Logic Models and Their Applications to Research, Technology, Development , and Deployment Policies and Programs

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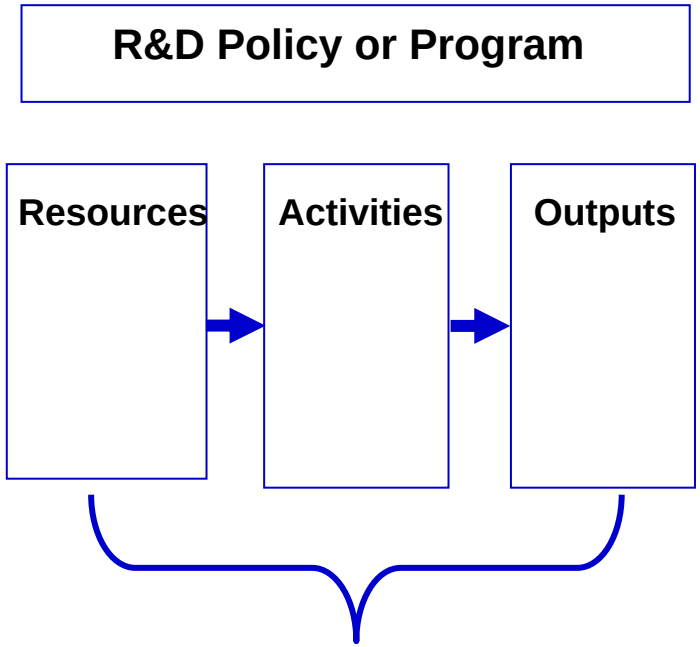
Presentation Outline

- Introduction to logic models
- R&D policy logic model and evaluation considerations
- Example: use in program description, performance measurement and evaluation
- More examples: for research, for deployment
- Response to questions

LOGIC MODELING – What and Why?

- The logic model concept was introduced in the 1970s, has evolved to meet new needs, and is a basic tool for program management, evaluation and performance measurement.
- A logic model describes the theory and design of the program, how program activities and outputs influence program participants, customers and / or beneficiaries, leading to the achievement of the intended outcomes (short term, intermediate and long term).
- A logic model (diagram or table, with text) can describe a project, program, or portfolio of programs.
- A logic model provides the basis for accountability, by identifying key relationships and performance indicators linked to success along the results chain.

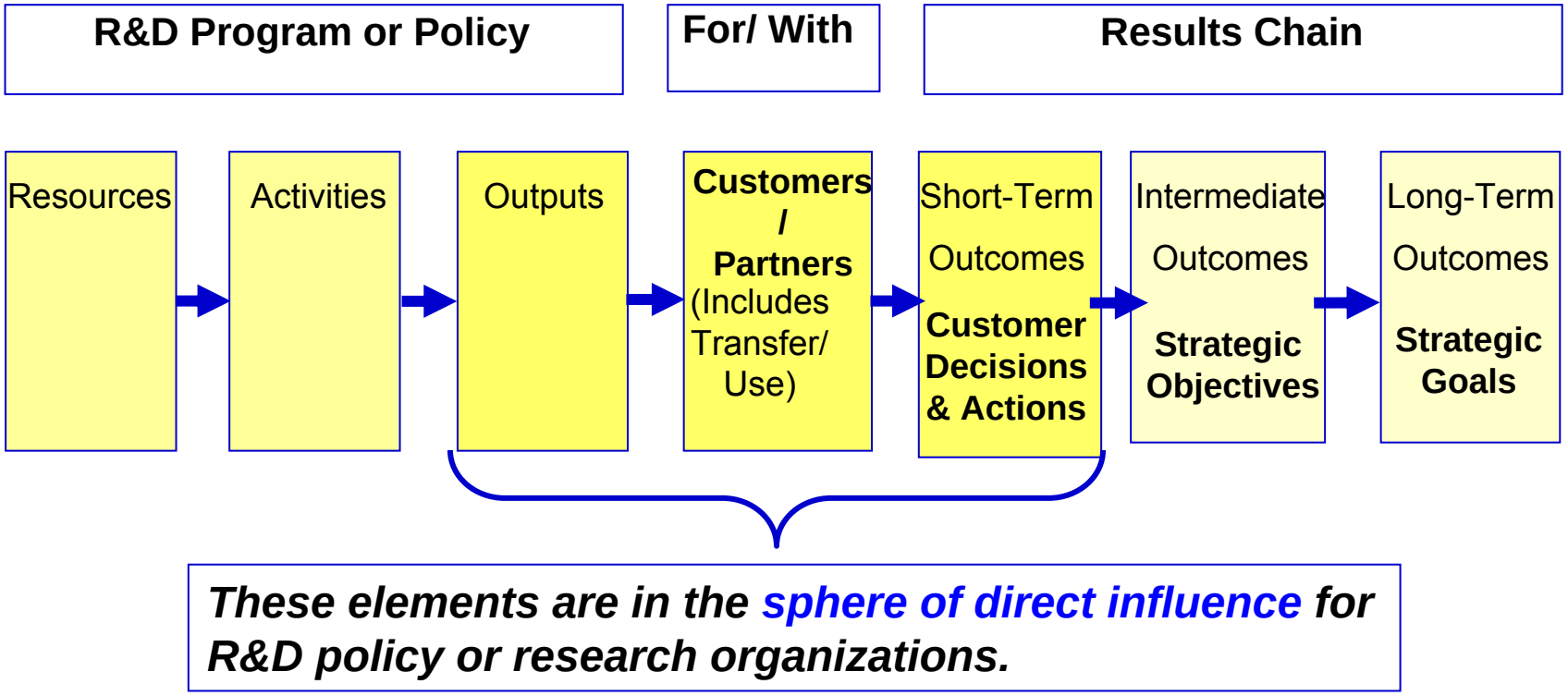
Logic Models Communicate About Program Operations: HOW the program will use resources



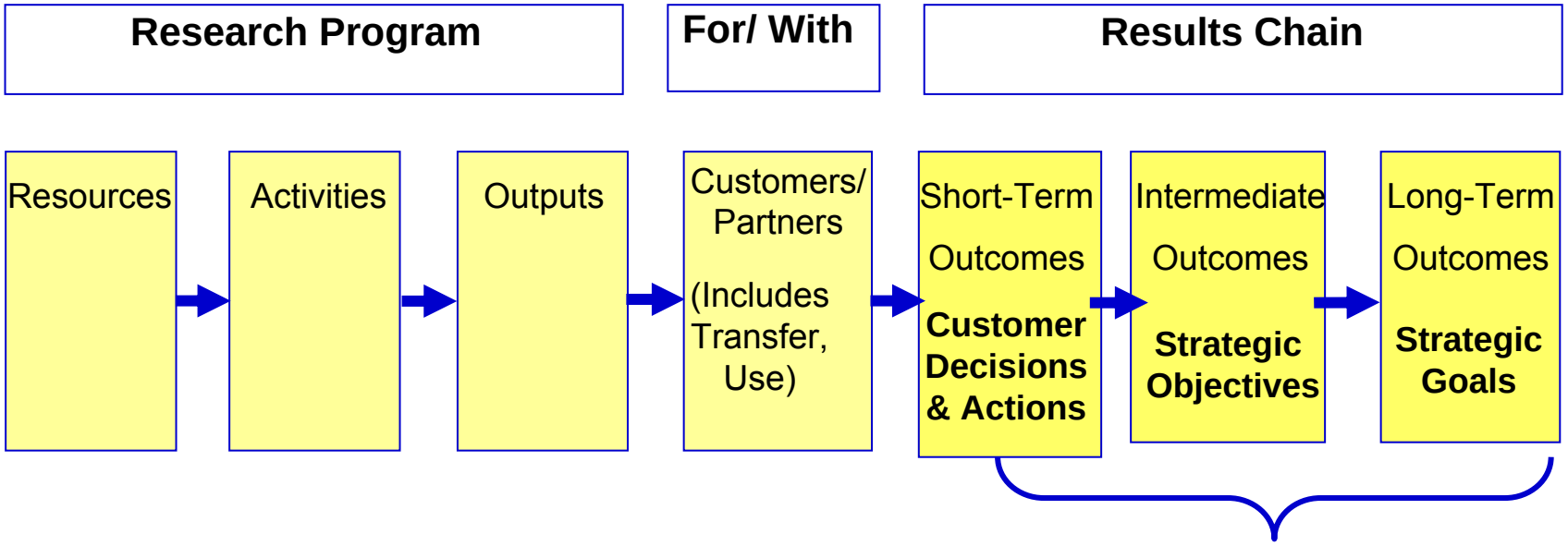
These elements are in the sphere of direct control for policy and program decision makers and implementers.

External Influences, context

Logic Models Communicate About WHO the Program Targets and WHAT Happens Then



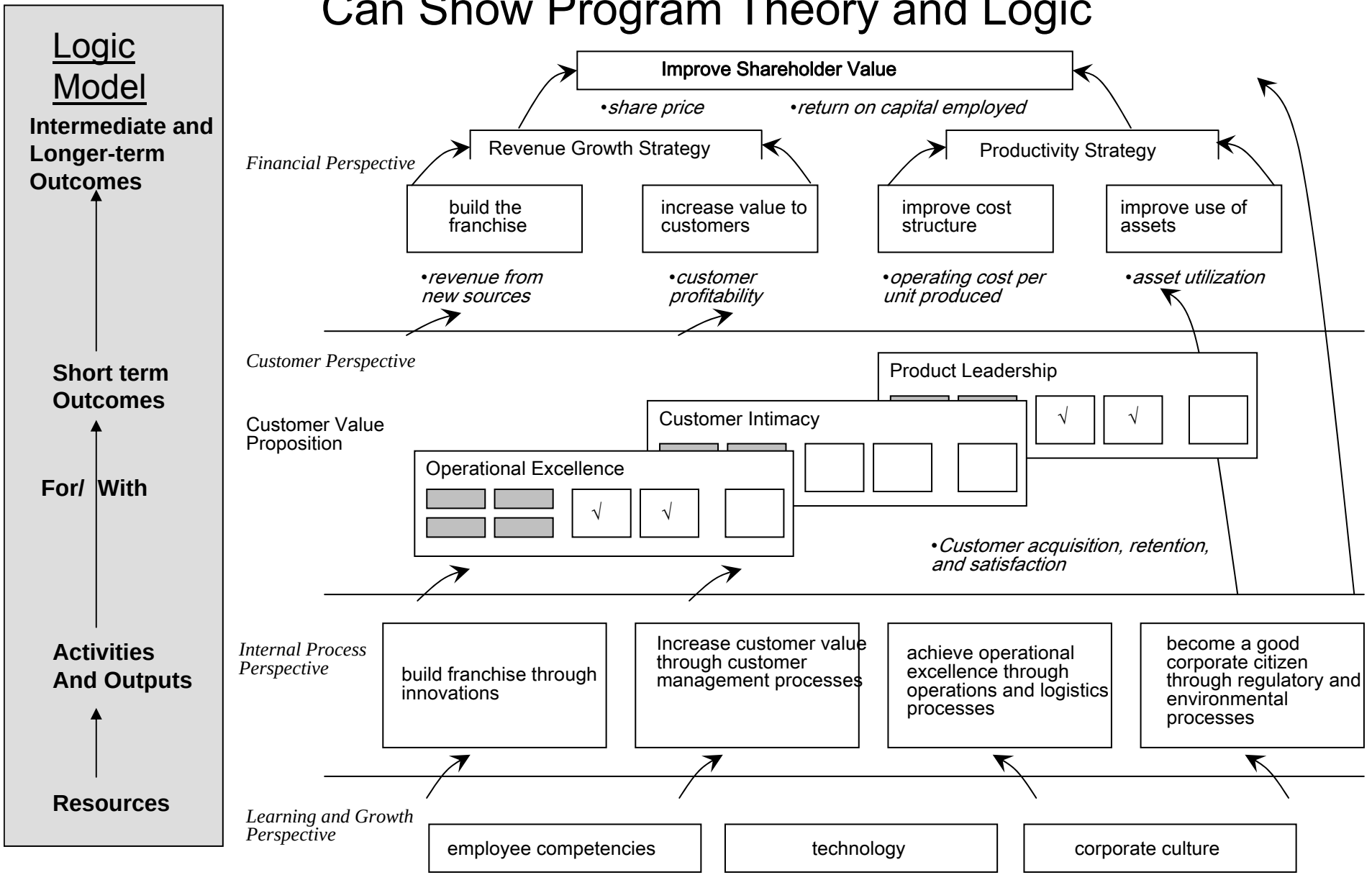
Logic Models Communicate About WHY the Program Exists -- Goals



These elements are in the sphere of indirect influence — and include changes in socio-economic factors.

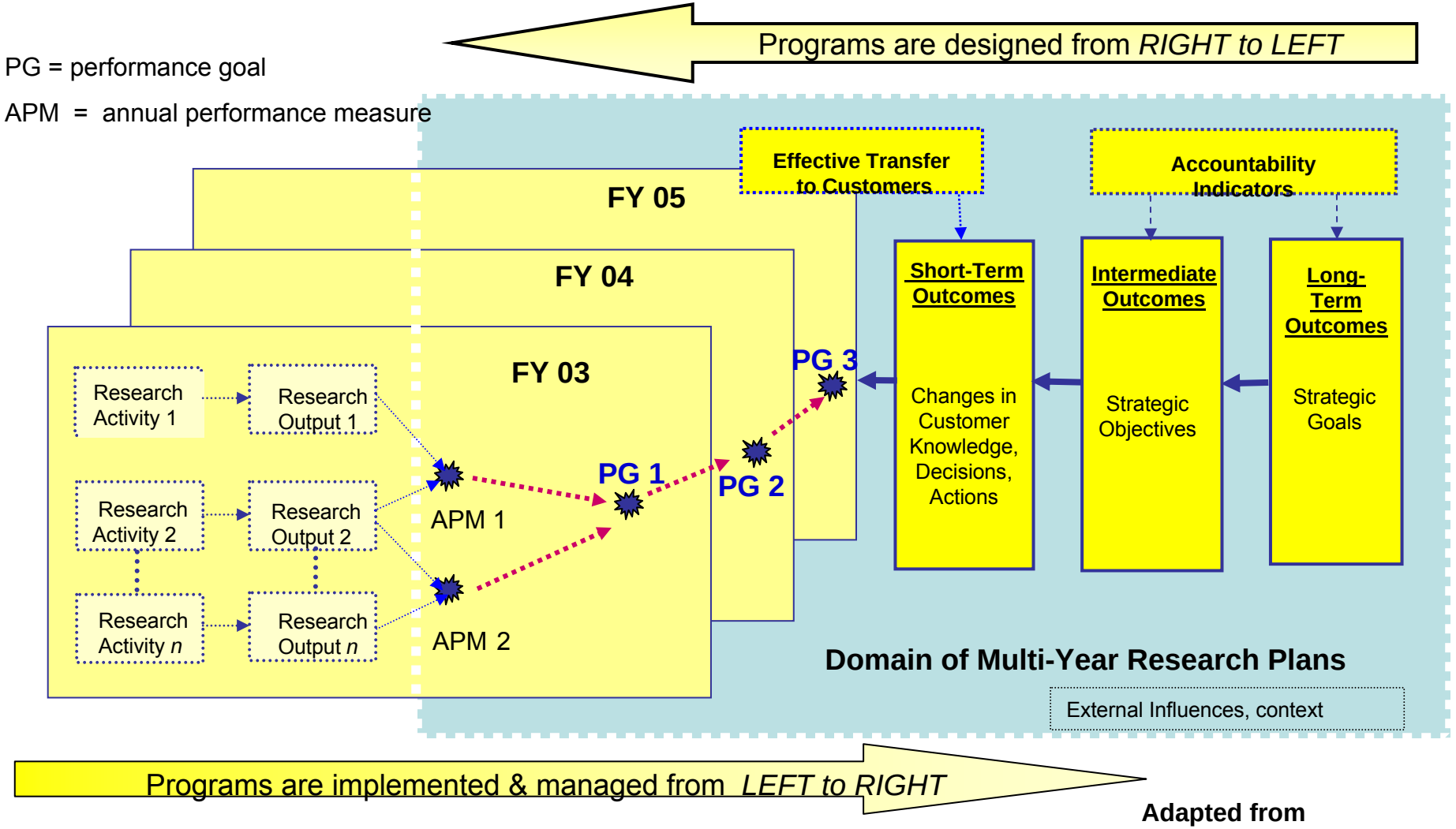
External Influences, context

The Strategy Map For a Balanced Scorecard Also Can Show Program Theory and Logic



(Kaplan and Norton 2000)

Multi-Year Planning During Logic Modeling Is Then Tested and Measured During Implementation



Adapted from Pahl & Norland, March 2002

Steps: logic model process

1. Collect information through documents and perhaps establish a stakeholder workgroup.
2. Define the problem and context for the program.
3. Define elements of the logic in a table.
4. Develop a diagram of logical relationships.
5. Verify the program theory/logic with stakeholders, comparisons with implementation results

Then use the logic model to develop or confirm performance measures for program monitoring and performance contracts, and in planning and evaluation.

* McLaughlin and Jordan, 1999, 2004

Sue Funnell's Program Logic Matrix

Intended Outcome	Success Criteria	Program Factors Affecting Success	Non Program Factors Affecting Success	Activities & Resources of Program	Performance Information	Sources of Data
Changes in attitudes of target businesses toward being willing to change practices	Agreement to meet to discuss action; Action plans; Specific examples of increased willingness	Availability of confidential advisory assistance, etc.	Business beliefs, past experiences, Etc.	Promotes advisors and makes commitments about confidentiality, etc.	% business that request assistance, compared with targets; % that do actions plans; etc.	Admin. Records; post program survey; site visits, etc.
Consumers purchase widget since she gets a rebate						
Consumers purchase the widget again without a rebate						

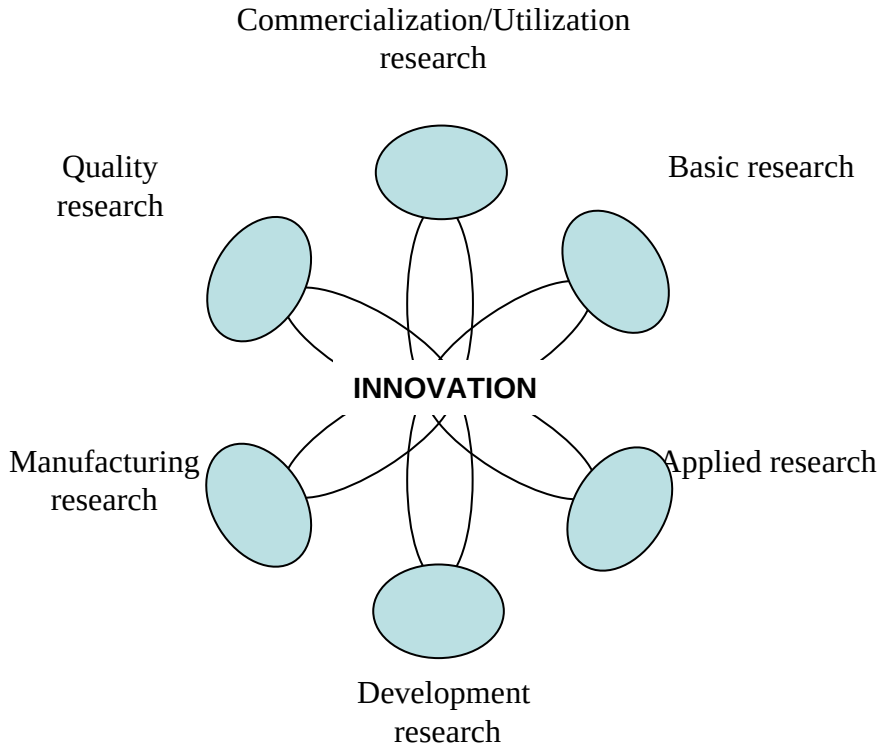
Working through this matrix helps people to specify outcomes and think through why the program will or will not achieve each of these.

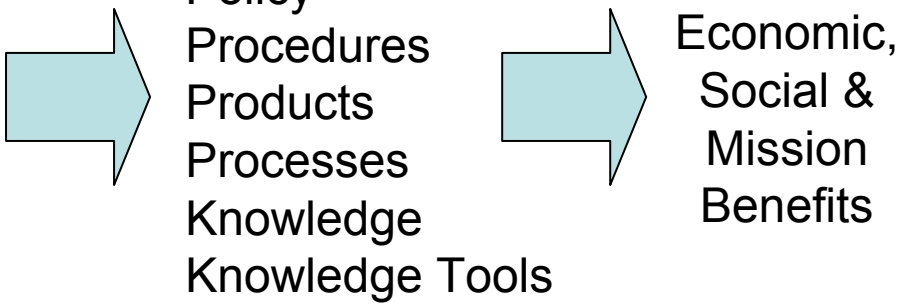
G. Jordan, March 2008

Many Possible Logics

Multiple arenas of research & technology development (R&D)

Multiple kinds of innovations, intermediate & ultimate outcomes



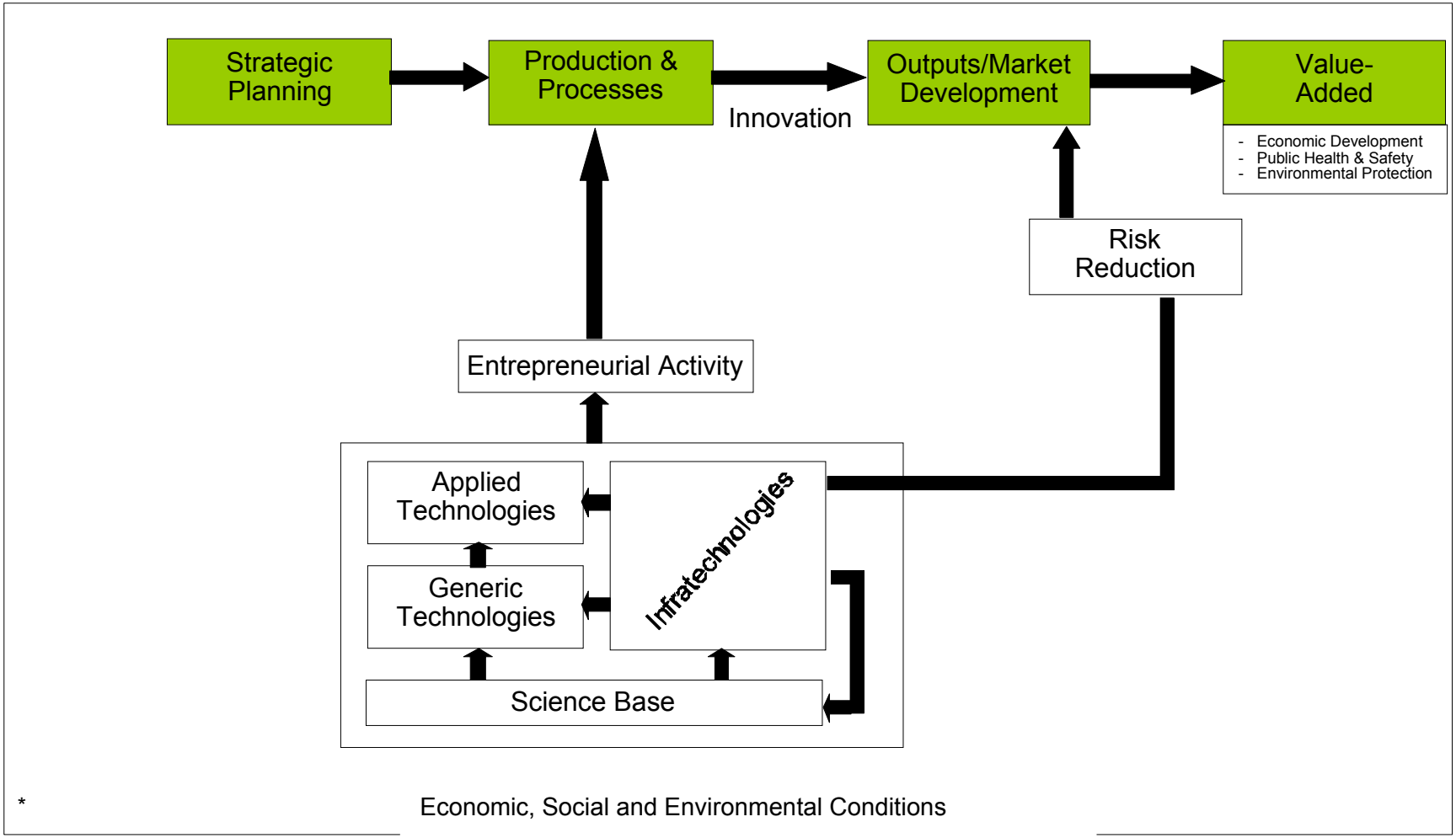


The idea innovation network: Hage and Hollingsworth (2000), modifying Kline and Rosenberg (1986)

Linkage of Evaluation Issues to R&D Policy Evaluation

- Evaluation needs to consider the rationale for R&D investments by government, that is, contribution to policy goals and the achievement of national economic, social and environmental objectives
- Government has three basic goals for funding S&T / R&D
  - development of new knowledge, technical infrastructure, innovation capability and creation of highly qualified personnel
  - Application of R&D for increased national competitiveness, economic growth
  - Application of R&D for social and environmental well being, quality of life (public good)

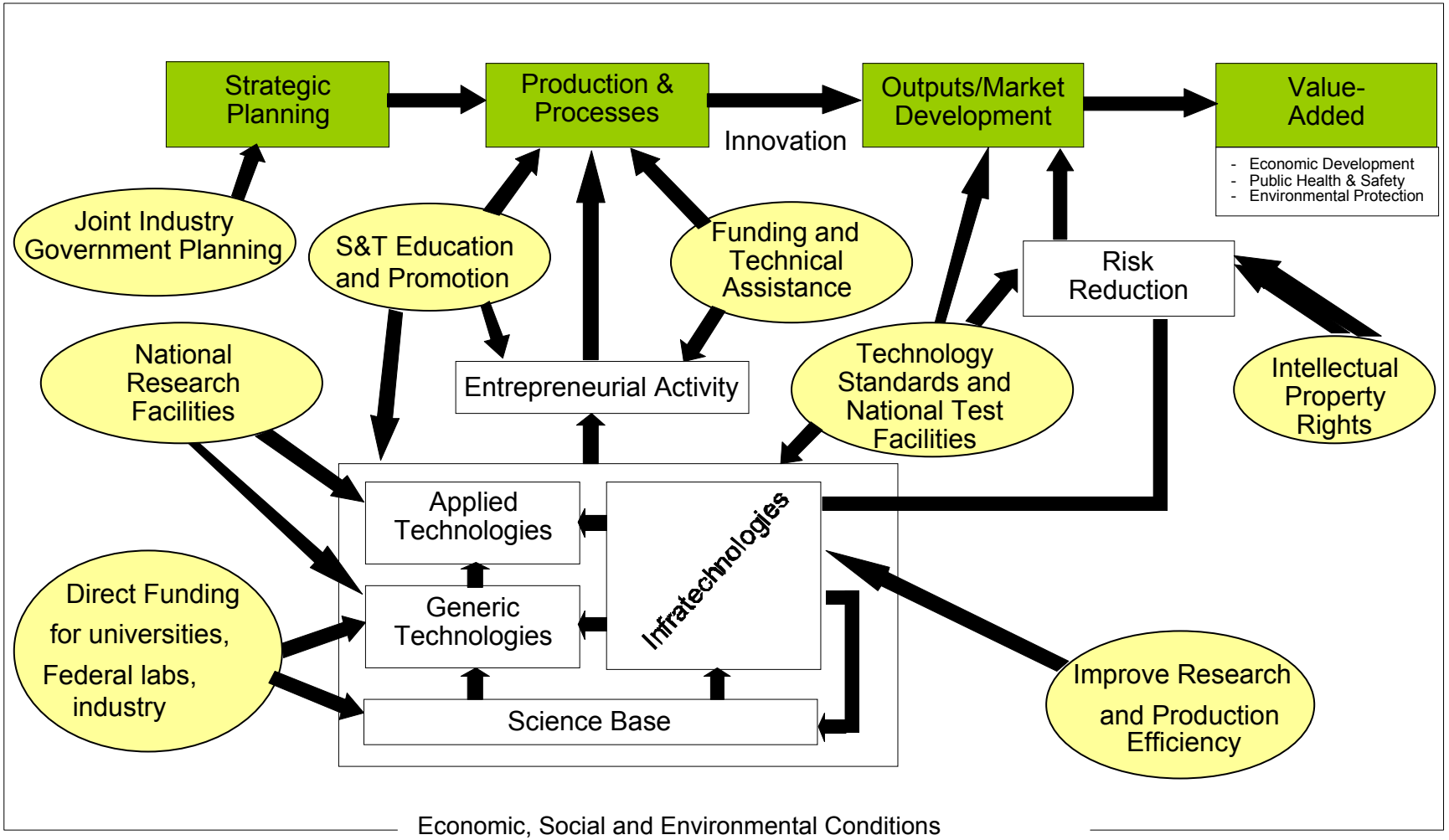
Greg Tassey's model of the Innovation System identifies different roles and contributions to the economy.



G. Jordan, March 2008

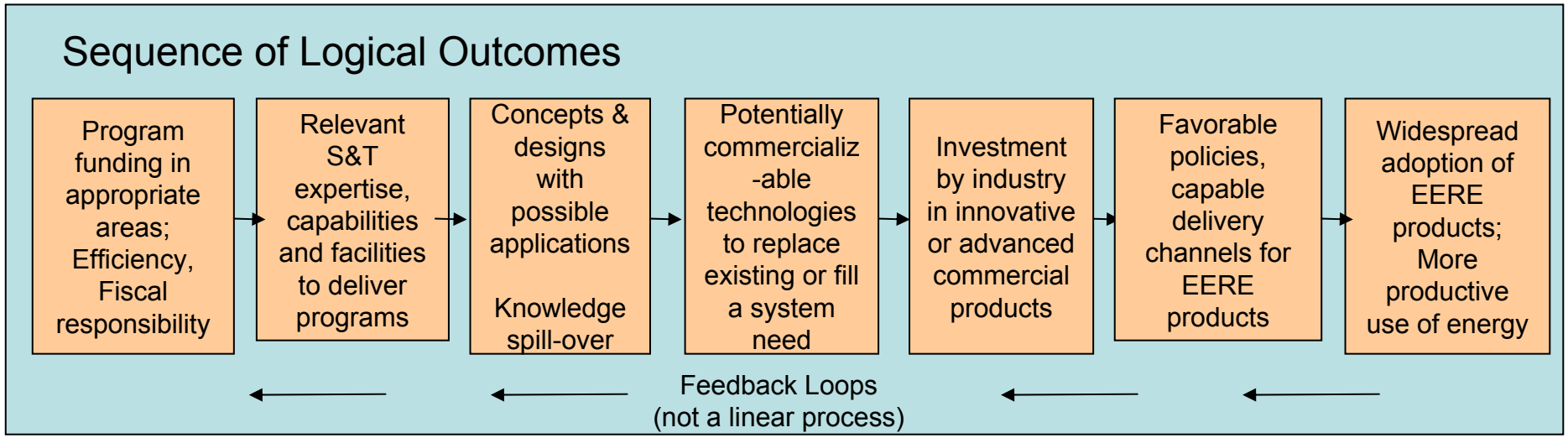
G. Tassey, National Institute of Standards and Technology, U.S.A. 1991

Showing Government Policy Interventions in the Innovation System

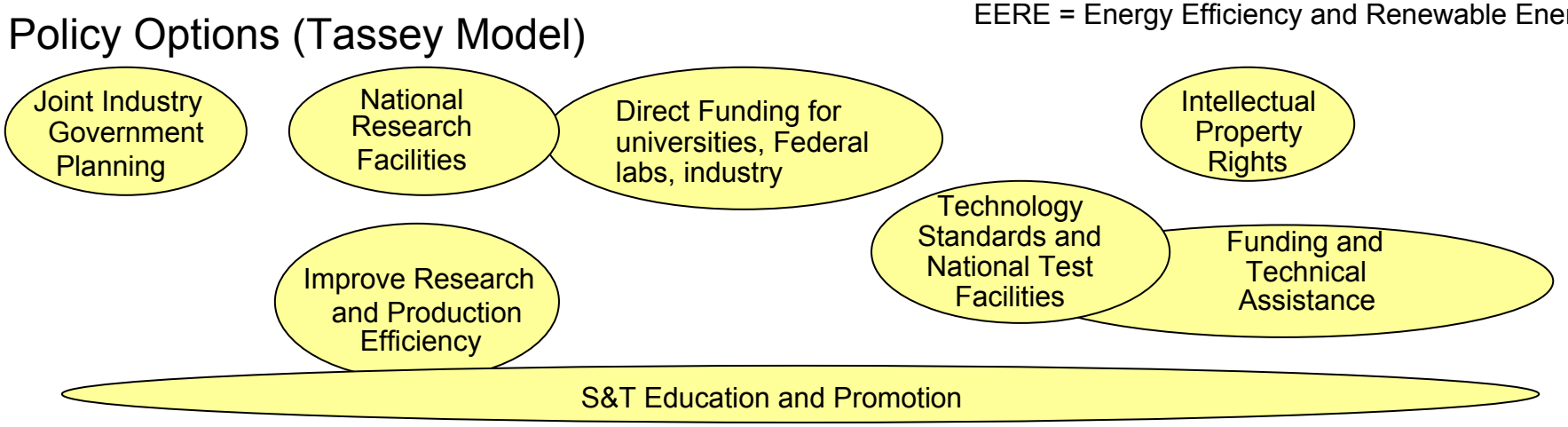


Derived from G. Tassey, National Institute of Standards and Technology, U.S.A. 1991

Translating Policy Options Into a Simple R&D Logic Model: What Area or Areas Require Government Intervention? With What Mechanisms?



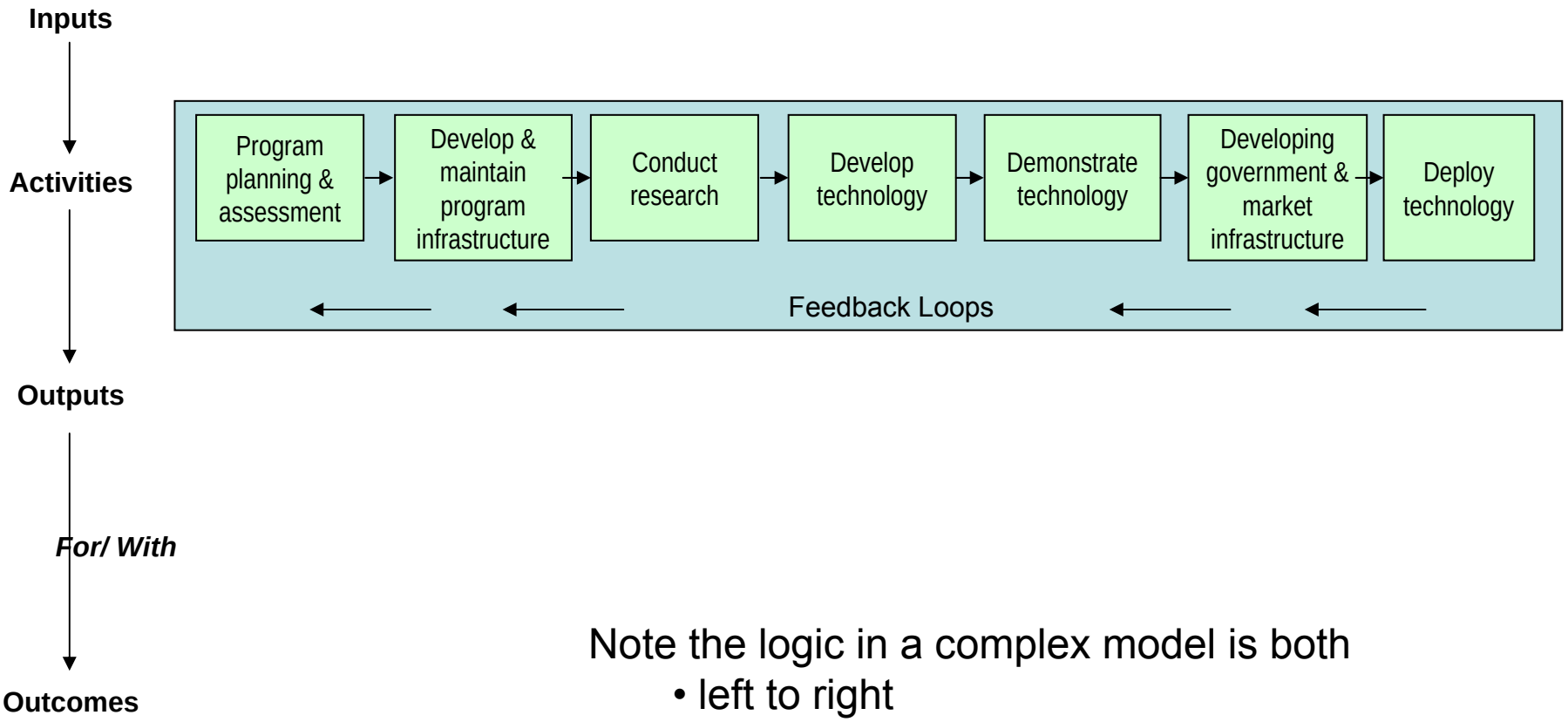
EERE = Energy Efficiency and Renewable Energy



Linking Logic Models to Program Monitoring and Evaluation: An Example

- The U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy (EERE) includes programs from research to utilization.
- A logic model of EERE's portfolio of linked programs was developed.
- This can be used by others as a "generic" R&D logic model.
- EERE's goals are to:
  - Modernize energy conservation
  - Increase energy supplies
  - Modernize our critical energy infrastructure

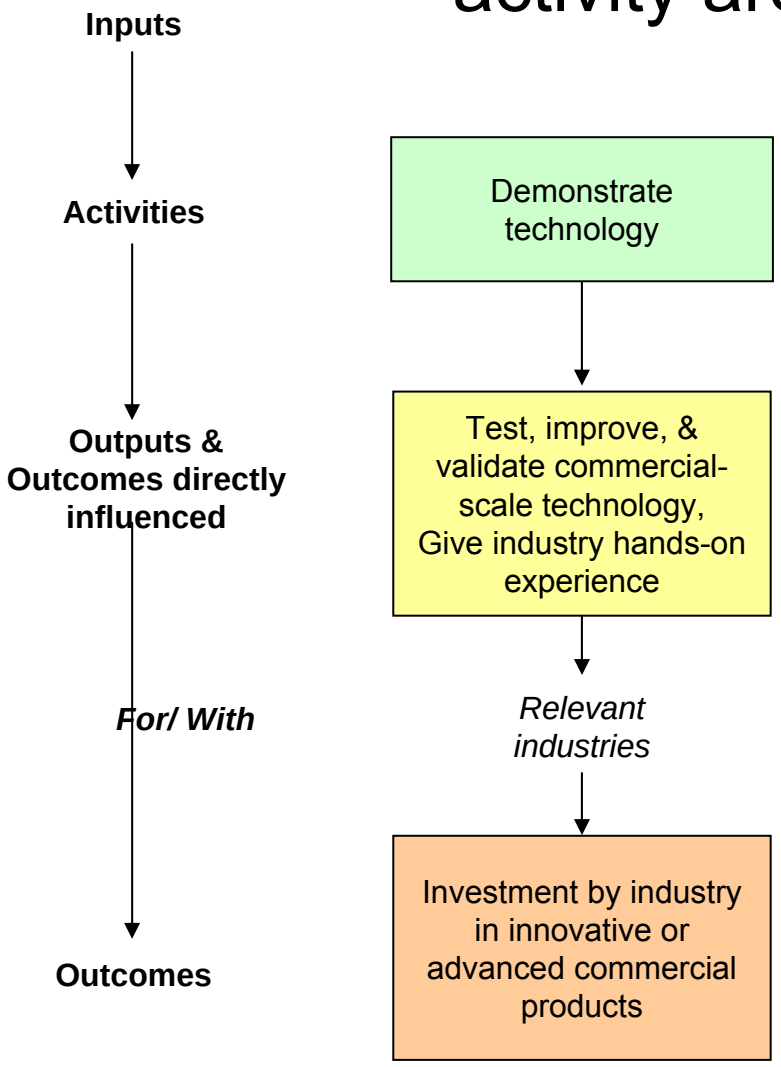
EERE has 7 different strategies and multiple policy instruments. The strategies are represented as “activities” in the logic model



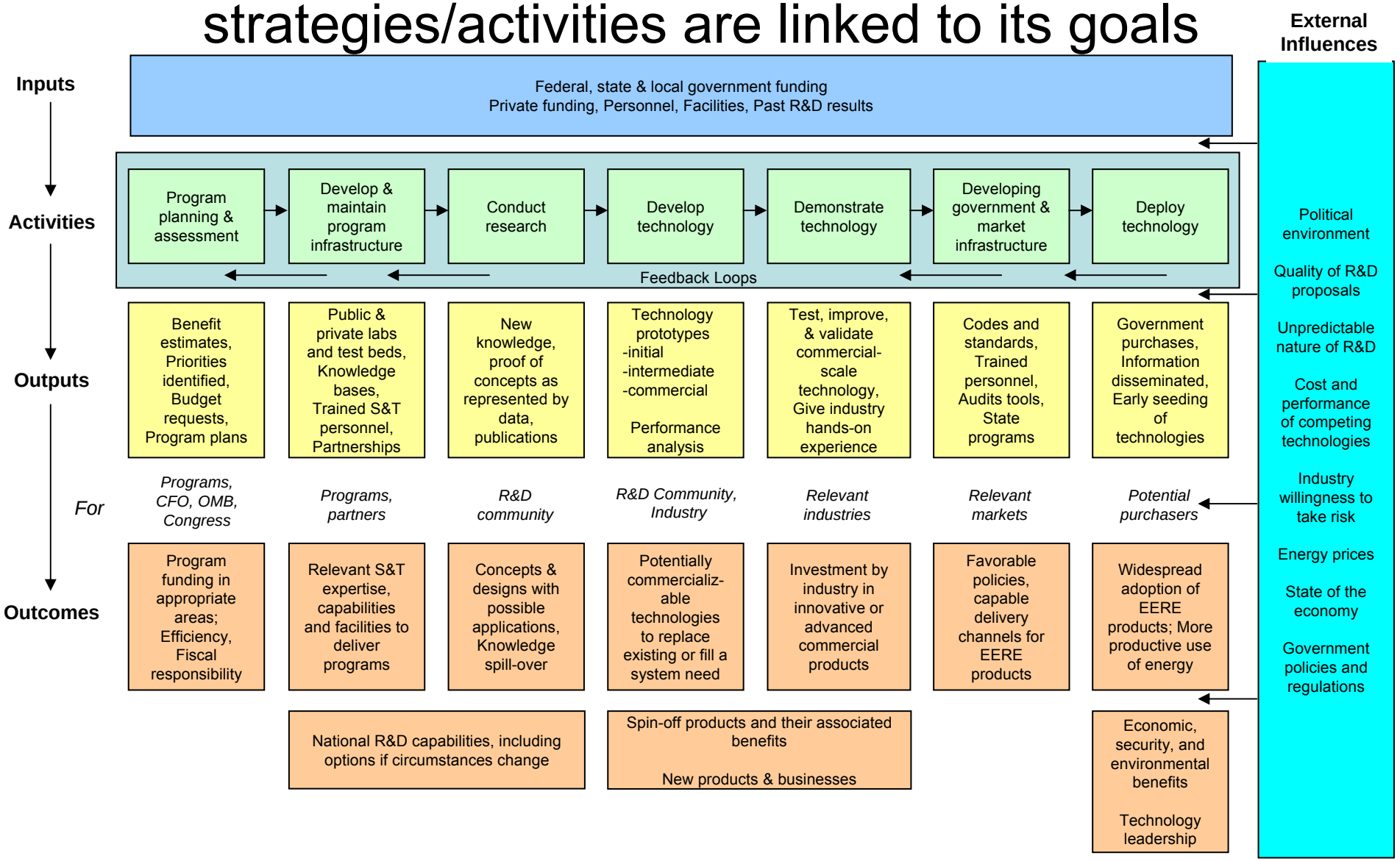
Note the logic in a complex model is both

- left to right
- top to bottom.

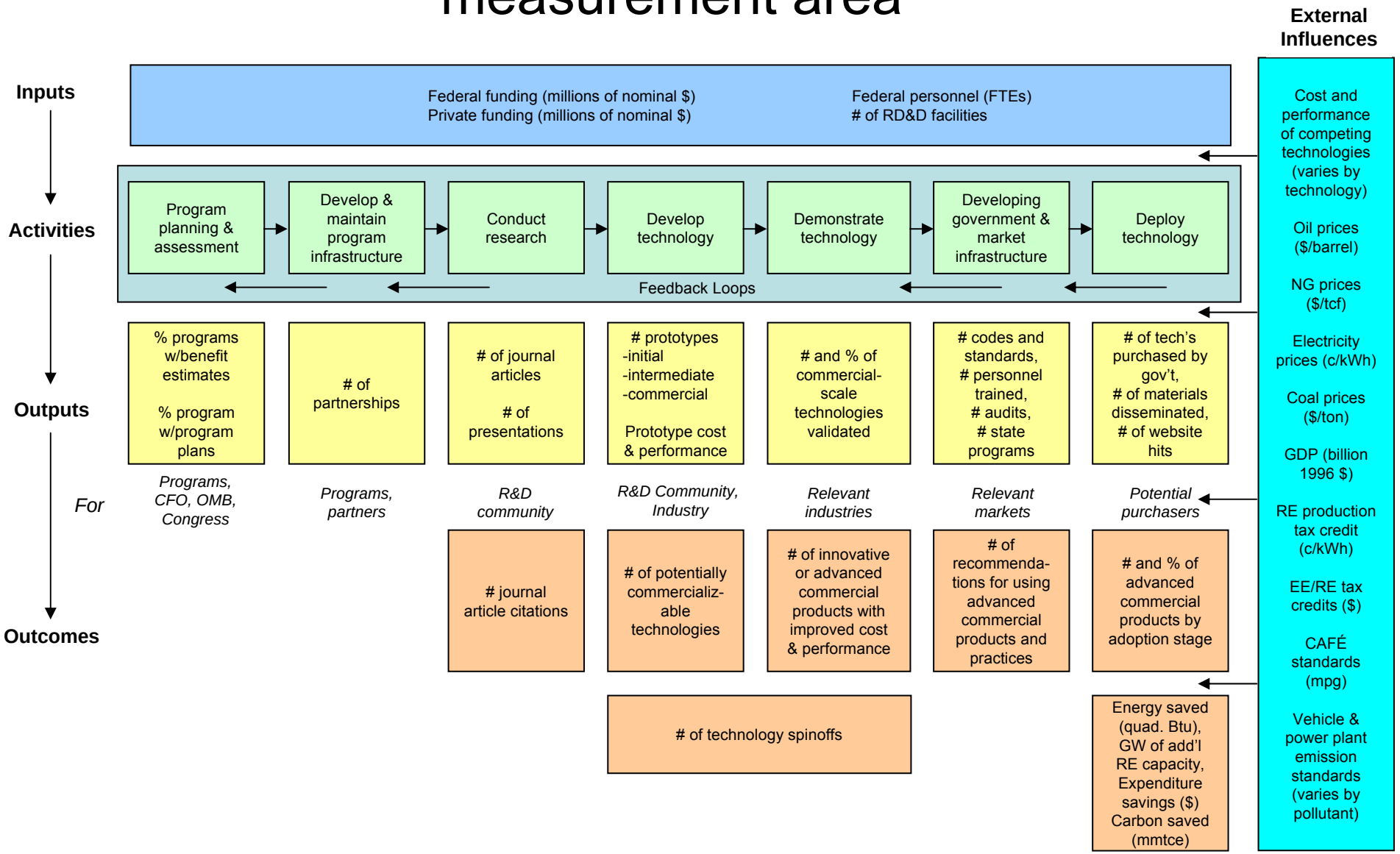
Outputs and a sequence of outcomes for each activity are in the columns



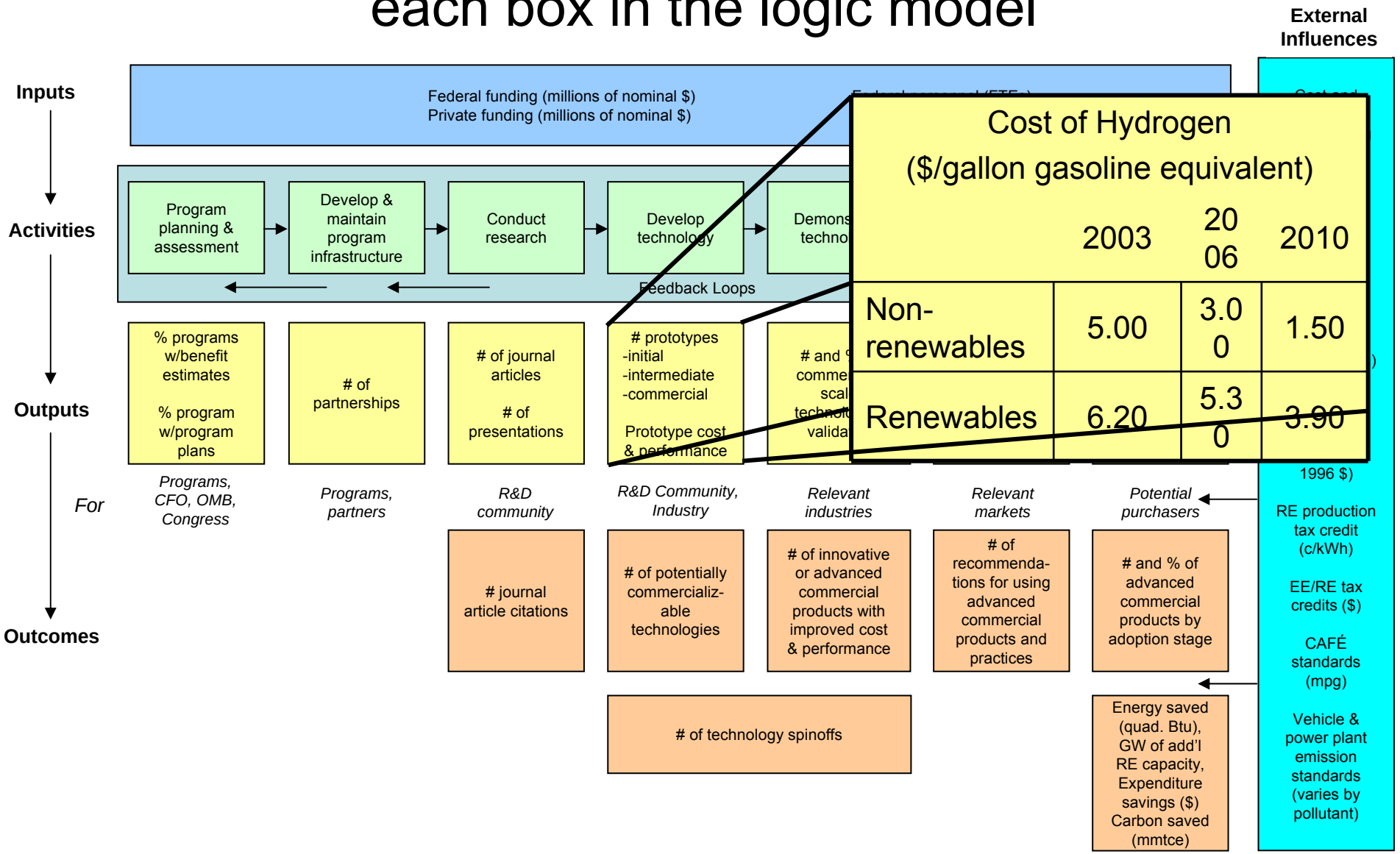
EERE's draft logic model shows how its strategies/activities are linked to its goals



Each box in the logic model is a potential measurement area



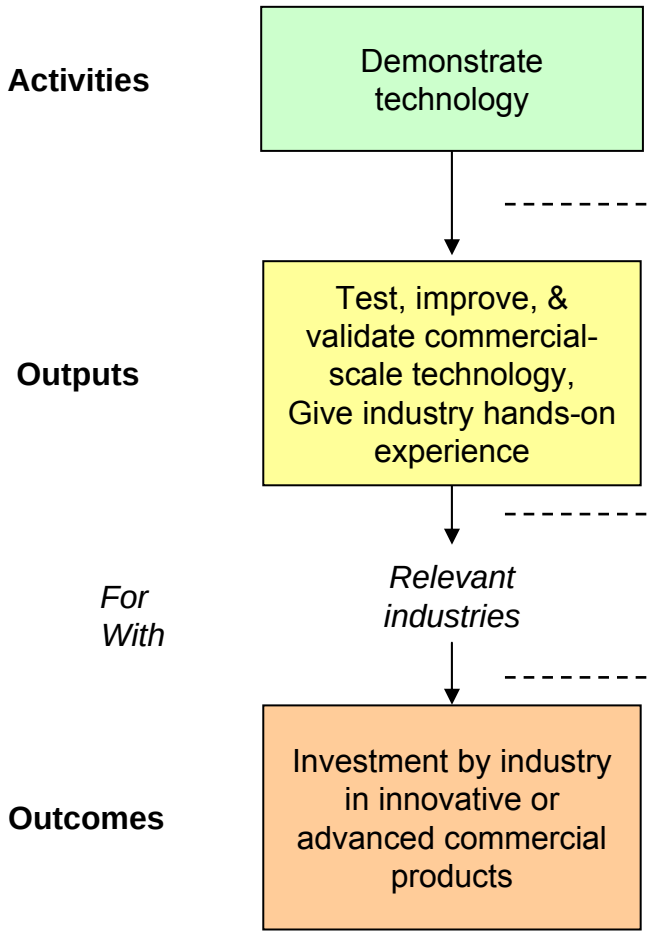
Performance targets may also be developed for each box in the logic model



Cost of Hydrogen
($/gallon gasoline equivalent)

	2003	2006	2010
Non-renewables	5.00	3.00	1.50
Renewables	6.20	5.30	3.90

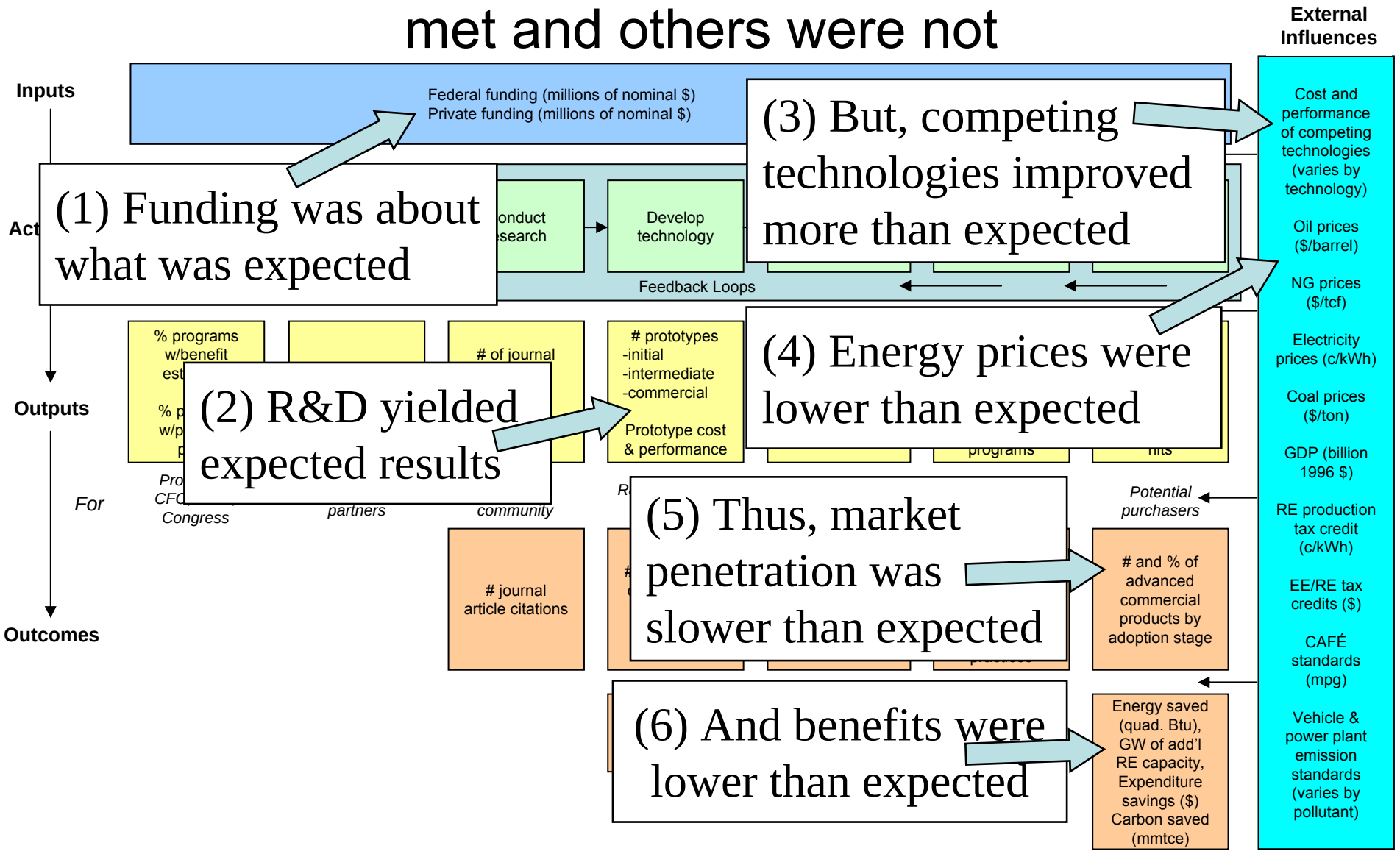
Arrows between the boxes help identify evaluation questions



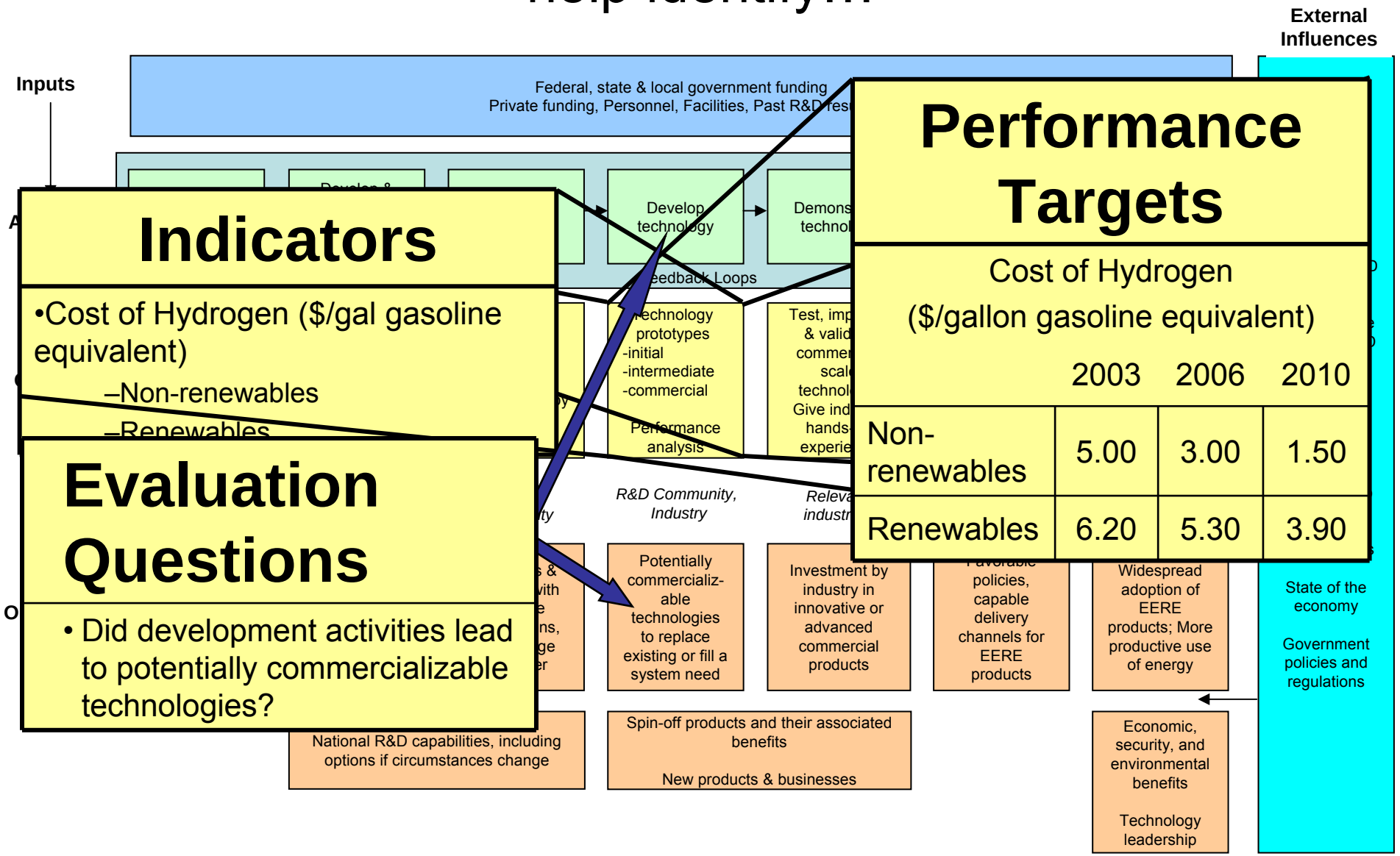
Evaluation Questions:

- Has EERE engaged the right partners in tests and done it efficiently?
- Have relevant industries gained hands-on experience with the technologies?
- Has industry experience lead to investment in these innovative or advanced commercial energy products?
- Have EERE's efforts to test and demonstrate energy technologies led to validated commercial scale technologies? (Activities to outcomes)

Evaluations can explain why some goals were met and others were not



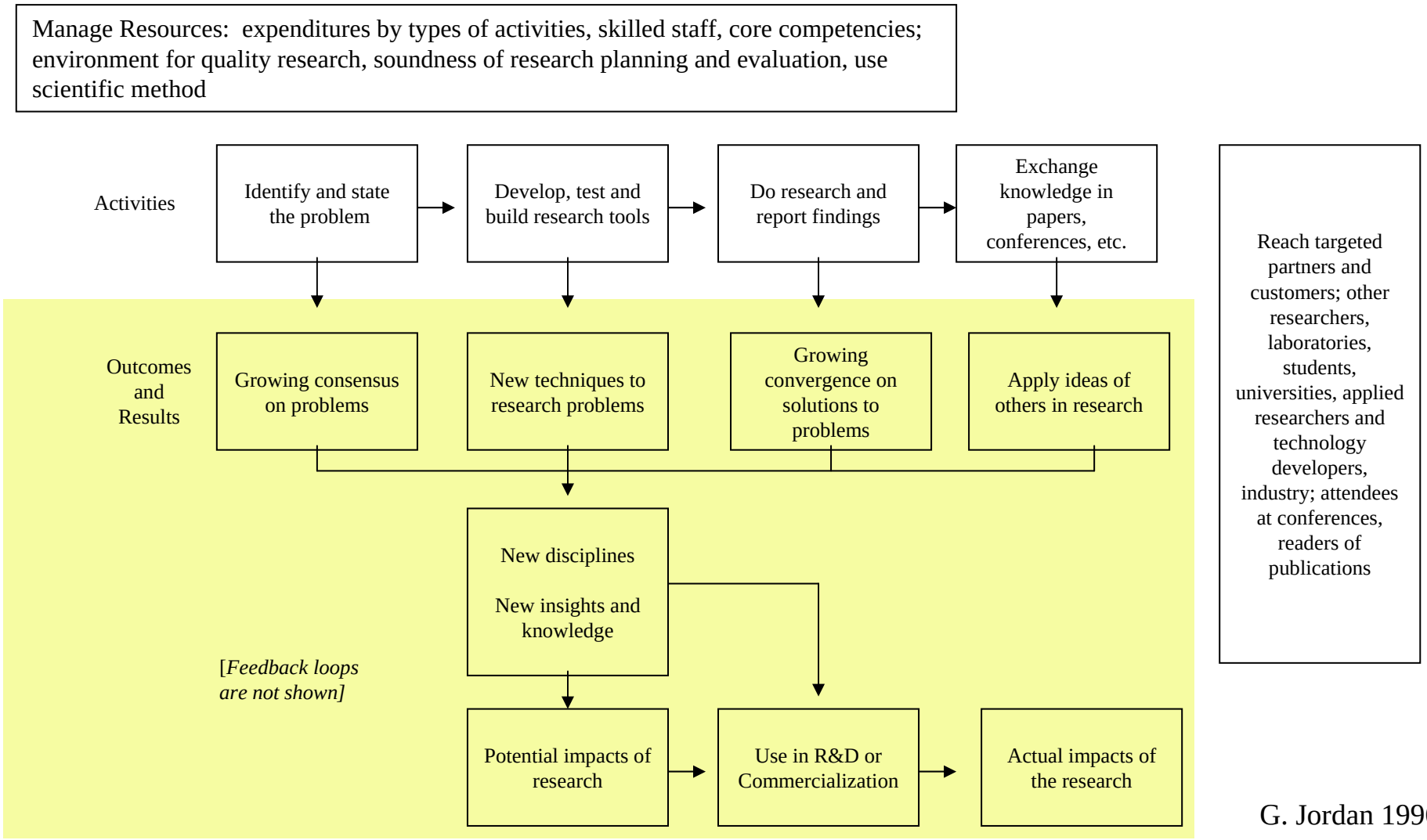
In summary, logic models for R&D programs help identify…



More Examples of Logic Models for Research, for Deployment

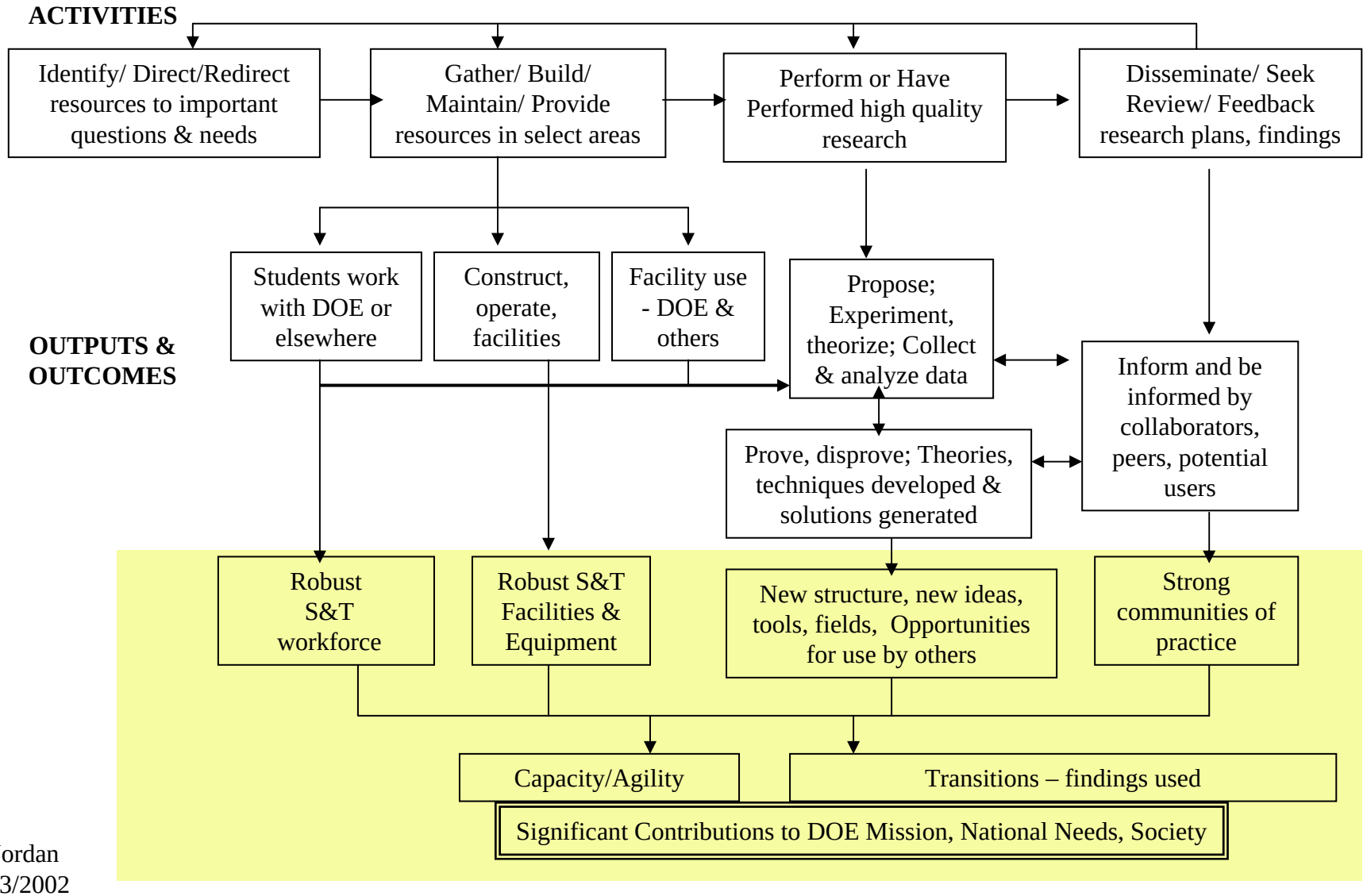
--with emphasis on Outcomes --

The Logic of a Basic Research Project



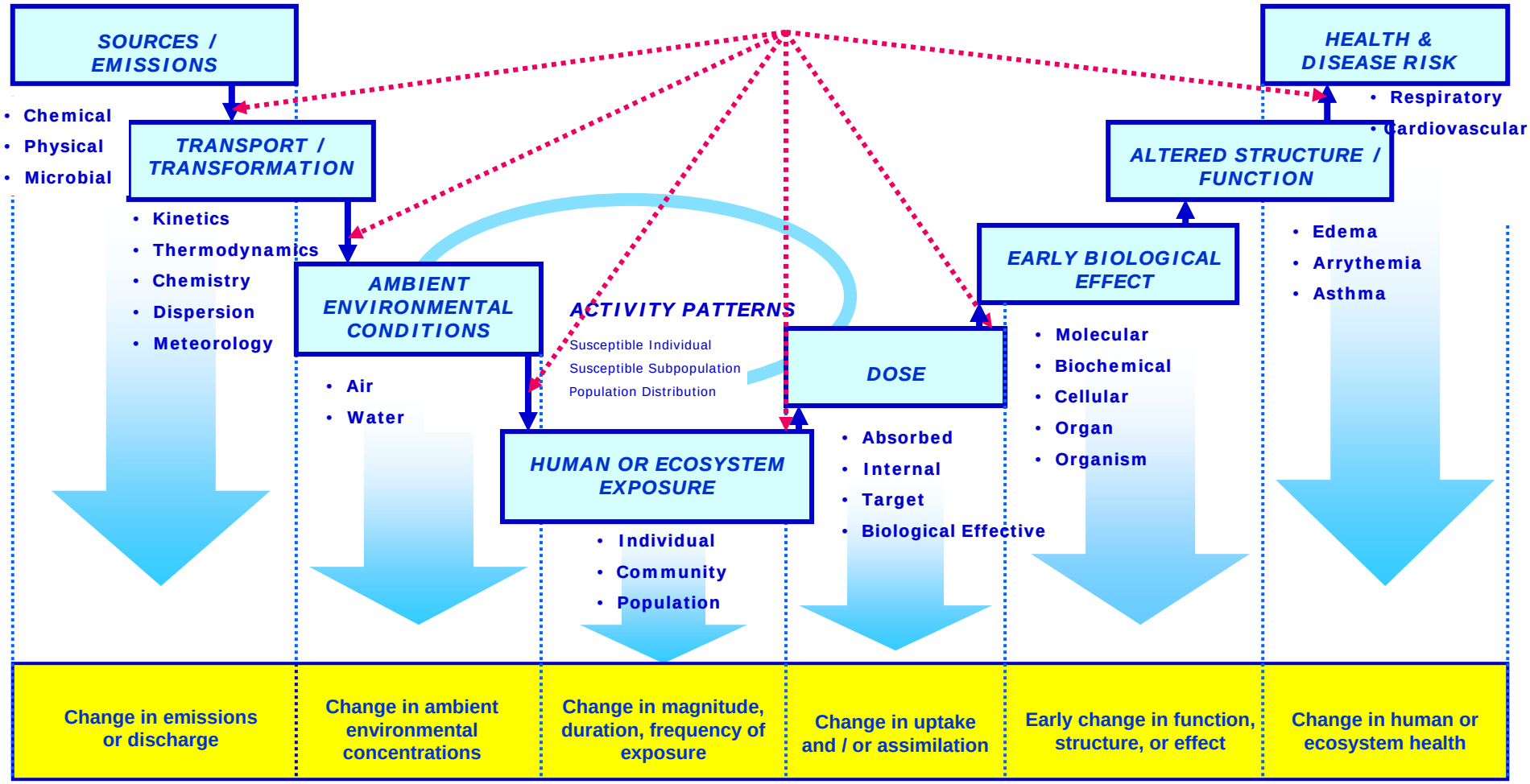
G. Jordan 1996

Logic Model of a Program of Basic Research (U.S. DOE DRAFT -Unofficial)



G. .Jordan
05/13/2002

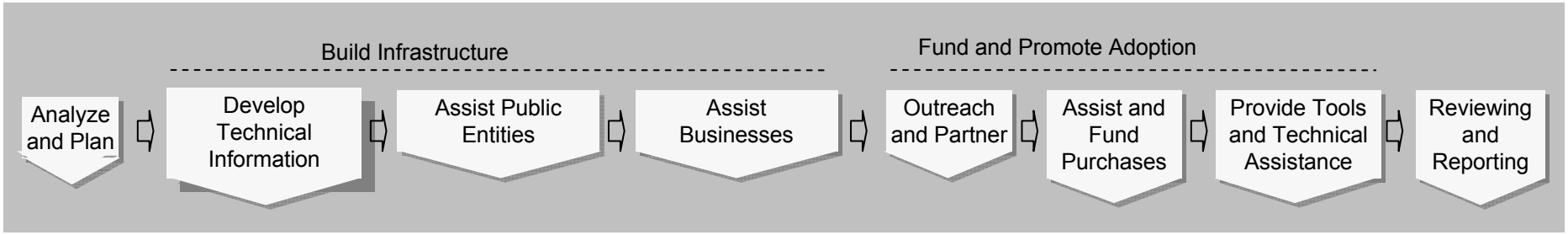
A Framework for organizing the scientific questions and research topics needed to create the scientific foundation for environmental decisions - Particulate Matter Research



Research reduces uncertainty across the health-to-source paradigm and in critical links related to sources, exposure, health effects, risk assessment, and regulatory decision-making

Source: US EPA, Pahl, et al, AEA 2007

EERE programs typically undertake these activities



Partnering with or targeting these audiences

- Technical and other personnel in laboratories, government, firms, colleges, universities
- Federal, state, and local agencies and nongovernmental organizations
- Investors and financiers, manufacturers, distributors, retailers, architects, engineers, trades people
- End user organizations, firms and individuals

To achieve the following intermediate outcomes

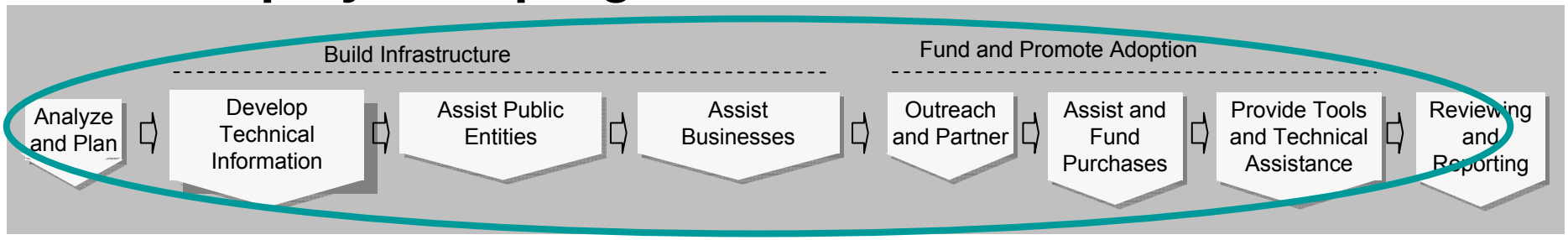
- Market and product knowledge
- Create, advance, and package market and technical knowledge to make energy efficiency more accessible and implementable
- Change the policies, structure and operation of public entities to smooth the advance of energy efficiency and clean energy supply
- Create and enhance products, create and align market channels, enhance marketing, and develop installation and support infrastructures
- Adopt, replicate, institutionalize, and enculturate energy efficient and clean energy supply practices and technologies
- New knowledge, alternative institutional arrangements and processes, new product and service ideas, new opportunities,

That produce the following long-term outcomes or impacts

Reduced energy use and emissions, increased clean energy supply, and enhanced productivity and global security

Source: US DOE, Reed & Jordan

EERE deployment programs undertake these activities.

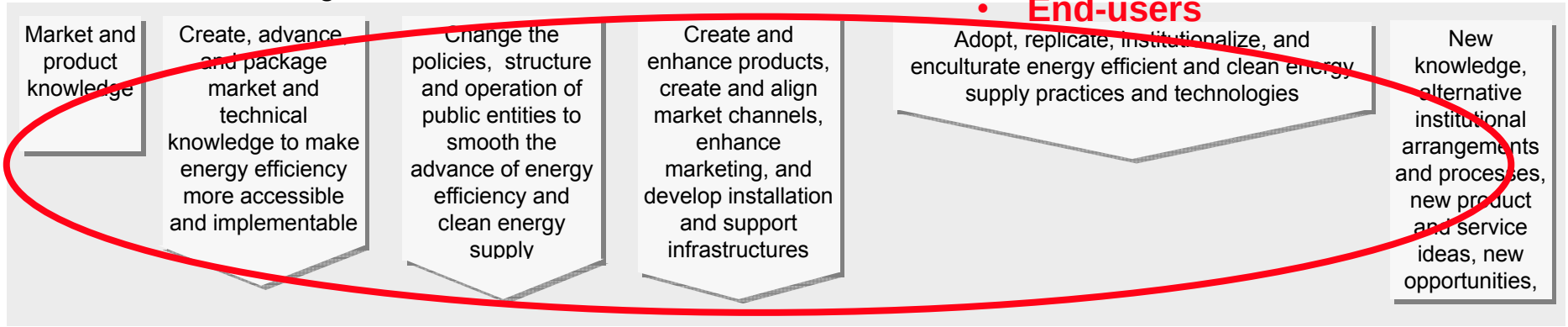


Knowing these activities and their corresponding outputs

We need to describe and measure the expected response of:

- **Knowledge workers**
- **Public Entities**
- **Businesses and manufacturing**
- **End-users**

To achieve the following intermediate outcomes



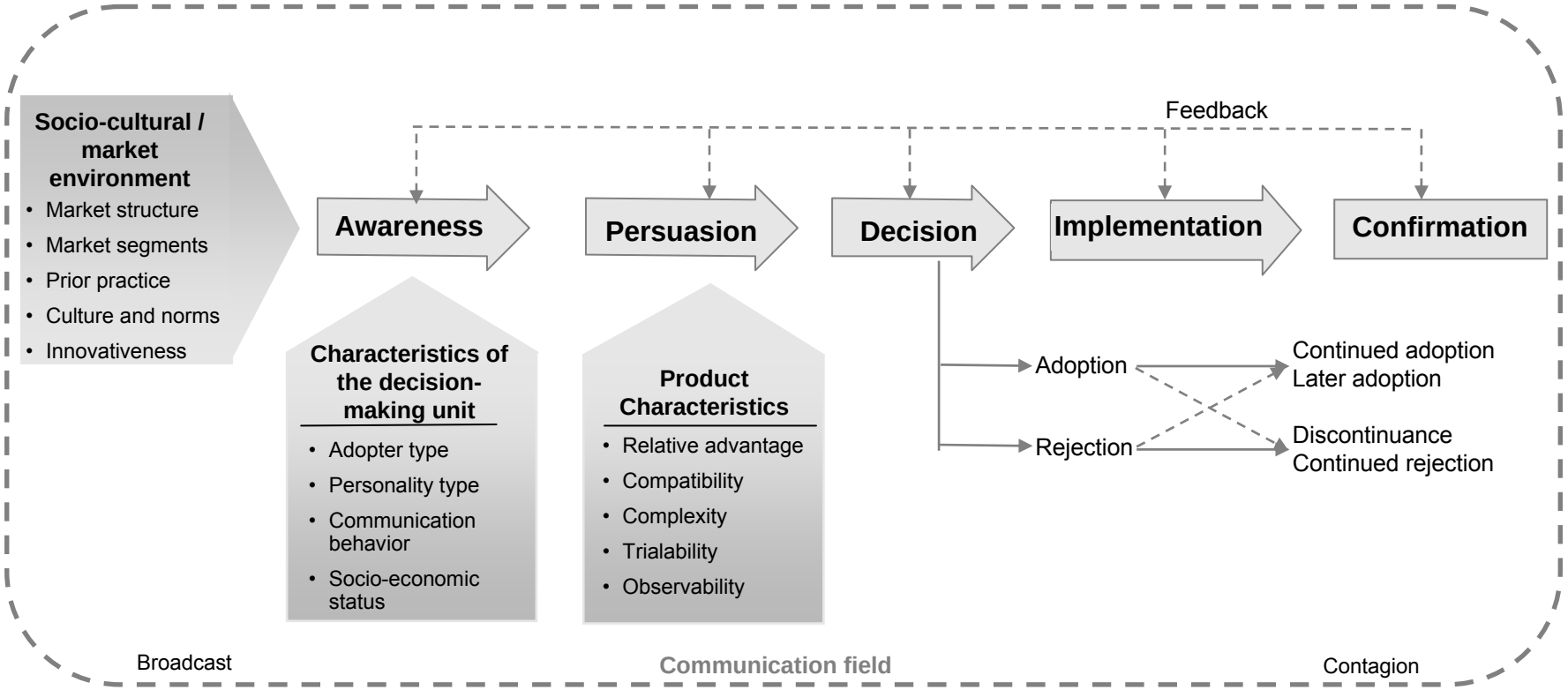
That produce the following long-term outcomes or impacts

Reduced energy use and emissions, increased clean energy supply, and enhanced productivity and global security

To show how activities are connected to impacts

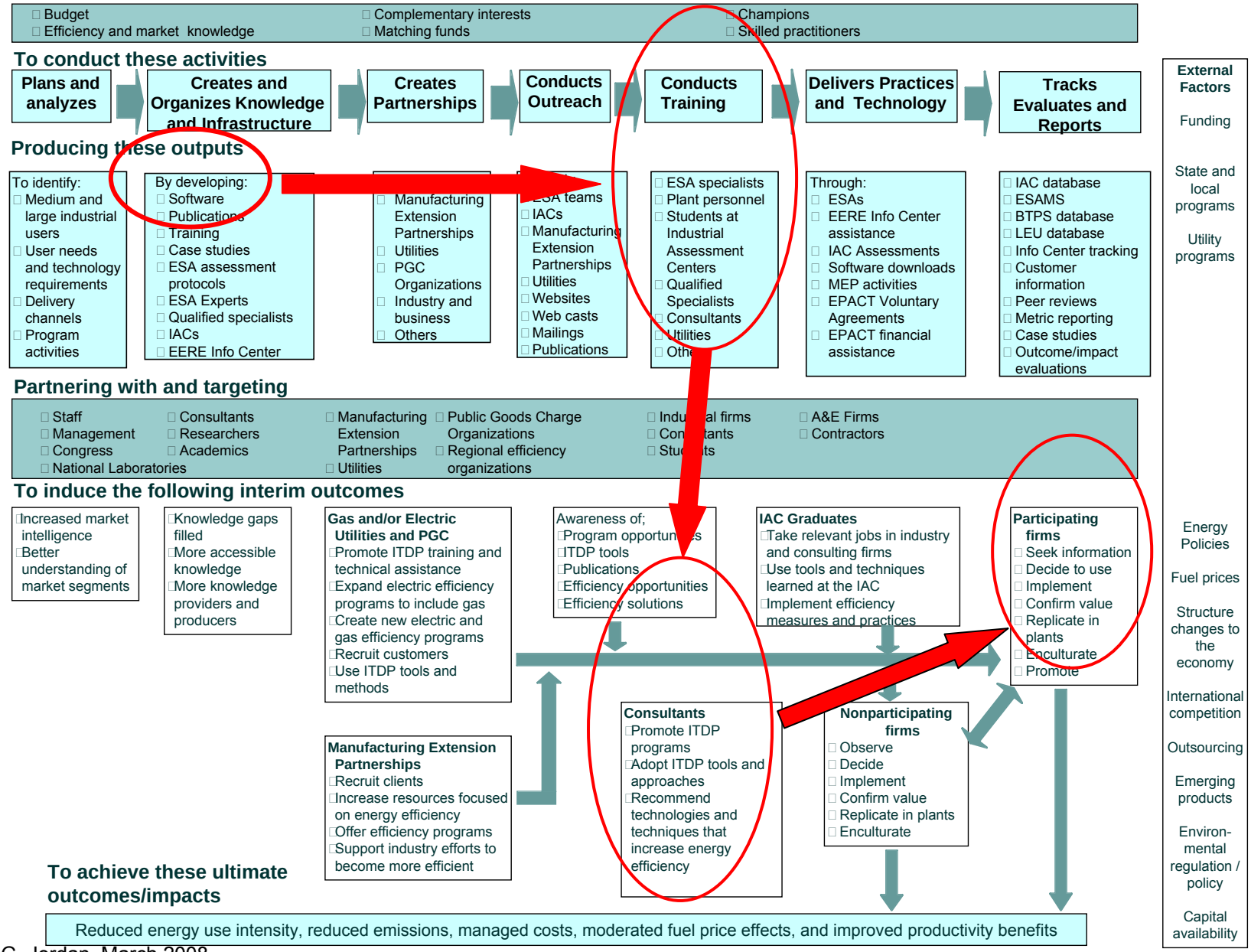
Source: US DOE, Reed & Jordan

Diffusion of Innovations – a model (applies in each domain)



Source: Everett Rogers 1994 as modified by Innovologie, LLC. 2005

A detailed deployment logic model



Thank you.

Questions and Answers