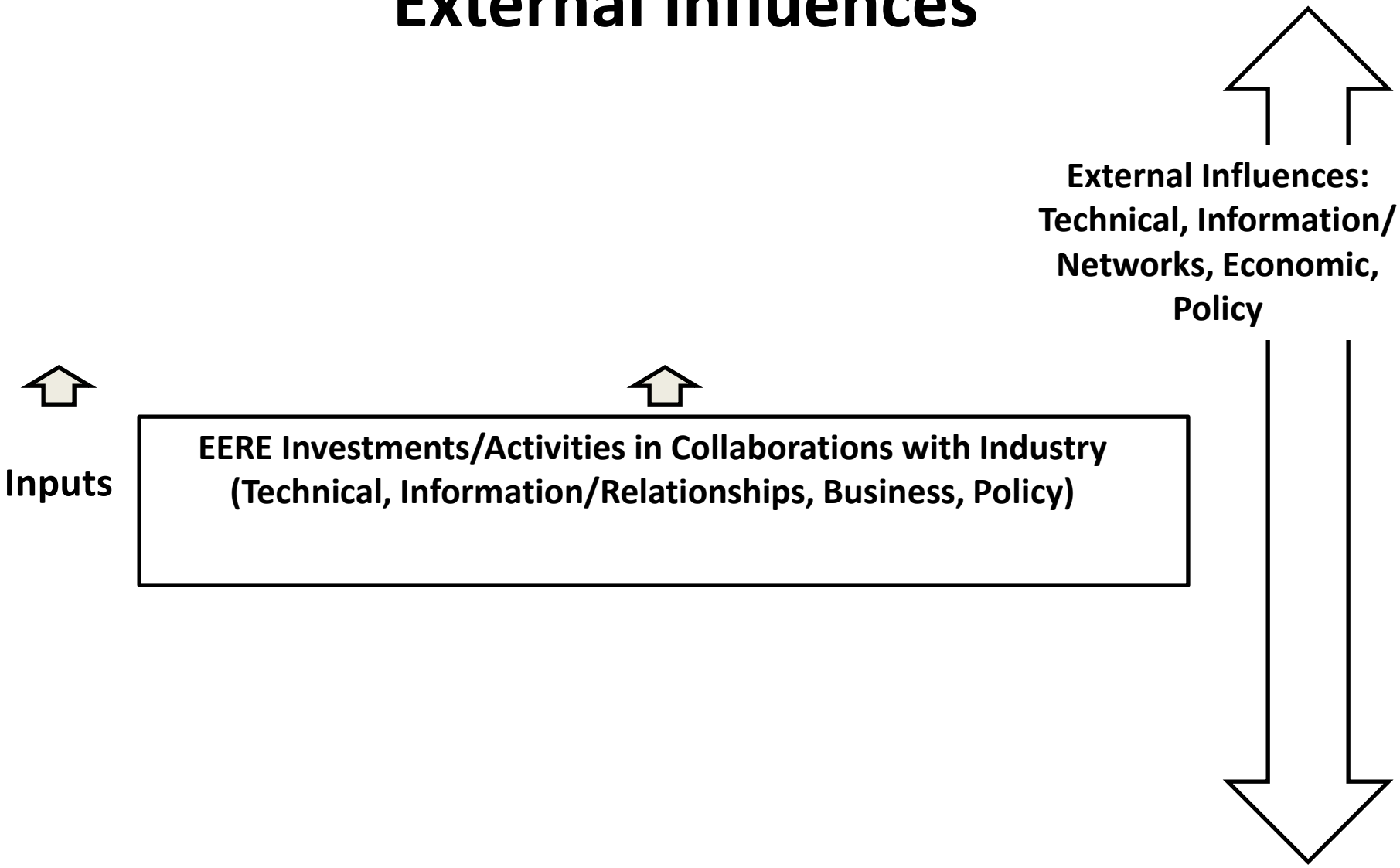
Goals of Investments Covered in the Framework



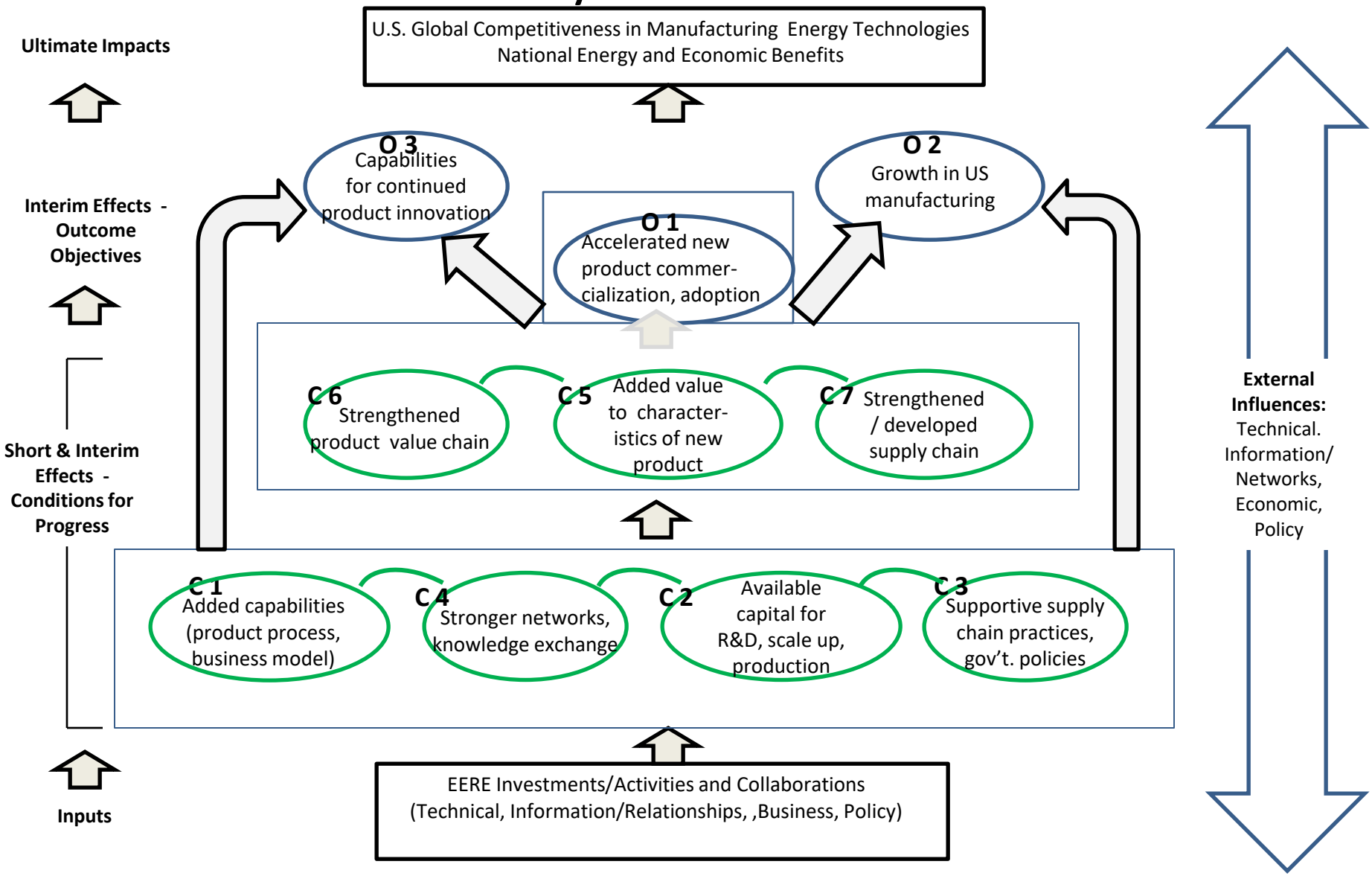
Critical Conditions: Short Term and Interim Effects



DOE Inputs Amongst Many External Influences



A Framework for Assessing Accelerated Product Innovation, Manufacturing, Early Market Growth



Conclusion: More Detailed Logic Mapping

- Was needed before we could be more abstract
- Is the basis for evaluation questions and selection of indicators
- Helps explain the theory
- Helps program managers to see where their efforts fit in the larger picture

Detailed Logic of Accelerating Technology Introduction in U.S. Supply Chains